BOULDER RESERVOIR

MASTER PLAN

2012

CITY OF BOULDER

Parks & Recreation

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Executive Summary

A. Overview

The Boulder Reservoir study area includes a total of 1190 acres including 560 acres of water surface located west of the Gunbarrel area in Boulder, Colorado. The Reservoir provides a range of recreational opportunities in an exceptional, natural and visual setting. It is a popular multi-use resource that contributes to the health and well-being of the Boulder community and to the quality of the natural environment.

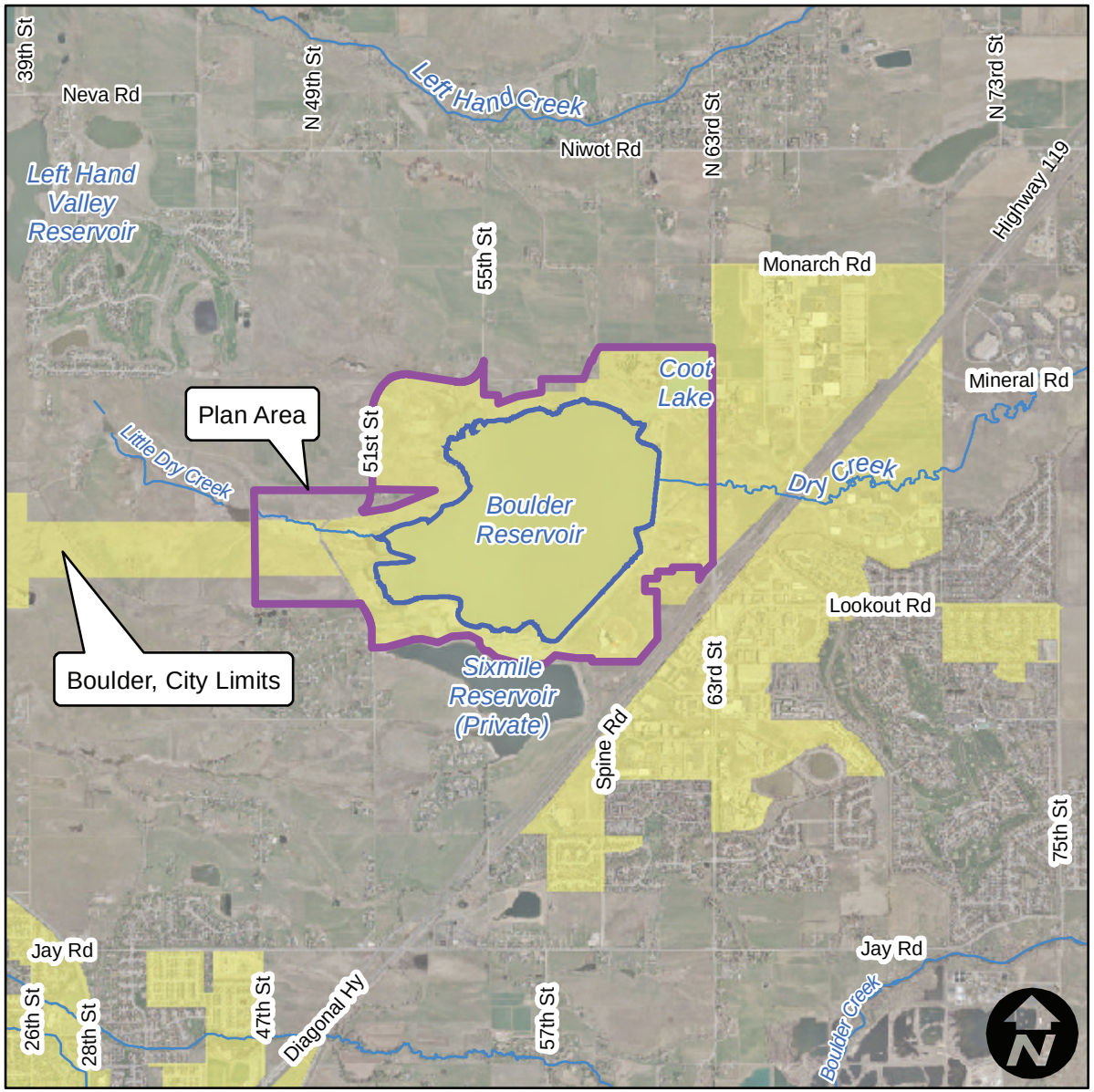
Constructed in the 1950s, the Boulder Reservoir collects and retains water for municipal, domestic, agricultural and industrial uses for members of the Northern Colorado Water Conservancy District (Northern Water). The Reservoir is, first and foremost, a valuable drinking water supply for the City of Boulder. The recreational activities at the Reservoir are supported by the Parks and Recreation Department in a manner that is compatible with the protection and management of the water supply.

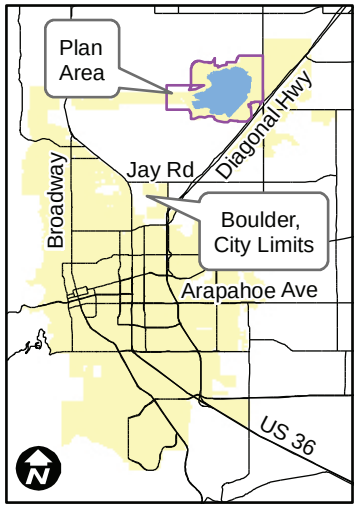
The Boulder Reservoir and Coot Lake are popular destinations with over 300,000 visits per year from people who come to hike, swim, boat, fish, walk dogs, ride bikes, picnic and enjoy the rich diversity of wildlife in the area. Several recreational facilities and services in the Reservoir and Coot Lake areas are provided by the Parks and Recreation Department. The South Shore provides facilities to support year-round water based activities including motorized and non-motorized boating, swimming, water skiing, fishing, wakeboarding and tubing, and land based recreation including picnicking, running, and cycling. A multi-use trail system, including two trailheads and parking lots, supports passive recreational uses of the North Shore and Coot Lake including hiking, dog-walking, biking, nature observation, and picnicking. The West Shore area is known for its extensive wetland and grassland complex that supports a diversity of sensitive wildlife species.

Over the years, the Boulder Reservoir has increased in popularity as a local and regional venue for small and large-scale group and organized events. In 2011, the Reservoir hosted 35 special events which attracted more than 21,000 participants. Special events held annually include triathlons, marathons, concerts and festivals.

The Parks and Recreation Department also sponsors a number of camps, classes and recreation programs at the Boulder Reservoir during the summer months. Classes on canoeing, kayaking, adaptive water skiing for people with disabilities, sailing, sailboarding and boater safety classes are periodically offered. Several community organizations involving rowing, sailing and aeromodeling also use the Reservoir for member activities and events.

Map 1. Vicinity





B. Master Plan Intent

The intent of the Boulder Reservoir Master Plan is to establish the long range vision, goals and objectives for the Parks and Recreation Department managed land and activities for Boulder Reservoir and Coot Lake. The Plan will guide future management and investment strategies by integrating the principles of economic, social and environmental sustainability, including recommendations addressing water quality, natural habitat and recreational uses at Boulder Reservoir.

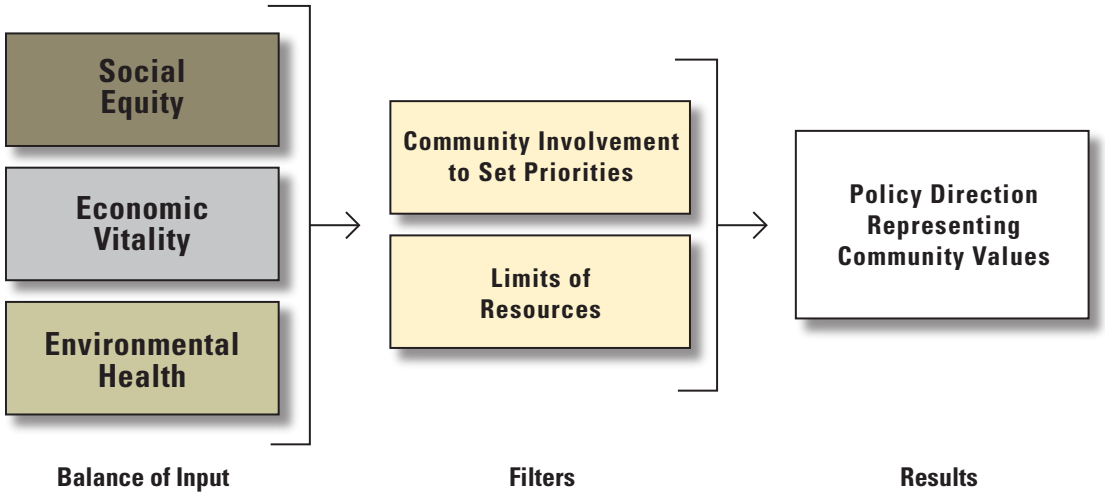
C. Purpose of the Plan

The original Boulder Reservoir Master Plan was completed in 1983. This plan outlined a development plan for the South Shore area and resulted in the creation of the swim beach, picnic area, boating facilities, parking lots and the main office building, which exist today. The master plan has not been updated since 1983, yet community needs and interests have changed, visitor activities in the area have multiplied and existing facilities have aged.

The 2012 Boulder Reservoir Master Plan considers the current recreational uses and provides a road map for balancing recreation, habitat protection and water quality at the Reservoir. The plan establishes management objectives for recreation and wildlife habitat around the Reservoir and is intended to guide future investment strategies and operations for the Parks and Recreation Department (see Figure 1). The plan broadens the scope of the 1983 development plan significantly to outline several actions for improving and expanding the active recreation facilities on the South Shore as well as improving the passive recreation facilities in other areas around the Reservoir. The plan also integrates City goals of protecting water supply and quality and conserving and enhancing valuable wetland and wildlife habitat surrounding the Reservoir and Coot Lake.

The master plan applies the principles of sustainability to the management of the water, recreational and natural resources of this area by integrating City-wide goals of energy conservation and waste reduction in future facility development and improvements. In addition, the plan also supports City and Boulder County alternative transportation goals by acknowledging the need for trail linkages to the regional trail system and promoting multi-modal travel options whenever appropriate.

Figure 1. **Sustainability Program**



Credit: City of Boulder Social Sustainability Strategic Plan

D. Site Management Plan

The Site Management Plan will focus on several areas to further refine the master plan objectives. The Site Management Plan will include all four Management Areas of the Reservoir study area and will address the following topics:

- Site master plan and capital improvement plan
- Program and operational analysis
- Market and visitor capacity analysis
- Detailed sustainable business model and operational plan
- Noise, pollutant and safety assessment
- Biological species inventory
- Traffic impact analysis and transportation alternatives assessment
- Adaptive management thresholds and monitoring program

The Site Management Plan will result in a physical site master plan illustrating, among other things, designated passive and active use areas, building footprints, natural habitat protected areas, recreational areas, trail alignments, parking areas and possible shuttle service access points, landscape and park amenity improvements.

Chapter 1.

Introduction

A. Vision and Goals

The Boulder Reservoir Master Plan vision and goals were crafted from input gathered in public, board and City Council meetings and through user surveys and focus groups discussions. The vision and goals provide the framework for the actions outlined in this plan.

Vision

Recognizing that the Boulder Reservoir is first and foremost a source of clean water and valuable natural resources, the community envisions a Reservoir where high quality and appropriate recreation activities are managed and sustained in a manner consistent with preserving and enhancing the environment.

Goals

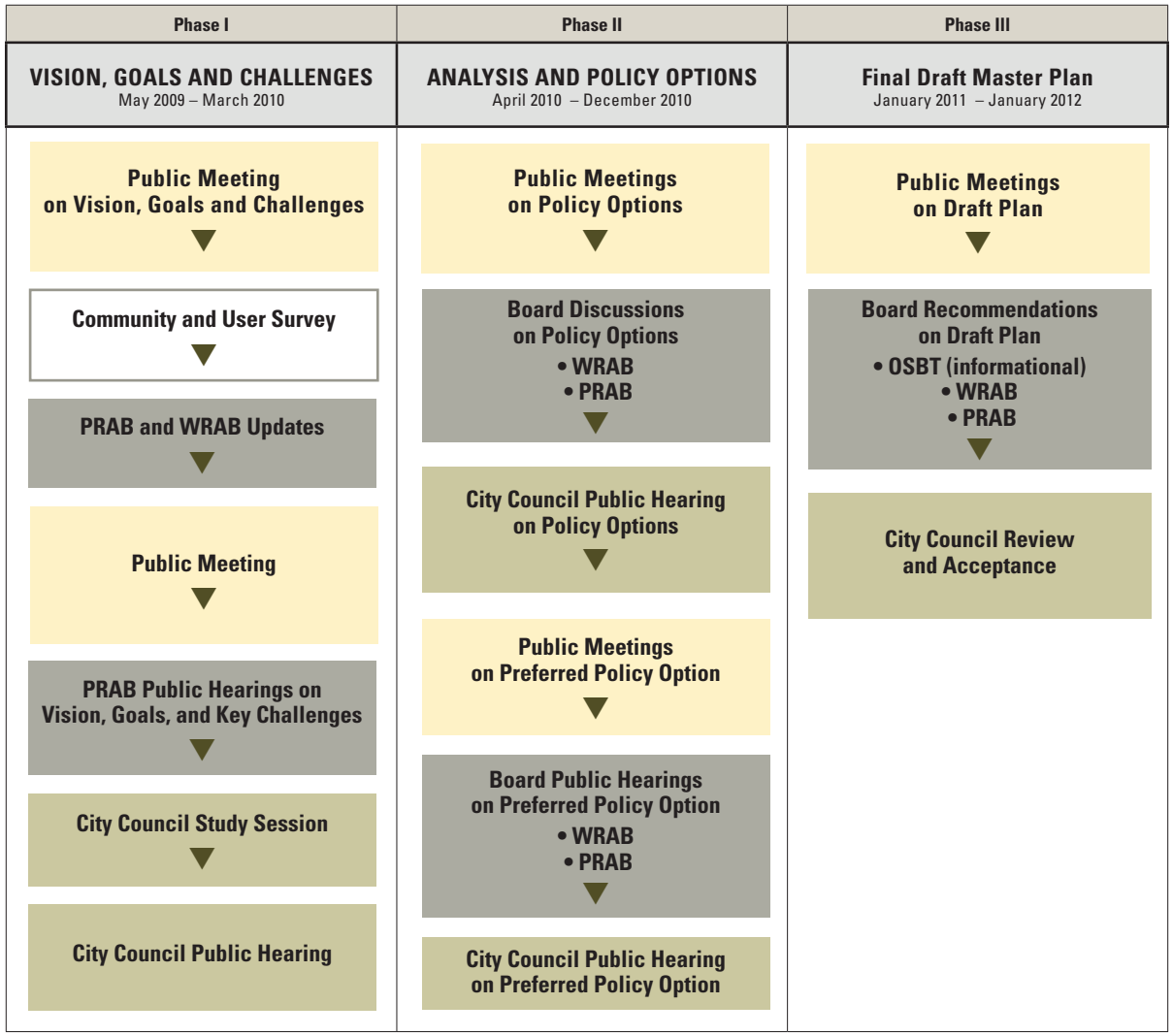
1. Support City sustainability objectives at the Reservoir.
   - Waste reduction
   - Carbon emissions reduction
   - Water conservation
   - Reduction of single occupancy auto trips through encouragement of alternative transportation options and management of parking
2. Provide for a range of high-quality recreational uses, events, facilities and services that are inclusive of the community.
3. Identify sensitive wildlife and plant species and protect, enhance and restore their natural habitat.
4. Develop and implement strategies and partnerships to reduce and manage the risks of **Aquatic Nuisance Species** (ANS) infestations.
5. Identify and minimize water pollutant sources.
6. Promote and support visitor safety.
7. Develop and implement a business model for long-term sustainable management of the Reservoir, including the use of public/private partnerships.
8. Endeavor to be a good neighbor to adjacent properties.
9. Promote visitor and community awareness and stewardship of the Reservoir through ongoing education and outreach.
10. Ensure the security and maintenance of the facilities and infrastructure in the Reservoir area.
11. Collaborate with other agencies and departments to accomplish mutual goals.

B. Community Involvement

The Boulder Reservoir Master Plan was developed over three phases involving numerous public meetings, study sessions and public hearings.

The community engagement process identified a wide range of participants, including Reservoir visitors, recreation and wildlife organizations, the Parks and Recreation Advisory Board (PRAB), the Water Resources Advisory Board (WRAB) and City Council. Community input was received through **focus groups, a user survey,** open houses, workshops, e-mail and public hearings. The Parks and Recreation Department created and continues to maintain a project website as well as an e-mail list with over 300 recipients. These measures kept the public informed and solicited input as plan elements develop over time. The department has received more than 400 comments on various aspects of the plan.

Figure 2. Community Engagement Process



C. Community Trends and Key Challenges

The Reservoir is a popular asset to the community and presents numerous opportunities for meeting community goals in a sustainable way. However, a growing population in the Boulder Valley may likely lead to an increase in demand for recreation facilities and services especially for those areas in close proximity to population centers. Increased user demand combined with aging facilities, threats from invasive plant and animal species around the Reservoir, and growing budgetary constraints pose challenges for the Parks and Recreation Department.

The Parks and Recreation 2006 Master Plan describes key demographic trends in Boulder County and their implication for recreational services. A key trend affecting management of the Reservoir is an expected increase in the population of the City and the County. By 2030, the City's **population** (Areas I and II) is projected to grow from the current estimate of 113,000 to 130,000.

As population in the region grows, demand for new and expanded recreation opportunities will likely increase requiring additional resources to manage recreational uses at the Reservoir in order to minimize conflicts between uses and habitat resources. A growing and changing Boulder County population is anticipated to result in increases in the following matters related to the Reservoir.

- Visitation and demand for recreational services and facilities.
- Conflict among users and need for more safety, educational outreach and enforcement services.
- Traffic along the access roads and main entries.
- Maintenance needs.
- Impact to natural resources.

There are six management entities in the Boulder Reservoir area with different management roles and missions, that include four departments in the City of Boulder, Northern Water, and Boulder County Department of Transportation.

D. Ownership and Management

City of Boulder

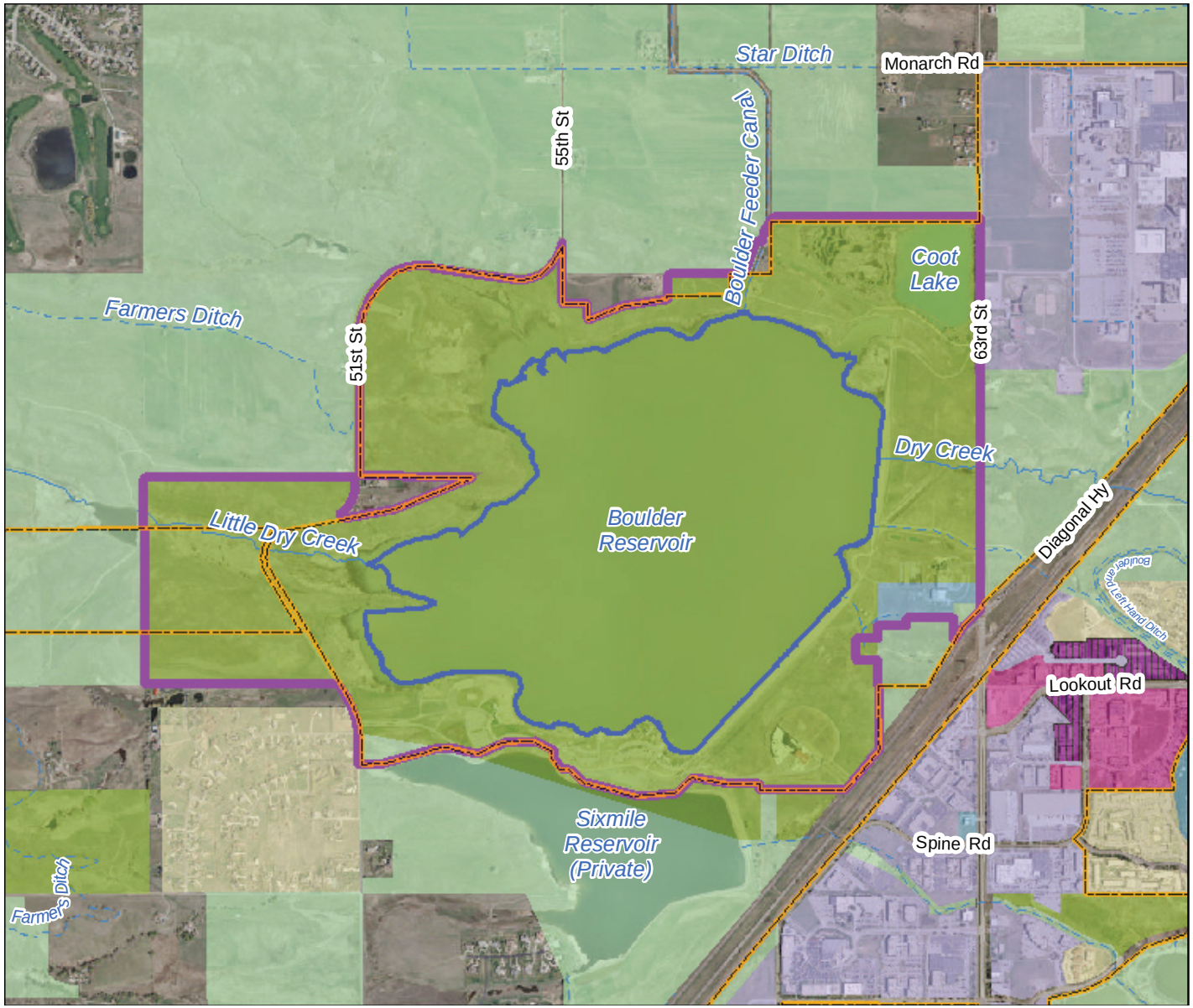
Parks and Recreation Department

The Parks and Recreation Department owns a total of 81 acres in fee on the South Shore and West Shore and manages the majority of the land in the Boulder Reservoir area for active and passive recreation and wildlife and habitat conservation.

Public Works Department

The Public Works Department, Transportation Division maintains 63rd street from the Diagonal Highway to Monarch Road. The Public Works Department, Utilities Division (Utilities) owns the majority of the immediate land around the Reservoir and is responsible for providing safe drinking water for the City. All roads, infrastructure and buildings associated with the Boulder Reservoir Water Treatment Facility are managed and maintained by Utilities. According to operating agreements between the City and Northern Water, the City is responsible for maintaining all land above the high water line in the Reservoir, or more specifically above an elevation of 5,183 feet (with certain exceptions, see below). This responsibility has traditionally

Map 2. Land Use



Land Use

- Residential
- Business
- Industrial
- Mixed Use
- Open Space
- Park, Urban and Other
- Public

- Plan Area
- Boulder Reservoir
- City Limits
- Creek
- Ditch

N

0 0.25 0.5 Miles

fallen on Utilities, if maintenance is not specific to, or in the purview of the Parks and Recreation Department, Open Space and Mountain Parks Department, or Fire Department activities.

Open Space and Mountain Parks Department (OSMP)
The OSMP owns and manages several hundred acres of property to the west, north and east of the Boulder Reservoir area. A small, 18-acre parcel of City open space is located immediately south of the Boulder Reservoir Water Treatment Facility (WTF). This property is managed by OSMP for its wetland and grassland habitat values and falls outside the Boulder Reservoir study area.

Fire Department
The Boulder Fire Training Center is situated on 12 acres in the South Dam area. The purpose of the center is to support the training of regional fire fighters in the basic skills to respond to emergencies. The facilities include an education and administration building, garage, burn building, training tower, driving pad and pavilion. Access to the center is through the Reservoir's South Shore entryway on 51st Street.

Northern Water
Although the City owns the dams, facilities and underlying land, Northern Water manages and operates the water supply storage and delivery facilities. Northern Water's primary responsibility is to supply members of the district with raw water for irrigation, municipal, domestic and industrial use. Northern Water has rights to use approximately one-third of the total capacity of the Reservoir and the City of Boulder has rights to the remaining capacity.

Northern Water delivers the City's share of water to either the WTF intake structure on the Boulder Feeder Canal or directly to the Reservoir. Water conveyed through the Reservoir for other members of the district is delivered through the north dam outlet works to the Boulder Creek Supply Canal.

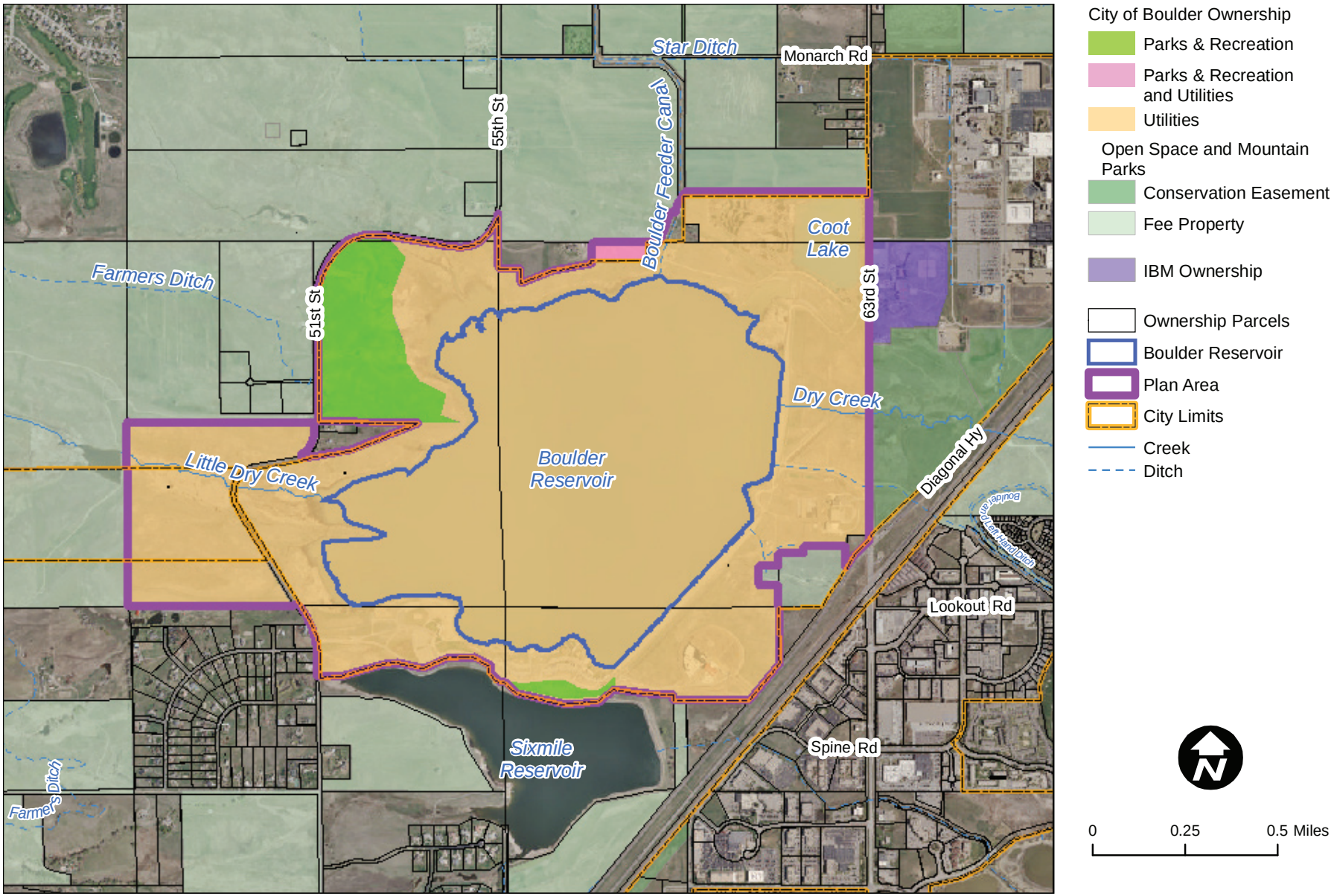
Northern Water has exclusive and sole control of the use, occupancy, operation and maintenance of certain lands around the Reservoir and within these areas only specific uses are allowed. These use restrictions have affected the present land use pattern at the Reservoir. The areas under sole control by Northern Water include the following:

1. Boulder Feeder Canal Inlet Area and a 30 foot buffer on either side of the canal from the inlet north, including the access road.
2. The parcel of land to the east of the north dam and west of 63rd Street (North Dam management area), including the spillway.
3. The parcel of land within the Reservoir which lies below the high water line or, more specifically, below an elevation of 5,183 feet.

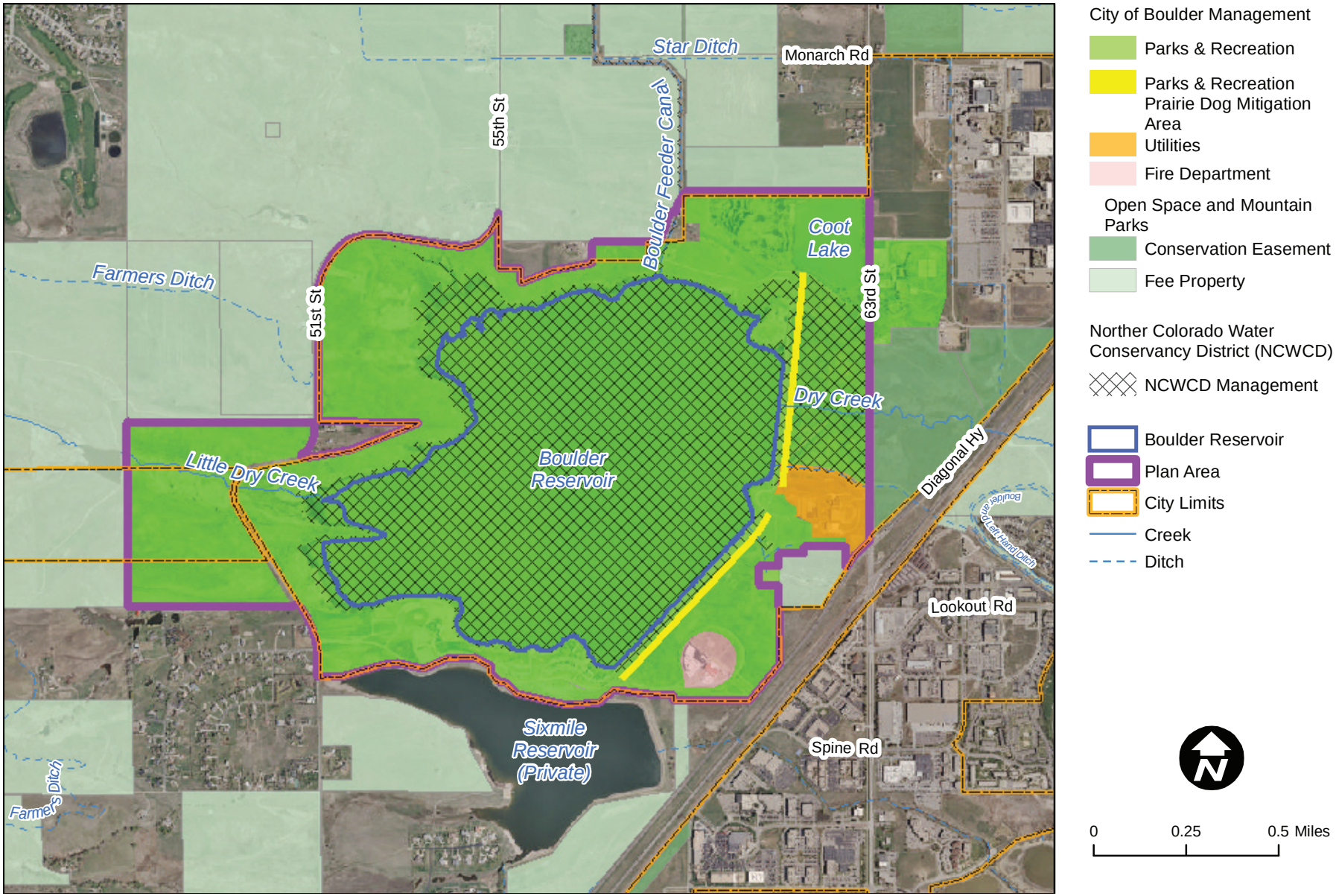
Through a series of agreements, Northern Water and the City of Boulder have established an understanding of how to mutually handle a variety of issues that affect Northern Water's operations on City-owned land and facilities. These agreements limit the extent of recreation access and public use of certain areas around the Boulder Reservoir and make all recreational use at the Reservoir subordinate to the primary use of the Reservoir for irrigation, municipal, domestic and industrial purposes. For instance, while public pedestrian and bicycle use is allowed on the maintenance and access roads in the North Shore area and along the dams, vehicular access by the general public is not permitted. In addition, the City must obtain approval for any facilities including trails and bridges, built in areas controlled by Northern Water.

Boulder County Department of Transportation
Boulder County maintains 51st Street and associated rights-of-way and has authorization to issue permits or allow closures for any special events along these roads.

Map 3. Ownership



Map 4. Agency Responsibility



E. Relationship to Other Plans

Boulder Valley Comprehensive Plan (2011)

The Boulder Valley Comprehensive Plan provides the general statement of the community's desires for future development and preservation of the Boulder Valley. The plan policies guide decisions related to City services and create the overarching framework for individual department master plans. Department master plans address policies, priorities, service standards, system needs and funding for the delivery of specific services.

Parks and Recreation Department Master Plan (2006)

The Parks and Recreation 2006 Master Plan identifies investment priorities guided by community input, the Parks and Recreation Advisory Board and City Council. Investment priorities are based on the City's business plan and the department's financial situation. Investment priorities for recreation facility development are prioritized based on needed improvements within a fiscally constrained funding level and leveraging existing infrastructure and resources by investing in revenue producing facilities such as the Reservoir. The department's master plan also includes a number of goals, including the need to prepare management plans for all developed and undeveloped park lands, and natural areas.

Recreation Programs and Facilities Plan (2010)

The Parks and Recreation Department's Recreation Programs and Facilities Plan was completed in September 2010. The goal of the plan is to guide future decisions and resource allocation for Boulder's recreation needs. The plan includes an assessment of recreation trends and issues, local demographics, and recommendations for recreation programs, services and facilities. Several of the recommendations in the Recreation Programs and Facilities Plan pertain to and guide the Boulder Reservoir Master Plan.

Open Space and Mountain Parks Department Visitor Master Plan (2005) and Grassland Ecosystem Management Plan (2010)

Over the past decade, the Open Space and Mountain Parks Department (OSMP) has developed a series of management plans to clarify how the City of Boulder will manage OSMP properties and deliver community services, including sustainable natural resource conservation and passive recreation. In 2005, the City Council accepted the Visitor Master Plan, which outlines the vision and strategies for providing sustainable recreational activities and facilities. The Grassland Ecosystem Management Plan (Grassland Plan) focuses upon the conservation of the 24,000 acres of land dominated by mixed grass and xeric tall grass prairie. The Grassland Plan is intended to provide a framework for on-the-ground management actions, public policies and land and water acquisition priorities to conserve the ecological values of Boulder's grasslands and ensure ongoing agricultural production. The Grassland Plan applies to extensive City open space surrounding the Boulder Reservoir.

Coordination and collaboration between the OSMP and the Parks and Recreation Department on trail and trail head development and location, as well as weed, wildlife, grassland, and wetland management will be important in attaining mutual departmental goals and objectives.

Source Water Master Plan (2009)

The Source Water Master Plan documents the current status of the City's water resources and raw water facilities and defines key issues addressing the City's future water supply needs. The Source Water Master Plan recommends capital improvement projects, programs and studies while providing a framework for sustainable management of the City's source waters to ensure that future water supply needs are met through drought periods without violating adopted reliability criteria. The master plan endorses the need to collaborate with all stakeholders in the Boulder Reservoir basin to develop and implement source water protection strategies such as active and passive recreation planning and Aquatic Nuisance Species (ANS) management.

Water Quality Strategic Plan (2009)

The Water Quality Strategic Plan outlines water quality goals, strategies, priorities and performance measures for the Water Quality and Environmental Services Group, which is part of the Public Works Department, Utilities Division. Water Quality staff participation in the Boulder Reservoir Master Plan process has integrated water quality goals into the plan.

Boulder Reservoir Development Master Plan (1983)

The purpose of the plan was to develop an existing facility analysis, examine program development, create a functional organization of uses, determine recreational use suitability and explore alternatives. The main focus of this plan was on the South Shore.

Urban Wildlife Management Plan
Black-Tailed Prairie Dog Component (2006)

The purpose of this plan is to understand the context, benefits and conflicts posed by urban wildlife and to outline a plan for the management of individual species or groups of species. Since most wildlife/human conflicts in the urban area occur out of the context of the natural ecosystem of that species, most urban species management will be addressed on a species by species basis. Where appropriate, the plan will address the management of species on an ecosystem level.

Climate Action Plan (2002)

The overarching vision of the plan is to develop a sustainable energy future for Boulder and Boulder County. The Climate Action Plan provides a framework to compare and analyze alternative strategies and policies, in order to facilitate Council's review and the decision-making process. The plan includes baseline data and emissions reduction strategies for all sectors - commercial, industrial, residential, transportation, and solid waste. It also addresses City operations, water conservation and urban forestry.

Master Plan for Waste Reduction (2006)

This Master Plan for Waste Reduction contains goals, objectives, and policy guidance for waste reduction and recycling programs. In addition, it outlines an investment strategy for waste reduction programs in Boulder.

Transportation Master Plan (2008)

The Transportation Master Plan (TMP) is the City's long range blueprint for travel and mobility. The goal is to create an innovative and balanced transportation system that sustains the quality of life valued by Boulder residents, employees and visitors. The TMP covers all forms of personal travel - walk, bike, bus, and automobile.

Boulder Reservoir Wildlife Habitat Impact Study (1993)

The study was commissioned to examine wildlife habitat at the Boulder Reservoir and potential conflicts with recreational users. The goals of the study were to:

- Map roosting and foraging areas for wintering raptors.
- Map nesting areas for raptors and other species of special concern.
- Compile a comprehensive list of breeding bird species at Boulder Reservoir.
- Develop management recommendations for wildlife habitat at the Reservoir.

Chapter 2.

History of the Boulder Reservoir

A. Introduction

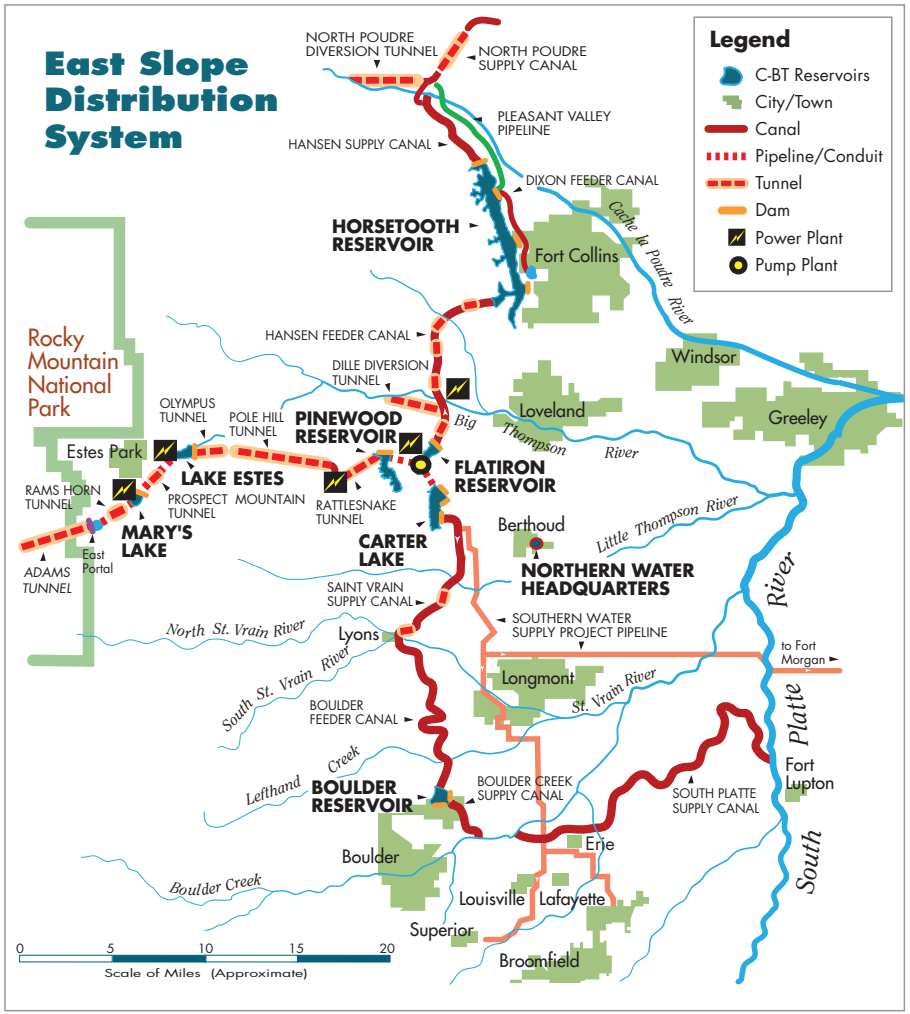
The Northern Colorado Water Conservancy District (Northern Water) was formed in 1937 as a result of severe and long-term water shortages caused by the drought of the 1930s. The purpose of the Northern Water was to develop, manage and operate a supplemental water supply project to protect water users in the northern Colorado region. The project is known as the Colorado-Big Thompson (CBT) Project, which delivers water from the headwaters of the Colorado River to water users in northeastern Colorado for agricultural, municipal, domestic and industrial uses as a supplemental supply to native basin water supplies.

The CBT Project is the largest trans-mountain water diversion project in Colorado. Built between 1938 and 1957 at a cost of $150 million, the CBT Project provides "supplemental" water to 30 cities and towns in northeastern Colorado. The project stores water from the Colorado River headwaters in a series of reservoirs on the western slope of the Continental Divide. Water is transported, via the 13-mile Alva B. Adams Tunnel, through the mountains to Northern Water's eight-county service area on the eastern slope. Boulder Reservoir is the southern terminus of the CBT Project.

The term "supplemental" refers to the fact that native water (water from local watersheds on the eastern slope) was historically available and used on the lands within Northern Water boundaries and the CBT water

Map 5. Colorado-Big Thompson

Courtesy:
Northern Water



supplements the historical supply. In addition to providing supplemental water for municipal, domestic, and industrial uses, CBT water is used to help irrigate approximately 693,000 acres of northeastern Colorado farmland. The CBT Project delivers, on average, 213,000 acre feet of water annually to northeastern Colorado.

The City of Boulder annexed to Northern Water in 1953 to ensure it had sufficient water supplies to meet municipal and agricultural water demands. The terms and conditions of annexation to the district were originally detailed in a 1953 agreement and later modified through a series of agreements. As conditions of annexation to Northern Water, the City was required to back-pay assessments from 1938-1953, build Boulder Reservoir (initially called Twin Lakes Reservoir) and provide Northern Water with capacity in the Reservoir to store and deliver water to users in the southern part of the district.

B. Development of the Boulder Reservoir

The City began acquiring land for the Reservoir in the 1950s and issued utility revenue bonds to fund the construction. The first parcel of land was purchased from the Axelson family's dairy farm. The City began construction on May 1, 1954 and finished in April 1955. The size of the Reservoir is currently 13,100 acre-feet with approximately one-third of the capacity reserved for Northern Water and two-thirds reserved for the City. The Reservoir was originally built to store agricultural and industrial water for downstream CBT users and to provide a source of municipal "exchange" water for the City. The City did not intend to directly treat its CBT water for municipal use, rather it "exchanged" the CBT water for Boulder Creek water that could be treated at Betasso Water Treatment Facility. "Exchange" refers to meeting water demands of downstream users through delivery of an alternate water source, such as CBT water, so that the City may divert Boulder Creek water when it otherwise would not be able to do so. Over time, population growth increased water demand and necessitated the construction of the Boulder Reservoir Water Treatment Facility in 1975 to satisfy peak day demands in the summer that could not be met through the Betasso Water Treatment Facility.

Although the City owns the dams, facilities and underlying land at the Boulder Reservoir, Northern Water controls, operates, and maintains the infrastructure, including the dams, Boulder Feeder Canal and spillway, for water supply storage and delivery. The Parks and Recreation Department maintains the land and facilities related to the recreational use of the Reservoir area.

The Boulder Reservoir area, the water treatment facilities, as well as several hundred acres of open space land in the north portion of the Boulder Valley were annexed in the 1970s and 1980s as part of an effort to bring the IBM Corporation property, east of the Reservoir, into the City and provide it with City services.

Photos Courtesy of- ***Boulder Public Library : Carnegie Branch Library for Local History.***

C. Boulder Reservoir as a Recreational Amenity

Like the majority of the reservoirs in the CBT system, the Boulder Reservoir has always been used for recreation. Though the Reservoir's initial purpose was the storage of irrigation and municipal water, it quickly became the region's most popular destination for boating, swimming and fishing. Under the operations and maintenance agreement with Northern Water, it was established that the Reservoir could be used as a recreational facility but that recreation would be subordinate to water quality, supply, and storage.

During the first 4th of July celebration held at the Reservoir in 1955, more than 1,400 cars paid the 25 cent admission fee to picnic, swim and enjoy the festivities. That August, the first boating licenses were sold. Over the years a variety of site amenities were added, including a concession area, boat launch, guard stations, boat storage and rental, and outhouses. By the early 1980s, the initial facilities had fallen into disrepair and visitor use of the facilities had increased beyond the capacity.

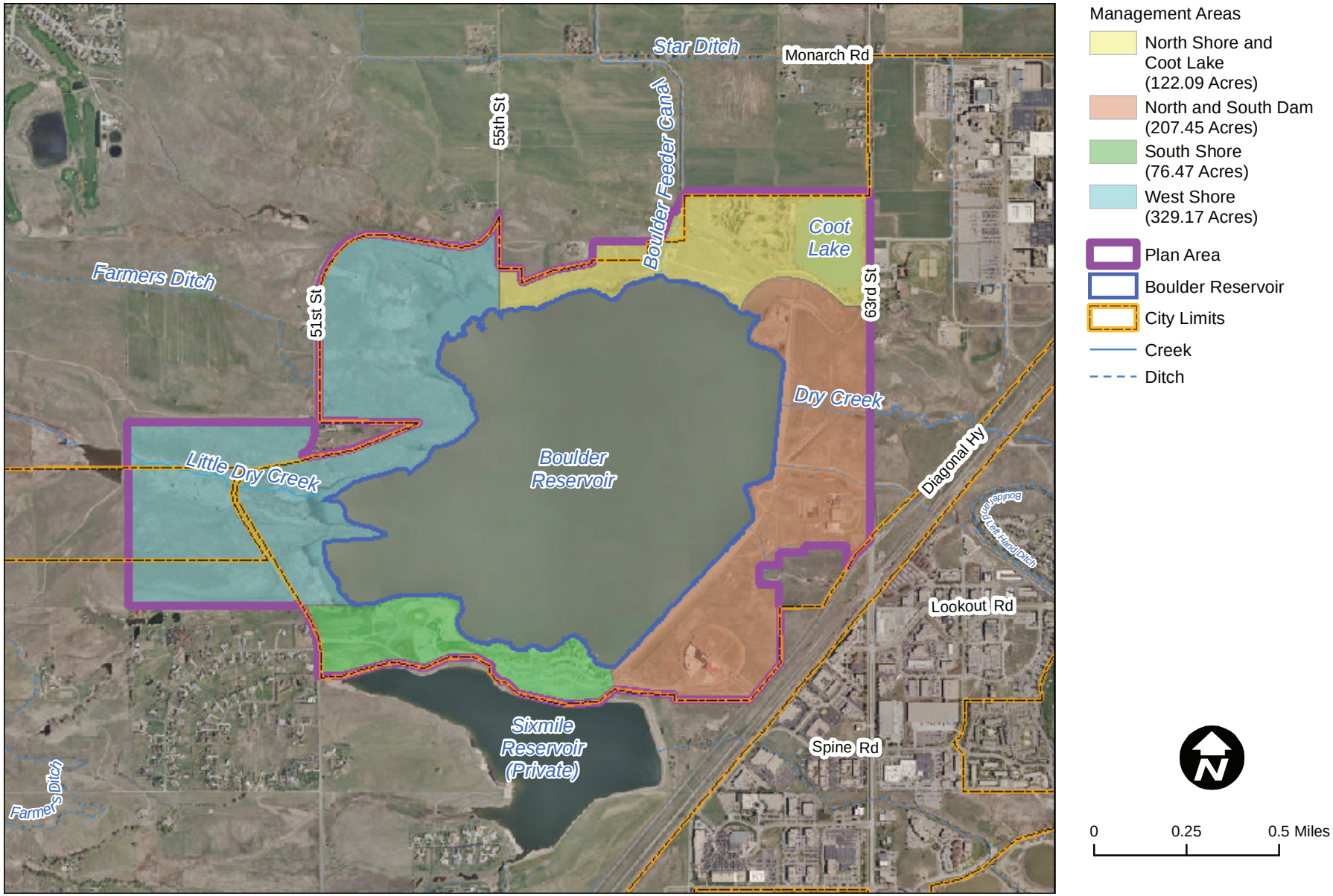
In reaction to community demand for facilities at the Boulder Reservoir, a parks bond issue was passed by City residents in November 1981 that provided $2.4 million for the development and improvement of the facilities on the South Shore. After passage of the initiative, the Boulder Reservoir Development Master Plan was initiated to investigate alternative master planning approaches for the redevelopment of the boat, swim and picnic facilities. Shortly after the plan was approved in January 1983, the swim beach was moved to its present location toward the more protected southwest "corner" of the Reservoir and the facility received its first running water (provided through the Left Hand Water District) along with many of its current structures.

Coot Lake, a twenty-five acre water body located northeast of the Reservoir, was the original borrow pit for earth needed to construct the dams at the Reservoir. Due to the natural flow and elevation of ground water in the area, the pit filled with water and remains a popular place for recreational activities and is a wildlife preserve. From 1955 until 1983, the Parks and Recreation Department provided basic facilities for health and safety at Coot Lake including portable toilets, parking, and trash cans. In the late 1990s, a pit toilet, parking lot, ADA accessible pier, trails, benches and interpretive signage were installed.

Chapter 3.

Management Areas

Map 6. Management Areas



A. Management Areas

The Boulder Reservoir consists of the following four management areas which provide the framework for recreation facility improvements and services described in the master plan:

- South Shore
- North Shore and Coot Lake
- West Shore
- North and South Dams

Table 1. Management Area Overview

Management Area	Estimated Area (acres)	Type of Use	Access	Habitat Quality
South Shore	*76*	*Active Recreational*	*Full*	*Low to Moderate*
North Shore & Coot Lake	*122*	*Passive Recreational/Natural*	*Limited*	*Moderate to High*
West Shore	*329*	*Passive Recreational/Natural*	*Limited*	*High*
North and South Dams	*207*	*Utility Dam Structure*	*Limited*	*Moderate*

B. South Shore

Uses and Activities

The South Shore of the Boulder Reservoir is a primary Boulder Valley destination for water-based recreational activities. Although recreation occurs year-round, visitation is highest during the summer months when the beach, concessions and boathouse are in operation. Daily summer activities include boat rentals (small craft), swimming, sun-bathing, running, walking, picnicking, biking, beach volleyball and fishing. From October through March, the South Shore is mostly frequented by runners, dog-walkers, cyclists and some boaters. Special events are also held in the winter on the South Shore.

Picnics and Swimming

The South Shore offers a number of facilities to support and enhance swimming, picnics and other group events. Thirteen picnic sites, accommodating as many as 1,000 people, are available and can be reserved in advance for planned events. The picnic sites are available for group picnics such as corporate parties, family reunions, weddings and birthday parties. The South Shore facility also provides a snack food concession, a seasonally guarded swim beach, restrooms, showers, volleyball courts, and horseshoe pits. Picnics or other planned activities that are expected to draw at least 50 participants must obtain permits from the Parks and Recreation Department prior to the event.

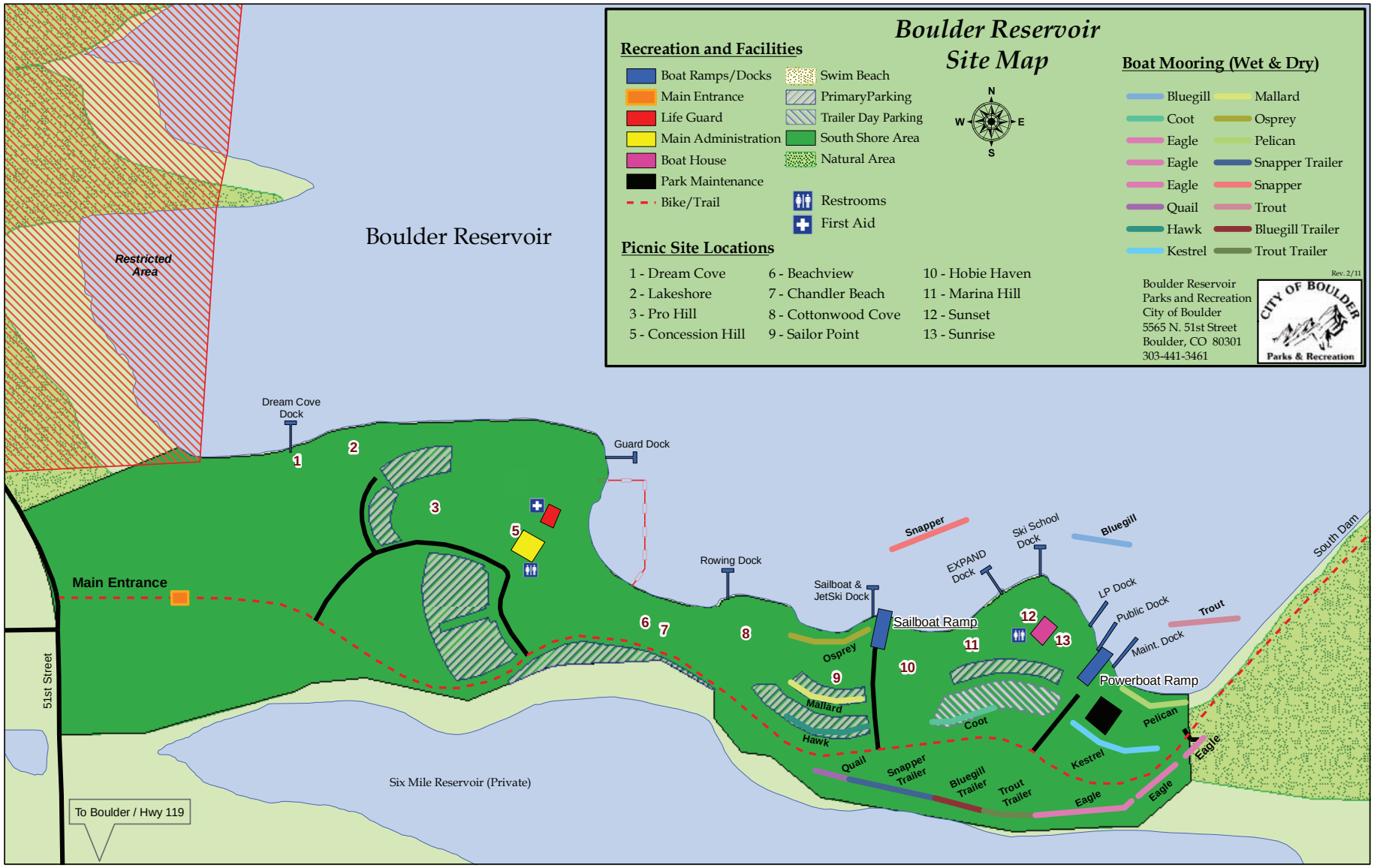
The swim beach is open on a daily basis from early May to Labor Day when lifeguards are on duty. Open water swimming is periodically allowed at designated times in the summer months. Swim groups of 10 or more people require a reservation to ensure staffing levels are adequate.

Boating

Boating has been a popular activity at the Boulder Reservoir since it was first opened to recreational use in the 1950s. Boating at the Reservoir includes the use of large water craft, such as powerboats and sailboats, and small craft such as sailboards, wakeboards, canoes, kayaks, paddle boats and kite boards. Personal Water Craft are allowed to use the Reservoir on a limited basis.

While boating at the Reservoir takes place year-round, the majority of the boating activity occurs May through October when most of the South Shore facilities are in service. Limited services are available for boating throughout the year including dry and shore moorings, boat ramp access and Aquatic Nuisance Species (ANS) inspection.

Map 7. South Shore Site Map



To manage the multiple boating uses on the Reservoir, various boating policies, rules, and regulations have been developed to ensure water quality standards, and to minimize the conflicts among users. A Boulder Reservoir **boating permit** is required for all watercraft using the Reservoir – including sailboats, power boats, kayaks, canoes, kite boards, sail boards and paddle boats. "No wake" periods are regularly scheduled during the week to accommodate the interest of non-motorized boaters.

Camps, Programs and Classes

The Parks and Recreation Department organizes and sponsors several water sports programs, classes and summer camps at the Boulder Reservoir for children, teens and adults. Summer camps for children include instruction in water sports such as swimming, sailing, canoeing, kayaking and windsurfing. City-sponsored programs are popular with the community for learning and enjoying water sports and are a source of revenue for the department. Expanding and enhancing these recreational opportunities will be important in development of a sustainable business model for the Reservoir.

Special Events

The Reservoir is a popular regional venue for large and small scale special events, including triathlons and marathons, races for people and dogs, and concerts and festivals. Special events are planned activities (for-profit or not for profit) involving 50 or more participants that are open for participation (with or without a fee) to the general public. "Signature Events" are those special events involving 1200 or more participants or requiring public entryway or high use area restrictions or closures (e.g. gate or boating closures). In 2011, the Reservoir hosted 35 events which attracted more than 21,000 participants to the Reservoir.

A **permit** is required to organize, promote or stage a special event at the Reservoir. All special events involving the multi-use trail system around the Reservoir must be planned to begin and end at the South Shore to minimize impacts on daily visitor use in the North Shore and Coot Lake area and at Tom Watson Park. Special events may take place using the South Shore area, the water, and/or on the multi-use trail system around the Reservoir. On the West Shore, special events must remain on designated trails or roadways (with permission from the Boulder County Transportation Department).

Commercial Use

Several local businesses and organizations use the Boulder Reservoir facilities for non-public events, classes and programs. In general, the Reservoir recreation facilities are for the public good and were not built for private profit. Any activity requiring a fee, charge, purchase of goods or services, donation for the service or as a condition of participation is considered a commercial use and must be permitted by the Parks and Recreation Department. Instruction programs, athletic or sports company events, outdoor guide services, clubs, dog walking for a fee, environmental education courses or any other activities conducted for monetary gain are considered a commercial use.

Facilities and Services

The South Shore currently provides several facilities to support both water and land-based activities. Many facilities and services have been developed over the past thirty years to support a variety of active and passive recreation uses. Most of the South Shore facilities were built in the 1980s to implement the Boulder Reservoir Development Master Plan adopted in 1983.

There have been limited renovations to the original structures on the South Shore, which are aging, outdated and, in some cases, inadequate in meeting current demand and current building requirements. As use of the Reservoir increases, there is a need for increased operations and maintenance services, renovation and refurbishment of existing facilities and construction of new facilities to replace aging ones. Refurbishment and replacement of South Shore buildings presents an opportunity to meet the City's green building requirements and to incorporate renewable energy sources, water quality best management practices and water conservation measures in redevelopment of the site.

Future Challenges

The Parks and Recreation Department faces challenges in the near term in providing the necessary funding for capital improvements and ongoing operations to maintain and improve the quality of the recreation facilities and services provided on the South Shore. Budgetary challenges include insufficient revenues, lack of stable long-term funding, and the expiration of sales taxes that support the department. Maintaining and increasing revenues from activities at the Boulder Reservoir is critical to both maintaining the facilities at the Reservoir and the financial future of the department.

C. North Shore and Coot Lake

Uses and Activities

The North Shore and Coot Lake are popular regional destinations for visitors seeking passive recreation opportunities in a quiet, peaceful setting with wide-open views of the Boulder Valley. The recreational uses in the North Shore and Coot Lake area include hiking, wildlife viewing, dog-walking, bicycling, horseback riding, running, and fishing. Swimming and watercraft launching are not allowed on the North Shore or in Coot Lake.

Passive recreation is managed to minimize impacts to the abundant wildlife habitat in the area and to promote water quality in the Boulder Reservoir and Coot Lake. Consequently, the Boulder Reservoir area has become a popular destination for wildlife viewing and bird watching. The Audubon Society and the Boulder County Nature Association periodically monitor bird species of special concern and provide the Parks and Recreation Department with ongoing monitoring data and information about changes and trends.

The North Shore and Coot Lake area is a very popular destination for people to walk their dogs and for dogs to swim in either water body. Dogs are permitted on designated trails along the North Shore and in Coot Lake throughout the year if in compliance with the City's **Voice and Sight Dog Tag Program.**

Although special events must begin and end on the South Shore, the trail system in the North Shore periodically serves as a connection for running and walking events circling the Reservoir. All special events and any commercial use of the trail system must obtain a permit from the Parks and Recreation Department and minimize impacts to general visitor use of the facilities.

Facilities and Services

The facilities provided in the North Shore and Coot Lake area include multi-use and pedestrian-only soft-surface trails, two small parking lots with a trailhead at both Coot Lake and 55th Street, pit toilets and portable toilets, a wheel chair accessible dock for fishing and pedestrian access to both the Reservoir and the lake. The multi-use trail system also provides an important recreation and commuter link for bicyclists in the Boulder Valley.

Future Challenges

The level of visitor use in the North Shore and Coot Lake area has substantially increased in recent years and is expected to rise in the future as the population in Boulder County continues to grow. Summer weekends and evenings are particularly popular for people and their dogs and the parking lots at Coot Lake and on 55th Street are often filled to capacity. Because parking is limited at either trailhead, many visitors park in the Tom Watson Park lot and cross 63rd Street to access the Coot Lake area, posing considerable safety concerns. As the regional trail system

is developed and use of this trail system increases, safety at this crossing will be more of a concern.

As popularity and use of the area has increased, unmanaged shoreline access to both the Reservoir and Coot Lake has increased resulting in impacts to resources such as vegetation loss and erosion, fragmentation of habitat and runoff contaminants in the water. The extensive wetlands in the area limit the feasibility of expanding the trail system in most of the North Shore and Coot Lake area and several improvements are needed to manage growing use of the area and minimize user conflicts.

The Lyons-to-Boulder Regional Trail is a proposed 13-mile soft-surface, multi-use trail along the Boulder Feeder Canal that would connect the regional trail system with the town of Lyons. This regional trail connection would merge with the trail system in the North Shore and Coot Lake areas, cross 63rd Street and then link to the IBM Connector Trail and the Gunbarrel area. The regional trail system linkage is anticipated to increase the popularity and use of the Coot Lake area and may pose future challenges to the Parks and Recreation Department in managing potential conflicts among the different uses of this area.

Ongoing management of the North Shore area to deter illegal boat launching and water access will be essential in minimizing the risk of Aquatic Nuisance Species (ANS) infestation in the Reservoir. All watercraft are required to go through ANS inspection and launch from designated launch areas on the South Shore. Education and information at the trailheads about boating regulations and ANS risk will be provided to support this management objective.

The North Shore and Coot Lake area do not currently generate revenue to help cover the cost of trail maintenance, weed management, shoreline protection, and restroom and trash services in this area. While fees are charged to enter the South Shore, access to Coot Lake and the North Shore is free and open. A business plan for the Boulder Reservoir area should include an evaluation of options for generating additional revenue from use of the area and ensuring an equitable access and fee system (entrance or parking) as well as funding for maintenance needs in conjunction with OSMP.

D. West Shore

Uses and Activities

The West Shore of the Boulder Reservoir supports an expansive and largely unfragmented wetland complex providing high quality habitat for numerous wildlife species. The City of Boulder identifies most of this area as one of the most exemplary wetlands in the valley due to its size, the quality of its vegetation and its location in a semi-protected landscape. This wetland sanctuary has proven to be a rich environment for many wildlife species including birds, fish, muskrats, bears and coyotes.

Although most of the West Shore area is not directly accessible to the public, it is a popular site for raptor viewing and environmental education. Due to the high value and sensitivity of the wetland and grassland habitat in the area, most of the West Shore is designated as a protected area. Seasonal wildlife closures are evaluated annually for nesting species of concern.

Current recreational use of the area is restricted to the aeromodeling facility located on the northwest side of the Reservoir near Dry Creek. Model airplane flying takes place most of the year at this site with a few large flying events held during the year. The club has had an agreement with the Parks and Recreation Department for use of the site since 1980 and helps to maintain the facility. Due to the potential conflicts between the aeromodeling use and seasonal use of the wetland area by various bird species of special concern, the site is evaluated annually for closure during nesting season.

Future Challenges

The need for a safe, off-road multi-use trail connection along the 51st and 55th Street rights-of-way has been expressed by the public, City Council, and City and Boulder County staff. The conceptual location of this trail is identified on the Trail System Map (pg 31). A future trail alignment study will define the trail corridor that is envisioned to be located on City-owned land along the County right-of-way to the extent possible. If natural resource and wetland constraints limit the potential to build portions of the trail on City property, the City will work with the Boulder County Transportation Department and other agencies to evaluate the feasibility of locating portions of the trail in the County right-of-way.

E. North and South Dams

Uses and Activities

The North and South Dam management areas are located to the east of the Reservoir and include the dams, the dam roads and roughly 250 acres of wetland and grassland habitat. Both habitat areas support black-tailed prairie dog colonies and other important grassland wildlife species. The North Dam area is particularly important because of the historic occurrence of burrowing owls, which nest in abandoned prairie dog burrows.

Recreational use and development of the North and South Dam areas are limited by land ownership and other public uses of the area. The dam roads are managed by Northern Water but owned by the City of Boulder Utilities. The Boulder Reservoir Water Treatment Facility (WTF) and the Fire Training Center are also located in the North and South Dam areas. These facilities are not accessible to the general public.

The dam roads provide an important link between the North Shore and South Shore for pedestrians and bicyclists. Fishing is also allowed in this area and generally occurs along both dams as well as along the shoreline where accessible.

Future Challenges

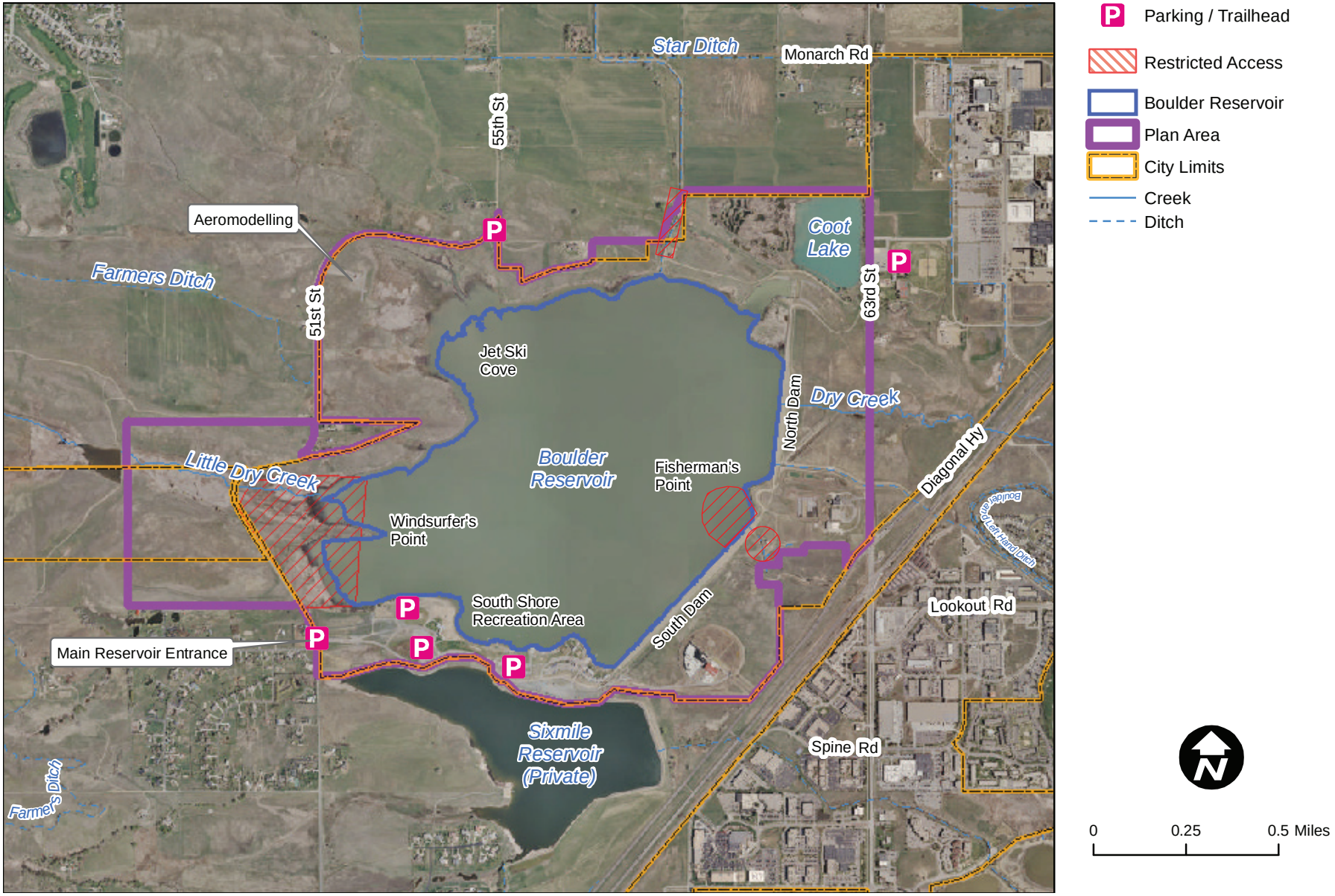
In recent years, the number of visitors accessing the South Shore via the multi-use path on the North and South Dam structure has increased substantially. In addition, the WTF and current and future programming of uses and activities at the Fire Training Center may also have impacts on access and circulation for recreation users along the multi-use path at the dam structures and at the South Shore area near the Fire Training Center entrance.

The future Site Management Plan will address access and circulation for all users including recreational users, maintenance and operations staff for all uses in the vicinity of the Fire Training Center including an emergency preparedness plan to address multi-use functions between recreational uses and emergency providers at the Reservoir.

Chapter 4.

Transportation and Access

Map 8. Transportation and Access



A. Existing Conditions

Transportation

The primary roads leading to the Boulder Reservoir area are 51st Street, 63rd Street and the Diagonal Highway (State Highway 119). The main entry gate to the South Shore facilities is on 51st Street on the southwest side of the Reservoir. 51st Street is a two-lane paved road from Jay Road to the Reservoir entrance gate. There are currently no turning lanes along this road for access to residential neighborhoods or the Reservoir. There is also no designated bike lane and a limited shoulder for bicycles.

Access

There are three designated entry points to the recreational facilities at the Reservoir which include:

1. The South Shore entryway on 51st St.
2. The trailhead and parking lot on 55th St.
3. The trailhead and parking lot on 63rd St. at Coot Lake

The South Shore entryway provides separated ingress and egress lanes for vehicles and boat trailers accessing and exiting the South Shore area. It also includes a gatehouse or fee station, which is staffed during open hours, and a lockable gate to prevent vehicles and boat trailers from entering the Reservoir when the park is closed.

There are two trailheads providing pedestrian and bicycle access to the North Shore, Coot Lake and the dams. One of the trailheads is located along 55th Street on the North Shore of the Reservoir. This trailhead includes a small parking lot with a capacity for 10 cars, a portable toilet and an information kiosk.

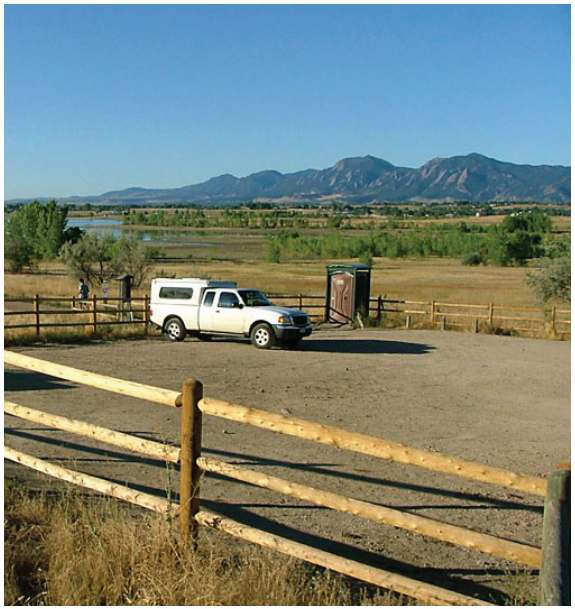
Coot Lake trailhead is located west of 63rd Street across from Tom Watson Park. Amenities at this site include 8 parking spaces, a pedestrian crosswalk, a fishing dock, a rest room and an information kiosk.

Parking

There are 12 parking lots on the South Shore of the Reservoir with a total capacity of 4275 vehicles. The table below details the capacity of each lot.

Table 2. Existing South Shore Parking Lot Data

Parking Lot	Capacity (# of vehicles)
North Overflow lot (grass lot)	*1450*
South Overflow lot (grass lot)	*1120*
Windsurfer lot	*124*
Prohill Dirt lot	*65*
Main Beach lot	*330*
Main Beach overflow lot	*206*
Sailboat lot	*60*
Sailboat overflow lot	*75*
Marina lot	*92*
Marina overflow lot (dirt lot)	*612*
Boat Trailer lot	*66*
Boats only	*75*
Total	***4275***



Eight parking spaces are available at the Coot Lake trailhead and 182 at Tom Watson Park. Coot Lake lot is often filled to capacity. Tom Watson Park lot often serves as overflow parking for Coot Lake as well as general parking for Tom Watson Park. Expansion of either of these lots to accommodate more vehicles is limited. Expansion of the Coot Lake parking lot is constrained by its location in a wetland buffer zone. Renovation or expansion of the Tom Watson Park lot would require approval by the IBM Corporation, which is the underlying landowner of the property.

Trails

The trail system on the North Shore and around Coot Lake has evolved over several years of visitor use without an adopted trails plan or initial trail development. The multi-use trail that has been maintained over the years by the Parks and Recreation Department provides a link between the 55th Street and Coot Lake trailheads. The trail crosses the Boulder Feeder Canal via a narrow bridge that is owned and operated by Northern Water for maintenance access. From the canal to 63rd Street, the trail connection is on a maintenance road that provides vehicular access to the Boulder Feeder Canal for City, emergency and Northern Water staff.

The multi-use trail connection between 63rd Street and the Boulder Feeder Canal provides a future link in a regional trail system along the Boulder Feeder Canal. Although the development of this trail is currently on hold, it has been included in the Boulder Valley Comprehensive Plan and the Boulder County Comprehensive Plan. Future enhancements to the Coot Lake area trail system should take a regional trail into consideration.

Other trail linkages in the Boulder Reservoir area include a pedestrian-only trail circling Coot Lake and the adjacent wetlands and several unofficial social trails that provide access to the north shoreline of the Reservoir. There is also a social trail connecting the maintenance roads along the north and south sides of the Reservoir spillway, which provides a connection to the North Dam road. The North and South Dam maintenance roads provide a link between the Coot Lake area and the South Shore for pedestrians and cyclists. The IBM connector trail will provide access from Gunbarrel to the east side of the Reservoir.

B. Challenges

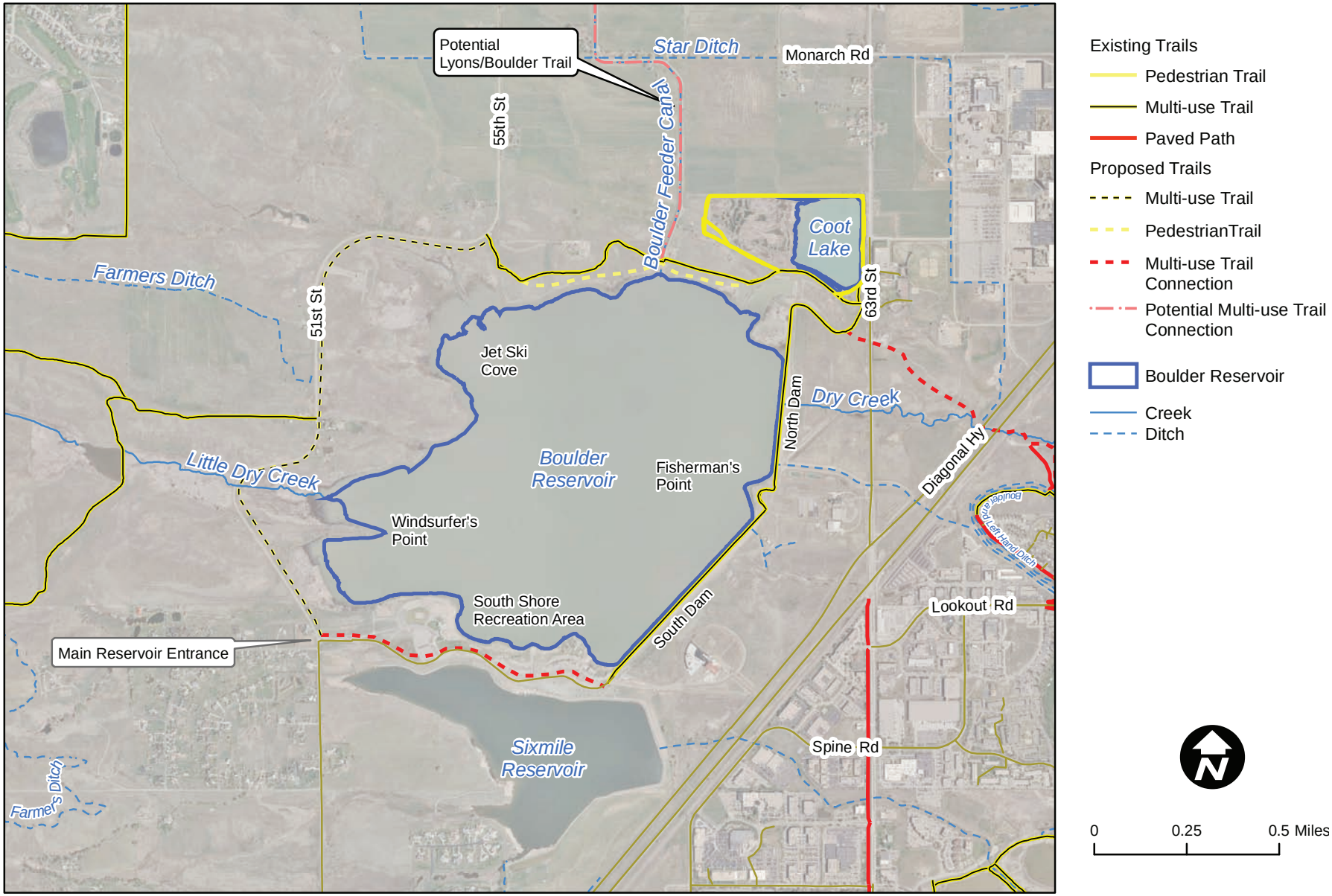
Managing Transportation

Traffic and parking along the primary access roads has become more of a concern over the years as popularity and use of the Reservoir have increased. Recent trailhead data suggests that increasing numbers of annual visitors enter the Reservoir area at the 55th Street and Coot Lake trailheads. On heavy-use days or during events, traffic can be backed up along 51st Street from the Reservoir entry gate to Jay Road. In addition, when event attendance is high, parking demand on the South Shore can exceed capacity in the designated lots resulting in overflow parking along 51st Street.

A new design for the South Shore entryway will create a northbound turn lane from 51st Street into the main entrance and relocate the gate house to allow more stacking of vehicles off the main road. An Aquatic Nuisance Species (ANS) boat inspection station and an additional gate house are also part of the new design. These entryway modifications will ease traffic flow on 51st Street and improve overall safety during major events at the Reservoir.

Periodic traffic along 63rd Street can also pose safety concerns for pedestrians and cyclists. Since limited parking is provided at the Coot Lake trailhead, visitors to the area typically park in the Tom Watson Park parking lot and cross 63rd Street to access the trail system. 63rd Street is a two-lane paved road and a major commuter road between Gunbarrel and residential areas in the north Boulder Valley and west Longmont areas. Due to growth and development in the region, traffic on 63rd Street has grown steadily over the past few years, increasing the risk of accidents involving vehicles, pedestrians or cyclists.

Map 9. Trail System



Managing Access

Currently, the parking lot at the 55th Street trailhead does not meet the existing demand. The parking lot is typically full on most weekends, and on busy days cars are parked along both sides of 55th and 51st streets. There is no fee requirement, entry gate or boat inspection station at the 55th Street trailhead and non-motorized craft are often brought in from this parking area and launched onto the Reservoir. The lack of control over boat access on the North Shore increases the risk of ANS infestation to the Reservoir.

Managing Social Trails

Several undesignated social trails have developed over time in the North Shore and Coot Lake area from walkers, cyclists and dog walkers accessing the shoreline of the Reservoir and forging links between the Coot Lake area and the dam road. Unmanaged visitor access to all areas of the Reservoir and Coot Lake shorelines often fragments and degrades habitat, and impacts water quality in the Reservoir. Unmanaged access to the north and west shorelines also increases the risk of ANS infestation through illegal launching of small watercraft. A challenge for the Parks and Recreation Department will be to remove and prevent undesignated trails and access points, and guide visitors along routes that minimize impacts to sensitive resources.

Chapter 5.

Water Resources

A. Introduction

Currently, 40 percent of the City's drinking water supply passes through the Boulder Reservoir facility. Twenty percent of the City's total supply is treated directly at the Boulder Water Treatment Facility (WTF) and the remaining 20 percent, exchanged from the Reservoir to Middle Boulder Creek and North Boulder Creek, is treated at the Betasso WTF. Water is transported to the WTF from one of two intake structures along the Boulder Feeder Canal or in the Reservoir itself. In general, the City treats water from the Reservoir during the fall and winter when the feeder canal is not running (from November through April) and treats water directly from the feeder canal in spring and summer (from May through October).

The Boulder Reservoir is a low volume shallow reservoir with a surface area of 560 acres and a capacity of 13,100 acre-feet. Its depth normally ranges from 19 to 28 feet deep. Between 80 and 90 percent of the water in the Reservoir comes from the Boulder Feeder Canal. Small flows also enter the Reservoir on the west side from Dry Creek, Farmer's Ditch (summer months only), Little Dry Creek and Unknown Creek.

WTF is located directly east of the Reservoir. Until the 1990s, the WTF was used only as a summer peaking plant. Since 1998, the WTF has been operating year-round based on varying requirements of the City's overall raw water supply, water demand, and other factors such as drought and maintenance.

Sixmile Reservoir, owned by Boulder and White Rock Ditch and Reservoir Company, is located immediately south of the Boulder Reservoir area and outside the topographic drainage basin of the Reservoir. However, water quality in Sixmile Reservoir potentially influences that in the Boulder Reservoir because of an emergency spillway connecting the water storage facilities.

B. Aquatic Nuisance Species (ANS)

The risk of ANS infestation in the Boulder Reservoir has become an increasingly important issue for the City in recent years. ANS are waterborne, non-native plant or animal species that threaten the diversity or abundance of native species, the ecological stability of impacted waters, or recreational activities. Zebra and Quagga Mussels as well as Eurasian Watermilfoil (milfoil) are of special concern to the City because of the enormous impact introduction of these species in the Reservoir would have on the economic, environmental and social aspects of the community. The City Council has identified ANS prevention as a priority for the City and instituted a boat inspection program which reduces ANS risk in the Boulder Reservoir. However, further diligence by the City and visitors to the Reservoir will be essential in the long-term **prevention of ANS infestation**.

Zebra and Quagga Mussels

Zebra and Quagga Mussels have been a growing problem in US waters since the 1980s. Zebra and Quagga Mussels are small, freshwater mussels originating from the Balkan region of Eastern Europe. They were first identified in the Great Lakes in the late 1980s and have rapidly spread throughout water bodies and river systems in the east. The mussels were probably introduced to United States waters when ships arriving from Europe discharged ballast water containing the mussel larvae or veligers.

Mussels spread from one water body or river system to another via recreational boats and fishing activities. The mussels have the ability to attach themselves to various surfaces, including boat hulls, and can survive under dry conditions for several days, making trailered boat transport one of the primary culprits for their spread. Other concerns include standing water such as in bilges, live-wells, fish bait buckets and ballast water.

Establishment of mussel populations in the Boulder Reservoir would have serious implications for recreation, drinking water quality and operations, and aquatic ecosystems. The mussels can reduce fish populations, ruin boat engines, jam steering equipment, make reservoirs unusable by boaters and swimmers, degrade ecosystems, and clog the infrastructure of the water supply and treatment facilities.

If infestation occurs in the Reservoir, the City would incur significant financial impacts. Zebra or Quagga Mussel growth and build-up in the water collection and treatment infrastructure would prompt capital replacement and long-term maintenance costs for the WTF.

Eurasian Watermilfoil (milfoil)

Eurasian Watermilfoil (milfoil) is an attractive plant with feathery underwater foliage. It was once commonly sold as an aquarium plant. The plant originated in Europe and Asia, but was introduced to North America around 1900 and is now found in water bodies over much of the United States.

Milfoil has never been observed in Boulder Reservoir. However, milfoil is considerably problematic once established in a body of water. Milfoil forms very dense mats of vegetation on the surface of the water. These mats interfere with recreational activities such as swimming, fishing, water skiing, and boating. Milfoil can also interfere with water transmission and treatment by clogging water intakes.

Milfoil can drastically alter a water body's ecology by out-competing native plants and reducing food chain animal diversity. Milfoil starts spring growth sooner than native aquatic plants and can shade out these beneficial plants. The mats can also reduce oxygen from the water by preventing the wind from mixing the oxygenated surface waters to deeper water and the plant material decay can create low oxygen situations. When milfoil invades new territory, the species diversity of aquatic plants typically declines.

Once milfoil becomes well-established within a water body, it is difficult or impossible to remove. Milfoil reproduces extremely rapidly and can infest an entire lake within two years of introduction to the system. Milfoil is able to reproduce very successfully and rapidly through the formation of plant fragments. Milfoil will also grow from fragments created by boaters or other disturbances during any time of year. A new plant can start from a tiny piece of a milfoil plant, demonstrating how easily it can be transported from lake to lake on boat trailers or fishing gear.

C. ANS Inspection Program

The Colorado State Parks Board adopted regulations in 2009 to assist in the statewide management of ANS. These regulations apply to all waters within the **State of Colorado**. Boaters are responsible for compliance with the new regulations while water body agencies have the responsibility for the protection of managed waters from ANS introduction and infestation.

Protection of the Reservoir from ANS is a priority for the City. In 2009, the City implemented an inspection program for all boats using the Reservoir. The program involves inspection, tagging, ongoing monitoring and data collection. One of the key components of the program is educating boat owners and fishers, and raising awareness of the ANS issue, as well operating the inspection program.

Inspections are conducted by state-certified City staff at the south entrance of the Reservoir. Inspectors are present when the South Shore entryway is open to the public to help provide the level of protection and customer service required for the program. To offset the cost of the program, inspection fees are charged to all watercraft owners who have Reservoir boating permits.

The availability of a hot water decontamination station at the South Shore would allow for better customer service and provide the opportunity for staff to provide options for boaters. A decontamination station would give boaters the option of quarantine or decontamination on-site at the Reservoir and decrease the amount of driving to the Colorado Division of Parks and Wildlife headquarters in Denver to have watercraft decontaminated. During a wet year, drain and dry quarantine procedures may not be as effective. A hot water decontamination station provides an enhanced preventative measure to introduction of mussels during wet years. This would also provide an option to allow boats that have been to other bodies of water access to the Reservoir in a timely manner. The ability to clean boats of oils and other contaminants on-site would also help to maintain water quality in the Reservoir.

Protection of the Reservoir from ANS is a priority. Consistent oversight of boat launching and fishing activities in the Reservoir through the main gate of the South Shore as well as the North and West Shore and in Coot Lake will be necessary for years to come to prevent ANS infestation. The Parks and Recreation Department will continue to monitor the program on an annual basis and make recommendations related to protecting this water source from ANS in the future.

D. Water Quality in the Boulder Reservoir

The primary purpose of Boulder Reservoir is water supply storage for municipal, domestic, agricultural, and industrial uses. Water quality in the Boulder Reservoir is a critical public health, environmental and economic issue for the community and essential to achieving many facets of City of Boulder sustainability goals. Good, dependable water quality benefits the City by contributing to the health of residents, increasing the City's economic well-being and enhancing quality of life.

A secondary purpose of the Reservoir is recreation. The water in the Reservoir supports many water and land-based recreational uses including boating, swimming, fishing and wildlife-viewing, all of which contribute to the health and well-being of Reservoir users.

The Reservoir is home to many species of animals and plants that depend on the aquatic and wetland environment for their health and survival. Water quality in the Reservoir is a necessary component of supporting the wildlife, plants and natural ecosystem processes which, in turn, contribute to the popularity of the Reservoir for wildlife viewing and appreciation of the natural landscape of the Boulder Valley.

Maintaining good water quality in the Reservoir reduces the resources required to meet water demands and to meet regulatory standards set by the state and federal governments. Degraded water quality could lead to reduced flexibility in use and treatment of the water and additional costs to meet regulatory standards in both raw water and treated water.

The City has adopted several goals and policies regarding protection of source water quality that are described in the Boulder Valley Comprehensive Plan, the Public Works-Utilities Source Water Master Plan, and Water Quality Strategic Plan. Overall, the City's policies are to minimize sources of pollutants, protect the water system, and continually maintain and improve the quality of the drinking

water. This master plan expands upon the goals and policies described in the previously referenced plans by outlining objectives and actions to address water quality concerns related to recreational use of the Reservoir.

Water Quality Standards

Water quality regulation is mandated under the **Clean Water Act** and the **Safe Drinking Water Act** at the federal level, and under the **Colorado Water Quality Control Act** and **Colorado Primary Drinking Water Regulations** at the state level. The **Colorado Water Quality Control Commission** (Commission), part of the Colorado Department of Public Health and Environment, regulates the quality of surface water (lakes and streams) and treated drinking water.

State water quality policies and beneficial use classifications for all surface waters in Colorado (such as Boulder Reservoir and its tributaries) are developed by the Commission. To protect the quality of Colorado's surface waters, the Commission develops and implements narrative and numeric water quality standards. Water quality standards describe the chemical, physical, and biological conditions necessary to achieve and protect a water body's beneficial use classification (i.e., water supply, aquatic life, agriculture, recreation, industrial).

The Commission is also responsible for establishing Colorado Primary Drinking Water Regulations, which include maximum contaminant levels in treated drinking water, as well as secondary drinking water standards. Secondary standards are non-enforceable guidelines for contaminants that may cause cosmetic or aesthetic effects in drinking water. Drinking water regulations also relate to a water system's water supply by establishing treatment requirements based on the quality of source water and also requiring public water systems to assess existing and potential contaminant sources to water supplies.

Water Quality and Recreation

Water quality in the Reservoir can be impacted by both human-made and naturally-occurring conditions in the watershed and the Northern Water system. The Reservoir developed as a multiple-use resource, and the City and the Reservoir users must continually evaluate and balance the uses. The raw water in the Reservoir is impacted by various land use activities outside the City's jurisdiction, such as nutrients and sediment in residential and agricultural runoff and bacteria in wild and domesticated animal waste. Land and water-based recreational activities around the Reservoir can also impact water quality in several ways as shown in the table below.

Table 3. Recreation Activity and Potential Water Quality Concerns

Recreation Activity	Potential Water Quality Concerns
Swimming	Pathogens, personal care products (insect repellents, suntan lotions)
Power boating	ANS, fuel or oil spills (filling, accidents), turbidity
Non-motorized boating	Aquatic and terrestrial nuisance species, erosion from shoreline access
Parking lots	Fuel, nutrients, oil, sediment, solid waste from runoff
Fishing	ANS
Wastewater management (lift station, portable toilets)	Nutrients from spills and pathogens
Trails for biking, hiking, and horses	Nutrients from runoff and erosion, pathogens, sediment
Dogs and horses	Pathogens from waste

Although several recreational activities can impact water quality in the Reservoir, the potential impacts of motorized boating have raised the most concern from the public in recent years. Motorized boating has the potential to impact water quality by introducing fuel and oil related chemicals into the raw water, infesting the Reservoir with ANS, such as Zebra and Quagga Mussels, and contributing to water turbidity (cloudiness of water).

The two primary water quality concerns associated with fuel-powered boating on the Reservoir are the introduction of BTEX (Benzene, Toluene, Ethyl Benzene and Xylene) from gasoline and PAH (Polycyclic Aromatic Hydrocarbon) from oil. BTEX compounds have been detected during high use activity in Boulder Reservoir, near the marina where boats launch and engines are started. However, BTEX compounds are volatile and evaporate when exposed to air. Since BTEX compounds have a tendency to float they can evaporate at the water-air surface and typically remain in the water column for a short period of time. Since the Reservoir water treatment intake is near the Reservoir bottom this provides another barrier against BTEX compounds entering the treatment facility. BTEX has not been detected near the WTF water intake.

PAHs can be introduced into the water from oil-burning two-cycle engine emission. There is a tendency for some PAH compounds to sink and accumulate in lake sediments. In 2010, the City conducted low-range sediment monitoring in the Boulder Reservoir for regulated and unregulated PAH compounds to evaluate if there is potential accumulation of PAHs in the Reservoir. PAH results from this monitoring do not indicate an accumulation in Boulder Reservoir sediments (i.e., consistent with PAH results from a reference in Rocky Mountain National Park). Few two-cycle engines are in use on the Reservoir and all newer outboard motorboats are four-cycle engines that create less oil pollution than older two-cycle engines.

Monitoring data collected on BTEX and other volatile organics have been substantially below state regulatory criteria for health and aquatic life and do not suggest an ongoing water quality impact of fuel-powered boating on the Reservoir. There is always, however, a potential risk of fuel discharges and spills from boat engines and a potential risk of PAH contamination in the sediment from older two-stroke engines in outboard motors that do not meet current EPA emission standards.

Other recreational activities around the Reservoir can also have a significant impact on water quality. Stormwater runoff from trails and trail use, if poorly managed, can contribute to the cumulative impact of nutrients and sediment in the Reservoir. Bank erosion from overuse or removal of vegetation can lead to increased sedimentation in the Reservoir and impact aquatic life. *E. coli* from human, dog and wildlife waste in runoff or from bodily contact with the water is also an ongoing concern and monitored regularly during the summer season to comply with human health-based swim beach standards. Human health-based standards are implemented to protect against the effects of bacteria that may be ingested during recreational activities, such as swimming for boating. Therefore, the City monitors for *E. coli* as an indicator of pathogens.

Water Quality Monitoring

The City's Public Works Utilities Division monitors and evaluates treatment processes at various locations within the WTF, including treated water quality prior to entering the distribution system. With treatment, the WTF consistently meets all of the state drinking water and secondary standards.

While there are water quality standards that apply to surface water, the City is not required by law to monitor the raw water in the Reservoir for the full range of constituents. Monitoring of constituents includes physical (e.g., temperature, oxygen, pH, clarity), chemical (e.g., nutrients, metals, alkalinity, organic carbon), and biological (e.g., *E. coli*, algae) components. The City monitors all constituents with established water quality standards, as well as 33 additional constituents. The City monitors Boulder Reservoir and its tributaries at least monthly to evaluate baseline source water conditions, water quality changes, aesthetics, treatment decisions, nutrient loading and indications of possible pathogens and other health related contaminants. The City monitors seven locations,

including the five tributaries flowing into the Reservoir and the Reservoir itself close to the treatment facility intake near the top and bottom depths. Water quality is generally consistent throughout the Reservoir primarily due to its shallow depth and mixing by wind.

Recent special studies, in addition to the ongoing routine monitoring, include the following:

- *High Quality Water Supply Reservoir Project.* The City participated in the 2010 state-funded study of nutrients, organic carbon, and disinfection by-product formation potential, which will provide data for the upcoming 2012 Commission rule-making hearing on nutrient criteria for lakes and reservoirs.
- *Coordinated reconnaissance monitoring.* The City is coordinating with other Colorado-Big Thompson water utilities in monitoring for a larger unregulated group of organic chemicals.
- *Aquatic vegetation surveys.* In 2007, the City conducted an aquatic vegetation survey at Boulder Reservoir as a targeted evaluation in response to observed vegetation changes. A more comprehensive aquatic vegetation survey was performed in 2008.

The Parks and Recreation Department has a role in the protection of water quality through its management of land and water-based recreation in and around the Reservoir. The department monitors *E. coli* at the South Shore swim beach weekly during the summer recreational use period to comply with health-based swim beach standards. These standards are established for the protection of people who may ingest water during recreational activities. If *E.coli* levels exceed the standards, the department will immediately close the swim beach.

E. Water Supply and Recreation

The main source of water in the Boulder Reservoir is delivered by Northern Water through the Boulder Feeder Canal. Agreements between the City of Boulder and Northern Water provide policies and guidelines on the timing of water delivery and storage volumes in the Reservoir. Because the Reservoir is primarily operated and managed as a water supply, water-based recreation opportunities may be constrained by water supply needs.

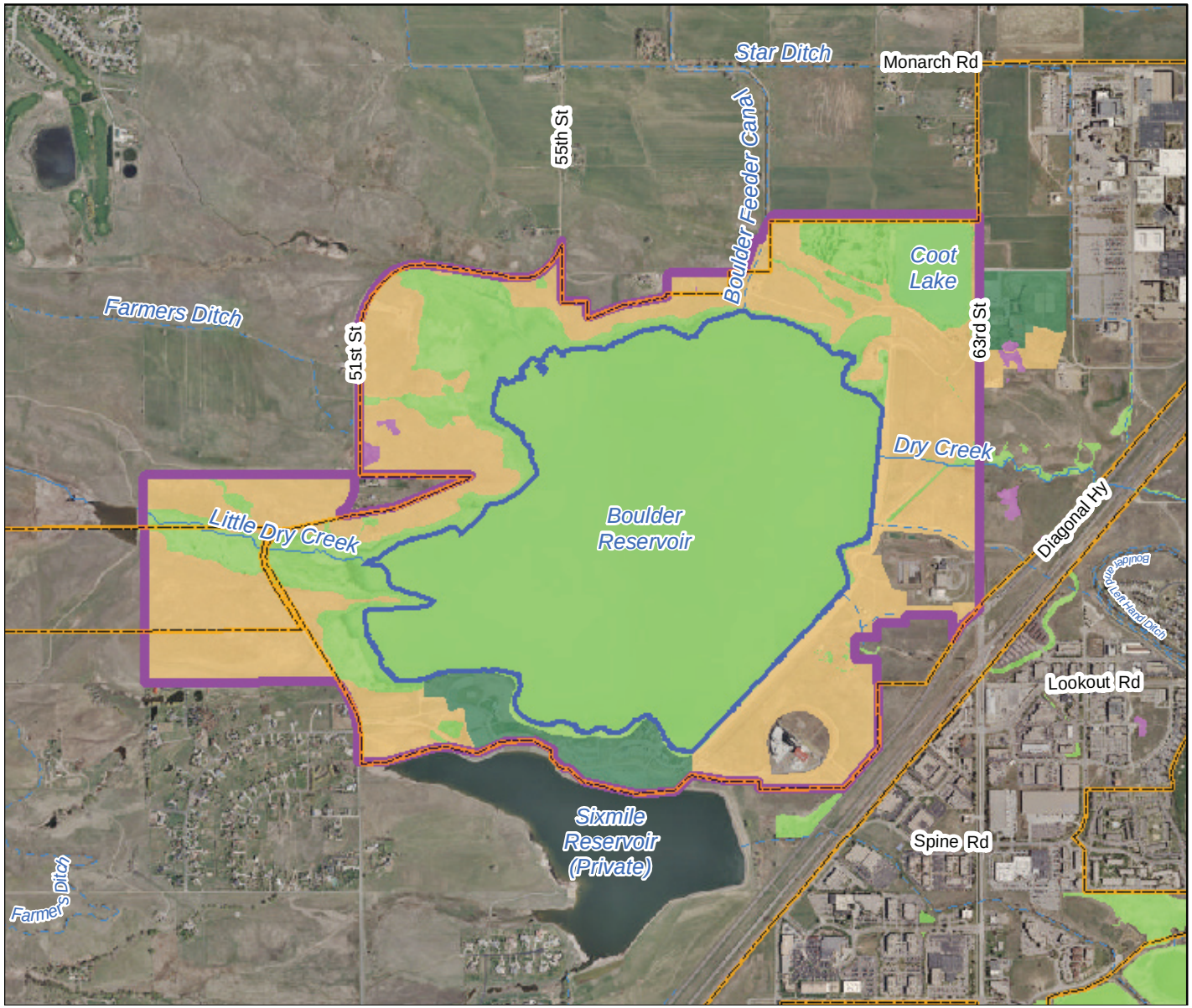
The operating season of the Boulder Feeder Canal is April 1 through October 31; however the actual start-up date is dependent on water demands and the ability to safely convey water through the feeder canal. Northern Water cleans the canal before the start of the season and ice, snow or excessive debris in the canal can delay this process. Northern Water starts filling the Reservoir in April or May and it is generally filled by June. Once the Reservoir is filled, Northern Water closely regulates how much additional water is added throughout the summer. There is a preferred maximum winter storage elevation, one that minimizes damage to the dams from freeze-thaw effects of water, and Northern Water attempts to reach that elevation by the time the feeder canal turns off. The water level in the Reservoir may fluctuate throughout the summer as Northern Water delivers water to meet the demands of the water users, but generally, the water level is at its highest after the initial spring fill, drains throughout the summer, fall and winter, and is at its lowest in the spring before the canal turns on.

Water quality in the Reservoir is strongly tied to the amount of water flushing through the basin. In wet years, the amount of water passing through the Reservoir tends to be low since the need for supplemental water is low. Other factors which might affect the amount of water and the water quality in the Reservoir include draw down of the Reservoir for periodic inspection of the submerged outlet gates in the dam (as required by the Colorado Division of Water Resources), maintenance of the dam or WTF intake structures, or capital improvements to the Reservoir facilities, shoreline, dam or WTF.

Chapter 6.

Habitat Management

Map 10. Vegetation and Wetlands



Generalized Vegetation
- Urban Park Land
- Short Grass Prairie

Regulatory Wetlands
- High Functioning
- Low Functioning

- Boulder Reservoir
- Plan Area
- City Limits
- Creek
- Ditch

0 0.25 0.5 Miles

A. Landscape Setting

The Boulder Reservoir and surrounding land area lies within the Dry Creek watershed in the north edge of the Boulder Valley. The natural watershed of the Reservoir encompasses a nine square mile area north of Boulder and consists of hilly terrain along the foothills and rolling slopes near the Reservoir. The watershed is characterized primarily by native shortgrass and midgrass prairies on mesas and outwash plains, and wetlands along the drainage swales.

Prior to construction of the Boulder Reservoir in 1955, the Dry Creek drainage area supported many acres of wetland habitat. The area around the Boulder Reservoir today is a remnant of the rich mosaic of wetlands and mixed grass prairie that characterized the Rocky Mountain foothills, but continues to support a rich complex of upland prairie, sedge meadow, cattail marsh, salt flat, lake shoreline and aquatic habitat. Since the remaining wetland and upland complex around the Reservoir represents a fragment of what was originally there and because of the continuing loss of large wetland complexes in the county, this habitat area is in particular need of protection and conservation.

Nearly all the undeveloped land area on the West and North Shore, including Coot Lake, is designated as a Natural Ecosystem in the Boulder Valley Comprehensive Plan. Natural Ecosystems are defined as places that support ecological systems of native plants and animals or possess important ecological, biological, or geological values. Natural Ecosystems may also contain features that are rare, unique, or sensitive to human disturbance and are essential to maintain the scientific and educational importance of places representing the rich natural history of the Boulder Valley.

Wetlands

The vast majority of the West Shore, North Shore and Coot Lake areas are delineated as wetland or within the City's wetland regulatory area. Wetlands are areas that are inundated or saturated by surface water or groundwater with sufficient duration and frequency to support life adapted to saturated soil conditions. Open bodies of water such as the Reservoir and Coot Lake are also considered wetlands.

The Boulder Reservoir wetlands are a product of water in the Dry Creek sub-basin being backed up by the dams. The 20 acres of wetland habitat on the western edge of Coot Lake were developed in the 1980s as a mitigation site and contain more than a dozen small ponds. The wetland types found in the Reservoir area include open water, marshes, wet meadows, salt flats and lake shoreline. Marshes in the area are characterized by the presence of permanent or semi-permanent shallow water on the edges of the Reservoir and Coot Lake and wetland plants such as cattails, bulrush and pondweed. The wet meadows in the West Shore area lack permanent standing water but are supported by a seasonally fluctuating high water table. The wetlands in the North and South Dam areas are salt or alkaline flats, a rare and diminishing type of wetland ecosystem in the Front Range.

Wetlands play key roles in retaining floodwaters, maintaining water quality, and enriching the biodiversity of an area. Wetlands store and/or transform nitrogen, phosphorous, sediment, and other contaminants that may wash down from agricultural areas, roadways, or other human land uses upstream or within the watershed. Vegetation in wetlands prevents erosion and further degradation of water quality in the Reservoir. Wetlands also provide important habitat for plants and wildlife, as well as play a vital role in many food chains. Wetlands can be easily degraded or lost by the pressures of development, recreational use and poor land management practices that can result in sedimentation, introduction of weeds, erosion and urban runoff.

The wetlands in the West Shore area are considered to be one of the eleven most exemplary wetlands in the City of Boulder due to the size, diversity, lack of fragmentation from human use, and role in protecting surface water quality from the Dry Creek and Little Dry Creek drainage-ways. In the semi-arid region along the Front Range, wetlands are less abundant than upland areas, greatly increasing their ecological importance to wildlife. Because wetlands support both aquatic and terrestrial plant and animal species, they contain a disproportionately high level of biodiversity relative to other ecosystems. The connectivity, density, large size and location in a semi-protected landscape increases the wildlife value of the Boulder Reservoir wetlands even more.

The ecosystems in the Boulder Reservoir area support numerous species of wildlife that require both upland and wetland or aquatic habitat to complete their life cycles. Prairie dog colonies in upland, mixed grass prairie ecosystems surrounding the Reservoir provide a food source for more than ten raptor species that nest, roost or forage in the area. The wetland habitat around Coot Lake and west of Boulder Reservoir support several native amphibian species including spiny softshell, snapping turtles and tiger salamanders. Important species found in the area include songbirds, fox, coyote, black bear, and black-tailed weasels.

Mixed Grass Prairie

Much of the habitat in the Boulder Reservoir area that is not wetland is mixed grass prairie habitat. Native grassland plant species such as blue gramma, big bluestem, needlegrass, scarlet globemallow and dotted blazing star can be found in the North Shore and West Shore areas. Various large and small mammals use these grassland areas for hunting and as travel corridors through the Boulder Valley. Rattlesnakes, meadow voles and a variety of grassland dependent species occupy important habitat throughout the Reservoir including niches along the ditches and canals that feed into the Reservoir.

Protection of the black-tailed prairie dog populations and habitat is important in maintaining the biodiversity of species around the Reservoir. Prairie dogs are the most common small mammal seen in these grasslands and have served as

an important prey base for raptors that nest and forage in the area, particularly those raptors that are around in the winter. The prairie dog burrows surrounding the Reservoir also provide excellent habitat for burrowing owls. The location of the prairie dog colonies adjacent to the wetlands and raptor nesting areas enriches the importance of this unfragmented ecosystem as wildlife habitat.

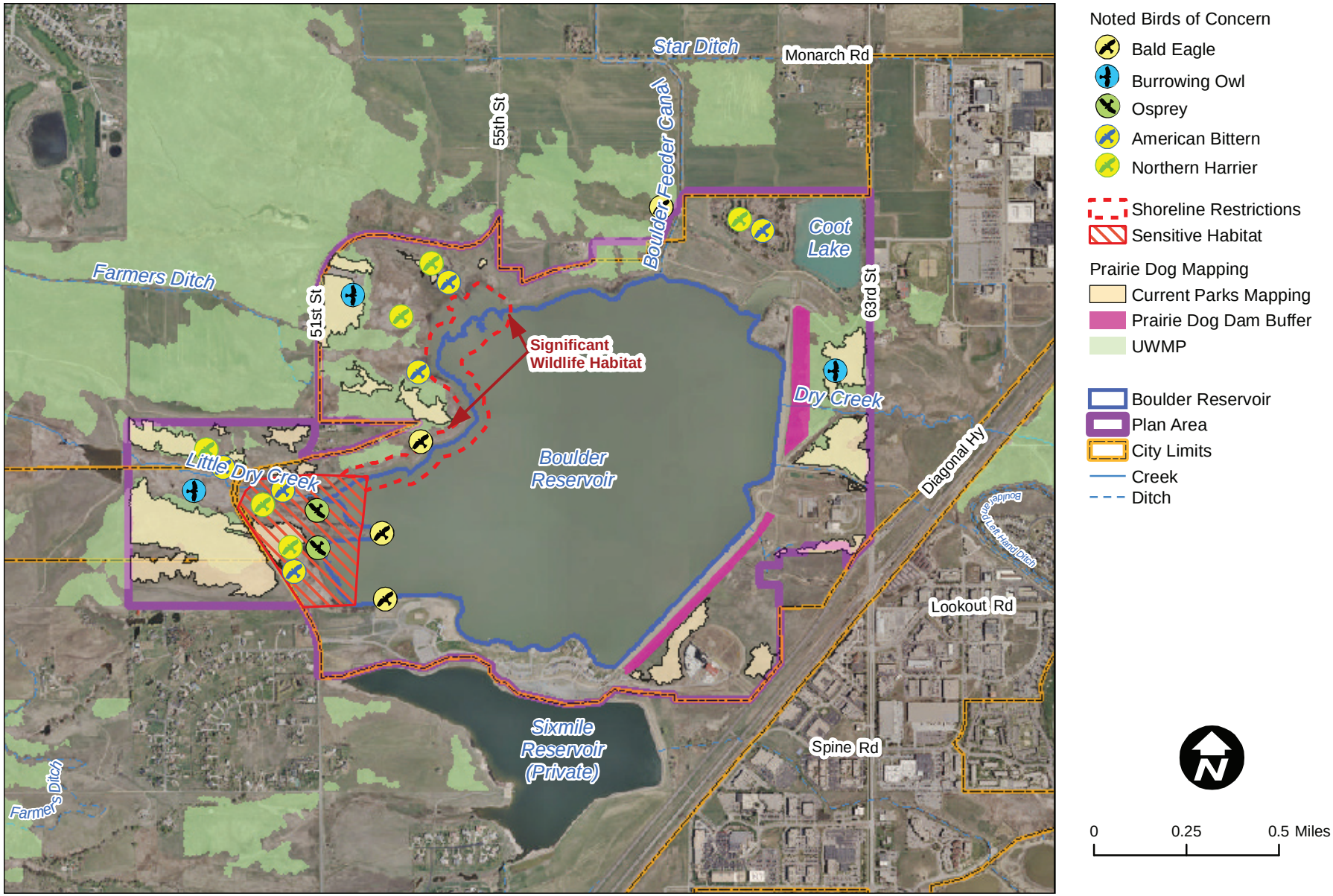
Management efforts have focused on preserving and enhancing these habitat areas to continue to support these species. The Audubon Society, Boulder County Nature Association, and members of the general public have served as raptor monitor volunteers who work with City staff for observation and monitoring efforts, in order to document trends of these species. Management works with volunteers and organizations to conduct annual bird counts and often travel the roads around the Reservoir area for regular and unique sightings to add to bird inventories.

Fencing along both the North and South dams was constructed in 2001 to deter prairie dogs from damaging utility facilities and potentially compromising dam integrity. The City has established a working agreement with Northern Water that provides protection of the dam while preserving historic prairie dog habitat.

B. Species of Special Concern

The marshes and grasslands around Boulder Reservoir support more nests of Boulder County avian species of concern than any other comparably sized area in the county. Bird species of concern found in the Reservoir area during various seasons of the year for foraging, breeding, nesting or roosting include rare and declining bird species such as Northern harriers and American bittern and species of local concern such as osprey, white egrets, snowy owls and sandhill cranes. Wintering and migrating bald eagles use the

Map 11. Sensitive Species



perch and roost opportunities in the area as well. Some rare species that have been historically found at the Reservoir include short-eared owls and burrowing owls. A brief description of some noted bird species that may be found at the Reservoir and Coot Lake are listed below.

American Bittern

American bittern nest in the marshes and wet meadows around the Reservoir and Coot Lake. American bittern were listed as "rare and declining" in the 1999 Boulder County Avian Species of Special Concern List; however, nesting populations of this species appear to have increased in Boulder County over the past few years. At least three nesting territories were active in the Boulder Reservoir area during each year from 2006-08 and in 2009 on the West Shore.

Osprey

In 1997, the first documented successful nesting by osprey in Boulder County occurred in the West Shore area. Osprey have nested successfully on the West Shore near Windsurfer's Point on an annual basis, seven months out the year, fledging at least two young each year.

Osprey are considered a sensitive bird species in the region because of the limited availability of suitable nesting habitat in the Front Range of Colorado. Due to the rarity of nesting sites for this species, old utility poles have been retained and nesting platforms have been designed to increase the nesting opportunities at the Reservoir. The area around the nesting platform is closed to human use from February 1 through September 10. The closure area is within 300 yards of the nesting platform on land and within 100 yards of the nest site on the water. The closure boundaries are marked with signage both on land and on water (buoy markers). During the nesting season, the nests are monitored by City staff and volunteers. Maintaining a buffer around the nesting platforms on both land and water will be an important management practice in the continuing conservation of this species at the Reservoir.

Northern Harriers

The Boulder Reservoir area is a known successful nesting ground for Northern harriers in Boulder County. They are identified in both the Boulder County Comprehensive Plan and the Boulder Valley Comprehensive Plan as a rare and declining species. Harriers need both dense marshlands for nesting and adjacent grasslands for hunting. As ground nesters, harriers are susceptible to ground predators such as coyotes and foxes, thus requiring a large area for both nest concealment and protection. Maintaining contiguous wetland properties reduces noise and physical disturbance. Minimizing habitat fragmentation is important to provide opportunities for breeding pairs of harriers at the Reservoir.

Burrowing Owls

Burrowing owls, a rare and declining species in Boulder County, have historically used the natural areas around the Reservoir for nesting and foraging since at least the late 1970s. The owls feed upon insects and small mammals around prairie dog towns and depend upon prairie dog burrows for their nests. The North Dam area, however, is one of only a few locations in the county where burrowing owl nesting activity has been reported within each of the past three decades. Although the frequency of nesting has decreased in recent years, a successful nest was observed in 2005.

Burrowing owls have been declining in Boulder County over the years for a variety of reasons. The massive destruction of prairie dogs throughout the Front Range over the last century has probably contributed to the decline of the burrowing owl populations. However, this species is sensitive to human and predator activity and will abandon sites if threatened. Low fledge rates of nests throughout Boulder County suggest that high mortality of young owls, possibly caused by predation, has contributed to declining burrowing owl numbers as well.

C. Management Challenges

Maintaining the health and biodiversity of the natural lands around the Reservoir is essential to both protecting water quality of the Reservoir and providing a high quality visitor experience. As the popularity and recreational uses of the Boulder Reservoir area continues to increase, unintentional impacts to the wildlife habitat from visitation will become more of a challenge. Some of the issues associated with visitor use on the North Shore, Coot Lake and West Shore are listed below.

Noxious Weeds

Noxious weeds occupy a significant portion of the wetland and grassland areas around the Boulder Reservoir and Coot Lake. Noxious weeds are plant species that degrade certain habitats and reduce biodiversity by out-competing the native vegetation that provides a specific food source and type of cover for wildlife. Noxious weed seeds are dispersed in a variety of ways, including by wind, through stormwater runoff and by people and animals.

Noxious weeds are most predominant in the Boulder Reservoir area along trails as weeds are commonly spread by people. Visitors can inadvertently transport weed seeds on their shoes or clothing or in the mud of bicycle tires. Dogs running off trail and leaving feces also contribute to the spread of weeds in off-trail areas.

The Parks and Recreation Department actively manages over 25 different noxious weed species in this area. A few prolific and very difficult to manage species, such as Mediterranean sage, purple loosestrife and spotted knapweed, must be eradicated by state mandate. Several management tools are used to control noxious weeds including manual, cultural, biological, and chemical methods. Control of noxious weed spread is a priority for the Department in maintaining biodiversity in the area. Additional resources will be required to stay ahead of the continual weed problem in both wetland and grassland areas and to comply with state mandates. Maintaining buffers between sensitive areas and trails, managing stormwater runoff and preventing development of social trails will also be important in controlling the spread of noxious weeds.

Wildlife Disturbance

While individual visitors may not produce a visible effect on wildlife habitat in the area, a cumulative impact results from the sheer amount of overall human activity in and around wildlife habitat. Adherence to the trail use policies and regulations around the wetland areas and in the vicinity of nesting bird habitat is essential to protecting biodiversity in the area. It will be important to continually educate visitors of the value and sensitivity of the habitat and to reinforce a sense of stewardship for the natural environment around the Reservoir.

Social Trails and Shoreline Erosion

Social or undesignated trails are always an issue in heavily used natural areas. Since the trail system around the Reservoir has evolved with the level of visitor use, a designated trail system has not been clearly delineated and visitors have created routes and access points to popular areas on the North Shore and around Coot Lake. Overuse and unmanaged access to certain areas, however, has led to decreased vegetation from trampling and subsequent erosion in sensitive areas such as the shorelines of both water bodies. Clear delineation of trail routes and development of specific water access areas will be an important step in improving the amenities on the North Shore and Coot Lake while maintaining the integrity of the habitat. It will also be important to close social trails that provide access to sensitive areas such as the West Shore wetlands, to restore grassland areas and to install fencing to deter future access.

Chapter 7.

Education and Stewardship

A. Introduction

Many of the Boulder Reservoir Master Plan goals will be accomplished through a combination of capital investment, visitor education and stewardship promotions. For example, to prevent ANS infestation, boaters and fishers will need to fully understand the recreational, environmental and cost implications of ANS infestation, if it should occur, and take personal responsibility in preventing the spread of Zebra and Quagga Mussels by following all boating and fishing procedures and rules. Water quality protection will best be achieved by building awareness among visitors of contaminant sources and the actions individuals can take to reduce impacts. Similarly, conservation of wildlife habitat around the Reservoir will require visitor understanding and consideration of the value and sensitivity of the natural resources at the Boulder Reservoir to promote responsible recreational use.

The Parks and Recreation Department currently provides many programs for enhancing awareness and stewardship of park facilities and resources. Several educational programs offered in the summer provide instruction on water-based recreational activities and water safety. The department also provides information about visitor safety, wildlife protection, departmental policies and special events through the following communication and programmatic tools:

- Information kiosks
- Trailhead information
- Pamphlets and publications
- Partnerships (e.g. adopt-a-trail, facility investments)
- Channel 8 programming
- News releases

Volunteer programs can be a primary tool for building awareness and promoting stewardship at the Reservoir. Volunteerism not only supports the Parks and Recreation Department's mission in providing recreational services to the community, it provides opportunities for individuals, families, businesses and organizations to learn about and care for the Reservoir facilities and natural resources through a hands-on work experience. Volunteerism can take the form of environmental education, wildlife and plant monitoring, clean-up events, instructional programs and trailhead guides or hosts. Currently, the following two volunteer programs provide invaluable services at the Boulder Reservoir.

Birds of Special Concern and Raptor Monitoring

The Parks and Recreation Department organizes volunteers every year to monitor birds at the Boulder Reservoir. Volunteer activities include monitoring, observing, and documenting nests, wildlife closures, and surrounding areas for birds of prey; reporting significant bird events; and assisting with educating the public about bird activities in the area.

Since 2004 volunteers have monitored nesting activities of avian species of concern within the Boulder Reservoir area. Locating nest sites, tracking nesting success, and monitoring human activities that might disturb nesting all contribute to conservation of sensitive bird species on City land. Since Boulder Reservoir receives tens of thousands of visitors each year, nest monitoring is particularly helpful to the department in managing recreation use near sensitive wildlife areas.

EXPAND Program for People with Disabilities

This program matches volunteers with people with physical disabilities enabling participation in multiple recreational activities. At the Boulder Reservoir, EXPAND staff and volunteers provide program support for water-based activities such as water skiing, tubing, sailing and kayaking.

B. Opportunities

Visitor education and stewardship promotion at the Boulder Reservoir are not a "one time only" cost for the City. Investment of City resources in these efforts will be an ongoing and long-term priority for the Parks and Recreation Department. Development and

administration of new volunteer programs involves staff resources. There may be opportunities, however, to leverage resources by expanding upon current department-wide programs or partnering with other City efforts. The following are examples of current City programs that could be expanded upon or modeled to provide volunteers at the Boulder Reservoir.

Adopt-a-Park

The Parks and Recreation Department recruits and trains individuals and organizations to help maintain the park system by choosing a park, establishing a maintenance schedule, and providing ongoing guidance and support. This program provides volunteers with the opportunity to gain valuable work experience, make a contribution to the community and to meet new people. Expansion of the Adopt-a-Park program to help maintain the trail system or landscaped areas in the Reservoir area could provide needed resources and promote a sense of stewardship for the natural environment around the Reservoir.

Community Clean-up Days

The City, in collaboration with the Boulder City Improvement Association II, sponsors Community Clean-Up Day in May to help maintain, improve and beautify Boulder's public lands through directed volunteer efforts, and to provide a convenient outlet for Boulder citizens to participate in the physical betterment of their City. Participants help by removing trash and recyclables, planting flowers and pulling weeds from parks and greenways.

Open Space and Mountain Parks (OSMP) Pick-up-Poop Derby

In association with Community Clean-Up Day, the OSMP organizes volunteers to help pick up dog waste in selected areas of City open space property.

OSMP Trail Guides/Hosts

The OSMP administers a volunteer trail guide program to greet and assist visitors on trails and at trailheads, providing information on trail use, area features, management and natural history. Trail guides also observe and report on visitor issues and inquiries to staff as needed to guide future policy development or facility investment.

Chapter 8.

Implementation Plan

A. Goals and Objectives

The Boulder Reservoir Master Plan outlines a set of goals and objectives intended to achieve the vision established for the Reservoir over a ten-year time period. The Plan defines funded and unfunded capital improvements necessary to maintain the Reservoir. The Plan also identifies programmatic and operational needs, and educational and promotional initiatives.

The 2006 Parks and Recreation Master Plan outlines several goals and strategies intended to make the department more economically sustainable. One strategy is to invest in facilities and programs at the Reservoir, such as special events, that offer additional revenue opportunities. Collaboration with other departments and agencies also will be an important step in leveraging resources and accomplishing mutual goals at the Reservoir. Building partnerships with community organizations and businesses will also contribute to the long-term sustainable management of the Reservoir area.

The following goals and objectives have been identified for the Boulder Reservoir in support for providing high-quality recreation facilities and services, water quality and habitat protection while meeting current and future needs of the community.

Goal 1.

Support City sustainability objectives at the Reservoir.

- ***Waste reduction***
- ***Carbon emissions reduction***
- ***Water conservation***
- ***Reduction of single occupancy auto trips through encouragement of alternative transportation options and management of parking***

Objectives:

Waste Reduction

1a. Promote and implement and the City's zero waste principles and best practices related to waste prevention, source reduction and reuse.

1b. Continue to apply zero waste policies to special events and other permitted activities at the Reservoir.

1c. Promote a "pack-in, pack-out" policy for the North Shore and Coot Lake.

Carbon Emissions Reduction

1d. Improve facility energy performance through energy efficient retrofits of the existing facilities and site management (i.e., placement, orientation and clustering) for new buildings on the South Shore.

1e. Strive to exceed all City energy efficiency requirements for commercial buildings and meet the City's goals for high performance building certification for new and remodeled facilities.

1f. Determine the feasibility of using on-site renewable energy systems in the redevelopment and renovation at the Reservoir.

1g. Investigate opportunities for carbon sequestration in the Reservoir's natural environment.

Water Conservation

1h. Incorporate water conservation principles and practices into the design and installation of an irrigation system on the South Shore.

1i. Complete installation for landscape irrigation pump mainline and laterals using raw water supply from the Reservoir for the South Shore.

1j. Emphasize the use of low-water use and drought-tolerant plant materials in landscape improvements on the South Shore.

Alternative Transportation Modes

1k. Determine the feasibility of providing improved bicycle, carpooling, alternative fuel vehicle, and shuttle facilities, and implement those strategies determined to be feasible in the redesign of the South Shore.

1l. Work with GO Boulder and appropriate agencies to develop a bicycle and vehicular parking management strategy that promotes and supports alternative transportation mode use and carpooling to the Reservoir, and establish incentives for pricing strategies to encourage carpooling and multiple occupancy vehicle visits.

1m. Encourage or require the use of shuttles for special and group events through a permitting process that requires a percent of alternative transportation options for large events, determine the feasibility of requiring participants and spectators to use shuttles, and work to eliminate excessive traffic congestion as a result of special events in order to minimize large numbers of idling vehicles.

1n. Identify temporary shuttle pick-up and parking locations in other areas of the City that may serve as staging parking areas for events.

1o. Coordinate with the Denver Regional Council of Governments to promote use of the on-line carpool organizer.

1p. Work with Boulder County Transportation to design and construct improved bicycle lanes along 51st Street from Jay Road to the South Shore entryway, and identify possible roadway improvements and event procedures that will improve traffic ingress and egress (flow) and minimize traffic conflict points during periods of heavy Reservoir use.

Goal 2.

Provide for a range of high-quality recreational uses, events, facilities and services that are inclusive of the community.

Objectives:

South Shore

2a. Develop a Site Management Plan to address the following:

- Traffic and noise impact
- Programmatic opportunities
- Operation and management thresholds
- Sustainable business model
- Vehicle and trail access
- Capital improvements
- Site plan

2b. Develop a detailed site plan (as part of the Site Management Plan) and a capital improvement program for each Management Area to accommodate new and relocate existing facilities; improve pedestrian, bicycle and vehicular circulation; minimize conflicts among recreational uses; accommodate parking demand and improve the attractiveness of the park. Evaluate the feasibility and prioritize development of the following:

- Boathouse and dry storage for small watercraft
- Picnic shelters and permanent shade structures
- Outdoor performance venue and event staging area
- Accessible playground and ropes course
- Area for special group functions, such as weddings and reunions
- Turf areas

2c. Replace and expand the boat rental and patrol fleet.

2d. Develop a rental program for swim beach amenities and equipment.

2e. Determine the programmatic feasibility for increasing the number of camps, classes, programs and other revenue-generating services within the parameters and thresholds defined by the Site Management Plan.

2f. Implement the South Shore entryway enhancements, including the planned provision of the additional gate house, to address bicycle, pedestrian and vehicular conflicts on 51st Street.

2g. Improve signage to help guide circulation and parking in the South Shore.

2h. Work with Boulder County Transportation to improve directional signage from Jay Road and modify traffic control procedures to improve flow at this intersection during times of heavy use as a result of Reservoir programs.

North Shore and Coot Lake

2i. Improve all multi-use trails to meet minimum design standards for all users, and to improve connectivity, communicate routes, and accommodate current and planned regional trail connections while minimizing impacts to sensitive areas.

2j. Discourage development of undesignated social trails through defined trail corridors, additional closure and restoration signage and fencing where appropriate.

2k. Design and construct a new pedestrian trail along the north shoreline of the Reservoir with designated access points to the water.

2l. Make improvements to the existing 55th Street and Coot Lake parking lots, such as parking access and egress upgrades, new informational boards, and evaluation of parking capacity.

2m. Improve fishing access areas on the North Shore, around Coot Lake and along the North and South Dams, which compliment the goals of the ANS program.

2n. Work with Northern Water to design and construct a new multi-use bridge over the Boulder Feeder Canal.

West Shore

2o. Work with OSMP, Boulder County Transportation, neighbors and the community to develop design and funding options for a multi-use trail along the 51st and 55th Street rights-of-way that provides a safe, off-road trail connection for cyclists and pedestrians while avoiding and minimizing impacts to wetland and prairie dog habitat.

2p. Work with the Boulder Aeromodeling Society to manage the aeromodeling facility in a manner that minimizes impacts to the adjacent wildlife habitat.

North and South Dams

2q. Determine the feasibility of an off-road multi-use trail connection along the dam road.

2r. Work with the Colorado Department of Transportation and the City of Boulder to pursue the potential for public egress from the South Shore to the Diagonal Highway (State Highway 119).

Goal 3.

Identify sensitive wildlife and plant species and protect, enhance and restore their natural habitat.

Objectives:

3a. Conduct a biological species inventory.

3b. Develop and implement wetland and grassland restoration and management plans.
- Identify noxious weed species and prioritize their eradication based on level of threat.
- Identify degraded areas and determine mitigation standards, costs and timelines to restore identified areas.
- Establish conservation goals for wetland and upland protection areas.

3c. Install fencing and/or visual barriers between trails and sensitive areas as appropriate to discourage direct disturbance of wildlife and promote protection of rare and declining wildlife species.

3d. Close "Jet Ski Cove" and place buoys near the Dry Creek inlet area to restrict boat access.

3e. Work with the Colorado Division of Parks and Wildlife to coordinate enforcement and to establish fish size criteria for the Reservoir and Coot Lake to support a healthy aquatic ecosystem.

3f. Implement access and seasonal closure policies to protect nesting birds.

3g. Update and expand interpretive and regulatory signage along trails near sensitive habitat areas.

3h. Work with local organizations and other educational institutions to monitor wildlife and plant species over the long term and to analyze population trends.

Goal 4.

Develop and implement strategies and partnerships to reduce and manage the risks of Aquatic Nuisance Species (ANS) infestations.

Objectives:

4a. Evaluate and provide an annual report on the ANS inspection program, the status of ANS infestation throughout the state, and best management practices available for prevention and control.

4b. Provide a decontamination station with the necessary infrastructure on the South Shore.

4c. Continue ANS inspection certification of Boulder Reservoir staff and continue City staff participation in the state ANS task force.

4d. Maintain inspection staff on site at all hours when the main gate is open.

4e. Ensure full cost recovery of the inspection program through boater permits and passes and other user fees.

4f. Redesign the multi-use trail connection from the 55th Street parking lot and install fencing to deter access to the Reservoir shoreline in the Dry Creek inlet area.

4g. Improve and enhance education and awareness about ANS at the 55th Street and Coot Lake trailheads and at appropriate points along the trails and shorelines.

4h. Increase enforcement measures and capability throughout the Reservoir area to reduce potential for illegal boat launching and use of live bait.

4i. Develop and implement a monitoring program for areas and species not monitored by the state (north shorelines, Coot Lake, and for milfoil) and prepare for possible City monitoring for all ANS.

4j. Provide the most updated computer hardware and software for ANS inspection, monitoring and tracking.

4k. Develop a response plan and strategies to prepare for all potential ANS infestation, including Zebra and Quagga Mussels and Eurasian Water Milfoil.

Goal 5.

Identify and minimize water pollutant sources.

Objectives:

5a. Integrate stormwater best management practices into all facility improvements.

5b. Restore portions of the Reservoir shoreline to minimize erosion and sedimentation from stormwater runoff.

5c. Continue standard water quality constituent monitoring at the current frequency.

5d. Add specific water quality monitoring to evaluate recreational impacts at specific locations and during selected periods of the year.

5e. Monitor and evaluate recreational management practices to be consistent with water quality thresholds.

5f. Use an adaptive management approach to monitoring (evaluate trends annually and make necessary changes).

5g. Provide information to the Parks and Recreation Advisory Board and City Council on a periodic basis to report on trends in water quality and boating use at the Reservoir.

5h. Work with Utilities and Northern Water to develop policies and protocols for recreation management in response to water supply changes.

5i. Provide educational information at trailheads and kiosks about water pollutant sources including stormwater runoff, pet waste, bodily contaminants, fuel spills, and ANS.

Goal 6.

Promote and support visitor safety.

Objectives:

6a. Increase enforcement capability to provide a consistent level of enforcement and staff presence throughout the trail system.

6b. Improve and enhance lake patrol and water safety services to meet all programmatic and use needs.

6c. Improve signage to ensure ongoing safety and awareness and to clarify emergency procedures.

6d. Clearly mark designated "no wake zone" near the dams and spillway to ensure boater safety.

6e. Implement and promote use of a new "no wake" time policy of up to two full weekdays to support non-motorized boating.

6f. Improve the safety of road crossings near trailheads. Evaluate the 63rd Street pedestrian and bicycle crossing between Tom Watson Park and Coot Lake and consider enhancements to improve safety.

6g. Work with Northern Water to improve signage at the Boulder Feeder Canal.

Goal 7.

Develop and implement a business model for long-term sustainable management of the Reservoir, including the use of public/private partnerships.

Objectives:

7a. Develop operations and business plans for the Boulder Reservoir area which provide detailed analysis on the items listed below, while balancing visitor capacity and activity levels within parameters identified in the Site Management Plan:

- Staff resources needed to support current and expanded services including daily use, special events, ANS inspection, safety and enforcement, habitat management and maintenance.
- Use of partnerships and sponsorships from recreational user groups, organizations, and local businesses to support Reservoir programming, events and facilities.
- A marketing strategy to promote revenue-generating uses, programs and services.
- Operating hours for Reservoir functions and services.
- A second fee station between the South Shore and South Dam areas to manage access to the South Shore.

7b. Pursue a variety of funding sources for future capital improvements through multiple sources including grants and partnerships.

7c. Perform periodic visitor use surveys to gauge future demands and future management and funding decisions.

Goal 8.

Endeavor to be a good neighbor to adjacent properties.

Objectives:

8a. Maintain and improve ongoing communication with and support from neighbors.

8b. Explore the potential for a second vehicular access point to the South Shore from the Diagonal Highway (State Highway 119).

8c. Work in conjunction with adjacent neighborhoods, Boulder County Transportation and other affected agencies to develop acceptable transportation alternatives intended to address vehicular traffic as a part of special events at the Reservoir.

8d. Invite the community to participate in meetings on the development of the Site Management Plan and discuss and share information on issues related to special events and other activities at the Reservoir.

Goal 9.

Promote visitor and community awareness and stewardship of the Reservoir through ongoing education and outreach.

Objectives:

9a. Provide up-to-date information about ANS inspection and prevention, recreation policies and regulations, visitor safety, resource conservation and recycling, water quality and habitat protection through several mechanisms including the Boulder Reservoir website, informational signage at trailheads and in public areas on the South Shore, brochures and personal contact at various locations along trails, entryways and high use areas.

9b. Provide wayfinding signage in all areas around the Reservoir to guide circulation and inform visitors about allowed uses and sensitive habitat areas.

9c. Develop partnerships with local organizations to facilitate environmental research and education.

9d. Develop a volunteer or "Adopt-a-Park" program to help with habitat management, trail maintenance and annual clean-up.

9e. Consider development of a "brand" for the Boulder Reservoir to promote familiarity and a sense of place, as well as to market revenue generating uses.

9f. Provide signage or posters to recognize volunteer work and donations.

Goal 10.

Ensure the security and maintenance of the facilities and infrastructure in the Reservoir area.

Objectives:

10a. Work with the City of Boulder Emergency Services to promote communication and to develop an emergency preparedness plan.

10b. Develop a facility security and lighting plan for the South Shore.

Goal 11.

Collaborate with other agencies and departments to accomplish mutual goals.

Objectives:

11a. Coordinate with other City departments and agencies to clarify management responsibilities of the Boulder Reservoir area.

11b. Continue involvement in the Boulder Reservoir Watershed Management Group to maintain communication among departments on water resource management.

11c. Work with Boulder County Transportation to clarify regulations and enforcement jurisdiction along 51st and 55th streets.

11d. Work with City of Boulder Public Works staff to evaluate the feasibility of a solar array system to support the Reservoir.

B. Key Policy Recommendations

The following policies and guidelines were developed for the Boulder Reservoir following City Council direction on December 7, 2010. Implementation will occur in Spring 2012, unless otherwise noted.

Boating:

- Motorized boat use will be limited based on the size of the engine to 500 horsepower maximum.
- A phase-out of all two-strokes engines that do not meet current EPA exhaust emission standards will be implemented by 2013.
- Refueling of motorized boats while in the water shall be eliminated.
- All watercraft shall be launched from designated areas on the South Shore only.
- No watercraft shall be allowed in Coot Lake (including belly boats).
- Eliminate "Jet Ski Cove" and expand a "no wake" zone at the Dry Creek inlet to protect aquatic and wetland habitat.
- All personal watercraft (PWC) shall be eliminated from the Reservoir with the exception for water safety purposes and any craft used for Department approved or managed programs.
- A 'no wake' restriction, up to 2 full days each week, shall be implemented.
- Implement a full cost-recovery and fee program addressing Aquatic Nuisance Species (ANS) regulations, inspections and monitoring.

West Shore:

- Recreational uses shall be restricted to low impact uses.
- The feasibility of developing a soft-surface multi-use trail shall be pursued along the 51st Street corridor right-of-way connecting the North Shore trail system to the South Shore entryway.
- The aermodeling facility shall be allowed to remain in its current location with seasonal wildlife closures as needed unless a suitable and acceptable land area can be identified for the relocation of the aeromodeling facility.
- Future trails on the West Shore will require that dogs be on-leash to protect habitat.
- Pursue designation of wetland, shoreline and prairie dog habitat as protected areas.

North Shore and Coot Lake:

- Continue to manage and maintain the passive recreational uses of the area.
- Dogs are allowed to swim on the south and east shores of Coot Lake and North Shore of the Reservoir. Human swimming is prohibited in these areas.
- Improve the existing trail system and build a pedestrian trail for access to the north shoreline of the Reservoir.
- Maintain the 55th Street parking lot.
- Allow voice and sight management for dogs on the trail and institute regulations that prohibit dogs and people from accessing established wetland areas, including installation of new fencing and signage to educate the public, and report back to City Council in 2012 outlining results of the programs as described.
- Current voice and sight rules will remain for all other areas of the North Shore and Coot Lake area.
- Reduce access to the northwest shoreline in the Dry Creek Inlet (currently Jet Ski Cove) to protect wetland and aquatic habitat and to discourage illegal boat launching.

Special Events:

- As part of the Site Management Plan in alignment with the Boulder Reservoir vision and purpose, develop a cumulative analysis and impact report that will address traffic impacts, noise and pollutant levels, biological species inventory, and programs and operations.
- Develop standards and a tiered approach to special events based on the cumulative analysis and impact report. The studies in the Site Management Plan will guide the determination of the type and number of special events. Until such time, the number of signature/special events held each year will remain consistent and not exceed current numbers for the past three years as of this plan date.
- Special events shall be restricted to the South Shore, Reservoir (water), North and South Dam roads, or the multi-use trails in the North Shore and Coot Lake management areas.
- Special events are required to begin and end on the South Shore.

C. Adaptive Management Approach

The Boulder Valley Comprehensive Plan (BVCP) indicates that:

'The City will employ an adaptive management approach to resource protection and enhancement. An adaptive management approach involves the ongoing monitoring of resource conditions, assessment of the effectiveness of management actions, revisions of management actions based on new information from research, and learning from experience what works and what does not work.'

– BVCP Section 4.02: Adaptive Management Approach

An adaptive management program represents good planning beginning with the identification of measurable goals and strategies intended to meet the plan objectives, and the formation of action items that are linked to the fiscal and resource limitations of the organization. The following conceptual diagram represents a typical adaptive management approach.

Figure 3. **Adaptive Management**

Step 1: Conceptualize

This includes the initial visioning and goal setting effort and is represented by the Boulder Reservoir plan process and final Master Plan. This step identifies collaborative team members and considers the project scope, key targets, potential threats and a situational analysis.

Step 2: Plan Actions and Monitoring

Step 2 includes the refinement of goals and strategies and a detailed Action Plan highlighting project priorities. The Reservoir Site Management Plan will address programmatic and operational strategies for the Reservoir that are linked to a fiscally-defined business plan. A monitoring plan will establish measurable criteria to assess ongoing capital improvements and operations and assessment of resources, water quality and recreational impacts over time.

Step 3: Implement Actions and Monitoring

The implementation of actions will be expressed as part of the annual work plan intended to coordinate individual management agencies, staff and resource availability at the Reservoir. Ongoing monitoring programs developed by individual agencies will serve to identify benchmarks and limits of acceptance associated with visitor and recreation use, impacts on habitat and water quality, safety and aesthetics. The monitoring effort provides guidance to the annual work plans, project timelines and capital and operating programming and budgeting.

Step 4: Analyze, Use, Adapt

The ongoing data collection and analysis guides recommendations and possible adjustments to the strategic planning effort over time. As recreational uses change at the Reservoir, the analysis of user information and possible impacts related to sensitive resources will serve to inform each agency as to how and when adjustments are required. Specific data collection methods may include user surveys, field observations, mapping, capital improvement programming, policing and/or educational and awareness campaigns. Programmatic and operational adjustments may be required when considering a range of strategies from least restrictive to more restrictive options as necessary.

Step 5: Capture and Share Learning

An important but often neglected step is the documentation of learned experiences and the sharing of information with the end users, agency staff, and decision-makers whom all have a stake in the long-term health and success of the Boulder Reservoir.

Table 4. Adaptive Management Program

Step	Description	Key Components	Output Deliverables
1	Conceptualize	▪ Define affected agencies and team members ▪ Define scope, vision and targets ▪ Identify critical threats ▪ Complete situation analysis	▪ Boulder Valley Comprehensive Plan (BVCP) ▪ Boulder Reservoir Master Plan ▪ Utilities Master Plan ▪ Open Space Mountain Parks Visitor Master Plan ▪ Transportation Master Plan
2	Plan Actions and Monitoring	▪ Develop goals, strategies and objectives ▪ Develop monitoring plan ▪ Develop operational plan	▪ Reservoir Site Management Plan • Business Plan • Reservoir Operations and Maintenance Plan ▪ Reservoir CIP/ Repair and Renovation (R&R) ▪ Asset Management Plan Inventory ▪ Public Engagement Program ▪ Specialized Programs / Events
3	Implement Actions and Monitoring	▪ Develop work plan and timelines ▪ Develop and refine budget ▪ Implement plans	▪ Annual Work Plan ▪ Annual Operating Program ▪ Asset Management Plan ▪ Project Management Plans ▪ Biological Assessment Reports ▪ Natural Resource Plan
4	Analyze, Use, Adapt	▪ Prepare data for analysis ▪ Analyze results ▪ Adapt strategic plan	Periodic Reviews / Updates: ▪ Annual Work Plan ▪ Annual Operating Program ▪ Asset Management Plan ▪ Post Construction Evaluation Reports
5	Capture and Share Learning	▪ Document learning ▪ Share learning ▪ Create learning environment	▪ Educational Awareness Programs / Campaigns ▪ User Surveys ▪ Water Quality Research ▪ Program Profit / Loss Evaluations

D. Funding Plans and Priorities

Full implementation of the Boulder Reservoir Master Plan will be a challenge for the Parks and Recreation Department under the current budgetary conditions of the City. As use of the Reservoir increases, there will also be a need for increased operations and maintenance services, including renovation and refurbishment of existing facilities and construction of new infrastructure to replace aging facilities.

The Parks and Recreation Department faces funding challenges including insufficient revenues, lack of stable long-term funding, and the expiration of sales taxes that support the Department. The Department has two ongoing sources of capital funds: 1) the .25 Cent Sales Tax Fund, and 2) the Permanent Parks and Recreation Fund. Those funds, however, must also be used for park development and renovation of all department facilities (including those at the Reservoir).

Operational funds are generated at the Reservoir through gate fees, boat permits, picnics, events, boat rentals, camps, special events and other programs. Revenue from the uses at the Reservoir goes into the Department's Recreation Activity Fund which provides operational funding for programs and services throughout the Recreation Division.

FOOTNOTE:

The Action Plan Funding Plan considers capital investment program priorities and cost estimates as defined for the Round 1 Bond (approved by voters Nov. 2011) allocating $3 million for critical infrastructure needs at the Boulder Reservoir.

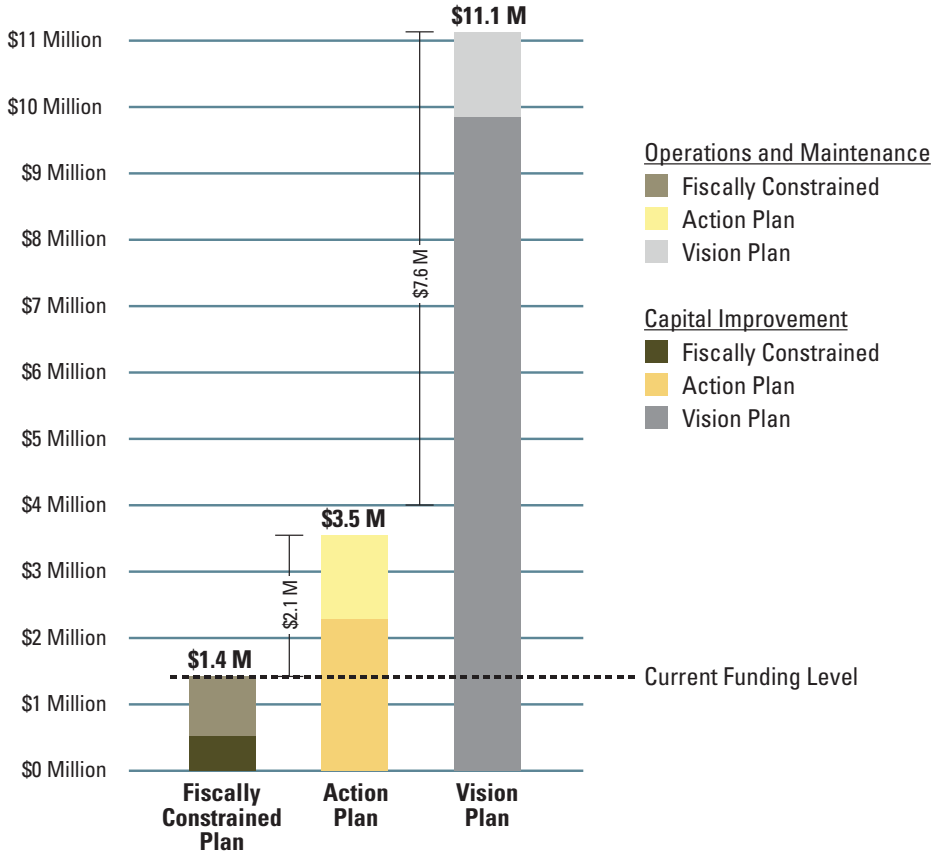
The Vision Plan Funding Plan considers other capital investment program needs and cost estimates and targets the future Round 2 Bond (potentially Nov. 2012) and/or other funding sources (grants, annual CIP and R&R program).

Fiscally Constrained Plan: based on current funding availability and/or staff resources to complete the action item.

Action Plan: the next step of service expansion or restoration that should be taken when funding becomes available. The action plan identifies services and capital investments that are in need of restoration, growth, or addition.

Vision Plan: the complete set of services and facilities desired by the community and aligned with values and policies, with alternative proposals to fund them.

Figure 4. **Funding Plan Bar Graph**



E. Next Steps

With the adoption of the Boulder Reservoir Master Plan, the Parks and Recreation Department will continue to advance the master plan's vision, goals, and strategies and respond to and reflect a collaborative approach to managing critical resources and recreational needs at the Reservoir. The collaborative approach will engage various City departments, as well as outside agencies, whom all have a role in monitoring and ongoing management of the valued resources offered by the Reservoir.

The next phase of the planning process includes the development of a detailed capital improvement program and operations plan as part of the upcoming Site Management Plan. The department will also produce an annual report evaluating accomplishments and deficiencies in context to the goals and recommendations as outlined in the master plan. The annual report will be linked to the Department's ongoing budget, capital improvement program, repair and renovation (R & R) and operating programs and will be used to address future master plan updates as required.

The master plan implementation process will include the following:

Infrastructure Needs Assessment Report

The Infrastructure Needs Assessment was initiated in December 2010 as a data collection effort of all known infrastructural-data related to the Boulder Reservoir. The purpose of this project is to collect existing data prior to the Site Management Plan and to summarize essential infrastructure needs and deficiencies, as well as regulatory and compliance issues related to health safety, environment, and accessibility. When completed, the Infrastructure Needs Assessment Report will serve as the principle database providing guidance to condition evaluation for infrastructure such as: buildings, roads, utilities, and recreational uses affecting docks, ramps, and amenities (shelters, volleyball, horseshoes and trails).

Site Management Plan

The Site Management Plan is intended to address the details associated with the recreational facility including programming, operations, management and the business plan for the Reservoir.

The Site Management Plan will address each management area at the Reservoir considering infrastructural and departmental needs such as public spaces, natural areas, shoreline conservation and habitat areas, access and circulation, trail connections, parking, signage, building programming and sustainable development strategies.

The result of the Site Management Plan will be an annual work program and a detailed capital improvement program and operations plan addressing management needs, regulations, education and enforcement policies and procedures and wildlife and water quality protection standards. The Plan will include a market analysis and financial business plan to determine revenue potential opportunities, partnerships, funding needs and priority improvements at the Reservoir.

Annual Report

The Department will develop an online annual report that is reviewed by PRAB and made available to the community to provide information on the progress towards achieving goals and recommendations of the master plan. The report will describe successes and challenges toward each goal, required next steps and what resources may be required to achieve the goal or strategy.

Parks and Recreation Advisory Board (PRAB) Updates

Parks and Recreation staff will provide periodic updates to PRAB on the progress associated with the master plan goals as a monitoring strategy to achieve plan goals. The reviews may result in the development of new strategic priorities over the coming years.

Capital Improvement Program (CIP) and Operating Budget Reviews

Parks and Recreation staff will provide annual updates to PRAB on the Department's CIP that will include the Reservoir capital and operational programs.

Action Item Responsibilities

This master plan details an ambitious plan for creating a self-sustaining recreational facility at the Boulder Reservoir. With the adoption of the plan, the Parks and Recreation Department commits to facilitate a collaborative approach to the objectives and action items in the Fiscally Constrained Plan and to actively pursue viable partnerships and funding opportunities to address both the Action Plan and Vision Plan elements.

Table 5: Action Item Responsibilities outlines over 70 individual action items that will require a collaborative approach to plan, design and implement each item. In most cases the Parks and Recreation Department will serve as the lead agency to facilitate the action item. However, to be successful, the Department recognizes the importance and need to work with many other City departments as well as the need to coordinate with outside agencies beyond the City of Boulder.

The Department will continue to assess needs for habitat and water resource protection and recreational facilities and programs while engaging the community in decisions that affect the long-term sustainable development at the Reservoir.

Table 5. Action Item Responsibilities

Capital Improvements / Repair and Renovations			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
1	Conduct a Site Management Plan to assess existing facilities and identify required improvements and develop a site plan and capital improvement program for all Management Areas.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, Transportation Open Space and Mountain Parks (OSMP) Other Agencies: County Transportation County Parks and Open Space	Fiscally Constrained Plan
2	Install a portable ANS boat decontamination station.	Lead: Parks and Recreation	Fiscally Constrained Plan
3	Complete the installation of the landscape irrigation pump, main line and laterals using raw water supply from the Reservoir for the South Shore.	Lead: Parks and Recreation	Fiscally Constrained Plan
4	Continue ongoing maintenance and repair of prairie dog fencing.	Lead: Parks and Recreation	Fiscally Constrained Plan
5	Complete the initial installation of fencing and signage at Coot Lake.	Lead: Parks and Recreation	Fiscally Constrained Plan
6	Complete minor road repair cracking and sealant as needed.	Lead: Parks and Recreation	Fiscally Constrained Plan
7	Complete the installation of new gas pump refueling station.	Lead: Parks and Recreation	Fiscally Constrained Plan

Table 5. Action Item Responsibilities

Capital Improvements / Repair and Renovations			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
8	Assess safety implications for priority dock/cable systems (2 locations) and determine a long-term approach to replacing existing Reservoir dock cable systems.	Lead: Parks and Recreation	Fiscally Constrained Plan
9	Replace sewer lift station at Administration Building and Boat House.	Lead: Parks and Recreation	Fiscally Constrained Plan
10	Implement the South Shore entryway enhancements including new entrance building, water and sewer service, security gates and signage, right-of way, landscaping and site improvements.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities	Action Plan
11	Design and develop multi-use trail system improvements including site work, trail modifications and expansion, fencing and signage.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation OSMP Other Agencies: County Transportation County Parks and Open Space	Action Plan
12	Redesign the North Shore multi-use trail connection from the 55th Street parking lot and install fencing to deter boater access to the Reservoir shoreline.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation OSMP Other Agencies: County Transportation County Parks and Open Space	Action Plan
13	Work with Northern Water to design and construct a new multi-use bridge over the Boulder Feeder Canal and improve signage.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, Transportation OSMP Other Agencies: Northern Water County Transportation County Parks and Open Space	Action Plan
14	Replace and expand the boat rental and patrol fleet.	Lead: Parks and Recreation	Action Plan
15	Make improvements to the 55th Street and Coot Lake parking lots.	Lead: Parks and Recreation	Action Plan

Table 5. Action Item Responsibilities

Capital Improvements / Repair and Renovations			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
16	Work with Boulder County to improve directional signage from Jay Road and 51st Street.	Lead: Parks and Recreation Other Agencies: County Transportation	Action Plan
17	Work with City and County transportation staff to improve the safety of road crossings near trailheads.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation Other Agencies: County Transportation	Action Plan
18	Provide updated computer hardware and software for ANS inspection, monitoring and tracking. Develop and implement an ANS monitoring program for areas and species currently not monitored by the state and prepare for possible future City monitoring for all ANS issues.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Other Agencies: Colorado Department of Public Health and Environment (CDPHE)	Action Plan
19	Complete the installation of the upgraded sanitary sewer line.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, Facilities and Asset Management (FAM) Other Agencies: CDPHE	Action Plan
20	Complete the installation of the new water main line including Plant Investment Fee (PIF) charges.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, FAM Other Agencies: CDPHE	Action Plan
21	Conduct a feasibility study assessing dock replacement for safety and ADA compliance options.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, FAM	Action Plan

Table 5. Action Item Responsibilities

Capital Improvements / Repair and Renovations			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
22	Decommission Left Hand Water District and transition to City of Boulder as the primary domestic water source provider.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, FAM Other Agencies: Left Hand Water District	Action Plan
23	Design and fund a multi-use trail along the 51st and 55th Street rights-of-way.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation OSMP Other Agencies: County Transportation	Vision Plan
24	Conduct a feasibility analysis on the Lyons-to-Boulder Regional Trail at the Boulder Reservoir to include a potential trailhead, parking, signage, and restroom facilities.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation OSMP Other Agencies: County Transportation Colorado Parks and Wildlife	Vision Plan
25	Complete infrastructure improvements including roadway and parking lot improvements, utility and stormwater management, prairie dog mitigating fencing, landscape and irrigation upgrades.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, FAM	Vision Plan
26	Design and construct improvements identified in the Site Management Plan that may include redevelopment of existing structures, new park amenities, boat ramp and camp equipment storage facilities, upgraded ADA play equipment, outdoor performance venue and beach areas, wayfinding and signage, permitting and fees.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, FAM	Vision Plan
27	Replace docks with new ADA accessible floating dock system.	Lead: Parks and Recreation	Vision Plan
28	Re-evaluate the option for the Sixmile Reservoir lease purchase as a recreation and ANS measure.	Lead: Parks and Recreation	Vision Plan

Table 5. Action Item Responsibilities

Capital Improvements / Repair and Renovations			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
29	Work with Boulder County to design and construct improved bicycle lanes along 51st Street from Jay Road to the South Shore entrance.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation Other Agencies: County Transportation	Vision Plan
30	Restore portions of the Reservoir shoreline to minimize erosion and sedimentation from stormwater runoff.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Other Agencies: Northern Water	Vision Plan

Operations, Maintenance and Coordination			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
1	Ongoing operations and maintenance including visitor services, maintenance, operations, seasonal staffing and equipment.	Lead: Parks and Recreation	Fiscally Constrained Plan
2	Develop management responsibilities, and operations and business plans for the Boulder Reservoir (part of the Site Management Plan).	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities	Fiscally Constrained Plan
3	Determine programmatic feasibility for increasing the number of camps, classes, programs and other revenue-generating services at the Reservoir (part of the Site Management Plan).	Lead: Parks and Recreation	Fiscally Constrained Plan
4	Clearly mark designated “no wake zones” and implement a “no-wake” time of up to two full weekdays to support non-motorized boating. Control boat use near the dams and spillway to ensure boater safety and close “Jet Ski Cove” to boating.	Lead: Parks and Recreation	Fiscally Constrained Plan
5	Work with local organizations or other educational institutions to monitor wildlife and habitat areas as a long-term program.	Lead: Parks and Recreation	Fiscally Constrained Plan
6	Conduct an annual water quality assessment report for the Reservoir and the ANS inspection program.	Lead: Parks and Recreation	Fiscally Constrained Plan

Table 5. Action Item Responsibilities

Operations, Maintenance and Coordination			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
7	Report to City Council periodically on trends in water quality and boating use.	Lead: Parks and Recreation	Fiscally Constrained Plan
8	Review current operational policies and procedures and implement revised regulatory, code and rule changes as required (part of the Site Management Plan).	Lead: Parks and Recreation Supporting Departments: City Attorney, City Manager	Fiscally Constrained Plan
9	Promote ongoing waste prevention, source reduction, reuse, composting and recycling principles and practices where feasible.	Lead: Parks and Recreation	Fiscally Constrained Plan
10	Encourage the use of shuttles for special and group events.	Lead: Parks and Recreation	Fiscally Constrained Plan
11	Work with Boulder Aeromodeling Society to manage the aeromodeling facility.	Lead: Parks and Recreation	Fiscally Constrained Plan
12	Develop and implement access and seasonal wildlife area closure policies (part of the Site Management Plan).	Lead: Parks and Recreation Supporting Departments: OSMP	Fiscally Constrained Plan
13	Continue ANS inspection certification of Boulder Reservoir staff and continue City staff participation in the state ANS task force.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities	Fiscally Constrained Plan
14	Maintain inspection staff on site at all hours when the main gate is open at the South shore only.	Lead: Parks and Recreation	Fiscally Constrained Plan
15	Maintain and improve on-going communication with and support from neighbors.	Lead: Parks and Recreation	Fiscally Constrained Plan
16	Work with emergency services to promote communications and to develop an emergency preparedness plan.	Lead: Parks and Recreation Supporting Departments: Public Works, FAM Fire - Rescue	Fiscally Constrained Plan
17	Continue involvement in the Boulder Reservoir Watershed Management Group. Develop standard water quality monitoring and expand frequency to evaluate recreational impacts at specific locations and during selected periods of the year. Evaluate developing water quality thresholds to support recreational use decision-making criteria and management responses.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities	Fiscally Constrained Plan
18	Work with Boulder County Transportation to clarify regulations and enforcement jurisdiction along 51st and 55th streets.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation Other Agencies: County Transportation	Fiscally Constrained Plan

Table 5. Action Item Responsibilities

Operations, Maintenance and Coordination			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
19	Increase enforcement measures and capability throughout the Reservoir area. Expand lake patrol and water safety services to meet all programmatic and use needs.	Lead: Parks and Recreation	Action Plan
20	Improve and enhance education and awareness about ANS at the 55th Street and Coot Lake trailheads and at appropriate points along the trails and shorelines.	Lead: Parks and Recreation	Action Plan
21	Develop a response plan to prepare for all potential ANS infestation. Determine future O & M and capital costs associated with required improvements that will be determined as a part of the Site Management Plan.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Other Agencies: CDPHE	Action Plan
22	Conduct a biological species inventory and develop and implement wetland and grassland restoration management plans based on inventory assessment findings and preferred implementation strategies.	Lead: Parks and Recreation Supporting Departments: OSMP	Action Plan
23	Work with Utilities and Northern Water to develop policies and protocols for weed management and recreation management in response to water supply changes.	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, FAM City Attorney, City Manager Other Agencies: Northern Water	Action Plan
24	Develop a volunteer or "Adopt-a-Park" program to help with habitat management, trail maintenance and annual clean-up.	Lead: Parks and Recreation	Action Plan
25	Work with GO Boulder to develop a bicycle and vehicular parking management strategy that promotes and supports alternative transportation mode use to the Boulder Reservoir.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation Other Agencies: County Transportation	Action Plan
26	Identify and determine the feasibility of temporary shuttle pick-up and parking locations in other areas of the city for events.	Lead: Parks and Recreation Supporting Departments: Public Works, Transportation	Action Plan
27	Develop a rental program for swim beach amenities and equipment (umbrellas, chairs).	Lead: Parks and Recreation	Action Plan

Table 5. Action Item Responsibilities

Operations, Maintenance and Coordination			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
28	Update and expand interpretive signage along trails near sensitive habitat areas.	Lead: Parks and Recreation	Action Plan
29	Work with Colorado Parks and Wildlife to coordinate fishing enforcement and to establish fishing criteria.	Lead: Parks and Recreation Other Agencies: Colorado Parks and Wildlife	Action Plan
30	Perform periodic visitor use surveys to gauge future demands and future management and funding decisions.	Lead: Parks and Recreation	Action Plan
31	Install fencing and/or visual barriers for sensitive habitat and wetland protection areas and along trails and high use pedestrian areas.	Lead: Parks and Recreation	Action Plan
32	Implement the City's zero-waste policy and programs practices where feasible.	Lead: Parks and Recreation	Action Plan
33	Develop a full inspection, monitoring and cost recovery ANS inspection program for the South shore.	Lead: Parks and Recreation Supporting City Departments: Public Works, Utilities Other Agencies: CDPHE	Action Plan
34	Develop a feasibility analysis of possible expansion of ANS monitoring facilities for the North Shore and West Shore access points.	Lead: Parks and Recreation Supporting City Departments: Public Works, Utilities Other Agencies: CDPHE	Action Plan
35	Explore the potential for a second vehicular access point to the South Shore from the Diagonal Highway (State Highway 119).	Lead: Parks and Recreation Supporting City Departments: Public Works, FAM Fire - Rescue Other Agencies: Colorado Department of Transportation	Vision Plan

Table 5. Action Item Responsibilities

Operations, Maintenance and Coordination			
No.	**Action Item**	**Responsible Agency**	**Plan Fund Scenario**
36	Determine the feasibility of a continuous off-road multi-use path adjacent to the paved road system (South Shore Management Area).	Lead: Parks and Recreation Supporting Departments: Public Works, Utilities Public Works, Transportation OSMP Other Agencies: County Transportation County Parks and Open Space	Vision Plan
37	Work with Public Works, Utilities staff to evaluate the feasibility of and identify a location for a large-scale solar array system to support the Reservoir and surrounding facilities.	Lead: Parks and Recreation Supporting City Departments: Public Works, Utilities	Vision Plan
38	Develop partnerships with local organizations to facilitate environmental research and education.	Lead: Parks and Recreation	Vision Plan
39	Coordinate with the Denver Regional Council of Governments to promote use of the on-line carpool organizer.	Lead: Parks and Recreation Supporting City Departments: Public Works, Transportation Other Agencies: Denver Regional Council of Governments	Vision Plan
40	Evaluate the feasibility of incorporating energy performance enhancements for the Reservoir facilities.	Lead: Parks and Recreation Supporting City Departments: Public Works, Utilities Public Works, FAM	Vision Plan