Bear Canyon Open Space
Visitor Use Plan

City of Albuquerque
Parks & Recreation Department
Open Space Division
March 2021 Draft

ACKNOWLEDGEMENTS

City of Albuquerque

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Volunteers

Volunteers are the backbone of stewarding Albuquerque-owned Open Space. The Open Space Division would like to acknowledge and thank those who give their work and time to preserving and maintaining their public lands.

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1. Introduction

The City of Albuquerque Open Space Division (OSD) manages nearly 30,000 acres of public lands in and around Albuquerque "to retain their natural character to benefit people throughout the metropolitan area by conserving resources related to the natural environment, providing opportunities for outdoor education and recreation, or defining the boundaries of the urban environment" (*City of Albuquerque Major Public Open Space Facility Plan*, 1999).

A significant area of Major Public Open Space (MPOS) is the Sandia Foothills, which help define much of the eastern urban boundary of Albuquerque, and include various trails, trailheads, and canyons draining runoff from the Sandia Mountains. The Bear Canyon Arroyo serves as one of these drainages and is owned and managed by various departments within the City of Albuquerque (COA) as well as the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). The OSD manages the natural habitat and recreational aspects of a portion of the Bear Canyon Arroyo known as Bear Canyon Open Space (BCOS).

Purpose

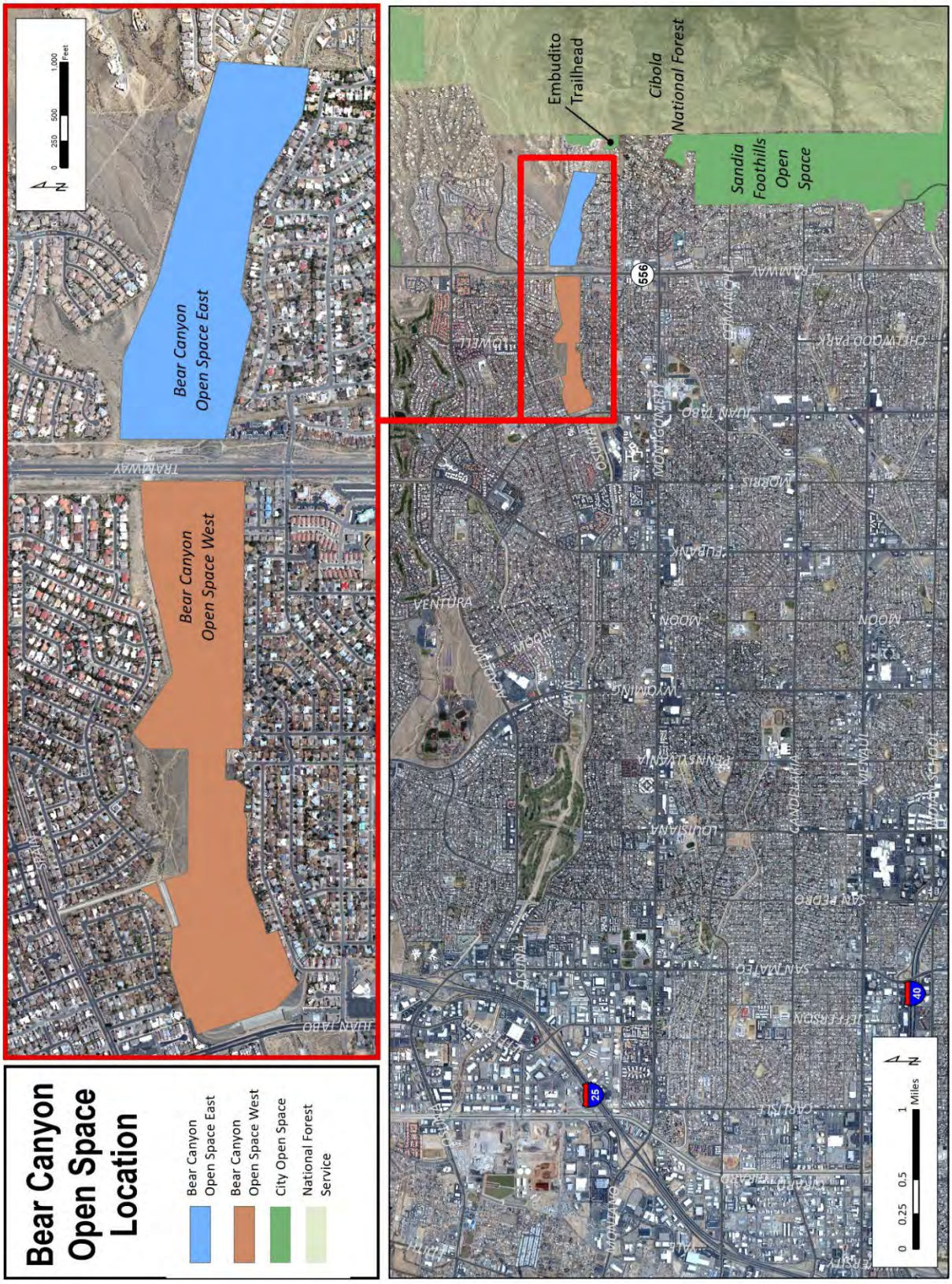
The purpose of this plan is to create a guiding framework for the management of visitor use within the section of Bear Canyon Arroyo managed for recreation by the OSD. The unique natural features and human use of the area create both challenges and great potential for a natural escape for both urban dwellers and wildlife. An approach that balances the needs of wildlife, the natural environment, and all users and neighbors of the space, is inherent to a successful management strategy.

Location

The Bear Canyon Arroyo and Embudito Canyon drain west from the Sandia Mountains managed by the United States Forest Service (USFS) Cibola National Forest and through High Desert Residential Owners Association (HDR) private open space before joining in BCOS. The Bear Canyon Arroyo then continues through the City of Albuquerque's Northeast Heights, and empties into the North Diversion Channel and eventually the Rio Grande. The OSD owns and manages for recreation much of the easternmost section of the Bear Canyon Arroyo, approximately 170 acres stretching from the High Desert open space west to the John B. Robert Dam at Juan Tabo Boulevard, and generally situated between Manitoba Drive to the south and Spain Road to the north.

Tramway Boulevard bisects BCOS north to south near its center and serves as a convenient geographic separation. For the purposes of this plan, Bear Canyon West (BCW) refers to Bear

Canyon managed by the OSD between Juan Tabo Boulevard and Tramway, and Bear Canyon East (BCE) to the land managed by the OSD between Tramway and the private open space.



Policy Framework

The Albuquerque Metropolitan Arroyo Flood Control Authority Resolution No. 1980-15 Drainage Policy (1980). This policy regulates the construction, design and alteration of AMAFCA facilities, which include the Bear Canyon Arroyo and Embudito Channel running through much of BCOS, and the John B. Robert Dam and drainage basin marking its western-most boundary.

Facility Plan For Arroyos (1986). The Bear Canyon Arroyo is identified in the Rank II *Facility Plan For Arroyos* as a high priority Urban Recreational Corridor due to its location in a populous residential area and its now well-realized potential to connect multiple transportation and recreation corridors and destinations. Because of the presence of the arroyo, BCOS's primary function is to facilitate drainage, with recreation addressed within the confines of drainage-related easements, structures, and other necessary erosion control efforts.

Bear Canyon Arroyo Resource Management Plan (1991). The Bear Canyon Arroyo Resource Management Plan (RMP), a Rank III plan adopted by City Council, provided policies and regulations for the development of the entire arroyo and its tributaries from the Sandia Mountains west to its terminus at the North Diversion Channel. While this plan was superseded by the *Albuquerque/Bernalillo County Comprehensive Plan* and *Integrated Development Ordinance* adopted in 2017 and 2018 respectively, it still provides an important baseline and historical reference for this Visitor Use Plan. This RMP was comprehensive to the entire arroyo and its tributaries, but made specific mention of Major Public Open Space arroyo policies.

City of Albuquerque Major Public Open Space Facility Plan (1998). The mission of the Open Space Division is "to acquire, protect, manage, and maintain the significant natural landscapes and cultural resources while providing low impact recreation for current and future generations." The Rank II *Major Public Open Space Facility Plan* was developed with that mission in mind, and contains a general overview and management strategies for the unique types and areas of MPOS.

Bear Canyon Open Space lies within an arroyo, but due to its location is also included in Sandia Foothills area policies and management as protected, undeveloped open space with no developed facilities. According to the *MPOS Facility Plan*, "Protected, Undeveloped Open Space [is a] significant undeveloped or conserved area with outstanding natural features or scenic qualities suitable for low impact recreational activities with no substantial facilities or improvements." Policy A.1.C. states:

> *This type of Major Public Open Space shall be protected from excessive public use and shall be conserved for its unique features, natural resources and overall visual*

significance. Trails can be paved or unpaved, however, alignments should be part of a resource management plan, master development plan or site plan. Protection of these areas should include fencing, signage, natural barriers, controlled use, and patrol by rangers.

As an arroyo and linear corridor, a major recreation and transportation function identified by the *MPOS Facility Plan* is to provide non-vehicular, multi-use trail links to other trails, facilities, and activities.

Bikeways and Trails Facility Plan (2015). This Rank II plan proposes projects, corridors, and programs intended to connect and improve non-motorized transportation and recreation corridors and facilities across Albuquerque.

Albuquerque/Bernalillo County Comprehensive Plan (2017). The Albuquerque/Bernalillo County Comprehensive Plan identifies goals and policies relevant to Bear Canyon Open Space, including providing low-impact recreational and educational opportunities, managing sensitive lands to protect natural resources, connecting trails to the larger multi-modal system to encourage the use of alternative types of transportation, and utilizing arroyos for recreation without impeding their primary drainage function.

2. Existing Conditions

BCOS consists of a generally undeveloped natural landscape, with the exception of human-made arroyo drainage and erosion control features. Basic components typical of protected, undeveloped MPOS that are present here include primitive multi-use trails, boundary fencing, multiple public access points, signage, and natural vegetation.

There are no developed parking areas provided by the City with the exception of the Embudito Trailhead, located east of and accessible through the adjacent private open space. There are no restroom facilities or fee areas, and therefore no need for permanent staff presence. The City provides trash receptacles and mutt mitt stations at several entrances. There is also one mutt mitt station and receptacle for pet waste in BCE, which are both serviced by neighborhood volunteers.

Public Use

The trail network in BCOS is open to various types of low-impact recreation including hiking, mountain biking, and horseback riding. Additional activities include bird watching, yoga, geocaching, and track events, although participants in all of these activities are required to stay on official trails and in some instances obtain special use permits.

Certain activities are prohibited in all MPOS in order to protect resources and the user experience. These activities include but are not limited to amplified noise, dogs off leash, off-trail gatherings, business activities, camping, hunting, alterations, and resource removal. Motorized vehicles are also prohibited per Open Space policy. Neighbors report that, while not common, unauthorized motor vehicles including dirt bikes do enter BCOS through breaks in the fence line. When this occurs and the incident is reported to the OSD, staff will either repair the unofficial access or work with the owner of the fence to do so. In addition the Open Space Unit of the Albuquerque Police Department monitors this and other Open Space properties.

Trails

There are approximately eight miles of official trail in Bear Canyon Open Space consisting of arterial connections to official access points and other destinations that don't overly burden vegetation and wildlife habitat. These include primitive multi-use trails and unpaved maintenance roads, as well as drainages managed by the Hydrology section of the COA's Department of Municipal Development (DMD) and AMAFCA. As drainages in Bear Canyon Open Space are soft channels allowed to remain in a natural state, they may meander and cause erosion to other trails; this results in the need for ongoing trail monitoring and maintenance, and potentially trail relocation. Maintenance roads necessary for both City and AMAFCA access

are included in the trail network. The drainage below Tramway allows wildlife and trail users to access the Open Space on either side of Tramway Boulevard, or leave the arroyo to travel on the multi-use path running north and south along Tramway.

While the OSD strives to design and construct sustainable trails according to national standards, segments of these official trails may require maintenance and potentially relocation if they are too incised or eroded or impair user experience. This includes trails adjacent to arroyo flows in danger of eroding into the drainage, trails in low-lying areas with little slope and contour where water tends to pool, or simply trails that developed in unfavorable locations.

A network of unofficial user-created trails is also prevalent and a concern due to resulting decreased vegetation, increased erosion, and wildlife habitat disturbance. User trails include shortcuts between official trails, trails that OSD closed due to erosion issues but have been reopened by users, and trails connecting entry points from adjacent private properties to main trails. A number of these are unsustainable and have erosion, pooling, and rutting issues because they were not intentionally designed to follow critical slope and construction guidelines. Many are also redundant and do not enhance the circulation of the overall trail system and are therefore unnecessary breaks in vegetation and habitat.

Access Points and Parking

The majority of BCOS is separated from adjacent uses by roadways, drainage facilities, and fencing or gates maintained primarily by private residents and the HDR. There are 16 official access points. Official access points include maintenance road entrances, trail connections to private open space areas and the street network, and some drainage features that users are able to access. Note that several official access points are privately owned and maintained trailheads. The three primary access points to BCOS are:

- Juan Tabo (the unpaved lot between Juan Tabo and the John B. Robert Dam is regulated and managed by AMAFCA, but OSD is responsible for coordinating trailhead signage);
- Tramway, which offers no official parking but is accessible by sidewalk, bike trail, and public transit;
- and the Embudito Trailhead, via trail links through private open space, which provides space for forty-three vehicles and also offers trail connections to the Sandia Foothills Open Space and Cibola National Forest. An automatic gate was recently installed at the Embudito Trailhead, which opens and closes according to open hours; this is intended to help improve safety and prevent unauthorized access during closed hours, primarily after dark.

The OSD will prioritize these three access points for maintenance (where applicable) and user information, although Tramway access will have more limited signage than the other two. Users also access BCOS through secondary entries that are through neighborhoods and do not offer parking dedicated to BCOS access. OSD will maintain these access points if possible, but those that are on private open space or drainage are not under OSD jurisdiction.

The private open space adjacent to BCE owned and managed by the HDR has an additional privately owned and operated parking lot at the Michial Emery Trailhead; BCOS is accessible via trail connections through the private open space. The final secondary/neighborhood parking options not maintained by the OSD offer a limited number of on-street spaces and are located at the end of both Vista Lejana and Vista Bonita NE. There are an additional ten public access points at various locations around BCOS that do not offer parking. The OSD does not direct visitors from outside the neighborhood to use these secondary access points. Official access points are signed with general information on BCOS, as well as rules and regulations for using City Open Space. Primary trailheads managed by OSD like at Embudito Canyon have more elaborate signage, trash cans, a map, and a mutt mitt station.

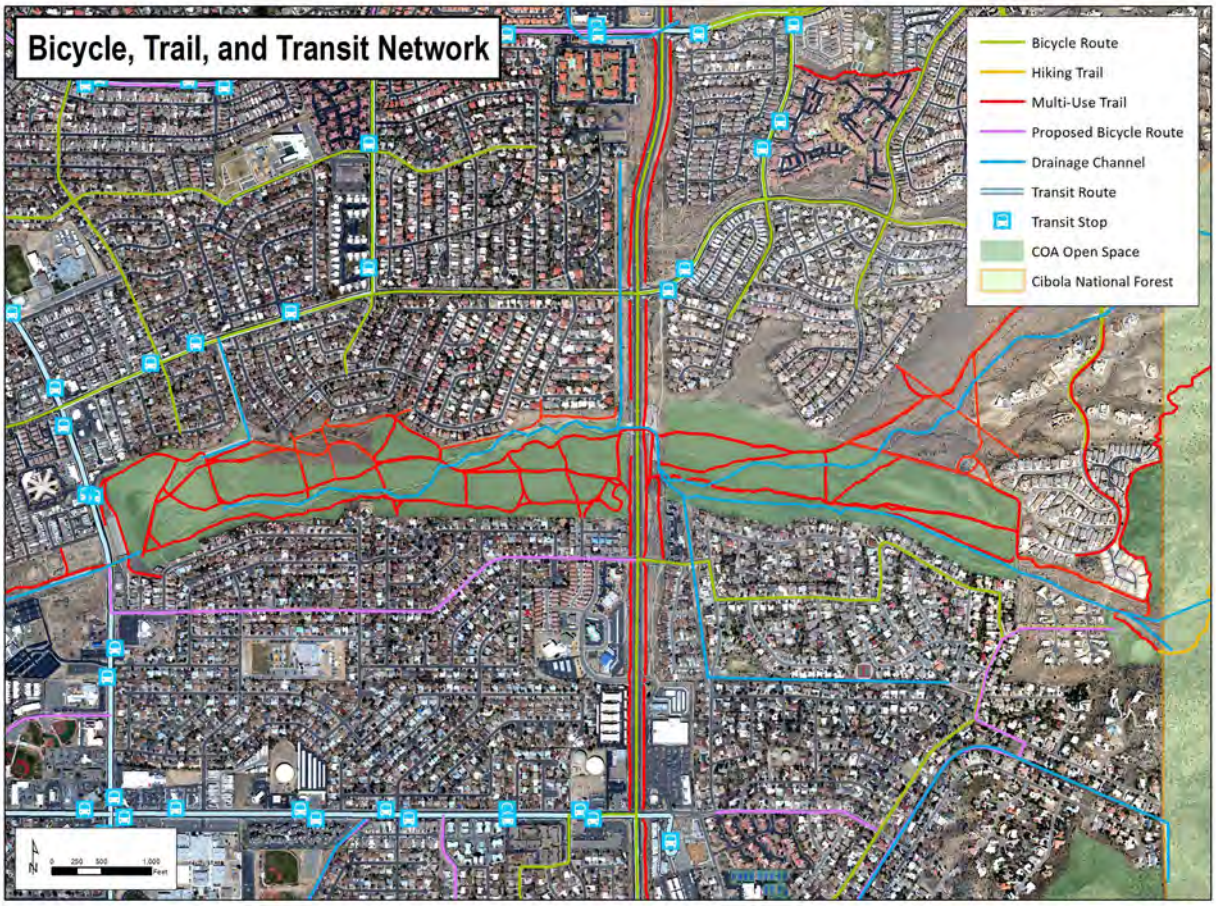
Trailhead signage at Embudito Canyon trailhead

Unofficial access points consist primarily of gates opening directly into Bear Canyon Open Space from adjacent private properties. Some of these gates are associated with various forms and levels of encroachment onto the Open Space that exacerbate disturbance including stairways, landscaping, flagstone paths, composting areas, lawn chairs, debris and yard waste, and unofficial trails.

Connections to the Existing Transportation Network

The *Major Public Open Space Facility Plan*, the *Facility Plan for Arroyos*, and the *Bikeways and Trails Facility Plan* all identify the development of a comprehensive transportation and recreation network as a major collective goal of the City of Albuquerque. Bear Canyon Open

Space trails meet this goal by providing non-motorized connections with other transportation and recreation corridors and facilities including Cibola National Forest; private HDR open space; sidewalks and bicycle routes on the road network, including an important arterial multi-use path on Tramway Boulevard; and public transit stops. The closest public transportation stop is on Juan Tabo Boulevard just north of the John Roberts Dam access point; there is another stop at Tramway and Spain approximately ¼ mile north, connected to BCOS via the multi-use path on Tramway Boulevard. See below for a map illustrating these connections.



Environmental Characteristics and Natural Resources

The primary natural feature of Bear Canyon Open Space is the arroyo that provides drainage from the foothills of the Sandia Mountains and adjacent development west to the North Diversion Channel, which eventually empties into the Rio Grande running south through the center of the City of Albuquerque. Albuquerque's weather patterns include months of drought conditions interrupted by a season of heavy summer monsoons. These monsoons produce significant and potentially destructive bursts of water flow and potential flooding that both create and make necessary urban arroyos. Arroyos provide an avenue for that water to reach

its eventual local destination, the Rio Grande, that allows for as minimal property damage as possible. Trail erosion during these storm events necessitates ongoing monitoring and maintenance.

Much of the Bear Canyon Arroyo to the west of BCOS is closely surrounded by residential and commercial development and channelized through a narrow hard-surface corridor and human-made flood control structures. However, Bear Canyon Open Space is considerably wider and undeveloped, and therefore more conducive to a natural arroyo with adjacent, primitive, multi-use trails that encompass an array of vegetation and wildlife habitat. Much of this section of the arroyo is not channelized, with the exception of some concrete or wire-enclosed riprap structures constructed to direct the flow of the Bear Canyon Arroyo and Embudito Channel, the majority of which is managed by DMD. The John B. Robert Dam and drainage basin is the major drainage facility at the western boundary and managed by AMAFCA. The OSD has no authority to alter these features.

Vegetation management is one focus of this plan, although it is secondary to the refinement of the recreation system and the remediation of human impact on the natural habitat. Bear Canyon Open Space is home to various species of vegetation including trees, grasses, cacti, and shrubs, ranging from native to non-native and invasive. According to a vegetation study performed by environmental consulting agency Tetra Tech (the full report is available in the Appendix), primary vegetation types include native steppe grassland and shrub scrub; native species include sand dropseed, red threeawn, blue grama, rabbitbrush, four-wing saltbush, brickellbush, cane cholla, Apache plume, and snakeweed. Native vegetation within the arroyos that require more water include the Rio Grande Cottonwood, willow, New Mexican olive. The sandy soil and annual flows prevent much vegetation from taking hold within the arroyo itself, as well as in the John B. Robert Basin at the western edge nearest the dam.

Cholla in bloom at Bear Canyon Open Space

While both native and non-native invasive species may provide wildlife habitat, erosion control, shade, and other environmental benefits, invasive species also compete against native species for resources and are particularly successful in disturbed areas. Species of concern in BCOS are common non-native invasive species throughout much of the region: cheatgrass, Russian olive, Siberian elm, tree of heaven, dodder, Russian thistle (tumbleweed), kochia, and horehound. Less desirable vegetation that take hold in disturbed areas like false tarragon also dominate

certain sections. Other ornamental species such as Giant Reed likely washed into Open Space from nearby residences through drainage facilities. In addition to living vegetation, collections of dead Russian thistle (tumbleweed) can also accumulate, and potentially increase wildfire concerns and become habitat for rattlesnakes and rodents.

This wealth of vegetation over a large area provides important habitat and a travel corridor for various species of birds, reptiles, amphibians, and mammals. Due to its location within a highly populated urban area and its role as a natural linear corridor, this is a crucial function of BCOS.

The view to the west from Bear Canyon Open Space

Bear Canyon Open Space, as stated in the goals of the *MPOS Facility Plan*, provides visual and physical relief from the urban environment. Standing within the arroyo, visitors and neighbors can appreciate an uninhibited view of the nearby Sandia Mountains to the east, as well as an exceptional vista to the west and north encompassing the City of Albuquerque and beyond: the cottonwood forest (*bosque*) along the Rio Grande, the volcanoes and escarpment of Petroglyph National Monument, Mount Taylor, and the Jemez Mountains. It offers a natural relief from the urban built environment to both visiting recreationists and adjacent private landowners.

Volunteerism

Education, restoration, and volunteerism are three interconnected aspects of public stewardship and maintenance of public lands. Because the City of Albuquerque manages nearly 30,000 acres of land in Bernalillo and Sandoval Counties as Major Public Open Space and has access to limited staff and resources, the OSD relies on a large group of Trail Watch Volunteers (TWVs) to observe and report conditions at the City MPOS properties they visit frequently. Volunteers also assist in maintenance through one-time and as-needed projects which consist of trail construction and maintenance (drain dips, rerouting, etc.), trash clean-up, revegetation, and graffiti removal.

Land Ownership

While the entirety of Bear Canyon Open Space is managed for natural habitat and recreation by the Albuquerque Open Space Division, there are also easements that are the responsibility of

DMD or AMAFCA to help manage drainage. This creates some restrictions on visitor use management, as drainage must serve as its primary function and the OSD does not have the authority to alter AMAFCA or DMD drainage features.

Ownership surrounding Bear Canyon Open Space consists of private properties to the north and south, including residential development and privately owned and managed open space; the John B. Robert Dam, owned and operated by AMAFCA to the west; and small areas of residential development and private open space bordered in turn by City-managed Foothills Open Space, the Embudito Trailhead, and the National Forest Service to the east.

Good Neighbor Policy

The Open Space Division strives to work with neighbors to achieve a harmonious coexistence and to address issues that may affect their private property and the protection of Open Space land. By working with residents who live near or adjacent to Open Space, the OSD hopes to build a community of volunteers who will help serve as the eyes and ears of the Division. Issues that have arisen in many Open Space areas that require cooperation between the Division and its neighbors include:

- Encroachment into the Open Space with landscaping, fencing or other backyard items
- Dumping of yard waste over walls into the Open Space
- Placement of Open Space signs, trash cans, fences and trails in close proximity to private property
- After-hours activity in the Open Space
- Noisy visitors

DMD and AMAFCA Management Policies

According to the *Facility Plan for Arroyos*, "[d]rainage and flood control are the most important functions of the City's arroyos. Other uses within or adjacent to them should not interfere with these functions" (pg. 16). Therefore, DMD and AMAFCA drainage policies must guide much of this plan. The OSD has discussed management policies relevant to BCOS with both agencies, which has informed strategies and decisions the OSD has made regarding visitor use.

AMAFCA's primary responsibilities are the dam and drainage basin, as well as drainage from the watershed and BCOS. Overall, AMAFCA maintains its facilities only for flood control and not for recreation or other activities. Much of their management policies are determined by the Dam Safety Bureau (Office of the State Engineer), which prohibits certain activities or changes that may compromise the integrity of such structures including but not limited to tree plantings and trails cut into the slope. AMAFCA has taken steps to close trails on the slopes of the dam with gravel to prevent potential negative impacts. Permissible trails do not alter the dam in any way,

and include the maintenance roads identified on the trail map. Other impacted trails are located in the basin directly to the east of the dam, as it may become necessary for AMAFCA to remove sediment to prevent flooding; for that reason, trails within the basin are subject to change. Signage is permitted, and the OSD will work with AMAFCA to determine appropriate locations for trailhead information at the dam.

DMD manages the natural drainageways in Bear Canyon Open Space. Their policy in areas such as this is to leave the arroyos in their natural state, meandering as flows dictate and not interfering unless there is a threat to safety or property, as was the case with the erosion project designed to protect the residences in BCW (see the recent project photos and map for more details). Trails in danger of washing away are not urgent and therefore not considered in DMD bank stabilization projects, so OSD must plan the official trail system to avoid the natural arroyos and potential erosion as much as possible.

The OSD will accommodate these policies when planning for natural habitat and recreational uses, and will continue to partner with these agencies for future management. During the redrafting of this Visitor Use Plan some of the official trails were identified, changed, or excluded, based on these policies due to proximity to the naturally meandering arroyos.

3. Visitor Use Plan Goals

This plan's primary focus is the management of visitor use and recreation facilities. According to the *MPOS Facility Plan*, "Visitor management is the key to resource protection, environmental education and a positive visitor experience" (*MPOS Facility Plan*, pg. 36). For Albuquerque-owned Major Public Open Space, this requires balancing the requests of various users and neighbors with healthy vegetation and wildlife habitat, and drainage, the primary function of the arroyo.

Maintenance

The Open Space Division maintains the recreational facilities in BCOS, which are primarily primitive multi-use trails. "Routine maintenance includes road and trail maintenance, trash pickup, facility maintenance, fence installation and repair, revegetation of heavily used or disturbed areas, removal of invading species, sediment and erosion control and facility and equipment repairs" (*MPOS Facility Plan*, pg. 36). Trail maintenance is emphasized separately in this plan due to its focus on visitor use.

Drainage features including the arroyo and concrete and rip rap structures are not under OSD ownership or maintenance authority. This plan will only discuss anticipated maintenance practices of OSD-maintained recreational features. AMAFCA and DMD will separately determine the maintenance needs of their own facilities within BCOS and coordinate with OSD.

Example of trail intersection signage at other MPOS locations

Signage and Visitor Information

A basic necessity for proper use of public spaces is appropriate signage and education. One of the primary goals of future management is to ensure trails and trailheads are properly signed so users are aware of the rules, regulations, and official trails and access points of BCOS. However, it is important to note that too many signs will result in clutter that many visitors won't bother to read; therefore, the OSD must determine an appropriate balance and limit subjects to

those that protect public safety, protect wildlife and sensitive natural resources, and enhance the user experience (per current OSD design standards).

Sustainable Trails in Desirable Locations

Another primary goal of this Visitor Use Plan is to design a sustainable, well-planned trail system in BCOS. This effort will utilize select current trails while constructing new or rerouting and closing other trails identified as unsustainable, redundant, or unsuitably placed. Unofficial user-created trails tend to be unsustainable and not located with the comprehensive trail system in mind; this creates multiple issues for the health of public land including decreased vegetation and habitat and increased erosion. This plan will identify opportunities to reduce the prevalence of user trails and thus any resulting unnecessary vegetation damage and erosion.

Vegetation Management

Vegetation management is briefly discussed in this plan, as it is important in maintaining the health of a system that adequately supports recreation, drainage, and wildlife habitat. It requires balancing the prevention of erosion, the further establishment of invasive species, and the availability of wildlife habitat.

4. Recent Projects

The Open Space Division regularly conducts routine, annual, and specific one-time projects at Bear Canyon Open Space utilizing both internal and external labor. This includes a combination of the OSD's Visitor Services, Maintenance, and Bosque Reclamation staff time and resources; neighborhood and Trail Watch Volunteer time; other volunteer groups like the New Mexico Volunteers for the Outdoors (NMVFO), youth corps like the Rocky Mountain Youth Corps (RMYC) and Open Space Youth Corps (OSYC); and student groups interested in educational service experiences.

Trail construction project at BCOS by a student volunteer group led by OSD staff

See the following page for a map showing locations of these recent and ongoing projects. Details for each project follow.


Recent Projects
2018-2020
Recent trail work
Temporary fencing for trail closure
Official Trail
Drainage Channel
City Open Space
N
11
1
10
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2
10
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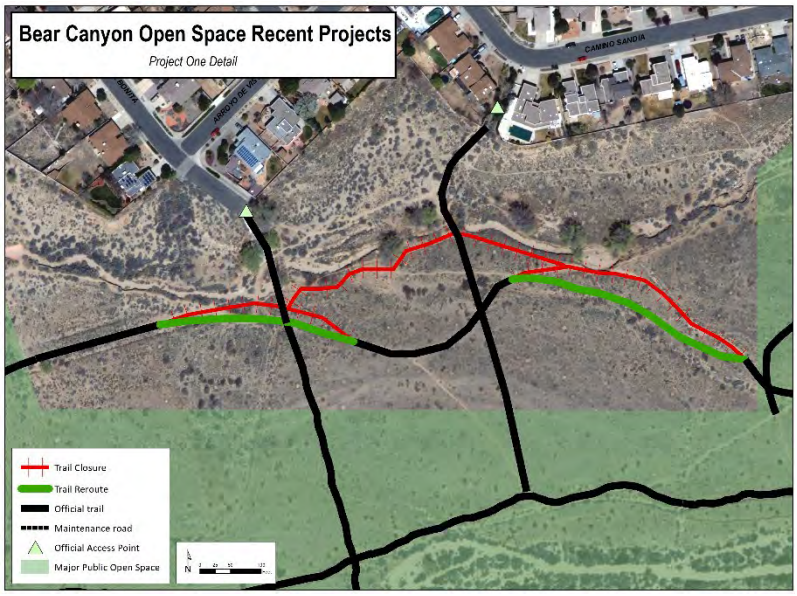
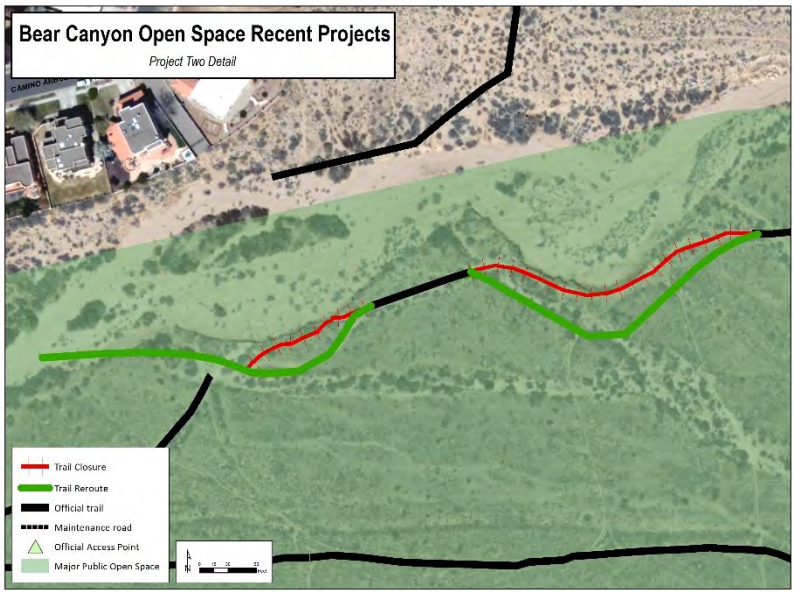
1. The OSD performed trail work on the private open space north of Bear Canyon West during October 2018 and July 2019, closing an eroding trail near incised drainage and formalizing a lower trail to form a connection across the private open space. There are two access points on the private open space at this location that BCOS visitors may utilize, and unmanaged trails on the private open space encourage further unsustainable user trails and erosion on the adjacent MPOS.



2. The OSD worked with ACE Charter School in 2018 to close and reroute additional sections of official trail in BCW that had partially collapsed into the drainage channel during a heavy rain event. The OSD did additional cactus plantings in 2019 to increase vegetation coverage and prevent usage of the closed section.



3. The OSD and volunteers performed trail maintenance including drain dips on approximately ¼ mile of a trail and maintenance road in BCE in both 2018 and on National Trails Day in 2019. Constructing drain dips is a sustainable trail practice that

Trail closure by ACE Charter School student volunteers (Project 2)

routes flowing water off of the trail and onto adjacent lowland to prevent the water from forming ruts or pooling in the trail. Due to the location and condition of this road, continued maintenance in the future will be necessary.

4. The OSD and RMYC removed accumulated dead Russian thistle from a section of BCE in early summer 2019 (the general area is indicated on the map on page 15).

5. On National Trails Day 2019, the OSD and volunteers performed trail maintenance including drain dips and recontouring on an eroding official trail in BCE.

6. Neighborhood volunteers participated in National Trails Day 2019 and committed additional personal time to remove Russian thistle sprouts (various locations, not mapped).

7. The OSD performs annual Siberian Elm sprout removal throughout BCOS. Due to public demand to allow mature trees to remain for both shade and habitat, continued sprout removal will be necessary to prevent inundation (various locations, not mapped).

Erosion control system constructed by COA Hydrology in Bear Canyon West (Project 9)

8. The OSD planted Desert Willows approximately ten years ago and successfully established the species in BCOS. They are now dropping seeds and naturally propagating (various locations, not mapped).

9. During summer 2019, City Hydrology (DMD) constructed erosion control structures within a section of private open space in BCW. This work is intended to prevent undercutting near residences during heavy rain events (general area indicated on map).

10. The OSD worked with the Boy Scouts on a trail maintenance project in February and September 2020, which consisted of drain dips and cactus plantings to reinforce trail closures. These projects provided maintenance on approximately ¾ mile of trail in BCW.

11. In October 2020, Open Space staff built temporary fencing along sections of closed trail that were still being used to allow the area to revegetate; after revegetation is successful, the fence will be removed. This temporary fencing will serve as a test run to determine if it is an effective method to prevent repeated use of closed trails.

Example of temporary fencing to help permanently close trails

5. Future Work

Maintenance

The OSD will continue to perform maintenance as needed. Needs beyond trail work primarily include fence and gate repair (with the exception of fencing at the private open space boundary, which is maintained by HDR), sign replacement, and litter control. Intact fencing is essential to reducing user-created trails and preventing unauthorized vehicle entry and damage to soils and native vegetation.

Signage and Visitor Information

As two of the primary goals of MPOS are to preserve natural areas and provide multi-use, low-impact recreation where appropriate, it is essential to provide users the information they need to use the space appropriately. This includes signage educating on rules and regulations at trailheads, boundaries, and other strategic locations, which the OSD will install where missing including at primary trailheads (Embudito and John B. Robert Dam). Because a lack of trail signage is likely a primary reason for a large number of existing social trails, other signage will clearly direct users to official trails, including at intersections and arroyo crossings where correct trail reentry may not be clear. These trail signs have been installed on other MPOS properties and include trail names, distances, and allowable uses. The OSD is currently working with a contractor on a new signage design, so trail junctions that are slated to remain will be signed as soon as the design is finalized and signs are manufactured; trails that will be rerouted will be signed as those projects occur and signs are available.

Current kiosk with trail maps and other information at Embudito Trailhead; note that the OSD is developing a new signage design so this may not represent the design of future kiosks

Sustainable Trails in Desirable Locations

Trail work at BCOS will consist of a combination of erosion control work like drain dips, trail closure and rehabilitation through revegetation, minor realignments (like “bumping up” to higher ground), and reroutes. The OSD is dedicated to providing quality natural surface multi-use trails that stand up to the test of time with minimal maintenance required. Designing a

sustainable trail that meets this criteria is an important tool for providing recreation as well as protecting resources, and the process the OSD uses is outlined in the "Sustainable Trails" section on the right.

Recently constructed by a Boy Scout group, this is an example of "bumping up" an eroded trail to take advantage of higher ground and improved runoff. The closed trail is just to the left of the new trail.

Maintenance on existing official roads and trails is a priority for visitor use management and primarily consists of constructing or repairing drain dips, removing built up soil and debris along the edge of the trail which obstruct drainage, rerouting unsustainable trails, and revegetating when necessary. Maintenance roads are necessary but create their own issues as vehicle use may cause ruts and erosion; therefore the recent project described in number 3 will be a recurring maintenance need. Other official trails will require attention as well, including the trail previously identified as a priority reroute (available in

SUSTAINABLE TRAILS

The National Park Service defines a sustainable trail as a trail that:

- Supports current and future use with minimal impact to the area's natural system.
- Produces negligible soil loss or movement while allowing vegetation to inhabit the area.
- Recognizes that pruning or removal of certain plants may be necessary for proper maintenance.
- Does not adversely affect the area's animal life.
- Accommodates existing use while allowing only appropriate future use.
- Requires little rerouting and minimal long-term maintenance.

To summarize, a sustainable trail is a trail that is designed and built to minimize erosion and maintenance, while accommodating the appropriate visitor use.

CREATING SUSTAINABLE TRAILS

The Open Space Division has adopted trail design standards developed by the International Mountain Bicycling Association. These standards are also recognized by the United States Forest Service and many trail building reference books. Some elements of sustainable trails include:

The Half Rule. The half rule states that the grade of a trail should be no more than half the grade of the hillside that it is built on. If a trail is built on a hillside with a 10% side slope, then the maximum grade of the trail should be 5% or less.

Outslope. The trail tread should be

(continues)

Appendix, or Project 1 in the previous draft of this plan). Due to public comments opposing relocation, this project was removed from the priority list; however, in its current location it will require ongoing maintenance. If conditions worsen and maintenance becomes too burdensome on staff resources, the OSD may determine a reroute is necessary in the future. Other trails similarly adjacent to drainage are high maintenance and potential hazards, and will be rerouted if necessary.

Trails identified for closure will be rehabilitated using a variety of tools including cactus cuttings, rocks, and vegetative debris found naturally within the immediate area, with larger areas potentially reseeded with a mix of native grass seed. If necessary, closed trails will be further identified with signs notifying users that the areas are closed to allow for revegetation; should all else fail, the OSD will install temporary fencing to prevent usage until the area is recovered, a method that is currently being tested in BCW (described in Recent Work #11). A combination of volunteer and youth corps will likely construct any trail projects that can be done by hand, overseen by OSD staff. Maintenance staff will conduct work that requires more advanced tools. Due to its width and conduciveness to vehicle access, maintenance on the maintenance road may be conducted with small pieces of mechanized equipment.

The OSD has identified primarily existing sustainable trails to formalize and establish an official trail network that provides adequate circulation options and minimal environmental impact, illustrated in the proposed trail map on page 30. This proposed trail network also includes some reroutes and changes to the official trail network, proposed after the previous

outsloped. That is, the uphill side of the trail tread should be higher than the downhill side to encourage sheet flow across the trail and off the tread. If a trail is in-sloped, u-shaped or v-shaped, water will run down the middle of the trail and cause erosion. To help maintain an outslope and proper drainage, a trail should be located on a side slope of hill.

Avoid building in flat areas. Trails located in flat areas will become lower than either edge of the trail tread. This means water cannot drain off the trail and will collect and convey water and the trail will turn into a rut.

Avoid fall line trails. Fall line trails often follow the shortest route down a hill. This is essentially the path of least resistance for water. Once water starts channeling down the trail, the trail will begin turning into a rut.

TURNING UNSUSTAINABLE TRAIL INTO MAINTAINABLE OR SUSTAINABLE

It is impossible to turn an eroded, unsustainable trail into a sustainable trail. The only way to accomplish this is to reroute the trail and follow sustainable trail design standards. It is possible to turn an unsustainable trail into a maintainable trail through the use of drain dips, also known as grade reversals; however these features require time and effort to build and also require regular maintenance. The amount of work needed to build the required amount of drain dips and the amount of work needed to maintain the drain dips should be weighed against the amount of time, effort and impact needed to build a sustainable reroute and close and reclaim the eroded section of trail.

NEW TRAIL CONSIDERATIONS

New trails may be proposed by OSD staff

(continues)

draft based on new input from DMD, AMAFCA, and the public, as well as the vegetation assessment conducted fall of 2020. This map indicates the locations of current and proposed trails, trails that are subject to change based on flooding or dredging (primarily in the basin), trails that may need to be bumped up to adjacent higher ground, and trails that are currently high maintenance and will require observation and potential realignment at a future date.

Note that any new trail alignment locations proposed in this plan are approximate and will not be finalized until staff determine a sustainable layout based on conditions prior to construction. Official trails are also subject to change as future rerouting may be necessary to bring them up to maintainable conditions. While the OSD does attempt to maintain good communication with adjacent entities, trails on private open space are under the maintenance of external entities and their locations may change without the knowledge or input of the OSD.

Currently, there are approximately eight miles of official trails in BCOS, including multi-use paths, maintenance roads, and drainage channels (see trail network map on page 8); additionally, there are approximately six miles of unofficial user-created trails. Through the implementation of this plan, the OSD anticipates closing approximately five miles of trail, constructing or rerouting one mile, and adopting ½ mile of unofficial trail, making the total official trail mileage approximately ten miles. The OSD also anticipates conducting trail and road maintenance on approximately two miles of the BCOS network based on current conditions.

or members of the public. New trail proposals are evaluated by Open Space staff for feasibility with the following criteria in mind:

- Sustainability
- Connectivity
- Disturbance of archaeological resources
- Impact on wildlife and native plants
- Proximity to private property

The Open Space Superintendent has the authority to approve or deny the proposed trail.

REASONS TO CONSIDER NEW TRAILS

- Disperse visitor use – when trail systems become crowded, new trails may alleviate the congestion
- Add interest like scenic overlooks and interpretive opportunities
- Improve flow of trail system

TRAIL REROUTE CONSIDERATIONS

A trail reroute is a new section of trail that replaces an existing section of trail. Existing trails may be rerouted for a variety of reasons including:

- The trail is too steep and erosion is evident
- There is poor drainage and the trail is turning into a rut that conveys water
- The trail is in constant need of maintenance
- Maintaining the existing trail involves more work than building a new sustainable trail
- The trail is damaging, or in danger of damaging an archaeological site
- Poor line of site which leads to user conflict.
- The trail is too close to private property

Trail reroute proposals are evaluated using the same criteria for evaluating a new trail and can be approved or denied by the Open Space Superintendent.

Trail Projects Overview (described in further detail below).

- Identify appropriate collector trails to consolidate trails from adjacent homeowners, with input from those neighbors when specific projects arise. The OSD proposes designating one collector trail to connect to the primary trail system between rip rap structures in areas where they occur and residents request grandfathered-in access.
- "Bump up" official trails to adjacent higher ground if useful for preventing erosion and ruts, and preventing additional user trails as visitors attempt to avoid these sections.
- Improve the Osos del Cañon statue area.
- Determine the best alternative for the proposed trail reroute on the eastern boundary (formerly Project 2) based on public comment and input from the Open Space Advisory Board.
- Release a trail map of BCOS. When a trail system is determined, the OSD will publish a map with current official trails, distances, and access points, which will be updated as needed. It will be posted at trailhead kiosks and on the City's website.

Note that projects will occur as resources and staff time become available, not necessarily in the order in which they are listed.

Example of a trail reroute with the retired trail revegetated with locally sourced native cacti

Eastern Trail Reroute

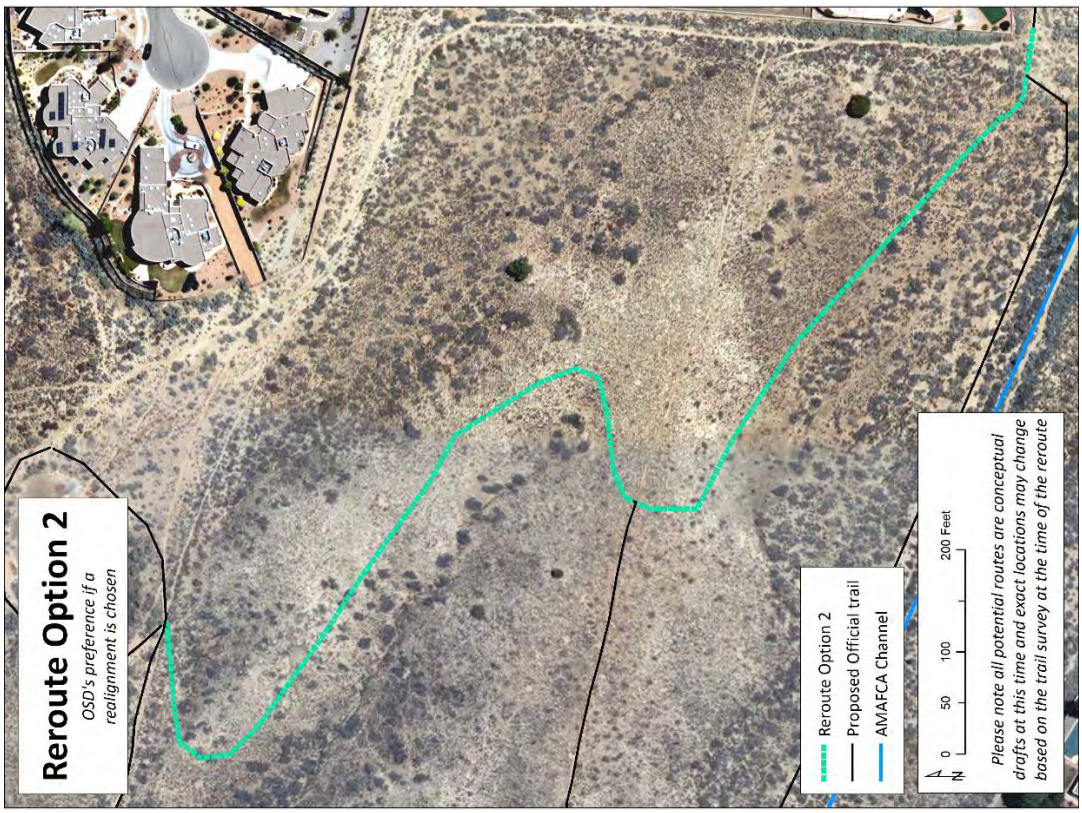
A neighbor with property adjacent to BCE has requested the reroute of a trail near their property line and backyard due to privacy and safety concerns. The OSD finds requests such as this to be reasonable and has worked with neighbors to find alternative alignments for many

trails in the Foothills and East Mountains in the past. The user experience would also improve if the trail were moved further away from walls and residences, both aesthetically and for the user's own sense of privacy and enjoyment of the natural, rather than built, environment. A reroute of this trail was identified as Priority Project 2 in the previous draft of this plan (see Appendix C for an overview map of all previously proposed projects). However, due to a number of public comments opposed to this reroute, the OSD is seeking additional input from the Open Space Advisory Board and the public on this proposed project. The two alternatives are:

1. *No action*. The trail location will remain unaltered, leaving the onus on the affected property owner(s) to determine screening methods compliant with relevant City regulations on their own property.

2. *Reroute the trail*. The area for a potential realignment does not contain sensitive species or habitat and in fact is vegetated with invasive and disturbance plants including dodder, tarragon, punctureweed, and sand dropseed. Where this or any other trail is identified for reroute or construction, the OSD will follow the methods of invasive species removal prescribed in the vegetation study to prevent its spread.

   The two potential realignments for this project, should a reroute be chosen, are indicated on the following page; please note that these are conceptual and the exact location of the chosen route may shift during the design and survey phase. If a realignment is determined to be the best alternative, the OSD prefers option 2.


Reroute Option 2
OSD's preference if a realignment is chosen
Reroute Option 2
Proposed Official trail
AMAFCA Channel
0 50 100 200 Feet
N
Please note all potential routes are conceptual drafts at this time and exact locations may change based on the trail survey at the time of the reroute


Reroute Option 1
Reroute Option 1
Proposed Official trail
AMAFCA Channel
0 50 100 200 Feet
N
Please note all potential routes are conceptual drafts at this time and exact locations may change based on the trail survey at the time of the reroute

Osos del Cañon statue area

The Osos del Cañon statue by sculptor Reynaldo Rivera was installed in 1995 in the southeast corner of BCW, and visitors are naturally drawn to observe this piece of public art. The OSD proposes improving the area surrounding the statue as it is a primary destination at BCOS. This project would include the revegetation of unsustainable or redundant trails and maintenance on others, installing a bench and shade structure near the statue, and improving the access point from Tramway to include a chicane and trailhead signage. A chicane is a serpentine-style entrance to the trail system designed to permit allowable users passage while preventing motorized vehicles.

Consolidate user trails

The *MPOS Facility Plan* identifies visitor management as vital to protecting natural resources. Policy C.5.B. states: "Access to Major Public Open Space shall be controlled in such a way as to protect and preserve it from degradation and disturbance due to overuse. Access to Major Public Open Space shall be controlled through facility development, trails, gates or fencing" (pg. 36).

As explained earlier, a number of user trails exist across all areas of BCOS, often due to a lack of trail signage. This is in addition to trails leading from unofficial access points from private properties, most if not all of which existed before OSD acquired the land. Reducing redundant

trails allows vegetation to recover and improves the overall health of the trail system and habitat. As there are two different primary causes of these user trails, the OSD will approach consolidation with different management techniques:

1. *Excess trails used by visitors.* The OSD has identified a preferred trail network, retaining the most advantageous trails used by the public. This network will both maintain loops and through connections while reducing unnecessary or eroded trails to improve vegetation, habitat, and the user experience. Trails identified as redundant, eroded, or misplaced (i.e., too close to an arroyo or a residence) throughout BCOS will be rehabilitated with native vegetation.
2. *Excess trails used only by neighbors.* The OSD will consult with neighbors to determine appropriate trails to formalize leading from nearby residences to the main trail network in order to consolidate and reduce the human footprint. In areas with riprap structures, the OSD anticipates identifying one trail between each pair to serve residents intent on retaining private access.

Trails identified for closure will be revegetated with cuttings from cacti within BCOS, seeded with native grasses, and/or covered with vegetative debris. Depending on the level of use, trail closures may also include signs at either end informing users that the area is closed in order to allow vegetation to recover. If use of the closed trail persists, the OSD may place barriers along limited lengths of the trail which may include boulders or temporary fencing to be removed when the area has recovered.

The OSD typically does not permit private access points into publicly owned City Open Space. Private access points encourage unsustainable and redundant user trails, which decrease vegetation and wildlife habitat and increase erosion and disturbance; they also create unequitable access to a public asset. In areas where private access points become problematic, the OSD typically requires the adjacent landowners to stop accessing MPOS through private gates. Closing access points is a disturbance reduction tool implemented by many open space programs including Petroglyph National Monument's 2018 Visitor Use Management Plan which prohibited private access and reduced the total number of public access points by nearly 50%.

At this time, the OSD will not require the closure of private access points, but does request that anyone with the ability to use an official access point rather than their own private access point do so to allow the area to recover. Residents intent on maintaining private access will have the opportunity to meet with OSD staff to determine appropriate collectors and connections to the wider network. However, should an informal network of user trails and encroachment persist,

the OSD will consider closing problem areas with a variety of tools including temporary fencing, boulders, and plantings, to direct users to sanctioned access points.

Estimated Trail Projects
Mileage Summary

Existing	
Official Trails	8
Unofficial Trails	6
Total	***14***
Implementation	
Trail Closure	4
Trail Construction/Adoption	.5
Trail and Road Maintenance	2
Approximate Mileage After Implementation	***11***

Bear Canyon Open Space
Proposed Trail Network
Natural surface single track (NSST)
NSST - subject to change based on flooding
Maintenance road
Existing, move to high ground
Ongoing assessment needed
Drainage Channel
Osos del Cañon statue
AMAFCA Drainage Basin
City Open Space
ESCALANTE WAY

Vegetation Management

The OSD hired environmental consultant firm Tetra Tech to perform a vegetation study in areas of BCOS where projects were proposed in fall 2020. This study is available in its totality in the Appendix.

Policies relevant to vegetation at BCOS include lists of desirable species in different areas. Although it is too low in elevation for several of these species including aspen and blue spruce, in the *MPOS Facility Plan* identifies the following plant species as desirable in the Foothills area:

Trees:	Aspen	*Populous tremuloides*
	New Mexico Locust	*Robinia neomexicana*
	One Seed Juniper	*Juniperus monosperma*
	Pinon Pine	*Pinus edulis*
	Shrub Live Oak	*Quercus turbinella*
	Desert Willow	*Chilopsis linearis*
	Blue Spruce	*Picea engelmanii*
Shrubs and Vines:	Soapweed Yucca	*Yucca glauca*
	Beargrass	*Nolina microcarpa*
	Four Wing Saltbush	*Atriplex canescens*
	Rabbitbrush	*Chrysothamnus nauseosus*
	Gooseberry	*Ribes inerme*
	Mountain Mahogany	*Cercocarpus montanus*
	Apache Plume	*Fallugia paradoxa*
	Three Leaf Sumac	*Rhus trilobata*
	Cane Cholla	*Opuntia imbricata*
	Fringed Sage	*Artemisia frigida*
	Broom Snakeweed	*Xanthocephalum sarothrae*
	Wolfberry	*Lycium pallidum*
	Cliff Rose	*Cowania mexicana*
	Cliff Fendlerbush	*Fendlera rupicola*
Herbaceous:	Blue Flax	*Linum lewisii*
	Butterfly Weed	*Asclepias tuerosa*
	Penstemon sp.	*Penstemon sp.*
	Primrose sp.	*Oenothera sp.*
	Threadleaf Groundsel	*Senecio multicapitatus*
	Sky Rocket Gilia	*Gilia rigidula*
	Santa Fe Phlox	*Phlox nana*
	Aster sp.	*Aster/Chrysopsis sp.*
	Indian Paintbrush	*Castilleja integra*
	Perkey Sue	*Hymenoxys argentea*

	Globemallow sp.	*Sphaeralcea sp.*
	Wrights Verbena	*Verbena wrightii*
Grasses:	Purple Threeawn	*Artistida longiseta*
	Indian Rice Grass	*Oryzopsis hymenoides*
	Sideoats Grama	*Bouteloua curtipendula*
	Blue Grama	*Bouteloua gracilis*
	Galleta	*Hilaria jamesii*
	Sand Dropseed	*Sporobolus cryptandrus*
	Needle and Thread	*Stipa comata*
	Sleepy Grass	*Stipa robusta*
	New Mexico Feathergrass	*Stipa neomexicana*
	Giant Sacaton	*Sporobolus wrightii*
	Alkali Sacaton	*Sporobolus airoides*
	Little Bluestem	*Schizachyrium scoparium*
	Vine Mesquite	*Panicum obtusum*
	Spike Muhly	*Muhlenbergia wrightii*
	Bush Muhly	*Muhlenbergia porteri*
	Mat Muhly	*Muhlenbergia richardsonis*
	Wolftail	*Lycurus phleoides*
	Green Sprangletop	*Leptochloa dubia*
	June Grass	*Koeleria pyramidata*
	Tobosa	*Hilaria mutica*
	Hairy Grama	*Bouteloua hirsuta*
	Black Grama	*Bouteloua eriopoda*
	Six Week's Grama	*Bouteloua barbata*
	Western Wheatgrass	*Agropyron smithii*

The *Facility Plan for Arroyos* (p. 113) also provides an abbreviated plant list and instruction for arroyo vegetation: “arroyo courses should be left to the natural encroachment of local species. If that is not desirable, the following shrub and grass species could be encouraged…

Shrub species

1. Rabbitbrush (*Chrysothamnus*)
2. Snakeweed (*Gutierrezia*)
3. Indigobush (*Dalea*)
4. Desertwillow (*Chilopsis*)
5. Brickellia (*Brickellia*)

Grass species

1. Little Blue Stem (*Andropogon scoparius*)
2. Poverty Threeawn (*Aristida divaricata*)

3. Red Threeawn (*Aristida longiseta*)
4. Sixweeks Gramma (*Bouteloua barbata*)
5. Burrograss (*Scleropogon brevifolius*)"

Bear Canyon Open Space accommodates a variety of species in these lists. The OSD has no current plans to revegetate any areas except trail closures; those will primarily consist of cuttings from cacti found in the immediate area, and potentially reseeding with a native seed mix (see page 34 for more information).

Several invasive species are also present, primarily horehound and false tarragon, but also Siberian Elm, Tree of Heaven, dodder, and Russian thistle. Ideally, Bear Canyon Open Space will support a biodiverse wildlife and native plant habitat with invasive species completely eradicated. However, the realities make this scenario impractical at best. After weighing the benefits and costs of different invasive species removal strategies as well as public comment, the OSD determined that the amount of disturbance wholesale removal would cause far outweighs the benefits of complete eradication, especially considering the ease with which they could again take hold when they are uncontrolled on neighboring properties. And finally, as mentioned earlier, there has been negative feedback from neighbors concerning the removal of plants like mature Siberian Elms as they provide shade and habitat.

The OSD will proceed with the following strategies based on existing conditions and constraints in BCOS and surrounding properties and available resources. Rather than remove invasive species all at once and cause massive disturbance, the OSD through volunteer support plans to:

- Annually remove immature Siberian Elms; seeds dropped by the mature Siberian Elms that are allowed to remain will inevitably grow new sprouts, so continued removal will be necessary. Mature elms are primarily located in the arroyo in south central BCE and northeastern BCW.
- Implement a new effort called "Weed Warriors" to assist in the removal of younger, less established plants. This new facet of the Open Space volunteer program will help recruit and educate local volunteers with a passion for maintaining the public lands they regularly use on proper low-impact invasive species removal, with a focus on identification, removal by hand, and disposal.
- Utilize youth corps and inmate crews to remove dead tumbleweed as it accumulates. The focus area for removal is southwestern BCE between Tramway Boulevard and the stand of mature elms in the arroyo.
- In all projects, follow Tetra Tech's recommended invasive species removal methods, included in the vegetation study in the Appendix.

Volunteerism

The OSD will continue to depend on volunteers for a significant amount of trash clean-up, trail work, vegetation management, issue reporting, and other stewardship needs.

The OSD also offers a more in-depth opportunity for volunteer groups to commit to a higher level of stewardship with the Adopt-An-Open Space program. As neighbors are very active in BCOS and have the benefit of being close or even adjacent to this asset, the OSD encourages local residents and groups to consider making a commitment through this program.

Costs and Funding Sources

The majority of the proposed trail projects will improve current conditions rather than construct additional facilities and will capitalize on OSD staff and volunteer time; therefore, the cost of implementation of those is minor. In-house trail design and construction will be conducted by hand by OSD staff and volunteers, and potentially the RMYC, and will not require any construction materials beyond what is available on-site: dirt, large rocks, cacti, and vegetation debris. Should the OSD choose to reseed with its typical "Foothills" mix (Blue Grama, Western Wheatgrass, Sideoats Grama, Galleta, Little Bluestem, and Fourwing Saltbush), the custom seed mixture would likely cost less than $100.

Trail closure including plantings, vegetation debris, and a sign reading "Area behind this sign closed to allow vegetation to recover"

Any trails contracted out are expected to cost $6 per linear foot to construct in addition to a mobilization fee of approximately $1,700.

Funding necessary for OSD's staff time and maintenance and supplies will come from the OSD's Annual Operating Budget. Additional events that may occur including restoration demonstrations and educational hikes will be funded by a combination of the Annual Operating Budget; the Open Space Alliance, a non-profit group dedicated to assisting the OSD with funding for outreach and education; grants from the State or outdoor recreation promoters like REI as they become available; and by volunteer organizations such as the NMVFO, which has expressed interest in conducting trainings and completing trail projects identified in this plan.

The RMYC is currently funded by the Mayor's Youth Initiative. The OSD is dependent on this type of funding to provide necessary labor as well as meaningful outdoor work experiences for youth.

The cost of repairing or replacing damaged fencing and signage will be negligible; the materials and tools needed are part of OSD's regular inventory and no special purchases are anticipated. However, there will be cost associated with new sign and post purchases. Costs related to construction and installation of both will come from the OSD's Annual Operating Budget.

ANTICIPATED COST ESTIMATES

	Per Unit	Unit	Anticipated # of Units	Total Cost
Signs*				
Trail Signs	$22	Sign	20	$440
Kiosk	$1,800	Kiosk	2	$3,600
Rules & Regulations	$87	Sign	2	$174
Name sign	$300	Sign	1	$300
Foothills Seed Mix	$78	Acre	1.2	$94
4x4 Sign Posts	$6	Post	20	$120
RMYC	$2,000	Week	2	$4,000
Bench**	$350	Bench	1	$350
Shade structure/pergola	$3,500	Pergola	1	$3,500
Trail construction (OSD, volunteers)***	.06 staff hours (sh)	Linear foot	1,310	78.6 sh
Trail maintenance (OSD, volunteers)***	.006 sh	Linear feet	4,550 (per year)	27.3 sh
Trail construction (contractor)	$6	Linear foot	1,500	$9,000
Fencing	$7	Linear foot	200	$1,400
Chicane	$461	Chicane	1	$461
			Total	*$23,439*
				105.9 sh

*The OSD is currently working with a contractor to redesign current signage. These prices are based on the signs currently used, so these costs will likely change when the design is finalized.

**Note that the Open Space Alliance runs a program to install wood benches for those interested in remembering individuals with memorials in Open Space; if this were chosen as a location it would cost the City nothing.

***Staff time is estimated in anticipated hours rather than a blanket cost due to varying salaries of the multiple staff members who participate in these projects.

Monitoring

The OSD strives to assess general maintenance needs continuously and trail and vegetation health annually but with approximately 30,000 acres and 150 miles of trail in the MPOS system and limited staff time, it can be difficult. For this reason the OSD relies heavily on volunteer reporting from Trail Watch Volunteers and neighbors to determine maintenance needs and trail erosion issues. Staff will more closely monitor trails previously identified as needing ongoing assessment, but the OSD encourages volunteers and other users to report issues when they are observed. Staff are willing to train anyone who is interested in assessing and reporting on trail health.

The OSD will continue to receive reports from TWVs documenting various aspects of BCOS and all of MPOS, including the number of users, wildlife, vegetation, dogs off leash, unusual encounters, and any other notable observations. Regular reports from TWVs help to document the area much more consistently than staff could alone.

6. Conclusion

Bear Canyon Open Space is an important property for flood control and drainage, visitor and neighbor experience, and vegetation and wildlife habitat. These sometimes-competing needs require a challenging balance that the Open Space Division will strive to maintain with the support of volunteers, input from the public, and cooperation with other managing agencies. Along with other relevant regulations and policies, this Visitor Use Plan serves as a guideline for managing the effects and needs of human use in that triangle. The ongoing projects planned improvements will continue to make Bear Canyon Open Space a valuable resource for all.

Appendix A: Public Participation Summary

The OSD prepared the initial draft of the BCOS Visitor Use Management Plan and posted it on the website to allow review prior to a series of public meetings. Comments were accepted at the public meetings and online through mid-December. Public meetings included:

- November 14, 2019: Initial public meeting
- January 17, 2020: with representatives from John B. Robert NA
- January 28, 2020: with representatives from High Desert Residential Owners Assn.
- February 5, 2020: with representatives from Friends of Embudito Arroyo/Glenwood Hills NA
- February 22, 2020: with representatives from Friends of Embudito Arroyo/Glenwood Hills NA

Summary of Public Comments

- John B. Robert Neighborhood Association: total number of supporters unknown
- Friends of Embudito Arroyo: 147 signatures
- High Desert ROA: total number of supporters unknown
- Individual commenters: 51*
  *Please note that some individual commenters also signed group comments and/or submitted comments multiple times; the OSD made every effort not to count multiple submissions of the same comment from one person more than once.

*Note that project numbers refer to a previous draft and not this one; the previous draft is available on request.

Project 1

There was both support for and opposition to this project. Those in support favor a sustainable trail system with minimal maintenance. Among the opposition, there was concern that the recommended realignment would harm vegetation. Some suggested rerouting just the section that's eroded.

Individual commenters:

- Support: 5
- Opposed: 2
- Only reroute the section that's eroded: 6

Neighborhood Association/organized group stance:

- John B Robert: No issues
- High Desert: No issues
- Friends of the Embudito Arroyo (Glenwood Hills): Only reroute the section that's eroded

OSD response: The OSD follows sustainable trail design standards approved by federal agencies like USFS as well as professional trail building and advocacy organizations. The OSD identified this trail for a reroute because it would reduce strain on staff time and resources, erosion and the potential for a wash-out during a rain event; and while it would create a new trail to the north, the old trail would be rehabilitated and offer the same type of vegetation habitat. Rerouting only a section of this trail would result in an unsustainable trail in other sections. If rerouting only a section would result in a sustainable trail, we would; however, this trail would still have issues that would require regular maintenance. Therefore, the OSD will not reroute at this time; however, should it prove to require too much maintenance, the OSD will reconsider the possibility in the future.

Project 2

There was both support for and opposition to this project. Supporters found moving the trail away from the residence reasonable, although different alignments were proposed and some didn't feel it should be a high priority. Those opposed, mainly members of Friends of the Embudito Arroyo, expressed concern at the previous unannounced attempt to move the trail. There was a general shared opinion among those opposed that it's not fair to move a trail for the benefit of adjacent property owners, it would set a bad precedent, and it would negatively impact pristine vegetation.

Specific commenters:

- Support: 9
- Opposed: 10

Neighborhood Association/organized group stance:

- John B Robert: No issues
- High Desert: No issues
- Friends of the Embudito Arroyo (Glenwood Hills): Opposed

According to the vegetation assessment conducted by environmental consultant Tetra Tech, the vegetation in the area of the proposed reroute is primarily disturbed or invasive species including false tarragon, dodder, and snakeweed, and a trail reroute would not disturb desirable habitat. During the design phase staff will avoid trees or any areas identified as significant or sensitive native vegetation, although none were identified in the vegetation study. The precedent of moving a trail at the request of a neighbor has already been set and followed many times, especially in the Foothills and East Mountains; the OSD considers this a reasonable request.

Project 3

Again, both support and opposition. A small number of commenters want access to the bear statue to be a top priority. Some are in support of reducing the number of trails but don't want *all* north-south trails to close so there are still loops. Some want more detail on which trails would be closed.

Specific commenters:

- Support: 8
- Opposed: 4
- Tentatively supports but wants more detail: 5

Neighborhood Association/organized group stance:

- John B Robert: No issues
- High Desert: No issues
- Friends of the Embudito Arroyo (Glenwood Hills): Tentatively supports but wants more details

The OSD identified trails to be formalized and broke out the Osos del Cañon area as a specific project with a proposed conceptual trail alignment. Please note that any trail alignment is tentative and subject to change should on-the-ground conditions warrant it during the design and construction phases.

Project 4

Some support, but mostly opposition, mainly to the idea of fencing (mostly adjacent homeowners). Some want to know specifically which trails would be closed. Many recommend using other methods of reducing those trails (including education), and only fencing the trouble sections as a last resort. There were also comments on the high cost estimate for fencing.

Those in support say trails from individual homeowners are problematic and cause erosion, and create inequitable access.

Specific commenters:

- Support: 8
- Opposed: 12
- Not opposed to reducing trails, but opposed specifically to fencing: 15

Neighborhood Association/organized group stance:

- John B Robert: Supports reducing trails, opposed to fencing

- High Desert: No issues
- Friends of the Embudito Arroyo (Glenwood Hills): Opposed

The fencing estimate cost in the first draft was the highest possible cost which would occur only if the entire are were fenced. The new draft of the plan specifically states that fencing would be in sections where closed trails are repeatedly used and other methods were unsuccessful. Therefore the fencing cost is more accurately estimated by linear foot than the original scenario.

Project 5

Both opposition and support. Most supporters say maintenance should be a top priority. Opposition consists of a few commenters who believe nothing should be changed and maintenance, trail demarcation, etc. are unnecessary.

Specific commenters:

- Support: 16
- Opposed: 2

Neighborhood Association/organized group stance:

- John B Robert: Supports
- High Desert: No issues
- Friends of the Embudito Arroyo (Glenwood Hills): Supports

Maintenance was never intended to be considered the last priority; it was listed as last because it is ongoing and as-needed and therefore doesn't fit in a timeline of projects, which is how the order of projects was originally listed. This is clarified in the new draft.

Maintenance, trail maintenance, and trail demarcation are necessary for sustainable management of public lands. Comments stating that the OSD should not actively manage the land are appreciated but not reasonable in managing public lands.

Other/General

- Keep it natural/no paved trails, etc.
    - *The OSD has no plans to make any drastic changes to the way the area is managed; all trails will remain natural-surface.*
- Vegetation management is a top priority
    - *Vegetation management is outside the scope of visitor use management, but is touched on in the plan as it is a concern for neighbors and an important aspect of managing public land.*

- Some want to be involved in writing the next draft.
    - *Public comments were solicited and considered and several public meetings were conducted, which is the typical public input method for management plans.*
- Open Space should work more closely with other managing entities so they don't damage the natural area when they work and so citizen concerns are more efficiently met.
    - *The OSD agrees and has met with both AMAFCA and DMD to discuss working more closely together on projects in co-managed areas and have established contacts for future projects.*
- Signage/trail demarcation is a high priority, particularly at arroyo crossings.
    - *The OSD agrees that this is a high priority and has made that clear in the new draft.*
- There should be information on what people should do if they encounter a camp.
    - *Contact information for Open Space and APD are included in trailhead signage; illegal activity should be reported to 242-COPS.*
- Suggestion to construct a solar covered pavilion at Embudito Trailhead
    - *OSD doesn't construct these types of facilities.*
- Consolidating redundant trails is a high priority. OSD should clearly sign and fully close retired ones.
    - *This is included as part of the trail plan.*
- The arroyo should be dredged at "the crossing" to prevent erosion.
    - *Per DMD policy this is a natural arroyo and they will not fortify it unless it poses a threat to life or property; this means the OSD must alter the originally proposed official trail network to avoid problem crossings as much as possible.*
- Coordinate with DOT to install trash cans along Tramway trail.
    - *The trail along Tramway is out of OSD's jurisdiction; anyone interested in suggesting the idea is encouraged to contact DOT.*
- Issues with users not following rules, particularly dogs off leash, not picking up dog poop, and bikers not yielding to or even yelling at other users.
    - *Rule abiding and trail etiquette are ongoing, pervasive issues when managing public land. The OSD attempts to educate the public through signage and outreach and address users when they see issues but do not have the authority to issue citations.*
- Public safety should be a priority; OSD police should regularly patrol, especially during off hours; unmaintained trails/ruts should be considered a safety hazard.
    - *The OSD police unit's number of officers and the time they are able to spend at Open Space properties have both been greatly reduced since the unit was created. Citizens are encouraged to be vigilant and contact APD if they see illegal activity, and to not use Open Space during dark which is after hours. Ruts in trails are also a concern of the OSD and one of the issues the OSD attempts to address with trail maintenance and reroutes.*

- OSD should widen trails to road width to accommodate hikers and bicyclists together.
    - *The OSD follows specific sustainable guidelines when designing and constructing trails, which includes keeping them below a certain width; this is less disruptive to vegetation, habitat, wildlife crossing and visual resources.*
- Include where the Bear Canyon originates in mountains
    - *Included*
- Include availability of additional parking at Michial Emery
    - *Included*
- There could be an annual clean-up/trailwork day
    - *The OSD conducts volunteer and clean-up days when possible. However, there are multiple opportunities for interested citizens to volunteer even when there isn't an OSD-run event. Events can be coordinated with visitor services staff, who can provide volunteers with clean-up tools.*
- Comments both for and against restricting bicycle use
    - *Most trails in MPOS are multi-use, with very few exceptions. The OSD is dedicated to providing access to all non-motorized recreationists. It would also be nearly impossible to enforce bicycle restrictions since there are no staff stationed there.*
- OSD should have a written policy on how project requests from citizens are handled
    - *OSD is developing a procedure for all citizen requests*

Appendix B: Vegetation Study conducted by Tetra Tech

TETRA TECH

MEMO

To:	Tricia Keffer, City of Albuquerque Open Space Division
Cc:	Colleen Langan-McRoberts, City of Albuquerque Open Space Division Ondrea Hummel, Tetra Tech
From:	Chris Sanderson, Tetra Tech
Date:	Final Draft March 1, 2021
Subject:	Open Space Sandia Foothills Vegetation Assessment – Bear Canyon

INTRODUCTION

This Technical Memorandum (tech memo) is an independent technical memo that has been prepared to evaluate vegetation regarding the Bear Canyon Arroyo trail closure and realignment activities proposed by the City of Albuquerque Open Space Division (OSD). This tech memo describes the methods and results of the desktop and 100% pedestrian field assessment conducted by Tetra Tech ecologist Chris Sanderson during the mornings of September 30 and October 1, 2020. This tech memo presents current conditions and evaluates the vegetation and habitat characteristics within the proposed action area regarding plant species and diversity, noxious weeds, and other nuisance plant species. High-value habitat was also evaluated in order to support the OSD decision making process for trail closure and realignments.

The Bear Canyon Open Space area is located in the eastern portion of Albuquerque, NM and is adjacent to the foothills of the Sandia Mountains; and is part of the numerous alluvial fans deposited into Rio Grande rift valley (Figure 1). Soils in the survey area are well-drained and consist of gravelly fine sandy loam derived from igneous and sedimentary rock and disintegrated granite (USDA-NRCS 2020). The survey area is primarily within a cold semi-arid climate type, with the eastern portion of the survey area consisting of a transition zone into a temperate climate type (Kottek et al. 2006).

Boundaries of the Bear Canyon Open Space area encompass about 169 acres and the survey area is sited in the Albuquerque Basin, an EPA level IV ecoregion, which is a subset of the larger Arizona/New Mexico Plateau Level III ecoregion (Omernik and Griffith 2005). The Albuquerque Basin is part of the Rio Grande rift valley, and due to its relatively lower elevation, it experiences comparatively drier and warmer conditions than surrounding areas. Vegetation of this region is characterized by desert grasslands and sand scrub vegetation types including array of grasses and forbs that intergrade with scrub shrub.

PROPOSED ACTION

As part of an effort to mitigate ecosystem damage and limit erosion, the OSD is proposing to close, realign and build new trails within Bear Canyon Open Space area. The spatial extents surveyed and discussed in this technical memo relates to the closure of approximately 0.33 miles of trails as well as trail reroutes and new trail construction totaling approximately 1 mile in length. Additional management actions in Bear Canyon outside of those surveyed and discussed in this memo are proposed by the OSD. Trail closures and realignments are intended to mitigate environmental impacts of trail use through reducing erosion, formalizing a main trail, and consolidating several access paths from private property along the southern edge of Bear Canyon. These trails are primarily a result of trail creation from access paths originating from single-family residences in the area.

METHODS

A methodological approach using a combination of desktop and field approaches was performed to characterize the survey area. Desktop research and analysis evaluated the regional and local habitat types and the associated biological resources known to occur or have potential to occur in the survey area. The following resources were consulted in this stage:

- SWReGAP (Prior-Magee et al. 2007)
- SEINet (SEINet 2020)
- New Mexico Rare Plants List (NMRPTC 2020)
- NMDA Noxious weeds list (NMDA 2020)

The State of New Mexico, under the administration of the NMDA, lists certain weed species as noxious (NMDA 2020). “Noxious” in this context refers to plants that are not native to New Mexico, that are targeted for management and control, and that have a negative impact on the economy or the environment. Class C listed weeds are common, widespread species that are well established in the state; Class B weeds are considered common but are not yet widespread in certain regions of the state; and Class A weeds have limited or no distribution in the state. Preventing new infestations of Class A species and eradicating their infestations is the highest priority. Class B species are found in limited portions of the state. In severe infestation areas, containing infestation and stopping further spread is the management goal. Class C species are widespread in the state, and their management decisions are determined at the local level, based on feasibility of control and infestation level.

Prior to the field visits the perimeter of the survey area along with proposed trail reroutes provided by OSD were uploaded to ArcGIS Online. Additionally, an editable layer was published for field data collection using ArcGIS Collector software and made available on a mobile device. These layers were available to support locational awareness during the field sessions and were used for all documentation activities. In this survey, the presence, distribution, and habitat characteristics of all species of special concern were documented and mapped. Field data collection was accomplished by walking the entire route of the proposed trail realignments and inventorying biological resources within a 50-foot buffer. Additional survey transects were walked to provide adequate coverage of the southern portion of Bear Canyon where trail consolidation activities are proposed. Vegetation and accompanying habitat features within the survey buffers and additional transects were noted and other significant abiotic and biotic features, such as erosion and existing trails, were documented.

A general list of plant species found within the boundaries of the survey buffer, inside the additional survey transects, or within the vicinity of the overall area surveyed was compiled. The location and approximate extent of any noxious or problematic plant species was noted and digitized in the field using Collector. Similarly, changes in vegetation composition and the presence any plant species of special concern were documented using Collector. Survey activities also noted any potential environmental issues to provide recommendations to reduce or eliminate environmental impacts.

RESULTS

A map containing the main results of the vegetation surveys is presented below (Figure 1), which includes the locations of invasive and non-native species, as well as other findings discussed in this section. A list of all plant species observed during field surveys is provided in Appendix A.

The survey covered approximately 50 acres of land, some of which is previously disturbed or contains varying levels of existing disturbance. Vegetation communities were noted by documenting the spatial distribution of dominant and co-dominant species present in the survey area. Results from this effort show that the survey area

is characterized by mesa and steppe grassland vegetation habitat types with limited shrub scrub components. Two primary vegetation types were identified: native steppe grassland consisting of sand dropseed (*Sporobolus cryptandrus*), red threeawn (*Aristida purpurea*), blue grama (*Bouteloua gracilis*), and shrub scrub containing rubber rabbitbrush (*Ericameria nauseosa*), four-wing saltbush (*Atriplex canescens*), California brickellbush (*Brickellia californica*), cane cholla (*Cylindropuntia imbricate*), Apache plume (*Fallugia paradoxa*), broom snakeweed (*Gutierrezia sarothrae*). These primary vegetation types intergraded at locations throughout the survey area, where pure stands of grassland later combing with patches of shrub scrub. Shrub scrub is primarily associated with drainage and hillside topographic positions, whereas steppe grassland communities are located throughout the survey area.

There were no threatened, endangered, or sensitive plants located within the survey area; nor were any potentially sensitive wildlife habitats or protected wildlife species identified. A stringer of deciduous woody vegetation, containing primarily Siberian elm (*Ulmus pumila*), was noted due the high density of bird activity in the area. This location is called out on the map and is situated in an incised channel feature where it appears to be away from any proposed activities.

Five Class C noxious weeds were observed during the field survey: cheatgrass (*Bromus tectorum*), Russian olive (*Elaeagnus angustifolia*), Siberian elm, tree of heaven (*Ailanthus altissima*), and giant reed (*Arundo donax*). Cheatgrass was observed in several discontinuous patches throughout the survey area, with a higher overall proportion noted on the western side of the survey area. Two large patches of cheatgrass were identified and the approximate boundary of these sites is presented in Figure 1. An image of a cheatgrass patch adjacent to a trail is depicted in Photograph 4 (Appendix B). Several tree of heaven individuals were documented, and a single stand was identified and is pictured in Photograph 2 (Appendix B). No Class A, Class B, or Watch List species were identified during the survey.

Tree of heaven was documented as the most common woody noxious species, whereas both Russian olive and Siberian elm were present in limited quantities with a single Russian olive identified and several isolated stands of Siberian elm individuals identified, which were codominant with tree of heaven in some settings (Photograph 2).

Dodder (*Cuscuta* sp.) was observed within the northeastern portion of the survey area (Photograph 6) but was not identified in any other portion of the survey area. This area appeared previously disturbed and primarily contained a mix of tarragon (*Artemisia dracunculus*), puncturevine (*Tribulus terrestris*), and sand dropseed plant species.

Green waste dumping was documented at two sites in the survey area. The waste from these sites is adjacent to private residences and contains various wood debris including branches and chipped plant material where tumbleweed (*Salsola tragus*), a ruderal plant species associated with disturbance, was colonizing.

Several areas with active erosion were noted. Active erosion was generally indicated by a lack of vegetative cover and evidence of eroded soil material resulting from steep trail alignments or channel formation parallel and adjacent to existing trails. Images of these typical erosion types are shown in Photographs 1 and 5 (Appendix B).

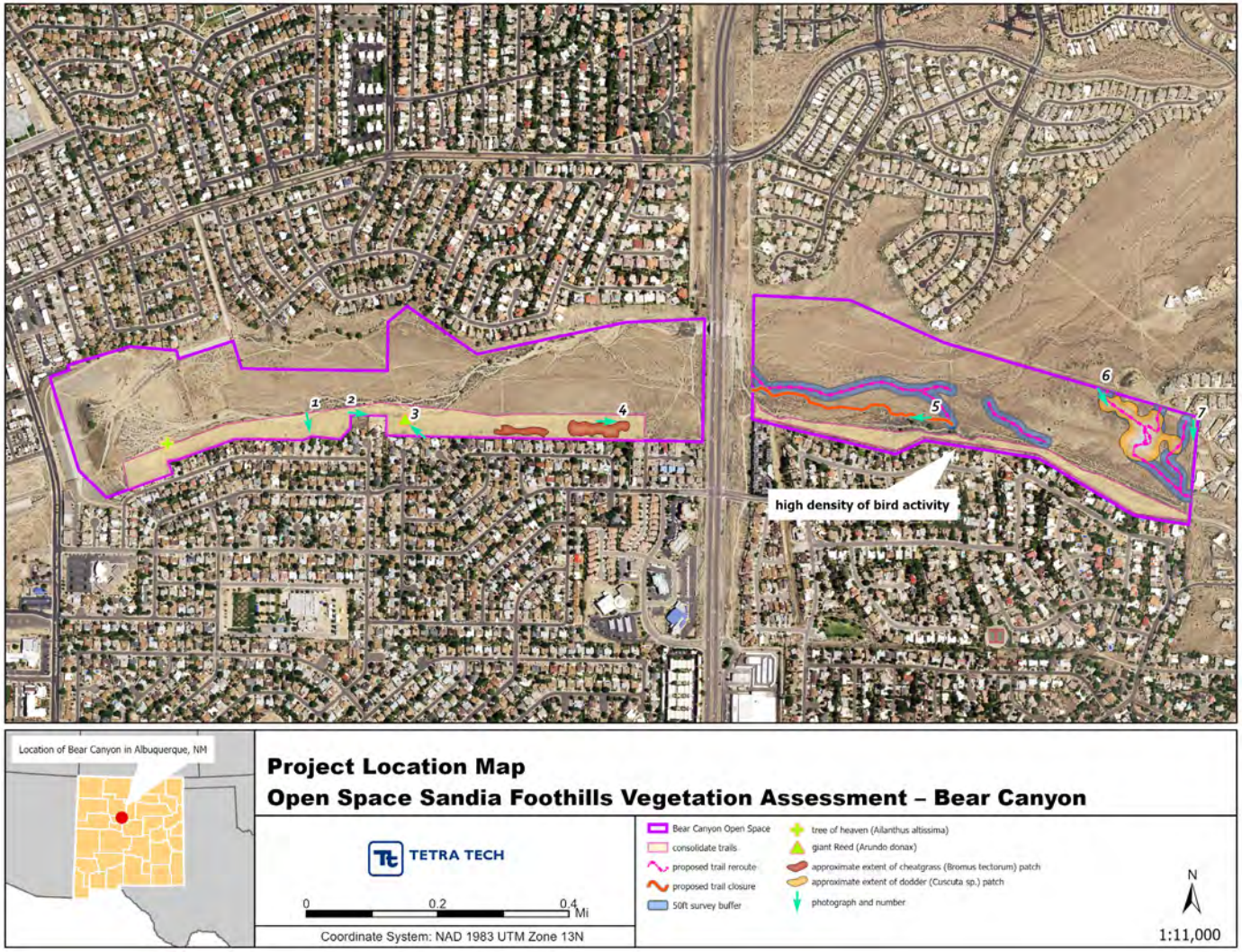


Figure 1. Map of Surveyed Vegetation Resources

DISCUSSION

Results suggest several recommended management activities to preserve the ecological and aesthetic integrity of this highly trafficked area. The quality of vegetation diversity and wildlife habitat is dependent on the management of problematic plant species and reducing excessive erosion. Overall, it is recommended that care be taken to limit disturbance in areas with invasive weeds species in order to prevent the further spread and displacement of native plants. The presence of these invasive weed species is currently not well disturbed in the survey area and effective management will limit the further dispersal and spread of these species.

Of the five NMDA noxious weeds documented in the survey area; cheatgrass and tree of heaven represent significant threats to the native vegetation and overall ecological integrity of the area (Invasives.org 2020).

Cheatgrass is an invasive annual grass species capable of displacing native grass and forb species. Anecdotal evidence shows that cheatgrass has not formed extensive monocultures in the Sandia Foothills area, however any disturbance near existing cheatgrass patches should be limited (USDA-FS 2014). Control of cheatgrass is recommended in areas where the grass exceeds 100 square feet. Small patches of cheatgrass can be mechanically removed by pulling in early spring before seeds are produced. All removed cheatgrass should be bagged and removed from the site. Most herbicide treatments for cheatgrass are non-selective and will impact non-target species, therefore spot spraying techniques using technicians equipped with backpack sprayers is advised in the fall prior to the first deep frost. Chemicals documented to treat cheatgrass and other annual grass infestations include glyphosate, hexazinone, imazapyr, and sulfometuron methyl (DiTomaso et al. 2013). Any use of these herbicides should be in accordance with label specifications and general application practices to mitigate against damage to non-target species. Areas treated for cheatgrass infestation should be reseeded with native perennial grass seed.

Tree of heaven has a high propensity for spread and infestation of disturbed areas and may invade channel bottoms that periodically inundate. Tree of heaven may aggressively spread into new areas through root sprouts and prolific seed production and eradication of existing infestations is recommended. Treatment of tree of heaven using stem injection (hack-and-squirt) method is advised. Using this method, the trunk of the tree is cut and nearly a vertical angle and the exposed cut is sprayed with triclopyr within 5 minutes of the cut being made (USDA-FS 2017). Wholesale cutting of tree of heaven is not recommended because of the prolific nature of the species. Once the trees die off using stem injection, dead material can be removed and the area can be reseeded with native grasses.

Giant reed is a large exotic grass that appears like bamboo and generally is found in habitat areas with high moisture such as irrigated fields or riparian areas. The patch of giant reed identified in the survey is reliant on stormwater flows and the outlet conveying stormwater flow from the subdivision south of the patch. The probability of spread is low due to the lack of appropriate habitat, but this area should not be disturbed in order to limit the potential spread of this species. If resources are available, it is recommended that this patch of giant reed be eradicated with mechanical and chemical methods (USDA-FS 2014). The overall wildlife habitat value of this species is low and therefore its removal will not degrade the overall character and quality of wildlife habitat in this area. The presence of giant reed is undesirable but is considered a lower priority species for management actions.

Any trail realignment through areas currently infested with dodder may result in the unwanted transport of seed and subsequent infestation of other areas of Bear Canyon. It is recommended that any treatment of dodder be completed by hand removal or herbicide treatment (not mechanically). The area with prevalent dodder infestation

is adjacent to a stable trail alignment paralleling private residences where no erosion or other degradation was observed (Photograph 7).

The presence of snakeweed is of limited concern; however, the over-abundance of this species is generally considered an indicator of degraded rangeland conditions (Jameson 1970). It is recommended that the overall proportion of this species in relation to the foliage cover of other species in the herbaceous strata and the spatial spread and distribution of snakeweed be monitored over time as a general indicator of the ecosystem integrity of Bear Canyon.

It is recommended that areas with green waste identified during field surveys be restored to their previous condition. The presence of large branches and other decadent plant material may increase fire potential in the area. Additionally, the dumping of green waste may introduce undesirable plant species.

The trail associated with Photograph 5 is parallel and adjacent to a drainage feature. The trail is elevated from the drainage feature and both the trail and the drainage features appear to convey surface water flows from east to west. The trail overlaps with the drainage feature in several sections, where it concentrates and introduces additional surface water flows during storm events, which is likely contributing to accelerated erosional processes within the drainage feature. It is recommended that these trail segments be monitored for potential ongoing erosion management issues. Current erosion should be measured (depth and/or width) and photos taken (including a GPS point and direction of photo(s)). Potential increased erosion could be checked after major storm events (or a series of them), with monitoring occurring at least twice a year. This further evaluation of erosion would aid in determination of potential additional trail realignment needs. If it is decided that realignment is needed in sections, they should be designed to reduce the volume and speed of surface water runoff. It is recommended that retired trail sections be reseeded with native perennial grass seed and efforts to arrest erosion implemented.

To prevent the spread of non-native and/or invasive vegetation species during and after trail closure and realignment activities, the following standard best management practices (BMPs) are recommended for all final design plans and implementation methods:

Trail Realignment and Design

- Pre-treat areas with invasive and non-native species prior to construction activities
- Avoid trail alignment activities in areas currently experiencing infestation of noxious or problematic plant species
- Minimize the amount and duration of trail construction to promote revegetation of disturbed areas
- Minimize the amount and duration of disturbance in new areas containing noxious and problematic plant species
- Use erosion control devices (i.e. erosion bales, erosion logs, silt fences) to arrest channel development and limit damage to native vegetation
- Other general trail rerouting recommendations as noted in the *Major Public Open Space Facility Plan* (1999) should also be followed

Equipment and Cleaning Procedures

- Implement daily equipment cleaning to reduce the transport of weed species
- Use a designated area for cleaning tools, equipment, and vehicles
- Remove soils and plant material from tools, equipment, and vehicles before entering and leaving the worksite
    - Use a portable pressure washer to wash equipment
- Inspect tools, equipment, and vehicles before entering and leaving the worksite

Management of Personal Gear

- Use clothing, boots and gear that do not retain soil and plant material and that can be readily washed
- Clean clothing, footwear, and other personal gear before leaving the worksite
- Use designated areas for cleaning clothing, boots, and other personal gear

Project Materials

- Select plant and other project materials that are from a certified weed-free source
- Prevent invasive plant contamination of project materials when stockpiling and during transport

Waste Disposal

- Designate waste disposal areas for invasive plant materials
- Place invasive plant material into a secure container during transport off-site

Post-construction Management and Revegetation

- Reseed and mulch disturbed areas as soon as possible with native grasses and forbs to prevent establishment of non-native and/or invasive vegetation species
- Use non-invasive plant material near the site for mulching and erosion control measures

A general guide describing techniques and BMPs is provided in the Integrated Vegetation Management Handbook (USDI-BLM 2008), which is widely available online. This document offers a thorough treatment of vegetation assessment techniques, invasive and non-native species BMPs, and treatment and design considerations to achieve ecosystem management objectives in upland settings such as Bear Canyon. The United States Forest Service maintains the Fire Effects Information System (FEIS) (USDA-USFS 2020), which contains plant species reviews with management considerations related to plant species impact and control measures. Additionally, the Invasive Species and Ecosystem Health (Invasives.org), a joint project between the U.S. Department of Agriculture (USDA) and other several other institutions, provides an excellent description of the ecological threats of various invasive species and methods for their management.

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APPENDIX A. OBSERVED PLANT SPECIES

Life Form	Scientific Name	Common Name
grass	*Aristida purpurea*	red threeawn
grass	*Arundo donax*	giant reed
grass	*Bouteloua gracilis*	blue grama
grass	*Bromus tectorum*	cheatgrass
grass	*Sporobolus cryptandrus*	sand dropseed
forb	*Artemisia dracunculus*	tarragon
forb	*Artemisia filifolia*	sand sage
forb	*Artemisia ludoviciana*	Louisiana wormwood
forb	*Asclepias latifolia*	broadleaf milkweed
forb	*Baileya multiradiata*	desert Marigold
forb	*Cirsium ochrocentrum*	yellow-spine thistle
forb	*Cucurbita foetidissima*	buffalo gourd
forb	*Cuscuta* sp.	Dodder
forb	*Dalea candida*	white prairie-clover
forb	*Datura quercifolia*	oak-leaf thorn-apple
forb	*Datura wrightii*	sacred thorn-apple
forb	*Descurainia sp.*	mustard
forb	*Dieteria canescens*	smooth purple aster
forb	*Grindelia squarrosa*	curlycup gumweed
forb	*Gutierrezia sarothrae*	broom snakeweed
forb	*Helianthus petiolaris*	prairie sunflower
forb	*Ipomea purpurea*	wild morning glory
forb	*Melilotus alba*	white sweetclover
forb	*Mentzelia multiflora*	Adonis blazingstar
forb	*Oenothera suffrutescens*	scarlet guara
forb	*Polanisia dodecandra*	clammyweed
forb	*Ratibida columnifera*	prairie coneflower
forb	*Rumex hymenosepalus*	sand dock
forb	*Salsola tragus*	tumbleweed
forb	*Senecio flaccidus*	Threadleaf Groundsel
forb	*Solanum elaeagnifolium*	silver-leaf nightshade
forb	*Sphaeralcea angustifolia*	copper globemallow
forb	*Sphaeralcea coccinea*	scarlet globe-mallow

Life Form	Scientific Name	Common Name
forb	*Tribulus terrestris*	puncturevine
succulent	*Cylindropuntia imbricata*	tree cholla
succulent	*Cylindropuntia imbricata*	cane cholla
succulent	*Grusonia clavata*	club cholla
succulent	*Nolina sp.*	beargrass
succulent	*Opuntia phaeacantha*	plains prickly-pear
succulent	*Yucca glauca*	plains yucca
tree/shrub	*Ailanthus altissima*	tree of heaven
tree/shrub	*Atriplex canescens*	four-wing saltbush
tree/shrub	*Brickellia californica*	California brickellbush
tree/shrub	*Elaeagnus angustifolia*	Russian olive
tree/shrub	*Ericameria nauseosa*	rubber rabbitbrush
tree/shrub	*Fallugia paradoxa*	Apache plume
tree/shrub	*Juniperus monosperma*	one-seed juniper
tree/shrub	*Ulmus pumila*	Siberian elm

APPENDIX B. PHOTOGRAPHS

Photograph 2. Erosion from unofficial trails.

Photograph 1. Patch of noxious plant species adjacent to trail.

Photograph 3. Isolated patch of giant reed (*Arundo donax*) supported by stormwater flows.

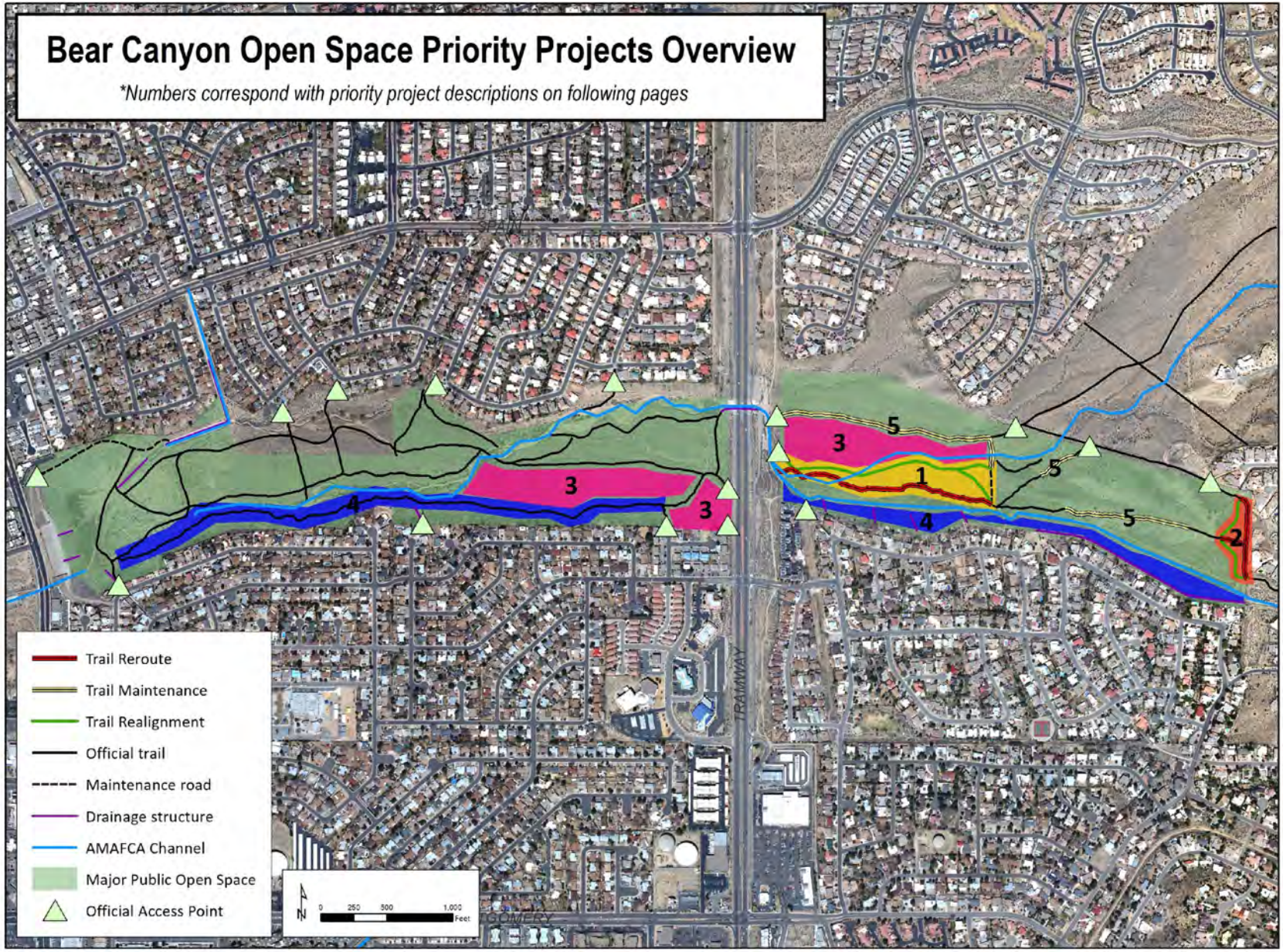
Photograph 6. Erosional feature parallel and adjacent to existing trail.

Photograph 7. Dodder (*Cuscuta* sp.) infested hillslopes.

Photograph 8. Existing stable trail alignment.

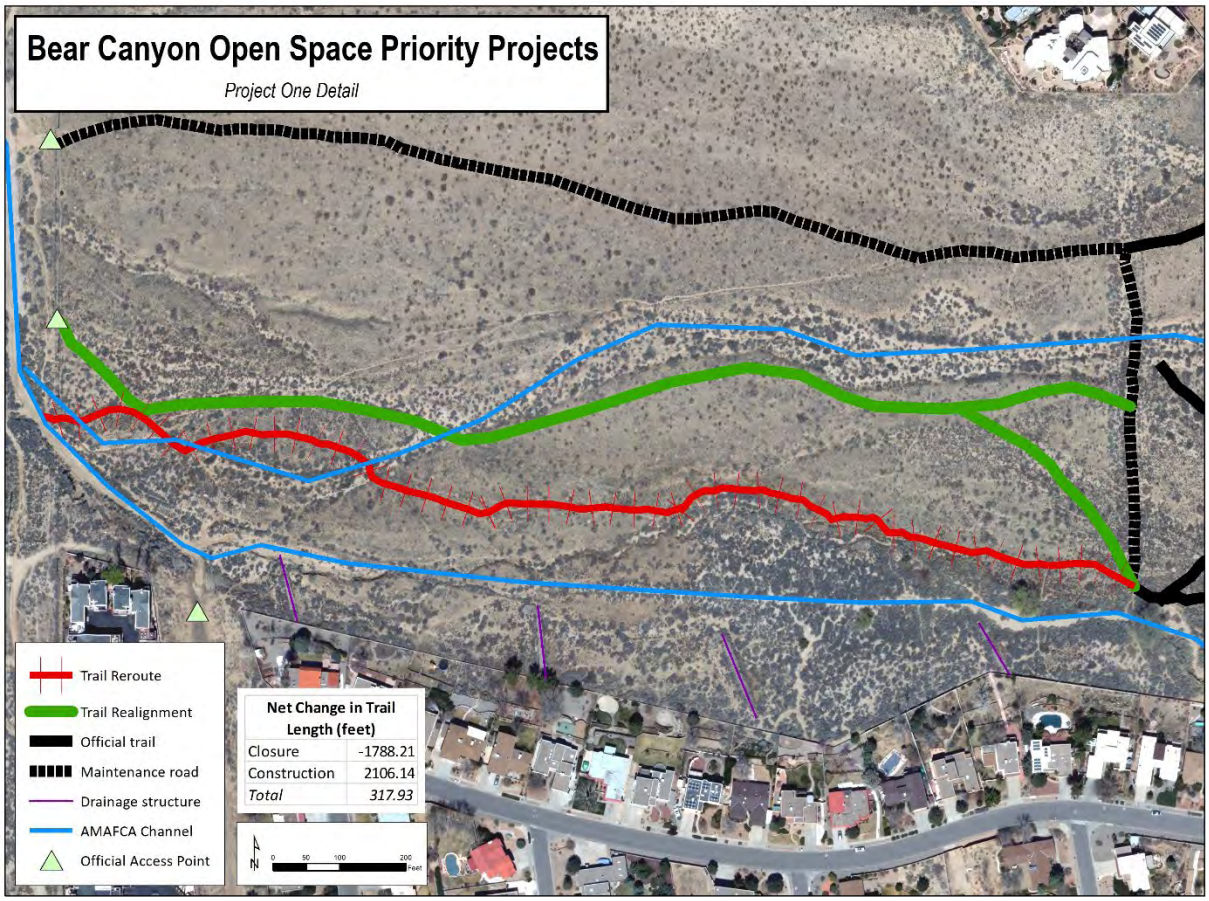
Appendix C: Draft One Proposed Projects

- **Map of project locations**
- **Project 1**


Bear Canyon Open Space Priority Projects Overview
*Numbers correspond with priority project descriptions on following pages
Trail Reroute
Trail Maintenance
Trail Realignment
Official trail
Maintenance road
Drainage structure
AMAFCA Channel
Major Public Open Space
Official Access Point
0 250 500 1,000 Feet
TRAMWAY
1
2
3
4
5

Priority Project One: Trail Reroute (removed since previous draft)
This project was originally identified because sections of the trail have deep ruts and its proximity to drainage will result in future erosion; unsustainable trails such as this require much more maintenance and staff resources than a sustainable trail, and also results in erosion and a negative impact on the surrounding landscape. To construct a completely sustainable trail the entire section would need to be moved to higher ground. Due to public comment opposing this reroute, this project was removed from this plan. However, the OSD will continue to monitor the health of the trail, drainage, and surrounding vegetation annually and may determine a reroute is unavoidable. If that occurs, the OSD will renew discussions on a potential reroute.

Description. Much of the current trail (approximately 1,800 feet in length) running east to west across the southwestern quadrant of BCE is incised or in danger of eroding into the drainage directly adjacent. The first priority identified in this planning effort is the realignment of this trail to a location further north. This realignment will take advantage of natural side slopes to encourage drainage across rather than straight down the trail. It will form a connection between the fence line just to the east of the Tramway entrance and the maintenance road running north to south in the center of BCE. As with all trail realignments constructed by City Open Space, the new trail will be completed before the retired trail is closed and revegetated.



Appendix D: Definitions & Abbreviations

Definitions

ADA: Americans with Disabilities Act of 1990 (Public Law 101-336). This law sets guidelines for accessibility to places of public accommodation and commercial facilities by individuals with disabilities. (*Major Public Open Space Facility Plan*)

Arroyo: a small steep-sided watercourse or gulch with a nearly flat floor: usually dry except after heavy rains (chiefly found in the southwest United States), also referred to as a "wash" or "gulch" (*Facility Plan for Arroyos*)

Corridor: A usually linear area of land, within which an existing public right-of-way or easement exists. Examples of corridors include, but are not limited to, utilities, the movement of people, vehicles, storm water and possibly wildlife. (*Major Public Open Space Facility Plan*)

Invasive Species/Vegetation: Vegetation that does not occur naturally in the area and was introduced by people

Low Impact: Facility development or public use which does not significantly degrade the natural character of an area (*Major Public Open Space Facility Plan*)

Major Public Open Space: Publicly-owned spaces managed by the Open Space Division of the City Parks and Recreation Department, including the Rio Grande State Park (i.e. the Bosque), Petroglyph National Monument, and Sandia foothills. These are typically greater than 5 acres and may include natural and cultural resources, preserves, low-impact recreational facilities, dedicated lands, arroyos, or trail corridors. (*Integrated Development Ordinance*)

Multi-use trail: A separate pathway designated by sign for use by non-motorized traffic only, including pedestrians, bicyclists, equestrians and people who use wheelchairs. Not all trails may accommodate all of these uses. Trails may either be hard or soft surfaced, but all trails within BCOS are primitive, unenhanced dirt paths. (*Major Public Open Space Facility Plan*)

Native Species/Vegetation: Vegetation that occurs naturally in the Southwest. Native vegetation has not been introduced by people (*Major Public Open Space Facility Plan*)

Private open space: Open space for passive or active recreation that is owned, managed, and maintained privately in its natural state and accessible either to the public or to the residents of a subdivision and zoned NR-PO-C (*Integrated Development Ordinance*)

Protected, Undeveloped Open Space: Significant undeveloped or conserved area with outstanding natural features or scenic qualities suitable for passive recreational activities with no substantial facilities or improvements (*Major Public Open Space Facility Plan*)

Semi-natural arroyo: an arroyo that has been stabilized with naturalistic channel treatments described in the *Facility Plan for Arroyos*, designed to blend visually with adjacent open space lands. Appropriate channel stabilization treatments include: ungrouted riprap, gabions, gabion weirs, tinted concrete and soil cement.

Sustainable trail: Recreation or transportation path designed to create minimum impact on the surrounding area and require minimal maintenance by following specific slope, width, and curve guidelines. The OSD follows International Mountain Bicycling sustainable trail guidelines.

Unofficial/user-created trail: Path not sustainably designed or formalized by the Open Space Division

Abbreviations
AMAFCA: Albuquerque Metropolitan Arroyo Flood Control Authority
BCE: Bear Canyon East
BCOS: Bear Canyon Open Space
BCW: Bear Canyon West
COA: City of Albuquerque
DMD: Department of Municipal Development
HDR: High Desert Residential Owners Association
MPOS: Major Public Open Space
NA: Neighborhood Association
NMVFO: New Mexico Volunteers for the Outdoors
OSD: Open Space Division
OSYC: Open Space Youth Corps
RMYC: Rocky Mountain Youth Corps
TWV: Trail Watch Volunteer
USFS: United States Forest Service

Appendix E: References & Data Sources

References

City of Albuquerque.

Albuquerque/Bernalillo County Comprehensive Plan. 2017. www.abc-zone.com.

Bear Canyon Arroyo Trail Corridor Plan. 1991. www.cabq.gov/planning/plans-publications.

Bikeways & Trails Facilities Plan. 2015. www.cabq.gov/planning/plans-publications.

Facility Plan for Arroyos. 1986. www.cabq.gov/planning/plans-publications.

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Major Public Open Space Facility Plan. 1999. www.cabq.gov/planning/plans-publications.

International Mountain Bicycling Association. Trail Solutions: IMBA's Guide to Building Sweet Singletrack. 2004. www.imba.com/resource/trail-solutions.

State of New Mexico. Sandia-Manzanita Mountains Land Use and Recreation Master Plan. 1978.

Data Sources

Albuquerque Metropolitan Area Flood Control Authority
Bernalillo County
City of Albuquerque
New Mexico 911
United States Forest Service