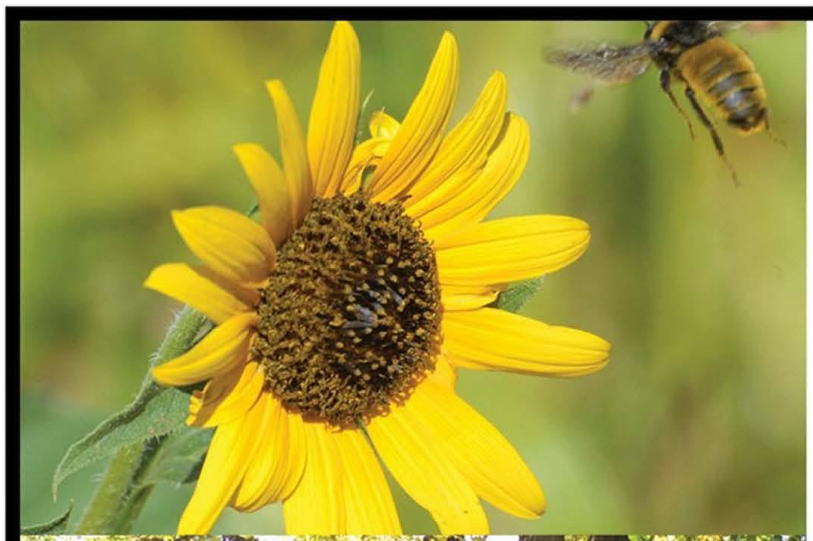
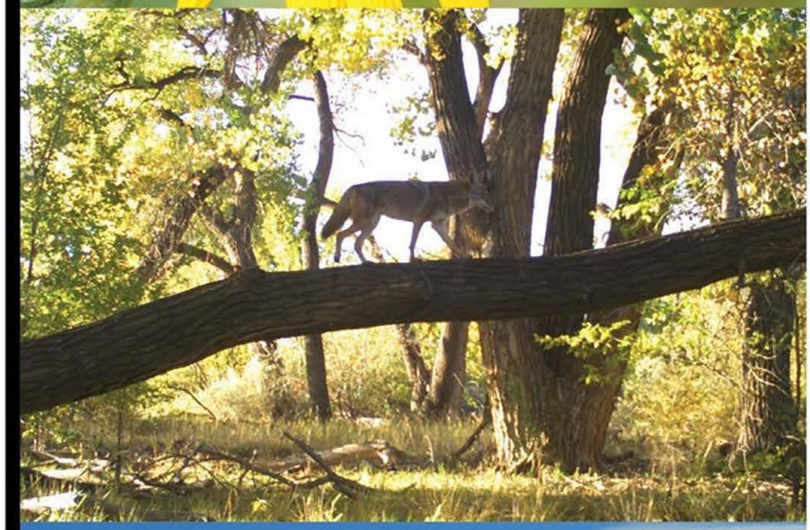




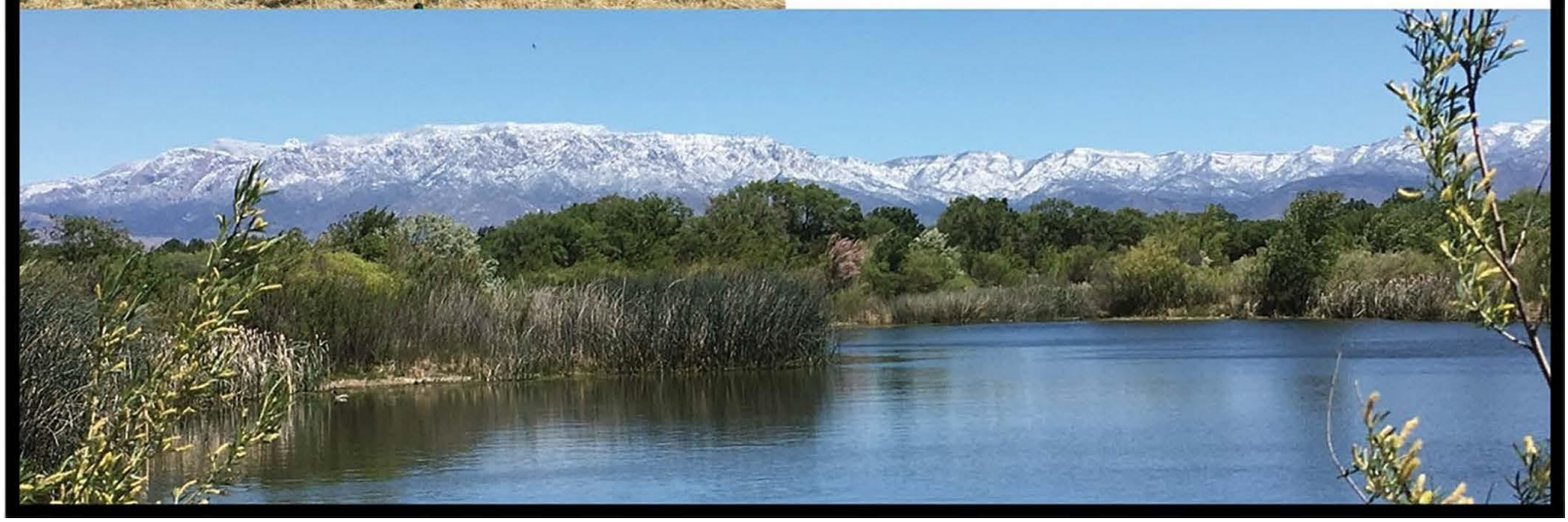
CANDELARIA NATURE PRESERVE RESOURCE MANAGEMENT PLAN

December 2019

ONE ALBUQUERQUE

city of albuquerque

The City of Albuquerque
Parks and Recreation Department
Open Space Division



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Top: Bill Pentler
Coyote: Bill Pentler
Cranes and geese: Mimi Hall
Bottom: Michael Jensen

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The Open Space Division would like to recognize and thank the Technical Advisory Group who led this planning process:

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	State Parks	Heather McCurdy	Rio Grande Nature Center State Park (RGNCSP) Superintendent
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EXECUTIVE SUMMARY

The Candelaria Nature Preserve Resource Management Plan was developed from 2016–2019 through a collaborative, community-driven process led by the Technical Advisory Group with oversight from the Open Space Advisory Board. The Candelaria Nature Preserve (CNP) is to be managed as a nature study area and wildlife preserve providing access to outdoor recreational opportunities for all residents and visitors. This resource management plan (RMP) provides the framework for implementing that mandate and helps to ensure compliance with the federal Land and Water Conservation Fund (LWCF) regulations and guidelines and the Major Public Open Space Facility Plan.

The Candelaria Nature Preserve (CNP) Open Space encompasses 167 acres east of the Rio Grande within the municipal limits of the City of Albuquerque (City). This includes 38.8 acres leased to the State Parks Division of the Energy, Minerals and Natural Resources Department for the Rio Grande Nature Center State Park (RGNCSP). The City purchased the CNP lands partially using federal LWCF funds, which require that the property remain in outdoor recreation use in perpetuity.

Since the purchase of the property in 1978 for the purpose of creating a nature study area and wildlife preserve, a variety of management plans have been developed to help realize that vision. Portions of those plans were implemented, but the original vision never completely materialized. In addition, the management plans were not submitted to the National Park Service to ensure they were compliant with LWCF rules and guidelines. The LWCF program managers and the City assumed that compliance was being met due to the activities at the RGNCSP.

In early spring 2016, concerns over farming practices on the property were raised by some CNP neighbors and other North Valley residents, leading them to contact the Albuquerque Open Space Advisory Board and the LWCF State Liaison Officer (SLO) asking for clarification of the status of the CNP site within the terms of both Major Public Open Space facilities and the LWCF. In October 2016, following a property inspection, the SLO notified the City that the property was not in compliance with LWCF rules and requested that the property be brought into compliance within 3 years.

In 2016 and 2017, in response to this request and the concerns raised by the public, the City Council passed two resolutions (R-16-147 and R-17-159) to develop a Resource Management Plan that brings the City of Albuquerque's Open Space Division into compliance with the LWCF guidelines at the CNP.

This RMP is designed to implement habitat restoration to the benefit of wildlife for the purposes of nature study and wildlife viewing. The plan also includes cost estimates of the various activities recommended to achieve that goal, including the transition from farming alfalfa to wildlife crops, and eventually a restored native habitat throughout the farmed area, as well as recreational activities and educational outreach at the CNP. To ensure that goals for habitat areas

are reached, data will be gathered and evaluated to inform operations and any changes to the plan in an adaptive management approach.

This plan is estimated to cover a 20-year time span and to be implemented in quarterly phases. The Open Space Division shall provide an annual report to the Open Space Advisory Board, available to the public, on the status of the RMP implementation that will include the year's activities, challenges, and funding. In addition, the Open Space Division shall present and review the RMP progress every 4 years with the Open Space Advisory Board to discuss potential updates and changes to the plan in accordance with the goals of outdoor recreation and habitat restoration.

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1 INTRODUCTION

1.1 The Purpose of this Resource Management Plan

The Candelaria Nature Preserve (CNP) shall be managed as a nature study area and wildlife preserve providing access to outdoor recreational opportunities for all residents and visitors, as required by the federal Land and Water Conservation Fund (LWCF) Act. The vision of the CNP as a wildlife preserve to be enjoyed by the public was outlined in the 1976 proposal for LWCF funds from the City of Albuquerque (herein called the City) and State of New Mexico for preserving the existing natural landscape and its plants and animals with a possible nature study area; as reaffirmed in the 1978 rezoning as a Special Use Zone for a Nature Study Center and Preserve; as affirmed by the U.S. Department of Agriculture (USDA) "Land Treatment" plan for wildlife habitat conservation, and as affirmed by the 1979 Master Plan for the Rio Grande Nature Center and Preserve (Predock 1979).

The City directed its Open Space Advisory Board to convene a Technical Advisory Group (TAG) to create a new Resource Management Plan (RMP) for the CNP, to clarify and update the conclusions and goals of previous plans and come into compliance with LWCF rules and regulations. The RMP is consistent with City policy and fulfillment of the City's fiduciary duties, and includes relevant surveys and cost estimates.

This RMP tackles the following management issues:

1. Transitioning the site to serve as a nature study area and wildlife preserve that includes wet and dry areas, hedgerows, grasslands, upland shrublands, conservation buffers, and forage for wildlife.
2. Adaptive management and monitoring.
3. Public access and outdoor recreation.
4. Phased implementation plan and budget.

According to the City's 1999 Major Public Open Space Rank II Facility Plan (City of Albuquerque 1999), the goals of the Open Space Division (OSD) are to acquire and protect the natural character of land designated as Major Public Open Space. These lands are managed to conserve natural and archaeological resources, provide opportunities for outdoor education and low-impact recreation, and define the edges of the urban environment. The Major Public Open Space Facility Plan identifies the types of Major Public Open Space, including Open Space Preserves, under which the CNP falls.

Additionally, the revised Albuquerque/Bernalillo County Comprehensive Plan (Rank 1 Comprehensive Plan) that was adopted by the City Council in 2017 identifies goals that align with the mission of the CNP and LWCF requirements. Those goals include the following:

Goal 10.1 Facilities and Access: Provide parks, Open Space, and recreation facilities that meet the needs of all residents and use natural resources responsibly.

Goal 10.3 Open Space: Protect the integrity and quality of the region's natural features and environmental assets and provide opportunities for outdoor recreation and education.

1.2 The Vision and Mission of the Candelaria Nature Preserve

The vision of the TAG is to engage in a planning process that results in improved ecosystem health and increased biodiversity of the CNP, ensures compliance with LWCF guidelines by providing opportunities for nature study and wildlife-oriented recreation, and fulfills the requirements of City Council Resolutions R-16-147 and R-17-159 (Appendix A).

The mission of the TAG is that the CNP is to be managed as a nature study area and wildlife preserve providing access to outdoor recreational opportunities for all residents and visitors. The CNP is uniquely situated to create and protect habitat for birds and other wildlife. Located along the Rio Grande Flyway, the preserve attracts numerous migratory bird species, as well as other wildlife. The preserve includes the aquatic and bosque habitats provided by the Rio Grande Nature Center State Park (RGNCSP) and is connected to the Rio Grande Valley State Park. Combined, these areas create a corridor of different habitats for birds, small to mid-sized mammals, reptiles, amphibians, and insects. Additionally, the property is in the heart of the North Valley and is a popular destination for residents and visitors due to the rich programs offered at the RGNCSP. The opportunities for community engagement and education abound. The TAG has thoughtfully explored how to provide meaningful education and citizen science activities, as well as cultivate stewards for this land while being protective of the wildlife habitat the CNP supports.

1.3 Maps and Location

The CNP, including the RGNCSP, comprises approximately 167 acres east of the Rio Grande within the municipal limits of the city of Albuquerque (see Figure 1, the LWCF 6(f)(3) map). This site is well situated in the network of local parks and Open Space areas and is easily accessed from area trails.

The RGNCSP tract is located on 38.8 acres leased from the original site and is managed by New Mexico State Parks. The remaining Open Space acreage is managed by the City of Albuquerque OSD. The Open Space has several distinct areas: the Candelaria North Tract (CNT) is located east of the RGNCSP and west of the Duranes Lateral and features farm fields, ponds, bosque habitat and the Woodward House; the 7-acre Tree Nursery Tract (TNT) located east of the Duranes Lateral along Rio Grande Boulevard; and the Candelaria South Tract (CST), south of Candelaria Road.

The CST consists of 31.8 acres located south of Candelaria Road and is bounded on three sides by private property and on the west side by the riverside drain and the Rio Grande. The site is dominated by mature Rio Grande cottonwood (*Populus deltoides* ssp. *wislizeni*), Siberian elm (*Ulmus pumila*), Russian olive (*Elaeagnus angustifolia*), a large expanse of fourwing saltbush (*Atriplex canescens*), sand sagebrush (*Artemisia filifolia*), and mixed grasses. The RGNCSP also

manages a section of the CST that includes a Discovery Pond. Except for the RGNCSP leased area, the CST has been closed to the public with only guided trips. It also includes remnants of the Fraternal Order of Police structures, including a swimming pool that has been filled in with dirt creating a slight elevation, a broken and degraded asphalt road, and a crumbling fire pit lined with basalt; this area is not currently arable and is not irrigated.

The Rio Grande Valley State Park ("the Bosque") is adjacent to the CNP on the west side of the Albuquerque Riverside Drain (see Figure 1 and Figure 2). Refer to Appendix D for project-related maps.

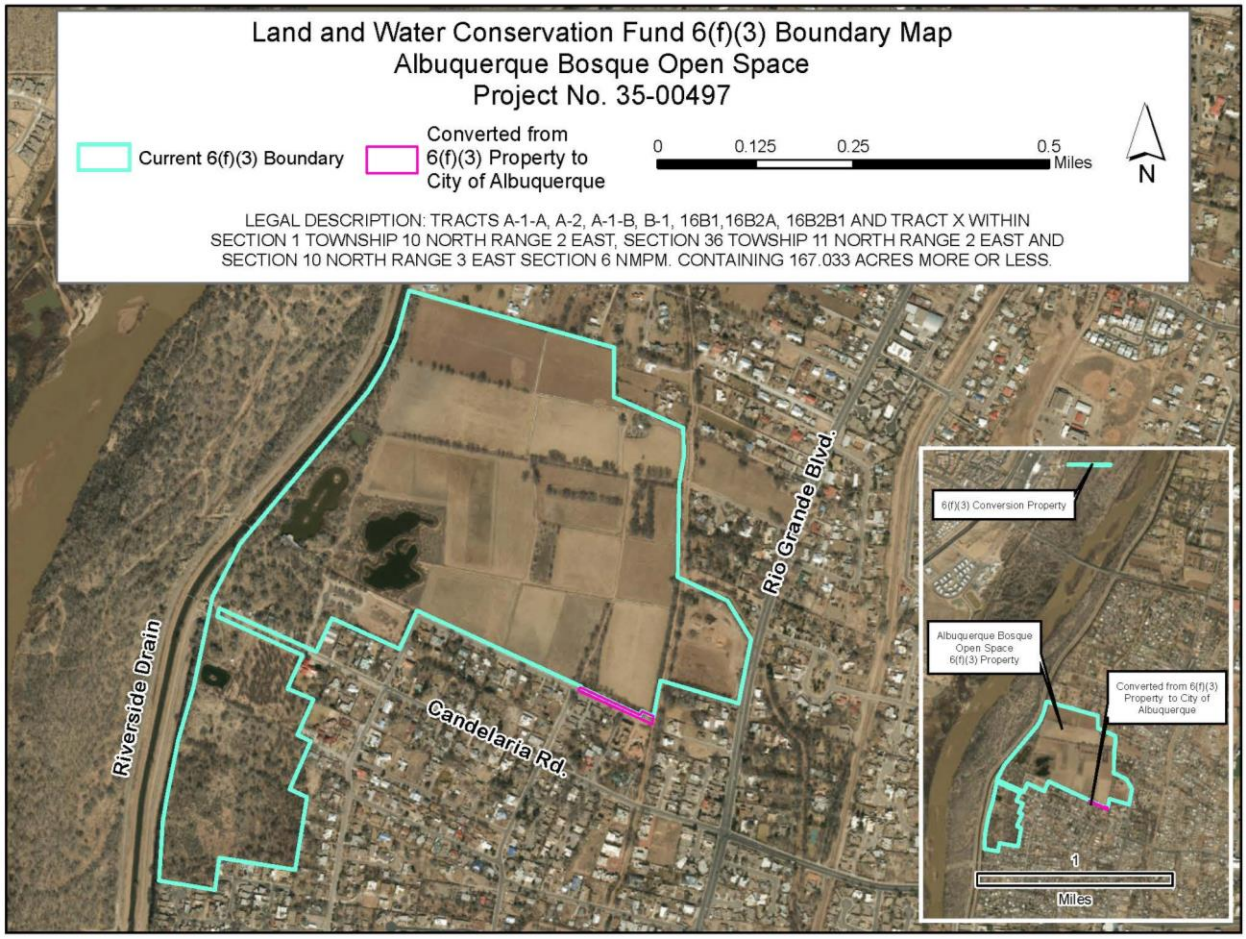

Figure 1. Land and Water Conservation Fund boundary map for Candelaria Nature Preserve.

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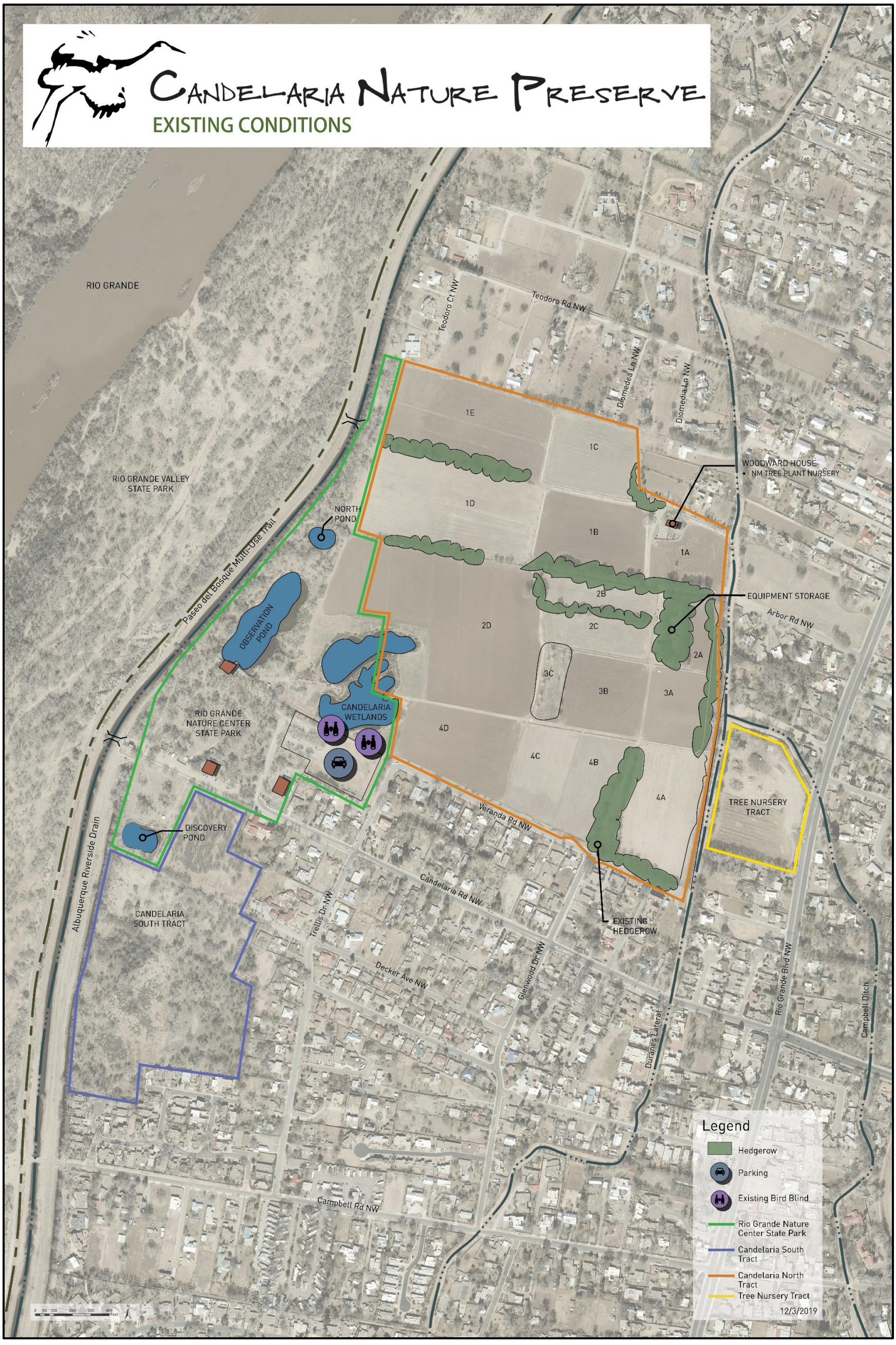

Figure 2. Aerial view of the Candelaria Nature Preserve and Rio Grande Nature Center State Park.

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1.4 Legal Description

The CNP property is described as a Parcel of Land, Section 1, Township 10 North, Range 2 East, and Section 36, Township 11 North, Range 2 East, New Mexico Principal Meridian. This parcel comprises portions of Tracts A-1, A-2, and B-1 of the Candelaria Farms Area Middle Rio Grande Conservancy District (MRGCD) Maps 31 and 34 (filed in Bernalillo County Clerk's Office on December 29, 1967, in Vol. D3 Folio 181).

1.5 Policy Framework

This RMP has been written within the context of an existing policy framework that includes the City of Albuquerque Major Public Open Space Facility Plan, the Albuquerque/Bernalillo County Comprehensive Plan (updated by the City in 2017), the zoning established by the City of Albuquerque, the 1979 Predock Plan, the 1980 Lease Agreement for the RGNCSP site, the 1983 Rio Grande Nature Center Memorandum of Agreement, the Rio Grande Nature Center Management Plan, the LWCF regulatory framework, the State Assistance Program Federal Financial Assistance Manual, and other planning documents, such as the 1993 Bosque Biological Management Plan. These documents, as well as other policy framework and planning documents, are listed below and provided in Appendix A. Due to the amount of reference documents in Appendix A, the documents are available on CD.

1.5.1 *The Land and Water Conservation Fund Regulatory Framework*

The property was purchased as part of the Bosque Open Space Land Acquisition Project in 1978. The cost was $1,707,000, funded with a combination of State and federal grants ($600,000), sale of surplus City land ($308,500), General Obligations Bonds ($737,324), and Surplus City Capital dollars ($61,176). The grant monies were from the Secretary of the Interior's Contingency Fund of the LWCF (16 United States Code 460D, 4601-4 to 4601-11). The purpose of the LWCF is to "assist in preserving, developing, and assuring to all citizens of the United States of present and future generations such quality and quantity of outdoor recreation resources as may be available and are necessary and desirable for individual active participating" (Public Law 88-578: 16 United States Code 4601-4 et seq.). As interpreted by the National Park Service (NPS), the rules governing use of LWCF funds apply not only to the specific property purchased with those funds, but also to the entire management unit. In this case, the entire CNP is "encumbered," or subject to the LWCF rules *in perpetuity*. This includes the RGNCSP, which is located on land that was part of the original purchase and leased to the State.

The LWCF regulations require that properties acquired or developed with LWCF assistance shall be operated and maintained so as to appear attractive and inviting to the public; protective of public safety and health; kept open for public use at reasonable hours and times of the year, according to the type of facility; and kept in reasonable condition to prevent undue deterioration and to encourage public use; and shall have posted an LWCF acknowledgement sign at the project site. Any removal of the property or portion of the property from outdoor recreation use

constitutes a "conversion," which must be approved by the NPS through a rigorous application and review process. An approved conversion requires that the outdoor recreation facility or property be replaced with a facility or property of equivalent value. Congress must approve any transaction for a facility or property replacement. Responsibility for compliance with the LWCF regulations rests with the State and the State Liaison Officer (SLO) and requires an inspection of the property every 5 years. Over the years, as a result of changes in management of the LWCF program, the understanding that the entire CNP property was subject to LWCF rules was lost and inspections were focused on the RGNCSP, which has always been compliant with LWCF guidelines.

On September 21, 2016, the LWCF SLO performed an inspection of the CNP property and found several issues of non-compliance. The entire property was not reasonably accessible to the public. The farm fields were fenced and equipped with signs clearly prohibiting public access. Additionally, no signs were posted acknowledging LWCF funding for the property's acquisition. In researching the history of the property, the SLO also found that there had been no NPS-approved management plan for the entire property outlining acceptable outdoor recreation activities to ensure compliance with LWCF guidelines. The City was notified of these issues in an October 6, 2016, letter to the Mayor requesting that efforts be made to bring the property into compliance.

In a subsequent letter of February 14, 2017, to the Albuquerque Parks and Recreation Director, the SLO further notified the City that the large extent of agricultural activities taking place on the CNP property (at least 60 acres of the 87 farmed acres were crops for sale by the farmer, with only 20 acres for wildlife cropping and 7 acres of unirrigated wildlife habitat) effectively excluded outdoor recreation opportunities, thus making agriculture the primary use of the property in those areas. The use of LWCF encumbered land primarily for agriculture is not allowed. Since no NPS-approved management plan for the entire property existed, the City determined that the best course of action for achieving compliance was to develop a new management plan with public participation. The February 14 letter from the SLO gave the City 3 years to bring the property into compliance. This RMP, in response to City Council Resolutions R-16-147 and R-17-159, is the result of that effort. Prepared with public notice and involvement, this RMP outlines the goals and objectives of the outdoor recreation use of the CNP property so as to ensure consistency with LWCF regulations and guidelines.

Large areas of the CNP property are still in agriculture production, with more land being devoted to wildlife crops to provide increased wildlife viewing opportunities to the public while an approved management plan is being developed and approved. The LWCF manual specifically excludes agriculture as an allowable primary activity. The LWCF also specifically prohibits acquisition of land primarily for the preservation of agricultural purposes. These mandates were not recognized in previous management plans completed for the property, which was intended to be a nature study area and wildlife preserve. Appropriate and allowable outdoor recreation activities consistent with the wildlife preserve objective must be outlined and management practices must be developed as to provide reasonable public access to the property for all

residents and visitors. This applies to the entire property, including the CNT, the CST, the TNT, and the RGNCSP leased areas.

This plan will identify appropriate outdoor recreation activities for the CNP, develop guidelines for reasonable public access consistent with the wildlife preserve objective, and outline a process and schedule for transitioning the current, non-compliant land uses to wildlife preserve–related outdoor recreation.

1.5.2 *City of Albuquerque Documents and Policies Related to the Candelaria Nature Preserve*

RESOLUTION R-16-147

Resolution R-16-147 states that the CNP is to be managed as a nature study area and wildlife preserve providing access to outdoor recreational opportunities for all residents and visitors, as required by the LWCF Act and as intended by the 1976 proposal from the City and State for preserving the existing natural landscape and its plants and animals for "nature study, recreation uses, open space, and urban shaping." The Resolution directed the OSD and Parks and Recreation Department to develop a new RMP for CNP that will meet LWCF requirements and commitments the City made in accepting LWCF funding to acquire the CNP site. In particular, the Resolution states that "[t]he RMP shall utilize as its basis and shall not reinvent, but rather clarify and update the conclusions and goals of previous plans, in particular the 1979 Predock plan." The RMP is to be submitted to the Parks and Recreation Department Director, the Open Space Advisory Board, and the City Council for review that will include conformance to LWCF rules, consistency with City policy, fulfillment of the City's fiduciary duties, and inclusion of relevant surveys and cost estimates.

To aid in developing the RMP, the OSD and Parks and Recreation Department were directed to convene a TAG (composed of representatives from neighborhoods, federal agencies, State agencies, and other technical experts) to work with all interested parties to determine the funding necessary to carry out the RMP and work collaboratively to secure the ongoing funding to maintain the CNP as a wildlife preserve and nature study area. The Resolution states that to prevent degradation of the property and maintain wildlife habitat, the City may lease the CNP for agricultural activity during the RMP process; however, organic farming practices shall be encouraged, use of pesticides shall be prohibited, and use of herbicides shall be minimized. In addition, nothing in the Resolution is intended to limit or interfere with projects intended for the repair, maintenance, or upkeep of the CNP.

RESOLUTION R-17-159

Resolution R-17-159 amended parts of Resolution R-16-147. The amendment gave the Open Space Advisory Board oversight of the RMP process, including convening the TAG and working collaboratively with the OSD and Parks and Recreation Department to complete the RMP. To develop a new RMP, the Open Space Advisory Board named a lead and alternate lead for the TAG, and the lead assembled the remaining TAG members and additional experts. A final

list of the TAG members was to be submitted to the Open Space Advisory Board, the OSD, the Parks and Recreation Department, and the City Council. The TAG was charged with providing a status report on the development of the RMP to the City Council upon request.

1978 ZONING CHANGE TO SPECIAL USE

The City Environmental Planning Commission re-zoned the original Candelaria Farm Nature Center and Preserve lands R-1 and R-2 to SU-1 (Nature Center and Preserve) on May 16, 1978. The SU-1 zoning also imposes restrictions on the use of the land. For example, new permanent structures are considered Extraordinary Facilities and must pass through a public hearing process before they are approved at the site.

1979 RIO GRANDE NATURE CENTER AND PRESERVE MASTER PLAN (PREDOCK PLAN)

The 1979 Rio Grande Nature Center and Preserve Master Plan (Predock Plan; Predock 1979) was developed to outline the elements necessary to establish a properly functioning nature facility. The facility would include a Nature Preserve—for the encouragement and protection of native wildlife communities—and a Nature Center and Interpretive Programs as an interface whereby the public could benefit from the knowledge gained in studying wildlife at the preserve. The site would be managed based on key criteria: biological feasibility; improvement of soils, plants, and wildlife communities; increased plant productivity with minimal artificial treatment; economic feasibility; and maximum edge condition. The plan states that in order to prevent disturbance to wildlife, access would be limited.

The Predock Plan was developed to provide a guide for development of the Candelaria Farms site that will not only explore its exciting educational and recreational potential but will also preserve and reinforce its existing beneficial open space qualities. The plan states that in order to prevent disturbance to the wildlife, certain zones of the site are restricted and public entry is not permitted into these areas (Predock 1979). The CNP shall be considered one such restricted area, and entry will be limited to guided programs. The plan also states that the farm was to be farmed for wildlife crops, providing forage and cover.

1980 LEASE AGREEMENT

The State leased 38.8 acres of the original site for the development and operation of the RGNCSP on December 3, 1980. The boundaries of this lease area are illustrated in Figure 1 and Figure 2.

1983 RIO GRANDE NATURE CENTER MANAGEMENT PLAN

The 1983 Management Plan, prepared by the New Mexico State Parks and Recreation Division, developed comprehensive operation and management strategies for the entire property, identifying eight distinct management units: wildlife cropland, agriculture cropland, bosque/riparian woodland (the 100 acres of the bosque leased from the Middle Rio Grande Conservancy District; lease has since expired), pond/wetland, tree nursery, State Park

development area, trails, and southern tract. The Management Plan outlined specific purpose and management guidelines for these specific management units.

1983 MEMORANDUM OF UNDERSTANDING BETWEEN THE CITY AND STATE

The Memorandum of Understanding between the State and the City (Contract No. 71-541-15 dated June 6, 1983) documents the working relationship and collaboration between the City of Albuquerque OSD and the New Mexico State Parks and Recreation Division (Appendix A). The Memorandum of Understanding states that the lands will be managed as outlined in the Rio Grande Nature Center Management Plan dated May 1983.

1999 MAJOR PUBLIC OPEN SPACE RANK II FACILITY PLAN

The City's 1999 Major Public Open Space (MPOS) Rank II Facility Plan identifies the types of Major Public Open Space, including Open Space Preserves. An Open Space Preserve is defined as an area that is set aside for its exceptional natural, cultural, or scenic value. Resources are fragile, and protection is the primary management objective. An Open Space Preserve provides protection of views, native vegetation and wildlife habitat, geological features, and/or archaeological, historical, or cultural features. Management emphasis is on restoring, preserving, and enhancing the characteristics of the area. Development is limited to the minimum required for public safety and resource protecting and enhancement. Public access is only allowed under the supervision of staff and by permit. Open Space Preserves may be closed to public access to protect habitat and historic, cultural, and archaeological resources. In the case of Candelaria Nature Preserve, the values intended for development and protection were a nature study area and a preserve for wildlife forage and habitat, with the goal of providing public education about the Middle Rio Grande and Bosque ecosystems through the RGNCSP. However, limited access for outdoor recreation—most typically wildlife viewing—needs to be provided at the CNP due to LWCF requirements. Therefore, the MPOS policies restricting general public access will be modified to comply with LWCF policy.

Policy A.1.B. This MPOS type shall be conserved and protected for its intrinsic value as a significant visual, natural, or environmental resource. Trails shall be limited to those necessary for research, maintenance, policing, and scientific study. Protection of these resources should include natural barriers, fencing, signage, control of use, and patrol by rangers.

Policy A.2.C. Resource Management Plans should be developed for the Sandia Foothills, West Side Open Space, Candelaria Farms, the Montessa Off-Road Vehicle Park, Placitas Open Space, Calabacillas Arroyo, East Mountain Open Space, and Tijeras Arroyo.

The Resource Management Plan shall:

- identify land use "carrying capacity;"
- identify access point(s);
- identify facility locations, including utility and transportation corridors;
- identify areas to be monitored and develop a monitoring and management plan;

- establish policies (in this RMP these are referenced as protocols) for resource management, access and parking, facility management, staffing, fees, interagency cooperation, and enforcement;
- classify the parcels within the RMP area by MPOS type, according to the criteria contained in Table 2-1 within the MPOS (City of Albuquerque 1999);
- evaluate impacts or proposed development within the MPOS on adjacent areas; and
- evaluate reasonable alternative development schemes.

1.5.3 *Albuquerque/Bernalillo County Comprehensive Plan (2017) Rank 1 Plan*

Additionally, the revised Albuquerque/Bernalillo County Comprehensive Plan that was adopted by the City Council in 2017 identifies goals, policies, and actions that apply to this RMP. They include the following:

Goal 10.1 Facilities and Access: Provide parks, Open Space, and recreation facilities that meet the needs of all residents and use natural resources responsibly.

> **Policy 10.1. 1: Distribution:** Improve the community's access to recreational opportunities by balancing the City and County's parks and Open Space system within the built environment.
>
> A) Protect and maintain a high-quality, accessible system of recreation facilities and site sufficient to serve all areas.
> B) Establish an interconnected network of parks, Open Space, and trails with safe pedestrian connections to community facilities, neighborhoods, and Centers.
>
> **Policy 10.1.2: Universal Design:** Plan, design program, and maintain parks, Open Space, and recreation facilities for use by people of all age groups and physical abilities.
>
> A) Design and maintain landscaping and park features appropriate to the location, function, public expectation, and intensity of use.
>
> **Policy 10.1.4: Water Conservation:** Employ low-water use and reclamation strategies to conserve water.
>
> A) Incorporate native vegetation and low-water use species wherever possible, particularly in areas without easy access to irrigation.
> B) Integrate irrigation, water conservation, drainage, and flood control functions within parks and Open Spaces with ecological preservation and recreational purpose.

Goal 10.3 Open Space: Protect the integrity and quality of the region's natural features and environmental assets and provide opportunities for outdoor recreation and education.

> **Policy 10.3.2: Preservation:** Identify and manage sensitive lands within the Open Space network to protect their ecological functions.

A) Manage public access to best protect natural resources.
B) Ensure that development within Open Space is compatible with its preservation purpose.

Policy 10.3.3: Use: Provide low-impact recreational and educational opportunities consistent with the carrying capacity of the Open Space resources.

Policy 10.3.4: Bosque and Rio Grande: Carefully design access to the Rio Grande, the bosque, and surrounding river lands to provide entry to those portions suitable for recreational, scientific, and educational purpose, while controlling access in other more sensitive areas to preserve the natural wildlife habitat and maintain essential watershed management and drainage functions.

A) Minimize disturbance or removal of existing natural vegetation from the bosque.

1.5.4 *Other Applicable Planning Documents*

Planning documents that may further complement the policy context of this plan include the following:

- 1979 Rio Grande Nature Center and Preserve Master Plan (i.e., Predock Plan)
- 1988 Albuquerque/ Bernalillo County Comprehensive Plan
- 1993 North Valley Area Plan
- 1993 Bosque Action Plan (Rank 2 Plan)
- 1993 Middle Rio Grande Ecosystem: Bosque Biological Management Plan
- 1999 Major Public Open Space Facility Plan
- 2004 Open Space RMP for the Candelaria Farm Preserve, Draft
- 2005 Middle Rio Grande Ecosystem Bosque Biological Management Plan, The First Decade: A Review and Update
- 2010 Special Management Areas Joint Management Plan
- 2010 Rio Grande Nature Center State Park Management Plan
- 2012 Department of the Interior–mandated Middle Rio Grande Conservation Initiative: A Citizen's Report: Strengthening Our Heritage in the Middle Rio Grande
- 2017 Albuquerque/Bernalillo County Comprehensive Plan
- City of Albuquerque's Integrated Development Ordinance

2 PROJECT HISTORY

2.1 Environmental History of the North Valley

The North Valley and CNP are situated at the northern end of the southern Rio Grande Rift valley, located at the western base of the Sandia Mountains in the physiographic Basin and Range Province of North America (Hawley 1978). The southern Rio Grande Rift valley resulted

from extensive tectonic activity, producing horst/graben physiography with fault block mountains, volcanic activity, and a subsidence rift valley during the early Miocene approximately 20 million years ago (Hawley 1978; Hunt 1983). The Rio Grande historically began flowing through the vicinity of the Albuquerque Reach of the Rio Grande during the Miocene, initiating the present river course (Hunt 1983). The southern Rio Grande Rift valley becomes broad in the vicinity of the Albuquerque Reach, where the Rio Grande transitions from a region of steeper elevation gradients and narrow valleys and canyons to the north, to a more gradual grade over a broad valley with historic floodplains to the south (U.S. Army Corps of Engineers [USACE] et al. 2006).

The Middle Rio Grande (MRG) Basin is defined as that portion of the Rio Grande and its drainages from Bandelier National Monument on the east side of the Jemez Mountains, south to the upper end of Elephant Butte Reservoir (Scurlock 1998) within New Mexico. However, this same geographic area also is known as part of the "Upper Rio Grande Basin" (USACE et al. 2006) relative to the entire Rio Grande watershed from Colorado to the Gulf of Mexico.
The North Valley area is part of the Albuquerque Reach of the MRG. The Albuquerque Reach ranges in elevation from 1,538 m (5,047 feet) above mean sea level (amsl) at the upstream end at Angostura Diversion Dam to 1,490 m (4,890 feet) amsl at the downstream end at the southern boundary of Isleta Pueblo. The MRG adjacent to the CNP is defined by Scurlock (1998) and the multi-agency Endangered Species Collaborative Program (Tetra Tech 2004).

Since the onset of the Holocene about 10,000 years ago, the climate of northern New Mexico has been semiarid with a history of cyclic drought and wet periods (Swetnam and Betancourt 1999). For the past 600 years, there has been little evidence for any major changes in the climate of the MRG Basin, other than a cool period from about A.D. 1450 to 1850 and the recent global warming trend (Hall et al. 2006; Rahmstorf et al. 2007). At least 52 major droughts were recorded in the MRG Basin over the past 448 years, occurring about every 9 years. In more recent times, increased occurrences of El Niño Southern Oscillation events have resulted in numerous short-term changes in precipitation and temperature, affecting flow volumes and rates in the Rio Grande (Lee et al. 2004; Swetnam and Betancourt 1999). Snowmelt runoff from the San Juan, Sangre de Cristo, and Jemez Mountains has historically been the primary source of water for the Rio Grande, with additional local input from summer storms. Hall et al. (2006) demonstrates that in recent times (since the 1960s), the timing of spring runoff and subsequent Rio Grande flow rates have begun to occur earlier in the season, in response to variations in temperature and precipitation. See the Climate section (D 1.1) below, for more about recent global warming and climate change.

2.2 Native and Early Spanish Settlement along the Middle Rio Grande

The valley floor of the Rio Grande varies in width from 3 to 5 miles near Albuquerque. It has the richest agricultural land in the semi-arid environment of New Mexico. The valley's fertility was maintained by the continuous deposition of rich organic soils formed by erosion of rocks and

debris from the Sandia Mountains and the west mesa, as well as from flooding of the valley floor by the Rio Grande.

Native peoples experienced unstable agricultural conditions caused by seasonal floods and droughts. Although floods periodically wreaked havoc on valley settlements, the indigenous people who carefully tended these productive lands to grow food for human and animal consumption considered them a blessing. In order to maintain economic stability, survival, and sustenance, they were forced to move their villages between the upland and riverine areas, as dictated by the river. Management of their agricultural and hunting lands involved rich symbolism and rituals that served to regulate land use practices and to articulate their agrarian knowledge of non-literal peoples (Conklin 1972; Ellen 1982). The survival of their pueblos along the river depended on the sustainable land use practices that enhanced the land's productivity.

When the Spanish settlers came to New Mexico, they entered with a different paradigm. Their evangelical activities often altered the symbolic, social, and ceremonial bases of agriculture of the Indians. The Spanish established small farms and a few large haciendas among the Indian lands. Using Native labor, they planted new crop species such as onions, lettuce, radishes, grapes, plums, peaches, wheat, barley, and chiles, as well as a variety of beans from Mexico. On the grasslands and lower foothills, the settlers grazed domesticated herds of cattle, sheep, and goats.

Although the Spanish were driven from the valley during the Pueblo Revolt of 1681–1692, they soon returned and reinstated the process of intense colonization. The land use patterns they established persisted in the valley for over 200 years. These patterns included the development of acequia irrigation and the division of land into lineas (long narrow strips) for the purpose of accessing both productive valley lands adjacent to irrigation waters and mesa lands for continued grazing of large herds of cattle and sheep. Their primary occupation was subsistence farming, through which farmers raised enough food to support themselves and their extended families.

By the time the Villa of Albuquerque was established in 1706 where Old Town is located today, the emergence of cash cropping and increased demand for particular export items had simplified indigenous and traditional Spanish land use strategies. The result was a destabilization of the resource base and agriculture risk management strategies. The Villa served a vital role as the center of early trading for food and supplies along the El Camino Real, or the "Royal Highway," which ran from Mexico City north to Santa Fe. An early Spanish visitor described the crops taken from the North Valley for sale in the plaza at harvest time as being, "many, good, and everything sown [in the valley] bears fruit" (Sargeant and Davis 1986).

By 1790, an official Spanish census listed six defined family settlements, or "plazas," north of Albuquerque, which grew into small villages. From south to north—roughly between present-day Rio Grande Boulevard and 4th Street—these were the Plaza de Senor San Jose de los Duranes, the Plaza de los Candelarias, the Plaza de Nuestra Senora del Guadalupe de los Griegos, the Plaza del Senor de los Gallegos, the Plaza de San Antonio de los Poblanos, and the Plaza de San Jose de Los Ranchos (Figure 3). Each community was centered around a chapel and connected by a series of dirt roadways (Sargeant and Davis 1986).

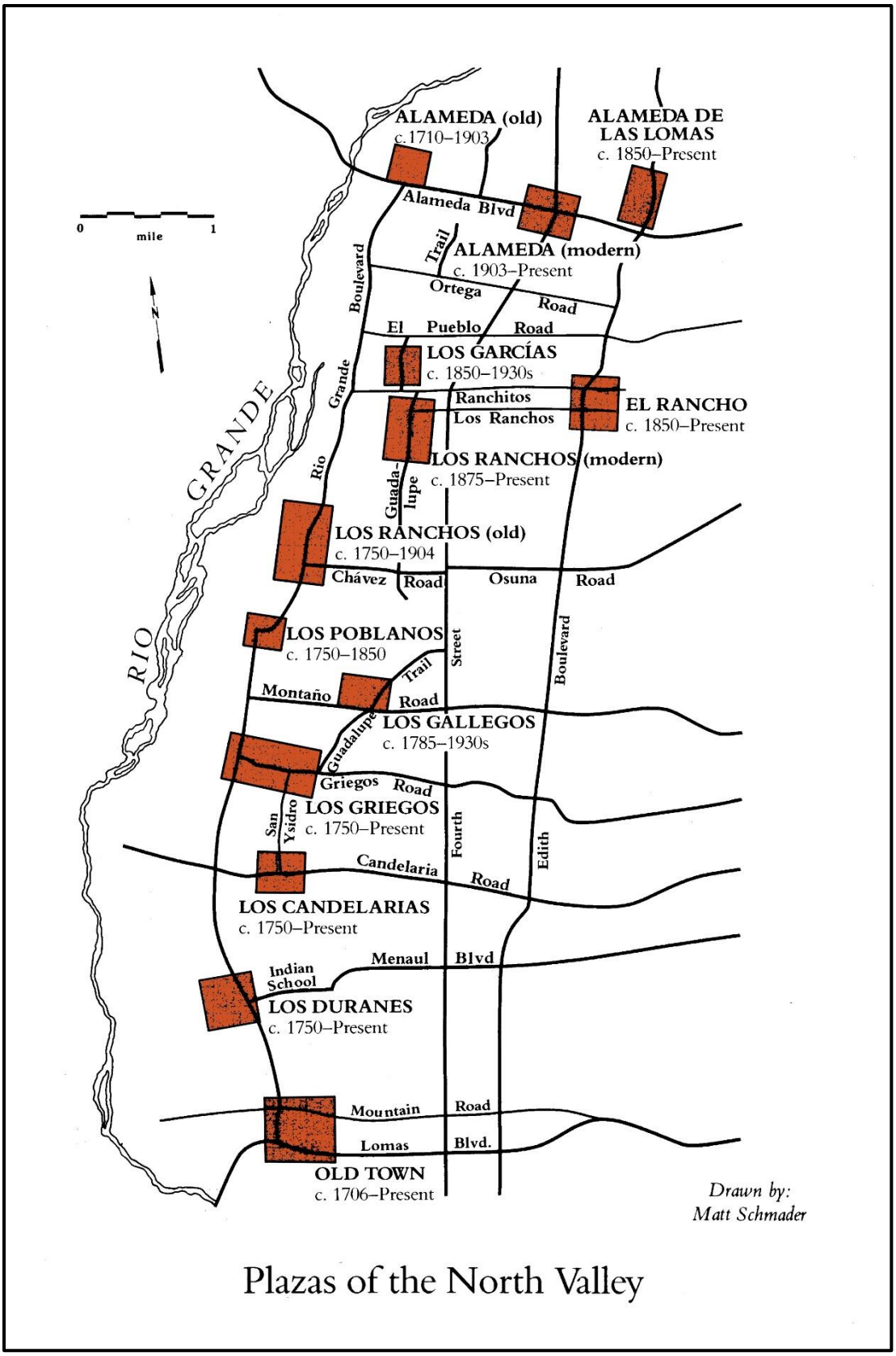


Figure 3. Historical plazas of the North Valley.

2.3 River Flooding, River Engineering, and the Consequences

Before the engineering of the mid-twentieth century, the Rio Grande consisted of numerous braided channels that were dynamic and changed frequently across a broad floodplain in the Albuquerque Reach (Scurlock 1998; see images in Tetra Tech 2004:28). Numerous channels, oxbows, and wetlands were common (Crawford et al. 1993; Scurlock 1998). During the 1700s, the Rio Grande channel shifted considerably to the west in several reaches of the MRG, including at the settlement of Bernalillo and likely the northern portion of the Pueblo. The Rio Grande again shifted to the west in the early 1800s, and was described as about 91 m (300 feet) wide, shallow, and sandy. However, in 1873, the Rio Grande at Albuquerque (Barelas) was described as being 183 m (600 feet) wide and about 1.2 m (4 feet) deep (Scurlock 1998).

Prior to the 1500s, human water use in the Rio Grande valley consisted of limited agricultural irrigation by Native pueblo people and early Spanish settlers (Scurlock 1998). Starting in the late 1600s, the division of the large Spanish and Pueblo land grants into smaller private parcels throughout the valley confined the historical and cultural movement of peoples from the riverine lands to the uplands. As a result, valley farms were susceptible to the Rio Grande's annual flooding and unpredictable activity, and precipitation events occurring in higher elevations would cause flash flooding in the lower land. Water volume in the Rio Grande historically peaked during the spring months due to snowmelt runoff and subsided to low-flow levels by late summer. At least 82 major Rio Grande flood events occurred in the MRG Basin between 1591 and 1942 (Scurlock 1998). The largest estimated flood was from spring runoff in 1872 at 100,000 cubic feet per second (cfs) in the MRG. Historical records for measured flow rates in the Rio Grande date back to the installation of gaging stations in 1889. Prior to the construction of dams and widespread river regulation from the 1930s to 1970s, large flooding events that altered river channel spatial distribution and morphology were common. Spring floods of 20,000 to 30,000 cfs resulting from snowmelt runoff were recorded commonly between the late 1800s, when gaging stations were installed, and 1942 when river regulation began. Record levels of rainfall and snow contributed to high Rio Grande flow rates from 1940 through early 1942, resulting in extensive flooding, but peak flow rates remained around 20,000 cfs. The largest measured Rio Grande flood within the MRG resulted from summer convectional storms in August 1929 and reached 47,000 cfs. In contrast, channel drying has also been observed several times since 1752, particularly during the 1880s downstream from Albuquerque (Scurlock 1998).

A considerable increase in water use and diversions occurred in the late 1800s. Growing numbers of settlers diverted increasing amounts of water from the river for irrigation. In addition, heavy logging in northern sections of the Rio Grande led to heavier snowmelt and rainwater sediment runoff. Rio Grande sediment loads likely were highest during the spring months and also following summer convectional storms. Historical records describe the Albuquerque Reach as experiencing considerable riverbed aggradation during the late 1800s and early 1900s. Reduced river flow from water diversions and growing agricultural practices caused soil erosion throughout the watershed, providing heavy sediment loads. The channel bed of the MRG

apparently consisted mostly of sand, whereas the riverbed above the confluence of the Rio Jemez consisted largely of cobble and gravel (Crawford et al. 1993). Historically, groundwater rose as a result of increased flood irrigation within the floodplain, resulting in waterlogged fields and alkali conditions (Berry and Lewis 1997). By early 1900, much of the land that had at one time been rich, fertile, and cultivated was classified as a "wasteland." Government reports listed much of the land as alkali, marsh, and sand hills.

Devastating floods and degraded land put the state government under pressure to reclaim the valley lands. Extensive Rio Grande water manipulations began after the formation of the MRGCD in 1925 to protect users along the river against flooding and provide centralized allocation of irrigation waters. By 1940, the MRGCD had built over 400 miles of levees, drains, and irrigation ditches, making thousands of acres of North Valley land safe for agricultural production and building. Even with those controls in place, more severe flooding occurred in 1941 and 1942, and this forced the U.S. Bureau of Reclamation and the USACE to implement widespread channel modifications with the implementation of the MRG Project in 1950. The river was straightened and confined between two parallel levees, and large iron Kellner jetty jacks were fixed to the bank to protect the newly created levees. Drainage systems, water diversion channels, and increased groundwater pumping eventually served to effectively limit overbank flooding and lower the water tables of the floodplain (Scurlock 1998). Commercial cropping expanded rapidly as a result.

All of the engineering done to tame the river for human purposes ultimately disrupted the ancient connection between river water and groundwater in the adjacent floodplain, which is essential to the survival of native riparian vegetation. Jetty jacks collected sediment that in turn became a seedbed for the establishment of Rio Grande cottonwood (Muldavin et al. 2004). The result was the transformation of a relatively open riparian zone into a nearly continuous, even-aged gallery forest (Crawford et al. 1993). Furthermore, the sediment and flood control structures constructed along the MRG caused accelerated channel degradation, creating a riverbed that is and will continue to be more incised and channelized (Crawford et al. 1993). Sediment loads have declined considerably since the construction of the Rio Jemez Dam in the early 1950s and Cochiti Dam in 1973, with a reduction from average annual suspended sediment concentrations of about 4,000 parts per million (ppm) by water volume to about 500 ppm (USACE et al. 2006). Groundwater levels in the Sandia Reach have declined significantly due to groundwater pumping, particularly by municipalities and channel incision.

Recent long-term trends in groundwater elevation indicated a decline in groundwater elevation (S.S. Papadopulos and Associates [SSPA] 2005). Wells located near Alameda Boulevard exhibited a linear decrease in groundwater elevation at rates of 0.23 to 0.35 m/year (0.75–1.15 feet/year) over a 16- to 48-year period (SSPA 2005). These declines are attributed to municipal and industrial water uses in the Albuquerque area. Groundwater fluctuations also have occurred seasonally. In the Alameda area, the fluctuations vary from well to well, but average about 0.3 m (1 foot) in magnitude. Greater fluctuations are evident at other wells between the riverside drains with peak groundwater elevations occurring between April and June. Since late 2008, when the Albuquerque Bernalillo County Water Utility Authority began supplementing

groundwater pumping with surface water from the San Juan Chama Drinking Water Project, groundwater levels have generally risen somewhat, but projections are that increased groundwater pumping will begin again by the 2030s.

Differences between the evapotranspiration rates of native versus non-native vegetation also have significant implications for groundwater depth. Simulation models used by SSPA (2005) have revealed that evapotranspiration rates have decreased by 20% when non-native vegetation was replaced by native vegetation, resulting in higher groundwater elevation and reduced seepage loss. Additional information about groundwater in the Albuquerque area can be found in McAda and Barroll (2002), SSPA (2005, 2006), and Tetra Tech (2004).

2.4 Agriculture in the North Valley

The name "Candelaria Farm" remains elusive in historical records and oral interviews with senior North Valley residents. However, it can be assumed that it is named after the Plaza de Los Candelarias and the prominent Candelaria family, who had strong agricultural ties in the early development of the North Valley. Candelaria Road has historically been, and currently remains, a major corridor that connects into the Plaza de los Candelarias (A.D. 750–present), just 1.5 miles east of the Farm (see Figure 3). The CNP's location at the westernmost end of Candelaria Road may be one simple reason why it has maintained the name Candelaria Farms.

Little is known about the actual history of ownership and land use on the Candelaria Farm site before 1928. Until the Rio Grande was contained within its levees and the riverside drains had eliminated the wetlands and marshes in the floodplain, there was not likely much agriculture in the area that is now the site of the CNP and RGNCSP. A 1917 Rio Grande Drainage Survey map prepared by the Office of the State Engineer shows 22 acres with water in the southeastern corner of the site bounded by Veranda Road and the Duranes Lateral, with the rest of the current CNP site listed as "Timber." A 1922 MRGCD map based on a Reclamation Service (now the Bureau of Reclamation) map does not indicate cultivation on the site. The area from Candelaria Road (which ended at Rio Grande Boulevard) west to the river and northwards along Rio Grande Boulevard was dominated by marshes, "Alkali," "Grasses," "Sandbar," and "Timber," with pockets of cultivation southeast of Candelaria Road and Rio Grande Boulevard, and south and west of Griegos at Rio Grande Boulevard.

In her 2018 book, *Albuquerque's North Valley: Los Griegos and Los Candelarias*, Francelle Alexander includes many oral history descriptions of the area as constantly flooding and containing lots of marshy land (Alexander 2018). The book contains a photograph (page 219) from the MRGCD archive titled, "Lake or estero in the 1930s, probably near Rio Grande Boulevard and Griegos", which shows a broad shallow flooded and open plain with a single horse grazing at its edge. She quotes (page 219) a resident who grew up on Rio Grande a little north of Arbor Road who remembered that "[t]he swamp ran from where we lived to near Candelaria." In a discussion of the Olguín property (page 177) on Rio Grande and Cherokee, she says that until the MRGCD started draining the lands in the 1920s, "much of it was swampy *vega* land with a lagoon that the kids paddled in." Aurelio Candelaria (1885–1984), who grew up in a

house on Rio Grande Boulevard just north of Griegos Road, described the area: “From my house on it was pure thicket to ditch [the Griegos ditch] until Mr. Dietz came. There were swamps all the way to Old Town.”

Based extensively on Robert Smith’s 2014 unpublished manuscript, “History of Albuquerque’s dairies,” there is an interesting connection between the area near the CNP site and the Valle de Oro National Wildlife Refuge on 2nd Street south of Rio Bravo Boulevard in the South Valley (Alexander 2018:152–154). James Matthew moved from Canada in 1881 shortly after the railroad came and began buying land on both sides of 12th Street, founding a dairy around 1893–1894 on land leased from the Armijo family; by 1903, he owned the land and had built a house northwest of what is now Matthew Avenue and 12th Street. He would eventually own land all the way to the end of Candelaria and Campbell Roads. He built a milk plant at the corner of 3rd Street and Roma Avenue (Alexander 2018).

Starting in 1908, consolidation of North Valley dairy operations began, with Matthew and his partners playing a leading role, beginning with modern facilities on the east side of Rio Grande south of Candelaria down to Matthews Road. A 1927 MRGCD survey indicates that Matthew owned almost 200 acres in this area and another large parcel west of Rio Grande Boulevard. Two Campbell family brothers were partners starting in the teens after James Matthews incorporated; Campbell Road is named after them. When Matthew died in 1931, the dairy merged with that of one of the partners, C.H. Christ, to form Valley Gold Dairy, which was soon purchased by Russell Price from El Paso, Texas, who moved the dairy to the far end of 2nd Street in the South Valley. The 570 acres of “Price’s Dairy” are now the site of Valle de Oro National Wildlife Refuge, the name of which in Spanish means Valley of Gold.

As part of the process that led to Price purchasing the dairy operations and moving them, other parts of the Matthew Dairy were sold between 1932 and 1937, with an early sale becoming Alvarado Gardens Additions. Remaining dairy lands eventually became Matthew Meadows and Meadows on Rio Grande. However, the land at the end of Campbell and Candelaria stayed agricultural. It is likely that alfalfa and corn were grown to support the dairy and, apparently, a slaughterhouse operated near the river in the area. Some of the land was worked by Japanese American farmers. The history of Matthew Dairy is indicative of the larger process taking place in the North Valley: large landowners bought out small holders and then turned around and offered them wage labor on their operations. Eventually, the large holdings were sold off to provide housing for the expanding city.

2.5 Candelaria Farms

Beginning in the early 1950s, tracts of North Valley agricultural lands were annexed under the City of Albuquerque’s jurisdiction for the purpose of increasing the tax base. Ultimately, many of the historic land grant holders lost their land due to outstanding taxes. The extremely severe drought that ran from the late 1940s into the early 1960s may have made paying taxes from agricultural proceeds difficult, resulting in easy land acquisitions by those who were able to purchase large parcels of land through immediate sales.

Around 1950, approximately 150 acres of land known as the Candelaria Farms Tract were quitted from Mrs. Leola Smith to Mr. Hugh Woodward.[1] Mr. Woodward acquired significant amounts of land throughout Albuquerque for his long-term personal secretary, who, in turn, would quitclaim them to Mr. Woodward's estate. When Mr. Woodward died in 1968, half of the acquired land was turned over to the Sandia Foundation.[2] The other half was turned over when Mrs. Woodward passed away in 1974. Fortunately, the Sandia Foundation preserved the land until it was purchased by the City of Albuquerque in February 1977.

Around the time of his death, Hugh Woodward applied to the State Engineer for a well permit that could provide sufficient water for the area north of Candelaria Road. From his application, we know that there were three Japanese farmers, all elderly men, working and living on the land. Two of them lived in the area around the Woodward House and worked fields in the northeast corner of the site. The third farmer lived near the end of Candelaria Road. They all worked small parcels growing a wide variety of fruits and vegetables, likely for sale at local markets, as well as for subsistence. There was no mention in his application of any alfalfa or other crop activity. One of the farmers initiated the well application for himself, but Woodward stepped in and reapplied to obtain water for the whole site. In 1968, Woodward had just received Office of the State Engineer approval for a well that could serve the three farmers. It appears that the well project, which was dug and tested but did not yet have a pump, was abandoned with his death.

Whether from age or the failure of the well, or Mrs. Woodward's interest in getting rent from activity on all the acreage, by the time of the sale to the City in 1977, the Japanese gentlemen were gone and there were three leaseholders on the property. Local farmers who maintained alfalfa crops on the southern fields and a horse pasture to the north held two of the leases. The third lease was held by a Midwest broadcast station that used approximately 9 acres within the current leased acreage of the RGNCSP Visitor Center for the placement of their transmitter.

The City of Albuquerque acquired the Candelaria Farm site in 1977, culminating more than a decade of community activism advocating for the establishment of a nature study area and wildlife preserve on the site. In 1969, the Middle Rio Grande Park Plan recognized the potential of this historical agricultural land adjacent the Rio Grande and stated that the "purchase of this tract of land will insure a permanent open space adjacent to the river for nature study, recreation uses, open space, and urban shaping (New Mexico State Park and Recreation Commission. 1969)." In 1975, the City and the Bosque del Rio Grande Nature Preserve Society conducted a joint study on the relationship between the river ecosystems and the Albuquerque metropolitan

[1] Mr. Hugh Woodward was the U.S. Attorney for New Mexico, appointed by Herbert Hoover, and served from 1929–1933. He served as Lieutenant Governor for the State in 1926. As an important local civil servant and major land holder in Albuquerque, he served on the original Planning Commission for the City of Albuquerque from 1948–1957. The Sandia Foundation was one of his organizations established to care for his properties after his death in 1968. Woodward Hall located on the University of New Mexico campus is named for him.

[2] The Sandia Foundation is a New Mexico non-profit corporation established in 1948 by the late Hugh B. Woodward and his wife, Helen K. Woodward, to aid and assist educational, scientific, benevolent, religious, and charitable institutions. Upon their deaths, the Woodward's estate (primarily land) was transferred to the Sandia Foundation. As of October 1996, the assets composition is 70% real estate in the Albuquerque limits equating to approximately $28 million.

area, which recommended establishing a pond and marsh restoration project on the Candelaria Farm site.

In 1976, the New Mexico State Legislature, persuaded by strong local support, agreed to partially fund a nature preserve and study center, and the City decided to contribute by purchasing Candelaria Farm as a site for the center. The Regional Office of the Bureau of Outdoor Recreation (now the NPS) contributed federal funds through the LWCF for purchasing the property, which was enacted by the Albuquerque City Council (Resolution 248) in early 1977. Following suggestions by the Kinney administration, funds for the purchase were consolidated as follows:

- State and Federal Grants $600,000
- Sale of Surplus City Land $308,500
- Proceeds of Parks and Recreations General Obligation Bonds $737,324
- Surplus Capital Account $61,176
- The Final Purchase Price $1,707,000

The environmental assessment completed by the City in preparation for acquiring the Candelaria Farm stated that this land was a "valuable resource for Albuquerque, presently and in the foreseeable future," both aesthetically and ecologically. Following purchase, the Environmental Planning Commission voted to rezone the entire land from R-2 to Special Use Zoning, SU-1 (Nature Study Center and Wildlife Preserve) on May 16, 1978 (No. Z-78-52). On December 30, 1980, the City Council approved a 25-year renewable lease with the State of New Mexico, Natural Resource Division for 38.8 acres upon which the RGNCSP would be constructed. Once the 8.934-acre lease agreement with a national radio station transmitter expired in April 1981, a 2.5-acre lined pond was constructed. Soon after, the RGNCSP Visitor Center, designed by Antoine Predock, was constructed with a $715,000 appropriation from the New Mexico Legislature.

The original 167-acre site was not contiguous. The Fraternal Order of Police owned 7 acres of residential-zoned land on the south side of Decker Road, which separated the 144-acre parcel (Tracts A-1 and A-2) acquired by the City north of Decker Road from the 23-acre parcel (Tract X) acquired by the City south of the Fraternal Order of Police site, towards Campbell Road. In 1982, the City exchanged 8 acres of land on the northwest corner of Trellis and Campbell for the 7-acre Fraternal Order of Police site. The land along Campbell became the gated Rio Grande Compound development. The Fraternal Order of Police parcel was later re-zoned to SU-1, matching the zoning of the rest of the site. In 1996, approximately 1 acre at the end of Veranda Road was converted (a process under the LWCF to remove land no longer being used for the original purpose and exchange it for similar land) in order to allow the City to improve Veranda Road's terminus. The exchange land was a short length of trail in the Bosque northwest of the Montano Bridge equaling approximately 1 acre. As a result of the exchanges, the CNP is a contiguous site of approximately 166 acres.

2.6 Candelaria – From Farm to Nature Preserve

The CNP site was managed as farmland since 1980 to preserve a cultural remnant of the agricultural land that was once abundant in the North Valley, and to minimize expenses to the City. The City, which had extended the leases of the existing alfalfa farmers in 1980, began contracting private farmers in 1985 to operate the CNP. Through Farm Operating Agreements, contracted farmers managed production of alfalfa and other commercial crops in the CNT (also referred to as "Candelaria Farms") that included around 60 acres in exchange for growing crops on the remaining acreage for wildlife feed and maintaining the irrigation infrastructure. The commercial farming strategy allowed the City to preserve the CNT as farmland, while providing feed crops for migratory birds that visit the farm and adjacent ponds at the RGNCSP, without incurring the expenses that would normally be required to farm the land.

Over the course of 3 years of TAG meetings, involving staff from federal, State, and City agencies, other technical experts, and the public, a revisioning of the site began to take shape. Careful review of the LWCF rules revealed that farming for commercial crop production is not allowed on the properties purchased with LWCF funds, but that farming to grow plants and crops for forage and cover solely for the benefit of wildlife is allowed. This was the 1979 Predock Plan vision, with "100 plus acres" devoted to growing wildlife crops. This would represent a dramatic shift in the way the farm had been managed since the City purchased the property and would pose both unique possibilities and challenges to the OSD. The new vision would require funds to convert fields to wildlife crops, as well as ongoing operations and management to continue tilling, seeding, and cutting crops multiple times a year to accommodate waves of migratory birds.

New information moved the TAG to a different approach, one adopted by the U.S. Fish and Wildlife Service (USFWS) at Valle de Oro National Wildlife Refuge and by the Valencia County Soil and Water Conservation District (with assistance from the USDA Natural Resources Conservation Service [NRCS]) at Whitfield Wildlife Conservation Area. Both of these wildlife areas will have natural mosaic landscapes that reflect the pre-engineering landscape of the Rio Grande valley, with wetlands, riparian vegetation, and a mix of upland grasses and shrubs. At Whitfield, this decision to shift from growing wildlife crops came when analysis showed that the cost of producing wildlife crops was not worth the amount of forage being produced. At Valle de Oro, the Federal Aviation Administration prohibited growing wildlife crops on the refuge because it is in the flight path of planes landing at the Albuquerque International Sunport and the agency was worried about bird strikes. Although there were initial concerns that conversion of 570 acres of alfalfa and other crops on the former Price's Dairy would diminish the attractiveness of the refuge to migratory birds, especially sandhill cranes, research by USFWS experts indicates that there may be little to no impact on migratory bird numbers and an increase in the overall habitat diversity at the Refuge.

The TAG has concluded that the CNP should be converted to a restored natural mosaic landscape and move away from crops altogether over time. The TAG took the ideas developed in alternative plans for the site and updated them to create a vision for something special in the

heart of Albuquerque—a natural landscape supporting diverse wildlife and providing outdoor recreation and environmental education for the City's residents and visitors.

3 NATURE PRESERVES AND WILDLIFE REFUGES IN THE RIO GRANDE VALLEY

Other nature preserves or wildlife refuges have been established in the MRG valley, and along with the CNP, they provide a regional array of habitats for native wildlife, especially migratory and resident birds (Figure 4). These regional wildlife preserves not only provide additional habitats for wildlife in the region, but also provide reference environmental conditions and management examples that could be applied to the CNP.

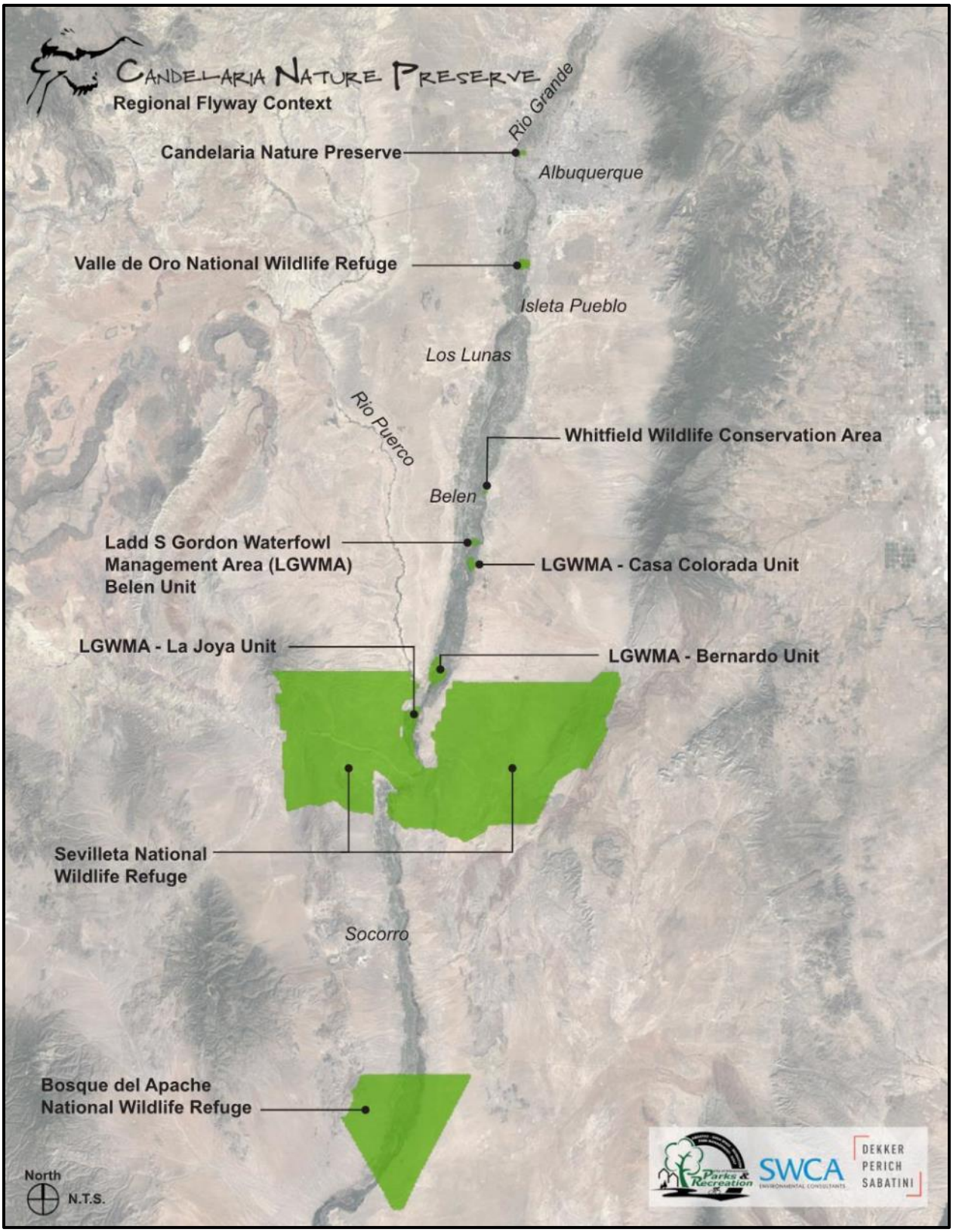


Figure 4. Wildlife refuges and preserves of the Middle Rio Grande valley.

3.1 Valle de Oro National Wildlife Refuge (Bernalillo County)

The Valle de Oro National Wildlife Refuge is located in the South Valley of Albuquerque along the Rio Grande. Formerly a commercial dairy, this 570-acre National Wildlife Refuge, the first urban National Wildlife Refuge in the Southwest, is managed for wildlife with an emphasis on public environmental education and recreation. Consists of former dairy pastures and agricultural fields that are being restored to a natural mosaic landscape with wetland habitats. Valle de Oro has been managed by the USFWS since 2013.

3.2 Whitfield Wildlife Conservation Area (Valencia County)

The Whitfield Wildlife Conservation Area is located on the east side of Belen along the Rio Grande. Formerly a commercial dairy, this 140-acre semi-urban wildlife preserve is managed for wildlife, with an emphasis on public environmental education and recreation. The conservation area consists of pastures and agricultural fields that have been restored to wetland, meadow, and bosque habitats. Wildlife crops have been converted to natural landscape because of the high costs of growing forage for wildlife. The Whitfield Wildlife Conservation Area is managed by the NRCS Valencia Soil and Water Conservation District since 2003.

3.3 Ladd Gordon Game Management Area/ La Joya State Game Refuge (Socorro County)

The Ladd Gordon Game Management Area/La Joya State Game Refuge is located between Belen and La Joya in central New Mexico. A complex of four separate management units along the Rio Grande, covering 2,700 acres, this refuge is managed for waterfowl production for hunting. The refuge consists of commercial farmland, wildlife crops, riparian bosque, and wetlands. The refuge is managed by the New Mexico Department of Game and Fish.

3.4 Sevilleta National Wildlife Refuge (Socorro County)

Located 20 miles north of Socorro, this refuge extends across the Rio Grande valley from the Sierra Ladrones to the Sierra los Pinos. The Sevilleta National Wildlife Refuge covers 230,000 acres of mostly natural landscapes ranging from the Rio Grande, across valley bottom grasslands, to montane woodlands. Management is for plant, wildlife, and ecosystem conservation, and environmental education. The refuge has been managed by the USFWS since 1973.

3.5 Bosque del Apache National Wildlife Refuge (Socorro County)

The Bosque del Apache National Wildlife Refuge is located near San Antonio, along the Rio Grande and the adjacent valley. Bosque del Apache National Wildlife Refuge covers 57,331 acres of mostly constructed lakes, ponds, wetlands, and wildlife cropland, in addition to 30,000 acres of upland desert grassland wilderness areas. Management is for waterfowl production, upland habitats for native vegetation and wildlife, and environmental education and recreation. The refuge has been managed by the USFWS since 1939.

4 ECOLOGICAL CONDITIONS

4.1 The Abiotic Physical Environment

4.1.1 *Climate*

The CNP is located in the MRG valley of central New Mexico at an elevation of 5,000 feet above mean sea level, with a semi-arid climate; most of the annual precipitation comes with a summer monsoon. Temperatures are mild, rarely exceeding 100 degrees Fahrenheit (°F) or falling below 0°F. The annual average is about 57°F. The generally low humidity results in an approximately 25-degree range between daily highs and lows. Average monthly high and low temperatures at the adjacent RGNCSP from 1995 to 2019 are presented in Figure 5. The growing season ranges between 173 and 188 days depending on local elevations. Mean annual precipitation is 11.8 inches. Winter precipitation, generally derived from frontal disturbances, tends to be protracted and of mild intensity. Summer precipitation, typically convective with orographic accentuation, is of short duration and higher rate. Average total monthly precipitation amounts from 1995 to 2019 are presented in Figure 6.

The RGNCSP is a volunteer in the Albuquerque Metropolitan Arroyo Flood Control Authority and the National Water Service, Albuquerque office precipitation recording program and the U.S. Geological Survey weather reporting station program. The temperature and precipitation data recorded at the RGNCSP are representative of the adjacent CNP.

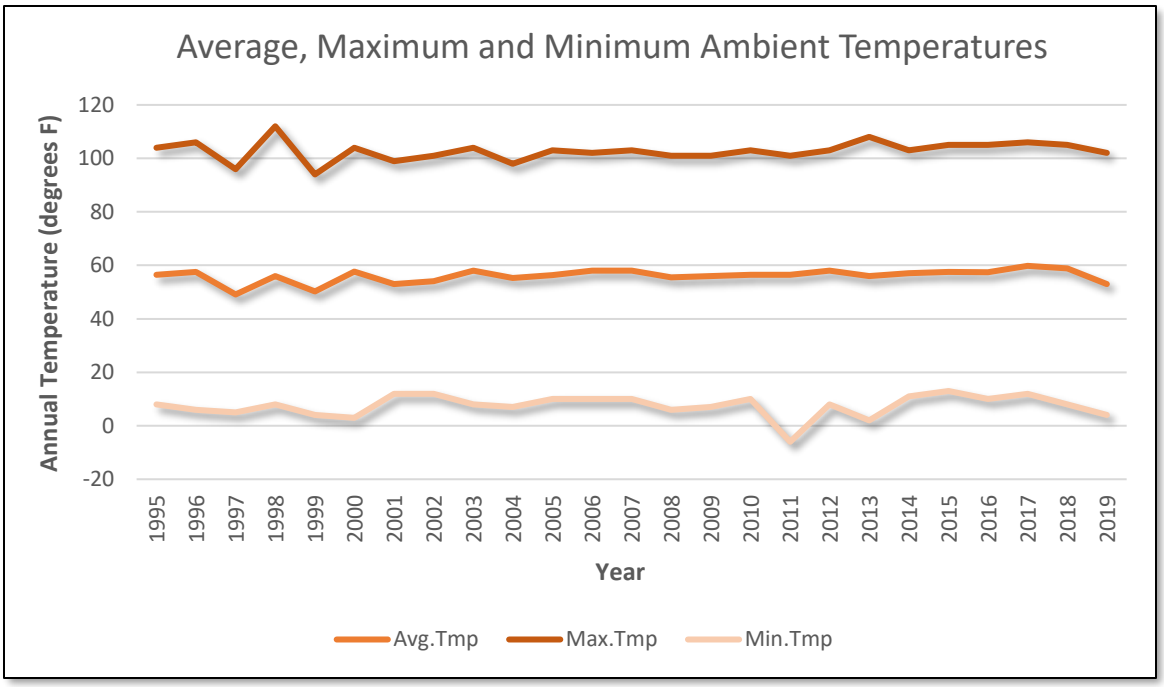


Figure 5. Average monthly, daily high, and daily low temperatures recorded at the RGNCSP, 1995–2019.

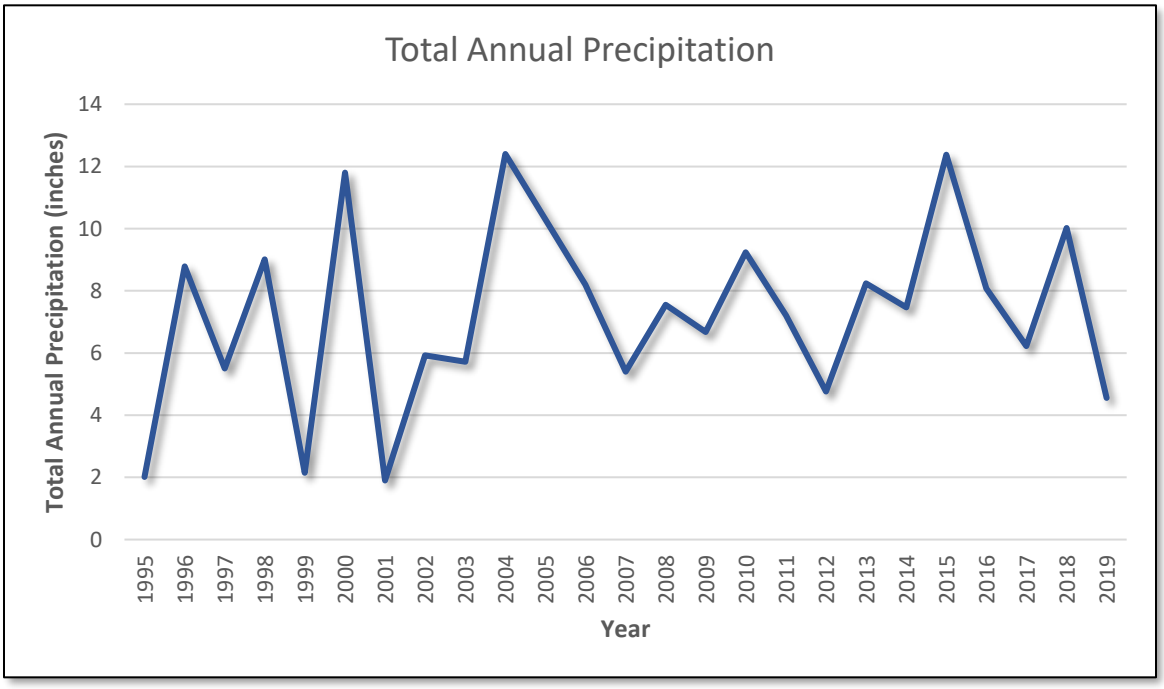


Figure 6. Average total annual precipitation recorded at the RGNCSP, 1995–2019.

4.1.2 *Global Warming and Climate Change*

Human-caused global warming, also known as the enhanced greenhouse effect, from the burning of fossil fuels is causing global climate change that is currently impacting the CNP and is forecast to have even greater effects on CNP weather conditions and management practices for the foreseeable future. Climate change for the region will be represented by increasing ambient, ground, and ocean temperatures, decreased winter snowpack, and decreased summer snowmelt runoff in rivers, and increased soil temperatures, decreased soil moisture, and increased variation in weather and more extreme weather events (Mann 2019; Melillo et al. 2014; U.S. Global Change Research Program [USGCRP] 2017, 2018). Gutzler (2013) and Llewellyn and Vaddey (2013) discuss how the climate of the Southwest has been documented as becoming warmer and less predictable, and how drought is becoming more common and more severe than in the past. The average annual ambient temperatures for the Upper Rio Grande and MRG regions of New Mexico (Colorado border to Truth or Consequences, New Mexico) has increased from 1971 to 2012 by 1.4 degrees Celsius (°C) (2.5°F), and in mountainous areas that increase has been even greater at 1.5°C (2.7°F) (Llewellyn and Vaddey 2013). Winter temperatures (December, January, and February) have been warming by as much as 1.3°C (2.3°F) since 1970 (National Weather Service 2015). Long-term episodic droughts have occurred in the Southwest region for centuries (Gutzler 2013), but the region is strongly affected by ongoing and projected century-scale climate change (Llewellyn and Vaddey 2013).

Llewellyn and Vaddey (2013) attribute the climate change observed across the Southwest to human-caused increases in greenhouse gases from burning fossil fuels, and report on a strong regional warming trend in recent temperature data that modifies natural drought/high-precipitation fluctuations by enhancing evaporative losses and decreasing snowpack in mountainous regions to the north (see Brown and Mote 2009). Mann (2019) provides a good description of how global warming–induced changes in the atmospheric wind patterns globally are impacting climate change. Recent climate modeling predicts that peak runoff will occur earlier, leaving less water for irrigators during the hot and dry months of the pre-monsoon growing season (Elias et al. 2015). As the climate warms, intense storms are expected to increase in the region (Gutzler 2013), and a greater fraction of total annual precipitation is expected to come from single intense rainfall or snowfall events as compared to more frequent low-intensity storms (Allan and Soden 2008; Intergovernmental Panel on Climate Change 2007; Tebaldi et al. 2006). Petrie et al. (2014) demonstrate that fewer single storm events are determining precipitation amounts in central and southern New Mexico, especially during the monsoon season, and that the number of such storms has declined and become more variable over the last decade. These fewer but more intense events are also being documented in the region by others (Allan and Soden 2008; Groisman and Knight 2008; Mann 2019). The periodic drought and intense rainfall patterns that are projected for the region (Alexander et al. 2006; Gutzler 2013; Gutzler and Robbins 2011; Hurd and Coonrod 2008) are expected to result in significantly diminished stream flow and drier surface conditions (Llewellyn and Vaddey 2013; Seager et al. 2007; Stromberg et al. 2012), causing the Southwest's climate to become even more arid than it currently is over the coming decades. For example, Figure 7 shows how ambient temperatures have risen across the Southwest from 2000 to 2013, relative to the long-term average.

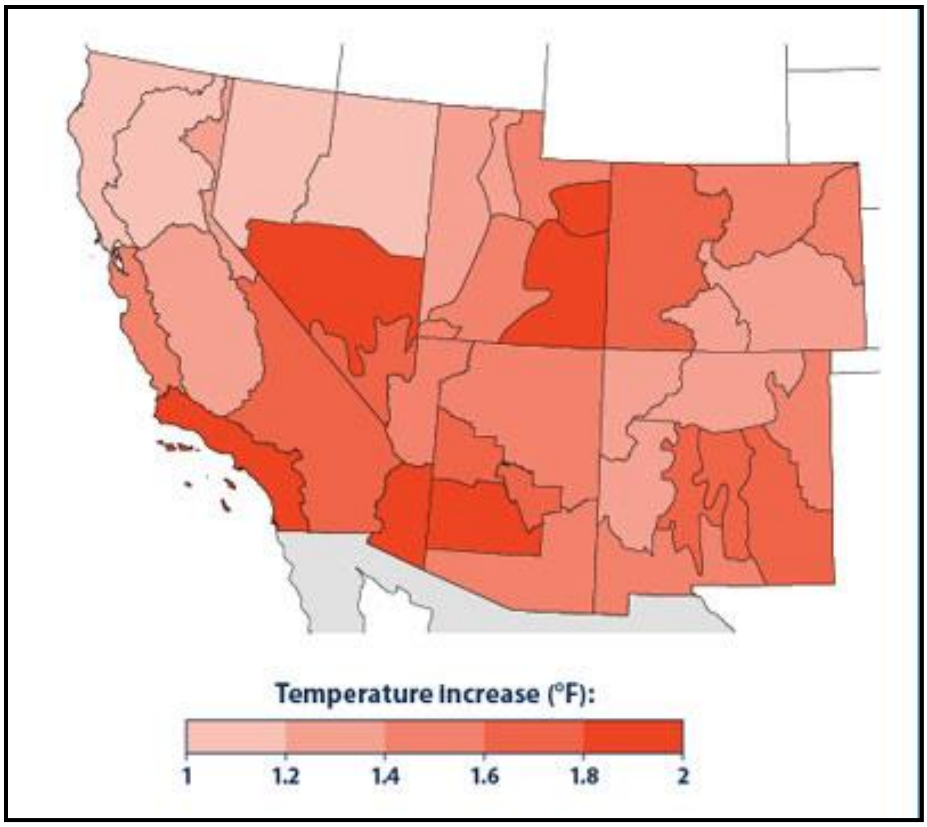


Figure 7. Average temperatures across the entire Southwest have increased in recent years, with some areas increasing by up to 2°F. This map shows the average temperature from 2000–2013 relative to the long-term average from 1895–2013. Source: U.S. Environmental Protection Agendy (EPA) (2015).

The CNP is located on the Rio Grande floodplain, and the surface water and groundwater are both connected to, and dependent upon, Rio Grande flow rates (Crawford et al. 1993). Climate change has already caused reductions and disruptions in Rio Grande flow, and such declines in available groundwater and surface waters are predicted for the MRG Basin, including the CNP (Llewellyn and Vaddey 2013). The best predictive computational model estimates for expected water availability for the Southwest and the MRG/CNP are presented in Figure 8. Those predictions show that both surface water and groundwater availability will decline over the next 50 years. Increasing temperatures alone also will cause increased soil water deficits, and will cause increases in both surface evaporation of water and transpiration of water from vegetation.

Climate change is already creating warmer and drier conditions, along with increased variation and extremes in weather conditions. This trend is expected to continue and to intensify in future years. The implications of climate change are very important relative to managing the CNP, in that water availability will decrease in coming years and shifts will take place in the geographic distributions of plant and animal species, as they already are. Associated changes to expect are the composition and abundance of both plants and animals, including shifts in noxious weeds and potentially other non-native invasive species. Any ecological restoration plans will need to

consider the overarching current and future effects of increasing climate change (e.g., Mann 2019; Seavy et al. 2009; USGCRP 2017, 2018).

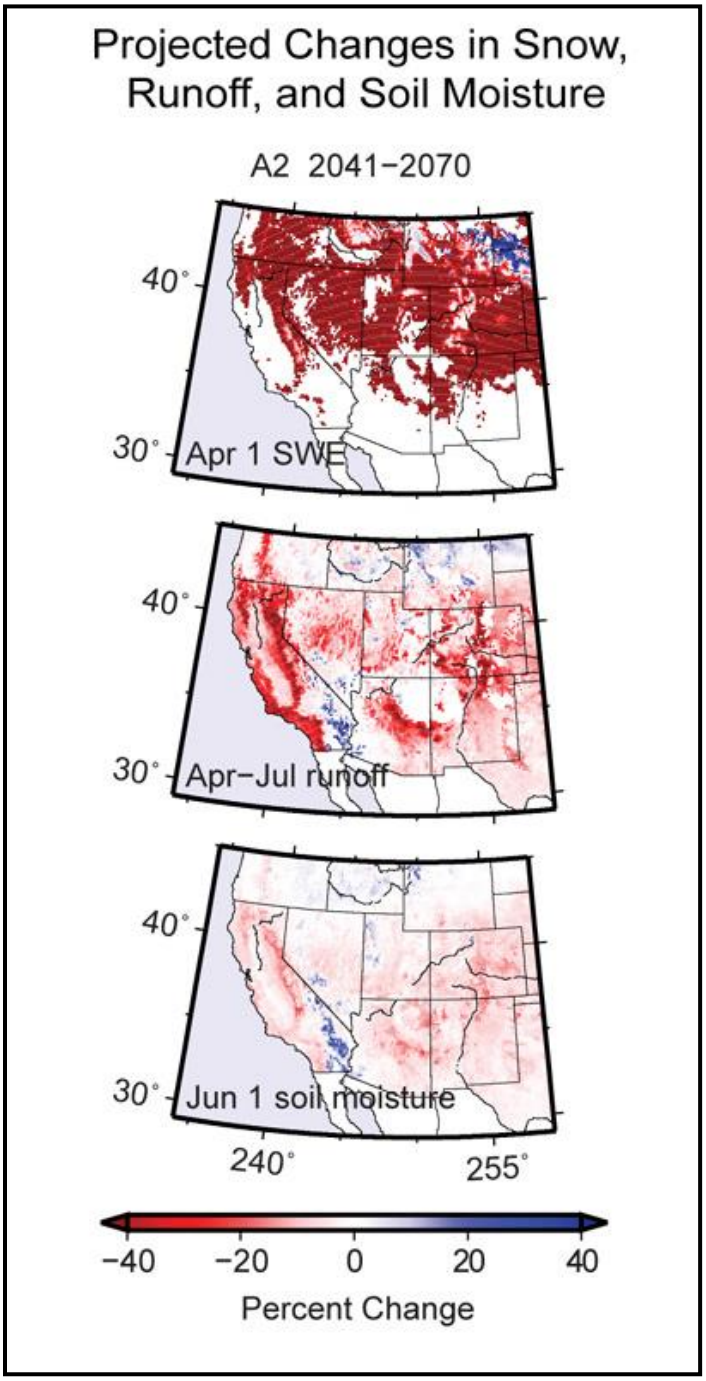


Figure 8. Declines in snowpack, runoff, and soil moisture are projected to occur if greenhouse gas emissions remain high. The map shows the change in conditions between the historic (1971–2000) and the expected mid-century (2041–2070). Note: SWE = snow water equivalent. Sources: Melillo et al. (2014); USGCRP (2014).

4.1.3 *Soils*

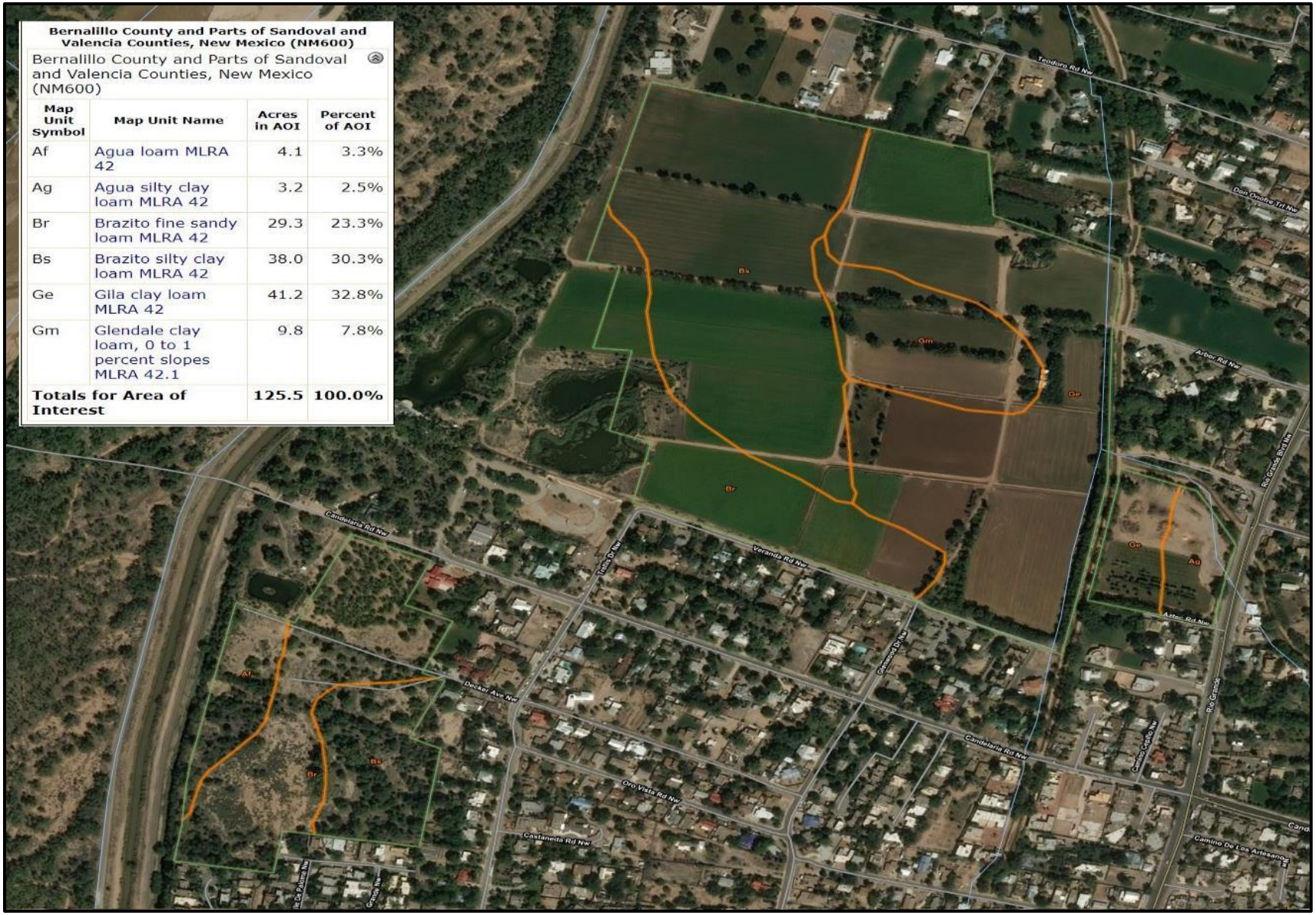
Since acquisition of the CNP in 1977, the NRCS has been providing technical assistance to the OSD. In 1995, an NRCS soil report was generated to describe the soils at the CNP to assist with the development of this management plan for wildlife crops and general agricultural use.
The soils maps and information about soil characteristics are important for planning wildlife habitat vegetation plantings and maintenance. Six distinct soil types were found on the property, including CST and the TNT (Table 1; Figure 9) areas of the CNP. A recent soil survey was conducted by GeoSystems Analysis, Inc. (GSA), in July 2018. The purpose of the GSA survey was to verify the older 1995 soils map and to install soil chemistry samples and a groundwater monitoring well. The GSA soil survey provided a current comparison to the previous NRCS mapping and was specific to the farmed areas of the CNP (Figure 10). Appendix B presents the soil descriptions from the GSA report. Unlike the 1995 NRCS soil survey, the GSA report does not include the CST or the TNT areas.

Table 1. Soils at the Candelaria Nature Preserve and Surrounding Area

Map Unit Symbol	Map Unit Name	Acres in CNP*	Percent of CNP
Af	Agua loam MLRA 42	4.1	3.3%
Ag	Agua silty clay loam MLRA 42	3.2	2.5%
Br	Brazito fine sandy loam MLRA 42	29.3	23.3%
Bs	Brazito silty clay loam MLRA 42	38.0	30.3%
Ge	Gila clay loam MLRA 42	41.2	32.8%
Gm	Glendale clay loam, 0 to 1 percent slopes MLRA 42.1	9.8	7.8%
Total		**125.6**	**100.0%**

*Numbers are rounded to the nearest tenth.

Soils of the CNP are deep, and slopes are gentle. Permeability rates generally increase towards the west and south sides of the farm. Permeability is moderately slow in the Glendale clay loam, and moderate in the Gila clay loam. Permeability is rapid below the 9-inch layer of Brazito silty clay loam, and rapid throughout the Brazito fine sandy loam on the west and south sides of the farm. The higher permeability rate of the Brazito soils indicates that water enters the soil rapidly, but that the water may percolate so far beyond the root zone of the plants that it may not be available for plant growth and can easily be wasted by excessive irrigation. In addition, the Brazito soils have low Available Water Capacity, and are very susceptible to drying out during drought. The Brazito soils are also much less productive for growing crops such as alfalfa, sweet corn, sorghum, other seed and grain crops, and pasture.



Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico (NM600)

Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico (NM600)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Af	Agua loam MLRA 42	4.1	3.3%
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Ge	Gila clay loam MLRA 42	41.2	32.8%
Gm	Glendale clay loam, 0 to 1 percent slopes MLRA 42.1	9.8	7.8%
Totals for Area of Interest		**125.5**	**100.0%**

Figure 9. Soils map produced by the U.S. Department of Agriculture, Natural Resources Conservation Service (2019).

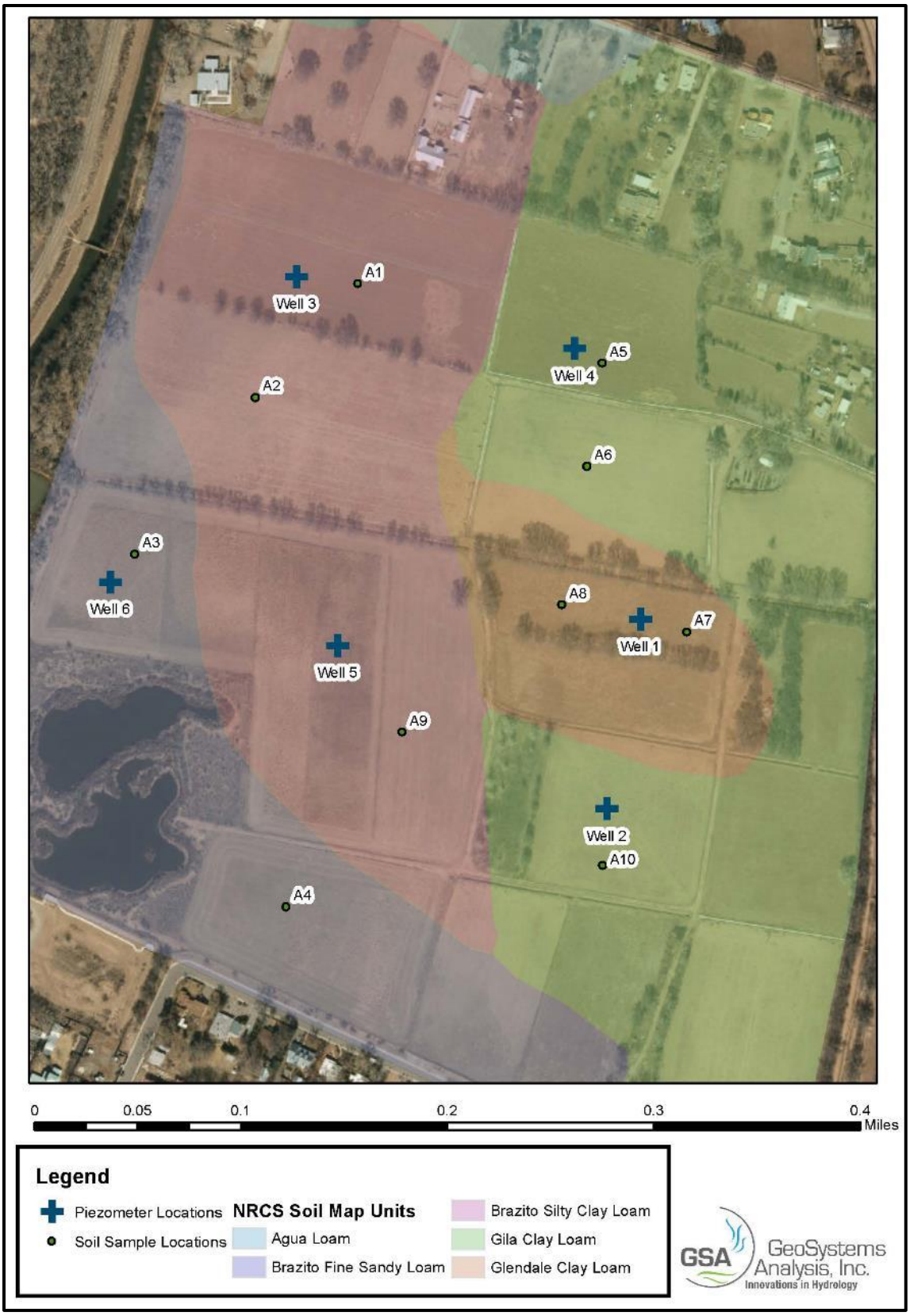

Figure 10. Soils map, including locations of soil samples and groundwater monitoring wells installed in 2018 (GeoSystems Analysis, Inc. 2018).

The permeability and poor drought tolerance of the Brazito soils combined with the variability in rainfall indicate that the success of habitat restoration depends on efficient use of the irrigation system. In order to achieve this, application of water in the right amount at the right time is critical. Fields must be properly laser-leveled, and the ditches must be kept in good working condition. The ability to work closely with the MRGCD during the irrigation period is imperative in order for the farmer to efficiently meet the demands of these fields. It should also be noted that three of the soils are susceptible to severe blowing hazards, and the Brazito silty clay loam may create moderate blowing hazards. To reduce the potential for eolian erosion and to maintain air quality, farm operations need to minimize the time during which soils are left bare.

4.1.4 *Surface Water and Groundwater*

The CNP lies within the 100- to 500-year floodplain of the Rio Grande according to the 1985 Federal Emergency Management Agency (FEMA) map. The Rio Grande has become channelized following the addition of jetty jacks and levees by the Bureau of Reclamation and MRGCD in the 1920s. This work changed the river from a more traditional braided river to a meandering channelized system. The results of these changes to the river severed the hydrologic connection between the floodplain (where CNP exists today) and the Rio Grande. Upstream dams and diversion structures have been constructed in order to detain water until the irrigation season, which typically runs from March to October. During this time, irrigators who have water rights will receive allocations of 3 acre-feet per acre of land per irrigation season.

The MRGCD constructed a lateral channel on the east side of the CNP known as the Duranes Lateral, which transports surface water from the Angostura Diversion Dam, approximately 25 miles north of the site on the Rio Grande. There are four head gates on the lateral that distribute water to the fields. The Albuquerque Riverside Drain runs along the west side of the property and transports excess ditch water and groundwater from irrigation back to the river.

In 1981, the RGNCSP built the 2.5-acre Observation Pond adjacent to the RGNCSP Visitor Center and fills this pond from a 150-foot-deep well, which is operated by electricity and pumps between 60–75 gallons per minute. In 1991, the RGNCSP built a 0.42-acre pond north of the Visitor Center. This north pond is deep and fed by seepage from shallow groundwater. The 0.56-acre Discovery Pond, south of the Visitor Center and within the CST area of CNP, is filled from a solar-powered well pump. In 2001, the OSD and cooperating agencies constructed the 5-acre Candelaria Wetland ponds east of the RGNCSP and southwest of the farm fields. The 150-foot-deep well fills these wetland ponds. Furthermore, a 175-foot well has been installed near the Woodward House to provide approximately 25 gallons per minute for drip irrigation in farm fields near the house.

WATER QUALITY AND DEPTH

Volunteers from the Friends of the Rio Grande Nature Center (FRGNC) regularly monitor water quality from the 150-foot well, the RGNCSP ponds, and the CNP wetlands near the farm fields. Shallow groundwater monitoring occurs on a well site that is on the east side of the Riverside

Drain. This well gives a good indication of groundwater quality and depth in the general area. In 2018, GSA installed six groundwater monitoring wells (see Figure 10) within some of the farm fields to measure groundwater depth. The GSA report (see Appendix B) shows that groundwater varies in each field but averages a depth of 7–14 feet. Groundwater depth studies just north of the Discovery Pond in the CST by volunteers at the Nature Center found that groundwater depths varied from 6.18 to 8.06 feet deep. The two observation wells were 216 feet and 467 feet east of the Riverside Drain (Hanson 2019). Aquatic Consultants, Inc., conducted a water quality study in 2012; this study was warranted on the basis that the ponds and wetlands on the CNP property were of poor water quality due to heavy algae blooms (Aquatic Consultants, Inc. 2012). Scientists gathered information that included lake (pond) management history, water quality including hardness, alkalinity, pH, and turbidity, lab analysis of the water samples, temperature/dissolved oxygen profiles, sonar and GPS transects to accurately map the contours of the "lakes," "lake" volume and area measurements, aquatic vegetation algae identification and quantification, evaluation of water source and water conveyance, sludge and sediment quantification, and habitat evaluation.

The water quality samples taken in all four ponds had very high levels of nitrogen. This elevated nitrogen is fueling the intense phytoplankton blooms and limiting photo-penetration into the water. Thus, the shading is not allowing beneficial species of rooted aquatic vegetation to grow on the pond's bottom, which would be the primary food source for migratory waterfowl. Currently, available food sources for migratory waterfowl are essentially nonexistent in all four ponds at the CNP (Aquatic Consultants, Inc. 2012). The assessment provides recommendations that deal directly with moving suspended nitrogen out of the ponds thereby increasing photo-penetration and allowing beneficial plant species to grow and outcompete the phytoplankton for remaining nitrogen.

WATER RIGHTS

On March 19, 1907, the New Mexico Territorial Engineer declared all surface waters public and took jurisdiction over the administration and further use of surface waters. From that date on, any new uses of surface waters required application and approval of a permit through first the Territorial Engineer Office and subsequently the New Mexico Office of the State Engineer (State Engineer). However, any water usage pre-dating March 19, 1907, falls outside of State Engineer jurisdiction. Even today in 2019, individuals or governmental agencies, such as the City of Albuquerque, still must file declarations of pre-1907 surface water right claims. The State Engineer uses certain criteria when evaluating a pre-1907 surface water right claim for transfer applications. This includes data from the Rio Grande Drainage Survey Maps from 1917–1918, MRGCD appraisal sheets, and accompanying plane-table surveys from 1926–1927. It also uses MRGCD re-appraisals from 1941 and aerial photographs from 1935, 1947, 1955, and 1963. Around 2004, the State Engineer developed a new policy that started to also consider further aerial photographic research to determine if abandonment of surface water rights has occurred. The State Engineer considers abandonment if structures appear in the photographic record or irrigated lands remain fallow for a period of 17 years or more. If the land appears as cultivated in 1917–1918 and continues as such through the data trail, then the land meets the criteria for a

prior-to-1907 surface water right claim. The Federal Government survey crews did not cover any land inside of Spanish Land Grants (Water Resource Management, Inc. 2004).

The CNP has two types of water rights associated with the property: surface water rights and groundwater/well water rights. Research was conducted by meeting with Gary Stansifer of the Office of the State Engineer. The surface water rights research shows that the eastern portion of the property has 22 to 45 acres of a "possible declared" pre-1907 water right (see map below). This information comes from a 1917 State Engineer Rio Grande Drainage Survey Map, sheet No. 9 and is known as "Cultivated Class I." The remainder of surface water rights for the CNP consists of water rights owned and managed by the MRGCD. The MRGCD allows the OSD to use their water right, which dates to 1926–1927. The MRGCD's Plane Table Photo-negative F- 10 (p. 7) has classified about 45 acres as irrigated pasture, hay, grain, and alfalfa which allows OSD to use this water right for a service delivery fee each year. Although 22 acres are declared as pre-1907, it is assumed that all 45 acres shown on the historical maps are considered a pre-1907 water right (Figure 11). In all legality, having a "right" under the MRGCD permit essentially gives the water user a right to water, but not an actual water right (Ward 1977).

Another area of the CNP that does not have an associated water right consists of 2.5 acres in the southeast corner of the property. This 2.5 acres was under the declared pre-1907 permit #04712, but in 1999 an offset was needed at one of the groundwater ponds and this pre-1907 water was transferred from permit #04712 to well permit RG-73373. To offset this 2.5 acres that has no water rights, the OSD has had to lease water from the MRGCD's water bank to water this acreage. All other areas of the CNP are considered unirrigated bosque land to the Office of the State Engineer and/or MRGCD and cannot be watered by surface water. There are several wells on the property and groundwater rights are permitted into wells.

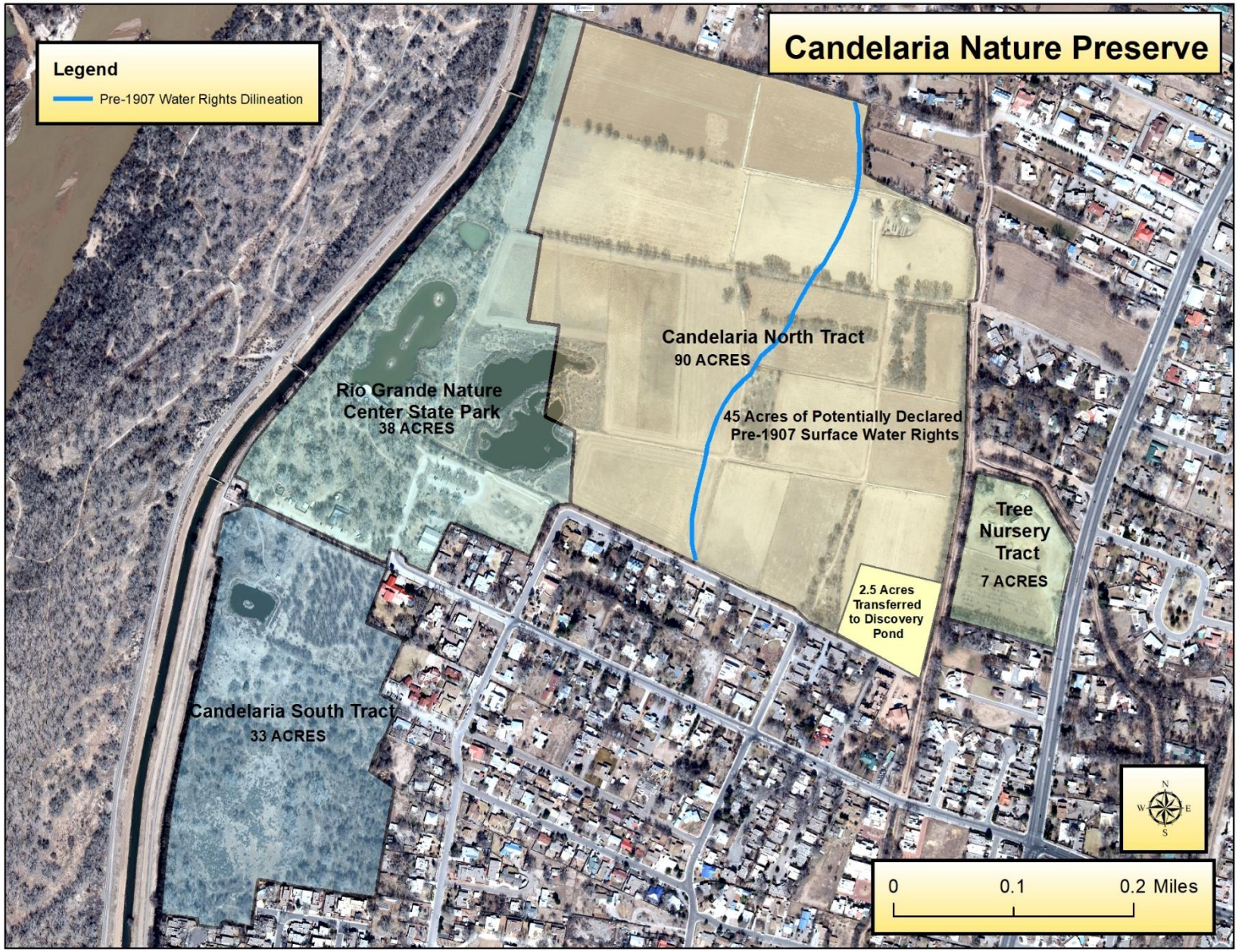

Figure 11. Water rights at the Candelaria Nature Preserve. Data from the New Mexico Office of the State Engineer.

Observation Pond and Wetlands

The well for the Observation Pond received an Office of the State Engineer permit approved March 11, 1981, under permit # RG-35823. The permit transferred 35.1 acre-feet per year to the well. The State Engineer analysis assumed a pond area of 4.5 acres, and a total of 29.58 acre-feet/year evaporated from the pond. The remaining water was for an annual filling. The State Engineer determined that 16.71 acres were required to be retired from irrigation, which has been done. The Observation Pond was expected to be 4.5 acres in size but was built at only 2.54 acres. Therefore, only 16.33 acre-feet permitted for that well were needed, and 17.32 acre-feet of these excess rights are currently used for the Candelaria Wetlands, as approved by the State Engineer in 2002. The remaining 6.95 acre-feet needed for the wetland is being provided through a lease from the City's master permit, RG-960, which is now maintained by the Albuquerque Bernalillo County Water Utility Authority.

North Pond

The North Pond at the RGNCSP is permitted by the State Engineer under file RG-35823 as a 0.67-acre pond with a depth of about 7 feet. It is supplied with water through seepage from the shallow groundwater in the area. The pond was actually built at a size of 0.42 acre. Approval was given by the State Engineer on December 29, 1992, after getting the water rights from the New Mexico State Highway and Transportation Department (now the New Mexico Department of Transportation [NMDOT]) through well # RG-1282-A located on Map 148 of NMDOT land. This pond was underwritten by the NMDOT as a mitigative measure to offset bosque impacts and loss associated with construction of the Paseo del Norte River crossing.

Discovery Pond

Permits 0620 and 1690 were moved into well # RG-35823-S and were approved on January 7, 2000, for the diversion of 3.28 acre-feet of water from well RG-35823. The well has a 4-inch casing and was drilled approximately 30 feet deep for the purpose of offsetting evaporative losses from a 0.80-acre pond located in the southwest corner of the RGNCSP. Known as the Discovery Pond, it was actually built to a size of 0.56 acre. The transfer of permits 0620 and 1690 was from Tract A-1-B, Map 34 (MRGCD). Permit 04712 and RG-73373 were approved February 7, 2000, for the diversion of 7.5 acre-feet per year for the purpose of supplementing the surface water used to irrigate the 2.5 acres of land at the southeast corner of the CNP property.

4.2 The Biotic Environment: Vegetation and Wildlife

4.2.1 *Vegetation*

Vegetation is not only a natural resource by itself, but also is important in providing habitats for wildlife. Historically, the MRG was a somewhat sinuous and braided river system that had a tendency to aggrade. The river channel migrated freely across a wide floodplain (1.2–3.7 miles) (Crawford et al. 1993) supporting a wide diversity of riparian vegetation types, such as forests,

shrublands, and wetlands (Scurlock 1998). Information prior to European settlement was largely anecdotal (Hink and Ohmart 1984), but it is generally understood that when Europeans arrived in the sixteenth century, the dominant plant communities of the Rio Grande bosque included Rio Grande cottonwood with an understory dominated by willow (*Salix* sp.) and inland saltgrass (*Distichlis spicata*) (Scurlock 1998). Although humans have used the Rio Grande riparian area for centuries, serious human alteration of the floodplain did not begin until the nineteenth century, with livestock grazing, extensive logging, and increased demand for irrigated agriculture (Crawford et al. 1993; Scurlock 1998).

Hydrology strongly influences plant species composition of Rio Grande riparian ecosystems. Willow-dominated communities require frequent surface saturation and shallow groundwater for survival (USACE et al. 2006), while cottonwood-dominated communities require spring overbank flooding every few years to scour away existing vegetation and make new seedbeds for seedling establishment and early success (Crawford et al. 1993). Overbank flooding is now infrequent along much of the MRG, and therefore suitable wet substrate for Rio Grande cottonwood reproduction and establishment has become limited.

Hink and Ohmart (1984) conducted an extensive biological survey of the MRG, including an intensive assessment of the reach from Bernalillo to the Jarales Bridge (New Mexico Highway 346). Vegetation was assigned to various community-structural types based on initial qualitative assessments of transects and subsequent quantifications by vegetation measurements, including density, relative cover, and relative frequency (Hink and Ohmart 1984). Hink and Ohmart reported cottonwood forest of structure Type I to be the most abundant vegetation in their intensive study area: mixed to mature age class stands dominated by Rio Grande cottonwood 15 to 18 m (50–60 feet) tall, with well-developed woody understory foliage layers, providing relatively dense vegetation canopy foliage from ground level to the tops of trees. Non-native Russian olive (*Elaeagnus angustifolia*) was the most common understory species often found in association with non-native saltcedar (*Tamarix* sp.). Community types throughout the MRG were largely cottonwood dominated with varying understory associations, including cottonwood/coyote willow (*Salix exigua*), cottonwood/Russian olive, cottonwood/juniper (*Juniperus* sp.), and species associated predominantly with the sandbar and river channel, and much of the MRG bosque was characterized by thick, mixed native and non-native shrubs and trees. The midstory vegetation was dominated by Russian olive, scattered saltcedar, and fourwing saltbush (*Atriplex canescens*). Canopy vegetation, where present, was dominated by scattered Rio Grande cottonwood with occasional non-native Siberian elm (*Ulmus pumila*). Understory herbaceous vegetation was sparse in areas that have thick woody growth; however, in areas that are more open, alkali sacaton (*Sporobolus airoides*) and giant sacaton (*S. wrightii*) dominated.

The establishment of non-native riparian trees along the riparian zone of the MRG has become a significant environmental and natural resource management concern (Parker et al. 2005). Exotic trees, shrubs, and herbaceous species that are not dependent on flood cycles for seedling establishment have invaded the riparian ecosystems, subsequently displacing native species throughout the river corridor (Muldavin et al. 2004). An increase in non-native vegetation has

been identified as the most significant indicator of failing ecological health in the riparian ecosystem.

In many areas, saltcedar has replaced native stands of cottonwood, decreasing habitat for many Neotropical birds, since its introduction in the twentieth century (Smith et al. 2006). Russian olive was introduced to the MRG between 1900 and 1915 (Hink and Ohmart 1984); the species spread throughout the MRG to become a dominant component of riparian vegetation by 1960 (Campbell and Dick-Peddie 1964). Like saltcedar, Russian olive is highly competitive due largely to its ability to survive environmental stresses such as low light and drought conditions. Hink and Ohmart (1984) and Dick-Peddie (1993) note that Russian olive is the dominant invasive tree found along riparian reaches north of Albuquerque, while saltcedar tends to proliferate along more southern reaches.

AGRICULTURAL FIELDS

A variety of wildlife and commercial crops have been planted at the CNP, including fescue grass, sorghum, alfalfa, and millet. This has been an effective and cost-effective way to manage the property while supporting wildlife and viewing opportunities that were identified in previous management plans. This plan moves management efforts to a fully restored mosaic of habitat where the current agriculture fields are located to maximize wildlife benefits, with a transition plan to grow crops for wildlife. This is a big change from the way that the farm has been managed. Crops planted will be determined by availability and funding. OSD will monitor the agricultural fields to determine wildlife use for the greatest benefit to wildlife. Crops will be phased out as native wildlife vegetation habitats are restored, mainly in the first 4 years if funding becomes available.

WILDLIFE HABITAT AREAS

Wildlife habitat areas include the RGNCSP wetland, neighboring grassland and moist soil areas, and hedgerows and tree groves. In addition, the Cottonwood Restoration Area just north of the Discovery Pond has been planted with the native Rio Grande cottonwood and pasture grass, and the elm rows and groves consist mainly of the non-native Siberian elm (*Ulmus pumila*).

NON-NATIVE PLANT SPECIES

Humans have introduced many species of non-native, and often invasive, plant species to the CNP region. These non-native plant species compete with native plant species for resources and in many cases have caused declines in native species and dominated disturbed environments that once supported native species. Primary species of concern include the trees/shrubs saltcedar, Russian olive, and Siberian elm. There are many non-native invasive forbs and grasses; primary species of concern include kochia (*Bassia scoparia*), prickly Russian thistle (*Salsola tragus*), puncturevine (*Tribulus terrestris*), Bermudagrass (*Cynodon dactylon*), cheatgrass (*Bromus tectorum*), and tumble mustard (*Sisymbrium altissimum*). A listing of New Mexico noxious weeds is available from the New Mexico Department of Agriculture. Efforts should be made to

manage non-native plant species at the lowest levels possible, to avoid competition and replacement of native plant species.

4.2.2 *Wildlife*

Crawford et al. (1993) and Scurlock (1998) provide detailed accounts of terrestrial riparian fauna historically associated with the MRG. Lists of the principal animal species of the Albuquerque Reach are available from a number of sources (Bateman, Chung-MacCoubrey, and Snell 2008; Bateman, Chung-MacCoubrey, et al. 2008; Bateman, Harner, and Chung-MacCoubrey 2008; Bateman et al. 2009; Cartron et al. 2008; Chung-MacCoubrey and Bateman 2006; Crawford et al. 1993; Hink and Ohmart 1984; Smith et al. 2006; USACE et al. 2006; Walker 2006). Many of the more recent studies cited above have addressed the effects of MRG bosque habitat restoration practices on the fauna. Cartron et al. (2008) provide complete accounts of vertebrate species and many invertebrates of the MRG bosque, along with biological and ecological information for each species. The following sections describe various elements of the fauna.

ARTHROPODS (INSECTS, SPIDERS, SCORPIONS, CENTIPEDES, CRUSTACEANS)

The MRG bosque supports characteristic assemblages of arthropods associated with different meso- and micro-habitats. Cartron et al. (2008) present many of the common arthropods of the MRG bosque, including the CNP. Two of the dominant macroarthropods of the riparian bosque are introduced isopods (pill bugs and woodlice, Crustacea). Both species are detritivores that feed on organic forest floor litter and often occur in very high densities, potentially competing with native detritivore arthropods for habitat and food resources. Ellis et al. (1999) have found the species, composition, and richness of MRG bosque ground-dwelling arthropods to be similar between native cottonwood and saltcedar habitats, but cottonwood habitats supported greater densities of non-native isopods. Numerically dominant MRG bosque arthropods include the two species of non-native isopods, and a number of native spiders, beetle, and cricket species. Cartron et al. (2003) have comparatively studied the ground arthropod fauna of a series of regularly flooded and non-flooded MRG bosque sites. The authors have found carabid ground beetles to be consistently associated with regularly flooded sites, while other arthropods were not. Eichhorst et al. (2006) provide a listing of ground-dwelling macroarthropod species recorded from a number of Bosque Ecosystem Monitoring Program (BEMP) sites across the MRG bosque, along with summaries of species richness and abundance from a number of sites.

AMPHIBIANS AND REPTILES

Hink and Ohmart (1984) found that reptile and amphibian populations tend to be greater in areas of open vegetation along the MRG bosque. Common species include the southwestern fence lizard (*Sceloporus cowlesi*), New Mexican whiptail (*Aspidoscelis neomexicana*), and southwestern Woodhouse's toad (*Anaxyrus woodhousei*). A principal species favoring denser vegetation and moister areas is the Great Plains skink (*Plestiodon obsoletus*), and open water supports American bullfrogs (*Rana catesbeianus*), western chorus frogs (*Pseudacris triseriata*), and eastern tiger salamanders (*Ambystoma tigrinum*) (Cartron et al. 2008; Hink and Ohmart

1984). More recent studies of MRG bosque reptiles and amphibians (Bateman, Chung-MacCoubrey, and Snell 2008; Bateman, Chung-MacCoubrey, et al. 2008; Bateman, Harner, and Chung-MacCoubrey 2008; Bateman et al. 2009; Chung-MacCoubrey and Bateman 2006) have focused on the effects of habitat restoration projects involving exotic tree and wildfire fuels reduction on reptile and amphibian communities. Those studies have found no effects of restoration activities on snakes (Bateman et al. 2009), in contrast to significant but variable (both positive and negative) effects on lizards (Bateman, Chung-MacCoubrey, and Snell 2008), both positively and negatively affecting different species.

Among the reptiles, the lizards are quite common and an important part of the food chain. The snake species are not dangerous and may help control small mammal populations. Turtles have moved into the Candelaria Wetlands and are now part of that ecosystem. The wetland has also attracted an array of amphibians. Tiger salamanders live in the wetland and Woodhouse's toads lay eggs there. Protecting water quality and aquatic invertebrates is critical for maintaining the reptilian and amphibious residents of the wetland, and preserving the link between the wetland and bosque is probably important for the amphibians that come seasonally.

BIRDS

Throughout the year, riparian communities of the MRG provide important habitat during breeding and migration for many bird species. Hink and Ohmart (1984) have recorded 277 species of birds within 262 km (163 miles) of the MRG bosque habitat. The surveys made of the wider MRG and the authors' intensive survey section (Bernalillo to the NM 346 Bridge) have identified principal resident species associated with cottonwood communities of the MRG; examples include mourning dove (*Zenaida macroura*), black-chinned hummingbird (*Archilochus alexandri*), Gambel's quail (*Callipepla gambelii*), northern flicker (*Colaptes auratus*), ash-throated flycatcher (*Myiarchus cinerascens*), and ring-necked pheasant (*Phasianus colchicus*). Of the six vegetation communities identified under the Hink and Ohmart classification, the preferred cover type for a large proportion of the bird species surveyed is cottonwood/coyote willow and cottonwood/Russian olive. Ohmart and Anderson (1986) suggest that species and abundance of birds of the MRG, most notably insectivorous species, increase with higher foliage density in the middle and upper vegetative layers. Vegetation change in the MRG bosque from dynamic stands of young native willow and cottonwood to mature stands of saltcedar, Russian olive, and older cottonwood trees probably has had a great effect on avian communities (Mount et al. 1996). Walker (2006) conducted a comparative study of MRG bird communities associated with native cottonwood bosque and exotic saltcedar stands, finding that cottonwood bosque habitats support considerably more species of birds than saltcedar stands. In addition, Finch et al. (2006) and Bateman, Chung-MacCoubrey, et al. (2008) have reported on the effects of MRG bosque habitat restoration activities involving the removal of exotic trees and fire fuels. The authors have found that bird species that utilized mid-level vegetation structure for nesting initially declined following restoration activities but speculate that densities of those species should increase again as understory woody vegetation develops following restoration.

In the fall, Canada geese (*Branta canadensis*) and sandhill cranes (*Grus canadensis*) are the most visible birds at the farm, as several hundred come to feed on the wildlife crops during their annual migration, and many spend most of the winter in the immediate area. There is also a large group of Canada geese that resides permanently at the RGNCSP ponds and now also frequents the Candelaria Wetlands year-round.

MAMMALS

Several native medium to large mammals associated with the riparian habitat of the MRG are beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), porcupine (*Erethizon dorsatum*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), and striped skunk (*Mephitis mephitis*). Principal small mammal species of the entire Albuquerque Reach are the native white-footed mouse (*Peromyscus leucopus*) and western harvest mouse (*Reithrodontomys megalotis*), as well as the non-native house mouse (*Mus musculus*) (Hink and Ohmart 1984). The abundance and distribution of small mammal species relate to the structure and mosaic of the vegetation community and the moisture regime of the riparian belt (Crawford et al. 1993). Ellis, Crawford, and Molles. (1997) and Ellis, Molles, and Crawford (1997) have found both saltcedar and cottonwood MRG bosque habitats to be dominated by white-footed mice, but the saltcedar habitats have supported more rodent species, including the more typically upland species and the non-native house mouse. The authors have found the white-throated woodrat (*Neotoma albigula*) to be only associated with cottonwood habitats. Additionally, Bateman, Harner, and Chung-MacCoubrey (2008) report that bat activity is higher in MRG bosque sites where exotic trees and fire fuels were removed compared to non-treated site. Both domestic and feral species of mammals occur throughout the MRG bosque. Feral domestic cats and dogs pose a potential threat as predators to many native animal species.

Small mammals, particularly rock squirrel (*Otospermophilus variegatus*), pocket gopher (Family Geomyidae), and house mice, make up the majority of the mammal population at the CNP. Coyotes frequent the property, and a small number of tawny-bellied cotton rats (*Sigmodon fulviventer*) have been found near the wetland. Coyotes also appear to have plenty of suitable habitat in the area and are sufficiently abundant. The tawny-bellied cotton rat, in contrast, has become scarce in the MRG valley, largely because the sacaton grasslands it favors have disappeared. The OSD is attempting to recreate this type of habitat as a buffer area around the wetland, and this could favor this rare species. Other small mammals, such as skunks, raccoons, weasels, porcupines, and beavers, generally reside in the bosque near the farm rather than the farm itself, as that is their preferred habitat.

NON-NATIVE WILDLIFE SPECIES

Animal species that have been introduced to the CNP area by humans include the following: feral domestic dogs (*Canis lupus familiaris*) and cats (*Felis catus*), house sparrows (*Passer domesticus*), European starlings (*Sturnus vulgaris*), ring-necked pheasants [*Phasianus colchicus*; a state game species that is not native and competes with native quail (*Callipepla* sp.), but is largely limited to human-disturbed habitats], Eurasian collared dove (*Streptopelia decaocto*),

isopods (Class Malacostraca), house spiders (Class Arachnida), brown dog ticks (*Rhipicephalus sanguineus*), and European earwigs (*Forficula auricularia*). The American bullfrog (*Rana catesbeianus*) is a predator from the eastern United States that has become invasive of aquatic habitats across New Mexico and is eliminating native amphibians such as the northern leopard frog (*Lithobates pipiens*). All efforts should be made to discourage these non-native species from occurring on the CNP and competing with, or potentially preying upon, native species.

4.2.3 *Threatened, Endangered, and Other Special-Status Animal Species*

Several federally listed and New Mexico State–listed plant and animal species are known to occur in the vicinity of the CNP. Table 2 lists some of the USFWS and New Mexico Department of Game and Fish (NMDGF) threatened and endangered species occurring in or near the bosque in Bernalillo County, New Mexico (BISON-M 2019; USFWS 2019a; 2019b).

Table 2. Special-Status Species Occurring in Bernalillo County, New Mexico

Common Name	Scientific Name	Status
Rio Grande silvery minnow	*Hybognathus amarus*	USFWS E; State E
Common black-hawk	*Buteogallus anthracinus*	State T
Yellow-billed cuckoo	*Coccyzus americanus*	USFWS T
Southwestern willow flycatcher	*Empidonax traillii extimus*	USFWS E; State E
Bald eagle	*Haliaeetus leucocephalus*	State T
New Mexican meadow jumping mouse	*Zapus hudsonius luteus*	USFWS E

Sources: USFWS (2019); BISON-M (2019); Cartron (2010); Cartron et al. (2008)
Listing status: E = endangered, T = threatened

5 WILDLIFE HABITAT SITE DESIGN, GOALS, AND PROTOCOLS

The creation of diverse wildlife habitat is an important part of the CNP's mission. Specific goals for wildlife improvements include creating a dynamic patch mosaic of habitat; removing exotic species while restoring native species in phases over time; keeping vegetative cover for wildlife until new plantings are established; creating appropriate recreation opportunities while minimizing wildlife disturbance; establishing habitat for pollinators, birds, and native fauna; and improving and expanding the wetland ecosystem. It is also critical to monitor management efforts and progress towards these goals, and to incorporate an adaptive management approach that allows the plan to be modified when and where necessary. Priorities for habitat improvements should be based on two criteria: 1) those that benefit the widest range of native species, and 2) those that increase the numbers of native populations.

Due to the loss of wetlands along the river and number of wildlife these ecosystems support, a major priority of this RMP is to expand and improve the wetland habitat for the diversity of waterfowl, shore and wading birds, small mammals, reptiles, amphibians, and invertebrates that

depend on wetlands. Additional priorities for habitat improvements should be based on further research at the site. With the exception of some bird species, little is known about individual species numbers. Any special-status species or species that are known to be in decline and that could thrive at the CNP site should be considered as focal species for planned habitat restoration.

Attention needs to be given to developing proper species assemblages for a given habitat type. For instance, grassland areas should have the proper species mix to replicate grassland habitat typical of the region. Since this site has limited space, species spatial requirements should also be factored into any habitat development design. Farm fields will be phased out as they are restored to desired native habitats and the native fauna they support.

This section will cover each habitat type that will be improved or newly established at the CNP and the specific requirements and plant assemblages in developing these areas. While the OSD will manage the CNP to achieve the wildlife habitat goals, it is unpredictable how the natural processes, plant succession, and ecosystem functions may unfold. Monitoring and adaptive management will be essential. Refer to the Habitat Implementation Plan at the end of this section for a detailed list of activities and when they are proposed over the 20-year plan.

5.1 Restored Wildlife Habitats

5.1.1 *Candelaria Wetlands*

The wetlands at the CNP include ponds in the CNT known as the Candelaria Wetlands; an Observation Room pond at the RGNCSP Visitor Center and a ground water pond to the north; and an additional pond in the CST known as the Discovery Pond. These important aquatic habitats create a matrix of deep, open, and shallow water with diverse wetland plant species that support a broad variety of wildlife. This plan focuses on improvements to and expansion of the Candelaria Wetlands habitat in the CNT.

The Candelaria Wetlands, consisting of two connected cells, was constructed in the southwest comer of the CNT in 2001. This area was selected because it is adjacent to the RGNCSP parking area and visible from a viewing blind. It was also an ideal site because it does not impede irrigation to the farmed fields, has sandy soils, a history of weed problems, and low agricultural productivity. The plan for the Candelaria Wetlands was originally to manage excavated sediments from berms that would gradually erode back into pond depressions. The ponds would eventually become a shallow water marsh rather than open ponds. However, that did not happen, and they remain open water ponds. There is a great opportunity with the implementation of this plan to create a long-lasting and functional wetland that attracts shore and wading birds.

The Candelaria Wetlands owes its existence to the dedication and cooperation of several parties. The wetland was designed by Hydra Aquatic Ecological Consultants and sited with the help of the USFWS. In 2001, OSD crews excavated the native soils to the desired topographical relief, guided by the design. OSD crews placed an impermeable liner, purchased with funding from the USFWS, over the bottom of the wetland, and backfilled native soil over the liner to a depth of

approximately 1 foot. OSD installed a pipe between the cells to allow water to flow between them and installed one drainpipe in the west side of each cell, to flush algae-causing nutrients from the wetland into adjacent moist soil areas. Excess soil from excavation was used to create berms around the wetland, to contain the water and provide space for planting vegetation. The wetland was filled with well water from the RGNCSP, without introducing the non-beneficial organisms (invasive weed seeds, non-native fish, and bullfrogs) that are present in ditch water. In the spring of 2001, and with funding from the General Electric Fund Environmental Stewardship Program, the FRGNC purchased native wetland plants and worked with the OSD and students from Rio Grande High School to organize volunteers and plant the vegetation in the shallow water areas and moist banks of the wetland.

For a time, scientists and volunteers working with the FRGNC created a Wetland Monitoring Team to monitor the vegetation, wildlife, water quality, and soils in and around the wetland. The Wetland Team removed non-native or nuisance species, placed logs for turtles, and planted additional wetland vegetation. Monitoring completed by the Wetland Monitoring Team indicated that the steep slopes of the berm around the wetland created a very narrow moist soil zone, restricting the growth of moist soil plant species and limiting the use of this area by native wildlife species.

The Candelaria Wetlands continues to support abundant wildlife; however, it does not function as well as it should. Invasive plant and animal species have crept into the area, water does not flow well and becomes stagnant, and an imbalance of nutrients and lack of oxygen diminish wildlife value. An extensive evaluation of all the ponds and how they function with the surrounding area is required. There are opportunities to flush water from the ponds to the adjacent fields creating nutrient-rich damp soil habitat while improving flow and aeration in the ponds. Therefore, it is recommended that the OSD work with consultants and the RGNCSP to assess and create a detailed plan to modify the existing ponds to improve the wetlands and surrounding area. This will require cooperation between parks and the OSD since the ponds are currently managed by the RGNCSP. This should be a high priority.

5.1.2 *Grasslands Adjacent to the Candelaria Wetlands*

OSD staff has worked with the contract farmer to plant the irrigated field areas immediately to the north, east, and south of the wetland cells with native grasses. These grassland areas are intended to simulate a natural meadow attractive to upland and semi-aquatic wildlife, and to provide a less mechanized buffer area between the wetland and adjacent cropland where mechanized equipment may be periodically used. Weeds that continue to compete heavily with the grasses will necessitate mitigation. Unless other techniques are found to facilitate the establishment of grasses, these areas will need to be maintained periodically to control weeds, until the grasses are established. Weed treatment methods must be approved by the OSD, with herbicide use only as a last resort.

5.1.3 *Hedgerow Habitat Improvements*

The purpose of hedgerows is to provide perches, nest sites, protective ground cover, food, and movement corridors for wildlife, particularly songbirds and pheasants. Hedgerows may also serve as windbreaks. The hedgerows will be enhanced with more plants and with more plant species to improve the diversity and function of the hedgerows as wildlife habitat. Plant species recommended for new hedgerows are presented in Table 3. Hedgerows also will be planted over the next 20 years to increase the array of hedgerows along all existing roads and ditches.
The primary function of the hedgerows will be to serve as wildlife movement corridors and provide additional wildlife food and vertical vegetation structure. The protocols listed below will apply to the existing and newly planted hedgerows. However, additional goals of increasing hedgerow physical structural diversity and hedgerow plant species diversity will be considered part of their wildlife habitat function. Also, attention will be made to increase the abundance and taxonomic diversity of flowering plants for pollinators. Newly planted hedgerows will be planned over the next 20 years to provide a landscape network of wildlife corridors for movement, and habitat for food and shelter. A 20-year multi-phase plan will be developed to determine the best landscape arrays and plant species compositions of hedgerows, relative to adjacent habitats, relative to serving as visual barriers, and based on wildlife and visitor routes and activities. Figure 12 below represents vertical and horizontal canopy cover views of the Hedgerow Habitats.

Table 3. Plant Species Recommended for Planting in the New Hedgerow Habitats

Plant Species[1,2] (Dominants are Bold; Pollinator Plants are Pink)	**Scientific Name**	**Plant Family[3]**	**Growth Form[4]**	**Life History[5]**
Oak-leaf thorn-apple	*Datura quercifolia*	Solanaceae	Forb	Annual/Biennial
Threadleaf groundsel	*Senecio flaccidus*	Asteraceae	Forb	Perennial
Hairy golden-aster	*Heterotheca villosa*	Asteraceae	Forb	Perennial
Copper globemallow	*Sphaeralcea angustifolia*	Malvaceae	Forb	Perennial
Fleabane	*Erigeron divergens, E. flagellaris*	Poaceae	Forb	Perennial
Sacred thorn-apple	*Datura wrightii*	Solanaceae	Forb	Perennial
Blue grama	*Bouteloua gracilis*	Poaceae	Grass	Perennial
Side-oats grama	*Bouteloua curtipendula*	Poaceae	Grass	Perennial
Scratchgrass	*Muhlenbergia asperifolia*	Poaceae	Grass	Perennial
Western wheatgrass	*Pascopyrum smithii*	Poaceae	Grass	Perennial
Galleta	*Pleuraphis jamesii*	Poaceae	Grass	Perennial
Indian grass	*Sorghastrum nutans*	Poaceae	Grass	Perennial
Spike dropseed	*Sporobolus contractus*	Poaceae	Grass	Perennial
Sand dropseed	*Sporobolus cryptandrus*	Poaceae	Grass	Perennial
Alkali sacaton	*Sporobolus airoides*	Poaceae	Grass	Perennial
Little-leaf sumac	***Rhus microphylla***	**Anacardiaceae**	**Shrub**	**Perennial**
Skunkbush sumac	***Rhus trilobata***	**Anacardiaceae**	**Shrub**	**Perennial**

Plant Species[1,2] (Dominants are Bold; Pollinator Plants are Pink)	**Scientific Name**	**Plant Family[3]**	**Growth Form[4]**	**Life History[5]**
Rabbitbrush	***Ericameria nauseosua***	**Asteraceae**	**Shrub**	**Perennial**
Willow baccharis	***Baccharis salicifolia***	**Asteraceae**	**shrub**	**Perennial**
Four-wing saltbush	***Atriplex canescens***	**Chenopodiaceae**	**Shrub**	**Perennial**
Golden current	***Ribes aureum***	**Grossulariaceae**	**Shrub**	**Perennial**
New Mexico desert olive	***Forestiera pubescens***	**Oleaceae**	**Shrub**	**Perennial**
Apache plume	***Fallugia paradoxa***	**Rosaceae**	**Shrub**	**Perennial**
Pale wolfberry	***Lycium pallidum***	**Solanaceae**	**Shrub**	**Perennial**
Torrey's wolfberry	***Lycium torreyi***	**Solanaceae**	**Shrub**	**Perennial**
Desert willow	***Chilopsis linearis***	**Bignoniaceae**	**Tree**	**Perennial**
Net-leaf hackberry	***Celtis reticulata***	**Cannabaceae**	**Tree**	**Perennial**
Screw-bean mesquite	*Prosopis pubescens*	Fabaceae	Tree	Perennial
Black locust	*Robinia pseudoacacia*	Fabaceae	Tree	Perennial
Rio Grande cottonwood	*Populus deltoides wislizenii*	Salicaceae	Tree	Perennial
Peachleaf willow	*Salix amygdaloides*	Salicaceae	Tree	Perennial
Coyote willow	*Salix exigua*	Salicaceae	Tree	Perennial
Goodding's willow	*Salix gooddingii*	Salicaceae	Tree	Perennial
Thicket creeper	*Parthenocissus vitacea*	Vitaceae	Vine	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods.

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note some biennial species may be annual or perennial, depending on annual growing conditions.

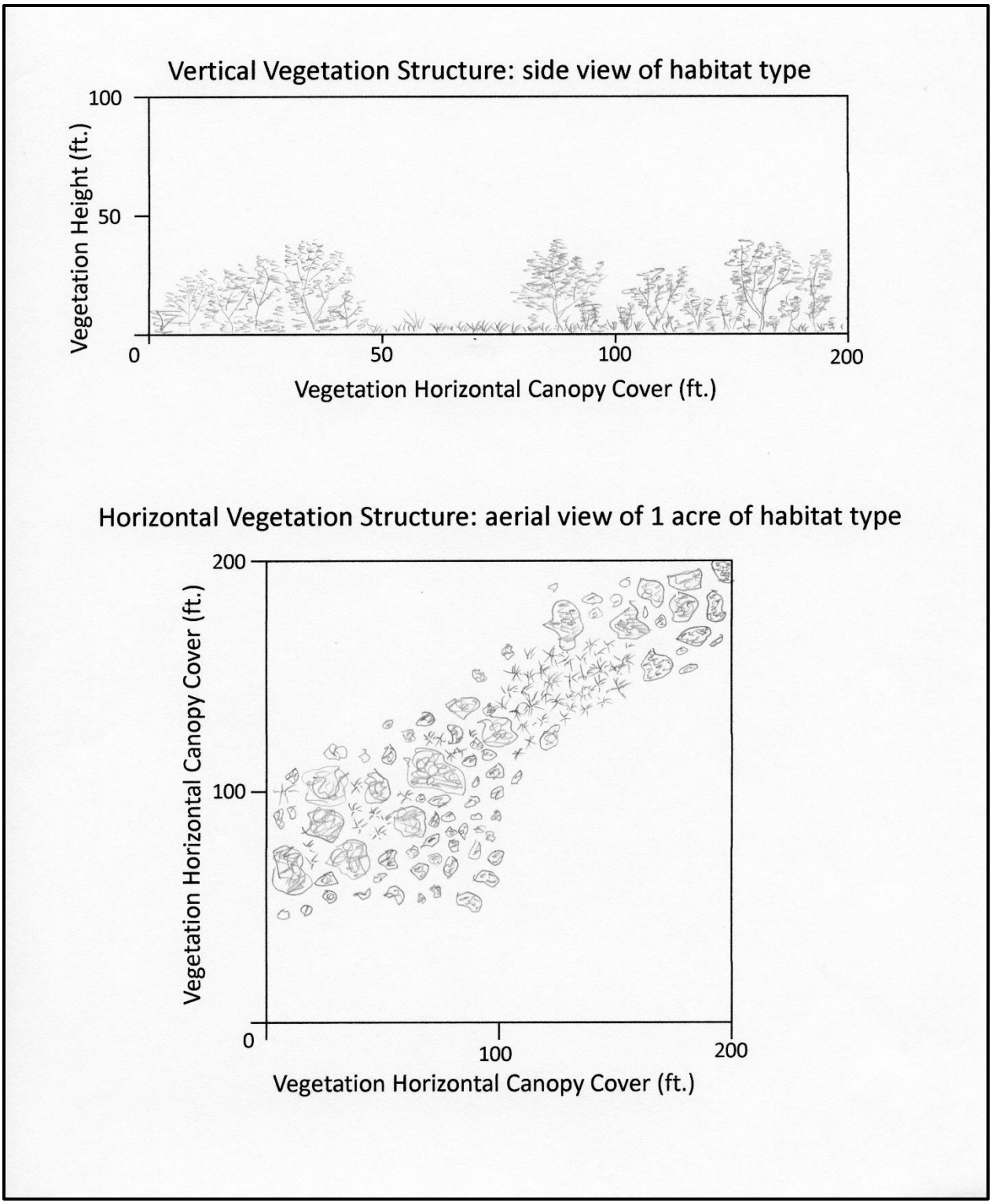

Figure 12. Vertical and horizontal canopy cover views of the Hedgerow Habitats.

5.1.4 *Bosque*

The existing bosque will be enhanced with more plants and with more plant species to improve the diversity and function of the existing bosque as wildlife habitat. Plant species recommended for planting are presented in Table 4. Additionally, new bosque habitat also will be planted over the next 20 years on the cropland adjacent to and immediately east of the existing bosque habitats to increase the size of the existing bosque habitat. The primary function of the new bosque habitat will be to serve wildlife that need woodland habitats and to provide additional wildlife food and vertical vegetation structure. The protocols listed below will apply to the existing and newly planted bosque. However, additional goals of increasing bosque physical structural diversity and bosque plant species diversity will be considered part of the bosque wildlife habitat function. Also, attention will be given to increase the abundance and taxonomic diversity of flowering plants for pollinators. Newly planted bosque species will be planned over the next 20 years to provide a landscape network of wildlife corridors for movement, and habitat for food and shelter. A 20-year multi-phase plan will be developed to determine the best landscape arrays and plant species compositions of bosque, relative to adjacent habitats. Figure 13 below represents vertical and horizontal canopy cover views of the Bosque Habitat.

Table 4. Plant Species Recommended for Planting in the Bosque Habitat

Plant Species[1,2] **Dominants are Bold;** **Pollinator Plants are Pink**	**Scientific Name**	**Plant Family[3]**	**Growth Form[4]**	**Life History[5]**
Navajo tea	*Thelesperma megapotamicum*	Asteraceae	Forb	Annual
Spectacle pod	*Dimorphocarpa wislizeni*	Brassicaceae	Forb	Annual
Rocky Mountain beeplant	*Cleome serrulata*	Capparaceae	Forb	Annual
Clammyweed	*Polanisia dodecandra trachysperma*	Capparaceae	Forb	Annual
Sandbells	*Nama hispidum*	Hydrophyllaceae	Forb	Annual
Velvetweed	*Gaura parviflora*	Onagraceae	Forb	Annual
Blue trumpets	*Ipomopsis longiflora*	Polemoniaceae	Forb	Annual
Warty caltrop	*Kallstroemia parviflora*	Zygophyllaceae	Forb	Annual
Oak-leaf thorn-apple	*Datura quercifolia*	Solanaceae	Forb	Annual/Biennial
Horsetail milkweed	*Asclepias subverticillata*	Asclepiadaceae	Forb	Perennial
Indian hemp	*Apocynum cannabinum*	Apocynaceae	Forb	Perennial
Hairy golden-aster	*Heterotheca villosa*	Asteraceae	Forb	Perennial
Wooly paperflower	*Psilostrophe tagetina*	Asteraceae	Forb	Perennial
Green Mexican-hat	*Ratibida tagetes*	Asteraceae	Forb	Perennial
Threadleaf groundsel	*Senecio flaccidus*	Asteraceae	Forb	Perennial
Riddell's groundsel	*Senecio riddellii*	Asteraceae	Forb	Perennial
White-heath aster	*Symphotrichum ericoides*	Asteraceae	Forb	Perennial
Lacy sleep-daisy	*Xanthisma spinolusum*	Asteraceae	Forb	Perennial
Freckled milkvetch	*Astragalus lentiginosus*	Fabaceae	Forb	Perennial
American licorice	*Glycyrrhiza lepidota*	Fabaceae	Forb	Perennial
Prairie flax	*Linum lewisi*	Linaceae	Forb	Perennial

Plant Species[1,2] **Dominants are Bold;** **Pollinator Plants are Pink**	**Scientific Name**	**Plant Family[3]**	**Growth Form[4]**	**Life History[5]**
Adonis blazingstar	*Metzelia multiflora*	Loasaceae	Forb	Perennial
Copper globemallow	*Sphaeralcea angustifolia*	Malvaceae	Forb	Perennial
Scarlet beeblossom	*Gaura coccinea*	Onagraceae	Forb	Perennial
Hooker's evening primrose	*Oenothera elata hirsutissima*	Onagraceae	Forb	Perennial
Pale evening primrose	*Oenothera pallida*	Onagraceae	Forb	Perennial
Fleabane	*Erigeron divergens,* *E. flagellaris*	Poaceae	Forb	Perennial
Yerba mansa	*Anemopsis californica*	Saururaceae	Forb	Perennial
Sacred thorn-apple	*Datura wrightii*	Solanaceae	Forb	Perennial
Indian grass	*Sorghastrum nutans*	Poaceae	Grass	Perennial
Giant sacaton	*Sporobolus wrightii*	Poaceae	Grass	Perennial
Scratchgrass	*Muhlenbergia asperifolia*	Poaceae	Grass	Perennial
Side-oats grama	*Bouteloua curtipendula*	Poaceae	Grass	Perennial
Indian ricegrass	*Achnatherum hymenoides*	Poaceae	Grass	Perennial
Blue grama	*Bouteloua gracilis*	Poaceae	Grass	Perennial
Western wheatgrass	*Pascopyrum smithii*	Poaceae	Grass	Perennial
Galleta	*Pleuraphis jamesii*	Poaceae	Grass	Perennial
Spike dropseed	*Sporobolus contractus*	Poaceae	Grass	Perennial
Sand dropseed	*Sporobolus cryptandrus*	Poaceae	Grass	Perennial
Alkali sacaton	*Sporobolus airoides*	Poaceae	Grass	Perennial
Little-leaf sumac	*Rhus microphylla*	Anacardiaceae	Shrub	Perennial
Skunkbush sumac	*Rhus trilobata*	Anacardiaceae	Shrub	Perennial
Rabbitbrush	***Ericameria nauseosua***	**Asteraceae**	**Shrub**	**Perennial**
Winterfat	*Krascheninnikovia lanata*	Chenopodiaceae	Shrub	Perennial
Broom dalea	*Psorothamnus scoparius*	Fabaceae	Shrub	Perennial
Golden current	*Ribes aureum*	Grossulariaceae	Shrub	Perennial
New Mexico desert olive	*Forestiera pubescens*	Oleaceae	Shrub	Perennial
Pale wolfberry	*Lycium pallidum*	Solanaceae	Shrub	Perennial
Torrey's wolfberry	*Lycium torreyi*	Solanaceae	Shrub	Perennial
Starvation prickly pear	*Opuntia polyacantha*	Cactaceae	Succulent	Perennial
Plains prickly pear	*Opuntia phaeacantha*	Cactaceae	Succulent	Perennial
Pott's prickly pear	*Opuntia pottsii*	Cactaceae	Succulent	Perennial
Desert willow	*Chilopsis linearis*	Bignoniaceae	Tree	Perennial
Net-leaf hackberry	***Celtis reticulata***	**Cannabaceae**	**Tree**	**Perennial**
Screw-bean mesquite	***Prosopis pubescens***	**Fabaceae**	**Tree**	**Perennial**
Black locust	***Robinia pseudoacacia***	**Fabaceae**	**Tree**	**Perennial**
Rio Grande cottonwood	***Populus deltoides wislizenii***	**Salicaceae**	**Tree**	**Perennial**
Goodding's willow	*Salix gooddingii*	Salicaceae	Tree	Perennial
Peachleaf willow	*Salix amygdaloides*	Salicaceae	Tree	Perennial

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Coyote willow	*Salix exigua*	Salicaceae	Tree	Perennial
Thicket creeper	*Parthenocissus vitacea*	Vitaceae	Vine	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods.

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note that some biennial species may be annual or perennial, depending on annual growing conditions.

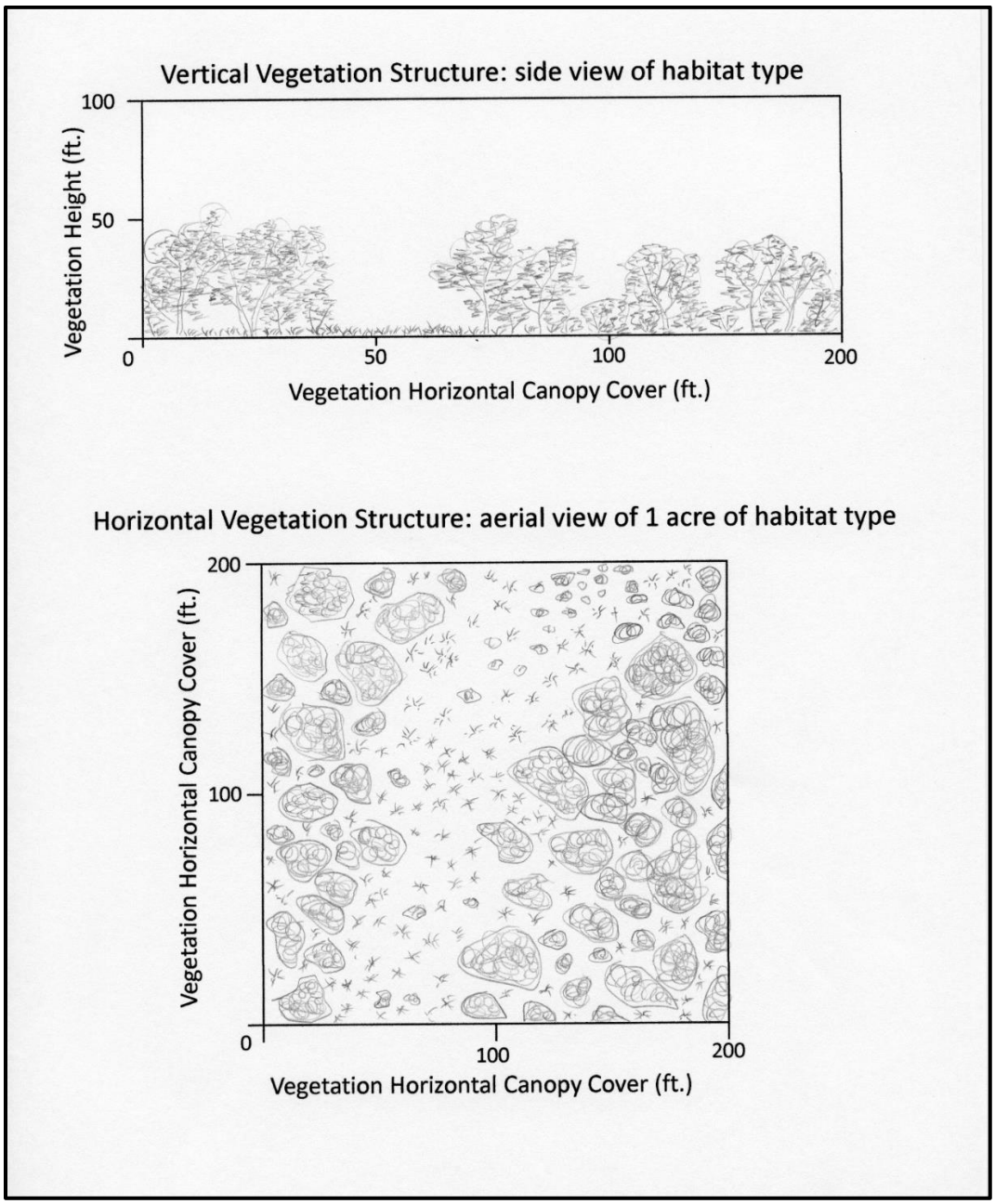

Figure 13. Vertical and horizontal canopy cover views of the Bosque Habitat.

5.1.5 *New Habitat Areas*

The following sections include newly proposed habitats areas intended to be developed over the next 20 years on existing crop fields and would greatly increase the diversity of habitats for wildlife on the CNP. These newly proposed habitats represent reference environments or habitats that were historically common and available to wildlife before the regulation (dams, levees, ditches) of the Rio Grande in the 1900s (Scurlock 1998; Watson 1912). These newly proposed habitats also are representative of modern variations of those historic habitats that occur today, but are no longer connected to annual flooding cycles of the Rio Grande, are not as biologically diverse as they were historically, and are now largely dominated by non-native invasive weed/tree species (Cartron et al. 2008; Crawford et al. 1993). The overall goal of restoring these habitats is to increase the natural biological diversity of the CNP, using historical and current MRG floodplain environments as reference models. The proposed new additions to bosque habitat and hedgerow habitats stated above also follow this overall goal of further increasing the biological diversity of the CNP. Additionally, plant species proposed for planting as part of restoration would be species that not only occurred in such habitats historically, but also are able to exist on the CNP today, and may be managed to persist or be replaced by other species as climate change continues to affect the biota of the region. Current human-caused climate change is already reducing available Rio Grande water, causing increasing atmospheric and soil temperatures, drought, and changes in the timing, amounts, and intensity of precipitation (see Chapter D: 1.2). Restoration of habitats for wildlife will require careful planning for the most appropriate plant species to use, appropriate irrigation and watering of plants with limited water, and the ability to shift species compositions over time as climate and water availability change.

These newly proposed habitats for wildlife are 1) Damp Soil Wetland, 2) Ephemeral Wetland, 3) Damp Soil Grassland, 4) Dry Soil Grassland, 5) Salt Shrubland, 6) Arroyo Margin Shrubland, and 7) Sandbar. Descriptions, lists of potential plant species, and management plans for each are stated below.

5.1.6 *Damp Soil Wetland Habitat*

Description. Juncus-Houttuynai (Rush-Yerba Mansa) Association of Watson (1912); Wetland/Open Area (wet/dry) habitats of Cartron et al. (2008); wetlands at Whitfield Wildlife Conservation Area (2019).

This habitat was represented along the Rio Grande by former river channel oxbows, where water levels vary, but the bottom of the oxbow is close to the water table and fluctuates between damp and inundated. Damp soil wetlands have damp clay, silty to sandy soil with occasional shallow (< 3 feet deep) standing water approximately every 2 months throughout the year. Naturally high water would be during the late spring Rio Grande runoff in May/June. With river regulation and climate change, that is no longer the case. To mimic the occasional flooding periods, the Damp Soil Wetland would be flood-irrigated on a schedule to best support the greatest number of obligate wetland plant species. Typical plant species would include obligate wetland graminoid rushes, sedges and grasses, several obligate wetland forb species, and several phreatophyte shrub

and tree species. This wetland will represent a range from early seral (all herbs) to late seral (shrubs and trees) damp soil wetland, and a vegetation structure that is open, dominated by herbs, with scattered individual and clumps of shrubs and trees. Plant species recommended for planting in the Damp Soil Wetland Habitat are presented in Table 5. Figure 14 below represents vertical and horizontal canopy cover views of the Damp Soil Wetland.

Table 5. Plant Species Recommended for Planting in the Damp Soil Wetland Habitat

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Rough cocklebur	*Xanthium strumarium*	Asteraceae	Forb	Annual
Showy milkweed	*Asclepias speciosa*	Asclepiadaceae	Forb	Perennial
Western goldentop	*Euthamia occidentalis*	Asteraceae	Forb	Perennial
Pecos sunflower	*Helianthus paradoxus*	Asteraceae	Forb	Perennial
Blueweed	*Helianthus ciliaris*	Asteraceaee	Forb	Perennial
Smooth horsetail	*Equisetum laevigatum*	Equisetaceae	Forb	Perennial
American water horehound	*Lycopus americanus*	Lamiaceae	Forb	Perennial
Field mint	*Mentha arvensis*	Lamiaceae	Forb	Perennial
Yerba mansa	*Anemopsis californica*	Saururaceae	Forb	Perennial
Roundleaf monkeyflower	*Mimulus glabratus*	Scrophulariaceae	Forb	Perennial
American brooklime	*Veronica americana*	Scrophulariaceae	Forb	Perennial
Indian grass	*Sorghastrum nutans*	Poaceae	Grass	Perennial
Vine-mesquite	***Panicum obtusum***	**Poaceae**	**Grass**	**Perennial**
Common reed	***Phragmites australis***	**Poaceae**	**Grass**	**Perennial**
Giant sacaton	***Sporobolus wrightii***	**Poaceae**	**Grass**	**Perennial**
Cosmopolitan bulrush	***Bolboschoenus maritimus***	**Cyperaceae**	**Grass/Graminoid**	**Perennial**
Emory's sedge	***Carex emoryi***	**Cyperaceae**	**Grass/Graminoid**	**Perennial**
Woolly sedge	***Carex pellita***	**Cyperaceae**	**Grass/Graminoid**	**Perennial**
Marshy spike-rush	***Eleocharis palustris***	**Cyperaceae**	**Grass/Graminoid**	**Perennial**
Toad rush	***Juncus bufonius***	**Juncaceae**	**Grass/Graminoid**	**Perennial**
Dudley's rush	***Juncus dudleyi***	**Juncaceae**	**Grass/Graminoid**	**Perennial**
Torrey's rush	***Juncus torreyi***	**Juncaceae**	**Grass/Graminoid**	**Perennial**
Great Plains seep-willow	*Baccharis salicina*	Asteracea	Shrub	Perennial
False indigo bush	*Amorpha fruticosa*	Fabaceae	Shrub	Perennial
Desert willow	*Chilopsis linearis*	Bignoniaceae	Tree	Perennial
Coyote willow	*Salix exigua*	Salicaceae	Tree	Perennial
Goodding's willow	*Salix gooddingii*	Salicaceae	Tree	Perennial
Rio Grande cottonwood	*Populus deltoides wislizenii*	Salicaceae	Tree	Perennial
Peachleaf willow	*Salix amygdaloides*	Salicaceae	Tree	Perennial
Coyote willow	*Salix exigua*	Salicaceae	Tree	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note that some biennial species may be annual or perennial, depending on annual growing conditions.

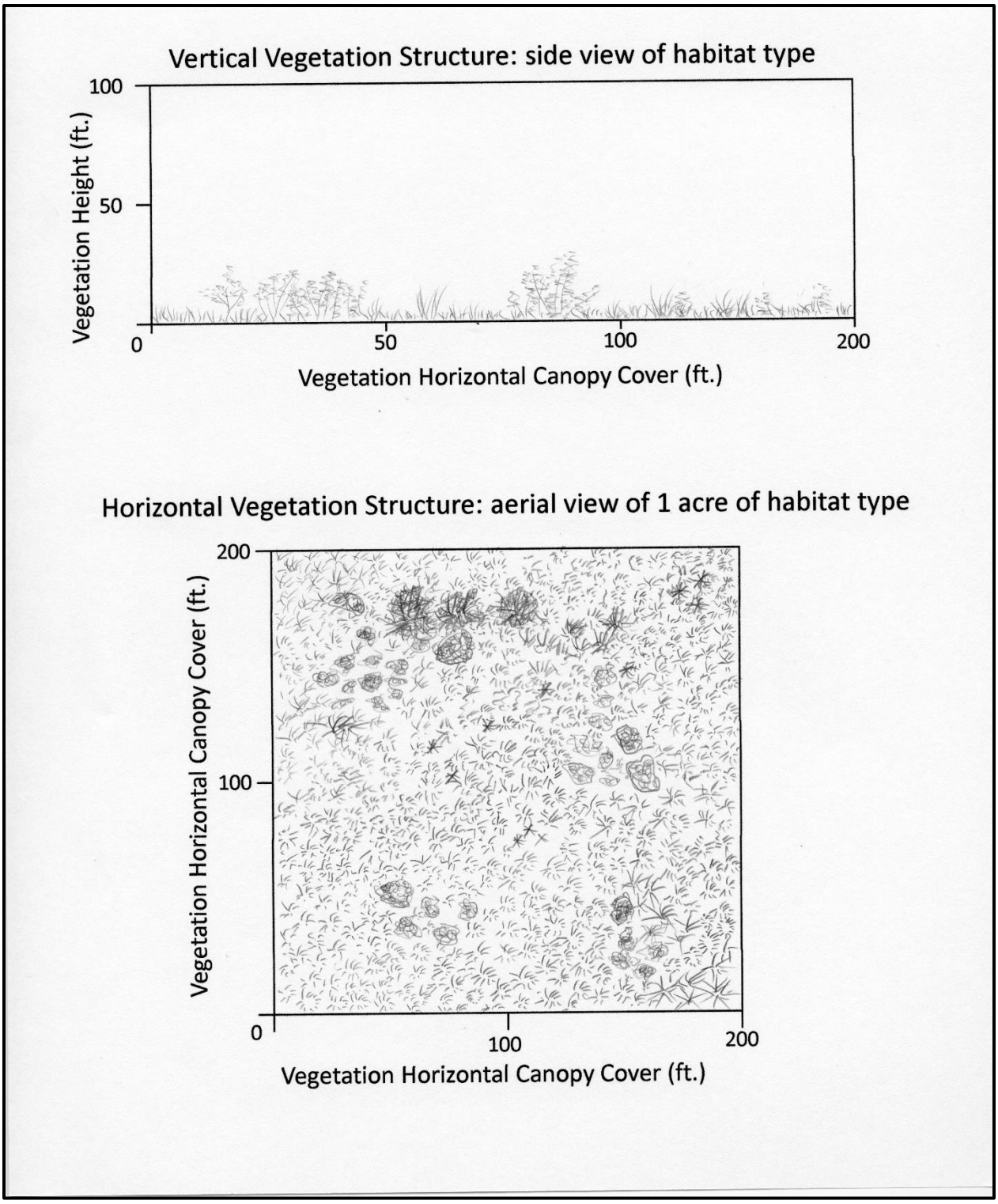

Figure 14. Vertical and horizontal canopy cover views of the Damp Soil Wetland.

Purpose. Permanent wetlands were once common among old oxbow channels adjacent to the Rio Grande. Such wetlands are now rare, and there is much need to restore/create more wetland habitats to support greater species diversities and abundances of native wildlife in the

Albuquerque region. The Damp Soil Wetland will provide habitats for wetland associated animal species, including many arthropods, other invertebrates such as annelid worms, wetland specialist amphibians, reptiles, birds, and mammals. Such species do not occur in other, drier or aquatic habitats. Without wetlands, these species will not occur in the area. Wetlands additionally provide important habitat for generalist species, where a great abundance of other more habitat-specific (wetland) species also occur.

Design. The Damp Soil Wetland would be constructed in the crop fields immediately to the east of the existing RGNCSP ponds and Candelaria Wetland ponds. The soils of this area are sandy and well drained, and the water table is at approximately 6 to 8 feet below the soil surface (see Chapter D: 1.3–1.4). The Damp Soil Wetland would take approximately 20 years for plantings to spread and for perennial woody species to become mature. All stages of natural ecological succession for an MRG wetland would be planted and maintained, from open graminoid areas, to perennial herb patches, and woody shrub and tree patches. The Damp Soil Wetland will be designed to have no transport of water to the Candelaria Wetlands or RGNCSP ponds.

Implementation. Earthmoving equipment will be needed to excavate a shallow simulated oxbow depression (2–4 feet deep, 100 feet wide, and 1,000 feet long) across the existing field. Soil from the excavation would be moved to the side margins and spread to an estimated distance of 100 feet away from the depression on both sides, in uneven depths of 1 to 2 feet, with slightly sloping margins to simulate shorelines. The Candelaria Wetland ponds were excavated to depths of about 6 feet, with the assumption that excavated soils piled as berms around the ponds would erode back into the ponds, but that did not happen. Based on that experience, the excavated soils around the Damp Soil Wetland perimeter should stay in place for many years, especially once vegetation has grown over the soil surfaces. A planting design will be produced and select plant species from Table 5 would be planted according to the spatial design, which would include phases over the next 20 years. A flood-irrigation watering plan will need to be produced based on the species planted and their water needs. Groundwater may also be used. The watering plan needs to ensure the soils in the bottom of the simulated oxbow depression remain damp at all times, and periodically flooded up to 2 feet deep.

Maintenance. Following construction and initial Phase 1 vegetation plantings, the primary maintenance needs will be the periodic flood-irrigation of the Damp Soil Wetland, based on the watering plan (see above). Additionally, a non-native invasive weed control plan will need to be developed and implemented on a periodic basis or as needed. Monitoring will be necessary to provide data on the effectiveness of both the watering plan and the non-native invasive weed control plan. Monitoring should also be employed to evaluate the water table (piezometer wells), soil condition (soil particle size and chemistry sampling), soil movement (erosion from the excavated soil, and sedimentation of the simulated oxbow depression) over the next 20 years.

5.1.7 *Ephemeral Wetland Habitat*

Description. Juncus-Houttuynai (Rush-Yerba Mansa) Association of Watson (1912), but with less periodic flooding, and drier than the Damp Soil Wetland above; Wetland/Open Area

(wet/dry) habitats of Cartron et al. (2008); drier portions of the wetlands at Whitfield Wildlife Conservation Area (2019).

This habitat was represented along the Rio Grande by former river channel oxbows where water levels vary and the bottom of the oxbow is not close to the water table. Most water is from summer rainstorms rather than groundwater. Ephemeral Wetlands have damp to dry clay, silty to sandy soil with occasional shallow (< 2 feet deep) standing water approximately two to three times during the summer growing season, mostly during the late summer monsoon period. Naturally high water may also occur during the late spring Rio Grande runoff in May/June. With river regulation and climate change, that is no longer the case. To mimic the occasional early and late summer flooding periods, the Ephemeral Wetland would be flood-irrigated on a schedule to best support the greatest number of obligate and facultative wetland plant species listed in Table 6. Typical plant species would include obligate/facultative wetland graminoid rushes, sedges and grasses, several facultative wetland forb species, and several phreatophyte shrub and tree species. This ephemeral wetland will represent a range of early seral (all herbs) to a late seral (shrubs and trees) damp to dry soil wetland, and the vegetation structure that is open, dominated by herbs, with scattered individual clumps of shrubs and trees. Plant species recommended for planting in the Ephemeral Wetland Habitat are presented in Table 6.

Table 6. Plant Species Recommended for Planting in the Ephemeral Wetland Habitat

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Curlycup gumweed	***Grindelia squarrosa***	**Asteraceae**	**Forb**	**Annual**
Annual sunflower	*Helianthus annuus*	Asteraceae	Forb	Annual
Rocky Mountain beeplant	*Cleome serrulata*	Capparaceae	Forb	Annual
Clammyweed	*Polanisia dodecandra trachysperma*	Capparaceae	Forb	Annual
Blue lettuce	*Mulgedium pulchellum*	Asteraceae	Forb	Annual/Biennial
Indian hemp	*Apocynum cannabinum*	Apocynaceae	Forb	Perennial
Horsetail milkweed	*Asclepias subverticillata*	Asclepiadaceae	Forb	Perennial
Showy milkweed	*Asclepias speciosa*	Asclepiadaceae	Forb	Perennial
Western goldentop	*Euthamia occidentalis*	Asteraceae	Forb	Perennial
Blueweed	***Helianthus ciliaris***	**Asteraceae**	**Forb**	**Perennial**
Seaside heliotrope	***Heliotroium curassavicum***	**Boraginaceae**	**Forb**	**Perennial**
Alkali mallow	***Malvella leprosa***	**Malvaceae**	**Forb**	**Perennial**
Yerba mansa	*Anemopsis californica*	Saururaceae	Forb	Perennial
Bearded sprangletop	*Leptochloa fusca fascicularis*	Poaceae	Grass	Annual
Inland saltgrass	***Distichlis spicata stricta***	**Poaceae**	**Grass**	**Perennial**
Giant sacaton	***Sporobolus wrightii***	**Poaceae**	**Grass**	**Perennial**
Vine-mesquite	***Panicum obtusum***	**Poaceae**	**Grass**	**Perennial**
Canada wildrye	*Elymus canadensis*	Poaceae	Grass	Perennial
Scratchgrass	***Muhlenbergia asperifolia***	**Poaceae**	**Grass**	**Perennial**
Western wheatgrass	***Pascopyrum smithii***	**Poaceae**	**Grass**	**Perennial**

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Galleta	***Pleuraphis jamesii***	**Poaceae**	**Grass**	**Perennial**
Indian grass	*Sorghastrum nutans*	Poaceae	Grass	Perennial
Alkali sacaton	***Sporobolus airoides***	**Poaceae**	**Grass**	**Perennial**
Goldenweed	*Isocoma pluriflora*	Asteraceae	Shrub	Perennial
False indigo bush	*Amorpha fruticosa*	Fabaceae	Shrub	Perennial
Desert willow	*Chilopsis linearis*	Bignoniaceae	Tree	Perennial
Screw-bean mesquite	*Prosopis pubescens*	Fabaceae	Tree	Perennial
Peachleaf willow	*Salix amygdaloides*	Salicaceae	Tree	Perennial
Coyote willow	*Salix exigua*	Salicaceae	Tree	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods.

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note that some biennial species may be annual or perennial, depending on annual growing conditions.

Purpose. Ephemeral wetlands were once common among old oxbow channels on the floodplain near the Rio Grande. Such wetlands are now rare, and there is much need to restore/create more wetland habitats to support greater species diversities and abundances of native wildlife in the Albuquerque region. The Ephemeral Wetland will provide habitats for wetland-associated animal species, including many arthropods, wetland-specialist amphibians, reptiles, birds, and mammals. Such species do not occur in other, drier or aquatic habitats, and some prefer ephemeral wetlands over permanent wetlands. Without wetlands, these species will not occur in the area. Wetlands additionally provide important habitat for generalist species, where a great abundance of other more habitat-specific (wetland) species also occur.

Design. The Ephemeral Wetland would be constructed in the crop fields immediately to the east of the existing RGNC ponds and Candelaria Wetland ponds, and adjacent to the Damp Soil Wetland. The soils of this area are sandy and well drained, and the water table is at approximately 6 to 8 feet below the soil surface (see Chapter D: 1.3–1.4). The Ephemeral Wetland would take approximately 20 years for plantings to spread and for perennial woody species to become mature. All stages of natural ecological succession for this MRG wetland would be planted and maintained, from open graminoid areas, to perennial herb patches, and woody shrub and tree patches. The Ephemeral Wetland will be designed to have no transport of water to the Candelaria Wetlands or RGNCSP ponds. Figure 15 below represents vertical and horizontal canopy cover views of the Ephemeral Wetland.

Implementation. Earthmoving equipment will be needed to excavate a shallow simulated oxbow depression (1–3 feet deep, 100 feet wide, and 1,000 feet long) across the existing field. Soil from the excavation would be moved to the side margins and spread to a distance of about 100 feet away from the depression on both sides, in uneven depths up to 1 foot, with slightly sloping margins to simulate shorelines. The Candelaria Wetland ponds were excavated to depths

of about 6 feet, with the assumption that excavated soils piled as berms around the ponds would erode back into the ponds, but that did not happen. Based on that experience, the excavated soils around the Ephemeral Wetland perimeter should stay in place for many years, especially once vegetation has grown over the soil surfaces. A planting design will be produced and select plant species from Table 6 would be planted according to the spatial design, which would include phases over the next 20 years. A flood-irrigation watering plan will need to be produced, based on the species planted and their water needs. The watering plan will need to be such that the soils in the bottom of the simulated oxbow depression are damp for several weeks at a time during the early and late summer, but periodically dry at the surface between irrigation events. Natural rainstorms should also fill the bottom of the ephemeral wetland for short periods and may preclude the need for irrigation.

Maintenance. Following construction and initial Phase 1 vegetation plantings, the primary maintenance needs will be the periodic flood-irrigation of the Ephemeral Wetland, based on the watering plan (see above). Additionally, non-native invasive weeds will need to be controlled by the development of a non-native invasive weed control plan, and implementation of that plan on a periodic basis. Monitoring will be necessary to provide data on the effectiveness of both the watering plan and the non-native invasive weed control plan. Monitoring should also be employed to evaluate the water table (piezometer wells), soil condition (soil particle size and chemistry sampling), soil movement (erosion from the excavated soil, and sedimentation of the simulated oxbow depression) over the next 20 years.

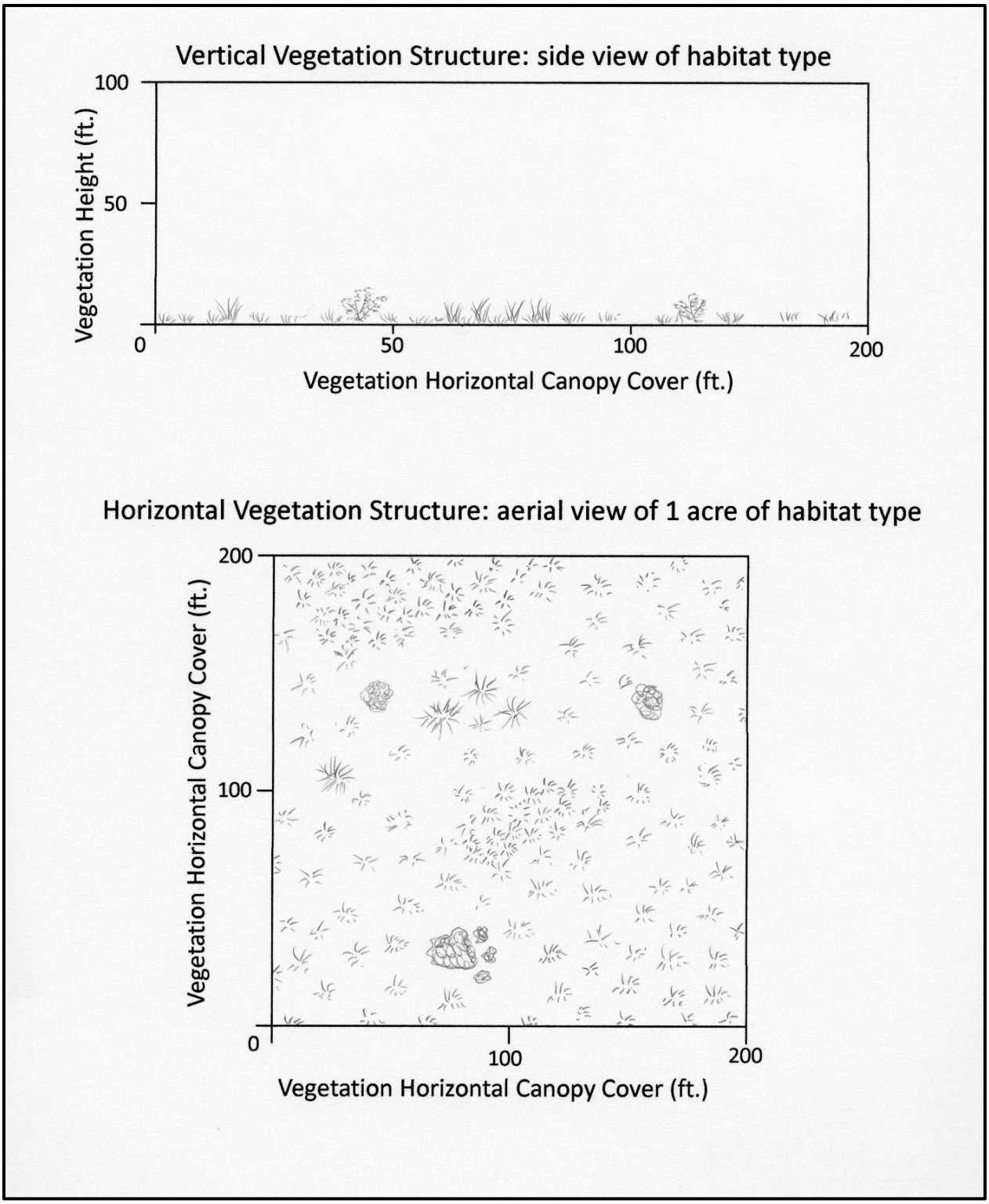

Figure 15. Vertical and horizontal canopy cover views of the Ephemeral Wetland Habitat.

5.1.8 *Damp Soil Grassland Habitat*

Description. Juncus-Houttuynai (Rush-Yerba Mansa) Association of Watson (1912), but upper portions that are drier than wetland areas; Wetland/Open Area (wet/dry) habitats of Cartron et al. (2008); saltgrass area at Whitfield Wildlife Conservation Area (2019).

This habitat was represented along the Rio Grande on the former floodplain near the river, where water levels vary, but tend to be drier than wetlands. Damp Soil Grasslands have damp to dry clay, silty to sandy soil that is wet approximately two to three times during the summer growing season, mostly during the late summer monsoon period. Naturally high water may also occur during the late spring Rio Grande runoff in May/June. With river regulation and climate change, that is no longer the case. To mimic the occasional early and late summer flooding periods, the Damp Soil Grassland would be flood-irrigated on a schedule to best support the greatest number of obligate and facultative damp grassland plant species listed in Table 7. Typical plant species would include obligate/facultative damp soil grasses, several facultative damp soil forb species, and several shrub and tree species. This Damp Soil Grassland will represent a range from early seral (all herbs) to late seral (shrubs and trees) damp to dry soil grassland, and a vegetation structure that is open, dominated by herbs, with scattered individual and clumps of shrubs and trees. Plant species recommended for planting in the Damp Soil Grassland Habitat are presented in Table 7.

Table 7. Plant Species Recommended for Planting in the Damp Soil Grassland Habitat

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Curlycup gumweed	*Grindelia squarrosa*	Asteraceae	Forb	Annual
Horsetail milkweed	*Asclepias subverticillata*	Asclepiadaceae	Forb	Perennial
Yerba mansa	*Anemopsis californica*	Saururaceae	Forb	Perennial
Blueweed	*Helianthus ciliaris*	Asteraceae	Forb	Perennial
Indian hemp	*Apocynum cannabinum*	Apocynaceae	Forb	Perennial
Prairie flax	*Linum lewissi*	Linaceae	Forb	Perennial
Alkali mallow	*Malvella leprosa*	Malvaceae	Forb	Perennial
Bearded sprangletop	*Leptochloa fusca fascicularis*	Poaceae	Grass	Annual
Inland saltgrass	***Distichlis spicata stricta***	**Poaceae**	**Grass**	**Perennial**
Alkali sacaton	***Sporobolus airoides***	**Poaceae**	**Grass**	**Perennial**
Giant sacaton	*Sporobolus wrightii*	Poaceae	Grass	Perennial
Blue grama	*Bouteloua gracilis*	Poaceae	Grass	Perennial
Sliver bluestem	*Bothriochloa laguroides*	Poaceae	Grass	Perennial
Galleta	***Pleuraphis jamesii***	**Poaceae**	**Grass**	**Perennial**
Sand dropseed	*Sporobolus cryptandrus*	Poaceae	Grass	Perennial
Vine-mesquite	***Panicum obtusum***	**Poaceae**	**Grass**	**Perennial**
Goldenweed	*Isocoma pluriflora*	Asteraceae	Shrub	Perennial
Four-wing saltbush	*Atriplex canescens*	Chenopodiaceae	Shrub	Perennial

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Winterfat	*Krascheninnikovia lanata*	Chenopodiaceae	Shrub	Perennial
Pale wolfberry	*Lycium pallidum*	Solanaceae	Shrub	Perennial
Torrey's wolfberry	*Lycium torreyi*	Solanaceae	Shrub	Perennial
Greasewood	*Sarcobatus vermiculatus*	Chenopodiaceae	Shrub	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods.

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note that some biennial species may be annual or perennial, depending on annual growing conditions.

Purpose. Damp Soil Grasslands were once common adjacent to old oxbow channels and on the floodplain near the Rio Grande. Such grasslands are now rare, and there is much need to restore/create more grassland habitats to support greater species diversities and abundances of native wildlife in the Albuquerque region. The Damp Soil Grassland will provide habitat for grassland-associated animal species, including many arthropods, reptiles, birds, and mammals. Without grasslands, these species will not occur in the area. Grasslands additionally provide important habitat for generalist species, where a great abundance of other more habitat-specific (grassland) species also occur.

Design. The Damp Soil Grassland would be constructed in the crop fields immediately to the east of the existing RGNCSP ponds and Candelaria Wetland ponds, and adjacent to the Damp Soil Wetland. The soils of this area are sandy and well drained, and the water table is at approximately 6 to 8 feet below the soil surface (see Chapter D: 1.3–1.4). The Damp Soil Grassland would take approximately 10 years for plantings to spread and for perennial woody species to become mature. All stages of natural ecological succession for an MRG damp grassland would be planted and maintained, from open grassy areas, to perennial herb patches, and woody shrub and tree patches. Figure 16 below represents vertical and horizontal canopy cover views of the Damp Soil Grassland.

Implementation. A planting design will be produced and select plant species from Table 7 would be planted according to the spatial design, which would include phases over the next 20 years. A flood-irrigation watering plan will need to be produced, based on the species planted and their water needs. The watering plan will need to be such that the soils are damp for several weeks at a time during the early and late summer, but periodically dry at the surface between irrigation events.

Maintenance. The primary maintenance needs will be the periodic flood-irrigation of the Damp Soil Grassland, based on the watering plan (see above). Additionally, non-native invasive weeds will need to be controlled by the development of a non-native invasive weed control plan, and implementation of that plan on a periodic basis. Monitoring will be necessary to provide data on the effectiveness of both the watering plan and the non-native invasive weed control plan.

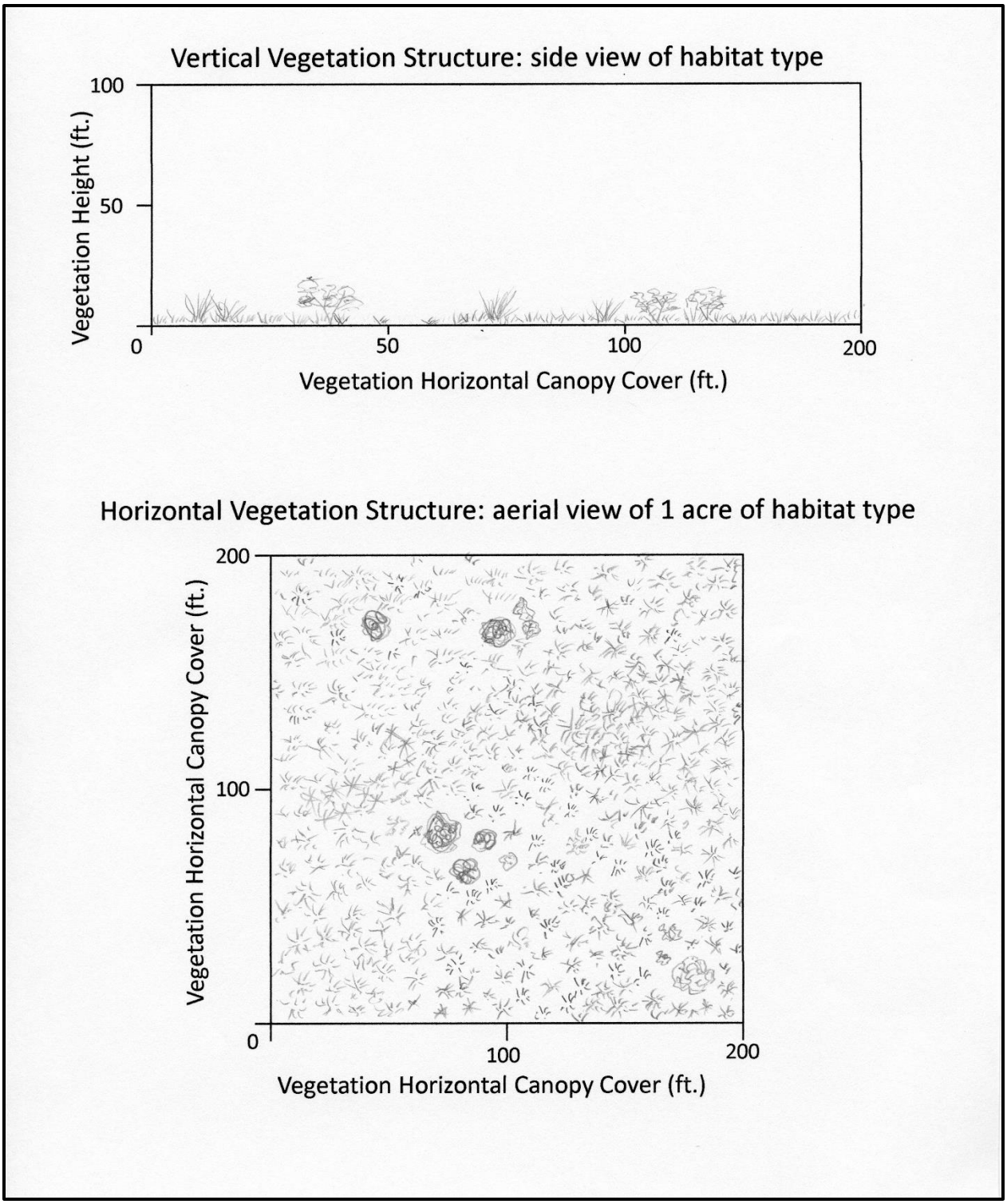

Figure 16. Vertical and horizontal canopy cover views of the Damp Soil Grassland.

5.1.9 *Dry Soil Grassland Habitat*

Description. Rabbitbrush (Biglovia) Association of Watson (1912), but upper portions that are drier than wetland areas; Open Area habitats of Cartron et al. (2008); grassy areas (not saltgrass area) at Whitfield Wildlife Conservation Area (2019).

This habitat was represented along the Rio Grande on the floodplain, with dry clay, silty to sandy soils. The Dry Soil Grassland would be flood-irrigated on a schedule to best support the greatest number of grassland plant species listed in Table 8. Typical plant species would include grasses, several forb species, and several shrub and tree species. This Dry Soil Grassland will represent a range of early seral (all herbs) to late seral (shrubs) dry soil grassland, and a vegetation structure that is open, dominated by herbs, with scattered individual and clumps of shrubs. Plant species recommended for planting in the Dry Soil Grassland Habitat are presented in Table 8.

Table 8. Plant Species Recommended for Planting in the Dry Soil Grassland Habitat

Plant Species[1,2] **Dominants are Bold;** **Pollinator Plants are Pink**	**Scientific Name**	**Plant Family[3]**	**Growth Form[4]**	**Life History[5]**
Navajo tea	*Thelesperma megapotamicum*	Asteraceae	Forb	Annual
Curlycup gumweed	*Grindelia squarrosa*	Asteraceae	Forb	Annual
Spectacle pod	*Dimorphocarpa wislizeni*	Brassicaceae	Forb	Annual
Rocky Mountain beeplant	*Cleome serrulata*	Capparaceae	Forb	Annual
Clammyweed	*Polanisia dodecandra trachysperma*	Capparaceae	Forb	Annual
Sandbells	*Nama hispidum*	Hydrophyllaceae	Forb	Annual
Velvetweed	*Gaura parviflora*	Onagraceae	Forb	Annual
Blue trumpets	*Ipomopsis longiflora*	Polemoniaceae	Forb	Annual
Warty caltrop	*Kallstroemia parviflora*	Zygophyllaceae	Forb	Annual
Oak-leaf thorn-apple	*Datura quercifolia*	Solanaceae	Forb	Annual/Biennial
Horsetail milkweed	*Asclepias subverticillata*	Asclepiadaceae	Forb	Perennial
Hairy golden-aster	*Heterotheca villosa*	Asteraceae	Forb	Perennial
Wooly paperflower	*Psilostrophe tagetina*	Asteraceae	Forb	Perennial
Green Mexican-hat	*Ratibida tagetes*	Asteraceae	Forb	Perennial
Threadleaf groundsel	*Senecio flaccidus*	Asteraceae	Forb	Perennial
Riddell's groundsel	*Senecio riddellii*	Asteraceae	Forb	Perennial
White-heath aster	*Symphotrichum ericoides*	Asteraceae	Forb	Perennial
Lacy sleep-daisy	*Xanthisma spinolusum*	Asteraceae	Forb	Perennial
Freckled milkvetch	*Astragalus lentiginosus*	Fabaceae	Forb	Perennial
Albuquerque prairie clover	*Dalea scariosa*	Fabaceae	Forb	Perennial
Prairie flax	*Linum lewissi*	Linaceae	Forb	Perennial
Adonis blazingstar	*Metzelia multiflora*	Loasaceae	Forb	Perennial
Copper globemallow	***Sphaeralcea angustifolia***	**Malvaceae**	**Forb**	**Perennial**
Scarlet beeblossom	*Gaura coccinea*	Onagraceae	Forb	Perennial

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Hooker's evening primrose	*Oenothera elata hirsutissima*	Onagraceae	Forb	Perennial
Pale evening primrose	*Oenothera pallida*	Onagraceae	Forb	Perennial
Fleabane	*Erigeron divergens, E. flagellaris*	Poaceae	Forb	Perennial
Sacred thorn-apple	*Datura wrightii*	Solanaceae	Forb	Perennial
Blue grama	***Bouteloua gracilis***	**Poaceae**	**Grass**	**Perennial**
Sand dropseed	***Sporobolus cryptandrus***	**Poaceae**	**Grass**	**Perennial**
Galleta	*Pleuraphis jamesii*	Poaceae	Grass	Perennial
Indian ricegrass	***Achnatherum hymenoides***	**Poaceae**	**Grass**	**Perennial**
Silver bluestem	*Bothriochloa laguroides*	Poaceae	Grass	Perennial
Side-oats grama	***Bouteloua curtipendula***	**Poaceae**	**Grass**	**Perennial**
Burro grass	*Scleropogon brevifolius*	Poaceae	Grass	Perennial
Western wheatgrass	***Pascopyrum smithii***	**Poaceae**	**Grass**	**Perennial**
Galleta	*Pleuraphis jamesii*	Poaceae	Grass	Perennial
Spike dropseed	***Sporobolus contractus***	**Poaceae**	**Grass**	**Perennial**
Rabbitbrush	***Ericameria nauseosua***	**Asteraceae**	**Shrub**	**Perennial**
Broom snakeweed	*Gutierrezia sarothrae*	Asteraceae	Shrub	Perennial
Winterfat	*Krascheninnikovia lanata*	Chenopodiaceae	Shrub	Perennial
Broom dalea	*Psorothamnus scoparius*	Fabaceae	Shrub	Perennial
Plains yucca	*Yucca glauca*	Asparagaceae	Succulent	Perennial
Plains prickly pear	*Opuntia phaeacantha*	Cactaceae	Succulent	Perennial
Tree cholla	*Cylindropuntia imbricata*	Cactaceae	Succulent	Perennial
Starvation prickly pear	*Opuntia polyacantha*	Cactaceae	Succulent	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods.

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note that some biennial species may be annual or perennial, depending on annual growing conditions.

Purpose. Dry Soil Grasslands were once common on the former floodplain near the Rio Grande. Such grasslands are now rare, and there is much need to restore/create more grassland habitats to support greater species diversities and abundances of native wildlife in the Albuquerque region. The Dry Soil Grassland will provide habitat for grassland-associated animal species, including many arthropods, reptiles, birds, and mammals. Without grasslands, these species will not occur in the area. Grasslands additionally provide important habitat for generalist species, where a great abundance of other more habitat-specific (grassland) species also occur.

Design. The Dry Soil Grassland would be constructed in several crop fields throughout the CNP. The soils of these areas range from clay to sandy loam (see Chapter D: 1.3–1.4). The Dry Soil Grassland would take approximately 10 years for plantings to spread and for perennial woody species to become mature. All stages of natural ecological succession for an MRG floodplain dry grassland would be planted and maintained, from open grassy areas to perennial herb patches

and woody shrub patches. Figure 17 below represents vertical and horizontal canopy cover views of the Dry Soil Grassland.

Implementation. A planting design will be produced and select plant species from Table 8 would be planted according to the spatial design, which would include phases over the next 20 years. A flood-irrigation watering plan will need to be produced, based on the species planted and their water needs. The watering plan will need to be such that the surface soils are damp for several days at a time during the early and late summer, but dry at the surface between irrigation events.

Maintenance. The primary maintenance needs will be the periodic flood-irrigation of the Dry Soil Grassland, based on the watering plan (see above). Additionally, non-native invasive weeds will need to be controlled by the development of a non-native invasive weed control plan, and implementation of that plan on a periodic basis. Monitoring will be necessary to provide data on the effectiveness of both the watering plan and the non-native invasive weed control plan.

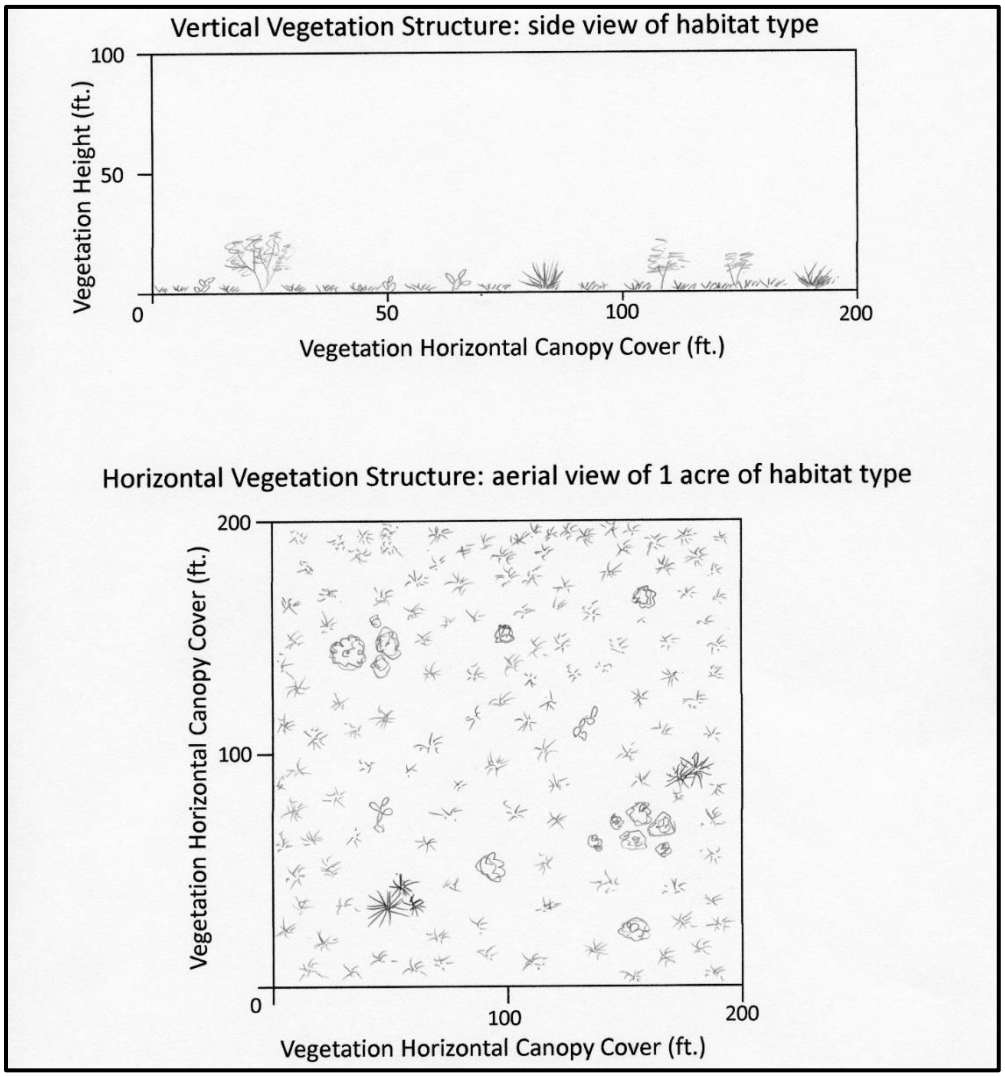

Figure 17. Vertical and horizontal canopy cover views of the Dry Soil Grassland.

5.1.10 *Salt Shrubland Habitat*

Description Rabbitbrush (Biglovia) Association of Watson (1912); Open Area habitats of Cartron et al. (2008); shrubland (four-wing saltbush) areas at Whitfield Wildlife Conservation Area (2019).

This habitat was represented along the Rio Grande on the floodplain, with dry clay, silty to sandy soils. The Salt Shrubland would be flood-irrigated on a schedule to best support the greatest number of shrubland plant species listed in Table 9. Typical plant species would include grasses, several forb species, and several shrub species. This Salt Shrubland will represent a range from mid to late seral (shrubs) Salt Shrubland, and a vegetation structure that is open, dominated by low woody shrubs, with scattered grasses and herbs. Plant species recommended for planting in the Salt Shrubland Habitat are presented in Table 9.

Table 9. Plant Species Recommended for Planting in the Salt Shrubland Habitat

Plant Species[1,2] **Dominants are Bold;** **Pollinator Plants are Pink**	**Scientific Name**	**Plant Family[3]**	**Growth Form[4]**	**Life History[5]**
Oak-leaf thorn-apple	*Datura quercifolia*	Solanaceae	Forb	Annual/Biennial
Blueweed	*Helianthus ciliaris*	Asteraceae	Forb	Perennial
Freckled milkvetch	*Astragalus lentiginosus*	Fabaceae	Forb	Perennial
Prairie flax	*Linum lewissi*	Linaceae	Forb	Perennial
Copper globemallow	*Sphaeralcea angustifolia*	Malvaceae	Forb	Perennial
Sacred thorn-apple	*Datura wrightii*	Solanaceae	Forb	Perennial
Bearded sprangletop	*Leptochloa fusca fascicularis*	Poaceae	Grass	Annual
Inland saltgrass	*Distichlis spicata stricta*	Poaceae	Grass	Perennial
Alkali sacaton	*Sporobolus airoides*	Poaceae	Grass	Perennial
Galleta	*Pleuraphis jamesii*	Poaceae	Grass	Perennial
Indian grass	*Sorghastrum nutans*	Poaceae	Grass	Perennial
Giant sacaton	*Sporobolus wrightii*	Poaceae	Grass	Perennial
Burro grass	*Scleropogon brevifolius*	Poaceae	Grass	Perennial
Goldenweed	*Isocoma pluriflora*	Asteraceae	Shrub	Perennial
Rabbitbrush	***Ericameria nauseosua***	**Asteraceae**	**Shrub**	**Perennial**
Greasewood	***Sarcobatus vermiculatus***	**Chenopodiaceae**	**Shrub**	**Perennial**
Four-wing saltbush	***Atriplex canescens***	**Chenopodiaceae**	**Shrub**	**Perennial**
False indigo bush	*Amorpha fruticosa*	Fabaceae	Shrub	Perennial
Golden current	*Ribes aureum*	Grossulariaceae	Shrub	Perennial
New Mexico desert olive	*Forestiera pubescens*	Oleaceae	Shrub	Perennial
Pale wolfberry	***Lycium pallidum***	**Solanaceae**	**Shrub**	**Perennial**
Torrey's wolfberry	***Lycium torreyi***	**Solanaceae**	**Shrub**	**Perennial**
Plains prickly pear	*Opuntia phaeacantha*	Cactaceae	Succulent	Perennial
Screw-bean mesquite	*Prosopis pubescens*	Fabaceae	Tree	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods.

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note that some biennial species may be annual or perennial, depending on annual growing conditions.

Purpose. Salt Shrublands were once common on the former floodplain near the Rio Grande. Such shrublands are now less common, and there is much need to restore/create more shrubland habitats to support greater species diversities and abundances of native wildlife in the Albuquerque region. The Salt Shrubland will provide habitat for shrubland-associated animal species, including many arthropods, reptiles, birds, and mammals. Without shrublands, these species will not occur in the area. Shrublands additionally provide important habitat for generalist species, where a great abundance of other more habitat-specific (shrubland) species also occur.

Design. The Salt Shrubland would be planted in the crop fields immediately to the east of the existing RGNCSP ponds and Candelaria Wetland ponds, and adjacent to the Damp Soil Wetland. The soils of this area range from clay to sandy loam (see Chapter D: 1.1). The Salt Shrubland would take approximately 10 years for perennial woody species to become mature. All stages of natural ecological succession for an MRG floodplain dry shrubland would be planted and maintained, from open grassy areas to perennial herb patches and woody shrub patches. Figure 18 below represents vertical and horizontal canopy cover views of the Salt Shrubland.

Implementation. A planting design will be produced and select plant species from Table 9 would be planted according to the spatial design, which would include phases over the next 20 years. A flood-irrigation and/or individual plant spot-watering plan will need to be produced, based on the species planted and their water needs. The watering plan will need to be such that the surface soils are damp for several days at a time during the early and late summer, but dry at the surface between irrigation events.

Maintenance. The primary maintenance needs will be the periodic flood-irrigation and/or individual plant spot-watering of the Salt Shrubland, based on the watering plan (see above). Additionally, non-native invasive weeds will need to be controlled by the development of a non-native invasive weed control plan, and implementation of that plan on a periodic basis. Monitoring will be necessary to provide data on the effectiveness of both the watering plan and the non-native invasive weed control plan.

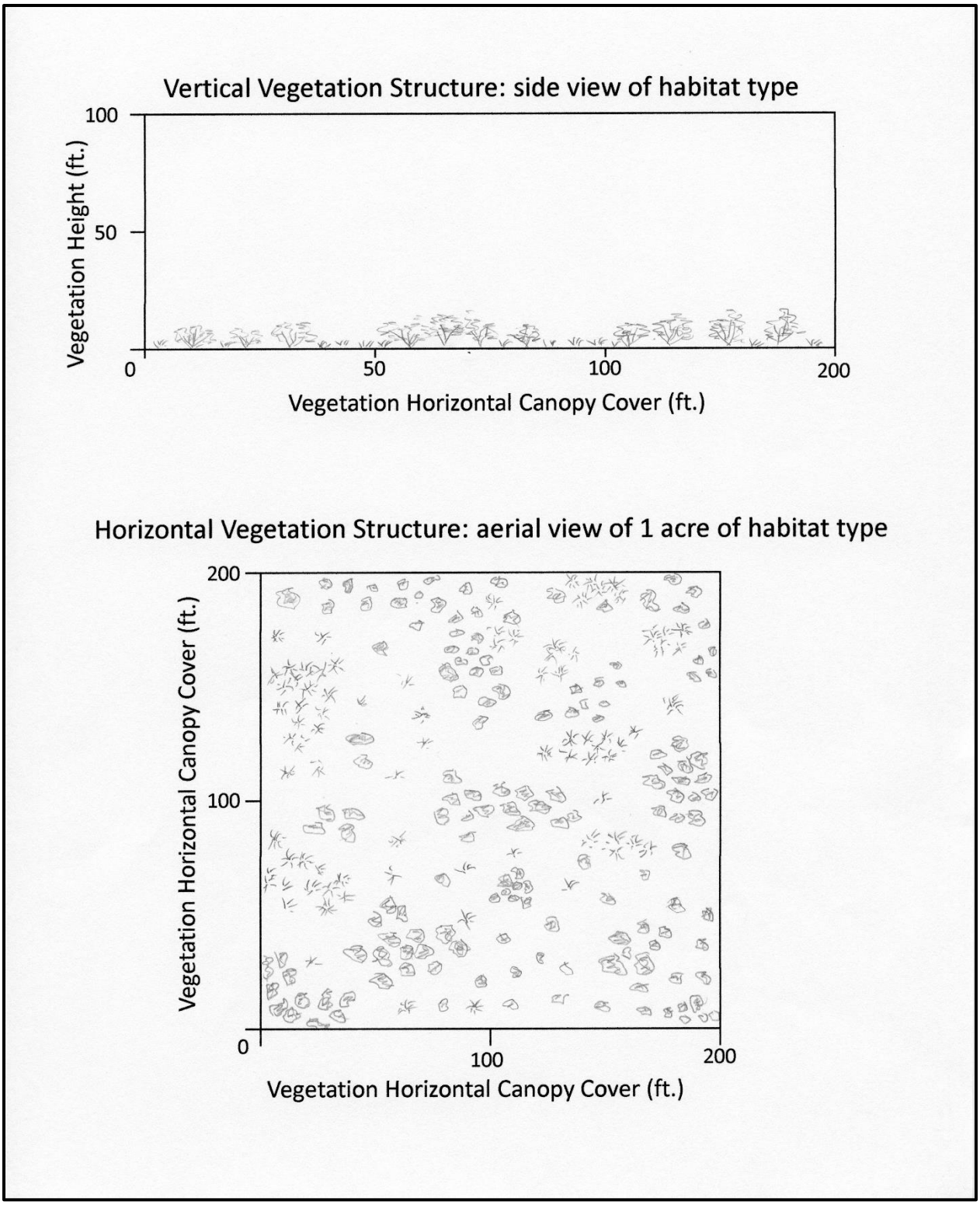

Figure 18. Vertical and horizontal canopy cover views of the Salt Shrubland.

5.1.11 *Arroyo Margin Shrubland Habitat*

Description. Rabbitbrush (Biglovia) Association, lower arroyo margins, of Watson (1912); largely replaced by non-native saltcedar and Russian olive habitats of Cartron et al. (2008); shrubland (mixed species) areas at Whitfield Wildlife Conservation Area (2019).

This silty to sandy soil habitat was represented along the Rio Grande floodplain, where large arroyos drained into the Rio Grande. The Arroyo Margin Shrubland would be flood-irrigated on a schedule to best support the greatest number of shrubland plant species listed in Table 10. Typical plant species would include grasses, several forb species, and several shrub species. This Arroyo Margin Shrubland will represent a range from mid to late seral (shrubs) Arroyo Margin Shrubland, and a vegetation structure that is open, dominated by tall woody shrubs, with scattered grasses and herbs and trees. Plant species recommended for planting in the Arroyo Margin Habitat are presented in Table 10.

Table 10. Plant Species Recommended for Planting in the Arroyo Margin Shrubland Habitat

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Oak-leaf thorn-apple	*Datura quercifolia*	Solanaceae	Forb	Annual/Biennial
Hairy golden-aster	*Heterotheca villosa*	Asteraceae	Forb	Perennial
Copper globemallow	*Sphaeralcea angustifolia*	Malvaceae	Forb	Perennial
Fleabane	*Erigeron divergens, E. flagellaris*	Poaceae	Forb	Perennial
Sacred thorn-apple	*Datura wrightii*	Solanaceae	Forb	Perennial
Giant sacaton	*Sporobolus wrightii*	Poaceae	Grass	Perennial
Blue grama	*Bouteloua gracilis*	Poaceae	Grass	Perennial
Side-oats grama	*Bouteloua curtipendula*	Poaceae	Grass	Perennial
Scratchgrass	*Muhlenbergia asperifolia*	Poaceae	Grass	Perennial
Western wheatgrass	*Pascopyrum smithii*	Poaceae	Grass	Perennial
Galleta	*Pleuraphis jamesii*	Poaceae	Grass	Perennial
Indian grass	*Sorghastrum nutans*	Poaceae	Grass	Perennial
Spike dropseed	*Sporobolus contractus*	Poaceae	Grass	Perennial
Sand dropseed	*Sporobolus cryptandrus*	Poaceae	Grass	Perennial
Alkali sacaton	*Sporobolus airoides*	Poaceae	Grass	Perennial
Little-leaf sumac	***Rhus microphylla***	**Anacardiaceae**	**Shrub**	**Perennial**
Skunkbush sumac	***Rhus trilobata***	**Anacardiaceae**	**Shrub**	**Perennial**
Rabbitbrush	***Ericameria nauseosua***	**Asteraceae**	**Shrub**	**Perennial**
Willow baccharis	***Baccharis salicifolia***	**Asteracea**	**Shrub**	**Perennial**
Four-wing saltbush	***Atriplex canescens***	**Chenopodiaceae**	**Shrub**	**Perennial**
Golden current	***Ribes aureum***	**Grossulariaceae**	**Shrub**	**Perennial**
New Mexico desert olive	***Forestiera pubescens***	**Oleaceae**	**Shrub**	**Perennial**
Apache plume	***Fallugia paradoxa***	**Rosaceae**	**Shrub**	**Perennial**
Pale wolfberry	***Lycium pallidum***	**Solanaceae**	**Shrub**	**Perennial**
Torrey's wolfberry	***Lycium torreyi***	**Solanaceae**	**Shrub**	**Perennial**

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Desert willow	***Chilopsis linearis***	**Bignoniaceae**	**Tree**	**Perennial**
Net-leaf hackberry	*Celtis reticulata*	Cannabaceae	Tree	Perennial
Black locust	*Robinia pseudoacacia*	Fabaceae	Tree	Perennial
Screw-bean mesquite	***Prosopis pubescens***	**Fabaceae**	**Tree**	**Perennial**
Peachleaf willow	*Salix amygdaloides*	Salicaceae	Tree	Perennial
Coyote willow	*Salix exigua*	Salicaceae	Tree	Perennial
Thicket creeper	*Parthenocissus vitacea*	Vitaceae	Vine	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods.

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note that some biennial species may be annual or perennial, depending on annual growing conditions.

Purpose. Arroyo Margin Shrublands were once common on the former floodplain near the Rio Grande. Such shrublands are now largely replaced by stands of non-native saltcedar, Russian olive, and Siberian elm. Those exotic tree species provide poor habitat for native wildlife, relative to a diversity of native shrubs and trees with their associated flowers, fruit, seeds, and insects. There is much need to restore/create more shrubland habitats to support greater species diversities and abundances of native wildlife in the Albuquerque region. The Arroyo Margin Shrubland will provide habitats for shrubland-associated animal species, including many arthropods, reptiles, birds, and mammals. Without shrublands, these species will not occur in the area. Shrublands additionally provide important habitat for generalist species, where a great abundance of other more habitat-specific (shrubland) species also occur.

Design. The Arroyo Margin Shrubland would be planted in the crop fields immediately to the east of the existing RGNCSP ponds and Candelaria Wetland ponds, and adjacent to the Damp Soil Wetland. The soils of this area range from clay to sandy loam (see Chapter D: 1.3). The Arroyo Margin Shrubland would take approximately 20 years for perennial woody species to become mature. All stages of natural ecological succession for an MRG floodplain Arroyo Margin Shrubland would be planted and maintained, from grass and herb patches to a dominance of woody shrub/tree patches. Figure 19 below represents vertical and horizontal canopy cover views of the Arroyo Margin Shrubland.

Implementation. A planting design will be produced and select plant species from Table 10 would be planted according to the spatial design, which would include phases over the next 20 years. A flood-irrigation and/or individual plant spot-watering plan will need to be produced, based on the species planted and their water needs. The watering plan will need to be such that the surface soils are damp for several days at a time during the early and late summer, but dry at the surface between irrigation events.

Maintenance. The primary maintenance needs will be the periodic flood-irrigation and/or individual plant spot-watering of the Arroyo Margin Shrubland, based on the watering plan (see

above). Additionally, non-native invasive weeds will need to be controlled by the development of a non-native invasive weed control plan, and implementation of that plan on a periodic basis. Monitoring will be necessary to provide data on the effectiveness of both the watering plan and the non-native invasive weed control plan.

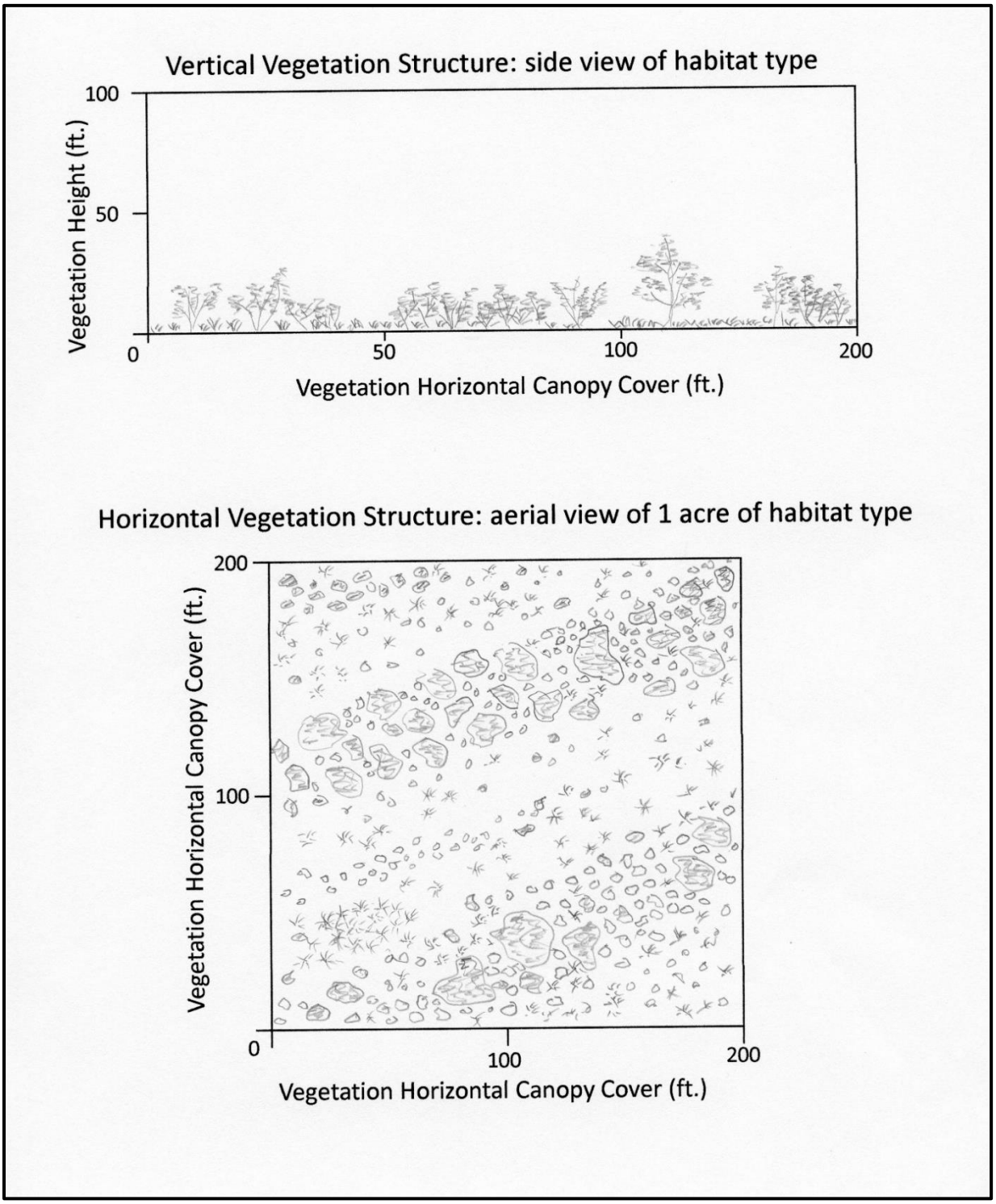

Figure 19. Vertical and horizontal canopy cover views of the Arroyo Margin Shrubland.

5.1.12 *Sandbar (Remnant, Dry) Habitat*

Description Rabbitbrush (Biglovia) Association, open sandy areas of former riverine sand bars, of Watson (1912); Open Area habitats of Cartron et al. (2008); sandy, grassy areas at Whitfield Wildlife Conservation Area (2019).

This habitat was represented along the Rio Grande on the floodplain as remnant river channel sandbars, with dry, silty to sandy soils. These are meant to represent historical dry remnant sandbars now disconnected from the river, not active, wet sandbars in the river channel.
The Sandbar Habitat would be flood-irrigated on a schedule to best support the greatest number of grassland plant species listed in Table 11. Typical plant species would include grasses, several forb species, and several shrub and tree species. This Sandbar Habitat will represent a range of early seral (all herbs) to late seral (shrubs) Sandbar Habitat, with a vegetation structure that is open, dominated by herbs, with scattered individual and clumps of shrubs. Plant species recommended for planting in the Sandbar Habitat are presented in Table 11.

Table 11. Plant Species Recommended for Planting in the Sandbar Habitat

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Indian blanket	*Gaillarida pulchella*	Asteraceae	Forb	Annual
Navajo tea	*Thelesperma megapotamicum*	Asteraceae	Forb	Annual
Desert marigold	*Bailea multiradiata*	Asteraceae	Forb	Annual
Annual sunflower	*Helianthus annuus*	Asteraceae	Forb	Annual
Spectacle pod	*Dimorphocarpa wislizeni*	Brassicaceae	Forb	Annual
Western tansymustard	*Descurainia pinata*	Brassicaceae	Forb	Annual
Rocky Mountain beeplant	*Cleome serrulata*	Capparaceae	Forb	Annual
Clammyweed	*Polanisia dodecandra trachysperma*	Capparaceae	Forb	Annual
Sandbells	*Nama hispidum*	Hydrophyllaceae	Forb	Annual
Velvetweed	*Gaura parviflora*	Onagraceae	Forb	Annual
Blue trumpets	*Ipomopsis longiflora*	Polemoniaceae	Forb	Annual
Warty caltrop	*Kallstroemia parviflora*	Zygophyllaceae	Forb	Annual
Oak-leaf thorn-apple	*Datura quercifolia*	Solanaceae	Forb	Annual/ Biennial
Hairy golden-aster	*Heterotheca villosa*	Asteraceae	Forb	Perennial
Wooly paperflower	*Psilostrophe tagetina*	Asteraceae	Forb	Perennial
Green Mexican-hat	*Ratibida tagetes*	Asteraceae	Forb	Perennial
Threadleaf groundsel	*Senecio flaccidus*	Asteraceae	Forb	Perennial
Riddell's groundsel	*Senecio riddellii*	Asteraceae	Forb	Perennial
Tall goldenrod	*Solidago altissima gilovcanescens*	Asteraceae	Forb	Perennial
White-heath aster	*Symphotrichum ericoides*	Asteraceae	Forb	Perennial
Lacy sleep-daisy	*Xanthisma spinolusum*	Asteraceae	Forb	Perennial
Buffalo gourd	*Cucurbita foetidissima*	Cucurbitaceae	Forb	Perennial

Plant Species[1,2] Dominants are Bold; Pollinator Plants are Pink	Scientific Name	Plant Family[3]	Growth Form[4]	Life History[5]
Freckled milkvetch	*Astragalus lentiginosus*	Fabaceae	Forb	Perennial
Albuquerque prairie clover	*Dalea scariosa*	Fabaceae	Forb	Perennial
Adonis blazingstar	*Metzelia multiflora*	Loasaceae	Forb	Perennial
Copper globemallow	*Sphaeralcea angustifolia*	Malvaceae	Forb	Perennial
Scarlet beeblossom	*Gaura coccinea*	Onagraceae	Forb	Perennial
Hooker's evening primrose	*Oenothera elata hirsutissima*	Onagraceae	Forb	Perennial
Pale evening primrose	*Oenothera pallida*	Onagraceae	Forb	Perennial
Fleabane	*Erigeron divergens, E. flagellaris*	Asteraceae	Forb	Perennial
Sacred thorn-apple	*Datura wrightii*	Solanaceae	Forb	Perennial
Indian ricegrass	***Achnatherum hymenoides***	**Poaceae**	**Grass**	**Perennial**
Sand dropseed	***Sporobolus cryptandrus***	**Poaceae**	**Grass**	**Perennial**
Giant dropseed	*Sporobolus giganteus*	Poaceae	Grass	Perennial
Side-oats grama	*Bouteloua curtipendula*	Poaceae	Grass	Perennial
Blue grama	*Bouteloua gracilis*	Poaceae	Grass	Perennial
Sliver bluestem	*Bothriochloa laguroides*	Poaceae	Grass	Perennial
Galleta	*Pleuraphis jamesii*	Poaceae	Grass	Perennial
Spike dropseed	*Sporobolus contractus*	Poaceae	Grass	Perennial
Rabbitbrush	***Ericameria nauseosua***	**Asteraceae**	**Shrub**	**Perennial**
Sand sagebrush	***Artemisia fillifolia***	**Asteraceae**	**Shrub**	**Perennial**
Broom snakeweed	*Gutierrezia sarothrae*	Asteraceae	Shrub	Perennial
Four-wing saltbush	*Atriplex canescens*	Chenopodiaceae	Shrub	Perennial
Winterfat	*Krascheninnikovia lanata*	Chenopodiaceae	Shrub	Perennial
Broom dalea	***Psorothamnus scoparius***	**Fabaceae**	**Shrub**	**Perennial**
Plains yucca	*Yucca glauca*	Asparagaceae	Succulent	Perennial
Plains prickly pear	*Opuntia phaeacantha*	Cactaceae	Succulent	Perennial
Starvation prickly pear	*Opuntia polyacantha*	Cactaceae	Succulent	Perennial

[1] Historic and/or current native plant species. Names follow Cartron et al. (2008).

[2] Common and scientific names and taxonomic classification follow Cartron et al. (2008). There have been many name changes over time, especially since Watson (1912).

[3] Native pollinators tend to specialize on different plant families and flowering periods.

[4] Grass, Forb, Shrub, Tree. Note that trees and shrubs are based on species' potential maximum size, not size at all life stages.

[5] Annual/Biennial, Perennial. Note that some biennial species may be annual or perennial, depending on annual growing conditions.

Purpose. Sandbar Habitats were once common on the former floodplain near the Rio Grande. Such grasslands are now less common and dominated by non-native invasive weeds such as prickly Russian thistle, kochia (*Bassia* sp.), puncturevine, and others. There is much need to restore/create sandbar habitats with a dominance of native plant species to support greater animal species diversities and abundances of native wildlife in the Albuquerque region. The Sandbar Habitat will provide habitat for grassland-associated animal species, including many arthropods, reptiles, birds, and mammals. Without sandbar habitats, many of these native species will not occur in the area.

Design. The Sandbar Habitat would be constructed in the crop fields immediately to the east of the existing RGNC ponds and Candelaria Wetland ponds, and adjacent to the Damp Soil Wetland. The soils of this area range from clay to sandy loam (see Chapter D: 1.3). The Damp Soil Wetland would take approximately 10 years for plantings to spread and for perennial woody species to become mature. All stages of natural ecological succession for an MRG floodplain dry sandbar habitat would be planted and maintained, from the open sandbar areas to perennial herb patches and woody shrub patches. Figure 20 below represents vertical and horizontal canopy cover views of the Sandbar Habitat.

Implementation. A planting design will be produced and select plant species from Table 11 would be planted according to the spatial design, which would include phases over the next 20 years. A flood-irrigation watering plan will need to be produced, based on the species planted and their water needs. The watering plan will need to be such that the surface soils are damp for several days at a time during the early and late summer, but dry at the surface between irrigation events.

Maintenance. The primary maintenance needs will be the periodic flood-irrigation of the Sandbar Habitat, based on the watering plan (see above). Additionally, non-native invasive weeds will need to be controlled by the development of a non-native invasive weed control plan, and implementation of that plan on a periodic basis. Monitoring will be necessary to provide data on the effectiveness of both the watering plan and the non-native invasive weed control plan.

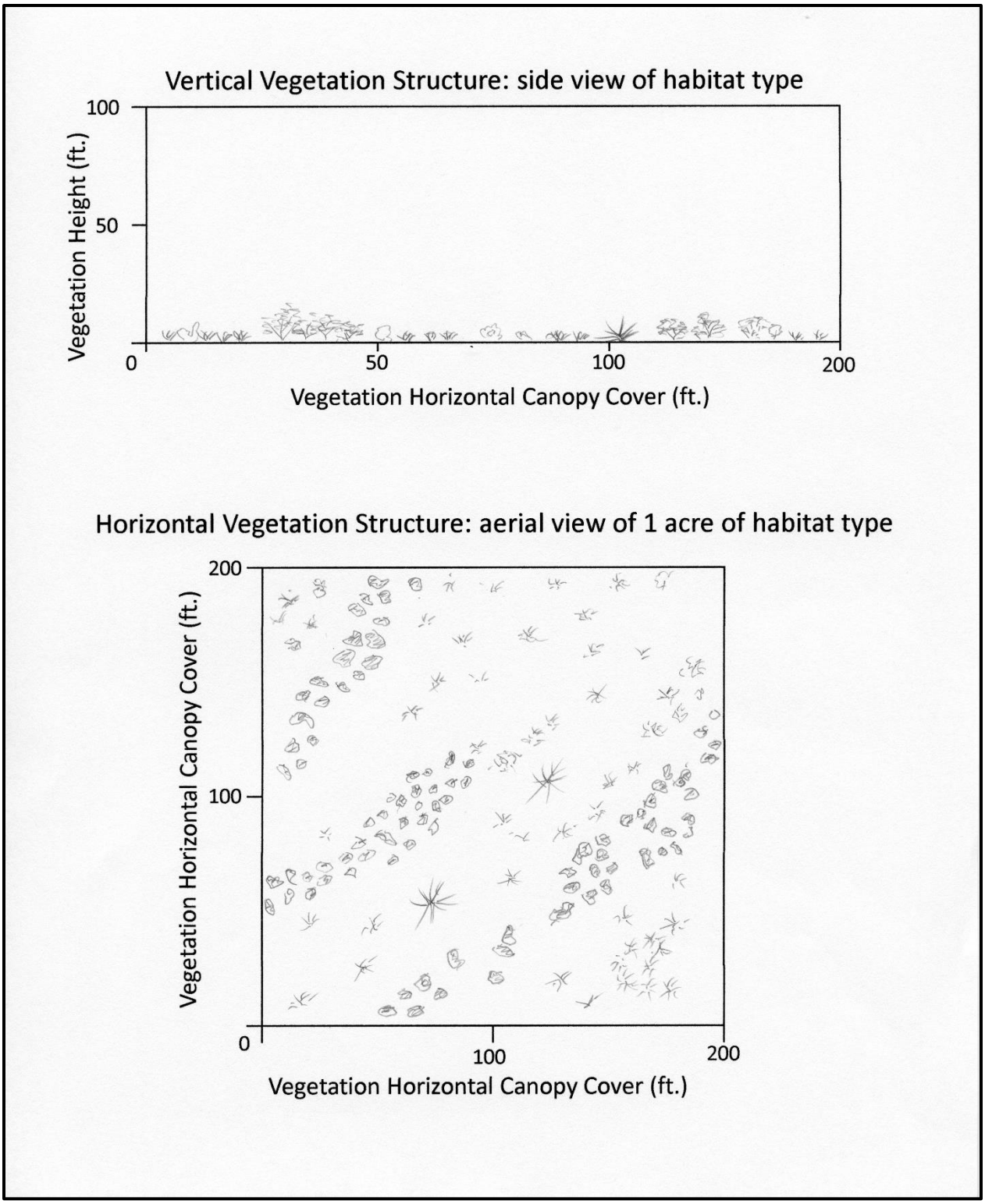

Figure 20. Vertical and horizontal canopy cover views of the Sandbar Habitat.

5.2 Transitioning to Native Habitat for Wildlife

The vision of this plan is to transition from crop farming, mainly comprising alfalfa, to 100% wildlife forage and cover crops, and then further transitioning to a dynamic mosaic of native habitats that support diverse plant and animal species. While cultivating wildlife crops such as corn, sorghum, and triticale, sustainable farming methods and practices that are environmentally sound and that protect public and wildlife health will be employed. This plan assumes that, in the short term, the City will work with a contract farmer to plant and manage the wildlife forage.

5.2.1 *Soil Management*

Healthy soil contributes to the overall health of an ecosystem by providing fungi and bacterial growth for bugs and grubs, which are food sources for larger vertebrate animals. The best sustainable method to increase soil health is to keep the roots of perennial crops in the ground, practice conservation tillage, and fertilize with only organic, soil-building materials. Conservation tillage, in contrast to conventional tillage methods that upturn the soil, involves limiting disturbance to the soil surface and allowing agricultural residue to compost in place. There are numerous conservation tillage techniques that vary per region, scale of the land to be cultivated, and the availability of equipment. The OSD will need to consult with the contract farmer to determine which of these methods is most feasible. It is also advised to consult with other farmers and natural resource specialist who are knowledgeable about farming techniques to determine reasonable and best practices.

Benefits of conservation tillage include the following:

- Water erosion reduction through improved water infiltration, as well as reduction of nitrate runoff from fertilized fields
- Wind erosion reduction through stabilized soil surface
- Soil nutrient retention
- Reduction in soil emissions of greenhouse gases that occur when soil is disturbed, speeding up the microbial breakdown of organic material
- Carbon sequestration
- Lowered equipment/fuel costs

Conservation tillage weaknesses include the following:

- Specialized equipment is required for large-scale implementation of conservation tillage techniques.
- Development of clay lenses and/or soil compaction limits oxygen and inhibits water permeability.
- Weeds and other pests are not impacted by traditional tillage techniques and could proliferate.
- While carbon dioxide (CO_2) emissions are reduced, other non-CO_2 greenhouse gases such as nitrous oxide and methane can still be emitted.

- Conservation tillage is a growing soil management technique with few experienced practitioners; thus, it requires more administrative time to hire farmers capable of practicing and successfully implementing new agronomy methods.

5.2.2 *Cover Crops and Crop Rotation*

Cover crops include a variety of species planted to reduce need for fertilizer, reduce use of herbicides and pesticides, increase yields from healthier soil, reduce erosion, and to retain soil moisture. Cover crops such as clover and other leguminous plants help fix atmospheric nitrogen into the soil where it becomes available to other crops. Some cover crops are used to mechanically aerate the soil, such as with daikon radish and some fibrous root grains. Cover cropping will also benefit native species and wildlife while building the soil.

Crop rotation in the context of growing annual crops such as corn for migratory waterfowl involves replenishing soil nitrogen that is depleted by an annual planting strategy. Alternating plots of corn with nitrogen-fixing species (such as clover) allows for sustainable production over time.

5.2.3 *Integrated Pest Management*

Integrated pest management (IPM) is a systems approach for management of pests, such as insects, insect-like creatures, weeds, plant diseases, or vertebrates whose presence or population density interferes with the land management goals for a given area. IPM is a system for the planning and implementation of an interdisciplinary program for containment or control of pests. IPM uses all available methods including education, prevention, physical or mechanical methods, biological control methods, chemical methods, cultural methods, and general land management practices. Pests and pest control measures are evaluated for their present or potential impacts to ecological, economic, and social systems. Based on this evaluation, management goals are developed, implemented, and monitored. Use of chemical herbicides and pesticides will be largely eliminated, and only applied sparingly when necessary to prevent further spread and encroachment of noxious weeds.

There are several components of an IPM approach:

1. ***Prevention*** of pest infestations is the most effective means of control. Preventative measures include early detection and eradication of pests, limiting introduction of contaminated materials to management areas, and use of farming practices that are known to promote resistance to pests.
2. ***Education*** of land managers and visitors in identification of pests and in preventative measures will promote early detection of pest problems.
3. ***Identification and inventory*** of pests may be done by the farmer with assistance from agency or industry experts. Weed identification, inventory, and removal may also be done by school groups or by volunteer groups.

4. ***Establishment of management goals*** is done through an evaluation of the present and potential impact of the pest and pest control measures to crops and/or wildlife habitat, and/or non-native species, and the economics of per-acre pest control costs. Integrated pest management goals may range from suppression of the pest, to maintenance of the pest population at an acceptable level, to complete eradication of the pest.
5. ***Evaluation of benefits and risks of management strategies*** is accomplished using similar criteria to establish control goals. Present or potential impacts of the pest should be weighed against the ecological and social risks and economic costs of per-acre pest control. Many farming techniques that are effective as potential preventative measures are also effective control measures for new or established pest populations. This evaluation then leads to the ***selection of an appropriate management strategy*** for the implementation of IPM goals.
6. ***Monitoring*** is a critical component of the IPM plan. An ongoing evaluation of management effectiveness and impacts will provide information for required adjustments to management goals and strategies.

At the CNP, contractors and OSD personnel should use an IPM approach and emphasize the use of natural pest control measures, such as farming practices, biological diversity, competition, plant succession, and biological agents.

5.2.4 *Wildlife Crops*

Wildlife cropping will require experimentation with a diversity of crops that provide significant food stuffs for the species of significance in the different habitat areas. Below is a partial list of potential crops that provide native wildlife with food, contribute to soil health, and provide habitat for insects and pollinators.

CROP TYPES AND VARIETIES

A. Leguminous nitrogen-fixing cover/habitat crops

- field peas
- sweet clover
- sunflower
- American vetch
- Astragalus

B. Grains for wildlife forage

- corn
- millet
- wheat
- kernza (perennial wheat)
- oats
- barley
- rye
- triticale (a hybrid of wheat and rye)
- sorghum (perennial sorghum preferred)
- milo
- amaranth

Irrigation

The OSD contracted with farmers to manage flood irrigation and maintain the ditches so they were in good working order. Irrigation efficiency was significantly improved since the change of contract farmers in 2016. As of 2019, the contract farmer used 2.3 acre-feet or less per year per acre to irrigate the farmland surface crops and received an MRGCD award for irrigation efficiency. This effort was led by the City and the farmer and resulted in the irrigation laterals being lined with concrete and the fields being laser-leveled for more efficient flood irrigation.

Critical to the operation of the CNP is the use of surface irrigation water rights to irrigate the property. This plan intends to perpetuate the use of flood irrigation to establish and sustain crops and restored habitat areas at the CNT. Water efficiency should continue to be a priority in managing the property.

Equipment Storage

Sustaining the property operations requires adequate storage space for equipment and supplies. The grove between Fields 2A and 2B/2C is designated as an equipment storage area for use by the contractors and OSD staff. The OSD also uses this area to temporarily store soil amendments and other related material, as well as dead and downed fuel wood removed from the Bosque, before distributing it to the receiving parties. As farming is phased out, the asphalt pad will be removed to reduce any possible leaching of toxins from the asphalt material, and the pad footprint will be restored to native vegetation, which is compatible with a Nature Preserve. A long-term storage area may need to be set up and could possibly be at the TNT or near the Woodward House.

Gates, Fences, Signage, and Farm Roads

The signs, gates, and fences around the property control access to the CNT, and the roads allow for the circulation of property and maintenance equipment, as well as guided programs for visitors (see Figure 2). Wildlife-friendly fences will be installed when appropriate while keeping security and disturbance in mind, especially with the potential of domestic dogs and cats entering the CNP. The existing chain-link fence will be maintained and reinforced when breached.

Site and Habitat Area Protocols:

- *In general, the roadway shall be used as a trail for foot traffic during educational programs or monitoring activities.*
- *The roadway will be closed to regular use with the exception of maintenance vehicles to maintain the habitat areas or to conduct monitoring.*
- *Guided educational programs shall avoid disturbing the plant and animal life, especially during the bird wintering and nesting seasons, from November through July. The OSD will inform those doing regular monitoring prior to scheduling guided educational programs.*

- *The OSD, RGNCSP, and other approved parties may access the property for the purpose of routine maintenance at any time, year-round, but should avoid disturbing wildlife, especially from November through July.*
- *Only approved parties may conduct monitoring activities, and only according to a schedule and plan approved by the OSD and RGNCSP.*
- *Parties interested in undertaking additional projects or habitat improvement activities must gain prior approval of the OSD and the RGNCSP.*
- *Exotic trees, such as Siberian elm, Russian olive, and tamarisk, shall be removed. As approved by the OSD, stumps of exotic trees may be treated with herbicides to prevent regeneration.*
- *The OSD and/or contractors are responsible for managing irrigation activities and coordinating with the MRGCD to schedule delivery of irrigation water.*
- *The OSD is responsible for making repairs to ditches resulting from regular use and installing alternative irrigation technologies; however, this task may need to be outsourced to a contractor.*
- *The contractor and the OSD are responsible for conducting regular ditch maintenance, including mowing vegetation and removing weeds and other debris in preparation for irrigating, cutting elm trees, patching cracks, and fixing gates and turnouts. The contractors are responsible for any damages to ditches or other irrigation technologies resulting from misuse or neglect.*
- *Contractors may burn weeds growing in ditches, but only with the prior approval of the OSD. Prior to burning, the contractor or the OSD must obtain the burning permits required by the City and/or County, notify the local fire department, and notify the RGNCSP.*
- *The OSD and contractors and partnering groups may store equipment in the Equipment Area.*
- *In order to store smaller equipment with more security, contractors may add temporary storage containers or sheds to this area, with prior permission from the OSD.*
- *The OSD and contractors shall keep the Equipment Area reasonably clean, tidy, safe, and operable. No hazardous materials shall be kept at the farm without permission from the OSD.*
- *Gates into the property shall remain closed and locked, opened only by the OSD, the contract farmer/s, the MRGCD, the RGNCSP or the* FRGNC*, and their agents, partners, and employees who have permission to enter or exit the farm to perform authorized work or programs. The public may enter these areas only during approved events including guided tours, monitoring or restoration work.*
- *The OSD shall maintain the farm roads and trails throughout the property.*
- *Vehicles and farm equipment must drive slowly on farm roads, so as to maintain public safety and avoid creating dust.*

5.2.5 *Implementation Plan*

As mentioned above, this plan is estimated to cover a 20-year time span and to be implemented in quarterly phases. Table 12 below shows the implementation process for each habitat area, as well as fuel thinning efforts and habitat improvements.

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Table 12. Candelaria Nature Preserve Habitat Restoration Implementation Plan

Habitat Area	1–2 Years	4 Years	8 Years	12 Years	16 Years	20 Years
CNT: Wetlands- Damp Soils and Ephemeral Soil wetland areas	Secure funds for the design of 8-acre wetlands; establish a contract to design and plan area. This will include improvements to the current wetlands as well.	Construction of wetlands; plantings and monitoring.	Plantings, invasive weed and animal management, and monitoring.	Invasive weed and animal management; and monitoring.	Invasive weed and animal management; and monitoring. Modify area if needed.	Invasive weed and animal management; and monitoring. Modify area if needed.
CNT: Wildlife Crops/Farm Fields	Secure funds for wildlife cropping and field conversion to salt grass and blue grama habitat areas; symposium on wildlife cropping and additional consultation with farmers and biologists on native habitat development; establish contracts for wildlife farming and restored habitat areas; pending funding, convert fields 4.A (6.26 acres) and 1C (4.9 acres) for a total of 11.16 acres, to restored habitat areas; begin removal of Siberian elm with staff and possibly contractors; and RGNCSP will begin transition of 3.5 acres of encroached crops to wildlife habitat.	Continue to secure required funding; convert at least one area per habitat type, including the following: sandbar, salt shrubland, and arroyo margin; the remaining fields will be planted in wildlife crops by year 4 at the latest in preparation to transition to wildlife habitat while supporting migrating birds; monitor each area; identify weed management and other issues and modify plan as needed; remove and treat Siberian elms; and consult with other related nature preserve areas including Valle de Oro Wildlife Refuge and Whitfield Wildlife Conservation Area.	Continue to secure required funding; modify and expand habitat areas based on monitoring efforts; the remaining fields that have not been restored will continue to be planted in wildlife crops in preparation to transition to wildlife habitat while supporting migrating birds; continue weed management efforts and modify plan as needed; and continue to consult with other related areas including Valle de Oro Wildlife Refuge and Whitfield Wildlife Conservation Area..	Continue to secure required funding; modify and expand habitat areas based on monitoring efforts; full conversion of restored habitat at the end of 12 years at the latest; continue weed management efforts and modify if necessary; and continue to consult with other related areas including Valle de Oro Wildlife Refuge and Whitfield Wildlife Conservation Area.	Continue monitoring, management and weed control; review progress and modify as needed; and continue to consult with other related areas including Valle de Oro Wildlife Refuge and Whitfield Wildlife Conservation Area.	Continue monitoring, management, and weed control; review progress and modify as needed; and continue to consult with other related areas including Valle de Oro Wildlife Refuge and Whitfield Wildlife Conservation Area.
CNT: Hedgerows	Continue community plantings of native hedgerows.	Continue community plantings of native hedgerows; monitor area; and remove invasive, including Siberian elm.	Continue community plantings of native hedgerows; monitor area; and remove invasive species.	Continue community plantings of native hedgerows; monitor area; and remove invasive.	Monitor area; remove invasive; continue community plantings if necessary; modify plan if needed.	Monitor area; remove invasive; continue community plantings if necessary; modify plan if needed.
CST: Fuel Thinning Efforts	Continue fuel thinning efforts with community support from, neighbors and youth crews, and in coordination with Albuquerque Fire Rescue and the RGNCSP. Maintain areas for wildlife habitat.	Continue fuel thinning efforts with community support from neighbors and youth crews, and in coordination with Albuquerque Fire Rescue and the RGNCSP. Maintain areas for wildlife habitat.	Monitor and prune trees as needed; continue to remove dead and downed material while maintaining wildlife habitat.	Monitor and prune trees as needed; continue to remove dead and downed material while maintaining wildlife habitat.	Monitor and prune trees as needed; continue to remove dead and downed material while maintaining wildlife habitat.	Monitor and prune trees as needed; continue to remove dead and downed material while maintaining wildlife habitat.
CST: Habitat Improvements	Collaborate with the RGNCSP to secure funding for restored habitat areas; soil analysis of the Siberian elm grove; consult with BEMP staff and other biologist; establish contract to establish habitat areas.	Collaborate with the RGNCSP to secure funding for restored habitat areas; construction of habitat areas, including swales and plantings; monitor area and progress; and ongoing invasive weed management.	Collaborate with the RGNCSP to secure funding for restored habitat areas; construction of habitat areas, including swales and plantings; monitor area and progress; and ongoing weed management.	Monitor area and modify as needed; and ongoing weed management.	Monitor area and modify as needed; and ongoing weed management.	Monitor area and modify as needed; and ongoing weed management.

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6 PUBLIC ACCESS AND OUTDOOR RECREATION

This plan identifies appropriate outdoor recreation activities for the CNP, as well as outlines a process, schedule, and protocols for reasonable public access consistent with the wildlife preserve objective. Refer to the Public Access and Outdoor Recreation Implementation Plan at the end of this section for a detailed list of activities and when they are proposed over the 20-year plan.

The LWCF program supports the protection of public lands and water, secures public access, improves recreational activities, and preserves ecosystem benefits for local communities. The OSD needs to ensure that the CNP complies with LWCF regulations in the following ways:

1. Appropriate and allowable outdoor recreation activities consistent with the wildlife preserve objective must be outlined and management practices must be developed to provide reasonable public access to the property for all residents and visitors. This applies to the entire property, including the CNT, the CST, the TNT, and the RGNCSP.
2. The CNP is to be managed as a nature study area and wildlife preserve providing access to outdoor recreational opportunities for all residents and visitors, as outlined in the original proposal for funding to the Bureau of Outdoor Recreation and as required by the LWCF Act.

Additionally, the Albuquerque/Bernalillo County Comprehensive Plan includes the following goals and polices specific to public access:

Goal 10.1 Facilities and Access: Provide parks, Open Space, and recreation facilities that meet the needs of all residents and use natural resources responsibly.

Goal 10.3 Open Space: Protect the integrity and quality of the region's natural features and environmental assets and provide opportunities for outdoor recreation and education.

6.1 Educational Programs, Citizen Science, and Stewardship Activities

A major goal of this plan is to provide a framework for providing outdoor recreation opportunities to all members of the community. This includes resource-based recreation that is in harmony with the wildlife habitat and preservation goals on the property. It is also important to engage community groups who will help the OSD manage and steward the property into the future. Engaging youth is of importance, as well as diverse sectors of the community that represent the city's demographics.

Guided programs will be led year-round by OSD staff, the RGNCSP, community partners, and trained volunteers. During wintering bird and nesting seasons from November through July, staff will pay special attention to minimize disturbance to wildlife. Hands-on activities will be offered that use scientific techniques to engage the public and assist with monitoring plants and wildlife at the property. Interpretive themes for the guided programs may include natural and human

history of the Rio Grande, water monitoring, acequia systems and culture, habitat types, local and migratory wildlife, native plants, and interconnections.

In the past, programs have been scheduled for school groups, as well as the general public. Boy Scouts and other volunteer groups have also taken part in service-learning projects at the preserve, such as planting hedgerows. These activities will continue and be further supported and enhanced. School programs should be based on the Science, Technology, Engineering, Art, and Math Ready Standards.

Programs and service-learning projects may be expanded to include senior citizen centers, community centers, service clubs, and other social and service groups; and the preserve may be an ideal site for demonstration field days highlighting ecosystem restoration practices, native plant propagation, and other activities that align with the management of the CNP and wildlife.

Limited availability of staff and the lack of funds may restrict the number of scheduled activities at the preserve. Additionally, limiting the group size and frequency of weekly activities is important to minimizing wildlife disturbance. With that in mind, it is important that the OSD engage community groups to help support the management of the CNP and to assist in delivering programs to the public and school groups.

6.1.1 *Access Opportunities and Restrictions*

Defining public access for the CNP requires a balance in the levels of public access and habitat and wildlife protection. Many people are unaware of the impacts of humans upon wildlife, and the TAG has heard the public's question about why there are access restrictions many times. Activities (e.g., recreation, restoration, maintenance) in wildlife habitats can impact wildlife. Specific life stages of wildlife can be harmed, and excessive uses can drive wildlife away. For example, a study comparing eastern bluebirds' (*Sialia sialis*) use of a natural area compared to an area at a golf course show many impacts to bluebirds. In the golf course area, eastern bluebirds took longer to complete nests, protected the nest more, laid eggs later, produced smaller clutches, and fledged fewer birds (Gillespie 2016).

There have been two types of access discussed during the development of this plan: physical and visual. Physical access includes walking into the CNP for guided walks and citizen science monitoring, as well as hands-on activities such as planting and weed removal. These experiences can provide lasting educational value including a sense of environmental stewardship and appreciation for the CNP and beyond. Visual access to the preserve will be provided in selected locations to allow visitors to experience wildlife undisturbed in their native habitat. The CNP educational program will emphasize limited access to important wildlife habitat areas in the CNP property to lessen wildlife disturbance, with higher levels of human activity in designated areas. All educational activities will be overseen by staff, partners, and/or trained volunteers, in order to minimize wildlife disturbance. Access may increase over time or be further restricted in certain areas. This will be reviewed every 4 years or as needed. No change to public access in the RGNCSP is being proposed.

Current and potential public access points, both visual and physical, were reviewed to determine what kind of access to the property already exists and where additional access could feasibly be developed, what kind of and how much parking exists and could be feasibly be provided, and whether the access points could be made Americans with Disabilities Act (ADA) accessible without great expense. The following summarizes the findings of the survey.

PROPOSED VIEWING BLINDS

Proposed viewing blind in northwest corner of CNP

Figure 21 shows the current access point being used by pedestrians, equestrians, and bicyclists. No vehicular access is available at this location. The CNP property is fenced, but it is possible to view the fields from the eastern side of the ditch. The ditch trail is blocked to the south of the bridge, but there is an informal trail heading north that is used by equestrians. The bridge can be accessed from the Bosque Trail on the levee via steps or a steep, informal pathway. To make this bridge ADA accessible would require a relatively long ramp similar to the one east of the RGNCSP gate to the river. The property is managed by MRGCD.

Figure 21. Proposed viewing blind in the northwest corner of the CNP.

Existing viewing blind access at RGNCSP parking lot to view the Candelaria Wetlands

Figure 22 shows the current access used by RGNCSP visitors, many of whom park in the adjacent lot. Visitors to the RGNCSP, and to this viewing point, are required to pay an entrance fee to the State Park. The adjacent parking area has space for 69 regular-sized vehicles (main parking area), one ADA space for the wildlife blind, two ADA spaces for the Education Building, and four ADA spaces for the Visitor Center. No designated bus parking is available in the main lot.

Access to the interior of the CNP is limited to one non-ADA compliant trail near the Visitor Center. This informal trail connecting the RGNCSP to the CNP runs between the Observation Pond and the Candelaria Wetlands/Ponds from the staff entrance of the Visitor Center to the

southwest corner of the CNP. There is no ADA-compliant access to this trail. The trail between the RGNCSP and the CNP property falls within the primitive zone, where the primary purpose is resource conservation and education and visitor use is low (guided tours only) per the 2010 RGNCSP Management Plan. Minor improvements would need to be made to make this viewing blind fully ADA accessible, but New Mexico State Parks could make these improvements relatively easily.

Figure 22. Existing viewing blind access at RGNCSP parking lot to view the Candelaria Wetlands.

Existing viewing platform at RGNCSP overflow parking lot to view Candelaria Fields

Figure 23 shows the current viewing platform that is already fully ADA accessible and open to pedestrians during the RGNCSP's regular hours. It can be accessed from the main RGNCSP parking lot and from the overflow lot. The overflow lot can accommodate 71 regular sized vehicles, with two ADA parking spaces for the viewing platform. There is no designated bus parking in the overflow parking lot. To access this location, visitors must pay the RGNCSP's entrance fee.

Use of this overflow parking lot has been proposed for vehicles participating in guided tours of the CNP, including buses and accompanying private vehicles. There is no physical access from this location to the interior of the CNP, only visual access.

Figure 23. Existing viewing blind access at RGNCSP parking lot to view the Candelaria Wetlands.

GATED ACCESS POINT AT GLENWOOD DRIVE AND VERANDA ROAD

Figure 24 shows the current access gate location at Glenwood Drive and Veranda Road. This location is gated and locked, but it leads to a dirt two-track road that could be appropriate for pedestrian access and possible vehicular access for maintenance purposes. This access would provide easy ADA access for pedestrians to the southeast corner of the CNT, with minimal improvements, as the terrain is flat in this area and the existing farm road provides a route into the property. There is ample on-street parking on both Veranda Road and Glenwood Drive.

Figure 24. Gated access point at Glenwood Drive and Veranda Road.

EXISTING ACCESS POINT AT DURANES LATERAL AND VERANDA ROAD

Figure 25 shows the existing access to the Duranes Lateral at the end of the cul-de-sac on Veranda Road. Parking is allowed along Veranda Road, but ADA access would be difficult because of the steep slope up to the ditch trail and the absence of City-owned property on which to construct a ramp. There is currently easy pedestrian access to the ditch trail, with no gate or

hours specified. The southeast fields of the CNP can be viewed from the ditch trail and Veranda Road.

Figure 25. Existing access point at Duranes Lateral and Veranda Road.

EXISTING PEDESTRIAN ACCESS AT WEST END OF CHEROKEE ROAD

Pedestrian access to the Duranes Lateral ditch trail is available from the cul-de-sac at the end of Cherokee Road (Figure 26). Parking is available on Cherokee Road, but a ramp would need to be constructed to provide ADA access to the east ditch trail. Access to a proposed viewing blind on the west side of the Duranes Lateral would require construction of a bridge in this location, as the current pedestrian "bridge" is a gate valve on the ditch and would not safely accommodate wheelchairs or vision-impaired visitors. Access from the TNT is currently fenced. There is also pedestrian access to this location from a trail along a ditch that leads to Rio Grande Boulevard. There may be some concerns about using this access point for groups of children, as there is no protection from accidentally entering the ditch. Views from the proposed viewing blind in this location would be into the east-central portion of the farm fields. Views of the volcanoes to the west are currently blocked by hedgerow vegetation.

Figure 26. Existing access point at Duranes Lateral and Cherokee Road.

VEHICLE ACCESS POINT AT ARBOR ROAD AND THE DURANES LATERAL

Pedestrian access and parking are available on Arbor Road with access to the Duranes Lateral trail (Figure 27). Vehicle access across the Duranes Lateral is afforded by the existing road, which is currently used by the City and the farmer to reach the equipment storage area and Woodward House, as well as the other farm roads. The farm road is currently gated, and vehicular access is available only to staff and the farmer, or for special events. The farm road also provides access to the Woodward House. ADA pedestrian access could be developed from the equipment storage area to a possible viewing blind just to the north of the road, which would provide views of the northeast fields and the volcanoes to the west. It is possible that an ADA accessible ramp could be constructed to provide access to the west side of the ditch, but land ownership is unknown in this location (cooperation from the MRGCD would most likely be required).

The equipment storage area could accommodate vehicle parking for a variety of users, including staff and volunteers doing restoration work in the fields, members of the public participating in interpretive events or guided tours, and class tours. The equipment storage area is approximately 1.3 acres and use of this area for parking would reduce the area available for wildlife habitat by approximately 1%. Using the equipment storage area for parking could disturb wildlife currently inhabiting the area and could result in contamination of the land from vehicles leaking oils and lubricants. the asphalt millings pad will eventually be removed to reduce potential disturbance to wildlife.

Figure 27. Vehicle access point at Arbor Road and the Duranes Lateral.

ROAD TO THE NORTH OF THE WOODWARD HOUSE

The road north of the Woodward House is too narrow to permit safe, two-way traffic (Figure 28). It is possible for pedestrians to access the Duranes Lateral trail from this lane and view the northeast fields and views of the volcanoes.

Figure 28. Road to the north of the Woodward House.

ACCESS TO THE TREE NURSERY TRACT

The TNT is not currently accessible by the public, but it has been proposed for potential access. Currently, there is vehicular access for City staff and there could potentially be parking for volunteers or other groups using the property. The site currently has no ADA accessible facilities and no direct connection to the rest of the CNP property. However, a pedestrian gate along the western boundary of the TNT has been proposed, which would lead people to a bridge across the Duranes Lateral to a wildlife blind with views across the property and to the volcanoes.
The pedestrian access gate will also serve as the main route to the CNT along the Duranes Lateral for guided tours and educational programs. The gate will be locked when the property is closed. Directional, regulatory, and interpretive signs will be installed at the TNT.

6.1.2 *Conservation Buffers*

Buffers within and around conservation areas, including increasing connectivity of undeveloped lands, provide multiple benefits. By establishing distance between human activities (including outdoor recreation) and habitat, wildlife disturbance is limited. Land adjacent to and near the preserve that remains undeveloped—including lands in agricultural status—will benefit the preserve by protecting viewsheds and wildlife habitat. Conservation easements on private land near the preserve and/or additional public land acquisition that may benefit the preserve are other methods to protect and enhance the preserve. OSD supports and will pursue such policy measures and objectives for the preserve area.

Additional vegetation buffers within the preserve also add protection and provides the following secondary environmental functions:

- Increases water quality by slowing water to infiltrate, trap pollutants, and stabilize soils
- Increases biodiversity by increasing habitat areas, protecting sensitive habitats, restoring connectivity, and increasing access to resources, and shades water
- Reduces soil erosion by reducing stormwater and wind intensity; stabilizes and improves soils; and removes pollutants

- Protects property by reducing wind energy, modifying microclimate; enhances habitat; and reduces flood water levels
- Enhances views and aesthetic quality by screening undesirable and enhancing desirable views and noise; filters pollutants and odors; and separates human activities (Bentrup 2008)

Site design challenges are inherent in a site that is surrounded by residential properties. The CNP's vegetative buffers are one component in the designer's toolbox to address the challenges of this urban/wildland interface. Conservation buffers create the following:

- a barrier that limits the extent of disturbance
- buffers to odors and wind-borne dust resulting from agricultural activity
- viewing areas or vegetation gaps that limit or expand visual access
- limits for physical access to sensitive habitat spaces
- a linking of an off-site vegetative buffer that can extend the habitat spaces into adjacent parcels

The process of widening existing buffers and planting hedgerows with native plant material has already started. The OSD has planted native shrubs along some of the CNP's farm field roads in the past several years in coordination with school groups. Additional efforts have been made working with inmate crews and youth crews to remove weeds and downed woody material along the road and ditches in preparation of future plantings. These efforts will continue and be ramped up as this plan goes into effect.

6.1.3 *Partners*

While the OSD is responsible for executing this plan, community and partner support is necessary to fully realize the plan and meet the milestones outlined in the implementation matrix and budget. It has been proposed by the TAG that a friend's group be formed to raise funds, support education and recreation efforts, and implement this plan. The OSD will also continue to work with, solicit and obtain support when needed from the following agencies:

1. Rio Grande Nature Center State Park and New Mexico State Parks Division
2. Friends of the Rio Grande Nature Center
3. Middle Rio Grande Conservancy District
4. Natural Resources Conservation Service (formerly the Soil and Conservation Service)
5. U.S. Fish and Wildlife Service
6. Other City of Albuquerque Departments
7. Other public agencies
8. Community and non-profit organizations including the Bosque Ecosystem Monitoring Program.

6.2 Candelaria South Tract

The CST is 31.8 acres, south of the RGNCSP and Candelaria Road. It is surrounded by residential areas to the east and south of the property and Riverside Drain to the west. The OSD has a lease agreement with the RGNCSP to manage part of the CST, including the Discovery Pond. The RGNCSP provides year-round educational opportunities to school groups at the Discovery Pond engaged in a wide range of activities including water quality testing, macro-benthic invertebrate sampling and identification, pond studies, turtle research, and more. With assistance from the FRGNC, the RGNCSP has removed tumbleweeds and kochia from the section they manage and are experimenting with native shrubs in an effort to identify which species are best suited for the site and the minimum water required to establish the plants. This study is instrumental in informing future plantings and restoration efforts at the CST. Additionally, bird studies are led by volunteers at the CST. While most of these activities are limited to the leased areas of the CST, the RGNCSP and FRGNC have expressed a willingness to expand their activities beyond those boundaries to the rest of the CST in an effort to support increased access and recreation to this part of the CNP. They have committed to leading up to three walks per week while expanding additional events like the BioBlitz into the CST.

A formal trail will be established for guided tours. The trail will extend 0.67 mile further south beyond the Discovery Pond. The surface of the trail should be as natural as possible while being accessible. Points of interest have also been identified along the trail for interpretive walks. Wildlife-friendly fences shall be installed where needed to limit unguided access and social trails. Wildlife studies may be conducted to further inform where fences should be installed, the type of fence, and use of wildlife portals.

A viewing deck that may also serve as a silent meditation area will be constructed. The location identified for this feature is on top of the Fraternal Order of Police swimming pool that has been filled in and raised above the surrounding topography providing an elevated view of the site. The observation area will be a stop along the walking tours and may be scheduled for groups to use via a special permit with the OSD. The permit will identify the type of group, number of people in the group, duration of stay, and other pertinent information that can be coordinated with the RGNCSP, FRGNC, and other groups to avoid conflicts and ensure site protocols and OSD regulations are being met.

6.3 Candelaria North Tract

The CNT is the largest contiguous section of the CNP, nearly 100 acres, with 82 acres currently in agricultural production. The RGNCSP and volunteer groups have led bird walks and bird banding activities since the 1980s to the Candelaria Wetlands. The OSD has also led guided tours upon request and engaged school groups to help with plantings and other activities on occasion. Additionally, neighboring communities have enjoyed wildlife viewing through the fence along Veranda Road, Duranes Lateral, Riverside Drain, and the residential properties along the northern boundary, as well as through a designated wildlife blind located at the Rio Grande Nature Center parking lot.

The OSD will work with the RGNCSP and volunteer groups to organize guided tours throughout the year. The existing roads will be used for trails with designated routes that are mindful of wildlife disturbance and indicated on the Recreation and Access site map. The trails may be rerouted, or sections may be closed off during heightened wildlife activity. Additional movable wildlife blinds may be set up to enhance visitors' experience and wildlife viewing opportunities.

Community groups, including youth groups, will assist with citizen science activities such as iNaturalist (iNaturalist 2019) and eBird (eBird 2019). Additional monitoring will require community and partner support. Refer to Adaptive Management and Monitoring in Section G for more information on the types of monitoring activities identified in this plan.

Additionally, the OSD will rely on partners and public involvement to transition the site from agriculture to a restored habitat. This will involve removing invasive plants and animals while establishing and maintaining native plants. Annual events and ongoing restoration projects will take place at the property and will be led by staff, contractors, and partners, and with the assistance of community and school groups.

Enhanced wildlife viewing opportunities will be established through wildlife blinds oriented towards ideal viewsheds. Views of the volcanoes and the west mesa can be seen from the CNT. One wildlife blind will take advantage of this viewshed and include interpretive signs that highlight the larger surrounding environment features and connections to the CNP. The other blinds will be constructed along Veranda Road to the south of this tract, and the trail along the Riverside Drain that skirts the property boundary to the west. The blinds at these two sites will be oriented to capture the best opportunities for viewing wildlife at the CNT, including sandhill cranes.

6.4 The Woodward House

The Woodward House is an approximately 800-square-foot adobe house in the northeast corner of the CNP. The house has been estimated to be around 70 years old, but it is currently not eligible for listing under the general guidelines of state or national preservation standards. The house is presently in good condition, with a sound foundation. The roof is pitched gable style with asphalt shingles. Every effort should be made to retain the house's original architectural ranch style.

The Woodward House may be established as an educational facility, where visitors can see interpretive displays, gather in classrooms for formal programs, and monitor the environment from its fixed location. Current partners in the development of educational programing include Tree New Mexico, which has an agreement with the OSD to grow native plant material for planting efforts city-wide and has an educational outreach programs to teach children planting techniques. This programming may be expanded to include partners and visiting student groups who would meet at the Woodward House to learn about the CNP. Partnering groups such as Tree New Mexico would benefit from a workstation in Woodward House with a meeting space and

storage for supplies and equipment. Additionally, there is a small parking area near the house, so groups approved by the OSD may arrive directly for scheduled programs via Arbor Road.

Additional opportunities for further community involvement may be considered in the future if there is public support. This may include increased educational opportunities at the house and adjacent field. Any additional activities in this area should be in support of the restoration work and ongoing management of the site as a nature preserve. This was proposed to the general public and the TAG for consideration. There were mixed opinions on the matter from the public, and the majority of TAG members advocated to restrict increased activity for fear it would negatively impact wildlife. The sentiment from most TAG members is to start off with restricting access and possibly easing certain types of access in the future if warranted.

6.5 Tree Nursery Tract

The TNT is roughly 7 acres and located off Rio Grande Boulevard, between Candelaria Road and Cherokee Road. This tract is also next to a public bus stop. Currently, the TNT is managed by the City of Albuquerque Park Management as a tree nursery and refuse station for green waste and other material that serves the greater park system. The TNT will continue to serve Park Management in a limited fashion, including the ongoing use and improvements of the tree nursery, but will predominantly be a multifunctional space to support the CNP. It is proposed that this site be considered for parking, pedestrian access, storage, and a grow-out station for restoration efforts. However further community planning and assessments are required before moving forward with this plan. Work on the Tree Farm shall not proceed until an approved site plan is developed with neighbor participation.

The design layout of the site's features will be coordinated with neighboring groups who have expressed concern over overflow parking onto neighboring streets, increased noise, security, lights, general disturbance, and exhaust from cars. Currently, a draft schematic identifies a parking lot for limited cars with additional bus and designated ADA parking. A grow-out station roughly 1 acre in size that includes a greenhouse, wet-beds, and raised beds for propagating plants intended to be transplanted throughout the CNT and CST may also be included.
A structure that provides storage, bathrooms, and a potential meeting space to support volunteers, contractors, and staff is also identified on the draft schematic. These facilities would not be open to the general public unless staffed for a specific event. All of these amenities will need to be further vetted by the neighbors and community. Additional studies will need to be conducted to reduce disturbance and impact to the neighbors while creating a smooth flow for allowable activities with clear directional and educational signs.

It is proposed that from this site a pedestrian gate be created along the western boundary to lead people to a bridge across the Duranes Lateral to a wildlife blind with views across the property and to the volcanoes. The pedestrian access gate will also serve as the main route to the CNT along the Duranes Lateral for guided tours and educational program. The gate will be locked when the property is closed. Directional, regulatory, and interpretive signs will be installed at the TNT. Additional signs discouraging parking along the residential streets will be posted. Visual

screens using vegetation should also be considered in the design plans to decrease the visual and audio disturbance to neighbors.

6.6 Protocols for Education Programs and Public Access

The following protocols are guidelines for education and access throughout the entire CNP. These protocols will be reviewed and adjusted every 4 years or as needed.

6.6.1 *Education Program and Public Access Protocols:*

- *In order to minimize wildlife disturbance, the level of human activity will be limited and include conservation buffers, including but not limited to the following: closing designated areas off to the general public; establishing visual and sound buffers through vegetation cover including hedgerows; and limiting activity during nesting seasons (November to July) or other critical times for wildlife and reproduction.*
- *The maximum number of program participants allowed at one time is generally limited to 24 people, although exceptions may be made if there is sufficient staffing available to divide into small groups and ensure a quality educational experience. There should be a maximum of three events per week.*
- *School groups should be limited to 60 students per field trip and have enough staff and adult supervision to manage the group well.*
- *No unguided or unreserved groups are allowed. However, groups or individuals who have a Special Use or other agreement with the OSD may access the CNP unguided under established protocols. This may include access for wildlife monitoring, restoration projects, service-learning activities, educational programs, or assisting with management of the property.*
- *Access through the preserve for guided programs shall generally be restricted to official trails and roads. User-created trails shall be closed and revegetated.*
- *The OSD shall comply with Title II of the ADA and other applicable federal and State accessibility standards in making reasonable accommodations, whenever possible and when adequate notice is given, to provide access for people with disabilities to enroll and participate in guided programs at the CNP. Staff may need to adjust programs as necessary to accommodate disabled participants.*
- *Vehicular access will be limited to the OSD and other "authorized" vehicles, emergency vehicles, and farm machinery. The majority of vehicles are expected to stay on the existing farm roads and access the site via the existing vehicular gates. Pedestrian access is limited to guided tours, education programs, citizen science monitoring activities, and rehabilitation/renovation projects.*
- *Specific areas around the perimeter of the CNP require fencing, and careful thought will be applied to designing its type and function. Because of the light density of homes and continuous agricultural land along the northern perimeter, the landscape/habitat of the preserve is extended by adjacent private land. Fencing along this perimeter should be wildlife-friendly. However, certain areas may warrant a stronger fencing option that*

limits dogs and unwanted pedestrian entry. Further studies should be conducted to better understand what will best support wildlife access and habitat protection.

- *Visual access includes overlooks and wildlife blinds. They will be installed at the western border north of the RGNCSP; eastern boundary along Duranes Lateral; southern boundary along Veranda Road; and northern boundary of the tract south of the RGNC south of the Bosque Trail access path.*
- *Parking and access to the CNT from the TNT is proposed. Additional parking for partner groups, as well as ADA parking, will be at the Woodward House for monitoring activities and specified guided programs. Parking and access for the CST will be from the RGNC parking lot.*
- *Access through the preserve for guided programs shall generally be restricted to the farm roads, designated trails, the wetland trail, and trails through the bosque area on the northwest corner of the farm.*
- *Educational and monitoring activities may take place in the wetland, the farm fields, and the bosque area, taking care to minimize environmental disturbance.*
- *The OSD will coordinate and inform the RGNCSP and other partnering groups of scheduled guided tours and educational programs to avoid conflicts. This includes those doing regular wetland monitoring (currently the FRGNC) prior to scheduling guided educational programs around the wetland; the contract farmer prior to scheduling guided programs in any farm fields; and special permits for the CST meditation area. Other groups including the RGNCSP and FRGNC will also coordinate and inform the OSD of any activities scheduled at the CNP.*

6.7 Implementation Matrix

Table 13 outlines the plan for phasing in access and outdoor recreation to the CNP over a 20-year period. Some of the actions listed below can be implemented with existing resources, while other activities outlined are dependent on available funds to support this project and partner support. Additionally, increased access or further restricting access may be warranted and will be reviewed every 4 years or as needed.

Table 13. CNP Public Access and Outdoor Recreation Implementation Plan

	1 year	4 years	8 years	12 years	16 years	20 years
Candelaria North Tract						
Public Events: Tours & Activities	Guided Tours will be offered with help of Friends Group. Frequency to be determined, but no more than three per week. Staff will offer quarterly tours or/and events.	Develop tours and audience-specific activities for a variety of community groups, including people with disabilities, school groups, and second language learners. Organize a public event in 2024 to present progress on the RMP implementation.	Evaluate public programs and modify as needed	Evaluate public programs and modify as needed	Evaluate public programs and modify as needed	Evaluate public programs and modify as needed
Citizen Science	Support existing and new citizen science programs: eBird, iNaturalist, Nature's Notebook; and strategize with BEMP.	Continue to support and oversee citizen science programs; launch BEMP monitoring; conduct a vegetation analysis in 2024, and present monitoring results at Crawford Symposium and/or other appropriate venues	Continue to support and oversee citizen science programs; maintain BEMP monitoring; conduct a vegetation analysis in 2028, and present monitoring results at Crawford Symposium or/and other appropriate venues	Continue to support and oversee citizen science programs; maintain BEMP monitoring; conduct a vegetation analysis in 2032, and present monitoring results at Crawford Symposium and/or other appropriate venues	Continue to support and oversee citizen science programs; maintain BEMP monitoring; conduct a vegetation analysis in 2036, and present monitoring results at Crawford Symposium and/or other appropriate venues	Continue to support and oversee citizen science programs; maintain BEMP monitoring; conduct a vegetation analysis in 2040, and present monitoring results at Crawford Symposium and/or other appropriate venues
Restoration	Work with community groups including youth corps and students to plant hedgerows and remove invasive plants	Work with community groups, including youth, to assist with plant propagation, plantings and invasive plant removal. Establish a volunteer group for ongoing assistance.	Work with community groups, including youth, to assist with plant propagation, plantings and invasive plant removal. Work with a volunteer group for ongoing assistance.	Work with community groups, including youth, to assist with plant maintenance, propagation, plantings and invasive plant removal. Work with a volunteer group for ongoing assistance.	Work with community groups, including youth, to assist with plant maintenance, propagation, plantings and invasive plant removal. Work with a volunteer group for ongoing assistance.	Work with community groups, including youth, to assist with plant maintenance and invasive plant removal. Work with a volunteer group for ongoing assistance.
Blinds	Wildlife blind design	Wildlife blind construction along southern and western boundaries	Wildlife blind construction	Wildlife blind maintenance	Wildlife blind maintenance	Wildlife blind maintenance. Evaluate and update as needed
Signage	Develop an interpretive signage plan, that includes directional signage	Finalize interpretive signage plan, construction and installation	Maintain and review interpretive signage	Maintain and review interpretive signage	Maintain and review interpretive signage	Update interpretive signage
Fencing	Identify fencing needs	Construct wildlife-friendly fencing	Maintain fencing	Maintain fencing	Maintain fencing	Maintain fencing
Trails	Utilize existing trails	Develop trails system, including accessible trails	Maintain trails	Maintain trails	Maintain trails	Review and update trail system as needed
Candelaria South Tract						
Public Events: Guided tours, Festivals, Open Houses	Guided tours and public events will be offered by volunteers and RGNC staff as part of existing programs.	Guided tours and public events (up to 3 per week) will be offered by volunteers and RGNC staff as part of existing programs and develop new programs for extended trail	Guided tours and events (up to 3 per week) will be offered by volunteers and RGNC staff	Guided tours and events (up to 3 per week) will be offered by volunteers and RGNC staff	Guided tours and events (up to 3 per week) will be offered by volunteers and RGNC staff	Guided tours and events (up to 3 per week) will be offered by volunteers and RGNC staff
Restoration	Complete necessary surveys of the area	Work with RGNC staff, volunteers, community groups, and youth to remove invasive plants and excess downed vegetation and begin planting native plants	Work with RGNC staff, volunteers, community groups and youth to remove invasive plants and continue planting native plants	Work with RGNC staff, volunteers, community groups and youth to remove invasive plants and continue planting native plants	Work with RGNC staff, volunteers, community groups and youth to remove invasive plants and continue planting native plants	Work with RGNC staff, volunteers, community groups and youth to remove invasive plants and continue planting native plants
Monitoring and Research	Work with citizen science programs, volunteers, and RGNC staff to establish monitoring protocols	Volunteers, RGNC staff, and interested groups will maintain monitoring and citizen science programs	Volunteers, RGNC staff, and interested groups will maintain monitoring and citizen science programs	Volunteers, RGNC staff, and interested groups will maintain monitoring and citizen science programs.	Volunteers, RGNC staff, and interested groups will maintain monitoring and citizen science programs	Volunteers, RGNC staff, and interested groups will maintain monitoring and citizen science programs
Viewing Platform	Identify and design viewing platform and possible silent mediation area	Construct viewing platform. Work with community groups and RGNC to provide access to the viewing platforms through a special permit system, guided tours, and public events	Work with community groups and RGNC to provide access to the viewing platform through a special permit system, guided tours, and public events	Work with community groups and RGNC to provide access to the viewing platform through a special permit system, guided tours, and public events	Work with community groups and RGNC to provide access to the viewing platform through a special permit system, guided tours, and public events	Reevaluate viewing platform and update as needed
Fencing	Identify fencing needs	Construct wildlife-friendly fencing	Maintain fencing	Maintain fencing	Maintain fencing	Maintain fencing
Trails	Utilize existing trails and plan appropriate location of new trail	Develop trails system, including accessible trails	Maintain trails	Maintain trails	Maintain trails	Review and update trail system
Tree Nursery Tract						
Parking Area	Design public access road and parking	Construct public access road and parking	Maintain parking area	Maintain parking area	Maintain parking area	Maintain parking area
Fencing & Gates	Identify fencing and gate locations	Design and construct fencing, gates and related infrastructure	Maintain fencing and gates	Maintain fencing and gates	Maintain fencing and gates	Maintain fencing and gates
Bridge	Discuss bridge across the Duranes Lateral and possible designs with MRGCD	Design bridge and secure funding	Construct bridge	Maintain bridge	Maintain bridge	Maintain bridge

	1 year	4 years	8 years	12 years	16 years	20 years
Wildlife Blind and Interpretive signage	Identify possible wildlife blind designs and costs	Design wildlife blinds and develop interpretive signage plan	Construct wildlife blind, design and install signs	Maintain wildlife blind and signs	Maintain wildlife blind and signs	Maintain wildlife blind and revaluate signage. Updated as needed
Outdoor furnishings	Identify possible location for a shade structure and outdoor gathering area	Design shade structure and related outdoor furnishings	Construct shade structure and related outdoor furnishings	Maintain shade structure and related outdoor furnishings	Maintain shade structure and related outdoor furnishings	Maintain shade structure and related outdoor furnishings
Facility: bathrooms, storage and gathering area		Design and identify location for facility and secure funding	Construct facility	Maintain facility	Maintain facility	Maintain facility
Tree Nursery	Re-establish tree nursery and cover crop	Work with Tree Stewards to help maintain and plant trees	Work with Tree Stewards to help maintain and plant trees	Work with Tree Stewards to help maintain and plant trees	Work with Tree Stewards to help maintain and plant trees	Work with Tree Stewards to help maintain and plant trees

7 ADAPTIVE MANAGEMENT AND MONITORING

The OSD, working with contractors, partners, community groups, and citizens, will implement an adaptive management and monitoring plan that will guide decision-making and determine the best management practices based on knowledge about the effectiveness of current management practices relative to project goals and objectives. In this way, the OSD will learn about successes and failures with the goal of implementing improved practices. Adaptive management promotes flexible decision making and incorporates uncertainties such as natural variability and other factors. Monitoring is essential to providing information for adaptive management.

Adaptive management must first begin with specific goals and objectives. Each habitat restoration area on the CNP needs to have a set of goals and objectives. For example, an important goal of this RMP is to increase biodiversity. The number of species that become established in a specific habitat area could be observed and tabulated to see if the number of species increases over time with restoration. Identifying evaluation criteria to be measured or observed can be complex, and can address single or multiple species, specific evaluation elements, different spatial and temporal scales and management components.

For each project, implementation assessment can be used that is a one-time or short-term evaluation of whether habitat restoration treatments have been implemented as planned. Adjustments can be made if the monitoring shows that the project does not meet a specific goal. After implementation is complete, monitoring can assess the progress towards a goal.

To measure improvement, baseline conditions must be documented followed by repeated observations or measurements taken over time. It may take many years to grow and establish habitat, and monitoring may take many years to show improvement. Monitoring may also show a decrease in the desired outcome, in which case a new project could be developed, or another goal or objective may need to be developed. Without monitoring, it would be difficult or impossible to determine if a project reaches a goal.

Monitoring can be measurements or observations and can be quantitative or qualitative. The amount of time for monitoring and the budget is a factor to consider. Cost-effective monitoring methods will be conducted on an annual basis with staff, partners, and volunteers. Every 4 years, a more in-depth monitoring will take place to further identify if the project goals and objectives are being met and what needs to be modified, which will require additional funds.

Table 14 below identifies a variety of strategies that may be employed for monitoring, including citizen science projects, Bosque Ecosystem Monitoring Program monitoring protocols, photo points per habitat area, aerial photographs, soil analysis, and wildlife camera documentation. Many of these methods are also being implemented at Valle de Oro Wildlife Refuge and Whitfield Wildlife Conservation Area. A comparative analysis may be conducted, as well as identifying how these areas are supporting wildlife in the context of the Rio Grande corridor rather than in isolation of each property.

The overall goal for the monitoring methods is to improve habitat for a diversity of wildlife by establishing a healthy plant community and to measure the change over time. Table 14 below is a brief outline of the monitoring methods that may be implemented at the CNP.

Table 14. Monitoring Methods for Candelaria Nature Preserve

Monitoring Method	Location	Objective	Baseline Data	Lead	Frequency
Photo Points with General Notes per Site	Each habitat area identified on the site plan, at a fixed location that remains constant	Identify the change in vegetation over time, percent change per year, and changes in fuel loading	Does not currently exist, will establish in year 1	OSD	Once a year, first week in September
Wildlife Cameras	Current fixed locations. More may be added at later dates.	Identify large mammal and migrating bird activity	Exists with 10 cameras in place from 2017–2019	OSD and volunteers	View photos on a quarterly basis and document animal sightings
Track Plant Mortality Rates	Hedgerows	Identify the number of trees and shrubs that die within first year of planting, and identify possibly causes to limit mortality rates moving forward	Does not currently exist.	Contractors, volunteers, and OSD	Will begin monitoring when contractors start planting, and thereafter on an annual basis
eBird	Around existing ponds, Wetland Marsh and Ephemeral Wetland as part of weekly bird walks	Identify the number and species of birds at the property and if the rates go up over time.	eBird has been an active program at the property since 1985. The program will extend further into the property.	Volunteers	Weekly
Bird Banding	Ponds, gardens, and fixed locations at existing sites	Identify the number and species of birds at the property and if the rates go up over time	Bird Banding has been an active program since 1979.	Rio Grande Bird Research Inc.	Twice weekly August–October; once weekly January–March
Monitoring Avian Productivity and Survivorship (MAPS)	Ponds, gardens, and fixed locations at existing sites	Identify survivorship and productivity of avian species	MAPS began in 2019.	Rio Grande Bird Research Inc.	Every 10 days during the breeding season
iNaturalist	TBD	Identify the diversity of plants and animals at the property	Does not exist. Will establish in year 1.	School groups, volunteers, staff	Monthly
Nature's Notebook	TBD	Identify the diversity and change of plants and animals at the property over time	Does not exist. Will establish in year 1.	Volunteers, BEMP staff	Weekly at fixed locations and monthly driving transect
BioBlitz	TBD	Identify the diversity of plants and animals at the property	Does not exist. Will establish in year 1.	Volunteers, RGNC, and OSD	Once a year
BEMP Transects	TBD	Identify the diversity and change of plants and animals at the property over time	Does not exist, but hope to get started in year 1.	BEMP staff and volunteers	TBD- monthly

Monitoring Method	Location	Objective	Baseline Data	Lead	Frequency
BEMP groundwater monitoring	TBD	Identify water depth and availability and impact on vegetation	Does not exist, but hope to get started in year 1.	BEMP staff and volunteers	TBD - monthly
BEMP Pitfall Traps	TBD	Identify types invertebrates at the property and possible trends related to soil health	Does not exist, but hope to get started in year 1.	BEMP staff and volunteers	TBD - monthly
BEMP small mammal trapping	TBD	Identify animal species and abundance over time	Exists for CST only. May establish CNT study sites in year1.	BEMP staff and volunteers	TBD
Aerial Photos	Over entire property	Identify the change over time, looking for plant diversity and decrease in Siberian elms	Completed in 2019 in February.	Contractors and/or OSD	Once a year for the first 4 years, then once every 4 years
Soil Analysis	10 samples within different soil types throughout the CNT. Add three samples in CST per soil type	Identify if the soil improves over time and is able to support more plant diversity	Completed analysis in 2018 in the CNT. Need to get a baseline for the CST.	Contractors	Every 4 years
Fuel Load Assessment at CST	CST at fixed locations	Identify areas the fuel loads are high and changes over time	Does not exist; conduct prior to treatment	Contractors	Every 4 years
In-depth Vegetation Analysis Reviewing All Relevant Information	Existing sites	Identify if the project goals are being met and what needs to be modified	Does not currently exist. First analysis in 2024	Contractors	Every 4 year

8 BUDGET AND IDENTIFIED FUNDING SOURCES

This plan outlines a big shift from the way things have been managed in the past with contract farmers who significantly offset the cost to taxpayers by managing the property. The move away from contract farming to wildlife cropping and restored habitat will add significant costs and staff time to the OSD. This plan can only be realized with partner and public support, and if funding becomes available. The TAG has identified numerous possible funding sources listed below. The TAG has also suggested that a friend's group be established to help secure funding and continue to work with the OSD to implement this plan.

Possible Funding Sources Identified by TAG:

- Coca-Cola and other private entities
- Bureau of Land Management – wetland mitigation
- USDA NRCS – farming grants
- State Legislature
- Utton Center
- USFWS – migratory bird funding

- HB204 – Healthy Soils Act
- Grants for Bee Friendly Cities
- Grants for Urban Migratory Bird Cities
- Albuquerque Urban Bird Coalition
- Audubon
- Ducks Unlimited
- LWCF
- Quivira Coalition
- Native Plant Society
- Intermountain West Joint Venture Wetland Restoration
- Establishment of a 501c3 Friends of Candelaria Nature Preserve to pursue foundation and corporate funds and City Capital Improvement Project funds
- City Open Space Division Open Space Trust Fund
- City Bonds
- City Open Space Mill Levy
- State Parks funding (for improvements to RGNCSP components)
- State appropriation sponsored by a legislator for earmarked projects
- State Public Project Revolving Fund (loans from the New Mexico Finance Authority)
- New Mexico Environment Department (NMED) Wetlands Program
- NMED 319 grants (from EPA to states under Section 319 of the Clean Water Act; competitive applications)
- NMED Surface Water Quality Bureau Wetlands Program
- USACE Wetland Mitigation Program
- USACE 401 Certification (impacts to wetlands)
- Bureau of Land Management wetland mitigation needs
- EPA Five Star restoration grants
- New Mexico Congressional Member's Appropriations

The budget estimate in Table 15 at the end of this section is projected to implement this RMP over the next 20 years, with most of the work being completed in the first 8 years, including a heavy concentration on habitat restoration efforts in the first 4 years. In order to secure necessary funding to start the project, the budget is broken down to the first year of implementation, as well as the cost estimate to cover the initial 4 years. Per the adaptive management strategy, the plan will be evaluated after 4 years and adjustments will be made as needed.

The OSD has worked to consider all the factors of this plan and associated costs. However, the projected costs are subject to change due to various unknown factors. An additional review of the budget is currently underway and may change the projected numbers before this RMP is finalized.

If the necessary funds are not secured, the timeline for implementing the project will need to be modified. The following list of activities can occur with existing or limited resources:

1. **Recreation and Access Actions**
   - Guided tours increase with the help of volunteers, including the FRGNC. Includes monthly tours at the CST.
   - Continue to work with school groups to remove weeds and plant hedgerow areas.
   - Begin designing wildlife blinds with existing capital outlay appropriations.
   - Begin developing themes and concepts for interpretive signs.
   - Fence improvements along the CST with existing capital outlay appropriations.
   - Begin designing TNT parking area and access with community, including neighbors on Cherokee Road
   - Support and possibly expand existing citizen science programs like eBird, bird banding, and BioBlitz. Begin to set up iNaturalist and Nature's Notebook projects with community groups.
   - Friends volunteers conduct weekly bird survey to include the RGNC and CNP
   - Summer Wings/Bioblitz extended to include the CNP and CST
   - Informational public presentations at the RGNC to encourage citizen science usage at the RGNC and CNP
   - New Mexico State Parks will design and build a blind on the west side of the CNP and/or Discovery Pond area of the CST for increased visual access.
   - Look into the possibility of establishing a friend's group for the CNP.

2. **Habitat Restoration Actions**
   - Develop wetland design with existing capital outlay appropriations.
   - Convert 1 to 2 fields to restored habitat (starting with 1C, 5 acres) to saltgrass meadow habitat with existing capital outlay appropriations.
   - RGNCSP transforms current croplands within RGNCSP boundary.
   - Elm removal.
   - Experiment with other ways to remove large elms.
   - Work with Ancestral Lands to assist with ongoing plantings and weed removal.
   - Work with school and community groups to continue planting hedgerow areas.
   - Explore possibilities for noncommercial farming until funds become available to transfer entire property to wildlife habitat.
   - Meet with knowledgeable farmers to better understand the technical challenges and possibilities around farming for wildlife and transitioning farm fields. Organize a symposium on farming for wildlife to be held in year 1 or 2.

3. **Monitoring Actions**
   - Take high-resolution aerial photos.
   - Establish and take photo points.
   - Contract with BEMP to develop monitoring protocols specific to their monitoring methods.
   - Support and possibly expand existing citizen science programs like eBird, bird banding, and BioBlitz. Begin to set up iNaturalist and Nature's Notebook projects with community groups.

Table 15. Draft Budget for the Candelaria Nature Preserve RMP Implementation – December 2019

Candelaria Nature Preserve RPM Implementation - December 2019

Capital Costs Initial Construction (Years 1 - 2)					
Item #	Item	Unit Price	Unit	Qty	Total
1	Field 1c - Damp soil grassland (SG) including shrub planting and seeding to be flood irrigated	$17,800.00	AC	4.90	$87,220.00
2	Field 4a (Blue Grama) including soil preparation and seeding	$4,160.00	AC	6.26	$26,041.60
3	Fence - 4 strand tensile wire with T posts	$8.85	LF	3,110	$27,523.50
4	Fence - Chain link	$11.50	LF	1,575	$18,112.50
5	Wildlife access portal	$2,000.00	EA	6	$12,000.00
6	Trail - 6' wide, 2" depth crusher fines with stabilizer installed over 4" depth compacted subgrade	$30.00	LF	3,500	$105,000.00
				Subtotal Initial Construction:	$275,897.60
				Initial Construction Contingency and Soft Costs (20%):	$55,179.52
				Tax (7.875%):	$21,726.94
				Initial Construction Total:	$352,804.06

7	Design for Damp soil wetland (WM) and Ephemeral wetland (EM)	$100,000.00	LS	1	$100,000.00
8	Fence and trail layout design (10% construction cost)	$15,000.00	LS	1	$15,000.00
9	Interpretive signage design - Entire CNP	$25,000.00	LS	1	$25,000.00
10	Wildlife blinds and viewing platform design (10% construction cost)	$32,000.00	LS	1	$32,000.00
				Subtotal Initial Design:	$172,000.00
				Tax (7.875%):	$13,545.00
				Design Subtotal:	$185,545.00

Total Design and Initial Construction:	$538,349.06

Capital Costs Years 2-4					
Item #	Item	Unit Price	Unit	Qty	Total
11	Field 2d and 4d - Ephemeral wetland (EW), Damp soil wetland (WM) and Salt shrubland (SS) - Year 2 - Includes grading, liner, water delivery with autofill controls, water transfer system between wetlands, shoreline protection, wetland plug plantings, and seeding	$105,000.00	AC	20.13	$2,113,650.00
12	Field 1b - Salt shrubland (SS) - Year 3 - including shrub planting with temporary irrigation, and seeding	$6,080.00	AC	5.51	$33,500.80
13	Field 3a - Salt shrubland (SS) - Year 3 - including shrub planting with temporary irrigation, and seeding	$6,080.00	AC	3.73	$22,678.40

14	Field 3b (Blue grama) - Year 3 - including soil preparation and seeding	$4,160.00	AC	3.91	$16,265.60
15	Field 3c - Arroyo margin - (AS) - Year 3 - including eradication of invasive species, and shrub and tree plantings with temporary irrigation	$10,500.00	AC	1.43	$15,015.00
16	Field 4b - Sandbar (SNB) - Year 3 - including soil preparation and seeding	$4,850.00	AC	3.87	$18,769.50
17	Field 4c - Damp soil grassland (SG) - Year 3 - including shrub planting and seeding to be flood irrigated	$17,800.00	AC	3.27	$58,206.00
18	Bosque along west side from norther boundary of CNP and northern boundary of RGNC - including tree and shrub planting	$75,000.00	LS	1	$75,000.00
19	Field 1d (Blue grama) - Year 4 - including soil preparation and seeding	$4,160.00	AC	10.00	$41,600.00
20	Field 1e - Damp soil grassland (SG) - Year 4 - including shrub planting and seeding to be flood irrigated	$17,800.00	AC	9.35	$166,430.00
21	Field 2a (Blue grama) - Year 4 - including soil preparation and seeding	$4,160.00	AC	1.45	$6,032.00
22	Field 2b - Sandbar (SNB) - Year 4 - including soil preparation and seeding	$4,850.00	AC	2.70	$13,095.00
23	Field 2c - Sandbar (SNB) - Year 4 - including soil preparation and seeding	$4,850.00	AC	2.70	$13,095.00
24	Field 1a - Year 4	$17,800.00	AC	2.85	$50,730.00
25	Hedgerows - including tree and shrub plantings and temporary irrigation	$135,000.00	LS	1	$135,000.00
26	Mastication of north 82 acres - including invasive species removal primarily along hedgerows	$1,830.00	AC	82	$150,060.00
27	Mastication of south 38 acres - including invasive species removal throughout and habitat restoration	$11,500.00	AC	38	$437,000.00
28	Wildlife access portal	$2,000.00	EA	12	$24,000.00
29	Trail - 6' wide, 2" depth crusher fines with stabilizer installed over 4" depth compacted subgrade	$30.00	LF	1,350	$40,500.00
30	Wildlife blinds and viewing platform	$320,000.00	LS	1	$320,000.00
31	Interpretive signage	$135,000.00	LS	1	$135,000.00
32	Movable Blinds	$2,500.00	LS	1	$2,500.00
				Subtotal Year 2-4 Construction:	$3,888,127.30
				Year 2-4 Construction Contingency (20%):	$777,625.46
				Tax (7.875%):	$306,190.02
				Year 2-4 Construction Total:	$4,971,942.78

33	Years 2-4 Design / Construction Admin	$15,000.00	YR	3	$45,000.00
				Subtotal Year 2-4 Design:	$45,000.00
				Tax (7.875%):	$3,543.75
				Design Subtotal:	$48,543.75

Capital Costs Tree Nursery Tract					
Item #	Item	Unit Price	Unit	Qty	Total
34	Building - Restrooms, storage, programming	$350.00	SF	1,000	$350,000.00
35	Shade structure	$50,000.00	LS	1	$50,000.00
36	Entrance road and parking area - Compacted base course	$12.00	SY	3,000	$36,000.00
37	Accessibility - Parking and trails	$10.00	SY	700	$7,000.00
38	Bridge over acequia	$90,000.00	LS	1	$90,000.00
39	Fencing and gates	$20.00	LF	700	$14,000.00
40	Landscape	$25,000.00	LS	1	$25,000.00
41	Signage	$15,000.00	LS	1	$15,000.00
				Subtotal Tree Nursery Tract Construction:	$587,000.00
				Tree Nursery Tract Construction Contingency and Soft Costs (20%):	$117,400.00
				Tax (7.875%):	$46,226.25
				Tree Nursery Tract Construction Total:	$750,626.25

42	Tree nursery tract design (10% construction cost)	$70,000.00	LS	1	$70,000.00
				Tree Nursery Tract Design:	$70,000.00
				Tax (7.875%):	$5,512.50
				Design Subtotal:	$75,512.50

Total Design and Construction Years 2-4 and Tree Nursery Tract:	$5,846,625.28

Habitat Management - Weed and Invasive Species Removal					
Item #	Item	Unit Price	Unit	Qty	Total
43	Habitat management following plantings completed in the first 4 years	$15,000.00	YR	4	$60,000.00
				Subtotal Habitat Management:	$60,000.00
				Tax (7.875%):	$4,725.00
				Habitat Management Subtotal:	$64,725.00

Grand Total Capital and Habitat Management Years 1-4:	$6,449,699.34

Operations and Management - Years 1-4					
Item #	Item	Unit Price	Unit	Qty	Total
1	Annual monitoring - Years 1-4	$30,000.00	YR	4	$120,000.00
2	Every 4th year monitoring and analysis	$70,000.00	4-YR	1	$70,000.00
3	General maintenance	$10,000.00	YR	4	$40,000.00
4	Irrigation	$4,100.00	YR	4	$16,400.00
5	Farming contract	$75,000.00	YR	4	$300,000.00
6	Equipment purchase	$100,000.00	LS	1	$100,000.00
7	Wildlife forage seeding - Years 1-4	$34,000.00	YR	4	$136,000.00
8	Soil amendments - Annual	$2,000.00	YR	4	$8,000.00
9	Soil amendments - Every 4th Year	$10,000.00	YR	1	$10,000.00
10	Education materials	$1,000.00	YR	4	$4,000.00
11	Annual youth crew expense	$15,000.00	YR	4	$60,000.00
				Subtotal Operations and Maintenance Years 1-4:	$864,400.00
				Tax (7.875%):	$68,071.50
				Total Operations and Maintenance Years 1-4:	$932,471.50

Operations and Management - Years 5-20					
Item #	Item	Unit Price	Unit	Qty	Total
1	Annual monitoring	$30,000.00	YR	16	$480,000.00
2	Every 4th year monitoring and analysis	$70,000.00	4-YR	4	$280,000.00
3	General maintenance	$10,000.00	YR	16	$160,000.00
4	Irrigation	$4,100.00	YR	16	$65,600.00
5	Equipment maintenance	$5,000.00	YR	16	$80,000.00
6	Wildlife forage seeding	$5,000.00	YR	16	$80,000.00
7	Soil amendments - Annual	$2,000.00	YR	16	$32,000.00
8	Soil amendments - Every 4th Year	$10,000.00	YR	4	$40,000.00
9	Education materials	$1,000.00	YR	16	$16,000.00
10	Annual youth crew expense	$15,000.00	YR	16	$240,000.00
11	Habitat management after initial management	$10,000.00	YR	16	$160,000.00
				Subtotal Operations and Maintenance Years 5-20:	$1,633,600.00
				Tax (7.875%):	$128,646.00
				Total Operations and Maintenance Years 5-20:	$1,762,246.00

Total Project Costs Years 1-4:	$7,382,170.84

Total Project Costs Years 5-20:	$1,762,246.00

Total Project Costs Years 1-20:	$9,144,416.84

Annual Staff Expenses					
Item #	Item	Unit Price	Unit	Qty	Total
1	Biologist or Ecologist M-14 Series	$66,000.00	YR	1	$66,000.00
2	Technician B-30 Series	$53,000.00	YR	1	$53,000.00
3	Educator (RGNCSP)	$30,000.00	YR	1	$30,000.00
			Annual Staff Expense:		$149,000.00

Annual Operations and Maintenance:	$110,140.38

Annual Staff and Operations and Maintenance Cost:	$259,140.38

Notes on This Estimate

This estimate is structured to separate capital costs, operations and management costs, and staff costs. Capital costs are divided consolidated into: initial design and construction to occur within the first 1-2 years of the project, the complete build-out of the site between years 2-4, construction associated with the tree farm, and habitat management which primarily consists of weed removal within the first two years post-construction.

Capital costs associated with years 2-4 of construction are subdivided into three phases. Year 1 costs are intended to secure contracts and begin initial construction.

Costs for field plantings, hedgerows, bosque, and mastication reflect the intensity of work to be performed in various treatment areas. Some areas eradication of invasive species, tree and shrub planting with temporary irrigation. Other treatment areas are limited in scope to soil preparation and drill seeding.

A contingency line item associated with construction costs includes permitting, bonding and insurance, mobilization, construction surveying, NEPA compliance, construction fencing and signage, and other general costs not associated with individual line items.

Design costs are generally calculated as 10% of the associated construction budget. These costs include consultant services for design and review, surveying, construction documentation, bidding assistance and construction phase services. Lower percentages have been calculated where less services are required.

Capital costs are calculated based on 2019 market conditions and are intended as a guide for planning purposes. Costs in future years will fluctuate based on market conditions and inflation.

Operations and management costs are estimated based on recent past experience with properties of similar use and intensity of management. These costs will vary based on actual conditions and site needs as the plantings mature and operating logistics evolve.

Operations and management costs are estimated based on recent past experience with properties of similar use and intensity of management. These costs will vary based on actual conditions and site needs as the plantings mature and operating logistics evolve.

9 PUBLIC PROCESS

The CNP is a highly visible and well-loved open space that has a wide variety of stakeholders with differing opinions about the management and operations of the property. A planning team composed of the TAG members, consultant team of SWCA Environmental Consultants (SWCA) and Dekker/Perich/Sabatini (D/P/S), and OSD staff developed a public outreach and input plan to listen to and address the various interests and concerns through public forum environments.

9.1 Goals of Public Outreach/Input

- Educate the public about LWCF regulations
- Comply with LWCF regulations for public input in the development of LWCF encumbered property resource management plans
- Address operations and management issues posed by the new RMP
- Establish durable lines of communication among managing agencies, oversight officials, stakeholders, and local organizations

9.2 The Public Engagement Process for the Resource Management Plan

Public engagement in a planning process provides a measure of inclusion and transparency to the public decision-making process and provides a barometer to gauge the success of a planning effort. The CNP RMP public outreach effort included the following outreach and engagement elements:

- Stakeholder Interviews
  - Groups and individual interviewees identified by the TAG, Open Space Advisory Board, and OSD staff
- Public Meeting #1: Planning Process Introduction
  - Present purpose statement and planning overview, goals and management objectives, existing ecological resources, and mapping
- Candelaria Preserve Discovery Hikes
  - Scheduled hikes to speak to the complexity of the landscape and what may be required in the planning process to achieve goals
- Public Meeting #2: Presentations of Alternatives and Preferred Alternative
  - Present alternative management and the preferred plan as developed through the process to date
  - Public comment period from June 22 to July 22, 2019
- Public Meeting #3: Preferred Alternative Presentation
  - Present preferred alternative management plan and process by which it was developed
  - Public comment period from September 11 to September 30, 2019.

- Candelaria Nature Preserve webpage, which allowed interested persons to find out the latest information, download documents, and make comments.
- Minutes and agendas from TAG general meetings posted on the City's website.
- Final report presented to the public and the subsequently the following entities: NPS, Parks and Recreation Department, Open Space Advisory Board, and City Council.

9.3 Roles

The core planning team of the CNP RMP is SWCA/DPS, RGNCSP, the Open Space Advisory Board, the OSD, and the TAG. The roles each of these organizations performed in the public outreach effort are described below.

SWCA/DPS: Conducted public engagement that contributed to the RMP. Tasks included providing a framework for public engagement, stakeholder interviews, conveying qualitative and quantitative information in verbal, written, and graphic form at public meetings, and guiding and documenting public input for inclusion in the final RMP.

Open Space Division: The city dedicated OSD management staff to planning and provided expertise to consultants on OSD processes including introductions to stakeholders and research into resources. City staff ran public meetings, were liaisons between the Open Space Advisory Board, TAG, and other City departments, and communicated regularly with other divisions of City government, including the leadership of the Parks and Recreation Department and the Public Information Office. The City Public Information Officer and Open Space staff coordinated updates to the City of Albuquerque website and initiated stakeholder meetings. The OSD also managed the contract and worked with SWCA.

Technical Advisory Group: Laid the groundwork for the RMP through the first year of meetings; coordinated a 2-day Landscape Workshop led by USFWS staff that clarified the historical pre-engineering landscape at the CNP site; began the process of developing alternatives for converting the CNP to a wildlife preserve; provided advisement and scientific expertise; visited other nature preserves; contacted residents for input; consistently advocated for developing a visionary RMP; participated in all aspects of the RMP, and responded to public comments.

Rio Grande Nature Center State Park: The RGNCSP provided an operational base for public input and outreach by providing access to meeting rooms, promoting outreach efforts and offering their experience managing the Nature Center and its interface with the rest of the CNP site. They also dedicated staff time to attend all of the TAG and public meetings to fully partner on the RMP.

9.4 Description of Public Outreach Components

The intent of the public outreach/engagement plan was to have strategies and recommendations within this RMP that are substantiated by a robust public discussion that was inclusive and

transparent. It is the hope of the planning team that the public outreach effort creates long-standing community commitment for the stewardship of the CNP. The outreach effort is described below.

9.4.1 *Stakeholder Interviews*

Stakeholders were identified by the TAG and OSD staff for consultant contact and meeting initiation and performed the following functions:

- Gathered preliminary public input regarding the planning effort
- Uncovered common themes or issues that guided planning conversations
- Identified other persons or organizations with knowledge and concerns
- Educated stakeholders about LWCF compliance issues, resource management planning, existing resources, and goals
- Encouraged involvement in the upcoming planning process

Interviews were open-ended discussions that sought answers for the following questions:

1. What is the importance of Candelaria Nature Preserve?
2. What management strategies are critical/important/not so important?
3. What do you think Candelaria Nature Preserve should look like in 10 years, 20 years, and beyond?
4. Who else should planners be speaking to and involving in the planning process?

Twelve stakeholder interviews were conducted between mid-November 2018 and mid-January 2019, in which more than 60 people were interviewed regarding their opinions about the CNP.

Some important findings came from interviews that became guiding principles in the development of the plan:

- Ecological Science ought to guide the planning decisions.
- Access to the Nature Preserve ought to be primarily visual in nature.
- Agri-chemical farming operations are considered incompatible with the purpose of the Nature Preserve.

9.4.2 *Public Meeting #1:*

The first public meeting was held on January 30, 2019, at the RGNCSP. The meeting was attended by approximately 108 people, which filled the education conference room to capacity. The audience included representatives of local neighborhood associations, non-profit organizations, environmental and local government organizations, and residents. The meeting was an open house with a short presentation. Attendees then could gather in smaller stations to discuss the specific topics presented, such as farming, wildlife, and public access.

The purpose of Public Meeting #1 was to:

- Introduce the planning process
- Describe the study boundaries and the sub-areas
- Describe the existing ecological resources
- Describe the legal framework that overlays the management of the properties
- Describe current and ongoing contract farming arrangements
- Describe preliminary goals and objectives
- Describe and invite attendees to next discovery hikes and public meetings
- Describe ways to communicate with the planning team
- Get feedback via comment cards notes on posters, sticky notes, etc.

9.4.3 *Candelaria Nature Discovery Hikes*

The Candelaria Nature Discovery Hikes were a way to engage more constituents in the conversation about the CNP while experiencing the place itself. There were two Candelaria Discovery Hikes on two separate Saturdays—February 23, 2019, and March 23, 2019—at two locations. Hikes typically lasted 1 hour and attendance varied between as few as four to as many as 20 persons.

PURPOSE OF THE DISCOVERY HIKES

- Present complex issues associated with wildlife management and outdoor recreation in an urban context, sustainable farming, and historic features of the CNP and ecosystem diversity
- Gather public input for inclusion in planning process
- Increase advocacy for wildlife diversity and protection of Open Space
- Promote the planning process and support for City management of open spaces

The hikes resulted in good discussions about the future of the preserve, the changes in the landscape that are being considered, habitat preservation and development, public access, and farming practices (see the discovery hike notes in Appendix C). Additional discovery hikes were conducted with staff members of the Bosque Ecosystem Monitoring program, Ancestral Land Southwest Conservation Corps, and the Middle Rio Grande Endangered Species Collaborative.

9.4.4 *Public Meeting #2: June 22, 2019, at the Woodward House*

PURPOSE OF MEETING

Educate, involve attendees, and solicit input on the management scenarios.

MEETING FORMAT

The public meeting format was an open house located outside by the Woodward House, with a presentation of 30 to 45 minutes followed by smaller discussion tables broken into three topic

areas: public access and recreation, restored habitat, and farming. Consultants and City OSD staff were stationed at different discussion tables around the meeting area to further explain the alternative and management options. The event followed up with a tour to the TNT. Participants were encouraged to complete comment cards at the event or later online.

MEETING ISSUES

- Public engagement and project overview
- Preferred management scenario
- Compliance with LWCF
- Management implications for the preserve
- Public access for outdoor recreation—limits and opportunities
- Funding and potential funding requests
- Next steps in the public process (approvals)

9.5 Summary

The intent of the public outreach/engagement plan is to have strategies and recommendations within this RMP that are substantiated by a robust public discussion that was inclusive and transparent. It is the hope of the planning team that the public outreach effort creates long-standing community commitment for the stewardship of the CNP.

The comment period specific to this meeting and what was presented lasted from June 22–July 22, 2019. Sixty-two people, including representatives from organizations including the Wilderness Society, Environmental Education Association of New Mexico, and Open Space Alliance, responded to the survey. Out of those comments, 35 people indicated they preferred limited access to the property; 27 people indicated they preferred increased access; 20 people supported the plan to move to a restored habitat; and 14 people expressed the importance of maintaining the site partly in agriculture production, with most of the comments leaning toward agriculture for wildlife; additional comments included concern over Siberian elms increasing throughout the property.

Comments continued to come in after July 22, 2019.

9.5.1 *Public Meeting #3: September 11, 2019*

PURPOSE OF MEETING

Educate and involve public in the preferred management scenario (presented with actions, anticipated outcomes, phased improvement plan, long- and short-term monitoring strategies, capital and operating costs).

MEETING PLAN

The meeting format included a presentation by TAG members providing an overview and purpose of the RMP, the preferred alternative regarding habitat, and the preferred alternative regarding recreation and access. A panel discussion followed the presentation. Panelists included members of TAG, and the discussion was moderated by the SLO. There was overall support for the plan and appreciation for the TAG members' time and effort. A few people expressed concern with the limited access being proposed in the plan, while others were in favor of this decision. A major point of concern brought up was with parking and the main access to the North Tract being at the TNT and the potential disturbance to neighbors, especially along Cherokee Road located to the north of the TNT.

TAG RESPONSES TO PUBLIC COMMENTS

Many comments came in via the internet and forms that were passed out during three public meetings in 2019 (January 30, June 22, and September 11). TAG categorized the comments and organized them into nine categories – 1. Access CST, 2. Access overall, 3. Woodward House, 4. Farming, 5. Natural habitat, 6. Parking, 7. TNT on Rio Grande Boulevard, 8. Recreation, and 9. Funding.

1. **Access to the Candelaria South Tract**

   The TAG supports limited access to this area, providing guided walks only. This has been an area that has had very little use over the years and, while not pristine, it does have qualities of protection for wildlife that should be preserved and enhanced. Habitat improvements are planned, especially in the elm thicket in the northeast corner. Neighbors adjacent to the property have had access. Dogs and cats running loose have probably negatively impacted wildlife, and TAG decided the area should be protected for wildlife to meet the wildlife preserve mandate. On the other hand, neighbors have helped take care of the property – by observation and physical labor.

   If this area provided unlimited access to the public, it would no longer be the pocket of protection for wildlife that it is. Annually, thousands of people use the access trail from Candelaria Road and upwards of 250,000 people use the Nature Center. Even a small percentage of this population would destroy the wildlife qualities of this area. A short trail is planned, but with unlimited access there would be nothing limiting people to the trail. Excessive public use will affect wildlife health and can drive wildlife away, making the area unusable by wildlife. TAG advocates keeping this as a wildlife area, not a place with a steady stream of human activity.

2. **Access Overall**

   Limited access provides habitat and protection for wildlife and fulfills the purpose of being a nature preserve. Excessive public use will affect wildlife health and can drive wildlife away making the area unusable by wildlife. Guided walks will be along the roads on the preserve. Visual access will continue on the boundaries of the current farm fields.

Several blinds will be provided for wildlife viewing. Los Poblanos is a farm that is unique in its own way and provides public access 24 hours a day. It provides public viewing of sandhill cranes and geese using fields of crops grown specifically for them. It does not provide habitat for diverse species of plants and animals. The CNP will be a mosaic of different habitats for these diverse species.

3. Woodward House

The TAG supports keeping minimal activity at the Woodward House, using it as a base for Citizen Science and allowing Tree New Mexico to continue activity there for the time being. As stated above, TAG supports all fields of the CNP being native habitat/mosaic. Although the field to the south of the Woodward House represents a small portion of the CNP, many of the activities suggested for that field would degrade habitat for wildlife and be incompatible with the wildlife preserve objective.

4. Farming

Many comments were received regarding the future of farming at the CNP. Comments ranged from retaining the current commercial farming operation to repurposing farming for the production of wild crops to restoring all farm fields to a mosaic of native plant communities.

TAG rejected the option of retaining the commercial farming activity because this use is not authorized under LWCF regulations.

Farming for the purpose of producing food or habitats for wildlife is an acceptable use. TAG anticipates that some fields will continue to be farmed as “wildlife” crops on an interim basis as other fields are restored to a mosaic of native plant communities that will provide diverse wildlife habitats and increased biological diversity throughout the CNP. TAGs ultimate recommendation is the conversion of all fields to a mosaic of native ecosystems over the 20-year restoration timeline. The restoration process will be guided by monitoring and adaptive management assessments at 4-year intervals or as restoration monitoring results dictate. TAG have concluded that the wildlife preserve mandate is best accomplished by the full conversion of agricultural fields to native habitats. This will result in the maximum restoration of biological diversity on the CNP and best serve the wildlife preserve mandate.

TAG believes that natural habitats, once well established, will become largely self-maintaining by natural ecological processes whereas the retention of some farming for wildlife crops would require annual investments to fund farming operations. In addition, ongoing farming operations will result in recurring disturbances to wildlife inhabiting other habitats on the CNP and may limit opportunities for on-site recreational activities such as guided tours for nature study/observation and bird watching.

Comments were received that both supported and opposed the use of pesticides and/or herbicides. Conversion of agriculture fields to native habitats will require the control of

non-native and invasive plants until natural habitats become established. Our goal is to manage "weeds" through mechanical means to the extent practicable. But we recognize that careful, targeted use of herbicides may be necessary, especially for the elimination of elms and other non-native plants. We will establish decision protocols to minimize herbicide use. The need to use pesticides for controlling animals is not anticipated. Animals that may be considered "pests" will be controlled by natural processes, such as predation by native predators, as diverse ecosystems are established.

5. Natural Habitat

TAG has concluded that the CNP should be converted to a restored natural mosaic landscape and move away from crops altogether over time, with a transition period to accomplish that. After consulting with staff at Valle de Oro and Whitfield Wildlife Conservation Area, and with Dan Collins, Migratory Bird Coordinator, USFWS, as well as others, we determined that a native mosaic of habitats will support many species of resident and migratory birds, as well as numerous other species of wildlife. Salt grass, a native plant, will be present in saltgrass fields and salt shrub areas and will provide food for cranes.

Other factors we took into consideration were that farming is disruptive to wildlife and destroys ground nests of birds and other animals. It is costly and has created problems over the many years of farming on the property - irrigation systems have not been kept up (the current farmer has done a great job of repair), pesticides have been used, crops have not been managed for the most benefits to wildlife, and financial accountability has been lacking. Farming, even wildlife crops, requires more ongoing use of synthetic chemicals, although transitioning to native habitat may require some chemical usage up front.

TAG has considered that it could be healthier for cranes to have a little more space. When a field is cut, hundreds of cranes come, eat the harvest, then go someplace else. For the small area we are talking about, not growing crops for cranes will not negatively impact the population in the middle Rio Grande valley. The public will still be able to observe cranes here and adaptive management will help ensure that. There were very few cranes here 3 years ago and that is where this current process started.

a. Wetlands – Wetlands are extremely valuable to wildlife and they are disappearing, especially in the Southwest. Two new habitats are proposed to be added north of the Nature Center and east of the present ponds: ephemeral wetland and damp soil wetland. It is likely that these new habitats will be linked to the existing ponds that will greatly improve water quality for wildlife in the ponds.

b. Transition – The RMP proposes that restoration will take 20 years, which includes adaptive management. Each subsequent year of work will make some adjustments based on experience of previous work. Most of the larger changes will occur in the first 10 years. Another good reason for the 20 years is the unknown budget since the entire

cost of restoration is not presently funded and it is expected that funding will be provided over time.

c. Transition Damage – Creating new wildlife habitat will involve some temporary loss of habitat due to landscape and vegetation changes. For this reason, it will take many years for restoration to proceed, allowing many of the present areas to continue to provide some wildlife value until new restoration is accomplished. For example, not all of the non-native vegetation will be removed all at once. It is expected that large elm trees will remain for many years before they will be replaced with native trees that have much better wildlife habitat. Present valuable habitat, such as trees for nesting raptors, will not be removed. New habitats will increase the number of wildlife species and density compared to the current wildlife values.

d. Weeds – As new habitats are created, some undesirable species may grow. Those species will be addressed on a case-by-case basis since it is difficult to predict what will happen. To minimize undesirable species, experts will provide their advice during restoration activities.

e. Diversity of Habitat – The goals of restoration to native bosque habitats will greatly increase wildlife diversity. The present monoculture of crops provides a very narrow range of wildlife species and does not constitute a vibrant ecosystem. Future target habitats will allow all levels of the ecosystem to thrive.

f. Pollinators – Because of the diversity of planned habitats, pollinators will flourish because different pollinators can utilize different plants. Also, the new habitats will provide food for pollinators throughout the growing season.

g. Predock Plan – The new RMP for CNP brings the entire area into the intent of the Predock Plan which is to manage the area as a nature study area and wildlife preserve.

h. Climate Change – There is no dispute that climate change is bringing overall temperatures higher and also causing weather events to be more intense causing droughts, heavy rain events and changing the length of various seasons. Establishing new wildlife habitats will be subjected to these weather conditions and because of the adaptive management approach, adjustments will be made. The overall result of new habitats will require less water than the current agricultural use.

i. Baseline Ecosystem – The current management of cropping disrupts the natural functions of a natural ecosystem. Cropping turns over the soil and prevents the natural development of biota in the soil and the vegetation that exists on the soil surface. This also prevents the use of the crop area for most species of wildlife. Components of a natural ecosystem, such as hedgerows, will be retained and expanded. After establishment of habitats, almost all of the area will be allowed to develop natural functions that will increase the number and abundance of wildlife species.

j. Invasive Species Transition – Invasive plant species, such as Russian olive, Siberian elm, tumble weed, kochia, etc., provide very poor habitat for wildlife. In addition, they tend to take over areas excluding native species. Removing these species is essential to the creation of excellent habitat. To be successful, after removal of undesirable species, new plant species should be established quickly to prevent the non-native species from dominating the landscape again.

6. Parking

Some issues that were identified in public comments included where, number of spaces and the current asphalt pad. Parking possibilities include residential parking at the Nature Center, parking at the existing TNT on Rio Grande, the asphalt pad and Woodward House. During the many meetings of TAG, the group decided that the best location for parking was the TNT on Rio Grande Blvd. Limited parking can still occur at the Woodward House and the asphalt pad to the south. Parking at the Nature Center would require a long hike to the Woodward House. The issue with parking at the asphalt pad is the wildlife disturbance caused by parking and human use of the area. Through the planning process, it was identified that the asphalt should be removed to avoid toxins leaching into the soil. The number of spaces proposed, 30, was established and was thought to be enough to meet visitor demand at the TNT. Restrooms have also been proposed there. Some residents have concerns with the noise and human activity at a new parking area at the TNT. Open Space Division staff has offered to meet with local residents to discuss parking and other improvements at the TNT, and to develop a site plan that addresses the concerns expressed by residents.

7. Tree Nursery Tract on Rio Grande Blvd

The CABQ TNT is the area next to Rio Grande Boulevard and we propose that this area be developed into an inviting place to introduce appreciation of this wildlife preserve in the middle of Albuquerque. Many ancillary uses could be facilitated at the TNT, such as plant production, heritage farming, native seed production and collection, interpretive signage, and parking.

8. Recreation

Recreational opportunities will be provided for the public to interact with the preserve in unique ways – citizen science, restoration, monitoring populations of plants and animals. Wildlife viewing will continue on the perimeter outside of the current farm fields and several blinds with educational signage will be provided for this recreational activity. Guided walks will be led to provide viewing and education. Horses, bikes, and people walking dogs will continue to be allowed on the perimeter. However, these activities are disruptive to wildlife and will not be permitted on the preserve.

9. Funding/Costs/Staffing

The TAG has provided a list of possible funding sources in the Management Plan. Some of those sources support restoring habitats for a variety of reasons. A Friends Group will need to be formed and we anticipate public support to help make that happen.

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APPENDIX A.
POLICY FRAMEWORK AND PLANNING DOCUMENTS

Please see below for City Council Resolutions R-16-147 and R-17-159, as well as the accompanying CD for other policy framework and planning documents referenced in the RMP.

CITY of ALBUQUERQUE
TWENTY SECOND COUNCIL

COUNCIL BILL NO. R-16-147 ENACTMENT NO. _____

SPONSORED BY: Isaac Benton

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RESOLUTION

CONCERNING THE FUTURE MANAGEMENT OF CANDELARIA FARM PRESERVE AS A NATURE STUDY AREA AND WILDLIFE PRESERVE.

WHEREAS, Candelaria Farm Preserve (CFP) was purchased using funding to the State of New Mexico from the Land and Water Conservation Fund (LWCF) as part of the Bosque Open Space Land Acquisition Project in 1978; and

WHEREAS, the LWCF Purpose is to provide access to outdoor recreation resources by the public, which include opportunities for interpretive education; and

WHEREAS, LWCF rules apply to the entire property purchased with LWCF funds, even if such funds are not the only funds involved; and

WHEREAS, in September 1976 the City of Albuquerque (the City) and the State of New Mexico (the State) submitted a proposal to the LWCF for funding the purchase of "170 acres of bosque land adjacent to the Rio Grande River [sic] in Albuquerque's North Valley" for "Albuquerque Open Space Land Acquisition"; and

WHEREAS, the City/State proposal stated that the acquisition was important because: "The area planned to remain primarily natural with preservation of existing plant and animal life," and that "Purchase of this tract of land will insure [sic] a permanent open space adjacent to the river for nature study, recreation uses, open space, and urban shaping"; and

WHEREAS, in 1978, the CFP property was re-zoned from R-2 to SU-1: "Special Use for a Nature Study Center and Preserve," which reflected the intent of the City/State's proposal: that it be used for nature study, open space, and recreation while preserving existing plant and animal life; and

WHEREAS, in March 1978, the USDA Soil Conservation Service (now the Natural Resource Conservation Service) prepared a "Land Use and Treatment" plan for the City to manage the CFP for wildlife, referring to this as a "conservation" plan with the "primary objective" being: "to provide optimum wildlife habitat. This will be accomplished by seeding the existing cropland to species that will provide a good source of food"; and

WHEREAS, in 1979 the City developed a Master Plan for the "Rio Grande Nature Center and Preserve" (the "Predock plan") that proposed two primary uses for the land: 1) a nature study area, which became the Rio Grande Nature Center and would provide public access to the CFP; and 2) the balance of the property – the Preserve – that would "remain primarily natural with preservation of existing plant and animal life" with "a minimum of 100 acres of historical farmland" preserved as irrigated farmland "for raising of crops for forage and cover for wildfowl and other wildlife" with areas not cultivated "to remain in as undisturbed a state as possible"; and

WHEREAS, the Predock plan was never sent to the LWCF oversight agency for approval, such that there is no approved plan for the CFP; and

WHEREAS, the 1983 "Rio Grande Nature Center State Park and Preserve Management Plan", prepared by the State Parks and Recreation Division, maintained the distinction between a "nature study area", the Rio Grande Nature Center (RGNC), and the Preserve and included the RGNC (38.8 acres), 127.2 acres of remaining CFP lands, and 100 acres of Bosque lands leased from the MRGCD with the 266-acre site "managed for the overall goal of a nature center and wildlife preserve"; and

WHEREAS, notwithstanding the stated intent of managing the entire 266 acres as a wildlife preserve and nature center, the 1983 Management Plan devotes 98 acres to commercial agriculture and mentions for the first time that the goal of CFP is to "preserve" vanishing agricultural traditions; and

WHEREAS, in 2004, a new management plan was drafted for CFP: the "Open Space Resource Management Plan for the Candelaria Farm Preserve" (RMP), which is the current management document for the lands and which acknowledges that, "the farm is uniquely situated to create and protect habitat for birds and wildlife" and that CFP, "will be managed as a preserve in the

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strictest sense, whereby humans are only guests ... in order to provide the greatest possible protection to wildlife"; and

WHEREAS, neither the 1983 management plan nor the 2004 management plan were sent to the federal LWCF oversight agency for approval; and

WHEREAS, the RMP also states that it is focused on the "management issues regarding the integration of wildlife conservation with agricultural land use" and identifying "three obstacles to the efficient and productive operation of the farm" and concludes that running a commercial agricultural operation means that, "most of the property is operated as a farm, so target species and habitat types will need to be compatible with farming to some extent"; and

WHEREAS, the LWCF guidelines specifically prohibit agriculture as a primary activity on land purchased with LWCF funds, as follows from the Federal Financial Assistance Manual, Volume 69:

Chapter 3.B.5 – Acquisition involving compatible resource management practices. Acquisition of land upon which the project sponsor proposes natural resource management practices such as timber management and grazing, *not including agriculture*, may be carried out concurrently within the area if they are clearly described in the project proposal, are compatible with and secondary to the proposed outdoor recreation uses, and are approved by the NPS.

Chapter 3.C.6.e – Outdoor recreation and support facilities, such as demonstration farms and wildlife management and hunting areas, may be planned by the project sponsor in conjunction with agricultural activities, provided that the type and extent of the agricultural activity is limited to that necessary to support the outdoor recreation activity; and

WHEREAS, the LWCF Act states that, "No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses"; and

WHEREAS, in its proposal the City stated that it, "will maintain and operate this project in accord with acceptable standards as a public recreation facility for a 25-year period and beyond."

BE IT RESOLVED BY THE COUNCIL, THE GOVERNING BODY OF THE CITY OF ALBUQUERQUE:

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Section 1. The City of Albuquerque hereby reaffirms that the Candelaria Farm Preserve is to be managed as a nature study area and wildlife preserve providing access to outdoor recreational opportunities for all residents and visitors, as required by the LWCF Act; as intended by the 1976 proposal from the City and State for preserving the existing natural landscape and its plants and animals with a possible nature study area; as reaffirmed in the 1978 re-zoning as a Special Use Zone for a Nature Study Center and Preserve; as affirmed by the USDA "Land Treatment" plan for wildlife habitat conservation; and as affirmed by the 1979 Master Plan for the Rio Grande Nature Center and Preserve.

Section 2. The City of Albuquerque directs the Open Space Division (OSD) and Parks and Recreation Department (PRD) to immediately begin the process of creating a new Resource Management Plan (RMP) for Candelaria Farm Preserve. The RMP shall utilize as its basis and shall not reinvent, but rather clarify and update the conclusions and goals of previous plans, in particular the 1979 Predock plan. A draft RMP shall be submitted to the PRD Director, the Open Space Advisory Board, and the City Council for review that will include conformance to LWCF rules, consistency with City policy, fulfillment of the City's fiduciary duties, and inclusion of relevant surveys and cost estimates.

Section 3. To develop a new RMP, OSD and PRD shall immediately convene a Technical Advisory Group composed of:

a. Staff from Open Space Division and Parks and Recreation.
b. A representative from the Open Space Advisory Board.
c. Technical experts from Bosque del Apache NWR and Valle de Oro NWR and elsewhere in the Fish and Wildlife Service as appropriate.
d. Technical experts from the USDA Natural Resource Conservation Service.
e. The State Parks LWCF liaison and staff from the Rio Grande Nature Center State Park.
f. Staff from the Middle Rio Grande Conservancy District.
g. Other technical experts on wildlife habitat and farming for wildlife forage and cover crops.

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h. Two representatives of the North Valley Coalition.

i. Other experts as deemed necessary for the task.

Section 4. In accord with the requirements of the LWCF Act and commitments made by the City in requesting and accepting LWCF funding for acquisition of Candelaria Farm Preserve, the Technical Advisory Group shall work with all interested parties to determine the funding necessary to return the CFP lands to wildlife croplands and natural areas and work collaboratively to secure the on-going funding to maintain CFP as a wildlife preserve and nature study area.

Section 5. To prevent degradation of the property and maintain wildlife habitat, the City may lease CFP for agricultural activity during the RMP process; however, organic farming practices shall be encouraged, use of pesticides shall be prohibited and use of herbicides shall be minimized.

Section 6. NO INTERFERENCE. Nothing in this resolution is intended to limit or interfere with projects intended for the repair, maintenance or upkeep of the CFP.

Section 7. SEVERABILITY. If any section, paragraph, sentence, clause, word, or phrase of this resolution is for any reason held to be invalid or unenforceable by any court of competent jurisdiction, such decision shall not affect the validity of the remaining provisions of this resolution. The Council hereby declares that it would have passed this resolution and each section, paragraph, sentence, clause, word or phrase irrespective of any provisions being declared unconstitutional or otherwise invalid.

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CITY of ALBUQUERQUE
TWENTY SECOND COUNCIL

COUNCIL BILL NO. R-17-159 ENACTMENT NO. _____

SPONSORED BY: Isaac Benton

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RESOLUTION

AMENDING RESOLUTION R-16-147, CONCERNING THE FUTURE MANAGEMENT OF CANDELARIA FARM PRESERVE AS A NATURE STUDY AREA AND WILDLIFE PRESERVE, TO CLARIFY RESPONSIBILITIES FOR THE PROCESS OF CREATING A RESOURCE MANAGEMENT PLAN

WHEREAS, Resolution No. R-16-147 (Enactment No. R-2017-001) was approved by the City Council on January 4, 2017; and

WHEREAS, Resolution No. R-16-147 directed the Open Space Division (OSD) and the Parks and Recreation Department (PRD) to immediately begin the process of creating a new Resource Management Plan (RMP) for the Candelaria Farm Preserve and convene a Technical Advisory Group to accomplish this task; and

WHEREAS, more clarification is needed as to who will lead and have oversight of the RMP Technical Advisory Group.

BE IT RESOLVED BY THE COUNCIL, THE GOVERNING BODY OF THE CITY OF ALBUQUERQUE:

SECTION 1. That Section 2 of Resolution R-16-147 is amended as follows: "The City of Albuquerque directs the Open Space Division (OSD) and the Parks and Recreation Department (PRD) to immediately begin the process of creating a new Resource Management Plan (RMP) for Candelaria Farm Preserve. [The Open Space Advisory Board shall have oversight of this process and will work collaboratively with OSD and PRD to complete the RMP]. The RMP shall utilize as its basis and shall not reinvent, but rather clarify and update the conclusions and goals of previous plans, in particular the 1979 Predock plan. A draft RMP shall be submitted to the PRD Director, the Open Space Advisory Board, and the City Council for review that will

include conformance to LWCF rules, consistency with City policy, fulfillment of the City's fiduciary duties, and inclusion of relevant surveys and cost estimates."

SECTION 2. That Section 3 of Resolution R-16-147 is amended as follows:

"To develop a new RMP, [~~OSD and PRD~~] [the Open Space Advisory Board] shall [name a lead and alternate lead for the] [~~immediately convene a~~] Technical Advisory Group[, who shall immediately convene the group] composed of:

a. Staff from Open Space Division and Parks and Recreation.
b. A representative from the Open Space Advisory Board.
c. Technical experts from Bosque del Apache NWR and Valle de Oro NWR and elsewhere in the Fish and Wildlife Service as appropriate.
d. Technical experts from the USDA Natural Resource Conservation Service.
e. The State Parks LWCF liaison and staff from the Rio Grande Nature Center State Park.
f. Staff from the Middle Rio Grande Conservancy District.
g. Other technical experts on wildlife habitat and farming for wildlife forage and cover crops.
h. Two representatives of the North Valley Coalition.
i. Other experts as deemed necessary for the task.

[A final list of the Technical Advisory Group members shall be submitted to the Open Space Advisory Board, OSD, PRD and the City Council. The Technical Advisory Group shall submit a status report on the development of the Resource Management Plan to the City Council upon request.]"

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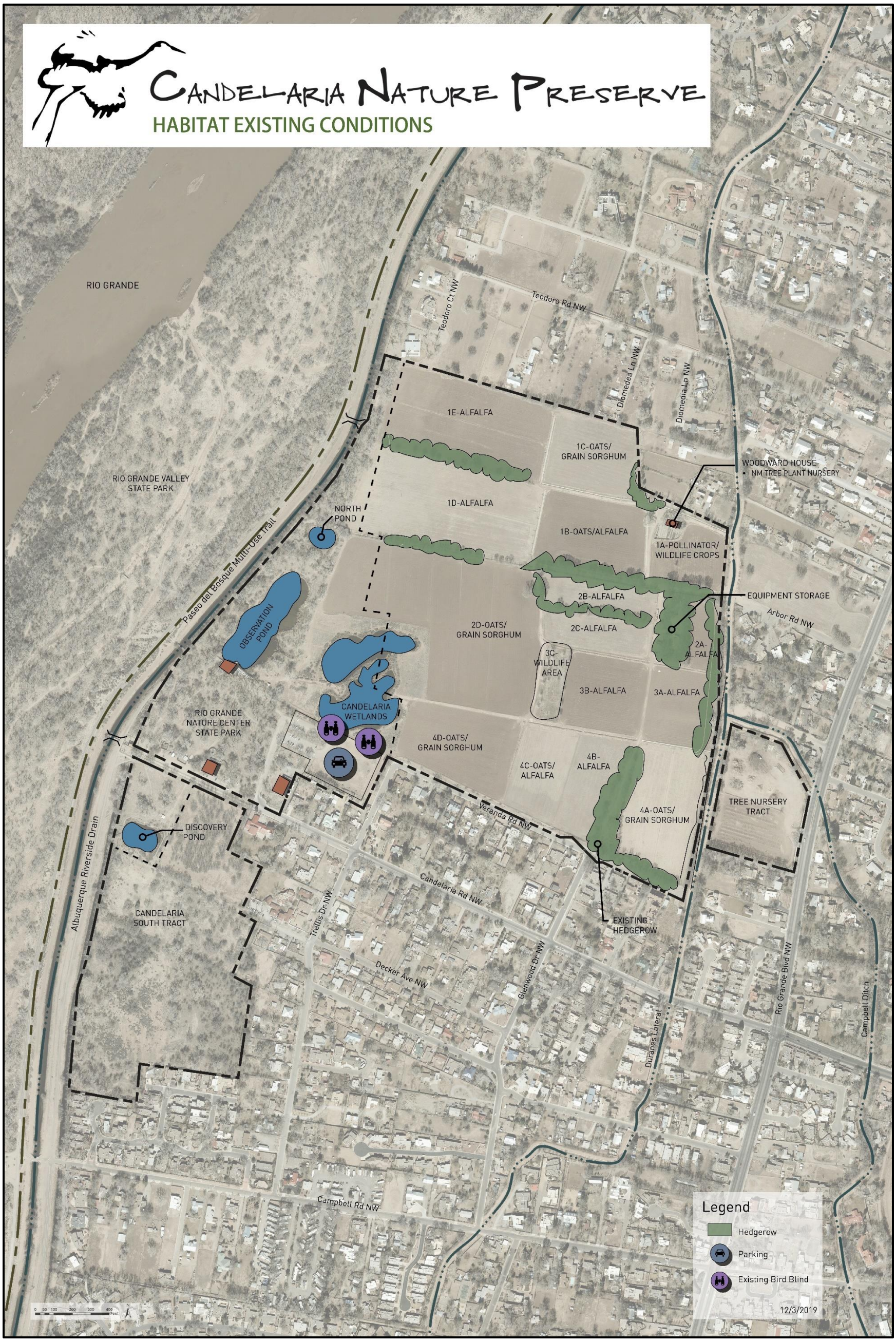
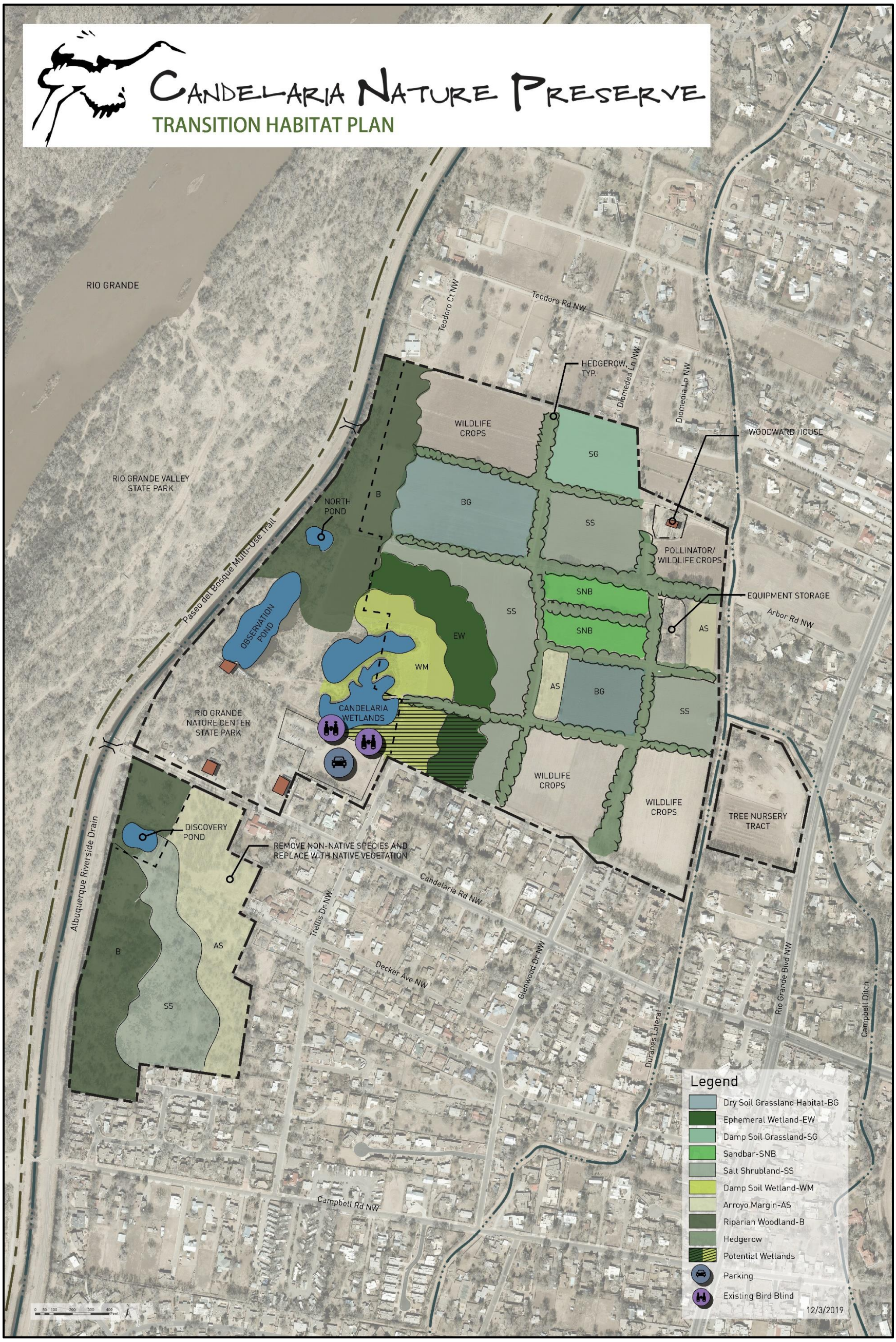
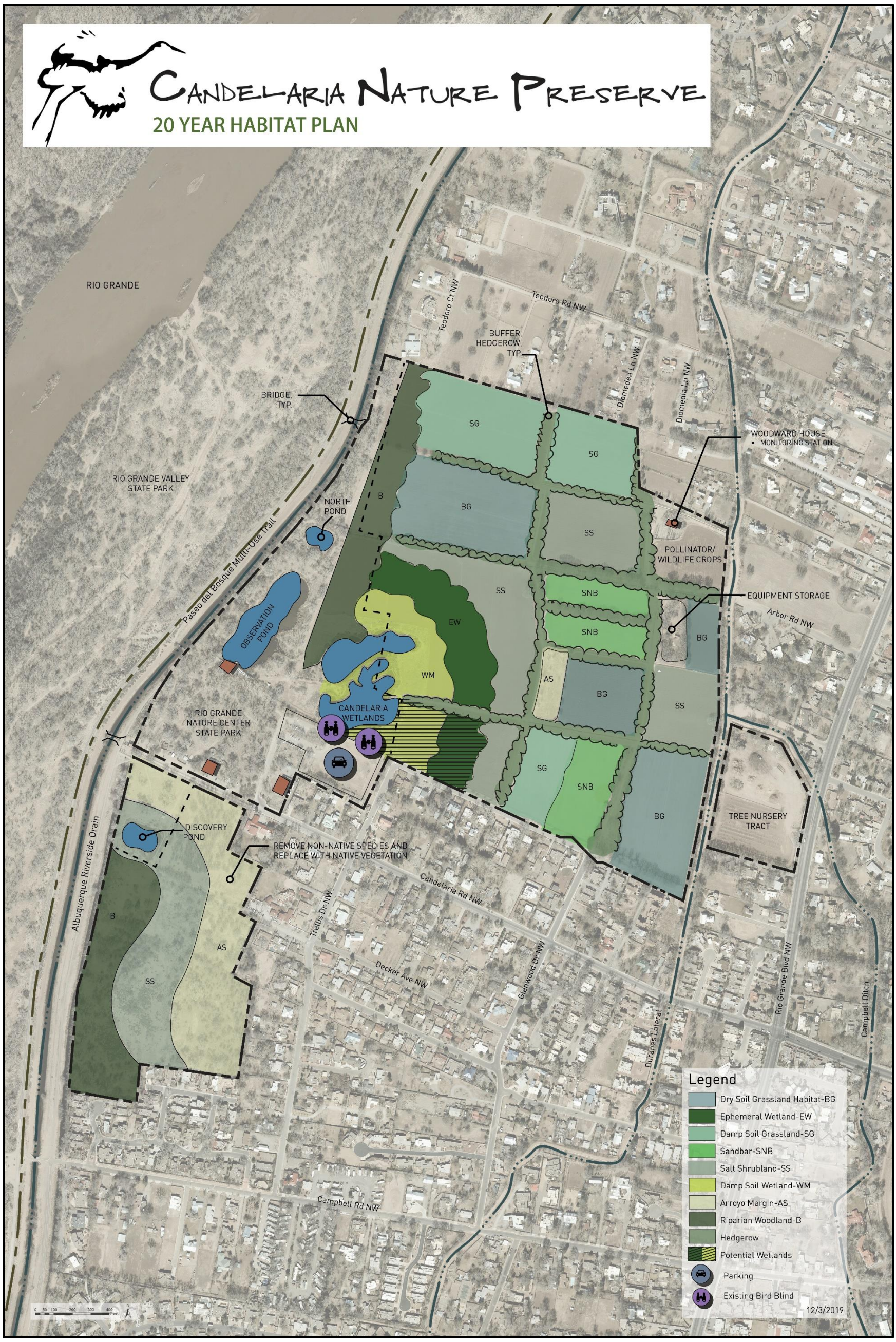
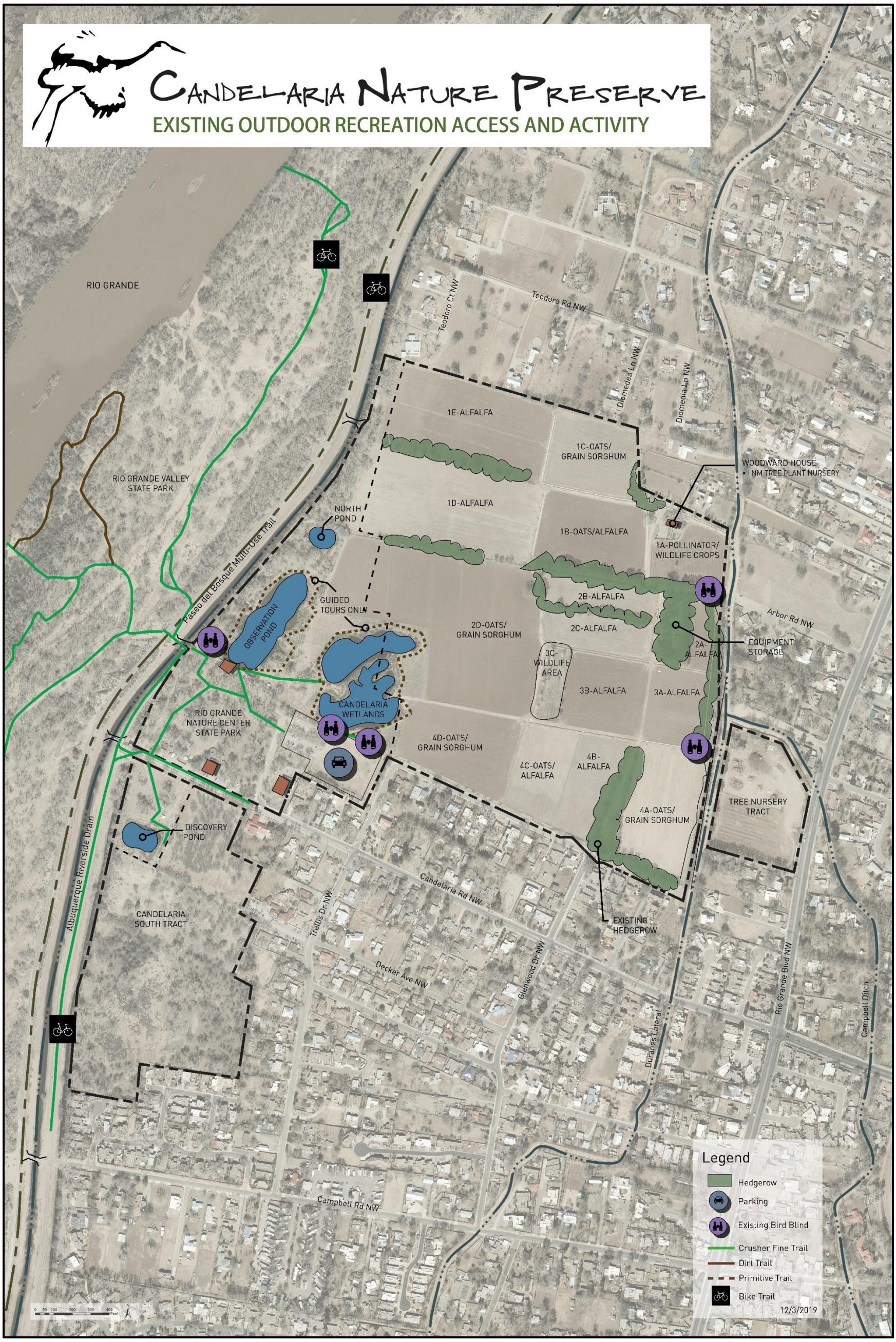
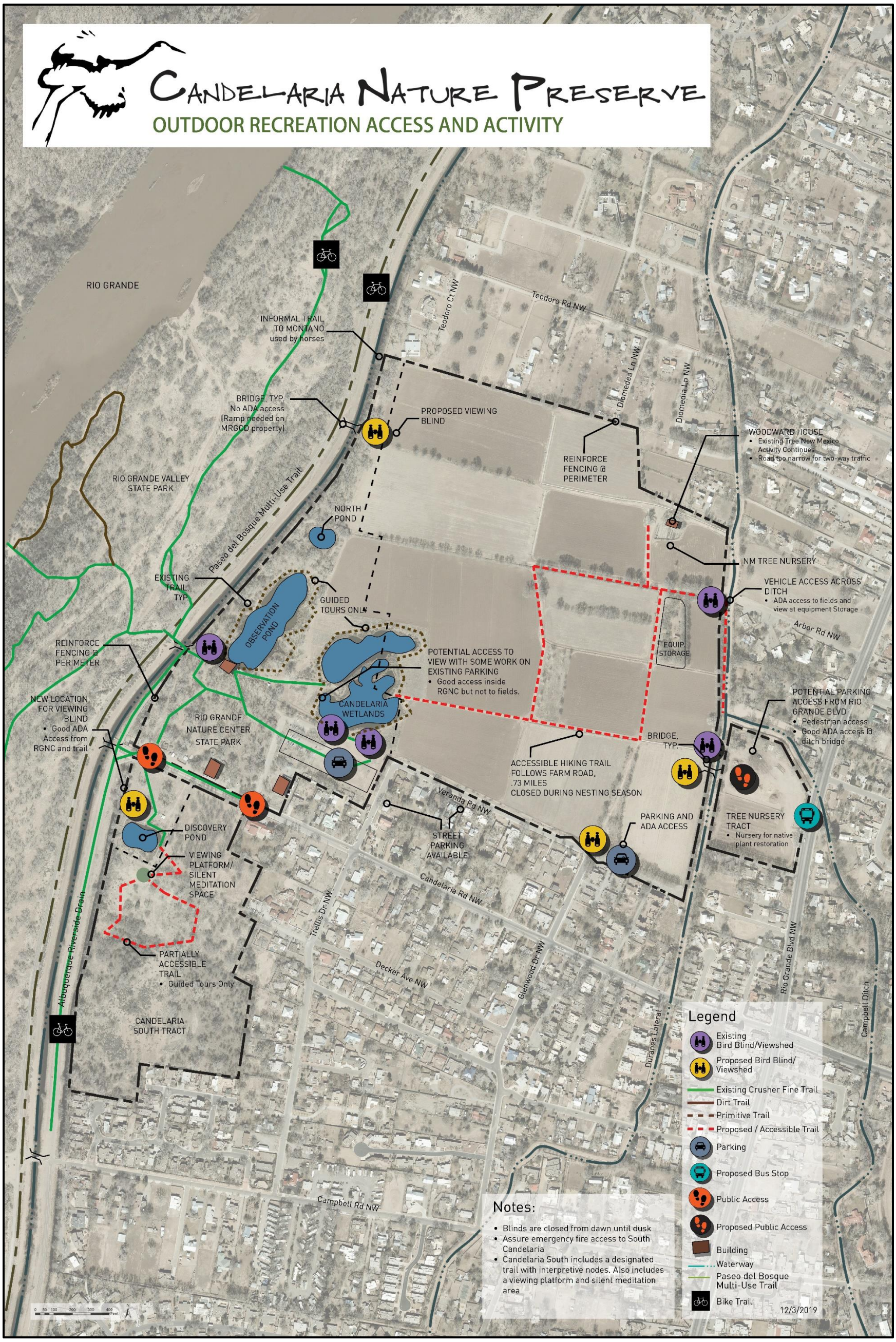
APPENDIX B.
CANDELARIA NATURE PRESERVE RESOURCE MANAGEMENT PLAN MAPS


CANDELARIA NATURE PRESERVE
HABITAT EXISTING CONDITIONS
RIO GRANDE
RIO GRANDE VALLEY STATE PARK
Paseo del Bosque Multi-Use Trail
NORTH POND
OBSERVATION POND
CANDELARIA WETLANDS
RIO GRANDE NATURE CENTER STATE PARK
DISCOVERY POND
CANDELARIA SOUTH TRACT
Albuquerque Riverside Drain
Teodoro Ct NW
Teodoro Rd NW
Diomedea Ln NW
1E-ALFALFA
1C-OATS/ GRAIN SORGHUM
1D-ALFALFA
1B-OATS/ALFALFA
1A-POLLINATOR/ WILDLIFE CROPS
WOODWARD HOUSE
NM TREE PLANT NURSERY
EQUIPMENT STORAGE
Arbor Rd NW
2B-ALFALFA
2C-ALFALFA
2D-OATS/ GRAIN SORGHUM
2A-ALFALFA
3C-WILDLIFE AREA
3B-ALFALFA
3A-ALFALFA
4D-OATS/ GRAIN SORGHUM
4C-OATS/ ALFALFA
4B-ALFALFA
4A-OATS/ GRAIN SORGHUM
TREE NURSERY TRACT
Veranda Rd NW
Candelaria Rd NW
EXISTING HEDGEROW
Trellis Dr NW
Decker Ave NW
Glenwood Dr NW
Durranes Lateral
Rio Grande Blvd NW
Campbell Ditch
Campbell Rd NW
Legend
Hedgerow
Parking
Existing Bird Blind
12/3/2019


CANDELARIA NATURE PRESERVE
TRANSITION HABITAT PLAN
RIO GRANDE
RIO GRANDE VALLEY STATE PARK
Paseo del Bosque Multi-Use Trail
Albuquerque Riverside Drain
Teodoro Ct NW
Teodoro Rd NW
Diomedea Ln NW
HEDGEROW, TYP.
WOODWARD HOUSE
WILDLIFE CROPS
SG
BG
SS
NORTH POND
B
POLLINATOR/ WILDLIFE CROPS
SNB
EQUIPMENT STORAGE
Arbor Rd NW
AS
OBSERVATION POND
EW
WM
CANDELARIA WETLANDS
RIO GRANDE NATURE CENTER STATE PARK
TREE NURSERY TRACT
DISCOVERY POND
REMOVE NON-NATIVE SPECIES AND REPLACE WITH NATIVE VEGETATION
Candelaria Rd NW
Trellis Dr NW
Decker Ave NW
Glenwood Dr NW
Durranes Lateral
Rio Grande Blvd NW
Campbell Ditch
Campbell Rd NW
Legend
Dry Soil Grassland Habitat-BG
Ephemeral Wetland-EW
Damp Soil Grassland-SG
Sandbar-SNB
Salt Shrubland-SS
Damp Soil Wetland-WM
Arroyo Margin-AS
Riparian Woodland-B
Hedgerow
Potential Wetlands
Parking
Existing Bird Blind
12/3/2019


CANDELARIA NATURE PRESERVE
20 YEAR HABITAT PLAN
RIO GRANDE
RIO GRANDE VALLEY STATE PARK
Paseo del Bosque Multi-Use Trail
BRIDGE, TYP.
NORTH POND
OBSERVATION POND
RIO GRANDE NATURE CENTER STATE PARK
CANDELARIA WETLANDS
DISCOVERY POND
REMOVE NON-NATIVE SPECIES AND REPLACE WITH NATIVE VEGETATION
Albuquerque Riverside Drain
Teodoro Ct NW
Teodoro Rd NW
BUFFER, HEDGEROW, TYP.
Diomedea Ln NW
WOODWARD HOUSE
• MONITORING STATION
POLLINATOR/ WILDLIFE CROPS
EQUIPMENT STORAGE
Arbor Rd NW
TREE NURSERY TRACT
Candelaria Rd NW
Trellis Dr NW
Decker Ave NW
Glenwood Dr NW
Durranes Lateral
Rio Grande Blvd NW
Campbell Ditch
Campbell Rd NW
SG
BG
SS
SNB
EW
WM
AS
B
Legend
Dry Soil Grassland Habitat-BG
Ephemeral Wetland-EW
Damp Soil Grassland-SG
Sandbar-SNB
Salt Shrubland-SS
Damp Soil Wetland-WM
Arroyo Margin-AS
Riparian Woodland-B
Hedgerow
Potential Wetlands
Parking
Existing Bird Blind
12/3/2019


CANDELARIA NATURE PRESERVE
EXISTING OUTDOOR RECREATION ACCESS AND ACTIVITY
RIO GRANDE
RIO GRANDE VALLEY STATE PARK
Paseo del Bosque Multi-Use Trail
Albuquerque Riverside Drain
Teodoro Ct NW
Teodoro Rd NW
Diomedea Ln NW
Arbor Rd NW
Candelaria Rd NW
Trellis Dr NW
Decker Ave NW
Glenwood Dr NW
Durranes Lateral
Rio Grande Blvd NW
Campbell Ditch
Campbell Rd NW
1E-ALFALFA
1C-OATS/ GRAIN SORGHUM
1D-ALFALFA
1B-OATS/ALFALFA
1A-POLLINATOR/ WILDLIFE CROPS
2B-ALFALFA
2C-ALFALFA
2D-OATS/ GRAIN SORGHUM
2A-ALFALFA
3C-WILDLIFE AREA
3B-ALFALFA
3A-ALFALFA
4D-OATS/ GRAIN SORGHUM
4C-OATS/ ALFALFA
4B-ALFALFA
4A-OATS/ GRAIN SORGHUM
WOODWARD HOUSE
• NM TREE PLANT NURSERY
NORTH POND
GUIDED TOURS ONLY
OBSERVATION POND
CANDELARIA WETLANDS
RIO GRANDE NATURE CENTER STATE PARK
DISCOVERY POND
CANDELARIA SOUTH TRACT
EQUIPMENT STORAGE
TREE NURSERY TRACT
EXISTING HEDGEROW
Legend
Hedgerow
Parking
Existing Bird Blind
Crusher Fine Trail
Dirt Trail
Primitive Trail
Bike Trail
12/3/2019


CANDELARIA NATURE PRESERVE
OUTDOOR RECREATION ACCESS AND ACTIVITY
RIO GRANDE
INFORMAL TRAIL TO MONTANO used by horses
BRIDGE, TYP. No ADA access (Ramp needed on MRGCD property)
PROPOSED VIEWING BLIND
Teodoro Ct NW
Teodoro Rd NW
Diomedea Ln NW
Diomedea Ln NW
REINFORCE FENCING @ PERIMETER
WOODWARD HOUSE
• Existing Tree New Mexico Activity Continues
• Road too narrow for two-way traffic
RIO GRANDE VALLEY STATE PARK
Paseo del Bosque Multi-Use Trail
NORTH POND
NM TREE NURSERY
EXISTING TRAIL, TYP.
OBSERVATION POND
GUIDED TOURS ONLY
VEHICLE ACCESS ACROSS DITCH
• ADA access to fields and view at equipment Storage
Arbor Rd NW
EQUIP. STORAGE
REINFORCE FENCING @ PERIMETER
POTENTIAL ACCESS TO VIEW WITH SOME WORK ON EXISTING PARKING
• Good access inside RGNC but not to fields.
CANDELARIA WETLANDS
NEW LOCATION FOR VIEWING BLIND
• Good ADA Access from RGNC and trail
RIO GRANDE NATURE CENTER STATE PARK
POTENTIAL PARKING ACCESS FROM RIO GRANDE BLVD
• Pedestrian access
• Good ADA access @ ditch bridge
BRIDGE, TYP.
ACCESSIBLE HIKING TRAIL FOLLOWS FARM ROAD, .73 MILES CLOSED DURING NESTING SEASON
Veranda Rd NW
PARKING AND ADA ACCESS
TREE NURSERY TRACT
• Nursery for native plant restoration
DISCOVERY POND
STREET PARKING AVAILABLE
VIEWING PLATFORM/ SILENT MEDITATION SPACE
Candelaria Rd NW
Trellis Dr NW
Albuquerque Riverside Drain
PARTIALLY ACCESSIBLE TRAIL
• Guided Tours Only
Decker Ave NW
Glenwood Dr NW
Rio Grande Blvd NW
Campbell Ditch
CANDELARIA SOUTH TRACT
Duranes Lateral
Legend
Existing Bird Blind/Viewshed
Proposed Bird Blind/ Viewshed
Existing Crusher Fine Trail
Dirt Trail
Primitive Trail
Proposed / Accessible Trail
Parking
Proposed Bus Stop
Public Access
Proposed Public Access
Building
Waterway
Paseo del Bosque Multi-Use Trail
Bike Trail
12/3/2019
Notes:
• Blinds are closed from dawn until dusk
• Assure emergency fire access to South Candelaria
• Candelaria South includes a designated trail with interpretive nodes. Also includes a viewing platform and silent meditation area
Campbell Rd NW

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APPENDIX C.
SOIL DESCRIPTIONS AND CHARACTERISTICS

Please see the accompanying CD.

APPENDIX D.
PUBLIC PLANNING PROCESS

Please see the accompanying CD.