BUTTON ROCK PRESERVE

MANAGEMENT PLAN

Accepted by Longmont City Council: XX, 2023

Prepared by

City of Longmont
Natural Resources Division

with

Colorado Natural Heritage Program
DHM Design
RiverRestoration

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- Danielle Cassidy, Natural Resources Project Manager

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- David Bell, Director of Parks & Natural Resources
- Ken Huson, Water Resources Manager
- Pryce Hadley, Senior Watershed Ranger
- Jim Krick, Ecosystem Management Administrator
- Scott Severs, Senior Wildlife Technician
- John Weaver, Assistant Fire Chief

Partners

TECHNICAL ADVISORY COMMITTEE

- Michelle Durant, Boulder County Parks & Open Space
- Ernst Strenge, Boulder County Parks & Open Space
- John Koehler, Colorado Parks & Wildlife
- Ben Swigle, Colorado Parks & Wildlife
- Ben Pfohl, Colorado State Forest Service
- Paul Glasgow, Town of Lyons
- Kevin Zimlinghaus, United States Forest Service

CONSULTANTS

Colorado Natural Heritage Program: Andrea Schuhmann, Pam Smith, Jill Handwerk and Jeremy Siemers

DHM Design: Ashleigh Quillen, Jeremy Allinson, Andrew Ehat and Eileen Kemp

RiverRestoration: Quinn Donnelly

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

A view of Button Rock Preserve's Longmont Reservoir

EXECUTIVE SUMMARY

Button Rock Preserve (Preserve), a 2,671-acre protected area located in the montane foothills near Lyons, Colorado, is owned and managed by the City of Longmont (Longmont). The Preserve is a special, unfragmented area containing an array of ecosystems from forests to wetlands and distinctive habitats such as gulches and rock outcrops. The area is home to a diversity of native plants and wildlife, rare plants, and critical wildlife habitat. The purpose of Button Rock Preserve is to protect Longmont's and the Town of Lyon's primary municipal drinking water supply. Maintaining healthy, resilient ecosystems throughout the Preserve is a fundamental part of achieving this goal.

In addition to functioning as a protected preserve, Button Rock Preserve is also a place to recreate. It is an accessible destination for Colorado's Front Range communities, and it is open year-round to various types of passive recreation including hiking, fishing, and rock climbing. When Button Rock Preserve first opened to the public, Longmont developed visitor use policies to protect natural resources and public safety. In the 1990s, as visitor numbers began to tick up, Preserve rules were updated. Between 1988 and 1993, visitor numbers ranged between about 3,200 and 9,000 hikers per year; in 2000, this number rose to 13,000 hikers and by 2011, the annual hiker count was 30,396. Today, 30 some years have passed since the last comprehensive Preserve rules update, and in this time, the Preserve has become a destination for local, regional, and out-of-state visitors. In 2020, when other open spaces were closed due to the COVID-19 pandemic, Button Rock Preserve hosted 71,332 hikers and 56,949 vehicles and in 2021, 57,608 hikers and 42,699 vehicles visited.

The Button Rock Management Plan (Plan) was developed by City of Longmont Natural Resources and Water Resources staff in collaboration with a Technical Advisory Committee (TAC) of local agencies and a team of consultants. It addresses increasing visitor use, out of date rules and regulations and a lack of baseline natural and cultural resources data, all of which guide management decisions that support protecting Button Rock Preserve's water and natural resources. The Plan's defined purpose and goals, the management direction and actions and Longmont Municipal Code changes are based on

1. Information gathered from four public surveys, three public meetings, a Plan web page and three resident-based advisory boards.[1]
2. Data gathered during baseline inventories of natural and cultural resources, Preserve infrastructure, and visitor services,
3. Visitor count data,
4. An existing Forest Stewardship Program and
5. An adaptive plan design that can integrate ongoing research and monitoring of Preserve resources into future planning.

Some areas of the Preserve are best suited for protection, e.g., critical wildlife habitat, sensitive plant populations and communities, and areas needing ecological restoration, while others are best for passive recreation and environmental education. Key decisions, based on science and a 'do no harm' management approach include using management zones to protect critical resources; prohibiting non-native animals, such as domestic dogs (Canis familiaris) to protect water and native wildlife; continuing recreational fishing and a fee-based fishing permit program; updating Preserve hours to align with other area open spaces and parks; utilizing prescribed fire as an integral part of forest stewardship and collaborating with other agencies in regional planning and implementation. Longmont strives to sustain and enhance Preserve resources for the benefit of water quality, wildfire and disaster preparedness using management tools including management zoning, noxious weed control, prescribed fire, ecological restoration, and ongoing research and monitoring.

[1] In February 2023, Water, Parks and Recreation and Sustainability Advisory Boards voted to recommend the Plan to City Council for acceptance. Although in support of the overall plan with a vote of 5 to 1, the Parks and Recreation board was split 3 to 3 split on the dog recommendation.

ACRONYMS AND ABBREVIATIONS

acre-feet	Unit of volume to measure water equivalent to an acre of area covered with one foot of water (325,850 gallons)
ADA	Americans with Disabilities Act
AMS	Adaptive Management at Scale
ATV	All-terrain vehicle
BMI	Benthic Macroinvertebrates
BMP	Best Management Practice
BCPOS	Boulder County Parks and Open Space
BLM	Bureau of Land Management
CIP	Capital improvement program
CAO	City Attorney's Office
City	City of Longmont
CBT	Colorado-Big Thompson Project
CDA	Colorado Department of Agriculture
CDOT	Colorado Department of Transportation
CDRMS	Colorado Division of Reclamation, Mining and Safety
CFRI	Colorado Forest Restoration Institute
CNHP	Colorado Natural Heritage Program
COSWAP	Colorado Strategic Wildfire Action Program
CPW	Colorado Parks and Wildlife
CSFS	Colorado State Forest Service
CSU	Colorado State University
CWCB	Colorado Water Conservation Board
CDBG-DR	Community Development Block Grant for Disaster Recovery
cfs	Cubic feet per second
EAP	Emergency Action Plan
EMR	Emergency Medical Responder
ECA	Environmental Conservation Area
FPD	Fire Protection District
FMU	Forestry Management Unit
GIS	Geographic information system
HCA	Habitat Conservation Area
IGA	Intergovernmental Agreement
Longmont	City of Longmont
LRI	Landscape Resilience Investment
LWD	Large Woody Debris
LDR	Longmont Dam Road
LECC	Longmont Emergency Communications Center
LMC	Longmont Municipal Code

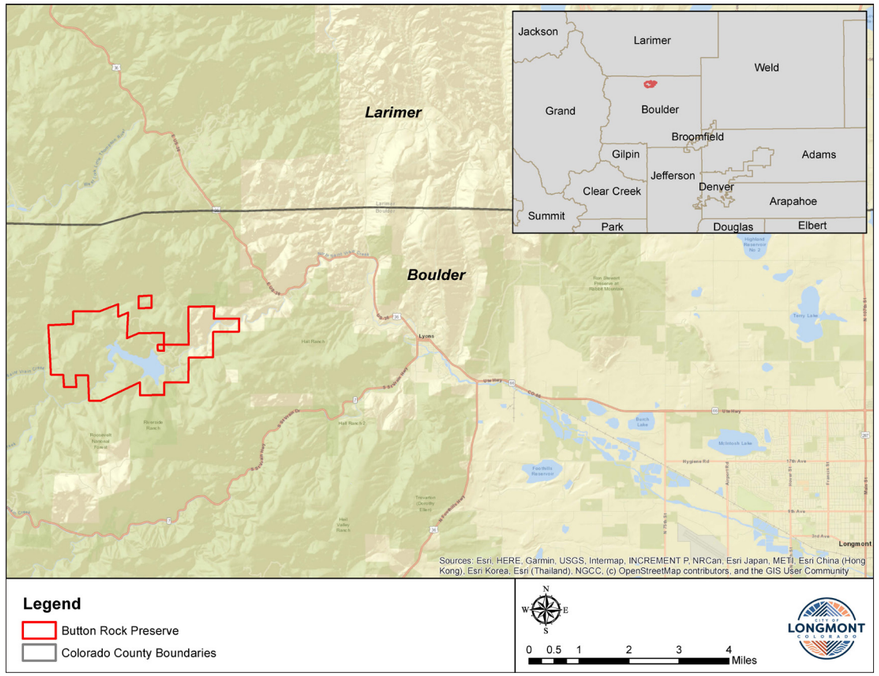
LWQL	Longmont Water Quality Lab
NPS	National Park Service
NA	Natural Area
NRCS	Natural Resources Conservation Service
NCWCD	Northern Colorado Water Conservancy District (Northern Water)
Preserve	Button Rock Preserve
POST	Parks, Open Space and Trails
PRA	Passive Recreation Area
P2P	Plains to the Park
PCA	Potential Conservation Area
PMP	Probable Maximum Precipitation
RPR	Ralph Price Reservoir
RMNP	Rocky Mountain National Park
SVCC	St. Vrain Creek Coalition
SVFHP	St. Vrain Forest Health Partnership
SVLHWCD	St. Vrain and Left Hand Water Conservancy District
SVMP	St. Vrain Master Plan
SAR	Search and Rescue
SWA	Seasonal Wildlife Closure Area
STEM	Science, Technology, Engineering and Mathematics
SGCN	Species of Greatest Conservation Need
SWAP	State Wildlife Action Plan
SES	Sustainability Evaluation System
TAC	Technical Advisory Committee
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTV	Utility terrain vehicle
WTP	Water Treatment Plant
WC	The Watershed Center
WRCC	Western Regional Climate Center

1. INTRODUCTION

1.1 Introduction

Button Rock Preserve (Preserve), a 2,671-acre protected preserve located in the lower montane foothills near Lyons, Colorado, is owned and managed by the City of Longmont (Longmont) (Map 1, Appendix A). The Preserve is a special place, encompassing unfragmented forested slopes, shrublands, grassland meadows, streamside corridors, wet meadows and distinctive habitats including seeps, steep rocky outcrops, and gulches surrounded by granitic cliffs. The property is home to a diversity of native plants and wildlife, rare plants, and critical wildlife habitat. The purpose of the Preserve is to protect Longmont and Lyon's primary municipal drinking water supply and maintaining healthy, resilient ecosystems is a fundamental part of achieving this goal.

The Button Rock Preserve Management Plan (Plan) is intended to address increasing visitor use in Button Rock Preserve. The Plan was developed by Longmont Natural Resources and Water Resources staff and a team of consultants. It was informed by a Technical Advisory Committee (TAC) of local agencies as well as a robust community engagement process. The Plan addresses increasing visitor use, updates rules and regulations and improves natural and cultural resources data; all of which point to a 'do no harm' approach to management as the best way to protect Button Rock Preserve now and into the future. This Plan is a foundation for long-term sustainable, adaptive management of Preserve resources based on best available science and information.



Map 1. Button Rock Preserve location within Boulder County, Colorado (Appendix A).

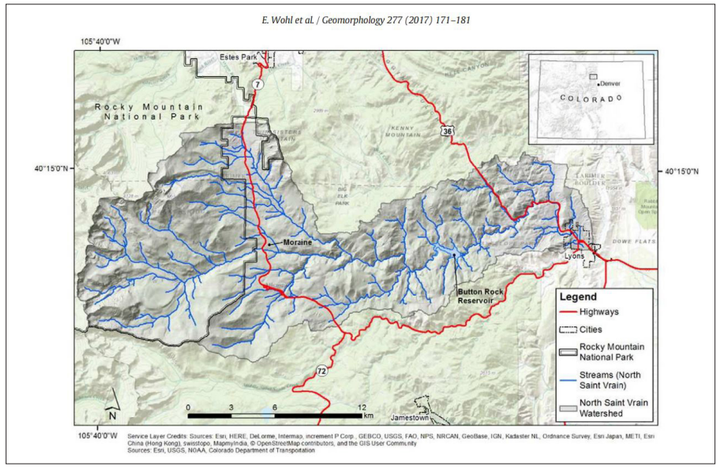
2. PLANNING CONTEXT

2.1 Overview

Although Button Rock Preserve has been open to the public since the 1960s, the Button Rock Preserve Management Plan is Longmont's first comprehensive management plan for the property. The Plan describes existing conditions, land use history, baseline data results, and it illustrates how present-day management priorities and actions need to account for history, future planning, and also for changing conditions both at the Preserve and in the entire North St. Vrain Creek watershed (Map 2, Appendix A). Since 2003, the Button Rock Preserve Forest Stewardship Plan (Forest Stewardship Plan), adopted in 2003 and updated in 2017, has guided forest management at Button Rock Preserve. The Forest Stewardship Plan is described further in Section 2.7, Related Plans and Programs. The Button Rock Preserve Management Plan expands upon information in the Forest Stewardship Plan, providing additional management direction to protect and enhance Preserve natural and water resources, cultural resources, and guide visitor services operations.

Climate change, causing a longer fire season and less predictable weather patterns, has increased the need for both natural disaster preparedness and resiliency including hazard mitigation and forest restoration work at Button Rock Preserve. An increasing number of visitors at the Preserve has prompted the need for Longmont to update its rules and regulations to align with present-day visitor use patterns. This Plan guides on-the-ground actions, informs the public, and updates budget planning for the Preserve.

The Button Rock Preserve Management Plan is an adaptive document. It should be changed or updated as new monitoring data or scientific research becomes available or as environmental conditions shift. This Plan includes multiple years of visitor use data, water resources and infrastructure data and forestry data. However due to time and budget constraints, the baseline ecological and zoological data gathered by Colorado Natural Heritage Program (CNHP) occurred over only one field season, where two or three years would have provided a more comprehensive picture of ecological and zoological resources. For this reason, further biological studies and monitoring, that can help answer specific resource and visitor use questions as they arise, are recommended. Staff also recommends a comprehensive review and update of this Plan in five to seven years after acceptance or between 2028 and 2030.



Map 2. North St. Vrain Creek's headwaters start in at the continental divide and flow east until the junction with South St. Vrain Creek in Lyons, Colorado (Wohl et al., 2016). Ralph Price Reservoir is called out in this image but is labeled as Button Rock Reservoir (Appendix A).

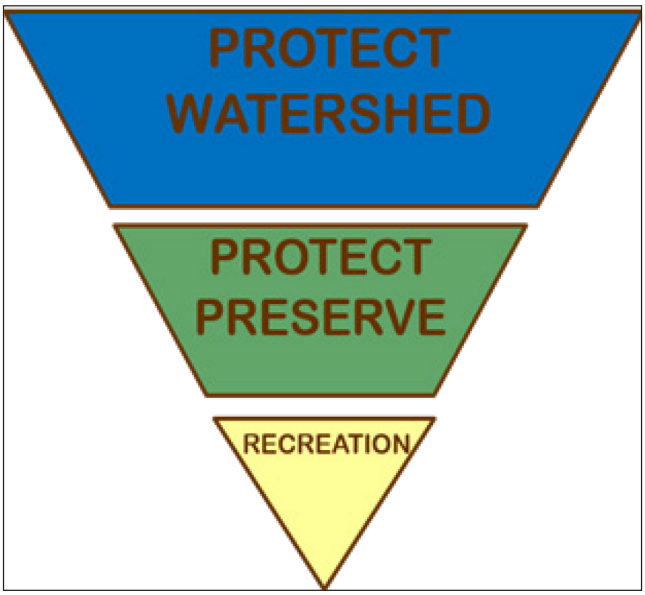
2.2 Purpose and Goals

The purpose of this Plan is to outline a clear vision for the direction of management of Button Rock Preserve for the next 15 to 20 years. Establishing a purpose statement and priority goals for Button Rock Preserve provides a foundation for this Plan's recommended management goals, objectives and priorities. The following purpose statement was developed during the planning process to be listed in Longmont Municipal Code (LMC), Section 13.20.060:

> *To protect, preserve, conserve, restore, and sustain Button Rock Preserve's municipal drinking water storage and supply, native ecosystems, wildlife habitat, and cultural resources in perpetuity; to support Preserve management and enhance the ecological function of Button Rock Preserve's natural systems as well as the St. Vrain Creek watershed in which it presides; and to prescribe areas suitable for passive use in addition to areas closed for resource protection, facility protection, or public safety.*

Because the primary purpose of the Preserve is to protect water supply and delivery and promote a healthy North St. Vrain Creek watershed, it follows that management goals for Button Rock Preserve broadly fall into three tiers of importance with water as the most important, 1) Water, 2) Natural Resources and 3) Visitor Use (Figure 1).

Figure 1. Management priorities at Button Rock Preserve are illustrated by the upside-down triangle. First and most important is to protect the water/watershed, second is to protect the greater Preserve. When these are met, supporting visitor use/recreation is a third priority.



GOALS ARE AS FOLLOWS:

1. Protect water quality, delivery and storage
2. Ensure water storage and delivery infrastructure are in proper working order at all times
3. Protect, adaptively manage and restore biodiversity and resilience of native plants and plant communities
4. Accelerate the Preserve's Forestry Stewardship Program by increasing the number of forested acres mitigated each year and working collaboratively with St. Vrain Forest Health Partnership partners
5. Work collaboratively with Preserve neighbors and partners to increase size and impact of forest stewardship projects
6. Reintroduce prescribed fire as a management tool
7. Protect and enhance wildlife habitat, critical wildlife habitat, and movement corridors
8. Responsibly steward Preserve cultural resources
9. Foster community stewardship by providing educational and volunteer opportunities
10. Provide passive recreational opportunities that are consistent with a 'do no harm' approach to natural and cultural resource protection and that are inclusive of all

2.3 Sustainability Evaluation System

Longmont's Sustainability Evaluation System (SES) tool helps ensure that Longmont's plans and projects incorporate the City's three pillars of sustainability, 1) Environmental Protection, 2) Economic Vitality and 3) Social Equity. At the onset of the planning process, the SES helped shape the Plan's purpose and goals and according to the SES report, 12 out of 12 SES sustainability categories apply to the Button Rock Preserve Management Plan (Appendix B). These include Best Practices (Organizational), Best Practices (Assets and Infrastructure), Best Practices (Financial), Buildings and Infrastructure, Energy, Transportation, Community and Individual Well-Being, Economic Vitality, Materials and Waste, Natural Environment, Water Resources, and Water Quality. Additionally, the SES report helped identify topics to include in the Button Rock Preserve Management Plan (Appendix B).

KEY SES TOPICS COVERED IN THIS PLAN:

1. Describe the public and stakeholder engagement processes and how feedback from stakeholders will be considered.
2. Clearly state priorities and intentions for use, i.e., water supply protection, Preserve natural resources preservation, manage public access for passive recreation only.
3. Inform visitors about the Preserve purpose, e.g., through literature, code, or educational signage.
4. Stress the benefits to Preserve resources of recreation that is limited and passive.

2.4 Public Engagement and Agency Collaboration

The Plan's management direction, LMC updates, and implementation priorities are partially based on community member ideas and insights. Public participation mechanisms included the *Caring for Button Rock Preserve* Engage webpage, public meetings, public surveys, Advisory Board meetings, and City Council meetings. A Technical Advisory Committee (TAC) included staff from Boulder County Parks and Open Space (BCPOS), Colorado Parks and Wildlife (CPW), Colorado State Forest Service (CSFS), Colorado Division of Reclamation, Mining, and Safety (CDRMS), the United States Forest Service, the Town of Lyons, the Watershed Center (WC), and City of Longmont Water Resources, Natural Resources, and Fire Services. TAC members attended a series of meetings during the planning process, met staff on site, and attended public meetings to speak to the public and answer questions.

The *Caring for Button Rock Preserve* Engage webpage provided a place for public discussion and questions. It listed public meeting dates, presentation materials, and summaries; Plan milestones; related documents and articles; and links to public surveys and results. In 2019, staff held 3 public meetings on June 26th, November 6th, and November 19th with a combined total of over 90 people in attendance (Appendix C). Between 2019 and 2022, staff conducted four public surveys, receiving a total of 2,471 responses. The public surveys, each containing multiple questions and a place for written comments, collected feedback on the following topics (Appendix C):

1. Why is Button Rock Preserve important to you?
2. How do you use the Preserve?
3. What is your opinion about recommended changes aimed at alleviating overcrowding and protecting natural resources?
4. What is your opinion of recommended municipal code changes/updates to Button Rock Preserve rules and regulations?

Between 2019 and 2023, staff met with Water Board, Parks and Recreation Advisory Board (PRAB), and Sustainability Advisory Board (SAB) five times each in February, May and October 2019, August 2020 and in February 2023 for a total of 15 appearances during key intervals of the planning process. Finally, staff appeared in front of City Council eight times in February, May, and October 2019 and in the first quarter of 2023 for presentations, interim updates, municipal code change readings and Plan acceptance.

2.5 Rules and Regulations

An important component of the planning process is the comprehensive review of Button Rock Preserve-specific municipal ordinances. The last time Button Rock Preserve ordinances were substantially updated was in the 1990s (Ken Huson, personal communication). Then and now, the reason to update the code is to adjust for increasing visitor numbers, changing visitor use patterns, and to make the rules and regulations consistent with the present-day needs of the Preserve. These code updates clarify definitions and varying interpretations, remove repetitive code text and outdated provisions and they amend the text to reflect current law. Further, this comprehensive review increases readability of the Button Rock Preserve section of code. LMC Title 13, Section 13.20.060 has been repealed and reenacted as the same code section. It now additionally includes a definition of the Preserve's purpose. Rules applicable to Button Rock Preserve that are covered in other parts of Chapter 13 include camping, closures, hunting, preserve access and hours and resource protection. More detail, including summary results from public surveys is available in Section 3.6, Visitor Use and Appendix C.

2.6 Special Designations

OVERVIEW

One important reason that Button Rock Preserve is special, is its adjacency to and overlap with areas recognized as ecologically important by various federal, state, and local agencies due to various critical biological resources, natural features, and/or values at risk. Being adjacent to or overlapping with these designated areas means that Button Rock Preserve shares ecological processes, wildlife travel corridors, and other biologic and geologic features that occur in the lower montane and montane life zones within the North St. Vrain Creek watershed.

NORTH ST. VRAIN RESEARCH NATURAL AREA (USFS)

Directly west of Button Rock Preserve, within the U.S. Forest Service's Arapaho-Roosevelt National Forest lands, is the 5,271-acre roadless area known as the North St. Vrain Research Natural Area (RNA), established in 2000. The Research Natural Area system is a national network of federal land designated by the USFS, Bureau of Land Management (BLM), U.S. Fish & Wildlife Service (USFWS), and NPS and intended to preserve representations of all significant natural ecosystems and their processes as baseline research and educational areas (USFS, 1993). Significantly, the North St. Vrain RNA is within the same drainage system as Button Rock Preserve. It includes almost six miles of the perennial North St. Vrain Creek and its tributaries directly upstream of the Preserve. It ranges in elevation between 6,700 and 9,134 feet and encompasses similar but also some higher elevation foothills forest, shrubland, and riparian ecosystems as those found in the Preserve. Being adjacent to the Preserve, it provides connected swaths of native wildlife habitat, wildlife travel corridors, as well as a large area of native plant associations and rare plants occurring across the boundaries of the RNA and Button Rock Preserve.

ELK: WINTER CONCENTRATION AREA, SEVERE WINTER RANGE (CPW)

In 2019, Colorado Executive Order D2019 011 directed CPW and Colorado Department of Transportation (CDOT) to conserve Colorado's big game resources, including restoring seasonal wildlife habitat and migration corridors (CPW, 2020). This includes the seasonal elk (Cervus elaphus) habitat encompassing the northwest quarter of Button Rock Preserve. This portion of the Preserve falls within an elk Winter Concentration Area and a Severe Winter Range area for migrating elk. A Winter Concentration Area is a part of winter range where elk population densities are at least 200 percent great than the surrounding winter range density during the average five winters out of ten from the first heavy snowfall to spring green-up (CPW, 2020). At BRP, this season is between December 1 to April 1 (Joe Halseth, personal communication). A Severe Winter Range is that part of the range where 90 percent of the individuals of that species are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten (CPW, 2020).

PROTECTION OF NORTH ST. VRAIN CREEK (SVLHWCD)

Directly upstream of Button Rock Preserve, there is an 8.5-mile stretch of North St. Vrain Creek that runs from its confluence with the Horse Creek tributary and terminates

at 6,550 feet in elevation; it almost reaches the upstream end of Ralph Price Reservoir. In the early 1990s, the St. Vrain and Left Hand Water Conservancy District (SVLHWCD), along with other water users including area residents, local governments and federal congressional representatives, researched the possibility of designating this stretch of creek as "Wild and Scenic." Although this proposal did not prevail due to concerns about restrictions on private property and water rights, a compromise was reached. In 1996, the legislation that created Rocky Mountain National Park was amended to include a prohibition on "construction of any new dam, reservoir, or impoundment on any segment of North St. Vrain Creek or its tributaries within the boundaries of RMNP or on the main stem of North St. Vrain Creek downstream to the point at which the creek crosses the elevation 6,550 feet" (SVLHWCD, 2022).

HIGH WILDFIRE RISK AREA (CSFS)

The Colorado State Forest Service (CSFS) uses its Colorado Wildfire Risk Planner system to support government agencies and wildland fire professionals in their hazard mitigation planning (CSFS, 2022). The tool designates an area, such as Button Rock Preserve, then it generates a composite wildfire risk ranking for the area based on combining annual burn probability with an area's values at risk, e.g., municipal water supply. There are six risk rankings including lowest risk, low risk, moderate risk, high risk, and highest risk. CSFS considers Button Rock Preserve a High Wildfire Risk area for catastrophic wildlife (CSFS, 2022).

POTENTIAL CONSERVATION AREAS (CNHP)

Potential Conservation Areas (PCAs) are areas that contribute to Colorado's biodiversity and encompass rare species and natural plant communities. Colorado Natural Heritage Program ranks PCAs by their biodiversity significance (B) on a scale of 1-5, with B1 being 'globally outstanding' to B5 being 'locally significant.' The North Saint Vrain and Button Rock Mountain PCAs, both ranked B2, areas with 'very high biodiversity significance' overlap with parts of the north and west boundaries of Button Rock Preserve (CNHP 2021a, 2021d). To the east and southeast of the Preserve, but not overlapping are the Indian Lookout Mountain PCA, which encompasses Boulder County's Hall Ranch Open Space, and the Coffintop Mountain PCA, both ranked B2 (CNHP 2021b, 2021c). Button Rock Preserve shares common ecological features with each of these four PCAs including elevational zone, Silver Plume granite canyons and outcrops, and some of the same globally and state ranked rare plants and plant communities, e.g., jeweled blazingstar (*Mentzelia speciosa*), foothills ponderosa pine savannas and habitat for Larimer aletes (*Aletes humilis*) and rock cinquefoil (*Potentilla rupincola*) (Table 1).

GLOBALLY AND STATE RANKED RARE PLANT SPECIES (CNHP)

CNHP tracks and watchlists rare species and natural plant communities using a standardized ranking system that allows scientists and land managers to target the most at-risk species and ecosystems for inventory, protection, research, and management (CNHP, 2022). For CNHP's 2019 botanical surveys at Button Rock Preserve, they ranked species and ecosystems on the Global (G) and State (S) levels between 1 through 5, with 1 as 'Critically Imperiled,' and 5 as 'Demonstrably Secure.' One rare plant and several rare plant communities observed in the Preserve are tracked as globally secure, but either state critically imperiled (S1) or imperiled (S2) meaning that in Colorado, these species are either extremely rare (5 or fewer occurrences or less than 1000 remaining individuals) or rare (6 to 20 occurrences or between 1,000 to 3,000 remaining individuals) and there are one or more factors making them vulnerable to extinction. CNHP's 2019 botanical survey results are detailed in Section 3.2.2.

ENVIRONMENTAL CONSERVATION AREA (BCPOS)

Boulder County Parks and Open Space designates areas of the county that possess a relatively low amount of fragmentation, contain high quality natural resources or habitats, are designated at a sufficient size to provide ecological benefit, and/or have significant potential for restoration (BCPOS, 2014). Button Rock Preserve falls with the 38,133-acre North St. Vrain Environmental Conservation Area (ECA). The Preserve possesses old-growth ponderosa pine/Douglas-fir (*Pinus ponderosa/Pseudotsuga menzensii var. glauca*) stands, critical wildlife habitat including golden eagle (*Aquila chrysaetos*) habitat, elk winter concentration and severe winter areas, good montane habitat and movement corridors for mountain lions (*Puma concolor*) and black bears (*Ursus americanus*), good riparian habitat along North St. Vrain Creek, rare plant populations and rare plant communities, and good potential for ecological restoration.

2.7 Related Plans

BUTTON ROCK PRESERVE FOREST STEWARDSHIP PLAN (UPDATE 2017)

The purpose of the Forest Stewardship Plan is to protect Longmont's water supply by promoting healthy forest ecosystems and resiliency to wildfire through forest planning, mitigation and restoration in Button Rock Preserve and throughout the greater St. Vrain Creek watershed (2017). The Forest Stewardship Plan identifies 17 Forestry Management Units (FMUs) and describes management prescriptions recommending thinning, broadcast burning, opening closed canopies, and retaining standing snags as wildlife habitat. Prescriptions were developed cooperatively with CSFS with a goal of restoring and reducing fuels in approximately 80 acres of overgrown forest each year. The focus of the Forest Stewardship Plan is forest management, natural disturbance and disaster resiliency, and collaborating with area agencies through the St. Vrain Forest Health Partnership (SVFHP)[1].

ENVISION LONGMONT: MULTIMODAL & COMPREHENSIVE PLAN (2016)

Longmont's Comprehensive Plan (Envision Longmont) is an advisory document, providing policy guidance and recommendations about the Longmont community's long-range needs. Natural Resources staff look to Envision Longmont's goals and policies to inform management planning and goals development processes for City properties such as Button Rock Preserve. Specifically, in Section 5 of its policy framework, *Responsible Stewardship of our Resources,* the comprehensive plan discusses Preserving Longmont's unique natural areas and important wildlife habitat (5.1A), maintaining a quality renewable water supply for the community (5.2), preserving historic and cultural resources (5.3), and enhancing ecological functions of Longmont's open spaces (5.5).

LONGMONT'S OPEN SPACE MASTER PLAN (UPDATE 2018)

The purpose of the Open Space Master Plan Update is to support Longmont's Natural Resources department's role in connecting our community with nature and living in "a sustainable and resilient Longmont." In the Open Space Master Plan Update's public survey, over 900 community members submitted responses to the question about priorities and functions of Longmont's Open Spaces. The highest values were placed on protecting nature areas from development, protecting rivers, creeks, riparian corridors and wetlands and preserving wildlife habitat.

LONGMONT'S SUSTAINABLITY PLAN (2018)

The natural environment section of Longmont's Sustainability Plan discusses the importance of combating the loss of biodiversity and wildlife habitat due to human population increases and land uses that diminish wildlife corridors and waterways. Priorities relevant to Button Rock Preserve are sustainable land management and stewardship, connection with nature and ecosystem health.

LONGMONT'S WILDLIFE MANAGEMENT PLAN (UPDATE 2019)

The Wildlife Management Plan Update guides Longmont's Natural Resources staff in the management and protection of Longmont's wildlife populations and habitats. It emphasizes the importance of biodiversity and how wildlife enhances the quality of life of Longmont's residents. Importantly, it described the importance of managing and protecting Longmont's threatened, endangered and species of concern. Button Rock Preserve encompasses many acres of native wildlife habitat, critical wildlife habitat and it is home to diverse populations of native wildlife species from macroinvertebrates, to small mammals, ungulates and large carnivores. Button Rock Preserve is Longmont's only protected Preserve and effectively the largest wildlife reserve in Longmont's system of open spaces and natural areas.

[1] **St. Vrain Forest Health Partnership (SVFHP):** The SVFHP officially formed in 2020 when additional agency partners, such as the Lyons Fire Protection District, joined and the Watershed Center (WC) became the group facilitator. This group was formerly and informally known as the 'Button Rock Collective,' a group of agency partners working together on fire mitigation in the St. Vrain creek watershed. Today, the SVFHP's three largest public landowners are the Boulder Ranger District of the USFS, Boulder County Parks and Open Space, and the City of Longmont, all of whom are supported by the Colorado State Forest Service.

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3. EXISTING CONDITIONS

3.1 Property Description

3.1.1 LOCATION

Button Rock Preserve is located in the Front Range of the southern Rocky Mountains in Section 19 of Township 3N, Range 70W; Sections 7, 8, 10, 11, 13, 15, 16, 17, 18, 19, and 20 of Township 3N, Range 71W and Sections 12, 13, and 24 of the Township 3N, Range 72W of the 6th principal meridian. It is approximately seven miles west of the Town of Lyons in the lower montane-foothills ecological zone of the North St. Vrain Creek watershed with elevations ranging from approximately 6,000 to 7,500 feet (Figures 1 and 2). The lowest elevation is where North St. Vrain Creek exits the property at the eastern boundary and the highest elevation is at the peak of Cook Mountain (7,533 feet) in the southwest corner of the Preserve.

With its headwaters originating at the continental divide, in the Wild Basin area of Rocky Mountain National Park (RMNP), a section of the North St. Vrain Creek runs through the Preserve. The Preserve's two reservoirs are Ralph Price Reservoir and further downstream, Longmont Reservoir (Map 3).

Exposed, south facing slopes are primarily vegetated by dry conifer forests, dominated by ponderosa pine. Dry mixed-conifer forests, co-dominated by ponderosa pine and Douglas-fir are found on more protected slopes with dry to mesic soils. Here, intermittent patches of foothills shrublands and piedmont grasslands also occur. The largest grassland on the Preserve, known as the 'borrow area,' was created when soil was excavated for dam fill and the area was revegetated with non-native grasses. A perennial seep within the 'borrow area' meadow supports mesic grasses and forbs as well as wetland ponds, providing important wildlife habitat.

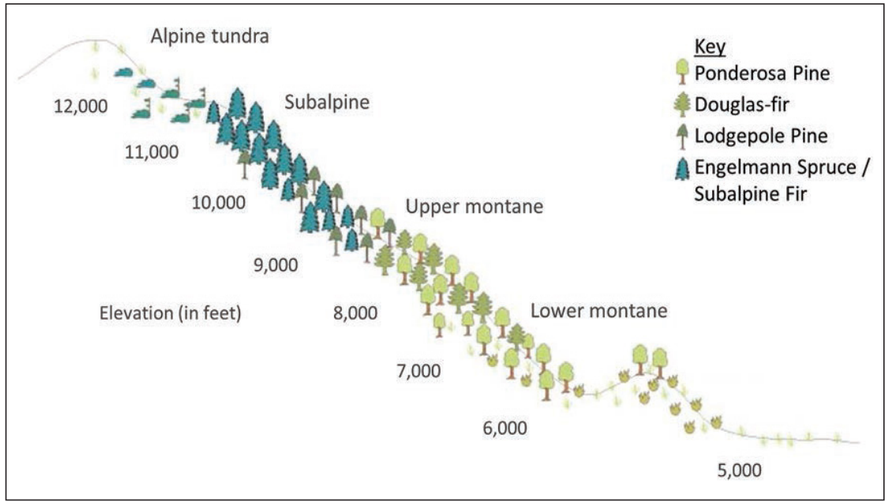
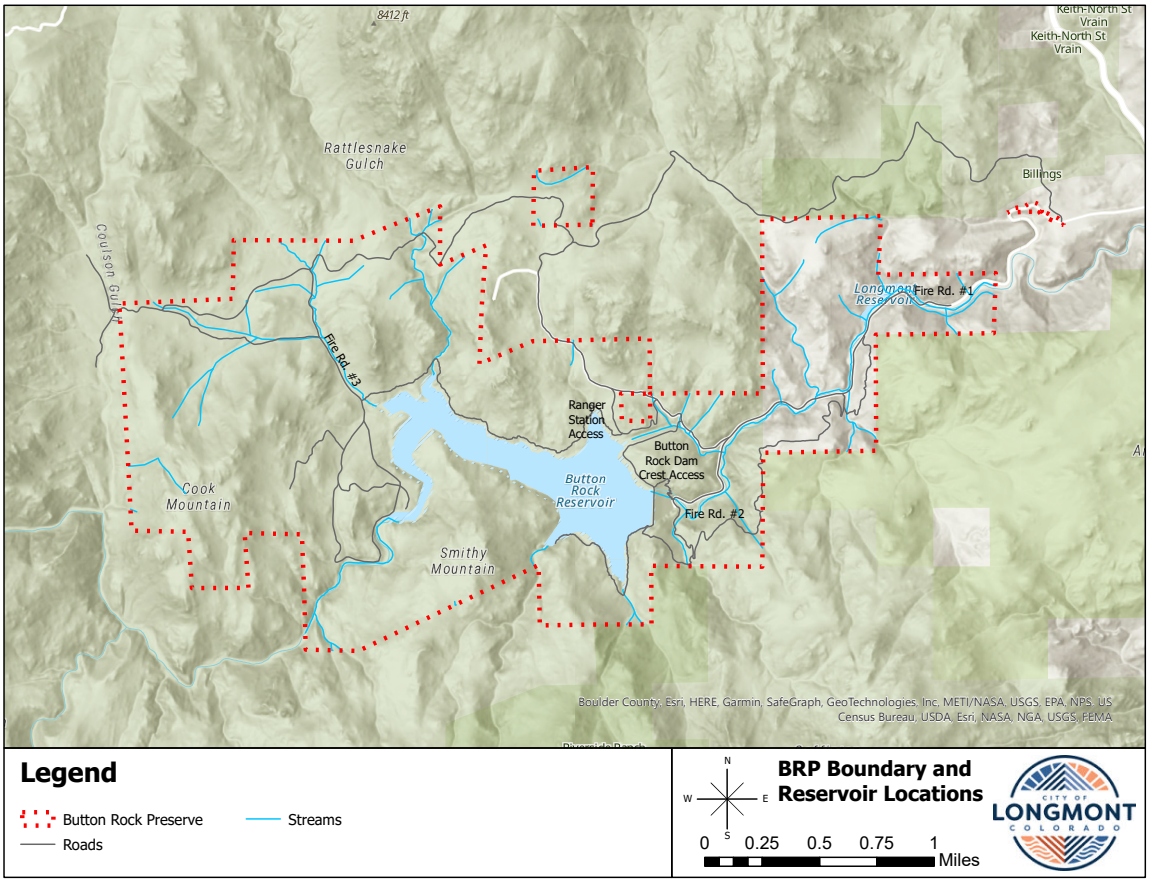


Figure 2. Shifts in life zones along the Front Range are linked to elevational changes (Addington et al., 2018).



Map 3. Button Rock Preserve boundary and reservoir locations (Appendix A).

3.1.2 ACCESS

There are four access points to Button Rock Preserve. The main access point, at the parking lot and trailhead, is located three miles southwest of the turn off from U.S. Highway 36 to Boulder County Road 80. The second and third entry points are in the southeast of the Preserve. These are Boulder County's Button Rock Trail which connects Hall Ranch Open Space to Button Rock Preserve's Sleepy Lion Trail and a county-managed fire road that connects into the Preserve's Fire Road 2, uphill of Button Rock Dam. The fourth access point is in the northwest corner, upstream of the inlet to Ralph Price Reservoir (RPR). Here, the United States Forest Service (USFS) Coulson Gulch Trail (Trail 916) intersects with the western end of the Preserve's Fire Road 1.

The primary emergency vehicle access to the Preserve is via Longmont Dam Road (LDR) and the Preserve's system of fire roads, 'Fire Roads 1, 2, and 3.' Helicopters are also used for evacuations, medical transports, and fire suppression. Rangers coordinate emergency response with the Boulder County Sheriff's Office and Lyons, Big Elk, and Pinewood Springs Fire Protection Districts.

3.1.3 ACQUISITION HISTORY

BUTTON ROCK PRESERVE

Present-day Button Rock Preserve comprises 21 parcels that Longmont purchased over time in the years 1911 to 1926, the 1960s, the 1990s, 2001, and 2015. In the early years, between 1911 and 1926, Longmont received a land patent from the State of Colorado and built Longmont Reservoir and the North Saint Vrain water supply pipeline. Longmont later acquired a second piece of the land in this area from the Hall family. For many years, this was all the land Longmont owned in the area. Then, in 1967, per decree and at a cost of $255,900, Longmont condemned the 'Professor's Ranch' and 'TO1 Ranch' parcels, using this land to build Ralph Price Reservoir and Button Rock Dam. In 1968, Longmont purchased 178.81 acres northeast of Ralph Price Reservoir from the Billings family; the present-day ranger station sits near the southern boundary of these parcels. Further detail about Longmont's early water projects can be found in Section 3.5, Water Resources.

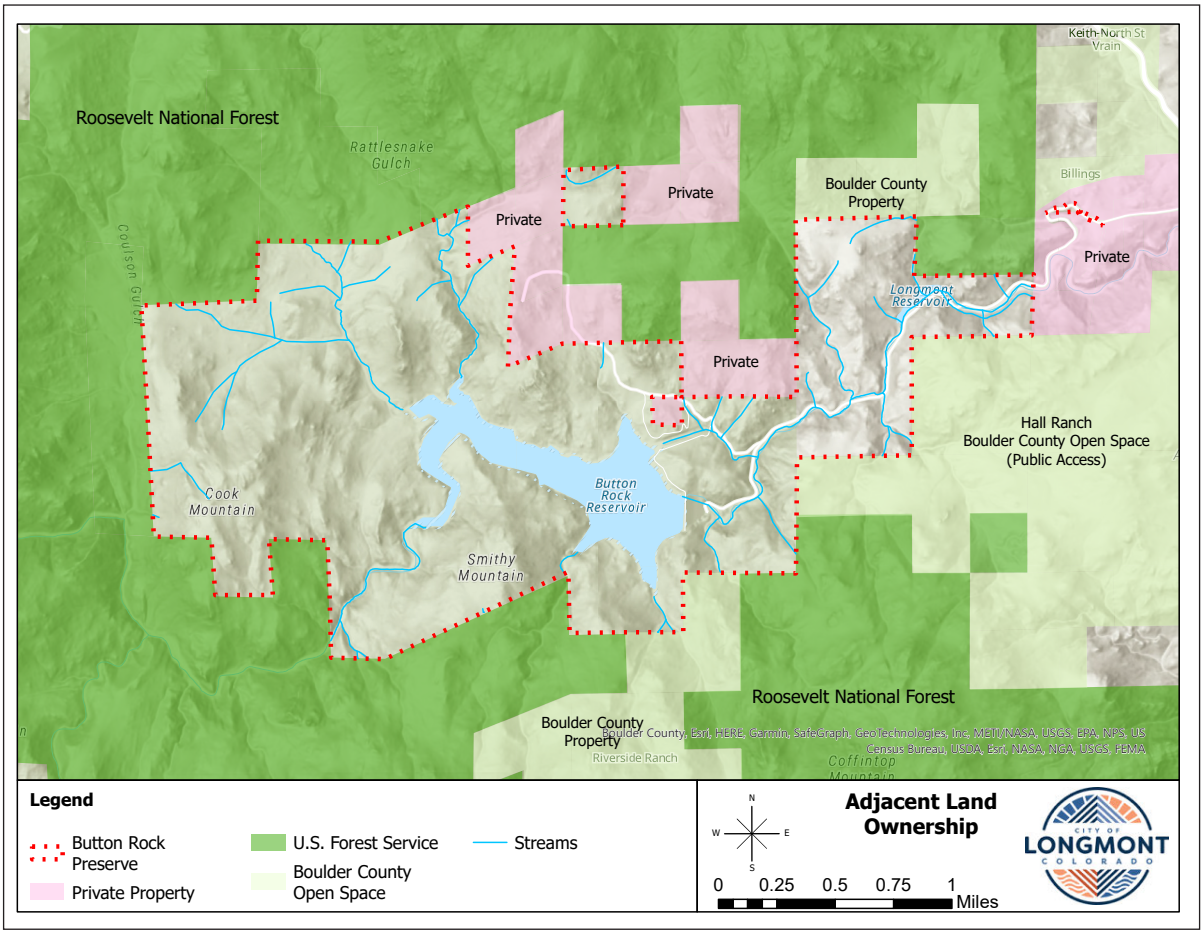
In 1997, Longmont and the USFS completed a land exchange to consolidate properties and eliminate inholdings for both

agencies. Longmont acquired parcels totaling 884 acres in the exchange and also completed the City's ownership of the parcels under Ralph Price Reservoir and adjacent ancillary facilities. In 2001, Longmont acquired 118 acres around and including Cook Mountain, from Steve Churner, a grantee from the Hall Family who owned this property for many years. This acquisition eliminated the last inholding in the 'borrow area' meadow of the Preserve.

In 2015, Longmont purchased the Hitz property from the Leupold family to provide housing for what was at the time, the one watershed ranger and caretaker for the Preserve. The parcel is 40 acres of land located about one mile north of Ralph Price Reservoir. Using Water Resources acquisition funding, Longmont paid $550,000 for the parcel and the water rights; no mineral rights were acquired. This parcel, known as 'Mullen Park,' is surrounded by private land and is not open to the public.

3.1.4 ADJACENT LAND USE AND OWNERSHIP

Button Rock Preserve is bordered by BCPOS, USFS and private property (Map 4, Appendix A). Additionally, there are nine private resident inholdings within Preserve boundaries comprising the Button Rock Preserve community.



Map 4. Adjacent land ownership map (Appendix A).

3.2 Physical Setting

3.2.1 CLIMATE AND TOPOGRAPHY

Button Rock Preserve is located in northeastern Boulder County and falls within the Southern Rockies Ecoregion, which stretches from northern New Mexico, through central Colorado to parts of southern Wyoming (Figure 3). This ecoregion receives about 10 to 40 inches of precipitation annually, mostly as snowfall, which in turn provides high-elevation snowpack that is an important water source for surrounding ecoregions (USGS, 2012). In the Northern Front Range mountains of Boulder County, the topographic relief is the main driver of the area's climactic variability (Figure 4) (USGS, 2012).

As one travels from the eastern high plains, through the temperate conifer forests of the montane foothills, and up to the colder and wetter mountain parks and high peaks to the west, small changes along the steep elevational gradient can cause abrupt temperature changes (USGS, 2012). In the lower montane life zone where Button Rock Preserve is situated (~6,000 to 7,500 feet elevation), winters are generally cold, summers are moderately warm, and humidity is low (WRCC, 2022).

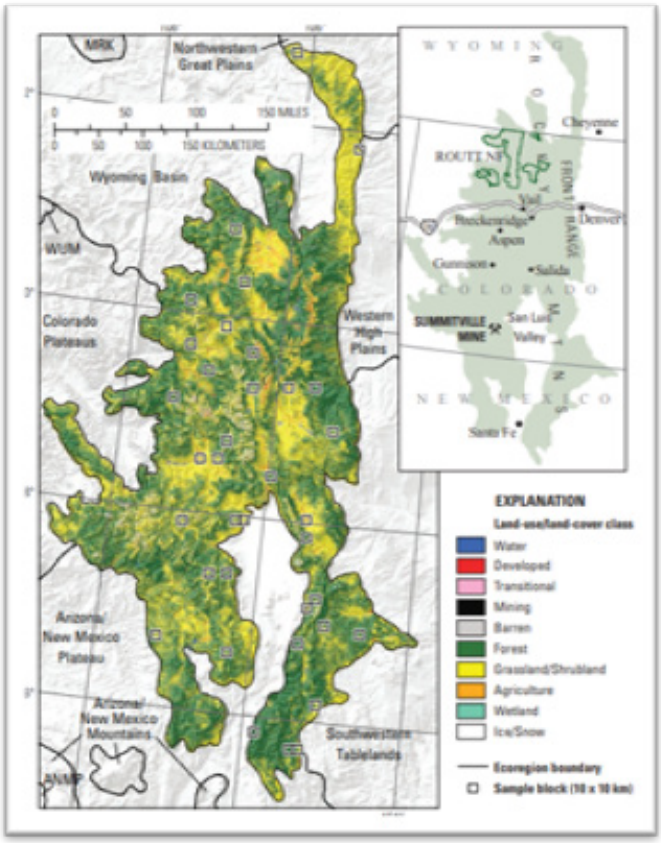


Figure 3. Map of Southern Rockies Ecoregion showing land-use/land-cover classes from 1992 National Land Cover Dataset (Vogelmann et al., 2001).

3.2.2 GEOLOGY AND SOILS

The last of the mountain-building episodes that shaped the western United States between 55 and 80 million years ago, known as the Laramide orogeny, formed the Rocky Mountains (Colton, 1976). The Rocky Mountain system consists of four physiographic provinces including the Northern Rocky Mountains, the Middle Rocky Mountains, the Wyoming Basin, and the Southern Rocky Mountains.

Button Rock Preserve is located in the Northern Front Range of the Southern Rocky Mountains, in the foothills of the North St. Vrain Valley. The rolling topography of the foothills, the gulches and ridges, rock outcrops and creek beds, steep granitic cliffs and narrow V-shaped valleys have been formed over geologic time by the erosive forces of wind, rain, and snowmelt. Bedrock consists mostly of Precambrian Silver Plume Quartz Monzonite with pockets of Colluvium under the Preserve's eastern half. While Silver Plume granite and a variety of other granites underlay the western half and comprise the exposed bedrock of many of the Preserve's rock cliffs and outcrops (Colton, 1976; Horton, 2017; UW-Madison Macrostrat Lab, 2022). The Natural Resources Conservation Service's (NRCS) Web Soil tool shows 14 soil units and two miscellaneous areas within the Preserve boundary (2021) (Appendix D).

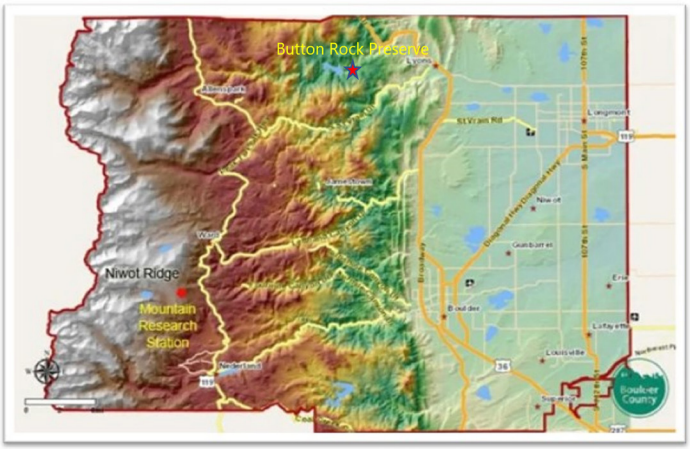


Figure 4. Map of Boulder County topography (CU Boulder, 2022).

The four most common soil profiles by acreage are:

1. Cypher-Ratake families complex, 5 to 40 percent slopes, 556 acres (Unit 2703B)
2. Typic Haplustolls-Cathedral family-Rock outcrop complex, 40 to 150 percent slopes, 400 acres (Unit 2704D)
3. Bullwark-Catamount families-Rock outcrop complex, 40 to 150 percent slopes, 276 acres (Unit 4703D)
4. Cypher family-Rock outcrop complex, 40 to 150 percent slopes, 254 acres (Unit 2706D)

3.2.3 CLIMATE CHANGE IMPACTS

As global temperatures rise, Colorado is expected to face significant challenges with wildfires and with managing water resources (Lukas et al., 2014). In recent years, Colorado's drier years and drier summers are already contributing to the increasing frequency and severity of wildfires. Button Rock Preserve, and the lands surrounding it, have experienced small to large acreage wildfires as well as a significant flood event: Colorado Front Range Flood (2013), Coffintop Fires (2011, 2020), East Troublesome Fire (2020), Cal-Wood Fire (2020), Kruger Rock Fire (2021), and the 37E Fire (2022) (National Interagency Fire Center, 2022).

Planning for the effects of climate change and for a carbon-neutral, sustainable city are high priorities for Longmont. In October 2019, Longmont City Council passed a resident-initiated resolution declaring a climate emergency, establishing Longmont's commitment to take immediate action to address the climate crisis (City of Longmont, 2019 (a)). In early 2020, City Council convened a task force of City staff, subject matter experts, partners, and residents who ultimately developed the Climate Action Recommendations Report and an implementation timeline (City of Longmont, 2020). Report recommendations largely pertain to planning within Longmont city limits and were not designed to address the unique range of possible impacts at Button Rock Preserve.

However, recommendations in the areas of public health, water conservation and flood mitigation education do overlap with key climate change challenges at Button Rock Preserve.

Climate change planning at the Preserve includes protecting water supply; preparedness and ecological resiliency for natural disturbances, e.g., wind blowdown, insects, wildfire, flood; public safety and evacuation planning and protecting public health, e.g., clean air and water. Additionally, as described in Longmont's Sustainability Plan, conserving native biodiversity of plants, wildlife and ecosystems is a priority at Button Rock Preserve (City of Longmont, 2018(a)). Longmont has a significant resource in Button Rock Preserve's 2,671 acres of unfragmented, majority native habitat that provides valuable ecosystem services including clean air, water and soil; and biodiversity conservation. In the increasingly urbanized and rural Front Range, unfragmented native areas are becoming scarcer. Button Rock Preserve, one of the last large tracts of unfragmented land in the North St. Vrain area, serving as an important refuge for wildlife and native ecosystem processes.

Since 2000, Longmont's population has grown by 39.4 percent (US Census Bureau, 2023). As Longmont population has increased, so too have visitor numbers at Button Rock Preserve. Both climate change and increasing visitor use at Button Rock Preserve are stressors impacting ecological health, native biodiversity and ecological resiliency. In order to respond to change at the Preserve, managers need to stay flexible, incorporate public outreach and education highlighting the importance of clean source water and native biodiversity and finally, managers need to continue working with agency partners and private landowners to implement cross-boundary land protection and restoration projects.

3.3 Natural Resources

3.3.1 OVERVIEW

Several biological inventories have been completed for Button Rock Preserve and the surrounding area since the 1940's, however, none have specifically targeted rare plants, plant communities, and wildlife. First, Faculty Ranch Birds captured 20 years of bird observations from 1946-1966 that pre- and post-date the construction of Button Rock Dam (Kingery, 1969). Second, Preserve wildlife was inventoried in 1976 but not since (Dowling, 1976). Third, the plant survey for the Proposed Longmont Land Exchange Environmental Assessment generated a limited plant list, but it did not highlight threatened, endangered, or sensitive plant species (USFS, 1996). The area surrounding the Preserve was surveyed in 2007 and 2008 by CNHP as part of the survey of critical biological resources of Boulder County (Neid et al. 2009), but the Preserve was not surveyed at that time. Finally, in its 2017 update, Longmont's Forest Stewardship Plan includes descriptions of broad land cover types but does not describe Preserve vegetation in depth (City of Longmont, 2017).

In summer 2019, Colorado Natural Heritage Program (CNHP) collected critical biological resources data, targeting vegetation (rare plants, plant communities, vegetation mapping and noxious weeds) and wildlife (amphibians and reptiles, breeding birds, mammals (not including bats) and bats). CNHP is a non-profit organization sponsored by Colorado State University that tracks and ranks Colorado's rare and imperiled species and habitats. Their Survey of Critical Biological Resources of Button Rock Preserve methods and key results are summarized in Sections 3.3.2, 3.3.3 and 3.3.5, management recommendations are in Section 4.1, Plan Implementation and full species lists are in Appendix E (CNHP, 2019).

In 2019, DHM Design also documented noxious weed and non-native species along drainage, road, and trail corridors; their methods and results are in Section 3.3.3. Because forest resources data and resiliency planning were captured during Longmont's Forest Stewardship Plan effort, additional forestry data collection was not done as part of this Plan. Key methods and results from the Forest Stewardship Plan (2017) are described in Section 3.3.4, Forestry. Management recommendations are in Chapter 4, Management Direction.

In 2021, an independent researcher, funded by Longmont's Natural Resources Small Grants Program and Boulder County Nature Association, collected baseline mountain lion data at the Preserve. Her study investigated where and how mountain lions and other wildlife are using the Preserve. Summary information is in Section 3.3.5, Wildlife.

In 2020, the WC completed their evaluation of Longmont's citywide water quality monitoring program (Watershed Center, 2020) and in 2022, as part of a basin-wide adaptive management at scale effort in the St. Vrain Basin, the WC began tracking watershed health indicators, including benthic macroinvertebrates (BMI), upstream of Ralph Price Reservoir (Watershed Center, 2022). In spring 2019, engineers from RiverRestoration spent several field days collecting baseline hydrology data for the Preserve. Prior to this, there had not been a detailed hydrologic inventory completed for the Preserve. The Watershed Center's and RiverRestoration's findings are described in Section 3.3.6, Hydrology.

In 2022, using CNHP's baseline data, the Holman wildlife data, publicly available CPW wildlife data, watershed ranger code enforcement data (Section 3.6.1, Appendix F) and staff knowledge of the Preserve, Longmont staff developed Management Zones for the Preserve. Results and management recommendations are in Sections 3.6.6 and 4.1. For DHM Design's baseline information about the Preserve's recreational fisheries, compiled between 2019 and 2021, go to Section 3.6.5., Recreation.

3.3.2 VEGETATION (FLORA, RARE PLANTS AND PLANT COMMUNITIES)

Button Rock Preserve consists of diverse landscapes including forests, woodlands, shrublands, grasslands, riverine riparian and meadow wetlands, canyons and gulches as well as very high biodiversity and a very large number of species (CNHP, 2019). There are likely more species that occur that were not encountered as the 2019 CNHP botanical survey occurred during only one growing season. Ideally at least two growing seasons are recommended for botanical surveys to more fully document number of species present (CNHP, 2019).

METHODS

Botanical naming conventions for both the common plant names and the Latin binomials appearing in this Plan follow *Flora of Colorado* (Ackerfield, 2015). The 2019 CNHP botanical surveys were conducted using a "Focused or Intuitive Controlled" survey method within the Button Rock Preserve boundary. First, CNHP collected all known information from the area and nearby areas including previous reports, online herbaria, CNHP database, and other information to create a target list of rare plants and plant communities that have the potential to be in the survey area (Tables 1 and 2). Ecological systems, plant communities, and distinctive areas, e.g., gulches were mapped using LANDFIRE (USGS, 2013) and inventoried during targeted ground assessments. (Distinctive areas, many of which are the Preserve's gulches, are also described in Section 3.3.6, Hydrology). Analysis of aerial photographs, available GIS information and other data were used to target specific search areas within Button Rock Preserve. The targeted study areas were surveyed on nine separate days between May and October, 2019.

Areas were surveyed on foot by a professional botanist and additional trained observers. Using a Garmin GPSMAP 66st to record tracks and waypoints, observers noted whether appropriate habitat was present for tracked species, i.e., rare plants and plant communities, and they recorded an overall list of every observed plant species and plant community (Appendix E).

Rare plants and rare plant communities are those that are defined by CNHP and NatureServe as being globally and/or state vulnerable. To classify them, CNHP assigns both a global (G) and state (S) rank between 1 and 5 to a given species or plant community, with 1 as 'Critically Imperiled,' 2 as 'Imperiled,' 3 as 'Vulnerable to Extirpation,' 4 as 'Apparently Secure,' or 5 as 'Demonstrable Widespread, Abundant, and Secure.' Or CNHP might rank as species or community as 'Watchlisted,' meaning that the species or community is potentially vulnerable and under consideration for full tracking (Table 3) (CNHP, 2022).

Table 1. List of target plant species for Button Rock Preserve. (Bolded text indicates element was documented during the 2019 survey).

SCIENTIFIC NAME	COMMON NAME	REPORTED FROM VICINITY	HABITAT PRESENT	DOCUMENTED BY CNHP IN 2019
Aletes humilis	Larimer Aletes	X	X	
Amorpha nana	Dwarf Wild Indigo			
Argyochosma fendleri	Fendler's False Cloak Fern			
Aristida basiramea	Forktip Three-Awn		X	
Asplenium septentrionale	Grass-Fern		X	X
Astragalus sparsiflorus	Front Range Milkvetch		X	
Carex oreocharis	Grassyslope Sedge		X	
Carex saximontana	Rocky Mountain Sedge	X	X	
Carex sprengelii	Sprengel's Sedge		X	X
Claytonia rubra	Redstem Springbeauty	X	X	
Crocanthemum bicknellii	Hoary Frostweed		X	
Geranium bicknellii	Bicknell's Cranesbill		X	
Listera convallarioides	Broad-Leaved Twayblade		X	
Malaxis monophyllos var. brachypoda	White Adder's-Mouth Orchid	X	X	
Mentzelia speciosa	Jeweled Blazingstar	X	X	X
Phacelia denticulata	Rocky Mountain Phacelia	X	X	
Oligoneuron album	Prairie Goldenrod	X	X	
Physaria vitulifera	Rydberg Twinpod		X	X
Polypodium saximontanum	Rocky Mountain Polypody		X	X
Potentilla rupincola	Rock Cinquefoil	X	X	
Smilax lasioneura	Blue Ridge Carrion Flower	X	X	X
Spiranthes diluvialis	Ute Lady's Tresses			
Triodanis leptocarpa	Venus' Looking Glass	X	X	
Viola pedatifida	Prairie Violet	X	X	

Table 2. List of target plant communities for Button Rock Preserve. (Bolded text indicates element was documented during the 2019 survey).

SCIENTIFIC NAME	COMMON NAME	REPORTED FROM VICINITY	DOCUMENTED BY CNHP IN 2019
Danthonia parryi Grassland	Parry's Oatgrass Grassland	X	
Pinus ponderosa / Carex inops ssp. heliophila Woodland	Ponderosa Pine / Sun Sedge Woodland		X
Pinus ponderosa / Leucopoa kingii Woodland	Ponderosa Pine / Spike Fescue Woodland	X	X
Populus angustifolia / Betula occidentalis Riparian Woodland	Narrowleaf Cottonwood / River Birch Riparian Woodlan	X	
Populus tremuloides / Corylus cornuta Forest	Beaked Hazelnut Forest Association		X
Sparganium angustifolium Aquatic Vegetation	Narrowleaf Bur-reed Aquatic Vegetation		X

RESULTS

The Preserve has very high biodiversity. Graminoids, which include grasses, sedges and rushes, accounted for 26% of species, forbs accounted for the largest group with 57% of species, woody plants accounted for 14%, and ferns accounted for 3% (Table 4). Six rare plant species were documented with 25 total occurrences (Table 4). Occurrences observed include 3 grass-fern (*Asplenium septentrionale*), 9 Sprengel's sedge (*Carex sprengelii*), 8 jeweled blazing star, 1 fiddleleaf twinpod, 1 Rocky Mountain polypody fern, and 3 Blue Ridge carrion flower (*Smilax lasioneura*).

Additionally, CNHP observed habitat for other rare plants species, species previously documented in the vicinity but not within Preserve boundaries (2019). These include the Larimer aletes (*Aletes humilis*) and the white adder's-mouth orchid (*Malaxis monophyllos var. brachypoda*).

The Larimer (Colorado) aletes is a rare Colorado endemic species (G2G3/S2S3) that has previously been reported from the Preserve (CNHP, 2019) but not located by CNHP in 2019. The Silver Plume granite outcrops this plant requires are found throughout the Preserve and populations have been mapped just outside the southwestern boundary and to the north of the Preserve on Button Rock Mountain. Larimer aletes is usually found on steep and rugged terrain (CNHP, 2019).

The white adder's-mouth orchid is a Colorado rare plant (G5/S1) that is fully tracked by CNHP. It is extremely rare in Colorado with a state rank of S1. It has been documented in Boulder County and listed in historical botanical information for Button Rock Preserve (CNHP, 2019). This orchid does not emerge every year. It has been known to come up after not being observed for more than a decade. CNHP did not locate it in 2019.

CNHP Summary of Findings - Botanical

- 349 plant species documented, demonstrating a botanically diverse landscape; 6 species are considered 'species of concern,' including 4 that are tracked by CNHP and 2 that are on the watchlist (under consideration for tracking).
- 19 occurrences of 3 tracked plant species that are considered globally vulnerable to extinction (G3) and are endemic to Colorado or the region:
  - Jeweled blazingstar (G3/S3), fiddleleaf twinpod (Physaria vitulifera) (G3/S3), Rocky Mountain polypody fern (Polypodium saximontanum) (G3/S3).
- 85% of observed species are native.
- 25 new occurrences of 6 different rare plant species and 4 rare plant communities.
- The Preserve's wetlands are botanically diverse and include groundwater seeps, seeps on rocky cliffs, wet meadows, ponds, swampy areas, streamsides in narrow gulches, as well as the riparian areas along the North St. Vrain Creek.
- Grassland and forested areas impacted by past grazing are recovering with a diverse array of native prairie grasses and forbs.
- No Colorado Department of Agriculture (CDA) List A noxious weeds were observed.
- 15% or 52 of observed species are considered non-native with 5% or 18 species, on the CDA B or C List of noxious weeds.
- Based on field surveys, 14 ecological systems, plant communities and/or distinctive areas were identified.

Table 3—RARE PLANTS. List of CNHP Tracked Rare Plants documented at Button Rock Preserve in 2019.

SCIENTIFIC NAME (# OF OCCURENCES)	COMMON NAME	GLOBAL RANK	STATE RANK	CNHP TRACKING STATUS
Asplenium septentrionale (3)	Grass-Fern	G5	S3/S4	Watchlisted
Carex sprengelii (9)	Sprengel's Sedge	G5	S2	Fully Tracked
Mentzelia (Nuttallia) speciosa (8)	Jeweled Blazingstar	G3	S3	Fully Tracked
Physaria vitulifera (1)	Fiddleleaf Twinpod	G3	S3	Fully Tracked
Polypodium saximontanum (1)	Rocky Mountain Polypody Fern	G3?	S3	Fully Tracked
Smilax lasioneura (3)	Blue Ridge Carrion Flower	G5	S3/S4	Watchlisted

Table 3—RARE PLANT COMMUNITIES. List of CNHP Tracked Rare Plant Communities documented at Button Rock Preserve in 2019.

SCIENTIFIC NAME (# OF OCCURENCES)	COMMON NAME	GLOBAL RANK	STATE RANK	CNHP TRACKING STATUS
Pinus ponderosa / Carex inops ssp. heliophila Woodland	Ponderosa Pine / Sun Sedge Woodland	G3/G4	S1	Probable (not mapped)
Pinus ponderosa / Leucopoa kingii Woodland	Foothill Ponderosa Pine Savannah	G3	S3	Fully Tracked
Populus tremuloides / Corylus cornuta Forest	Quaking Aspen / Beaked Hazelnut Forest	G3	S1	Fully Tracked
Sparganium angustifolium Aquatic Vegetation	Montane Floating/Submergent Palustrine Wetland	G4	S2	Fully Tracked

Table 4. A tally of plant species observed by CNHP during 2019 field surveys.

LIFE FORM	NUMBER OF TAXA WITHIN GROUP	& OF BRP TOTAL
Graminoids Sedges Rushes Grasses	91	26
Ferns/Fern Allies	11	3
Woody Plants Vines Trees Shrubs Cacti	50	14
Aquatic Moss	1	< 1
Forbs	196	56
TOTAL SPECIES	**349**	**100**

RARE PLANTS

Grass-fern

Three occurrences of globally secure, state vulnerable (G5 / S3S4) grass-fern were documented at Button Rock Preserve. This species is currently on CNHP's watchlist. Grass-fern looks more like a grass than a fern, except for the forked leaves (Figure 5). Forked leaves are not found in grasses. At certain times of the year and upon close inspection, spores are visible on the back side of the forked leaves. This fern has a very wide distribution in the mountains of the northern hemisphere. In the United States, it is largely a western species and is considered rare in Colorado, California, Wyoming and Oregon The three locations where this fern was observed at Button Rock Preserve were widely distributed.

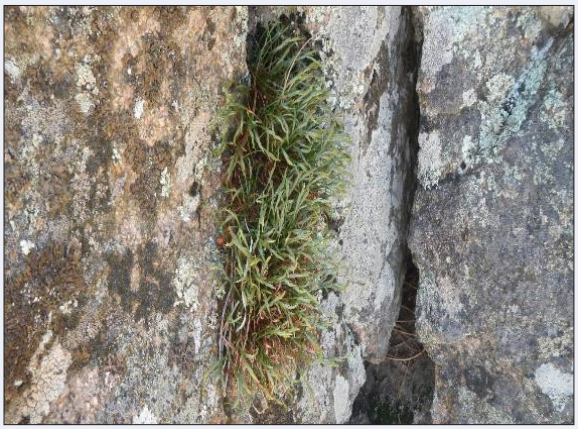


Figure 5. Grass-fern growing in a rock crack at Button Rock Preserve.

Sprengel's sedge

Nine new occurrences of globally secure and state imperiled plant (G5 / S1) Sprengel's sedge were documented at Button Rock Preserve. Also known as long-beaked sedge, it is native largely to the northern United States and Canada. In Colorado, it is known from the central and southeastern counties. This very attractive sedge is often used in restoration activities. It is considered uncommon along streams and lakes, in forests and in dry to mesic woodlands. It can form colonies. At the Preserve, occurrences of Sprengel's sedge are widely scattered, found along small perennial tributaries as well as along North St. Vrain Creek (Figure 6). Population sizes cover small areas with the number of individuals ranging from only a few in some instances and close to 100 plants in other instances.

Figure 6. Sprengel's sedge in a seep area along the North St. Vrain Creek at Button Rock Preserve.

Jeweled blazingstar

Eight new occurrences of a globally and state vulnerable (G3/S3) plant, jeweled blazingstar were documented at BRP. Jeweled blazingstar is an herbaceous perennial plant with leaves that stick to clothing and animal fur. As with other members of this family, it blooms around sunset and is pollinated by moths (Figure 7). Habitat for jeweled blazingstar is found in the high plains to foothills on rocky soils, road cuts and trail sides. The numbers of plants at each occurrence ranged from a single plant up to 20 plants. Jeweled blazingstar is regionally endemic, found sporadically in north and southcentral Colorado and is known from only one county in Wyoming (Albany), where it is considered to be State Critically Imperiled (S1) (CNHP, 2019). Importantly, although there were eight occurrences, there are only small numbers of individuals at each site.

Figure 7. Jeweled blazingstar in flower (left) and fruit (right) at Button Rock Preserve.

Fiddleleaf twinpod

One new occurrence of fiddleleaf twinpod (*Physaria vitulifera*) was located in a rare ponderosa pine savanna community (see also Rare Plants, above). This species is considered both globally and state vulnerable to extinction (G3 / S3). Fiddleleaf twinpod is a small perennial herb in the mustard family, known only from eight counties in central Colorado. Its fiddle-shaped leaves are used in identification. Its habitat consists of rocky, dry areas of the foothills and montane zone, often on decaying granite soils (Figure 8). There is more habitat for this species at the Preserve, however it is likely that some habitat was lost during the construction of Ralph Price Reservoir when areas were flooded. Pollinators for the mustard family are typically very diverse and include bees, wasps, thrips, butterflies and moths.

Figure 8. Rosette growth form of fiddleleaf twinpod observed at Button Rock Preserve.

Rocky Mountain polypody fern

One new occurrence of Rocky Mountain polypody fern was located in a shaded area of a Douglas-fir forest in a large crack in a rock outcrop (Figure 9). The Rocky Mountain polypody fern only occurs in Colorado and Wyoming and is a regional endemic that is both globally and state vulnerable (G3 / S3) to extinction. There are four occurrences in Wyoming, and it is known from 18 counties in Colorado. Habitat includes cracks and ledges in granitic or gneissic rocks often in canyons with Douglas-fir, aspen and Rocky Mountain maple (*Acer glabrum*). The bright orange spores are diagnostic for this fern (Figure 13). It is often found with other rare ferns. This was also the case at Button Rock Preserve, the grass-fern was found growing nearby.

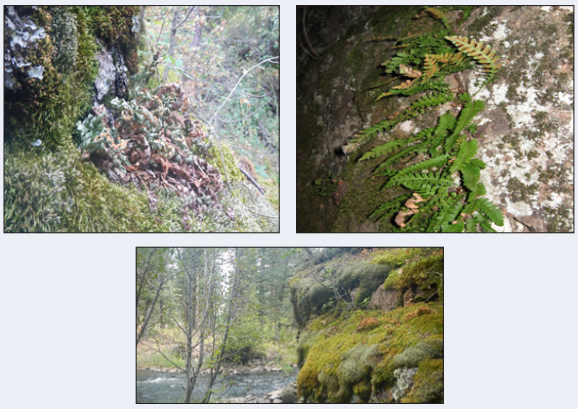


Figure 9. Rocky Mountain polypody fern at Button Rock Preserve in October (top left), view of fern with orange spores before senescence (top right, P. Smith) and habitat at Button Rock Preserve (lower)

Blue Ridge carrion flower

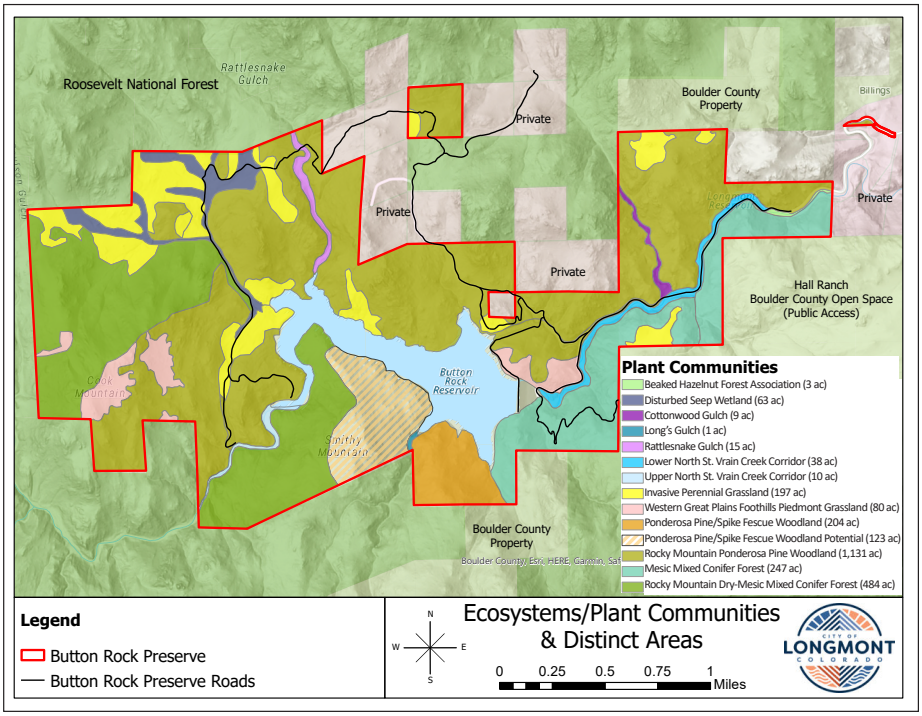
Three occurrences of a globally secure, state vulnerable plant (G5 / S3S4), Blue Ridge carrion flower were documented at the Preserve. Blue Ridge carrion flower is currently on CNHP's watchlist, under consideration for full tracking. Its growth form is a perennial vine, with male and female flowers on separate plants. CNHP found only female plants; these are easier to detect in the dense herbaceous layer where this plant is often found, because of the large balls of flowers it produces. Pollinators include bees, beetles and flies such as the carrion fly (Figure 14) that are attracted to the carrion scent produced by the green flowers. The berries are eaten by wildlife. At Button Rock Preserve, these plants were found in the upper floodplain bench of the North St. Vrain Creek and along small tributaries in the eastern half of the property (Figure 10).

Figure 10. Blue Ridge carrion flower with blue bottle carrion fly at Button Rock Preserve.

ECOLOGICAL SYSTEMS/PLANT COMMUNITIES AND DISTINCTIVE AREAS

During the 2019 field season, CNHP observed 14 ecological systems, plant communities and/or distinctive areas within Button Rock Preserve including uplands, woodlands, shrublands, cliffs, gulches, creek corridors, and wetland and riparian communities (Map 5, Appendix A). These 14 ecological systems fall into one of four groups:

1. Upland ecological systems,
2. Distinctive areas,
3. Riparian ecological systems and
4. Wetland ecological systems.



Map 5. Ecological systems, plant communities, distinctive areas of Button Rock Preserve as documented by CNHP during 2019 field surveys (Appendix A).

UPLAND ECOLOGICAL SYSTEMS/PLANT COMMUNITIES

Rocky Mountain Ponderosa Pine Woodland

Rocky Mountain Ponderosa Pine Woodland is the most common ecological system along Colorado's Front Range, occurring at elevations between 6,000 and 9,000 feet. This system covers 47% of the Preserve, not including the open water of Ralph Price Reservoir. Ponderosa pine dominates dry slopes and forms a matrix with Douglas-fir on moister north-facing slopes. Within this woodland system, the Preserve contains areas of mature, climax-aged forests with large-diameter trees. Canopy density changes depending on the age of the forest and past landscape disturbances, both anthropogenic and natural, e.g., fire or flood. Historically, it is thought this woodland system sustained frequent, low intensity wildfire with sporadic catastrophic burns (Shinneman & Baker, 1997 and Huckaby et al., 2003 as in CNHP, 2019).

Plant communities within this woodland system are distinguished by understory structure, some being characterized by a shrub component and others by a grass-dominated understory. Both community types are found at the Preserve. These mature forests have understories dominated by sun sedge (*Carex inops ssp. heliophila*) or spike fescue (*Leucopoa kingii*) grasses, both

Figure 11. Ponderosa Pine/Spike Fescue Woodland at Button Rock Preserve.

of which are CNHP tracked plant communities (Table 3). In the past, Longmont treated the sun sedge dominated forests for wildfire mitigation, thus, CNHP did not map these areas. CNHP did however map another rare plant community that had also been treated for wildfire mitigation, the ponderosa pine/spike fescue woodland (Figure 11). This woodland type covers an estimated 8% (204 acres) of the total Preserve acreage.

Dry-mesic/mesic montane mixed conifer forest and woodland

Dry-mesic conifer forests occur in a matrix across the Preserve with other plant communities. About 20% (484 acres) of the Preserve is mapped as this ecological system. It is the next most common forest type after the Rocky Mountain ponderosa pine woodland. It is found at elevations between 4,000 and 10,000 feet. Douglas-fir and ponderosa pine co-dominate canyon side slopes. Other common tree species include Rocky Mountain juniper (*Juniperus scopulorum*) and aspen (*Populus tremuloides*). A variety of shrubs are common in this forest type including Oregon grape (*Berberis repens*), kinnikinnick (*Arctostaphylos uva-ursi*), mountain snowberry (*Symphoriocarpos rotundifolius*), wax currant (*Ribes cereum*), common juniper (*Juniperus communis var. depressa*), fivepetal cliffbush (*Jamesia americana var. americana*) and mountain mahogany (*Cercocarpus montanus*). Common grasses include Arizona fescue (*Festuca arizonica*), muttongrass (*Poa fendleriana*) and mountain muhly (*Muhlenbergia montana*).

Southern Rocky Mountain mesic montane mixed conifer forest and woodland

The Southern Rocky Mountain mesic montane mixed conifer forest and woodland is estimated to cover 10% (247 acres) of the Preserve. This ecosystem occurs mostly on steep, north-facing slopes and ravines with Douglas-fir as its main overstory component. An uncommon native plant in the ginseng family, wild sarsaparilla (*Aralia nudicaulis*) dominated the lower section of the South Cove drainage. Wild sarsaparilla is shade tolerant and an indicator of a climax forest (Figure 12).

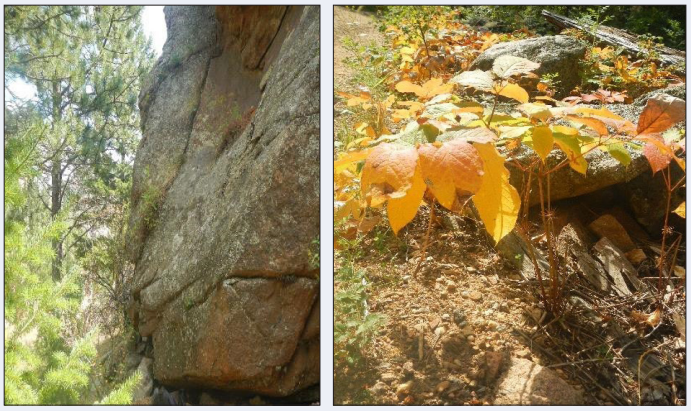


Figure 12. Douglas-fir and ponderosa pine in South Cove (left) with wild sarsaparilla (right).

Ponderosa pine woodlands, which are part of the Southern Rocky Mountain mesic montane conifer forest and woodland system, include areas with widely spaced trees over grassland parks forming savannas. These savannas occur at the ecotones between forests on the higher slopes and grasslands in the valley bottoms, combining elements of both. Unique in this system is the presence of big bluestem (*Andropogon gerardii*), a tallgrass species that more commonly occurs further east in the plains states and is much less common in the foothills of the arid west. Thus, the occurrence of big bluestem at Button Rock Preserve is significant (Figure 18). The north and east side of the Preserve support forests with a shrub component and a dense canopy. Shrubs include antelope bitterbrush (*Purshia tridentata*), kinnikinnick, mountain ninebark (*Physocarpus monogynus*), fivepetal cliffbush, and wax currant. Some of these plant communities have been impacted by wildfire mitigation work, clearing some desirable vegetation to pile trunks for future pile burning. In areas around Button Rock Preserve, similar plant communities have been documented as rare (Neid et al., 2009 as in CNHP 2019). Due to the disturbance, it was difficult for CNHP to map these same plant communities within the Preserve.

Rocky Mountain lower montane – Foothill Shrublands

This ecological system is known from the Northern Colorado Front Range where it occurs in exposed, dry rocky sites where tree growth is limited between about 5,000 and 9,500 feet in elevation. At Button Rock Preserve, these areas are distributed throughout on canyon slopes. These areas were not mapped due to their small size, their numerous occurrences, and their wide distribution across the landscape. Common shrubs include western serviceberry (*Amelanchier alnifolia*), mountain mahogany, wax currant, mountain snowberry, antelope bitterbrush and Great Plains yucca (*Yucca glauca*). Common grasses include muhly grasses (*Muhlenbergia spp.*), grama grasses (*Bouteloua spp.*), needle grasses (*Hesperostipa spp.*) and bluebunch wheatgrass (*Pseudoroegneria spicata*).

Western Great Plains Foothills piedmont grassland

The Western Great Plains foothills piedmont grassland system was observed in one area northeast of Ralph Price Reservoir, covering 1% (2.6 acres) of the Preserve. There is evidence of past cattle grazing operations here, but the area is recovering and is dominated by native vegetation. Introduced species such as rattlesnake grass (*Bromus briziformis*), smooth brome (*B. inermis*), Canada bluegrass (*Poa compressa*) and Kentucky bluegrass (*P. pratensis*) dominate small dry ephemeral drainages within the system. Near Button Rock Dam, a population of CNHP tracked, globally rare jeweled blazingstar occurs in this system.

This ecological system is commonly found adjacent to ponderosa pine savannas. It usually occurs on the extreme western edge of the Great Plains where elevations between about 5,250 and 7,200 feet and precipitation create mixed tallgrass associations on moderate to gentle slopes. Common grasses observed include big bluestem, little bluestem (Schizachyrium scoparium), green needlegrass (Nassella viridula), bluebunch wheatgrass, western wheatgrass (Pascopyrum smithii), sand dropseed (Sporobolus cryptandrus), blue grama (Bouteloua gracilis), sideoats grama (B. curtipendula), needle-and-thread (Hesperostipa comata), bluegrasses (Poa spp.) and mountain muhly. In addition, dry sedge (Carex siccata) was common.

Figure 13. Big bluestem (orange color) and other grasses in the Western Great Plains foothills piedmont grassland at Button Rock Preserve.

Grasslands of the foothills form a mosaic with Ponderosa Pine and Lower Montane Foothills Shrubland systems. This habitat is one of the most severely altered systems in the Southern Rocky Mountain Ecoregion as most of these lands have been converted to agriculture or used extensively for grazing. It is rare to find occurrences that are in good condition (Rondeau, 2001 as in CNHP, 2019), but these areas in Button Rock Preserve seem to be recovering with many native species occupying most of the landscape (Figure 13).

Cliff and rock outcrop

Cliff and rock outcrop areas are distributed through the Preserve. Characteristic plants associated with these areas include a variety of shrubs and forbs including cutleaf daisy (*Erigeron compositus*), stemless Indian parsley (*Aletes acaulis*), clasping Venus' looking-glass (*Triodanus perfoliata*), James' nailwort (*Paronychia jamesii*) and bigflower cinquefoil (*Potentilla fissa*). A large diversity of ferns, mosses, spikemosses and lichens were also present. Common grasses include bluebunch wheatgrass, littleseed ricegrass (*Piptatherum micranthum*) and Scribner's needlegrass (*Achnatherum scribneri*). The two CNHP tracked rare fern species, grass-fern and Rocky Mountain polypody, were observed in Cliff/Rock Outcrop communities.

Invasive perennial grassland

These areas were previously grazed by cattle or cleared for dam construction. It is likely that these disturbances were the times when nonnative grasses were introduced into these systems. Due to the nonnative grass species, ecosystems mapped by LANDFIRE (USGS 2013) as Western Great Plains foothills piedmont grasslands are actually invasive perennial grasslands at the Preserve, dominated by Kentucky bluegrass or smooth brome.

The Kentucky Bluegrass grassland located in the northeastern part of the Preserve was not disturbed during dam construction and has now not had grazing on it for some decades. Although Kentucky bluegrass is still a dominant species, there are also a variety of native prairie forbs and grasses establishing here (Figure 14). Common native forbs observed include purple locoweed (*Oxytropis lambertii*), foothill arnica (*Arnica fulgens*), Drummond's milkvetch (*Astragalus drummondii*), flexible milkvetch (*Astragalus flexuosus*), tailcup lupine (*Lupinus caudatus*) and miner's candle (*Cryptantha virgata*). Nonnative species include Kentucky bluegrass and Dalmatian toadflax (*Linaria dalmatica*), a List B noxious weed. These areas should be protected to allow recovery to continue thus contributing to the biodiversity and health of the Preserve's upland grassland communities.

Many of the areas where soils were disturbed to build roads or borrow fill material are now dominated by smooth brome, which compared to Kentucky bluegrass, is more aggressive in terms of its ability to spread, establish, and become the dominant species in an area (Figure 15).

Figure 14. Kentucky bluegrass dominated grassland with a diverse array of native forbs at Button Rock Preserve.

Figure 15. Smooth brome dominated grasslands on the west side of Button Rock Preserve.

DISTINCTIVE AREAS

Rattlesnake Gulch, Cottonwood Gulch and Long Gulch are also described in Section 3.3.6, Hydrology.

Rattlesnake Gulch

Rattlesnake Gulch is located in northwest Button Rock Preserve where a trail follows the gulch upslope. The outlet into Ralph Price Reservoir has a large amount of sediment deposited there after the 2013 flood. Growing on the gravel sandbars here are native species like field sagewort (*Artemisia campestris var. pacifica*), wild geranium (*Geranium caespitosum*) and bigflower cinquefoil – all species reestablishing after disturbance. Upstream areas are dominated by ponderosa pine and Douglas-fir shady forested uplands (Figure 16). Near the perennial stream flowing over large rocks, New Mexican fontinalis moss (*Fontinalis neomexicana*), which is an aquatic moss species, along with willow species (*Salix spp.*) and blue wildrye (*Elymus glaucus*), occur commonly along the stream in this area.

Figure 16. Rattlesnake Gulch near the Ralph Price Reservoir outlet.

Cottonwood Gulch

The Cottonwood Gulch tributary, located north of Chimney Rock Dam, is heavily accessed by Preserve visitors. Where the tributary meets North St. Vrain Creek, an interesting assemblage of plants can be found in the ponded water north of the creek. Common plants here include coyote willow (*Salix exigua*), field horsetail (*Equisetum arvense*) along with a number of rushes and sedges including, inland rush (*Juncus interior*), longstyle rush (*Juncus longistylus*), Torrey's rush (*Juncus torreyi*), fox sedge (*Carex vulpinoidea*), slenderbeak sedge (*C. athrostachya*), Liddon's sedge (*C. petasata*), short-beaked sedge (*C. brevior*), meadow sedge (*C. praticola*) and woolly sedge (*C. pellita*). A grass species, few-flowered panicgrass (*Dicanthelium oligosanthes var. scribnerianum*) and a forb species, tiny trumpet (*Collomia linearis*), also occur here. Non-native species include sulfur cinquefoil (*Potentilla recta*), a List B noxious weed, Canada thistle (*Cirsium arvense*), another List B noxious weed, prickly lettuce (*Lactuca serriola*), black medic (*Medicago lupulina*) and gromwell (*Lithospermum arvense*), a species known only from Boulder County. A number of bird species, including American dippers and belted kingfishers, dive for food and build nests in the area.

Long Gulch

Long Gulch is south of Ralph Price Reservoir. During the 2013 flood, the area at the confluence with the reservoir was heavily inundated by sediment. In the gulch's upper reach, the canyon is steep, rugged, narrow and rocky, with small cave like crevices in the rocks. Common understory species include Parry's milkvetch (*Astragalus parryi*), Short's milkvetch (*A. shortianus*), fringed sage (*Artemisia frigida*), Britton's skullcap (*Scutellaria brittonii*), Rocky Mountain geranium (*Geranium caespitosum*), curlycup gumweed (*Grindellia squarrosa var. squarrosa*) and large false Solomon's seal (*Maianthemum racemosum ssp. amplexicaule*). Shrubs include willows (*Salix spp.*), chokecherry (*Prunus virginiana ssp. melanocarpa*), fivepetal cliffbush, wild raspberry (*Rubus ideaus*) and wax currant. Wet cliffs include ferns, mosses, Fendler's waterleaf (*Hydrophyllum fendleri*), Pennsylvania pellitory (*Parietaria pensylvanica*), fragrant bedstraw (*Galium triflorum*) and figwort (*Scrophularia lanceolata*). Non-native species include houndstongue (*Cynoglossum officinale*), a List B noxious weed, and common mullein (*Verbascum thapsus*), a List C noxious weed.

RIPARIAN ECOLOGICAL SYSTEMS/PLANT COMMUNITIES

The Upper and Lower North St. Vrain Creek Corridors are also described in Section 3.3.6, Hydrology.

Upper North St. Vrain Creek Corridor

Upper North St. Vrain Creek enters Ralph Price Reservoir on the southwest side of the Preserve, between Cook and Smithy Mountains. Canyon slopes are extremely steep and narrow (Figure 17). On the east side of the creek corridor, the Rocky Mountain dry-mesic mixed conifer forest ecological system dominates northwest-facing slopes with ponderosa pine, Douglas-fir and Rocky Mountain juniper. On the west side, southeast-facing slopes are dry and dominated by the Rocky Mountain ponderosa pine woodland system (Map 5, Appendix A).

Figure 17. Upper North St. Vrain Creek on the southwest side of Ralph Price Reservoir.

Lower North St. Vrain Creek Corridor

Along the Lower St. Vrain Creek Corridor, vegetation within the active floodplain is recovering from the recent 2013 flood; the flood scoured the area and deposited large amounts of sediment throughout the drainage. Along the south side of creek, the very steep north to northwest facing slopes are dominated by a Mesic Mixed Conifer Forest that includes a densely shaded overstory of mixed ponderosa pine and Douglas-fir. On the south- to southeast-facing slopes on the north side of the creek, a much drier Rocky Mountain ponderosa pine woodland is interspersed by steep, open rock outcrops.

A variety of native grasses occupy the creek's adjacent floodplain including Colorado brome (*Bromus polyanthus*), woolly brome (*B. lanatipes*), Montana wheatgrass (*Elymus albicans*), blue wild rye, Canada wild rye (*E. canadensis*), slender wheatgrass (*E. trachycaulus*), few-flowered panicgrass and creeping wild rye (*Leymus triticoides*). Common forbs in the area include Fendler's waterleaf, streamside bluebells (*Mertensia ciliata*), yarrow (*Achillea millefolium*), fringed sage, willow dock (*Rumex triangulivalvus*) and curly dock (*R. crispus*). Woody vines include wild hops (*Humulus neomexicanus*), Blue Ridge carrion flower and western white virgin's-bower (*Clematis ligusticifolia*).

In the more disturbed sites and near the roadway, non-native grasses including smooth brome, orchard grass (*Dactylis glomerata*), Kentucky bluegrass and jointed goatgrass (*Aegilops cylindrica*) dominate. A number of List B noxious weeds grow along the maintained roadway including diffuse knapweed (*Centaurea diffusa*), a diffuse and spotted knapweed hybrid (*Centaurea xpsammogena*), sulfur cinquefoil, musk thistle (*Carduus nutans*), and Dalmatian toadflax. Also, along the road are redstem filaree (*Erodium cicutarium*), a List C noxious weed and hoary alyssum (*Berteroa incana*), a Watchlist species. Other non-native species within the creek corridor include bouncingbet (*Saponaria officinale*), a List B noxious weed, birdsfoot trefoil (*Lotus corniculatus*), alyssum (*Alyssum simplex*), prickly lettuce and common burdock (*Arctium minus*), a List C noxious weed.

Beaked Hazelnut Forest Association

In some areas along the Lower St. Vrain Creek, beaked hazelnut (*Corylus cornuta*) forms dense thickets that were likely more vigorous prior to the 2013 flood. Near the main trailhead and parking lot and continuing east and west of this area, there is a quaking aspen/beaked hazelnut (*Populus tremuloides/Corylus cornuta*) forest association that is considered globally vulnerable and state critically imperiled (G3 / S1). This rare plant community is known from Boulder, El Paso, Jefferson and Larimer counties. It only occurs in portions of deep, cool canyons that that have high humidity (Figure 18). Beaked hazelnut thickets are thought to be long-lived and are known to increase in size with lack of disturbance (Carsey et al., 2003 as in CNHP, 2019). The 2013 flood impacted the size of this plant community, but it still currently covers approximately 0.3 linear miles and has high biodiversity, with many representative species of the plant community intact.

Overstory tree species are widely scattered and include Douglas-fir, plains cottonwood (*Populus deltoides ssp. monilifera*), narrowleaf cottonwood (*P. angustifolia*) and aspen. The diverse shrub layer includes chokecherry, wild raspberry, river birch (*Betula occidentalis*), thinleaf alder (*Alnus incana ssp. tenifolia*), Rocky Mountain maple,

Figure 18. Beaked hazelnut plant community at Button Rock Preserve.

mountain ninebark, Bebb willow (*Salix bebbiana*), strapleaf willow (*S. eriocephala var. watsonii*), pin-cherry (*Prunus pensylvanica*), and whitestem gooseberry (*Ribes inerme*). Beaked hazelnut dominates in patches along the creek on both sides. Common plants in the herbaceous layer include common cow parsnip (*Heracleum maximum*), scouring-rush horsetail (*Equisetum hymale ssp. affine*), Indian hemp (*Apocynum cannabinum*), false Solomon's seal, Canadian white violet (*Viola candensis*), blunt sweet-cicely (*Osmorhiza depauperata*) and osha (*Ligusticum porteri*). Other areas mixed in along the beaked hazelnut forest association include creek banks that have been planted and fenced off as part of a restoration effort along the creek's north side.

WETLAND ECOLOGICAL SYSTEMS/PLANT COMMUNITIES

Rocky Mountain Montane Wet Meadow

Within the larger area CNHP mapped as a disturbed seep wetland, there are small occurrences of the Rocky Mountain Montane Wet Meadow plant community (LANDFIRE, USGS 2013). These small, graminoid-dominated wetlands consist of species typically found at mid- to lower montane elevations, including clustered field sedge (*Carex praegracilis*), Nebraska sedge (*C. nebrascensis*), common spikerush (*Eleocharis palustris*), mountain rush (*Juncus arcticus*) and chamisso sedge (*C. pachystachya*), with lesser amounts of smooth horsetail (*Equisetum laevigatum*). The hydrologic regime is seasonally flooded without a perennially high-water table so that it dries out at some point in the growing season. An organism known as a magnificent bryozoan (*Pectinatella magnifica*), a North American species that feeds on algae, provides food for fish and snails, and is a harmless host species for other aquatic species, was

Figure. 19. Rocky Mountain montane wet meadow at Button Rock Preserve, including two views of the magnificent bryozoan, a colony of aquatic invertebrates that feed on algae and are harmless host species for other aquatic species.

observed in this plant community (NC Identification Guide, 2019 as in CNHP, 2019) (Figure 19). This is a good example of the biodiversity of organisms on the Preserve that can be found even in some of the areas that were subjected to past disturbances.

Disturbed seep wetland

The area mapped as a disturbed seep wetland in Figure 20 is a drainage that was highly impacted by both the construction of Ralph Price Reservoir and past cattle grazing. The drainage runs from the Preserve's north boundary, where it is fairly unobstructed, all the way to the northwestern edge of Ralph Price Reservoir. The fire road follows the majority of the drainage with some side seeps joining the main drainage. Even though the surrounding grasslands are dominated by smooth brome, the wet areas contain a number of native wetland species including a large population of Northern green orchid (*Platanthera aquilonis*). While not considered rare, the Northern green orchid is one of only two orchid species documented by CNHP during the 2019 survey. Other wetland species in the central seep area are Rocky Mountain iris (*Iris missouriensis*), Torrey's rush, swordleaf rush (*Juncus ensifolius*), interior rush, Nebraska sedge, yellow monkeyflower (*Mimulus guttatus*), and spikerushes (*Eleocharis spp.*) Numerous dragonflies and damselflies were observed during CNHP's spring and early summer visits.

Further south along the disturbed seep wetland drainage, there are small ponds with varying wetland plant communities. One of these ponds contains the elements of a narrowleaf bur-reed (*Sparganium angustifolium*) aquatic plant community, a community considered globally apparently secure but state imperiled (G4 / S2) (Figure 21). Although the occurrence is small, it contains a suite of species that characterize this community type (Carsey et al., 2003 as in CNHP, 2019) including threepetal bedstraw (*Galium trifidum var. subbiflorum*), spikerushes (*E. acicularis, E. palustris*) and, dominating the emergent layer, cattails (*Typha angustifolia*). The pond is less than a meter deep with a permanent, semi-permanent flooding regime with cobbles and rock in muck soil. Aquatic plants include vernal water star-wort (*Callitriche palustris*) and duckweed (*Lemna minor*). Narrowleaf bur-reed aquatic plant communities are known from California, Oregon, Washington and Colorado. Another pond area downstream of this forms a small swamp dominated by aspen and peachleaf willow (*Salix amygdaloides*) in the overstory and coyote willow in the shrub layer (Figure 22).

Figure 20. Looking south at the disturbed seep wetland community surrounded by the disturbed perennial grassland or 'borrow area' meadow at Button Rock Preserve.

Figure 21. Narrowleaf bur-reed aquatic community at Button Rock Preserve.

Figure 22. Swamp wetland with mature peachleaf willow and cottonwood trees in the overstory.

3.3.3 NOXIOUS WEEDS AND NON-NATIVE SPECIES

METHODS

CNHP and DHM Design

As part of conducting botanical surveys during nine survey days between May and October 2019, CNHP created a table of all observed species throughout Button Rock Preserve, categorizing species into native, noxious weeds, or non-native species. In accordance with the Colorado Noxious Weed Act, the Colorado Department of Agriculture (CDA) designates noxious weed species and categorizes them into List A, List B, List C or Watchlist species based on management priority (Table 5) (CDA, 2022):

List A – Noxious weed species designated by the Commissioner for eradication.

List B – Noxious weed species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments and other interested parties, develops and implements state noxious weed management plans designed to stop the spread of these species.

List C – Noxious weed species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments and other interested parties, will develop and implement state noxious weed management plans designated to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands.

Watchlist Species – Species that have been determined to pose a potential threat to the agricultural productivity and environmental values of the lands of the state. The Watch List is intended to assist the Commissioner in determining which species should be designated as noxious weeds.

Non-native species are species that occur outside their native range influenced mainly by an intentional or accidental introduction by humans or animals. These species are not defined as noxious weeds by the Colorado Department of Agriculture but they can disrupt native plant communities and ecosystems by outcompeting native species for habitat and some cases, taking over a specialized microclimate or food source for rare native species.

On August 14 and 15, 2019 DHM Design ecological services staff conducted a focused noxious weed and non-native species inventory. Using handheld GPS units, DHM Design staff collected point locations for all noxious weed and non-native species observed within the 200-foot buffers around the Preserve's major drainages, roads and trails. To display these locations on a map as weed densities, DHM staff assigned a rating of high, moderate or low, to each point location observation within the buffer areas as follows:

High Density – Greater than 10 noxious weed individuals observed at one GPS point location

Moderate Density – Between 5 and 10 noxious weed individuals observed at one GPS point location

Low Density – Between 1 and 5 noxious weed individuals observed at one GPS point location

Staff and Contractors

In addition to the point-in-time observations made by CNHP and DHM Design in 2019, beginning in approximately 2012, Button Rock Preserve watershed rangers have used either Longmont Open Space staff or hired contractors to control noxious weed populations. This work has occurred mainly within the portion of the Fire Road 1/Longmont Dam Road corridor that extends from the main trailhead parking lot (east) to the Button Rock Dam spillway bridge (west). On a biannual to annual basis, depending on the year, staff or contractors use backpack sprayers to apply herbicide to noxious weed populations. Additionally, in some seasons, Longmont Natural Resources volunteers have augmented chemical control using mechanical methods including hand pulling and clipping seedheads in some of the most infested areas along the road corridor.

RESULTS

CNHP and DHM Design

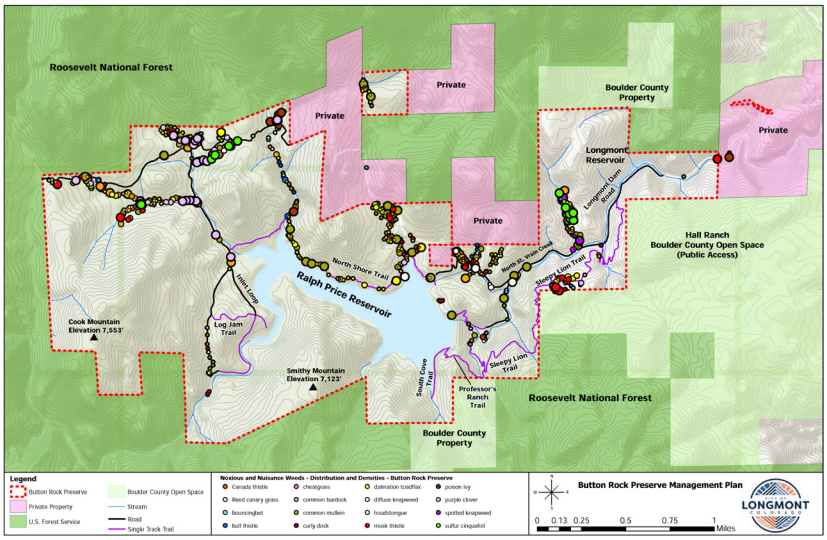
Generally, in urban open space areas, non-native species account for about 50% or more of the species (Smith and Kuhn, 2015 as in CNHP, 2019). At Button Rock Preserve, CNHP found that non-native species accounted for 15% (44 taxa) of observed species, with 5% or 18 species on the Colorado State Department of Agriculture Noxious Weed List including 11 List B species, 6 List C species and 1 Watchlist species (CNHP 2019, CDA 2022). This indicates the high quality of much of the landscape at Button Rock Preserve (CNHP, 2019).

Both CNHP and DHM Design found that the majority of weed species were located in disturbed areas along roadsides, active floodplains and trail sides (Map 6). However, CNHP botanists observed several noxious weed occurrences in the vicinity of tracked rare species. For example, Sprengel's sedge was found in areas with Canada thistle and jeweled

blazingstar was found in areas with Dalmatian toadflax (2019). Cheatgrass (*Bromus tectorum*), common mullein, redstem filaree, houndstongue, sulfur cinquefoil, Canada thistle, Dalmatian toadflax, knapweed species, musk thistle and bouncingbet were very common and widely dispersed (CNHP, 2019). DHM Design staff observed low densities of noxious weeds in forested areas and low to moderate densities of noxious weeds in the western Preserve 'borrow area' meadow. In many of the same areas where noxious weed populations were observed to be the highest at the Preserve, DHM Design also documented high densities of several non-native species including sweet clover (*Melilotus officinalis*), reed canary grass (*Phalaris arundinacea*), curly dock and birdsfoot trefoil (2019).

Table 5. List of 18 noxious weed species observed at Button Rock Preserve (CNHP, 2019)

USDA CDA SCIENTIFIC NAME	USDA CDA COMMON NAME	STATUS	COMMENT
Aegilops cylindrica	Jointed Goatgrass	List B	NE corner of Longmont Reservoir
Arctium minus	Common Burdock	List C	Roadside N. St. Vrain Creek shade
Berteroa incana	Hoary Alyssum	Watchlist	Trails in PIPO woodlands
Bromus tectorum	Cheatgrass	List C	Rattlesnake Gulch, Invasive Perennial Grasslands, rock outcrops
Carduus nutans	Musk Thistle	List B	NE corner Longmont Reservoir, St Vrain restoration area
Centaurea diffusa	Diffuse Knapweed	List B	Roadside N. St. Vrain Creek
Centaurea xpsammogena	Diffuse/Spotted Knapweed Hybrid	List B	Roadside by Sleepy Lion Trail east entrance
Cirsium arvense	Canada Thistle	List B	Perennial Seep west, upstream Chimney Rock Dam
Cirsium vulgare	Bull Thistle	List B	Southeast side Ralph Price Dam
Convolvulus arvensis	Field Bindweed	List C	Upstream Chimney Rock Dam
Cynoglossum officinale	Houndstongue	List B	Shady riparian areas
Elymus repens	Quackgrass	List C	South side of road just east of parking lot
Erodium cicutarium	Redstem Filaree	List C	Disturbed Perennial Seep uplands
Lepidium latifolium	Perennial Pepperweed	List B	North side of road east of parking lot
Linaria dalmatica	Dalmatian Toadflax	List B	Multiple sites in dry areas
Potentilla recta	Sulfur Cinquefoil	List B	Perennial seep, roadsides, near Chimney Rock Dam
Saponaria officinalis	Bouncingbet	List B	East of parking lot, multiple areas along floodplain of N. St. Vrain Creek
Verbascum thapsus	Common Mullein	List C	Common disturbed upland



Map 6. Noxious weed and non-native species locations and densities at Button Rock Preserve (Appendix A) (DHM Design, 2019).

Staff and Contractors

Along the Fire Road 1/LDR corridor, chemical control, augmented by manual control in some areas, is controlling spread and reducing the size of existing weed populations for most species. Throughout the treated portion of the road corridor, noxious weed density has decreased significantly, by up to 60%, over the past several seasons (Shaun Linnihan, personal communication). Two of the most problematic species at Button Rock Preserve are diffuse knapweed and the diffuse and spotted knapweed hybrid. Dense populations of knapweed persist on the bank of N. St. Vrain Creek near the junction of Fire Road 1 and Fire Road 2. Manually digging up and removing the knapweed root crowns in early spring and mid-summer to prevent further spread is recommended to control this population while avoiding use of herbicides adjacent to the creek (Shaun Linnihan, personal communication).

Beyond the Fire Road 1/LDR corridor, noxious weed populations remain largely untreated. Problem areas exist in multiple drainages and along heavily used trails, including Sleepy Lion Trail. While CNHP found few noxious weed populations in forested areas, it is likely that disturbance caused by on-going and future forest stewardship projects may cause populations to spread along skid routes and in staging areas. Cheatgrass, a List C noxious weed in both Boulder County and the state of Colorado, is a highly flammable cool season grass that is already established in the western Preserve and that could continue to spread as a result of forest stewardship or other disturbances such as road maintenance, vehicles and pedestrians.

Cheatgrass emerges in the spring before warm season native species, giving it a competitive advantage. It dies out by mid-summer, leaving behind thick mats of combustible, dry grass that can increase fire intensity, act as ladder fuel, igniting other vegetation including shrubs and low tree branches and it can decrease intervals between fires (CSU Extension, 2022). Fuel loading can lead to high intensity wildfire, leaving behind hydrophobic soils which cannot absorb water or hold the soil in place. This can lead to excess soils sloughing off into Ralph Price Reservoir, which could damage drinking water infrastructure and impact water quality. Locations near the reservoir and Preserve utility sites should be the priority treatment areas.

When noxious weed control began at the Preserve in the late 1980s, Longmont's budget was ad hoc. Beginning in 1995, as part of a land exchange with the USFS, Longmont and the USFS began a joint cross-boundary noxious weed control effort. Each agency pledged to further this effort and Longmont budgeted $5,000 per year. For many years, this was an appropriate annual budget for Longmont.

Now, using the baseline data collected by CNHP and DHM design in 2019 and records of the mechanical and chemical control efforts by contractors, staff and volunteers in recent years, Longmont should develop a comprehensive noxious weed program at Button Rock Preserve. The program should account for rising costs, expand treatment beyond the Fire Road 1/LDR corridor, identify priority treatment areas throughout the Preserve and include specific detail about controlling cheatgrass.

3.3.4 FORESTRY

In 2003 and updated in 2017, Longmont developed its Button Rock Preserve Forest Stewardship Plan in consultation with the Colorado State Forest Service (CSFS), the Colorado Forest Restoration Institute (CFRI) at Colorado State University (CSU), and the USGS. The five overarching goals of the updated Forest Stewardship Plan, as well as its intention to be the guiding document for forest management at Button Rock Preserve for the next 15 to 20 years, align with the purpose and goals of the Button Rock Preserve Management Plan, as detailed in Section 2.2 (City of Longmont, 2017):

1. Water Quality: Button Rock Preserve's primary goal is maintaining and operating the Preserve as a healthy and resilient landscape that provides a reliable, clean water supply to the people of Longmont.
2. Natural Disturbance & Disaster Resiliency: The Button Rock Preserve landscape shall be maintained in a manner that is resilient to natural disturbances and disasters.
3. Healthy Forest Matrix Ecosystem: The uplands of Button Rock Preserve shall be restored to and maintained as a healthy forest matrix that is functionally equivalent to a forest with an appropriate and functional fire regime.
4. Recovered, Resilient, and Healthy Creek System: North St. Vrain Creek shall be managed as a functioning, healthy ecosystem.
5. Meaningful Recreational Opportunities: Where not inconsistent with the other four goals, Button Rock Preserve shall be managed as a public resource that can provide diverse low-impact recreation opportunities such as angling, hiking and wildlife viewing.

To restore, manage, and re-treat Button Rock Preserve's forests in a way that will achieve these goals and lessen the impacts of catastrophic wildfire, Longmont's forest managers need to understand Button Rock Preserve's past

ecological conditions, i.e., before European settlement and fire suppression, including the historic fire regimes[1] for each forest type and how these compare to the current ecological conditions within the Preserve's forest types. A brief summary of Button Rock Preserve's past and present forest conditions, as described in the Forest Stewardship Plan, is as follows:

> Like many ponderosa pine forests throughout the Colorado Front Range and Intermountain West, the forests of Button Rock Preserve are overgrown from a century of management without fire or harvesting. Prior to Euro-American colonial settlement, these ponderosa stands experienced regular fires from lightning strikes every few years as well as from Native Americans using low severity prescribed fires as a management tool. These ground fires would burn the surface fuels and most of the young ponderosa regeneration, but would not harm the mature, fire-adapted pines.
>
> Today, without regular surface fires, more ponderosa regeneration survives to become mature trees, which in turn has led to a much more densely stocked forest than existed historically. Fire intolerant species such as Douglas-fir and Rocky Mountain juniper have also become more prevalent in present-day forest stands. The result of these structural changes is a forest that it is now much less resilient to fire. Instead of surface fires, more wildfires now result in catastrophic stand-replacing events that severely damage soils and can lead to drastic changes in water quality and the severity of erosion, sedimentation and nutrient loading in Button Rock Preserve's reservoirs and creeks (2017).

Today, Button Rock Preserve's upland forests and woodlands consist of three dominant ecosystems or land cover types (CNHP, 2019; City of Longmont, 2017). First, the most dominate ecosystem of the three, the Rocky Mountain ponderosa pine woodland, a xeric ponderosa pine-dominated forest ecosystem, covers 47% of the Preserve not including the open water of Ralph Price and Longmont Reservoirs. Second, the dry-mesic/mesic montane mixed conifer forest/woodland, described in the Forest Stewardship Plan as a matrix of grasslands and ponderosa pine-dominated forests, covers 20% or 484 acres of the Preserve. Finally, the Southern Rocky Mountain mesic montane mixed conifer forest and woodland, a mesic mixed conifer forest type, co-dominated by ponderosa pine and Douglas-fir, covers 10% or 247 acres of the Preserve. CNHP's detailed descriptions of each of these ecosystems, including the various plant communities within them that are distinguished by understory species associations, are in Section 3.3.2, Results (2019). An ecosystems map of the Preserve is shown in Map 5.

Although these forest types are all dominated by ponderosa pine, the forest structures within each are highly heterogeneous. Differences in elevation, aspect and topography create variation in historic fire regime and historic stand structure. Based on this understanding of Button Rock Preserve's forest conditions, the Forest Stewardship Plan recommends first, restoring historically open ponderosa pine stands adapted to a low-severity fire regime to their historic density and second, creating structural heterogeneity in the forests adapted to a mixed-severity fire regime in a manner that effectively isolates areas susceptible to stand-replacing fires. To achieve this, the Forest Stewardship Plan breaks the Preserve's forests into 17 Forest Management Units, including 8 Front Country Units, 6 Back Country Units, 2 Mullen Park Units, and 1 Southshore Management Unit (City of Longmont, 2017).

Using these prescriptions, Longmont has carried out fuels reduction projects each year since 2004. Longmont also works collaboratively with St. Vrain Forest Health Partnership agencies (formerly known as the 'Button Rock Collective'), whenever feasible, to treat more acres on adjacent, cross-jurisdictional fuels reduction projects within the North St. Vrain Creek watershed. Between 2004 and 2022, approximately 1,153 acres of Button Rock Preserve's forests were treated, primarily using mechanical thinning and lop and scatter techniques. The process is continual. Some of the first units to be treated are re-densifying or filling in with fire intolerant species and should be scheduled for retreatment. The Mullen Park Retreatment Project is an example of a retreatment that occurred in 2022. Longmont utilized the Larimer County Conservation Corps (LCCC) to retreat a 10-acre area adjacent to the watershed ranger residence.

Upcoming forest stewardship projects include:

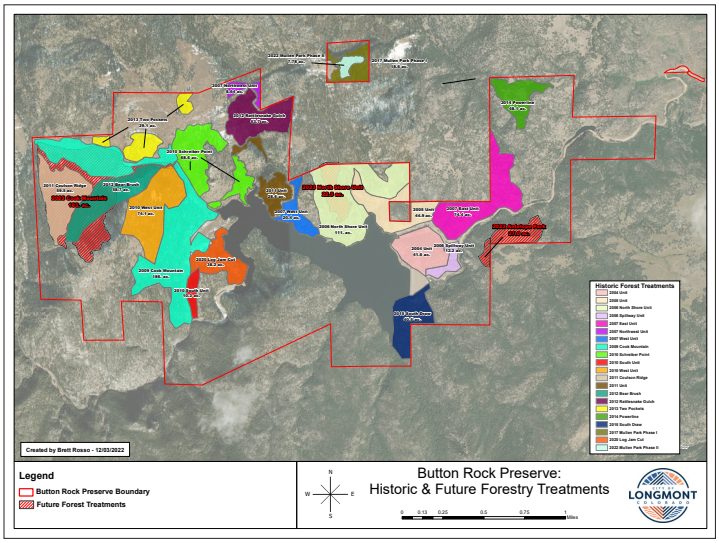
1. Button Rock Watershed Protection Project (2023): This project will treat approximately 50 acres above the Preserve's North Shore Trail to protect Ralph Price Reservoir, improve forest health and improve emergency egress via LDR. This effort is partially funded by a

[1] **Historic Fire Regime:** A summary of fire frequency, extent, seasonality, behavior (e.g., surface vs. crown fire), intensity (defined as heat release), and severity (defined as impacts on organisms and the abiotic environment) (Kauffman, 2006 as in City of Longmont, 2017).

Colorado Strategic Wildfire Action Program (COSWAP) Workforce grant.

2. Cook Mountain Project (2023-2024): This is a 183-acre cross boundary effort between Boulder County, Longmont and private residents to create fuel breaks between Coulson Gulch and Ralph Price Reservoir and improve forest health. The effort is partially funded by a $1,000,000 COSWAP Landscape Resilience Investment (LRI) grant with $600,000 of those dollars going to Longmont.

The latest planning map, created in 2022, shows historic and future planned forestry treatments at the Preserve, including treatment year and treatment size in acres (Map 7).



Map 7. This map shows historic forestry treatments (dating back to 2004) and those planned for the near future (2023) at Button Rock Preserve (Appendix A).

3.3.5 WILDLIFE

METHODS

Zoological naming conventions for both the common wildlife names and the scientific names appearing in this Plan follow NatureServe (2022). In order to inventory major vertebrate taxa occurring in Button Rock Preserve, CNHP biologists visited the Preserve 10 times in March, May, June, July, August and September, 2019. Through opportunistic visual observation, wildlife camera surveillance, and small mammal trapping, CNHP biologists documented wildlife species, including some listed as Species of Greatest Conservation Need (SGCN) in Colorado's State Wildlife Action Plan (SWAP) (CPW, 2015).

Amphibians and Reptiles

CNHP documented opportunistic visual encounters for all amphibians and reptiles observed on field visits. Temporary ponds and larger pools of standing water were searched for amphibian adults, eggs and larvae.

Birds

During the 2019 breeding season, breeding bird surveys were conducted over four days between late May through mid-June. To document breeding bird use, CNHP conducted early morning walking transects through the Preserve's major plant communities, recording visual and aural observations. On other field visits throughout the late summer and early fall, additional bird observations were recorded. Observations were annotated when they occurred outside of the breeding season. All bird observations were submitted to eBird, which is a global citizen science online database utilizing submitted bird observations to document bird distribution, abundance, habitat use, and trends (Cornell Lab of Ornithology, 2022).

Mammals (Not Including Bats) – Live Traps

Small mammal surveys, excluding bats, relied on visual observations, opportunistic encounters, e.g., Abert's squirrel (Sciurus aberti) and live capture of small mammals using baited Sherman traps. Beginning in September 2019, trapping occurred over 442 trap nights and across four primary trapping transects, established to provide broad geographic coverage of the Preserve while still maintaining reasonable accessibility for animal health and safety (Table 6, Figure 23). Each evening between 5:00 pm and 7:30 pm, traps were opened, baited with crimped oat/sweet feed mix and supplied with a small amount of polyfil for warmth. Each following morning, traps were checked for animal captures between 7:00 am and 10:30 am daily and then closed until the evening to prevent capturing animals during the heat of the day.

Mammals (Not Including Bats) – Camera Observations

CNHP surveys targeting medium and large mammals relied upon visual observations, opportunistic observations and motion sensitive remote Cuddeback Digital Attack IR cameras. Camera locations were selected based on establishing broad-geographic and plant community representation, heavily used animal trails, and discrete watering/feeding locations. Starting on March 20, 2019, with some, though not all cameras running until early September 2019, cameras were placed in eight locations across the Preserve (Figure 23). All cameras were placed at least 150 feet away from trails and roads.

In May 2021, Holman worked with watershed ranger staff to select locations for 19 Spec Ops Elite HP4 Browning trail cameras throughout the Preserve. Holman's 19 wildlife

cameras were activated on June 5, 2021 and deactivated on October 17, 2021. The purpose of the small grant funded large mammal study was to 1) Identify the presence of mountain lions in the Preserve, 2) Ascertain if human activity is negatively impacting mountain lion habitat utilization or movement throughout the Preserve and 3) Verify if areas Longmont wildlife closure areas are functioning as intended, i.e., to support wildlife populations currently in need of protection (Holman, 2021). In order to distinguish between higher and lower levels of recreation, Holman divided the Preserve into east, which is more heavily used for recreation, and west, which is further from the Preserve's main trailhead and has less human and domestic dog (Canis familiaris) activity. Each of the 19 cameras were given the same delay settings and then placed about 3 feet high in a tree. A total of 10 cameras were located on the west side and 9 cameras on the east side.

Since 2016, Westview Middle School has been conducting its Plains to the Park (P2P) STEM program at Button Rock Preserve using wildlife cameras to collect data and learn about wildlife diversity, watershed restoration and human impacts. Between 2016 and 2022, students visited the Preserve's east side about every other month to check, maintain and relocate 3 motion-activated wildlife cameras (Dan Cribby, personal communication).

Bats – Acoustic Survey

In July 2019, four stationary acoustical monitoring stations were established for a total of 15 days. The stations assessed bat use and distribution on the Preserve. The location of each monitoring station was selected to maximize the number and quality of recordings. Therefore, detectors were placed in areas with high potential for bat foraging activity, with little to no vegetation "clutter," i.e., vegetation density at the mid and upper canopy level, allowing unobstructed flight paths, near open water areas likely used for drinking and foraging, and away from fast flowing streams that produce too much competing noise, e.g., North St. Vrain Creek (Loeb et al., 2015 as in CNHP, 2019). Song Meter SM4BAT FS ultrasonic detectors (Wildlife Acoustics, Inc., Maynard, MA) were used to continuously record nighttime bat echolocation calls (Figure 24). Resulting bat call files of sufficient quality were identified to species using SonoBat v.4.2.2.1.

An additional survey for roosting bats was conducted on March 20 and September 3, 2019. When possible, bats were identified to species visually and assessed for any signs or symptoms of white-nose syndrome but no individuals were physically handled for identification purposes in order to limit disturbance to the animals. This information was compiled in a staff report.

Table 6. The number of small mammal traps deployed at each transect and a description of the associated plant communities.

TRANSECT I.D.	NUMBER OF SHERMAN TRAPS	PLANT COMMUNITY DESCRIPTION
A	30	Riparian (St. Vrain) corridor adjacent to Preserve entrance/parking lot. Area experienced significant flooding damage in 2013.
B	27	Dry drainage feeding into St. Vrain, protected W-facing slope and adjacent uplands with large mature *Pinus ponderosa, Juniperus, and Pseudotsuga menziesii.*
C	48	Large ephemeral terrace pond with mature Salix overstory; transitions into open *Bromus inermis* meadow, rock outcrops and *Pinus ponderosa* woodland.
D	48	Rich, small stream riparian communities of Rattlesnake Gulch matrixed with sandbars at Reservoir edge, small grassland openings and *Pinus ponderosa* woodlands and rock outcrops (upper).

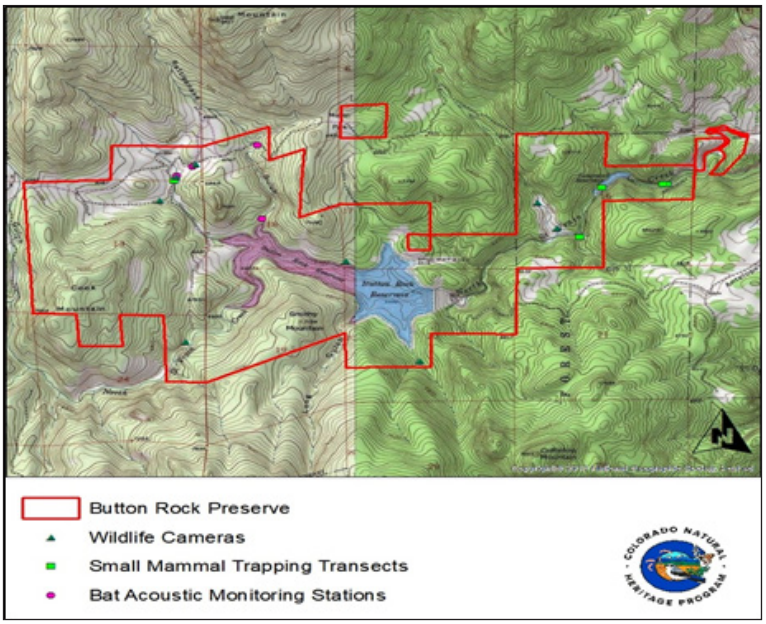


Figure 23. Locations of CNHP wildlife survey activities occurring across Button Rock Preserve in 2019.

Figure 24. Views from bat acoustic monitoring sites located across the Preserve. Site A (top left): Small stream located at the upper end of Rattlesnake Gulch. Site B (top right): Opening adjacent to the large pond heavily vegetated with willows. Site C (lower left): Small pond in the Button Rock Dam 'borrow area' meadow, Site D (lower right): Lower end/ mouth of Rattlesnake Gulch opening into Ralph Price Reservoir.

RESULTS

CNHP Summary of Findings - Wildlife

- 11 vertebrate SGCN (CPW, 2015) were observed by CNHP biologists: 5 birds, 5 mammals, and 1 reptile.
- A total of 7 herpetofauna were observed: 5 snakes, 1 lizard, and 1 amphibian.
- 64 total bird species were observed with 55 documented during the breeding season. 117 birds were reported through all eBird observations occurring in the area and dating back to 1989 (Cornell Lab of Ornithology, 2022).
- 14 mammal species (not including bats) were documented for the Preserve, this includes the long-tailed vole not previously known for the area.
- 8 bat species, nearly half of the 19 species known for Colorado, were observed through acoustical monitoring; 4 of these bats are considered SGCN and tracked by CNHP. The Preserve is significant for its bat activity and diversity.

Holman Summary of Findings – Wildlife

- 13 mammal species and 3 bird species were detected, these include 4 mammal species and 1 bird species in addition to those observed by CNHP (Table 10).
  - The 5 species in addition to those CNHP observed include bobcat (*Lynx rufus*), eastern fox squirrel (*Sciurus niger*), gray fox (*Urocyon cinereoargenteus*), long-tailed weasel (*Neogale frenata*) and Woodhouse's scrub-jay (*Aphelocoma woodhouseii*) (Table 10).
- Mountain lions were detected in three distinct areas.
- It is thought that the Preserve can support denning and hunting habitat for adult mountain lions.
- Black bears and bobcats exhibited a high capture probability on wildlife cameras.
- Elk are currently utilizing the CPW winter range area in the Preserve, Longmont's Management Zone 2/Zone 3, which is recommended as a Seasonal Wildlife Closure Area (SWA).
- 5 wildlife cameras were reset and left with watershed rangers to collect additional data on an ongoing basis starting in spring 2022.

Other Summary of Findings – Wildlife

- The 3 Westview Middle School wildlife cameras captured many of the same species as CNHP and Holman but they observed 1 additional species on their cameras, the yellow-bellied marmot (*Marmosta flaviventris*).
- In 2022, watershed rangers observed moose (*Alces alces*) for the first time (Table 10).
- Between CNHP, rangers, Holman and Westview Middle, 28 mammal species (including bats), 7 amphibians and reptiles and 65 bird species were observed (Tables 7, 9, 10 and 11).

Amphibians and Reptiles

Six reptiles and a single amphibian were observed opportunistically by visual encounter during field visits in 2019 (Table 7). All snake observations occurred in September and early October 2019, and all snake species observed were photo documented. The milksnake (*Lampropeltis gentilis*) is considered a secretive snake, not often observed, though nonetheless a relatively common species east of the Rocky Mountains. Milksnakes will feed on rattlesnakes along with other vertebrate prey such as birds, small mammals, lizards and other snakes. One milksnake was observed at the base of the cliff system lining the upper North St. Vrain Creek (Figure 25). It is very likely that milksnakes and other snakes, e.g., rattlesnakes and gartersnakes, use suitable rock shelters/crevices as hibernacula and for summer aestivation (torpor/dormancy that occurs during extreme hot or dry periods). Generally, snakes are assumed to select dormancy sites that achieve suitable thermal profiles, i.e., above freezing in the winter, below external air temperature in the summer, made possible by subsurface geomorphology, air circulation, etc. that allow them to survive seasonal weather extremes. Although there is no shortage of superficially available rock crevices/cracks in the Preserve, it is unknown where critical hibernacula may occur and further research and documentation may be needed if future management plans are expected to impact these areas.

Table 7-REPTILES. List of the reptiles CNHP biologists observed at Button Rock Preserve in 2019.

COMMON NAME	SCIENTIFIC NAME
Bullsnake	*Pituophis catenifer*
Western Milksnake	*Lampropeltis gentilis*
Terrestrial Gartersnake	*Thamnophis elegans*
Prairie Rattlesnake	*Crotalus viridis*
North American Racer	*Coluber constrictor*
Plateau Fence Lizard	*Sceloporus tristichus*

Table 7-AMPHIBIANS. List of the amphibiansCNHP biologists observed at Button Rock Preserve in 2019.

COMMON NAME	SCIENTIFIC NAME
Western Chorus Frog	*Pseudacris triseriata*

Figure 25. The six reptiles observed opportunistically at Button Rock Preserve: Plateau fence lizard (*Sceloporus tristichus*), prairie rattlesnake (*Crotalus viridis*), terrestrial gartersnake (*Thamnophis elegans*), western milksnake (*Lampropeltis gentilis*), North American racer (*Coluber constrictor*) and bullsnake (*Pituophis catenifer*).

Table 8-BIRDS. Wildlife species observed by CNHP at Button Rock Preserve. These species are listed as SGCN in the SWAP for Colorado (CPW, 2015) and/or additionally, they receive other state or federal conservation priority designation.

COMMON NAME	SCIENTIFIC NAME	Priority SWAP Tier	Federal Status	State Status	USFS Sensitive Species	BLM Sensitive Species	USFWS Birds of Conservation Concern	NatureServe Global Status Rank	CNHP/NatureServe State Status Rank
Golden Eagle	*Aquila chrysaetos*	Tier 1					X	G5	S3S4B, S4N
Olive-sided Flycatcher	*Contopus cooperi*	Tier 2			X			G4	S3S4B
Lazuli Bunting	*Passerina amoena*	Tier 2						G5	S5B
Virginia's Warbler	*Leiothlypis virginiae*	Tier 2						G5	S5
Bald Eagle	*Haliaeetus leucocephalus*	Tier 2		SC	X			G5	S3

Table 8-MAMMALS. Wildlife species observed by CNHP at Button Rock Preserve. These species are listed as SGCN in the SWAP for Colorado (CPW, 2015) and/or additionally, they receive other state or federal conservation priority designation.

COMMON NAME	SCIENTIFIC NAME	Priority SWAP Tier	Federal Status	State Status	USFS Sensitive Species	BLM Sensitive Species	USFWS Birds of Conservation Concern	NatureServe Global Status Rank	CNHP/NatureServe State Status Rank
Abert's Squirrel	*Sciurus abertii*	Tier 2						G5	S5
Fringed Myotis	*Myotis thysanodes*	Tier 1						G4	S3
Little Brown Bat	*Myotis lucifugus*	Tier 1	P		X	X		G3	S4
Townsend's Big-eared Bat	*Corynorhinus townsendii pallescens*	Tier 1		SC	X	X		G3G4 T3T4	S2
Hoary Bat	*Lasiurus cinereus*	Tier 2			X			G3G4	S3S4B

Table 8-REPTILES. Wildlife species observed by CNHP at Button Rock Preserve. These species are listed as SGCN in the SWAP for Colorado (CPW, 2015) and/or additionally, they receive other state or federal conservation priority designation.

COMMON NAME	SCIENTIFIC NAME	Priority SWAP Tier	Federal Status	State Status	USFS Sensitive Species	BLM Sensitive Species	USFWS Birds of Conservation Concern	NatureServe Global Status Rank	CNHP/NatureServe State Status Rank
Western Milksnake	*Lampropeltis gentilis**	Tier 2				X		G5	S5

Birds

CNHP documented 64 total bird species, 55 were documented during breeding or suspected breeding activity (Table 9). Survey efforts focused on the breeding season for most birds in the area. The number of observed species would have increased if surveys were extended through the migratory and over-wintering seasons. Coincidentally, there were 63 bird species documented by James L. Dowling in his 1976 inventory of the Ralph Price Reservoir area. All bird observations were submitted through eBird, a global citizen science program that utilizes submitted bird observations to "document bird distribution, abundance, habitat use, and trends." To date, 117 birds are listed in eBird for Button Rock Preserve based on 89 checklists dating back to 1989. CNHP documented five new species for the Preserve that had not been previously listed in eBird, those species include olive-sided flycatcher, dusky flycatcher, Eastern kingbird, blue grosbeak and horned lark. The Eastern kingbird, dusky flycatcher and olive-sided flycatcher were last observed by Kingery during his 20 years of observations of the Button Rock area (1969). CNHP's full list of documented species is in Appendix E (CNHP, 2019).

Kingery (1969) provides a valuable 20-year inventory of the birds observed in the Button Rock Preserve area both pre- and post-dam and Ralph Price Reservoir construction. CNHP documented three species, olive-sided flycatcher (migrant), dusky flycatcher (probable-breeder), and American redstart (Setophaga ruticilla, migrant), all of which according to available eBird records, have not been documented for the area since Kingery (1969).

CNHP biologists observed 5 bird SGCN at Button Rock Preserve (Table 8) (CPW, 2015; CNHP, 2019). There was a single golden eagle observation, a juvenile seen outside of the breeding season roosting atop the west-facing bluff at the mouth of Rattlesnake Gulch and the reservoir. There is an abundance of superficially suitable and prominent cliff nesting habitat for golden eagles at Button Rock Preserve including along upper and lower North St. Vrain Creek (above and below RPR) and along Rattlesnake Gulch, however, no known breeding activity has been documented by CNHP or eBird observers. Whitewashing associated with cliff nesting bird activity was observed in rock outcrop/cliff locations, the south-facing side of Button Rock Mountain (USFS property) and the inaccessible, west-facing cliff midway up Rattlesnake Gulch within the Preserve. There are a variety of birds other than golden eagles that use cliffs/rock outcrops for nesting including raven, rock pigeon, and peregrine falcon. The species associated with these nests were not observed, therefore further monitoring is recommended. Additionally, a flyover of two bald eagles (Haliaetus leucocephalus) was observed outside of the breeding season, but no known breeding activity has been documented by the CNHP or eBird observers. It appears that based on CNHP observations and those of eBird contributors, both eagles are occasional visitors to the Preserve, using it as a temporary stopover and for possible foraging activities.

Lazuli buntings (*Paserina amoena*) are a Tier 2 neotropical migratory species and were commonly observed during the breeding season by CNHP. These birds are of regional concern in the Southern Rocky Mountains Bird Conservation Region due in part to their declining population trend (Partners in Flight, 2019 as in CNHP, 2019), though their population appears to have stabilized in Colorado over the last two decades (Wickersham 2016 as in CNHP, 2019).

Virginia's warbler (*Leiothlypis virginiae*) is a Tier 2 neotropical migratory species that was only occasionally observed by the CNHP in patches of sloped ponderosa pine woodlands with a brushy understory often in close association with drainages and broad, upper gulches. Breeding success of Virginia warblers can be severely impacted by the presence of the brood parasites brown-headed cowbird (*Molothrus ater*), but fortunately only one pair of cowbirds was observed on Preserve during breeding season.

Olive-sided flycatcher (*Contopus cooperi*) is a Tier 2 neotropical migratory species that is of regional concern in the Southern Rocky Mountains Bird Conservation Region due in part to their declining population trend (Partners in Flight 2019). A single male was observed on May 30, 2019 by CNHP, a newly recorded species for the Preserve. The male was singing from atop a juniper tree in the open ponderosa pine/juniper woodland on the eastern edge of the 'borrow area' meadow in close proximity to the two terrace ponds and wetlands. A video recording was made of the distinct song, "quick, THREE BEERS!" to verify the record. This individual could not be relocated in subsequent June surveys. Because breeding activity typically occurs after June 1 for this species in Colorado (Wickersham, 2016 as in CNHP, 2019), this individual was most likely still migrating.

Table 9.[1] Birds observed by CNHP during breeding bird surveys and other field visits occurring outside of breeding season. In Appendix E, CNHP lists birds documented on eBird through citizen scientist observations (2019).

B = Breeding, B? = Possible Breeding, NB = Non-breeding

COMMON NAME	SCIENTIFIC NAME	OBSERV. STATUS
Canada Goose	*Branta canadensis*	B
Wild Turkey	*Meleagris gallopavo*	B
Broad-tailed Hummingbird	*Selasphorus platycerus*	B
Spotted Sandpiper	*Actitis macularius*	NB
Double-crested Cormorant	*Nannopterum auritus*	NB
Great Blue Heron	*Ardea herodiash*	NB
Turkey Vulture	*Cathartes aura*	NB
Red-tailed Hawk	*Buteo jamaicensis*	NB
Belted Kingfisher	*Megaceryle alcyon*	NB
Hairy Woodpecker	*Dryobates villosus*	B
Northern Flicker	*Colaptes auratus*	B
Olive-sided Flycatcher	*Contopus cooperi*	B?
Cordilleran Flycatcher	*Empidonax occidentalis*	B
Dusky Flycatcher	*Epidonax oberholseri*	B
Western Kingbird	*Tyrannus verticalis*	NB
Eastern Kingbird	*Tyrannus tyrannus*	NB
Plumbeous Vireo	*Vireo plumbeus*	B
Warbling Vireo	*Vireo gilvus*	B
Steller's Jay	*Cyanocitta stelleri*	NB
Woodhouse's Scrub-jay	*Aphelocoma woodhouseii*	B?
Black-billed Magpie	*Pica hudsonia*	NB
American Crow	*Corvus brachyrhynchos*	NB
Common Raven	*Corvus corvax*	NB
Black-capped Chickadee	*Poecile atricapillus*	B
Mountain Chickadee	*Poecile gambeli*	B
Horned Lark	*Eremophila alpestris*	B
Violet-green Swallow	*Tachycineta thalassina*	B
White-breasted Nuthatch	*Sitta carolinensis*	B
Red-breasted Nuthatch	*Sitta canadensis*	B
Pygmy Nuthatch	*Sitta pygmaea*	B
Brown Creeper	*Certhia americana*	B
Blue-gray Gnatcatcher	*Polioptila caerulea*	NB

COMMON NAME	SCIENTIFIC NAME	OBSERV. STATUS
Rock Wren	*Salpinctes obsoletus*	B
House Wren	*Troglodytes aedon*	B
American Dipper	*Cinclus mexicanus*	B
Townsend's Solitaire	*Myadetes townsendii*	B
American Robin	*Turdus migratorius*	B
Cedar Waxwing	*Bombycilla cedrorum*	B
Red Crossbill	*Loxia curvirostra*	B
Lesser Goldfinch	*Spinus psaltria*	B
American Goldfinch	*Spinus tristis*	B
Chipping Sparrow	*Spizella passerina*	B
Lark Sparrow	*Chondestes grammacus*	B
Dark-eyed Junco	*Junco hyemalis*	B
Vesper Sparrow	*Pooecetes gramineus*	B
Song Sparrow	*Melospiza melodia*	B
Spotted Towhee	*Pipilo maculatus*	B
Brown-headed Cowbird	*Molothrus ater*	B
Virginia's Warbler	*Leiothlypis virginiae*	B
MacGillivray's Warbler	*Geothylpis tolmiei*	B
Yellow Warbler	*Setophaga petechia*	B
Yellow-rumped Warbler	*Setophaga coronata*	B
American Redstart	*Setophaga ruticilla*	NB
Western Tanager	*Piranga ludoviciana*	B
Black-headed Grosbeak	*Pheucticus melanocephalus*	B
Blue Grosbeak	*Passerina caerulea*	B
Lazuli Bunting	*Passerina amoena*	B
Hermit Thrush	*Catharus guttatus*	B
American Kestrel	*Falco sparverius*	NB
Bald Eagle	*Haliaeetus leucocephalus*	NB
Golden Eagle	*Aquila chrysaetos*	NB
Golden-crowned Kinglet	*Regulus satrapa*	NB
Mountain Bluebird	*Sialia currucoides*	NB
Evening Grosbeak	*Coccothraustes vespertinus*	NB

[1] One additional, unique bird species observed by Holman, the Woodhouse's scrub-jay is included in Table 9 (2021).

Mammals (Not Including Bats) - CNHP

CNHP biologists observed 14 mammal species (not including bats) at Button Rock Preserve. This is not an exhaustive list of the mammals known or suspected to occur on the area (Dowling, 1976 as in CNHP, 2019), but rather, it includes the species verified by CNHP biologists (Table 10).

Over 442 trap nights with the live traps, CNHP biologists observed 3 small mammal species. The most commonly observed species was the deer mouse (*Peromyscus maniculatus*); 26 individuals were captured in multiple traps across all transects. Deer mice are habitat generalists; they are the state's most common mammal and occur in both intact high quality natural communities and highly disturbed sites (Armstrong et al., 2011 as in CNHP, 2019). Six Mexican woodrats (*Neotoma mexicana*) were captured in areas with rocky outcrops and in association with rocky stream/riparian corridors. Coincidentally, woodrat dens and latrines were observed in countless rocky outcrops and cliffs area-wide (Figure 26). A single long-tailed vole (*Microtus longicaudus*) was captured in the shrubby riparian vegetation of Rattlesnake Gulch.

With the use of wildlife cameras and opportunistic observations, the most notable small mammal documented by CNHP biologists at Button Rock Preserve was the Abert's squirrel, a ponderosa pine forest/woodland indicator (Armstrong et al., 2011 as in CNHP, 2019). They were the only non-bat SWAP Tier 2 mammal species observed by CNHP biologists in 2019 (Table 8). Abert's squirrels rely on ponderosa pine for food (e.g., seeds, twigs, inner bark) and nesting and are considered "important agents of natural selection" in ponderosa pine communities (Armstrong et al. 2011, p.151 as in CNHP, 2019). Abert's squirrels were documented via opportunistic visual observation of the area, especially in the older growth ponderosa pine stands south of North St. Vrain Creek (Figure 27).

Wildlife camera photos affirmed Dowling's (1976) observations that the 'borrow area' meadow and the associated terrace ponds are important elk and mule deer (*Odocoileus hemionus*) habitat in the late winter and early spring (use may extend throughout the entire fall and winter but CNHP field surveys were limited to between March and October). Elk leave Button Rock Preserve for higher elevation summer habitat, but camera observations revealed mule deer use, particularly of does and fawns, throughout the summer and into early fall. In 2022, watershed rangers observed moose for the first time. This species has been gradually increasing in Boulder County from an introduced population expanding in northern Colorado from animals imported from Wyoming in the 1970s and 1980s. They especially prefer to forage on native willows in riparian habitats.

Other camera-based observations were related to the large carnivores occurring on the Preserve. Black bears were documented on three cameras; a single adult at the large pond in the 'borrow area' meadow, a sow and her cub south of the Button Rock Dam, and another adult bear just north of what remains of Chimney Rock Dam (Figure 28). A yearling bear was observed on two consecutive days by CNHP biologist near Longmont Reservoir. A single mountain lion was photographed on multiple occasions using the area north of Chimney Rock Dam (Figure 28). Half of the eight cameras captured off-trail human use. In particular, the camera placed just north of Chimney Rock Dam was an especially popular area for off-trail exploration with at least 34 different individuals recorded.

Table 10. Mammals (not including bats) observed through camera recordings, photos and opportunistic visual observation (CNHP, 2019; Holman, 2021; Westview P2P STEM Program; Pryce Hadley, personal communication).

COMMON NAME	SCIENTIFIC NAME
Abert's Squirrel	*Sciurus aberti*
Eastern Fox Squirrel	*Sciurus niger*
Yellow-bellied Marmot	*Marmota flaviventris*
Colorado Chipmunk	*Tamias quadrivittatus**
Beaver	*Castor canadensis*
Black Bear	*Ursus americanus*
Bobcat	*Lynx rufus*
Mountain Lion	*Puma concolor*
Elk	*Cervis elaphus*
Moose	*Alces alces*
Mule Deer	*Odocoileus hemionus*
Striped Skunk	*Mephitis mephitis*
Nuttall's Cottontail	*Sylvilagus nuttalii*
Gray Fox	*Urocyon cinereoargenteus*
Red Fox	*Vulpes vulpes*
Coyote	*Canis latrans*
Mexican Woodrat	*Neotoma neomexicana*
Deer Mouse	*Peromyscus maniculatus*
Long-tailed Vole	*Microtus longicaudus*
Long-tailed Weasel	*Neogale frenata*

Mammals (Not Including Bats) – Holman

The minimum and maximum length of time a single camera was deployed was 90 days and 133 days, respectively. In total, there were 2,822 camera trap nights and 25,503 photos taken on 19 cameras. From the photos, 13 mammal species and 3 bird species were detected. In her report, Holman did not identify species by their scientific name which meant that in some instances it is hard to know if CNHP, who used scientific names, and Holman observed the same species, e.g. rat (Holman) vs. Mexican woodrat (CNHP). Of the 13 mammal species and 3 bird species detected by Holman's wildlife cameras, 4 mammal species and 1 bird were in addition to those observed by CNHP and include bobcat, eastern fox squirrel, gray fox, long-tailed weasel and Woodhouse's scrub-jay (Table 10).

In general, Holman's baseline data indicates that the Preserve's ecosystems are functioning well enough to support mountain lions which are large predators and a keystone species. Mountain lions were detected in three distinct locations, in areas with lower human and domestic dog recreational activity. With corridors and use areas inside the Preserve, mountain lions appear to use Button Rock Preserve as part of their overall larger territory and with a high detection of mule deer within the Preserve, prey is accessible for hunting. In the last five years, CNHP and Westview Middle School cameras have captured evidence of female mountain lions raising kittens in the Preserve; by extension it is thought the Preserve can support adult mountain lion denning and hunting habitat. Data about mountain lion populations, spatial occupancy and fecundity is still largely unknow. Wildlife cameras revealed a high capture probability for black bears and bobcats which could be indicative of a healthy population of each species but more data is needed.

Figure 26. Mexican woodrat latrine under a rock overhang (left) and adult female (right) captured during live trapping surveys.

Figure 27. Abert's squirrel (left) observed by CNHP biologists in old-growth ponderosa pine stand south of North St. Vrain Creek near Sleepy Lion Trailhead east. Feeding evidence (right), pile of pine twigs of Abert's squirrel.

Figure 28. Mountain lion and black bear captured on off-trail camera north of Chimney Rock Dam.

Mammals (Not Including Bats) – Westview P2P STEM Program

In 2022, the P2P STEM instructor met with Longmont to discuss ways that students could begin quantifying their wildlife camera findings including tallying each wildlife species recorded per camera and per a specific time period and sharing these counts with Longmont at regular intervals (Pryce Hadley, personal communication).

Bats – Acoustic Surveys

Eight species of bat were documented by the acoustical monitoring stations with a total of 25,025 recorded non-noise bat calls (Table 11). The highest call activity occurred at the mouth of Rattlesnake Gulch and the Ralph Price Reservoir, followed by both the large and small ponds located in the open 'borrow area' meadow (Figure 29). Short species profiles for each of the four SGCN observed at the Preserve follow:

Townsend's Big-eared Bat *(Corynorhinus townsendii)*

The distribution of this species in Colorado is limited to caves, rock crevices, mines and other structures that provide suitable thermal habitat for the bat's roosting and hibernating needs (Navo et al., 2018 as in CNHP, 2019). Outside of large female maternity colonies, these bats are considered solitary roosters/hibernators ranging in elevation up to 9,500 feet. Other Townsend Big-eared Bat summer occurrences were documented through acoustical monitoring.

These bats are a state Tier 1 SWAP SGCN (CPW, 2015). They are also tracked by CNHP due to their sensitivity to disturbance and because the availability of suitable roosts/hibernacula are limited across Colorado. Management is therefore recommended that protects known roosts/hibernacula from disturbance. It is suspected that other roost and hibernacula may exist on Button Rock Preserve for these bats, i.e., suitable rock crevices.

Little Brown Bat *(Myotis lucifugus)*

This bat species has been petitioned for federal listing under the Endangered Species Act, it is a Tier 1 SWAP species and it is fully tracked by CNHP. Although this species has one of the largest ranges of any bat in North America, it has experienced precipitous population declines across its eastern and midwestern range due to white-nose syndrome (WNS), a disease caused by a non-native pathogenic fungus Pseudogmnoascus destructans (Pd). WNS has not been documented in Colorado, though the fungus and the disease have spread to 35 states including four of the seven states bordering Colorado (WNS 2019). Occurrences were documented for this species through acoustical monitoring.

Hoary Bat *(Lasiurus cinereus)*

This bat is a Tier 2 SWAP species and is on CNHP's watchlist. This species is highly migratory, migrating in some instances up to 1,200 miles between summer habitat in Colorado and winter habitat outside of the state, e.g., California or Mexico. The Hoary Bat is a tree-roosting species, using the foliage of coniferous and deciduous trees. Occurrences were documented for this species through acoustical monitoring.

Fringed Myotis *(Myotis thysanodes)*

This bat is a Tier 1 SWAP species and is fully tracked by CNHP. Summer roosts of this bat most frequently occur in rock outcrops and cliffs; tree snags, caves, abandoned mines and houses are reportedly used as well, though less frequently (O'Shea et al., 2018 as in CNHP, 2019). Winter hibernacula are not well-described for this species in Colorado but it is suggested that they likely overwinter in rock crevices and fissures (Neubaum et al., 2006 as in CNHP, 2019). Occurrences were documented for this species through acoustical monitoring.

Table 11. Bat species recorded at each sampling location where acoustic detectors were deployed across Button Rock Preserve for 15 nights. Includes the total number of non-noise call files recorded for each location.

COMMON NAME	SCIENTIFIC NAME	RATTLESNAKE GULCH	LARGE POND	SMALL POND	SMALL STREAM
Townsend's Big-eared Bats°	*Corynorhinus townsendii*	X	X		
Big Brown Bat	*Eptesicus fuscus*	X	X	X	X
Hoary Bat°	*Lasiurus cinereus*	X	X	X	X
Silver-haired Bat	*Lasionycteris noctivigans*	X	X	X	X
Western Small-footed Bat	*Myotis ciliolabrum*	X	X	X	X
Long-eared Myotis	*Myotis evotis*	X		X	X
Little Brown Bat°	*Myotis lucifugus*	X	X	x	X
Fringed Myotisa°	*Myotis thysanodes*		X	X	X
TOTAL NUMBER OF NON-NOISE CALL FILES		**10,465**	**7,413**	**6,018**	**1,129**

° Denotes species is tracked as a Species of Conservation Concern by CNHP.

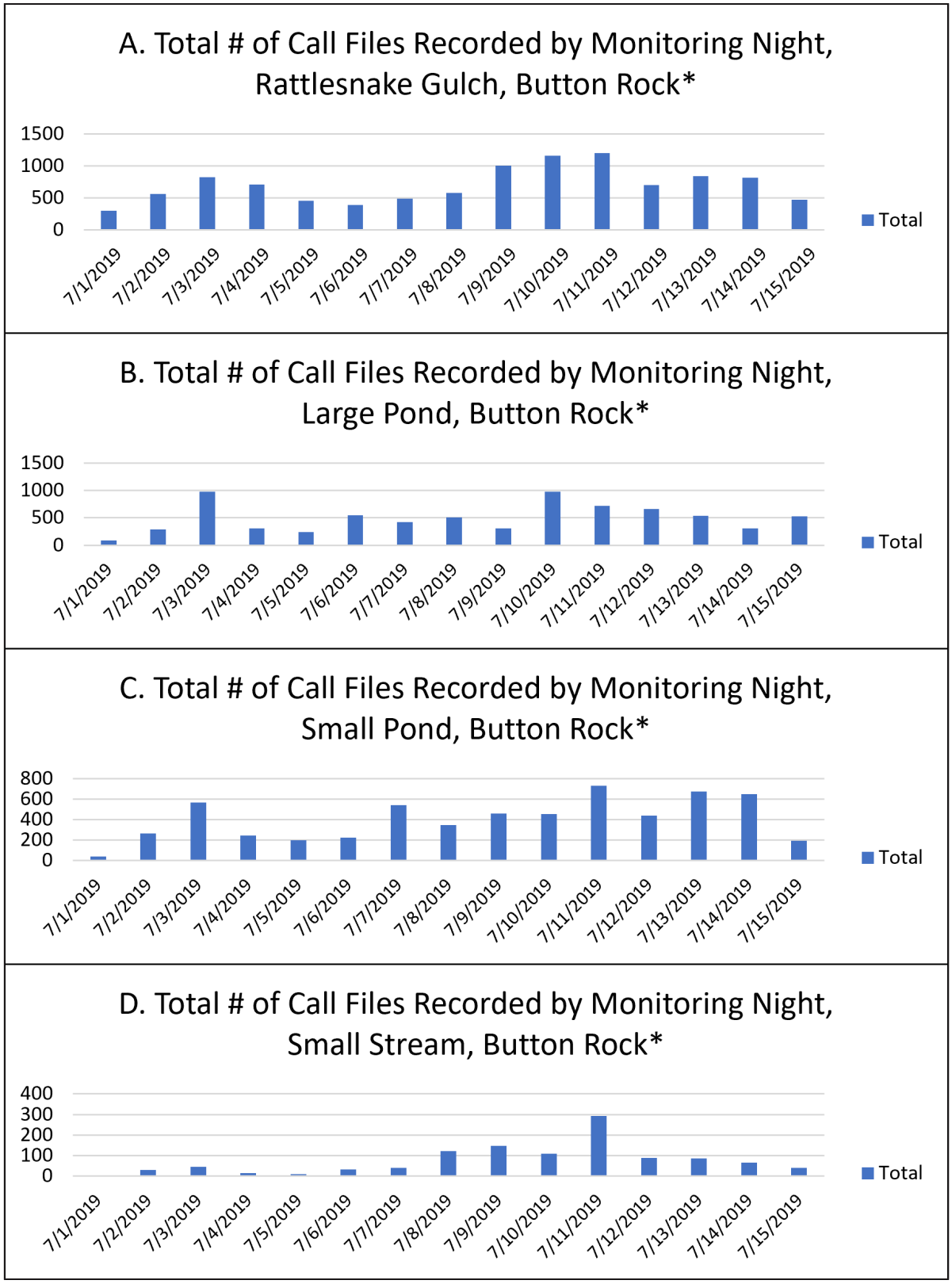


Figure 29. Bat call files recorded by Song Meter SM4BAT FS acoustic detectors at 4 Button Rock Preserve sampling locations.
**The counts represent call files that received an identification from the SonoBat autoclassifier.*

3.3.6 HYDROLOGY

A network of creeks, rivers, reservoirs, lakes and groundwater is known as a watershed. The section of the North St. Vrain Creek and its tributary drainage basins within Button Rock Preserve are part of the North St. Vrain Creek watershed, which in turn is part of the greater St. Vrain Creek watershed which ultimately drains into the South Platte River (Figure 55). The North St. Vrain Creek watershed's nested system of creeks, tributaries and reservoirs have adjacent drainage basins that channel rain and snowmelt, which flows over rocks, soils or impervious surfaces and may pick up pollutants that affect watershed health (CU Boulder, 2020). The science of hydrology is studying the movement and distribution of water systems at various scales (USGS, 2022). At Button Rock Preserve, this means characterizing and assessing the Preserve's stream channels, drainage areas and sources of point and non-point source pollution.

Button Rock Preserve houses Longmont largest source water supply. The physical, chemical and biological properties of the water flowing through the Preserve's reservoirs and creeks can be affected by weather, substrate and land use which can ultimately impact watershed health and water quality. The North St. Vrain creek watershed is a relatively pristine and high-quality source water supply for Longmont. Direct impacts from water contaminants that may get into the Preserve's source water, e.g., those introduced by human or dog water contact or dog waste are mitigated with filtration and treatment in Longmont's Nelson-Flanders water treatment plant (WTP) or its Wade Gaddis WTP. However, to sustain its high-quality source water supply at Button Rock Preserve, Longmont needs to be proactive and continually evaluate its management practices, eliminate natural and human-made threats, educate the public and plan for emerging issues that could threaten Button Rock Preserve's source water supply.

METHODS – WATER QUALITY

Longmont's Water Quality Lab (LWQL) has been monitoring the reservoirs and streams of the greater Longmont area since 2007 at sampling sites extending from Ralph Price Reservoir at the upstream end to the confluence of St. Vrain Creek and Boulder Creek on the downstream end. For reservoir sampling points, like the two located in Ralph Price Reservoir, the lab collects samples three times per year in May, July and September to capture seasonal reservoir turnover. In 2019, Longmont hired the Watershed Center to provide a comprehensive review of its historic water quality data for the years 2008 to 2018. The review included providing recommendations for updates or changes to Longmont's water quality sampling program as well as a statistical evaluation and discussion of potential implications of the data at various places throughout the greater Longmont area, including Button Rock Preserve (Watershed Center, 2020).

Longmont is also participating in the Watershed Center's *Adaptive Management at Scale* (AMS) effort that kicked off in 2022. For the AMS effort, the WC worked with various partners including Longmont, to set up monitoring points throughout the St. Vrain Basin. One of the long-term monitoring points, the 'Upper Ralph Price' point, is in western Button Rock Preserve upstream of the RPR inlet. Monitoring at all the WC's sites across the St. Vrain Basin aims to capture long-term data trends as well as discrete impacts. Starting in 2022, the WC began monitoring the benthic macroinvertebrate (BMI) community annually using the CDPHE Water Quality Control Division's kick sampling method. They will use Timberline Aquatics to sort and analyze the data (Deb Hummel, personal communication). LWQL will provide the chemical water data from the other three Button Rock Preserve monitoring points (Figure 30).

METHODS - HYDROLOGY

Between March and April 2019, RiverRestoration engineers surveyed the Preserve's 13 stream channels that drain into Ralph Price Reservoir (Map 8). Using the USGS StreamStats program and field work, engineers characterized drainage areas, stream channel and riparian characteristics and point source pollution locations.

RESULTS – WATER QUALITY

The Watershed Center's 2020 report evaluated Longmont's citywide water quality monitoring program. The report evaluated 34 analytes at 30 locations for the years 2008 to 2018. Two of LWQL's 30 sampling locations reviewed in their report are in the open water of Ralph Price Reservoir in Button Rock Preserve. Specifically, they are located downstream of the WC's AMS monitoring site, 'Upper Ralph Price' and upstream of Colorado's Department of Natural Resources (DNR) site that monitors the discharge flow rate from Button Rock Dam (Figure 30) (Watershed Center, 2020 and 2022). There is a third water quality site established in 2018 and located across the road from Longmont Dam. Here LWQL samples water from the pipeline via the hatch. This 2018 point, along with the WC's 'Upper Ralph Price' point, established in 2022, was set up after the WC began its water quality analysis. Neither of these sites are included in the WC's review of Longmont's water quality data (Drew Albright, personal communication).

Drawing conclusions about specific contaminants, e.g., E. coli, dissolved metals, at specific sampling points was not the purpose of the report. Knowing this and with the caveat that the 2008 to 2018 data set is out-of-date and incomplete, in one discussion about Ralph Price Reservoir inflow data (BUTRCK-I), an increasing trend in E. coli bacteria had been seen since 2010, with higher values during warmer months and low values during cool months. This may have been due to leakage from septic systems in Allenspark or increased wildlife activity upstream of RPR. The report goes on to say that the risk at the time was low, with only 7 detects above 1 MPN/100 mL at the RPR surface (BUTRCK-T (top)) (The Watershed Center, 2020). In another discussion, the report saw a decline in summer dissolved oxygen levels at the BUTRCK-B (bottom) sampling points on RPR. A possible explanation is that oxygen-demanding organic debris washed into RPR during the 2013 flood (The Watershed Center, 2020). Most of the 2020 report data is pre-flood. Several years of data are missing from the RPR points because after the 2013 flood, Ralph Price Reservoir and LDR sustained damage and for a period of years, the LWQL was unable to reach the RPR sampling points by boat. At this time, no management decisions can be made based on this out-of-date and incomplete water quality data.

Beginning in 2022, monitoring resumed at both RPR sampling points for all three depths, i.e., top (surface), middle (2x secchi depth) and bottom and sampling at Longmont Dam 2018 point continues (Drew Albright, personal communication). Now that data is being gathered consistently at multiple sampling points in Button Rock Preserve, future trend analysis is possible. Additionally, in December 2022, LWQL, WC and St. Vrain Chapter of Trout Unlimited kicked off project planning to establish continuous water quality monitoring for temperature, conductivity and possibly other metrics near Button Rock Preserve's main parking lot. Future data could inform decision making around recreational fishing or other recreational activities at the Preserve (Deb Hummel, personal communication).

The goal of the WC's 2022 AMS framework is to assess long-term watershed health in the entire St. Vrain Basin. Along with BMI community and the other metrics that the WC will look at with the 'Upstream Ralph Price' sampling point, they will also utilize the LWQL's chemical water quality data from its three current sampling sites within the Preserve (described above). The BMI data will not have direct implications for the North St. Vrain Creek section running through the Preserve or its recreational fisheries. If any issues exist in RPR or further downstream in the Preserve, they will show up in LWQL's data. AMS framework monitoring results will start becoming available in winter, 2023 with some focused results. Then, every three to five years, the WC will do a full-scale analysis of all the data.

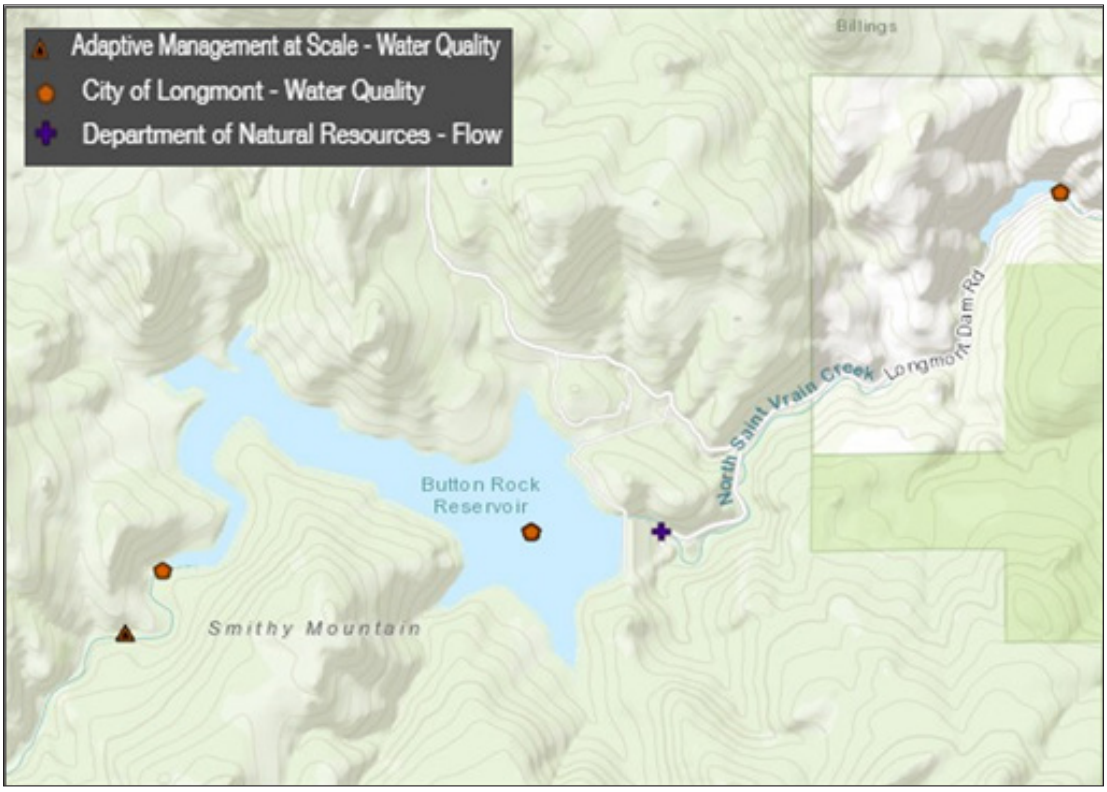
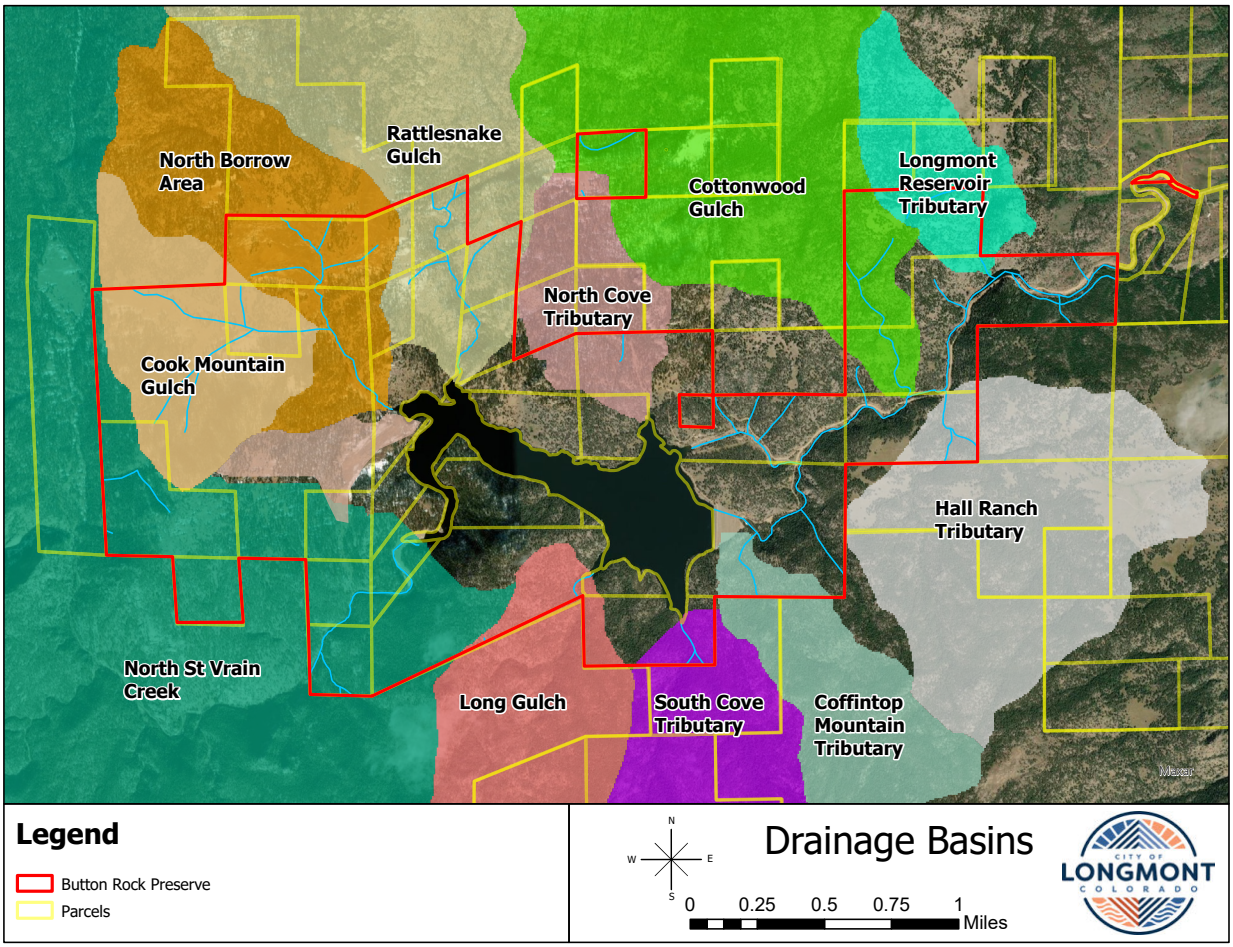


Figure 30. Map excerpt from Adaptive Management at Scale showing Watershed Center, Longmont and DNR water quality and flow discharge sampling points upstream of the Preserve, in Ralph Price Reservoir, below Button Rock Dam and the downstream end of Longmont Reservoir (Watershed Center, 2022).

RESULTS - HYDROLOGY

Overall, RiverRestoration found Preserve stream channels to be generally stable and unlikely to be contributing significant quantities of sediment to Ralph Price Reservoir, except during high flow events. The exceptions to this are North St. Vrain Creek upstream of the reservoir and the hillsides of the South Borrow Area drainage basin. These areas likely contribute sediment to the reservoir more frequently (RiverRestoration, 2019). Several culvert crossings may be undersized, contributing to erosion and sediment transport during high flow event. Basins with a higher density of public use through roads and trails have a greater potential for impacts to water quality from things like road/trail erosion, water contact, and dog waste (RiverRestoration, 2019).

In their *Drainage Basin Assessment Report* (2019), RiverRestoration engineers describe North St. Vrain Creek as two separate areas; 'Upstream North St. Vrain Creek' is upstream of Ralph Price Reservoir and 'Downstream North St. Vrain Creek' is downstream of the reservoir. Below are RiverRestoration's summary descriptions of Button Rock Preserve's drainage basins.



Map 8. Button Rock Preserve includes parts of 13 drainage basins draining to Ralph Price Reservoir (Appendix A).

Coffintop Mountain tributary

The Coffintop Mountain tributary channel follows the Sleepy Lion Trail for approximately the first 0.3 miles from its confluence near the base of Button Rock Dam. The tributary's calculated drainage area is 0.5 square miles with elevations ranging from 6,200 feet at the outlet to a maximum of 8,030 feet. Stream length is 1.6 miles, with 0.3 miles within Preserve boundaries. The 100-year peak flow rate is estimated to 81.7 cubic feet per second (cfs).

The stream channel width ranges from two to six feet and channel substrate ranges between relatively fine material up to small boulder size. There are pool sections, gravel bed riffles, boulder gardens, bedrock cascades, and dense in-channel vegetation including aspens and other trees. The banks and floodplain are vegetated with willows and other shrubs, grasses, and large trees. Where the trail follows the stream, gravel and sand material have eroded from the trail and deposited into the streambed and onto the overbanks (Figure 31). While there are several locally eroding banks along the channel, the erosion is not widespread or systemic. However, the gravel trail surface material may be a significant source of sediment to the stream system and may impact the creek function and ecology of the reaches.

Figure 31. Sand and gravel deposits in channel from adjacent road/trail (Photo CT6, RiverRestoration, 2019).

Cook Mountain Gulch tributary

The Cook Mountain Gulch tributary enters the Preserve from the west and outlets into the North Borrow Area tributary approximately 0.4 miles upstream of Ralph Price Reservoir. The calculated drainage area is 0.6 square miles, with an outlet elevation of 6,582 feet and a maximum elevation of 7,620 feet. The stream length is 1.3 miles, of which 0.8 miles is located in the Preserve. The tributary's estimated 100-year peak flow rate is 162 cfs.

The drainage basin encompasses forested hillslopes, a more open, relatively flat valley bottom, and a small ephemeral channel. Stream channel width varies significantly from one to eight feet with side slopes ranging from near vertical within incised reaches to very shallow, when the streambed is near the adjacent grade. There are two earthen dams across the channel which may have been created as check dams or livestock watering ponds. The smaller of the two dams has head cuts on around the north side and downstream. It appears to be actively eroding when there is enough flow to fill the pond and spill.

The 36-inch culvert, designed to convey the stream flow under the Johnny Park Access Road near its confluence with the North Borrow Area tributary, was partially blocked at the time of assessment. Downstream of the culvert, erosion and head cutting were apparent. This culvert backed up and overtopped the road during the 2013 flood event causing significant erosion of the downstream access road adjacent to the North Borrow Area tributary (Jamie Freel, personal communication). The culvert may need to be resized, reset and/or cleaned to prevent future overtopping risk and damage to the road downstream.

Figure 32. Typical channel section with dense grasses on streambanks (Photo CMG07, RiverRestoration, 2019).

Most of the stream channel appears stable with dense grasses on streambanks and willows and large trees in the channel and on the overbanks (Figure 32). Due to the mild channel slopes, small catchment area, channel size, dense vegetation, and two small sediment trapping dam impoundments, this drainage likely does not transport a significant amount of fine sediment into the reservoir other than at the highest flows. There is no evidence of widespread erosion or deposition.

Cottonwood Gulch tributary

The Cottonwood Gulch tributary's confluence with North St. Vrain Creek is downstream and east of Ralph Price Reservoir; it ties in from the north and just upstream of Chimney Rock Dam. The calculated drainage area is 2 square miles, with an outlet elevation of 6,131 feet and a maximum elevation of 8,380 feet. The 100-year peak flow rate estimate is 444 cfs. The stream length is 2.9 miles, with 0.7 miles found in the Preserve, and two distinct sub-reaches. On average, channel width ranges between one and four feet.

The channel in the upper sub-reach is shallow, flowing through a sparsely forested valley bottom with a mild bed slope and more gradual side slopes (Figure 33). Channel substrate ranges from fine sands up to large cobble with periodic boulder rock fall and bedrock. The lower sub-reach has a distinctly steep bed slope, a deep channel, and steep side slopes. The grade is controlled in areas by large boulders and periodic granitic bedrock outcrops. These controls form what can be characterized as a step-pool morphology (Figure 34).

The Preserve reach of the small Cottonwood Gulch stream appears stable with no visible signs of bank erosion or vertical incision. The sand and gravel deposits at the bottom of the reach may be mobilized into North St. Vrain Creek at high flows, but it does not appear to occur enough to affect water quality or ecological function outside of localized influences. The access road following the stream is likely not impacting the stream function or ecology of the lower reach as there is an adequate buffer between the road and the stream and it appears to experience infrequent use.

Figure 33. Typical upstream channel section, narrow with dense grass covered channel form (Photo CG01, RiverRestoration, 2019).

Figure 34. Typical downstream channel section near confluence with North St. Vrain Creek (Photo CG04, RiverRestoration, 2019).

Downstream (lower) North St. Vrain Creek

The Downstream (lower) North St. Vrain Creek area begins at the plunge pool on the east side of Ralph Price Reservoir and continues downstream approximately 1.8 miles to the eastern Preserve boundary near the main parking lot. The channel can be characterized as step-pool with periodic bedrock outcrops, natural and man-made boulder grade controls and intermittent pool-riffle sequence. The channel is intermittently confined by Fire Road 1/LDR occupying a portion of the valley bottom along the entire length of the creek. The calculated drainage area is 107 square miles, with an outlet elevation of 5,977 feet and a maximum elevation of 14,300 feet. The measured stream length within the drainage basin is 25.3 miles, of which 2.2 miles falls within the Preserve downstream of Ralph Price Reservoir. The estimated 100-yr peak discharge at the eastern Preserve boundary is 5,818 cfs.

The creek passes around the side of partially constructed Chimney Rock Dam, constructed with decomposed granite aggregate from the nearby 'Borrow Area' in the Cottonwood Gulch tributary reach. Further downstream, North St. Vrain Creek flows into Longmont Reservoir and over the face of Longmont Dam, also concrete. Longmont Reservoir was completely filled with sediment

Figure 35. Concrete box culvert under road and Chimney Rock Dam (Photo DSSV08, RiverRestoration, 2019).

in the 2013 flood event. There are several possible influences on water quality of the Downstream North St. Vrain Creek reach. First, conditions in Ralph Price Reservoir could allow entrapped contaminants to be passed downstream from the outlet works. Second, the decomposing Chimney Rock Dam could be a source of pollutants (Figure 35). Finally, Longmont Dam Road is used by pedestrians, dogs, City staff vehicles, and neighbor vehicles. Generally, impacts from vehicle operations, swimming, fishing, dog access to the creek, trash, dog waste, etc., could have a detrimental impact on the creek's water quality.

Hall Ranch tributary

The Hall Ranch tributary enters Downstream North St. Vrain Creek from the south, immediately downstream of Chimney Rock Dam and east of Sleepy Lion Trail access. The channel averages between two to six feet in width, with intermittent riffles and pool sequences and relatively mild sloping streambanks. The calculated drainage area is 1.1 square miles, with an outlet elevation of 6,106 feet and a maximum elevation of 7,500 feet. The measured stream length is 1.9 miles, of which 0.3 miles are located in the Preserve. The calculated 100-year peak flow rate in the Hall Ranch tributary is estimated to be 180 cfs.

The Preserve stream reach flows through an evergreen and aspen forested valley bottom with a low, frequently accessed floodplain bench. The streambanks are largely composed of boulder with infrequent granitic bedrock outcrops, creating localized stable points within the reach. The channel substrate is primarily composed of fine material up to small boulder size. Where the banks

Figure 36. Typical channel form in upper reach (Photo HR01, RiverRestoration, 2019).

are not composed of granite boulder and bedrock, a shallow topsoil mantel stabilized by pine needles, leaf litter and roots meets the streambed at a variety of side slopes up to vertical. The banks and floodplain are primarily vegetated with shrubs, grasses, and large trees (Figure 36). In general, the stream is stable and does not appear to transport significant quantities of sediment into the Downstream North St. Vrain Creek. There is no evidence of point source or other pollution.

Long Gulch tributary

The Long Gulch tributary enters Ralph Price Reservoir from the south, on the east side of Smithy Mountain. Only a small portion of the stream near the reservoir outlet was assessed. The stream in this reach has an irregular form with some narrow, two- to four-foot-wide sections, some larger pools and some small bedrock cascades. The measured drainage area is 1.3 square miles, with a mean elevation of 7,557 feet and an outlet elevation of 6,400 feet (Ralph Price Reservoir MHWL). Approximately 0.2 miles of the stream is in the Preserve. The estimated 100-year peak flow is calculated to be 122 cfs.

There are a series of shallow pools separated by boulder and bedrock outcrop grade controls (Figure 37). Willows line the channel and banks, along with several medium-size ponderosa pines in and adjacent to the flowing water. At the reservoir inlet, significant sediment deposits below the level of reservoir, influence the stream. In the higher elevations of the stream channel, deposits are composed of sand to large cobble sized material, and approximately 50 feet downstream, deposits are generally sand size. At the time of the assessment, the small amount of flow passing through the lower sand deposits, flowed sub-grade and then daylighted in a small head-cut at the reservoir water surface. Boulder and bedrock features generally control the grade of the small stream, which appears stable. The stream adds some alluvial sediments to the reservoir, but likely a small quantity compared to other, larger drainages. There is no visual evidence of water quality impacts or pollution.

Figure 37. A shallow pool with cobble and boulder serving as grade controls (Photo LG08, RiverRestoration, 2019).

Longmont Reservoir tributary

The Longmont Reservoir tributary enters North St. Vrain Creek from the north, via Longmont Reservoir. Its stream channel ranges from one to three feet wide, with a relatively steep bed slope and sheer streambanks. The calculated drainage area is 0.3 square miles, with an outlet elevation of 6,029 feet and a maximum elevation of 7,530 feet. The measured stream length is 1.3 miles, of which 0.4 miles are located in the Preserve. The estimated 100-year peak flow rate is 216 cfs.

The tributary is a steep channel, flowing through a narrow valley with steep walls and granitic bedrock outcrops. The channel substrate is composed of cobble to small boulder. The steep banks and floodplain are vegetated with shrubs, grasses, and large trees (Figure 38). In the past, in the upper reaches, this drainage has been impacted by cattle grazing. Today the stream is stable and does not appear to transport significant quantities of sediment into North St. Vrain Creek. There is no visual evidence of point source or other pollution.

Figure 38. Typical pool and bedrock channel form (Photo LR01, River Restoration, 2019).

North Borrow Area tributary

The North Borrow Area tributary enters the west end of the Ralph Price Reservoir from the northwest. The entire drainage area includes the Cook Mountain Gulch tributary as well. The calculated drainage area is 1.4 square miles, with an outlet elevation of 6,400 feet (Ralph Price Reservoir MHWL) and a maximum elevation of 7,940 feet. The measured stream length is 1.9 miles, including 0.9 miles within the Preserve. The estimated 100-year peak flow rate is 285 cfs.

The portion of stream within the Preserve flows through two distinct sub-reaches. In the upper reach, several small ephemeral streams collect in a broad, grassy, sparsely treed basin. The typical channel width in this upper reach is one to four feet with side slopes varying from near vertical to very shallow where the streambed is near the adjacent grade. Streambed material appears to be largely decomposed granite and is mostly sand and finer size with some deposits of angular gravel and cobble size material. This area is one of the historic 'borrow' locations for the fill material that was used to construct the earthen Button Rock Dam (Jamie Freel, personal communication). The removal of the upper organic soil layers via clearing and soil stripping is likely the cause of the limited forest reestablishment here. Cross slope swales are graded into the basin presumably to improve drainage and manage erosion. Most the surface soils in the upland appear stable, likely due to robust grass communities, the drainage swales, and relatively gentle slopes. There are a couple of head cuts in lower areas of the upland basin near the outlets of two of the larger culverts. Effort has been made to mitigate the erosion in one of the down cut channels by installing piles of wood in the incised reach (Figure 39). There are also two ponds towards the outlet of this upland basin formed by berms across the streambed which would trap sediment and reduce downstream flow magnitude during large rain events. Fire Road 3 descends along the side slopes of this basin, then follows the streambed through the lower portion of the tributary drainage. Several culverts, which convey flows under the road in the upland area, are partially or mostly filled in with deposition and may be undersized.

In the lower reach, the stream channel is relatively straight with established vegetation, including large trees and willows in the bed and on the streambanks. During the 2013 flood event, the Cook Mountain Gulch stream, which joins the North Borrow Area tributary from the west, backed up at the culvert near the confluence and created a flow path on the west side of the road resulting in severe erosion of Fire Road 3, which has since been repaired. More recent evidence of erosion along the road was observed. Where the tributary begins to enter the influence of the reservoir, there are sand and gravel deposits. This lowermost portion of the reach is less stable than the rest of the stream channel, likely due to a combination of unconsolidated deposits, increased flow velocity downstream of a bedrock grade control, and a steep grade. The stream in this sub-reach is actively avulsing with eroding banks (Figure 40).

Figure 39. Head cutting and placed wood piles as an erosion control measure (Photo NB14, RiverRestoration, 2019).

Figure 40. Channel form and avulsion at stream outlet into Ralph Price Reservoir (Photo NB05, RiverRestoration, 2019).

There are no visible signs of point source pollution. This drainage likely does not transport a significant amount of fine sediment into the reservoir at all but the highest flows due to the mild channel slopes, channel size, dense grass and other vegetation, and two small sediment trapping dam impoundments. There was no evidence of widespread or severe erosion. The localized erosion of the channel banks just above the inlet into the reservoir does not appear to contribute a significant amount of sediment to the reservoir. It is not expected that the road crossings have a significant impact on stream water quality given their infrequent use. The trail that traverses a slope from the North Borrow Area tributary to the Rattlesnake Gulch Tributary could be a source of impacts to water quality from human use, dog waste, etc. depending on use and frequency.

North Cove tributary

The North Cove tributary enters Ralph Price Reservoir from the north near the overflow spillway. Only a small portion of the stream near the reservoir outlet was assessed. Here, the channel can generally be characterized as step-pool with boulder and granitic bedrock outcrops largely controlling the steep grade. The calculated drainage area is 0.4 square miles, with an outlet elevation of 6,400 feet (Ralph Price Reservoir MHWL) and a maximum elevation of 7,180 feet. The measured stream length is 1.2 miles, of which 0.4 miles are located within the Preserve. The estimated 100-year peak flow is 88.1 cfs.

In the accessed reach, the stream flows through a narrow valley bottom with sparse ponderosa pines, other large trees, and dense grasses. Sporadic willows populate the banks and channel bottom. The channel is relatively shallow and approximately one to three feet in width with irregular banks that vary in steepness. The channel substrate is fine material in the pools up to boulder size material and bedrock through the cascades. The channel is shallow with a steep bed slope (Figure 41). In the lowest part of the reach where the stream experiences the influence of the reservoir pool, large sand and gravel deposits were observed. It is unclear what portion of these deposits is from the 2013 flood event. Fire Road 1/LDR joins and parallels the stream for a short distance upstream of the Preserve boundary, providing a secondary source of fine sediment to the reach.

The stream channel appears stable throughout the observed reach. At the bottom of the reach, the sand and gravel deposits at and below the MHWL of the reservoir likely have a very small impact on reservoir capacity. The input of fine sediments to the reservoir that could impact water quality, but likely a very small quantity relative to other larger stream inputs to the reservoir. Fire Road 1/LDR, which follows the stream is likely not impactful to the function and ecology of the broader stream corridor as it appears infrequently used and there is generally an adequate buffer between the road and the stream. There is no evidence of point source or other pollutants in the reach.

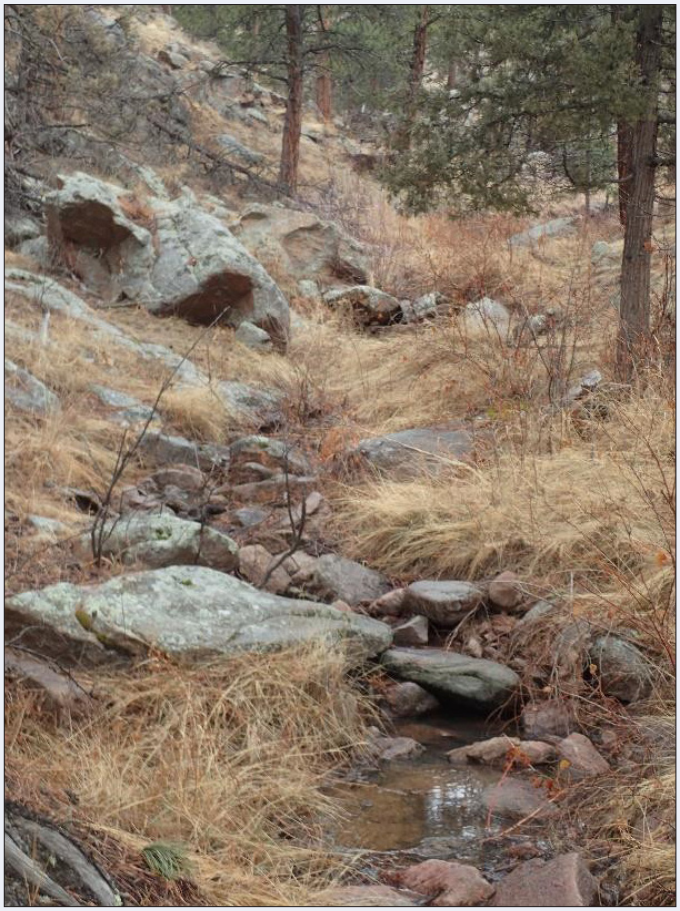


Figure 41. Typical stream channel section. Looking upstream from near reservoir outlet (Photo NC02, RiverRestoration, 2019).

Rattlesnake Gulch tributary

Rattlesnake Gulch tributary enters the Preserve from the north, crosses Fire Road 1/LDR, and outlets into the western end of Ralph Price Reservoir. The calculated drainage area is 1.9 square miles, with an outlet elevation of 6,400 feet (Ralph Price Reservoir MHWL) and a maximum elevation of 8,460 feet. The measured stream length is 2.8 miles, of which 0.9 miles are within the Preserve. The estimated 100-year peak flow rate is 273 cfs.

The stream channel ranges from two to five in width on average. The channel bed form can be characterized as step-pool with several small waterfalls and bedrock slides and a few sections of lower gradient riffles and runs with sand, gravel and cobble bed material. There are large deposits of unconsolidated sand, gravel and cobble where the stream enters the influence of the reservoir. The stream flows through a steep, narrow, forested canyon with a low frequently accessed floodplain bench. Much of the streambed and banks are composed of large boulder and granitic bedrock outcrops creating a geomorphically stable form (Figure 42). Where the banks are not composed of granite boulder and bedrock, a topsoil mantel stabilized with grasses, pine needles and leaf litter, willow and other native riparian and upland species meets the streambed at a variety of side slopes up to vertical.

There are no signs of significant incision or avulsion along the stream channel. The grade and alignment of the streambed is primarily controlled by large boulder, bedrock outcrops, and established riparian vegetation. A second smaller ephemeral stream joins Rattlesnake Gulch tributary just downstream of the road crossing. Both streams pass through culverts. The road was overtopped and washed out in the 2013 flood event. The stream appears to be a threshold type stream, likely only transporting a significant sediment load at relatively high flows. The transported bedload is made up of sand, gravel and cobble size material as evidenced in the deposits at the outlet and is largely decomposed feldsparitic granite. There is evidence of the extreme flows experienced in the 2013 flood in the form of wood and detritus deposits several feet above the current stream bed, however it does not appear that these flows caused any significant degradation of the corridor.

Figure 42. Boulder bed channel form (Photo RG07, RiverRestoration, 2019).

There are no visible signs of point source pollution. Additionally, there is no evidence of systemic or widespread erosion which could lead to compromised water quality in the reservoir in the form of suspended fine sediment. The deposition of transported material below the reservoir full pool elevation could have a small but appreciable impact on the total reservoir capacity. It is not expected that the road crossing has a significant impact on stream water quality given the infrequent use. The North Shore Trail is close to the stream near the reservoir. There could be impacts to water quality from washing, bathing, dog waste, etc. depending on the typical use and frequency.

South Borrow Area tributary

In the western Preserve, an unforested hillslope drains directly into Ralph Price Reservoir. The contributing area to this rilling and gullying was a "borrow" location for Button Rock Dam (the other "borrow" area is in the North Borrow Area). The drainage includes some forested slopes which drain onto the unvegetated highwater line marking the operating pool of the reservoir. A portion of the drainage has an outlet in the North Borrow Area tributary, while the remainder drains directly off of the barren slope above the reservoir. The calculated drainage area is 0.1 square miles, with an outlet elevation of 6,400 feet (Ralph Price Reservoir MHWL) and a maximum elevation of 7,500 feet. The measured stream length is 0.7 miles, and the entire drainage is within the Preserve.

This basin is steeper than the North Borrow Area and does not have any of the drainage swales that were created in the North Borrow Area. Hillslope erosion in the form of rilling and gullying exists on much of this slope and continues all the way to the reservoir (Figure 43). Woody debris has been placed in one area of the hillslope adjacent to the access road in an apparent attempt to check ongoing erosion (SB05.JPG). There is also some erosion on the access road as it appears to be a distinct flow path for rainfall runoff. There is some evidence of soil destabilization from deer and elk grazing on the unforested hillslope and the reservoir sediments as well (SB08.JPG). There is also an erosional area at the head of the cut from the excavation for the dam material (see picture SB03.JPG and SB04.JPG). Generally, the surface water flow in this drainage can be considered overland flow. There are some collection points where the overland flow has created gullies but there is no well-defined channel. The estimated the 100- year peak flow rate is 38.2 cfs.

Figure 43. View of rilling through reservoir sediments from overland flow (Photo SB01, RiverRestoration, 2019).

The steep grades, lack of large vegetation, and minimal erosion control measures in the hillslopes has caused rilling, gullying, and general soil destabilization in parts of the drainage. This drainage likely contributes a small but appreciable quantity of silt, sand and gravel to the reservoir.

South Cove tributary

The South Cove tributary enters Ralph Price Reservoir from the south near Button Rock Dam. Only a small portion of the stream was assessed. The channel in the upper reach is approximately two to four feet wide, with shallow vegetated overbanks. In the lower reach, the stream is influenced by the reservoir tailwater, where significant sediment deposits below the high-water line and the surface flow disappears sub-grade for approximately 100 feet. The calculated drainage area is 0.6 square miles, with an outlet elevation of 6,400 feet (Ralph Price Reservoir MHWL) and a maximum elevation of 8,020 feet. The measured stream length is 1.3 miles, of which 0.2 miles is located in the Preserve. The estimated 100-year peak flow rate is 106 cfs.

The upper reach flows through an evergreen forested valley bottom. The channel substrate is primarily composed of coarse material up to small boulder. The banks and floodplain are vegetated with willows and other shrubs, trees and grass communities. Soils in the upland appeared thin with exposed bare mineral soil overlain by a dense layer of pine duff stabilized by grasses and roots. There are several undercut banks in the upper reach.

Figure 44. Sand deposits and incision at channel outlet into Ralph Price Reservoir (Photo SC06, RiverRestoration, 2019).

The channel appears to be stable with no sign of significant bank erosion or channel degradation. The channel form suggests a threshold type system that only mobilizes a significant portion of the bed load at relatively high flows. The stream appears to transport relatively small quantities of sand and finer sediments, during more frequent flow events, depositing them in the reservoir inlet cove (Figure 44). There is no evidence of point source or other pollution.

Upstream (upper) North St. Vrain Creek

North St. Vrain Creek is the largest stream flowing into the Preserve, supplying Ralph Price Reservoir with the greatest volume of water and sediments. Upper North St. Vrain Creek (the portion of the creek west of and upstream of the reservoir) enters the Preserve from the southwest, discharging into the reservoir in a long narrow cove. The channel's upper reach is characterized as step-pool morphology with periodic bedrock and boulder grade controls creating cascades and small waterfalls separating intermittent pool-riffle sequences. The lower reach is characterized by significant deposits of sand, gravel, cobble and boulder as well as large rafts of woody debris and other detritus, deposited during the 2013 flood event. Today, the lower channel reach is actively incising and migrating through the depositional region, transporting deposited material further into the reservoir.

The calculated drainage area is 94.8 square miles, with an outlet elevation of 6,400 feet (Ralph Price Reservoir MHWL) and a maximum elevation of 14,300 feet. The measured stream length is 21 miles, with 0.9 miles found within the Preserve. The estimated 100-year peak flow rate from North St Vrain Creek discharging into the reservoir is 7,472 cfs.

Upper North St. Vrain Creek was heavily impacted by the 2013 flood. By one estimate, peak flood flow response was estimated at 10,591 cfs at the outlet of the creek into the reservoir, which is greater than a 200-year flow (Schram et al., 2014 as in River Restoration, 2019). Estimates of the total erosion within the watershed upstream of the reservoir are greater than 500,000 cubic meters from channel and hillslope erosion. More than half of the eroded sediment was deposited in the delta and reservoir inlet resulting in the equivalent of 100 years of sedimentation and approximately two percent total lost storage capacity. Post-flood remobilization of sediments resulted in an additional approximately 100 years of reservoir sedimentation (Rathburn et al. 2017). North St. Vrain Creek is continuing to adjust to the new sediment and morphologic conditions.

Figure 45. Cobble deposits and staining from localized source, possibly from acid rock drainage (Photo USSV12, RiverRestoration, 2019).

Within the upper portion of the stream reach, there are intermittent cobble deposits, and it appears that much of the gravel and finer materials transport through the reach. There are large ponderosa pines on the banks and the small floodplain bench. About halfway along the creek, there is a weir used to control flow for a gaging station. There is no longer an active gaging station here and the structure is degrading with exposed rebar and compromised concrete along its top. Much of this damage occurred during the 2013 flood event.

Immediately below this structure, alluvial deposits from the 2013 flood begin to appear and continue downstream. Upstream deposits are a matrix of material sizes from large boulder down to sand. Downstream, deposits become finer and finer as the bed load and suspended load deposit as a result of the reservoir controlling the tailwater of the creek. The channel is incising and migrating laterally as it mobilizes the deposited sediments. These sediments continue to transport further into the inlet of the reservoir. The seasonal variability in the reservoir water surface elevation creates hydraulic conditions conducive to increased transport at low reservoir water surface elevations. There is evidence of some point source pollutants in exposed sediments of the flood deposits (Figure 45). The observed staining may be from acid rock drainage (ARD) and the oxidization of sulfide minerals.

3.4 Cultural Resources

3.4.1 LAND ACKNOWLEDGEMENT

We acknowledge that Longmont sits on the traditional territory of the Cheyenne, Arapaho, Ute and other indigenous peoples. We honor the history and the living and spiritual connection that the first peoples have with this land. It is our commitment to face the injustices that happened when the land was taken, and to educate our communities, ourselves, and our children to ensure that these injustices do not happen again.[1]

3.4.2 OVERVIEW

Relevant archaeological literature was reviewed and compiled into a brief human history of Colorado and the Front Range from the time of Paleo-Indians, to federally recognized Native American tribes, to the pioneers, traders, homesteaders and ranchers that lived in and around Button Rock Preserve before City of Longmont purchased the parcels that comprise the present-day Preserve. Between 2019 and 2021, while collecting other baseline data in the Preserve, DHM Design staff opportunistically documented cultural artifacts observed on the ground surface, e.g., homesteading structural remnants and a headstone memorial. Findings were not evaluated by an archaeologist nor did they adhere to any specific cultural resources survey standards, they can be considered only qualitative. However, now that these sites have been mapped and described, this allows Longmont to plan ahead, implementing protective measures before disturbances such as forestry mitigation, road work, or utility work take place.

3.4.3 PALEO-INDIAN PERIOD (12,000-6,500 BC)

People were living in present-day Colorado by 12,000 BC, but it is also possible that people were in this region earlier (Bamforth, 2016; Black, 2017). Discoveries of artifacts, such as spear points and late ice-age Columbian mammoth bones have been linked to the nomadic Clovis cultures, including the Dent site in present-day Greeley, Colorado and various tool caches including the Mahaffy cache in present-day Boulder, Colorado (Bamforth, 2016; Black, 2017) as well as the Folsom culture, such as the Lindenmeier Folsom Site in Larimer County, Colorado (Figure 46) (Cassells, 1997; La Belle, 2016). Later Paleo-Indian hunter and gatherer groups, between 10,800 to 9,700 BC, are subdivided by spear point types, e.g., Folsom in the plains and mountains, and a variety of others. These early Paleo-Indians hunted bison, deer, elk and other animals. They used creeks to follow game to higher elevations during the summer and when the snow came, they followed the creeks down to the foothills (CO Encyclopedia, 2022). By 7,000 BC and after, people throughout Colorado began making new styles of spear points and utilizing new kinds of hunting, marking the end of this period (Bamforth, 2016).

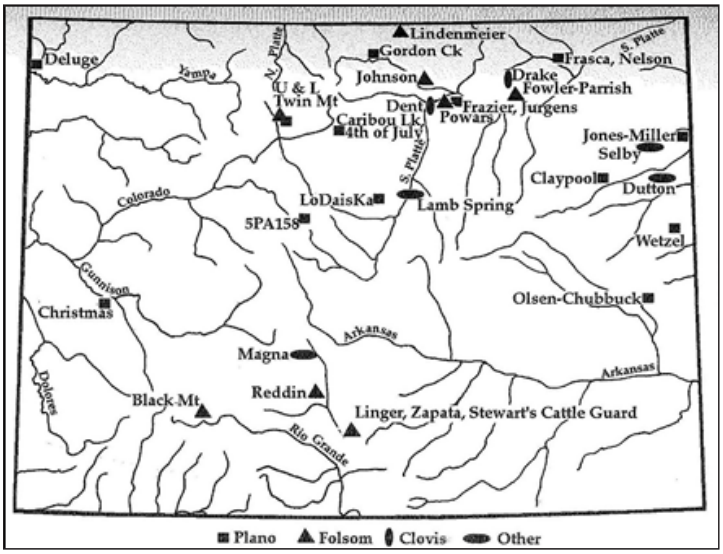


Figure 46. Principal Paleo-Indian Sites in Colorado (Cassells, 1997).

[1] This is City of Longmont's Land Acknowledgement Statement. It was recommended for adoption by Longmont's Museum and Sustainability Boards in June 2021 and adopted by Longmont City Council on July 13, 2021.

3.4.4 ARCHAIC PERIOD (6500 BC-AD 200)

Most and possibly all Archaic populations descended from preceding Paleo-Indian cultures. Technologies employed by the Archaic cultures in Colorado varied only slightly from Paleo-Indian forms with artifacts consisting of bone, antler, horn, wood as well as stone for the spear tips, which were slightly smaller in size than Paleo-Indian forms (Black, 2017). By this period, the large bison (Bison antiquus), the mammoth, and other Ice Age fauna were extinct (Black, 2017; Cassells, 1997). Herd hunting of bison endured during this period, more so in the subalpine and alpine of Colorado's Front Range (Figure 47) and evidence of small mammal hunting, plant foraging and grinding tools began to appear. Late in the Archaic period, the transition to farming spread from the southwest to Colorado between about 400-350 BC which led to a very different era, the Formative period (Black, 2017).

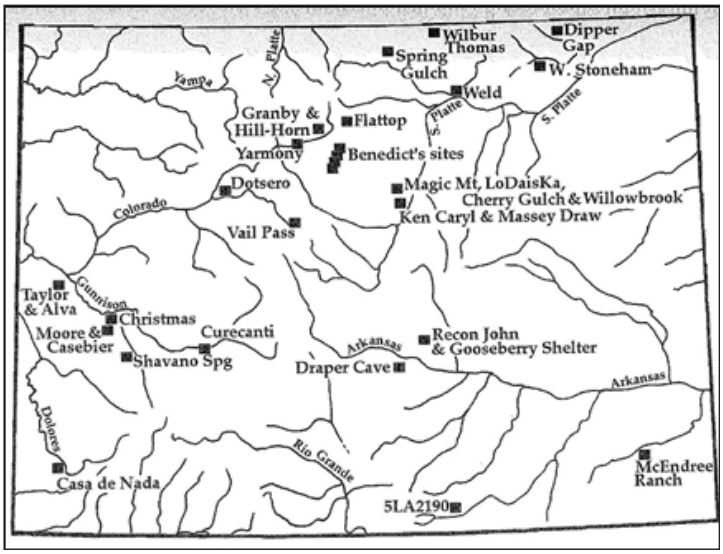


Figure 47. Selected Archaic sites in Colorado (Cassells, 1997).

3.4.5 FORMATIVE PERIOD (AD 200-1500)

Agriculture, focusing on corn, beans, and squash, was not reliable on the plains of Colorado so plains people such as the Fremont and Plains Woodland people continued to practice hunting and gathering while indigenous mountain residents never farmed but did partake in trading (Black, 2017). The bow and arrow came about during this period, becoming an integral part of hunting between AD 200-500 (Black, 2017). With rising populations and the frequent failure of crops, conflicts arose, food and water stores shrank and times became stressful (Black, 2017). The end of the Formative period is defined by the end of farming in Colorado between approximately AD 1400-1450. When the Spanish arrived in Colorado, the only native people they encountered were nomadic bands of Apaches, Pawnees and Utes (Black, 2017).

3.4.6 HISTORIC PERIOD (AD 1500-1900)

Button Rock Preserve sits on the ancestral lands and hunting grounds of the nomadic Tsestho'e (Cheyenne), hinono'eino' biito'owu' (Arapaho) and Núu-agha-tʉvʉ-pʉ (Ute) Nations (Figures 48, 49, 50)[1]. Other less prominent tribes, including the Comanche, Apache, Kiowa and Pawnee also passed through Colorado and Colorado's Front Range before European settlers arrived.

Figure 48. Approximate boundaries of the Arapaho Nation's territory on the Great Plains of present-day Colorado, Wyoming, Nebraska, and Kansas (Native Land Digital, 2018).

[1] Maps showing locations of Native American tribes are not exact for several reasons: 1) Indigenous land borders were not static as many tribes were nomadic, 2) Everything changed when Europeans arrived and 3) Maps of North American indigenous lands were often created much later in time and were based mainly on indigenous oral histories and colonist letters (Redish, 2022).

In the beginning of this period, the Spanish enslaved some tribes, introduced novel diseases, and forced Christianity on many. By the 1620s, the Ute Nation began trading with the Spanish, acquiring horses, which had a lasting impact on native tribes and life in Colorado (Black, 2017). In the summer months, Utes followed elk and bison through montane habitats with easy access to creeks, such as present-day Button Rock Preserve, and into high mountain parks, such as Allenspark. In cold months, valley bottoms became important wintering grounds, with cottonwood twigs and roots providing food for horses. By the early 1800s, the Ute found their hunting and wintering grounds contested by the Arapaho. And in the early 1800s, the Cheyenne, another equestrian tribe of bison hunters originally from the Great Lakes region, joined the Arapaho and formed an alliance against the Ute for the rights to hunting and wintering grounds and access to the French and Anglo fur trade networks along the Colorado Front Range (CO Encyclopedia, 2022). According to Ivan Wallin, a member of the St. Vrain Ranch Association that would later own many of the parcels that comprise present-day Button Rock Preserve, "Our valley was a favorite summer hunting ground for the Indians, the Arapahoes [sic]. In the early years of our visits in the valley we found specimens of their artifacts – arrow heads, old grinding stones and bits of pottery (1963)."

The fur trade meant the Ute, Arapaho and Cheyenne were exposed to European diseases they did not have immunity to, including smallpox. Their populations were decimated. In 1851, Niwot, the leader of the Arapaho, signed the Treaty of Fort Laramie, preserving Arapaho rights to the Boulder Creek area. However, when gold was discovered, many white settlers ignored the treaty, moving into the foothills and displacing the Arapaho, Cheyenne as well as the Ute (CO Encyclopedia, 2022).

In 1861, the new Colorado Territory was established. Eventually the Arapaho and Cheyenne were forced to surrender the Front Range. Niwot's group was moved to the Sand Creek camp in Kiowa County. In 1864, Niwot was shot during the Sand Creek Massacre, an unjustified attack against the Arapaho and Cheyenne people. The southern Arapaho led by Little Raven were moved to a reservation in present-day Oklahoma (CO Encyclopedia, 2022). In the Kit Carson Treaty of 1868, the Ute Nation ceded the mineral rich Central Rocky Mountains and were moved onto a reservation on Colorado's western slope (Figure 51) (CO Encyclopedia, 2022).

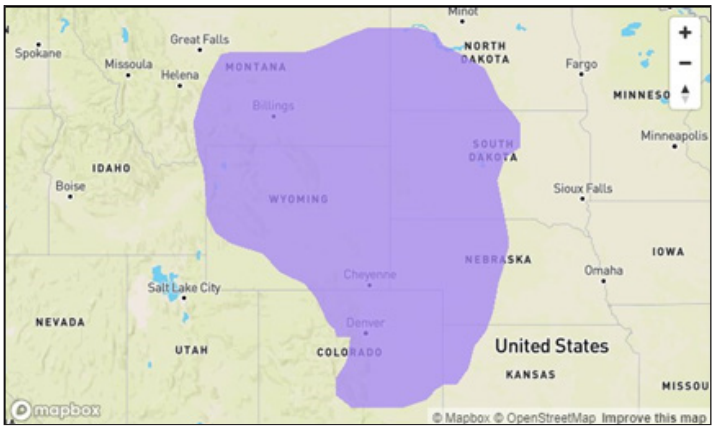


Figure 49. Approximate boundaries of traditional Cheyenne Nation lands in Colorado, Wyoming, Montana, South Dakota, Nebraska, and Kansas (Native Land Digital, 2018).

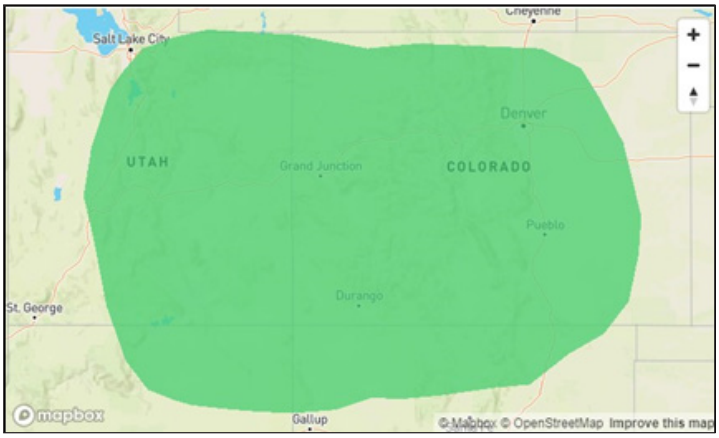


Figure 50. Approximate boundaries of traditional Ute Nation lands in Colorado, Utah, Arizona, and New Mexico.

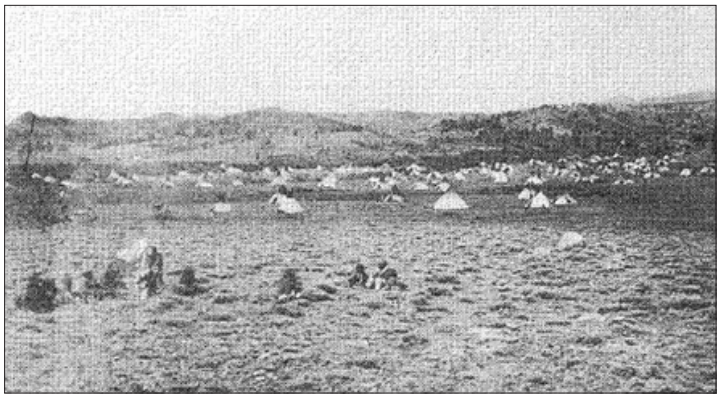


Figure 51. A Ute encampment at the first Los Piños Agency in 1874, as photographed by W.H. Jackson (Colorado Historical Society) (Cassells, 1997).

3.4.7 RECENT HISTORY

LONGMONT AND THE ST. VRAIN VALLEY

Together the gold rush and the Homestead Act of 1862 attracted many settlers to Colorado. News of gold, limestone, coal, and granite brought many settlers and frontier towns such as Boulder City (Boulder), Caribou, Gold Hill, and Nederland, began to form. The small town of Longmont was founded in 1871.

The first pioneers to take up homestead in the North St. Vrain valley were Mr. Bickerdike and a Mr. Smitty (Wallin 1963, Weaver 1977). The first government surveyors in the area named Cook Mountain, which is in the southwest corner of the Preserve, after Aquilla Cook who lost his life on the mountain elk hunting (Wallin, 1963). Around 1880, four brothers, George, Ferdinand, Norton and Jabe Billings, traveled by covered wagon from South Dakota and settled on ranches along the North St. Vrain Creek. Norton and his wife Theresa raised a large family near the Town of Lyons. George Billings and his wife Henrietta bought the Bickerdike and Smitty homesteads and established a cattle ranch along the North Saint Vrain creek, which became known as the Billings Resort (Figure 52) (Weaver, 1977). George and Henrietta had three children and operated the ranch until 1918, as a hunting and fishing resort. In 1918, the Billings sold the property to Fred and Pearl Smith. The Smiths owned the ranch for eight years, operating it as fishing resort where a person could get lodging and meal for $0.50 each and fish for trout in North St. Vrain Creek (Wallin, 1963; Weaver, 1977). That same year, for his first visit to the Smith resort, a University of Colorado Anatomy Professor in Boulder, Dr. Ivan Wallin, was given the directions to "drive up to the Longmont dam by way of Welch's Resort on the North St. Vrain, leave [his] car at the dam and hike in over a trail some two miles up the canyon (1963)."

Around September 1927, the Smiths were forced to sell their ranch. Upon hearing this, Dr. Wallin, 15 other University of Colorado professors plus two non-faculty, organized into the St. Vrain Ranch Association and purchased approximately 715 acres along North St. Vrain Creek, extending on the western end from where the creek enters the Preserve in the southwest on to the eastern end, about half a mile downstream of where Button Rock Dam stands today. For a time, locals dubbed the Association parcels "Professors' Ranch" (Wallin, 1963). Professors' Ranch was a private fishing resort, a place where university staff and their friends and families could go to fish the creek and enjoy the natural setting (Figure 53) (Wallin, 1963).

Beginning in the early 1900s, City of Longmont began purchasing parcels in and around present-day Button Rock Preserve for water supply and storage. Over time, Longmont purchased, exchanged, or acquired by condemnation the Professors' Ranch parcels, the Longmont Reservoir parcels and the parcels needed for raw water delivery and the supply pipeline (Mason, 2022). Today, remnants of some of the early cabins and the memorial bronze plaque of Aquilla Cook are visible on the Preserve's landscape (Figure 54). Other artifacts, including arrowheads, pottery and other evidence of how Native Americans once used the Preserve and the surrounding foothills are also likely on the Preserve, but were not located during baseline data collection.

REPAIRING RELATIONSHIPS

As acknowledged at the beginning of this section, through the centuries and long before Europeans arrived, Boulder County including Button Rock Preserve, has been the ancestral homeland to many indigenous tribes. Today, 50 federally-recognized tribes have historical and traditional ties to Colorado (Black, 2017).

Longmont acknowledges this history and is working to rebuild relationships and strengthen connections with indigenous cultures through meaningful acts in and outside our community. First, Longmont has starting hosting educational student exchange opportunities and in 2022 added the Northern Arapaho exchange to this program. Second, in September 2021, Longmont created its third Sister City relationship and it's first with the sovereign tribal nation of the Northern Arapaho. Longmont is the first city in the country to do establish a Sister City relationship with a sovereign tribal nation. Finally, Longmont, along with the City of Boulder and Boulder County are collaborating on an intergovernmental agreement (IGA) outlining common best management practices (BMPs) for working with indigenous people to support their cultures and traditions on public open space lands.

Figure 52. (Left): Henrietta Billings, standing, and her three children at the Billings Resort. (Right): Henrietta Billings at the Billings Resort in 1900 (Weaver, 1977).

Figure 53. (Left): Cabins at Professors' Ranch in 1964. (Right): Professors' Ranch gathering in 1951 (Wallin, 1963).

Figure 54. (Top Left and Right): Foundational remains of historic cabins. (Bottom Left): Remains of an historic outbuilding. (Bottom Right): A piece of an old Studebaker left on the Preserve.

3.5 Water Resources

3.5.1 OVERVIEW

Button Rock Preserve's water storage capacity and supply are critical pieces of Longmont's municipal water supply system and are the primary land use at the Preserve. In order to protect and maintain this system, Longmont strives to keep the whole of Button Rock Preserve ecologically healthy and resilient. On June 26, 1990, Ralph Price Reservoir, Button Rock Dam, Longmont Reservoir, and their surrounding lands were designated a protected watershed and 'Button Rock' became 'Button Rock Preserve.' Today, Button Rock Preserve's forests, grasslands, wetlands, gulches, and rock outcrops support a diversity of native plant communities, native wildlife and critical wildlife habitat. By protecting and restoring Button Rock Preserve's natural resources, Longmont is protecting its municipal drinking water supply and it is also contributing to the ecological health and resiliency of the St. Vrain Creek watershed.

3.5.2 EARLY WATER HISTORY

> *"Before Ralph Price, [Longmont] had some very senior water rights, but they were seasonal irrigation rights, [Longmont] didn't have a lot of storage rights." -Dale Rademacher* (Rochat, 2012)

In September 2012, as Longmont observed the passing of 130 years since the installation of its first water line, the Longmont Times-Call writer Scott Rochat published an article giving a brief history of Longmont's early water projects. The article includes information from interviews with both Ken Huson, Longmont's Water Resources Manager and Dale Rademacher, Longmont's former Deputy City Manager:

> In Longmont's earliest days, people lived near St. Vrain Creek to get their water. But as the town grew, people had to keep moving farther west to get clean water. Wells were not the solution because Longmont does not have a good sand or gravel aquifer. For a time, a water wagon from Lyons supplemented the local supplies.
>
> In 1882, Longmont installed its first water line, a 6-inch pipeline that ran from just south of the Town of Lyons to the current site of Price Park. Over the next 25 years, as Longmont continued to grow and the Great Western sugar refinery began operating, it became necessary from Longmont to run a 12-inch line into town. By 1912, Longmont had a hydro-powered electrical plant and could store 500 acre-feet of water in McCall Lake (Rochat, 2012).

Longmont continued to grow and soon 500 acre-feet of water storage was not enough. In 1925, a time when Ku Klux Klan (KKK) members held the majority of seats in Longmont's City Council, Council promised water security for Longmont and began building Chimney Rock Dam just downstream of where Button Rock Dam stands today. Chimney Rock Dam was never completed due to public sentiment turning against the KKK and due to swelling costs rising from an initially estimated $85,000 to $350,000 for the project. Today, the partially built concrete dam juts partway out into North St. Vrain Creek, just as it did when construction was abandoned in 1927 (Mason, 2019).

During the Dust Bowl of the 1930s and a series of droughts in the 1950s, it became clear that securing water access for municipal supply was important and having a way to store water was essential (Rochat, 2012). In 1963, Longmont formed its Water Board to advise City Council on raw water matters and ensure a stable water supply for the growing community. In 1965, due to increasing water demands, Longmont residents approved a $7,000,000 bond measure to construct Ralph Price Reservoir and Button Rock Dam as well as a water treatment plant and a treated water storage tank.

In 1965, the City established that in addition to water storage and delivery, Button Rock Preserve would be open to passive recreational use for the benefit of its residents (Ken Huson, personal communication). Between 1967 and 1969, McCall Ellingson Consulting Engineers designed and built Ralph Price Reservoir and Button Rock Dam. The total reservoir and dam construction cost was $5,200,000.

3.5.3 WATER SUPPLY AND DELIVERY

To describe the entire profile of Longmont's municipal water supply and distribution system is beyond the scope of this Plan. These details are available on Longmont's Water Resources and Supply webpage (2022) as well as in Longmont's Draft Water Efficiency Master Plan Update (Figure 55) (CH2M, 2017). The Button Rock Preserve system components fall within Longmont's North St. Vrain Creek raw water collection system which, along with the South St. Vrain Creek system, merge into St. Vrain Creek in the Town of Lyons, Colorado (Figure 56). From Lyons, the system feeds into Longmont's water treatment plants along with area ditches that deliver raw water to irrigate Longmont's parks and greenways.

Ralph Price and Longmont Reservoirs, the North St. Vrain Creek and the North St. Vrain raw water pipeline, North Pipeline, all play a critical role in Longmont's greater water supply and delivery system as Longmont's primary raw water supply source. In 2021, the municipal supply from the St. Vrain Creek was 40% with the other 60% coming from the western slope via the CBT project (City of Longmont, 2021). These percentages vary from year-to-year based on various factors including water rights, e.g., in 2015, 63% came from the North St. Vrain and St. Vrain Creeks and 37% came from the western slope via the Colorado-Big Thompson (CBT) project (City of Longmont, 2021).

Today the North St. Vrain Creek system delivers water from Ralph Price Reservoir via a diversion point from Longmont Reservoir and eventually makes its way down to Longmont's Nelson-Flanders and Wade Gaddis WTPs. Section 3.4.4 is a description of the components of the North St. Vrain Creek raw water delivery system located within and adjacent to Button Rock Preserve, as well as components related to Button Rock Preserve's history, e.g., City of Longmont historic and current ownership in the Copeland Lake Reservoir area of RMNP.

3.5.4 NORTH ST. VRAIN CREEK BASIN

Longmont began to solve for its municipal supply and storage problem in 1911. By 1912, Longmont had constructed the first two components of its North St. Vrain Creek system, Longmont Reservoir and the North St. Vrain raw water supply line. In 1913, to supplement its municipal supply, Longmont purchased 115 acres in unincorporated Boulder County and present-day RMNP, approximately 2.9 miles northwest of Allenspark, Colorado and adjacent to RMNP's Wild Basin area. The acreage encompassed a portion of County Highway 115, a portion of North St. Vrain Creek and present-day Copeland Lake Reservoir. It also included a portion of the Copeland willow carr wetland, which, along with adjacent habitats in the immediate watershed, is a 766-acre montane wetland (CNHP, 2021).

Figure 55. City of Longmont's drinking water comes from creeks, lakes and reservoirs that are fed by snowmelt and rainfall in the St. Vrain Creek watershed and the Colorado and Fraser Rivers on the western slope delivered via the Colorado-Big Thompson project (City of Longmont, 2022).

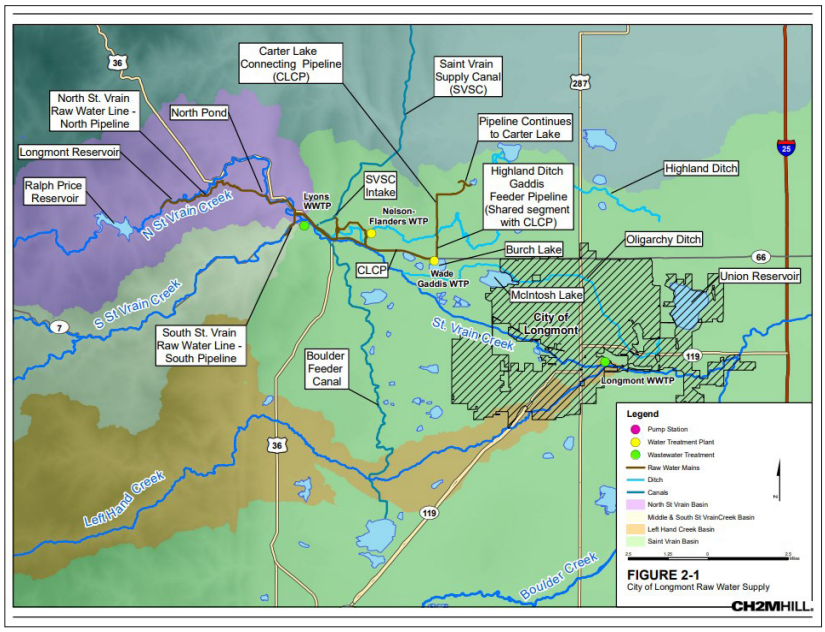


Figure 56. City of Longmont Raw Water Supply system overview including Button Rock Preserve's Ralph Price Reservoir, Longmont Reservoir, North St. Vrain Creek and North St. Vrain Raw Water Line North Pipeline (CH2M, 2017).

COPELAND LAKE RESERVOIR

In 1916, Longmont completed construction of the Copeland Lake Reservoir with a holding capacity of 75.5 acre-feet (AF) but was unable to pursue construction of a larger 1,500-AF planned reservoir in the valley bottom due to soil conditions and other environmental concerns. Initially, Longmont utilized the Copeland Lake Reservoir and allowed grazing in the willow carr and camping in the upland west of the reservoir. However, without being able to construct the larger planned reservoir, the 75.5-AF reservoir has only limited value as a backup water supply for Longmont in times of drought. It is a long distance from Longmont and a small capacity reservoir and thus, it is not considered critical to the City's water supply system.

Eventually, Longmont exchanged the 75.5-AF Copeland Lake Reservoir, along with an additional 35.4 acres used for reservoir operation, to the St. Vrain and Left Hand Water Conservancy District (SVLHWCD) for a one-half interest in the Golden Ponds storage project. Longmont retained 80.1 acres of the willow carr wetland habitat. In the 1980s, as a result of community concern about the impacts of grazing in the willow carr, Longmont discontinued grazing. Longmont also suspended camping and turned the upland area into a day use picnic area. In 1991, as visitation to the Wild Basin area of RMNP increased, Longmont and the National Park Service (NPS) entered into an agreement allowing the NPS to administer Longmont's 80-acre site under NPS access and use rules. This annually renewed agreement allows for more frequent on-site management and keeps Longmont's operational costs low (CH2M, 2017).

RALPH PRICE RESERVOIR/BUTTON ROCK DAM

Ralph Price Reservoir and Button Rock Dam construction started in 1965 and was completed in 1969 (Figures 57-59). To acquire the necessary land to build, Longmont purchased various parcels over time (Section 3.1.3). The function of the reservoir is to store water during the water storage year and release it year-round for municipal supply. An integral function of this reservoir is to provide winter water supplies and to carry-over storage from water rich years to water deficient years (City of Longmont, 2014 (a)). Ralph Price Reservoir has a storage capacity of 16,197 acre-feet and a water surface area of 222 acres.

Button Rock Dam is a zoned earthfill structure with a rock face and an internal rock drainage blanket. A gravel access road runs along the crest of the dam to allow for maintenance access. Public visitors can also cross the dam here. Longmont updates its Emergency Action Plan (EAP) on an annual basis; it outlines protocol for emergency actions and evacuations in the event of an emergency at the Preserve, such as structural concerns at the dam (City of Longmont, 2019 (b)).

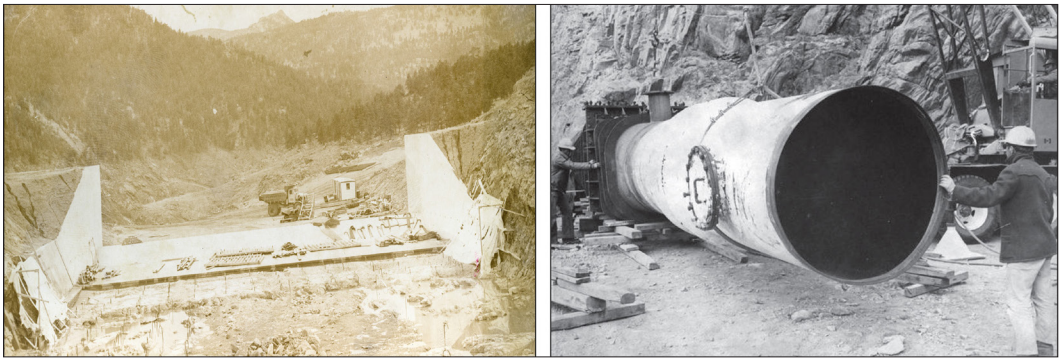


Figure 57. (Left): Button Rock Dam spillway under construction; (Right): Button Rock Dam sleeve sitting in the diversion while it was encased in concrete (Longmont Museum & Longmont Times-Call collection, 1968).

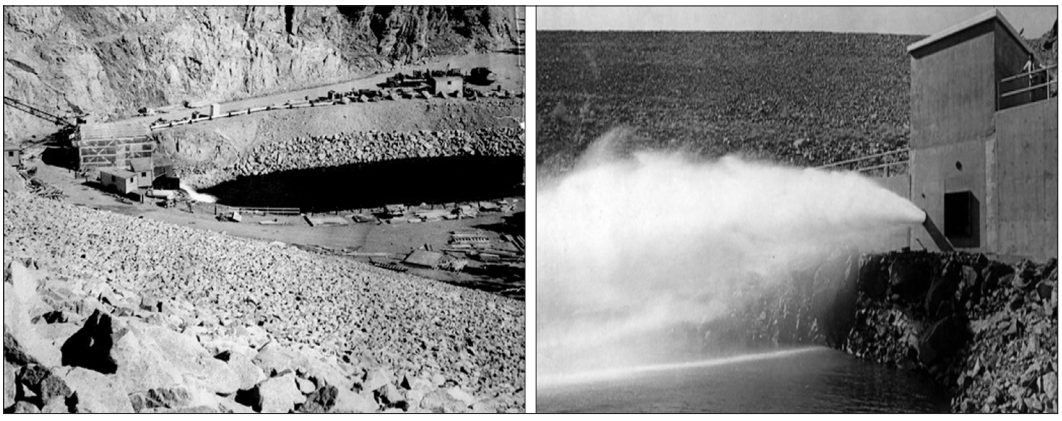


Figure 58. (Left): Button Rock Dam stilling basin and outlet works (1969); (Right): Outlet works bypass pipe, used during low water demand periods. The square opening, designed for a greater volume of water, is used during high water demand periods (1974) (Longmont Museum & Longmont Times-Call collection).

BUTTON ROCK DAM OUTLET STRUCTURE

The outlet house sits at the bottom of Button Rock Dam. It houses drainage infrastructure and monitoring equipment and its two gates control water releases from Ralph Price Reservoir into North St. Vrain Creek. Water is carried under the road through a 108-inch circular culvert, which can pass up to 875 cfs (Figure 60) (City of Longmont, 2014 (a)). When this capacity is surpassed, water can additionally flow over the concrete spillway.

BUTTON ROCK DAM OUTLET STRUCTURE

The spillway is located at the northeast end of the reservoir. Unlike the outlet structure, it is uncontrolled overflow with a crest elevation of 6,400 ft. and a 32,000 cfs capacity (Figures 61-62). It discharges into a 1,200-foot-long rock channel that drains into the North St. Vrain Creek about one half mile downstream of Button Rock Dam. During the 2013 Colorado Front Range Flood, it was estimated that the spillway passed 1/3 of this capacity (City of Longmont, 2014 (a)).

Description of the Dam

Dam Type & Dimensions

• Type of Dam:	RE
• Dam Height:	210 (feet)
• Crest Length:	925 (feet)
• Crest Width:	30 (feet)

Spillway Characteristics

• Drainage Basin Area:	63360 (acres)
• Reservoir Normal Capacity:	16197 (acre-feet)
• Emergency Spillway Type:	UCHAN
• Emergency Spillway Width:	110 (feet)
• Spillway Freeboard:	20 (feet
• Maximum Spillway Capacity:	32,500 (cfs)
• *Pass 100 year Flood?:*	Yes

Outlet Characteristics

• Size:	54"dia steel pipe (594ft) in tunnel: Outlet Gates: 54" u/s guard gate; 54" regulating gate; 12" dia jet flow valve (feet)
• Maximum Capacity:	875 (cfs)

Figure 59. Button Rock Dam Specifications (City of Longmont, 2019 (b)).

Figure 60. Exterior and interior views of the reservoir outlet house at the base of Button Rock Dam.

RALPH PRICE RESERVOIR SPILLWAY

The spillway is located at the northeast end of the reservoir. Unlike the outlet structure, it is uncontrolled overflow with a crest elevation of 6,400 ft. and a 32,000 cfs capacity (Figures 61-62). It discharges into a 1,200-foot-long rock channel that drains into the North St. Vrain Creek about one half mile downstream of Button Rock Dam. During the 2013 Colorado Front Range Flood, it was estimated that the spillway passed 1/3 of this capacity (City of Longmont, 2014).

a.	Elevation top of Training Walls	6,420.0
b.	Elevation Spillway Crest	6,400.0
c.	Width at Crest	110.0 ft.
d.	Width of Channel	110.0 ft.

Figure 61. Spillway specifications (City of Longmont, 2019 (b)).

Figure 62. Views from the top of the concrete spillway with no water flowing over it.

RALPH PRICE RESERVOIR GAGING STATIONS

The upper and lower gaging stations are located in North St. Vrain Creek at Ralph Price Reservoir. They measure the flow rate of water in the North St. Vrain Creek as it enters and exits Ralph Price Reservoir. Each station is a concrete broad-crested weir 40' wide by 4' tall with a capacity to pass 1,160 cfs (City of Longmont, 2014 (a)). During the 2013 Flood, the upper gaging station was heavily damaged and is currently not scheduled for replacement.

NORTH ST. VRAIN BY-PASS DIVERSION STRUCTURE

The by-pass diversion structure is located between Ralph Price Reservoir and Longmont Reservoir in North St. Vrain Creek, downstream of the lower gaging station. The purpose of this component is to allow water to be diverted from the creek, bypassing Longmont Reservoir when needed, e.g., during maintenance of the reservoir or dam. This concrete gravity dam was damaged during the 2013 Flood. It was repaired in 2015 following the flood. Its maximum height is five feet, with water flowing over the diversion structure when not in use or when creek flow exceeds the diversion works capacity (City of Longmont, 2014 (a)).

NORTH ST. VRAIN BY-PASS PIPELINE (24-INCH)

The function of this pipeline is to carry water the approximately 0.4-mile distance from the by-pass structure to the 30-inch North St. Vrain pipeline. This line was originally constructed in 1920 and sections of it were replace in 1966 during Button Rock Road construction. During the 2013 Flood, approximately 130 feet of the pipeline washed out.

LONGMONT RESERVOIR/DAM

Longmont Reservoir was one of the first components built in Button Rock Preserve in 1912. It is three surface acres in size and has no useable storage capacity. The reservoir and dam were constructed to provide hydraulic head, thus allowing for municipal water supply diversions (Figure 63). After the 2013 flood event, the reservoir had to be drained and massive amounts of sediment and flood debris were removed behind Longmont Dam. This effort was completed to ensure the holding capacity of the reservoir and to allow the structure to continue to divert water into Longmont's raw water system.

Figure 63. Longmont Reservoir and Dam.

NORTH ST. VRAIN PIPELINE (30-INCH)

The 30-Inch pipeline's function is to deliver water across the approximately 4-mile distance from Longmont Reservoir, through Longmont's hydroelectric plant, to the North St. Vrain sedimentation pond. This pipeline was originally constructed between 1909 and 1910 with sections replaced in 1947 and throughout the 1990s and 2000s (City of Longmont, 2014 (a)).

Other components of the North St. Vrain Creek basin system, located downstream of Button Rock Preserve include the North St. Vrain sedimentation pond (North Pond), the north pipeline (24-Inch) and the Lyons intake pipeline (6-Inch and 8-Inch).

3.5.5 COLORADO FRONT RANGE FLOOD (2013)

The 2013 Colorado Front Range Flood occurred between September 8 and 18, 2013 in north-central Colorado on the eastern side of the continental divide (Batka, 2014; Gochis et al., 2015). During this time, a late season heavy rainfall event dropped approximately 17 inches of rain, causing catastrophic flooding along Colorado's Front Range, impacting 18 counties. The sustained rainfall and flash floods caused dams to overtop or break; roads, homes, bridges and other infrastructure to wash downstream; and creeks and rivers to flow at peak rates causing erosion, sediment deposition, avulsion, large wood debris (LWD) flows and,

Figure 64. Button Rock Dam spillway (left) on Sept. 13, 2013 with near peak flows of over 10,000 cfs (CDWR, 2014). What remained of Longmont Dam Road (right) after the flood surge in the Preserve.

Figure 65. Ralph Price Reservoir (left) with log jam on Sept. 16, 2013 (CDWR, 2014). Damaged bridge culvert (right) below Longmont Dam.

in some cases, channel migration. The rain event caused the 2013 annual precipitation level to rise above 30 inches, which is the most rain recorded in 120 years of hydrological record (The Baker Team, 2014). Boulder, Larimer, and Weld Counties were among the most impacted.

Within Button Rock Preserve, residents, wildlife, roads, the water supply and various infrastructure components were seriously threatened as near peak flood flows discharged approximately 10,591 cubic feet per second (cfs) from Ralph Price Reservoir, over the Button Rock Dam emergency spillway and into North St. Vrain Creek (Figure 64) (Schram et al., 2014 as in RiverRestoration, 2019). The primary ingress/egress for the Preserve, Longmont Dam Road, was almost completely washed away between the main trailhead parking lot and the Ralph Price Reservoir spillway upstream (Figure 64). The force of the water and large woody debris (LWD) heavily impacted North St. Vrain Creek and surrounding habitat and infrastructure (Figure 65). Flood waters took out a small bridge above Button Rock Dam and moved trees and large amounts of sediment downstream where they accumulated above Longmont Dam before spilling over. Downstream of Longmont Reservoir, fast moving flows and debris continued down North St. Vrain Creek, and simultaneously down South St. Vrain Creek, to where the two tributaries converge into St. Vrain Creek in the town of Lyons, causing devasting damage. Button Rock Preserve residents and Longmont's Watershed Ranger were safely evacuated by National Guard helicopter.

According to the Association of Dam Safety Officials:

> Although the 2013 Colorado Front Range Flood was extreme, it did not rise to the level of a Probable Maximum Precipitation (PMP) event, which is on the order of 30 to 40 inches over a period of 72 hours. The maximum measured rainfall for the 2013 flood was in Boulder, Colorado at 20 inches of rain over the 10-day period. As a result, "significant hazard" and "high hazard" dams[1], including Button Rock Dam, performed as designed and did not fail (Batka, 2014).

3.5.6 FLOOD RESTORATION AND RECOVERY

Immediately following the flood, CDOT and other agencies implemented emergency stabilization measures throughout the St. Vrain Creek watershed in order to protect public safety, provide transportation up and down U.S. Highway 36 and Longmont Dam Road, repair bridges and culverts, get utilities operating, and install temporarily stabilization of roadsides and creek banks. Longmont also began recovery. After the flood, Button Rock Preserve was closed to the public through June 2015 while Longmont began debris removal and infrastructure repairs:

- Removing LWD from Ralph Price Reservoir (Longmont stockpiled the LWD in the meadow west of the reservoir, these piles are still there today)
- Repairing bridge, culvert, and spillway outlet
- Repairing Longmont Dam Road, including constructing a gabion wall below the Button Rock Dam emergency spillway, to stabilize and protect the road from future erosion
- Rebuilding the main parking lot and trailhead
- Building an ADA accessible fishing pier to replace the one lost in the flood

The next steps in the recovery and restoration process were conceptual restoration planning and implementation of long-term restoration projects.

CONCEPTUAL RESTORATION PLANNING

In June 2014, eight agency stakeholders in the St. Vrain Creek watershed, including the City of Longmont, Boulder County, the Colorado Department of Transportation (CDOT), the Colorado Water Conservation Board (CWCB), the SVLHWCD, the Town of Lyons, the Arapaho/Roosevelt USFS and the Natural Resources Conservation Service (NRCS) formed the St. Vrain Creek Coalition (SVCC). The SVCC, along with a team of six consulting firms, developed the St. Vrain Creek Master Plan (SVMP) to serve as the foundation and conceptual reference document for implementing long-term restoration along St. Vrain Creek and its tributaries (The Baker Team, 2014). Scientific data, including hydrology and hydraulics data, creek corridor ecological evaluations, risk assessments, geomorphological assessments and historic aerial photography review, is the foundation of the SVMP.

[1] **Low Hazard Dam:** A dam for which minor damage to property with no anticipated life loss is expected. **Significant Hazard Dam:** A dam for which significant property damage is expected, but no loss of life. **High Hazard Dam:** A dam for which loss of human life is expected to result from failure of the dam.

The SVMP breaks St. Vrain Creek watershed into seven reaches, describing restoration design strategies and specific restoration projects for each. The plan then makes reach-specific technical recommendations, ranks alternatives and assigns an estimated cost to each item, e.g., natural channel restoration, drainageway crossing repairs, water quality improvement, land acquisition, bank protection, etc. Button Rock Preserve is in the geologically confined upstream portion of Reach 5, which begins at Apple Valley on its downstream end and ends at Ralph Price Reservoir at its upstream end (Figure 66).

In the upstream end of Reach 5 and within Button Rock Preserve, the 2013 flood disrupted the connectivity of North St. Vrain Creek. Flooding and large debris also significantly damaged Longmont Dam Road. The ecological assessment for Reach 5 shows it to be in "fair" condition, ranking between a 5 and 7 out of 10, with the lowest scoring elements related to impacted fish and aquatic habitat (The Baker Team, 2014). The geomorphic assessment shows that the alignment of North St. Vrain Creek, which has been relatively stable over the past 60 years, is similar in terms of its pre- and post-flood conditions. In the absence of a large storm events, the channel planform will likely remain somewhat stable once streambank vegetation has re-established. However, beyond some threshold discharge, the channel planform can be expected to change due to avulsion and migration (The Baker Team, 2014).

As shown in the 2014 SVMP Reach 5 Recommendations, Maps 4 and 5 (Figures 67 and 68), the primary recommendations for Button Rock Preserve restoration are to:

1. Restore or preserve the channel banks and floodplain benches in the post-flood alignment where needed
2. Incorporate or stabilize a low flow channel section with lower width-to-depth ratio
3. Increase in-stream habitat complexity by incorporating pools, boulders, rock clusters, and large wood debris (LWD)
4. Revegetate the riparian corridor with native species where needed

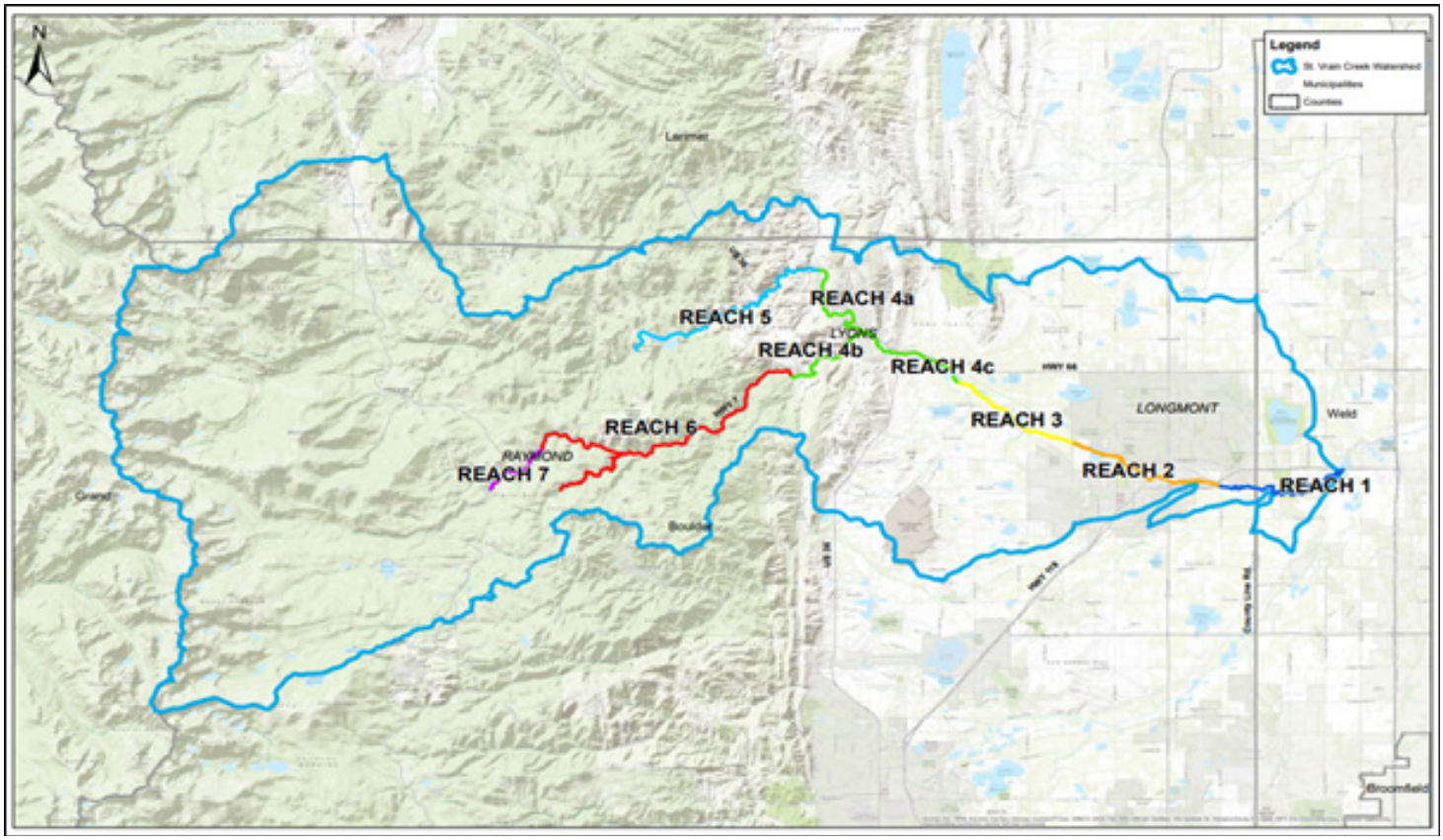


Figure 66. The St. Vrain Creek watershed is also the planning area boundaries for the St. Vrain Creek Master Plan. Within it, St. Vrain Creek and its tributaries are divided into seven reaches, with Button Rock Preserve falling within Reach 5.

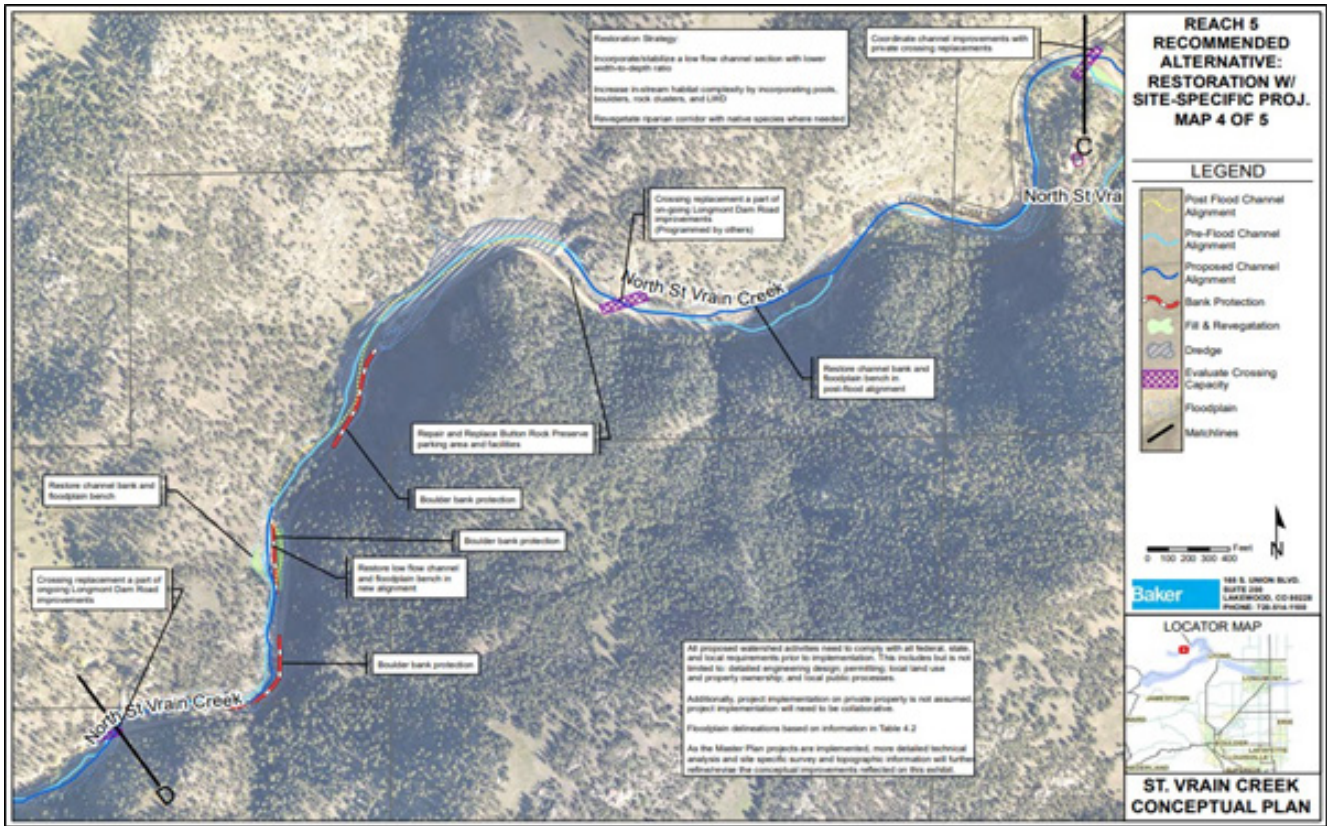


Figure 67. St. Vrain Master Plan Reach 5, Map 4. Recommended Conceptual Alternative for eastern Button Rock Preserve 2013 Flood Recovery: Restoration with site-specific projects (The Baker Team, 2014).

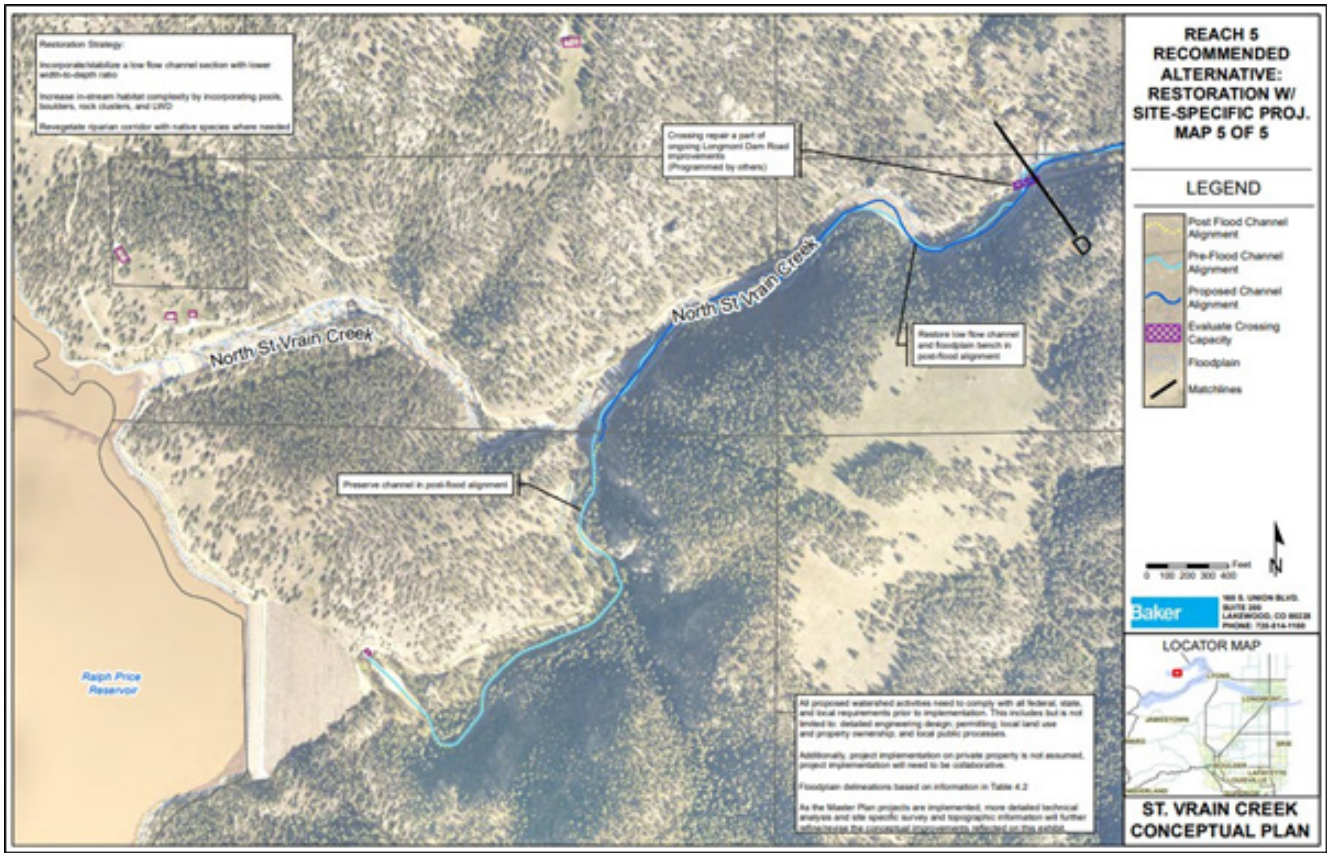


Figure 68. St. Vrain Master Plan Reach 5, Map 5. Recommended Conceptual Alternative for middle Button Rock Preserve 2013 Flood Recovery: Restoration with site-specific projects (The Baker Team, 2014).

LONG-TERM RESTORATION PROJECTS

North St. Vrain Creek Phase 1 Restoration

Phase 1 Restoration project limits were the box culvert just upstream of the main trailhead parking lot for Button Rock Preserve, continuing downstream about 1,600 linear feet. Flood impacts to this area included sand and cobble deposition within the channel and scoured out vegetation along the road. The primary recommendations of the SVMP, as listed above (Section 3.5.6, Conceptual Restoration Planning), match up with the following project goals for both Phase 1 and 2 Restoration projects:

1. Excavate and reconfigure creek benthic material to create, enhance, and protect thalweg, riffle, pool, and run habitat features.
2. Improve creek resiliency, stability, and flow diversity by placing large rock structures such as boulder vanes, single habitat boulders, and imbedded root wads.
3. Revegetate riparian areas with native species to improve terrestrial and aquatic habitat
4. Restore/preserve the channel banks and floodplain benches to in the post-flood alignment to restore/ establish bank stability

The Department of Local Affairs (DOLA) administers federal Community Development Block Grant for Disaster Recovery (CDBG-DR) through its Watershed Resilience Pilot Program. City of Longmont and Boulder County Transportation were both awarded CBDG-DR grants for this work which cost close to $270,000 (City of Longmont, 2015). Because staff coordinated Phase 1 mobilization with Longmont Dam Road repair mobilization, the total Phase 1 project cost efficiencies were estimated at 50% compared to completing a creek restoration project of this magnitude on its own (BOCO Transportation, 2016). Phase 1 design was done in fall 2015 and construction took place between March and May 2016, with in-channel restoration lasting approximately three weeks, followed by revegetation (Figures 69 and 70).

Figure 69. Phase 1: Restoration before and after: Looking upstream from main parking toward the box culvert in the distance. Left photo was taken in March, 2016, right photo of restoration was taken March, 2017.

North St. Vrain Creek Phase 2 Restoration

The Phase 2 Restoration encompasses almost 2 linear miles of creek corridor. The project limit on the upstream end is just downstream of where the Button Rock Dam spillway flows into North St. Vrain Creek and on the downstream end, the limit is just upstream of Longmont Reservoir.

During the 2013 flood, when flows traveled over the Button Rock Dam emergency spillway, they left a ¼ mile section of creek upstream of this point, undisturbed. The difference between this small undisturbed creek section and the corridor within the project limits was stark, an undisturbed reference reach vs. a devastated creek corridor in need of restoration. The flood left behind an overly wide and shallow creek channel, with few areas of suitable habitat for trout and other aquatic life. It also washed away most of the riparian vegetation in the creek corridor and deposited large amounts of debris and sediment into the creek and reservoirs.

Phase 2 design divided the approximately 2-mile creek corridor into 8 reaches, identifying the same four restoration project goals as in the Phase 1 Restoration effort downstream. With a large area to restore and limited funding, restoration efforts needed to concentrate on only the most impaired reaches while doing more basic stabilization in others. The Phase 2 design called for re-establishing a narrower channel form, re-creating natural floodplain benches to accommodate high flood flows as well as low flows. Re-seeding efforts in the riparian corridor sought to use native, ecotypic seed from Button Rock Preserve in an effort to emulate a natural recovery process as opposed to using seed from out of state than may not be as well adapted to local soil, elevation and temperature conditions at the Preserve.

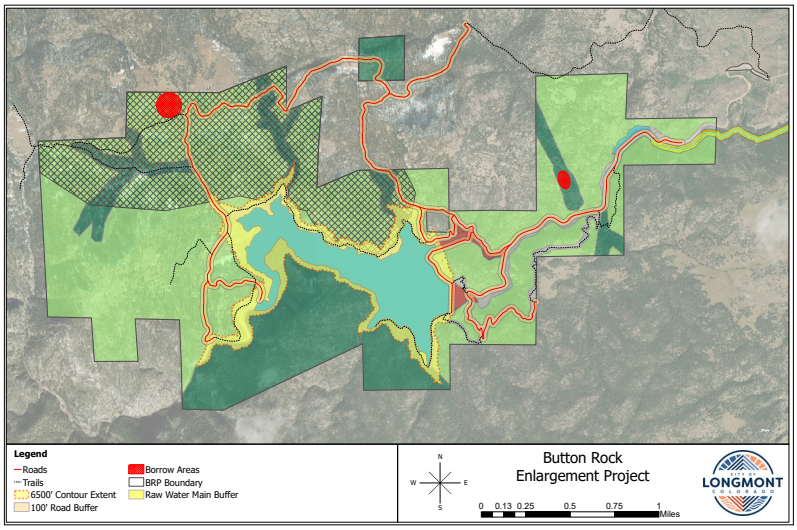
The Phase 2 Restoration funding came from multiple sources including 1) Excess DOLA CDBG-DR funding from Phase 1, 2) a Great Outdoors Colorado (GOCO) grant, 3) Fundraising and grant dollars from the local St. Vrain Chapter of Trout Unlimited, 4) a CPW Fishing is Fun Grant and 5) Surplus CWCB grant funding from a St. Vrain Creek restoration project downstream of County Line Road. Design began in 2016 and construction was completed in 2017 for a project cost close to $426,000.

Figure 70. Phase 1 restoration before and after, looking downstream. The left photo (March, 2016) shows the overly wide channel planform and a riprap slope with no vegetation. The right photo (March 2017) is one year later. Sediment deposition had been removed from the channel, the left bank is seeded with erosion control measures in place and native riparian shrubs are planted on both banks.

3.5.7 WATER NEEDS PLANNING

As Longmont continues to grow, staff continue to plan for our water future and the best ways to add additional raw water supply and storage as needed. One alternative being considered is a future enlargement of Button Rock Dam that would increase the storage capacity of Ralph Price Reservoir.

In 1987, Longmont hired Woodward-Clyde Consultants to conduct a Geologic Feasibility Study and assist the City's conceptual planning for a potential future enlargement of Ralph Price Reservoir. The study examined the feasibility of increasing the raw water storage capacity of Ralph Price Reservoir and estimated per acre foot costs associated with raising Button Rock Dam by 40, 70, 100, or 130 feet (Map 9, Appendix A). These raises would result in a dam with a corresponding crest elevation of 6,460 ft., 6,490 ft., 6,520 ft., or 6,550 ft., respectively.



Map 9. An illustration of Ralph Price Reservoir's potential future footprint (in yellow), showing a median dam crest elevation of 6,500 ft. (City of Longmont, 2022) (Appendix A).

3.6 Visitor Use

3.6.1 OVERVIEW

The Button Rock Preserve Management Plan planning process began in 2019 and continued through early 2023. With the exception of one temporary rule change and one LMC Public Lands update that previously went through a City Council approval process as well as a few changes implemented around the Ralph Price Reservoir fishing permit program, the majority of Preserve-related staff recommendations would only be enacted after Plan adoption.

Visitor use-related changes that have occurred between Plan kick off and Plan acceptance include:

1. 2019: Interim Dog Visitation Policy – Button Rock Preserve (City of Longmont, 2019 (c)).
2. 2020: Increasing staff at Button Rock Preserve. External Services has hired an additional full-time watershed ranger at Button Rock Preserve, going from one to two full-time watershed rangers for the first time.
3. 2021: A change to the Ralph Price Reservoir fishing permit program. Now daily passes in addition to annual passes are available during the May 1 to October 31 fishing season.
4. 2021: A change to the RPR fishing permit program. The public can now purchase permits online.
5. 2023:A potential change to Button Rock Preserve's main trailhead parking lot hours to align with hours observed at parks and natural areas in the City of Longmont system.[1]

On February 5, 2019, City Council instituted a temporary 'one dog per person, on a leash, with a waste pick-up bag' rule at the Preserve. This temporary rule was to remain in place until the end of the Button Rock Preserve Management Plan process at which time City Council's decision(s) will direct how Longmont will move forward with dog policy at Button Rock Preserve.

Between 2020 and 2022, staff did a comprehensive review of all the LMC rules and regulations pertaining to Button Rock Preserve. Through a series of meetings, staff discussed how high visitor numbers affect Preserve natural resources, watershed ranger priorities and staffing, operations/maintenance and facilities/infrastructure and how to capture these present-day circumstances in the Button Rock Preserve code. Staff worked with the City Attorney's Office (CAO) to

[1] Although Button Rock Preserve is a protected preserve, not a park in terms of natural resources management, Longmont allows visitors at the Preserve. As such, Button Rock Preserve visitor rules and regulations should be the same (or similar) to those adhered to in the rest of Longmont's parks and natural areas system.

develop code language. Then, staff gathered public feedback about the 14 proposed LMC updates in Public Survey 4, the final public survey of the planning process.

Between 2019 and 2021, DHM Design staff collected baseline inventory data using the following methods:

1. Engaging in a series of onsite tours with watershed rangers to gather information about recreational amenities, Preserve infrastructure and priorities.
2. Inventorying the Preserve's roads and trails.
3. Working with CPW and compiling baseline recreational fisheries data and fish stocking metrics.
4. Working with Longmont staff to conduct four public surveys and review public feedback collected on Longmont's Caring for Button Rock Preserve Engage project webpage.

Between 1988 and 2017, Preserve watershed rangers kept track of annual visitors using various methods of manual counting. In 2018, rangers automated the process and began using TRAFx infrared trail and vehicle counters to record Preserve visitors and vehicles parking in the main parking lot. Between 2019 and 2022, watershed rangers used code enforcement observations recorded in patrol logs and dating back to 2017 as well as two wildlife camera studies to collect the code enforcement data presented in this Plan. In addition, in 2019 and 2021 respectively, CNHP staff and the independent large mammal researcher, Holman, incidentally captured dog regulation violations on wildlife cameras while collecting wildlife data.

The following is a summary of public survey results and watershed ranger code enforcement results. Complete public survey data, including questions, answers and written comments, is in Appendix C. Complete watershed ranger code enforcement reporting is in Appendix F. All visitor use summaries and results are in Sections 3.6.1 to 3.6.6 and management recommendations are in Chapter 4.

DHM DESIGN SUMMARY FINDINGS – PUBLIC SURVEYS

All four public surveys were qualitative in nature and are not statistically valid. The surveys provide a general sense of public opinion on various topics. The main survey questions for each of the four surveys were posed in multiple formats including 'yes and no,' 'multiple choice' and level of agreement including either 'strongly agree/ neither agree nor disagree/strongly disagree' and 'strongly agree/agree/neither agree nor disagree/disagree/strongly disagree.' Written comments were an important part of each survey, capturing nuances in public opinions that cannot be expressed in multiple-choice questions (Appendix C).

Three out of the four public surveys asked questions about dogs. In Survey 1, most of the respondents do not bring a dog to the Preserve and in Surveys 3 and 4, questions about domestic dogs at a protected preserve were posed slightly differently, but in both surveys the majority of respondents disagreed with a no dog policy at the Preserve for the sake of protecting water and natural resources. In Surveys 2 and 3, when asked if they would still come to Button Rock Preserve if an entrance fee were charged, the majority of respondents in each survey, 60% and 55% respectively, said they would still visit. In Survey 3, when asked about riding a shuttle to help with parking congestion, the majority of people (72%) said they would not ride a shuttle. When asked about eliminating the fishing permit program, the majority of respondents (48%) disagree with eliminating the program, with 22% agreeing and 30% neither agreeing nor disagreeing.

Public Survey 1

Survey 1 was open to the public between February and August, 2019 and received 426 total responses to multiple choice questions and written comments from 195 people with some leaving multiple comments. Not all respondents responded to all questions.

- 84% of respondents are from Longmont or live within 30 miles of Longmont
- 36% of respondents visit the Preserve multiple times per year
- 76% of respondents come to hike or walk, 42% of respondents come for dog walking (multiple selections permitted)
- 45% of respondents bring dogs to the Preserve when they visit

To the question, 'why do you bring your dog to the Preserve,' there were 195 written answers, some with multiple comments. These were the most popular:

- 47 ppl, to exercise their dog
- 42 ppl, to enjoy off-leash trails
- 21 ppl, proximity to home
- 20 ppl, to let their dogs swim
- 72 ppl commented on the 2019 temporary dog rule (one dog per person on a leash) with 59 ppl approving of the rule, 13 ppl disapproving of it

Public Survey 2

Survey 2 was open to the public between September and October, 2019 and received 983 total responses to multiple choice questions.

- 36% have a Longmont zip code
- 59% are between 18 and 45 years old
- 67% bring 1 to 2 people per vehicle
- 60% said they would still visit the Preserve for a fee
- 70% are aware that the Preserve's primary use is to protect Longmont drinking water
- 82% agree with using prescribed fire for forestry management
- 81% prefer to encounter fewer than 25 people when hiking

When asked about what additional amenities they would like, more restrooms and trash cans were the two most popular answers. (The other two choices were a shelter and interpretive signage)

Public Survey 3

Survey 3 was open to the public between May and August, 2020 and received 831 total responses to multiple choice questions (Strongly Agree / Neither Agree or Disagree / Strongly Disagree) and 131 written comments.

- 74% are from Longmont
- 72% would not ride a shuttle to/from Button Rock Preserve (This survey was conducted during the first months of the COVID-19 pandemic)
- 64% disagree with a 'no dog' policy to protect drink water and Preserve natural resources
- 48% disagree with eliminating the Button Rock Preserve fishing permit and fee.
- 55% agree with charging a fee on Fri./Sat./Sun. between Memorial Day and Labor Day to help with high visitation numbers.

As a method of dispersing and limiting Preserve visitor numbers:

- 35%, weekend daily vehicle pass ($5 utility customers/$10 non-customer)
- 26%, annual pass ($65 utility customer/$150 non-customer)
- 27%, annual pass, senior or disabled ($35 utility customer/$70 non-customer)
- 12%, don't support dispersing and/or limiting visitors

131 written responses focused on dogs, hiking, charging a fee, parking or cars, trails, fishing, bikes or bicycles

Public Survey 4

Survey 4 was open to the public between February 7 and 21, 2022 and focused on proposed LMC updates and changes pertaining to Button Rock Preserve (Table 12). There were 231 total responses to multiple choice questions (Strongly Agree/Agree/Neither Agree nor Disagree/Disagree/Strongly Disagree) and 490 written comments. Not all respondents answered all questions.

The only update that the majority of the 215 respondents to that question (56%) strongly disagreed with were staff recommended changes to the Dogs and Domestic Animals code section for Button Rock Preserve (LMC 13.20.060). For the other 13 staff recommended changes/updates, the majority of people strongly agreed with them:

13.20.060:
- C. Preserve Access and Hours (47%)
- D. Fires (88%)
- E. Smoking and Marijuana (79%)
- G. Wildlife Protection (74%)
- H. Fishing Regulations (49%)
- I. Ralph Price Reservoir Fishing Permit Program (49%)
- J. Prohibited Activities on Preserve Waters (40%)
- K. Organized Sports (56%)
- L. Special Events or Activities (41%)
- M. Signs Prohibited (61%)

13.20.040 or 13.20.050
- Closures (52%)
- Hunting (82%)
- Resource Protection (45%)

A majority of respondents did not agree with the four recommended changes to Dogs and Domestic Animals. Respondents referred to the excerpt shown in Table 12 and were asked:

> *How strongly do you agree or disagree with the staff recommended changes to the Dogs and Domestic Animals section of the code?*

Respondents could only answer about all four changes at once, not separately for each of the proposed updates and they were able to leave comments (Appendix C). Of the 215 respondents that answered the question, 120 respondents (56%) strongly disagreed with the recommended changes. Other answers to the question included 11 respondents (5%) somewhat disagreed, 5 respondents (2%) were neutral, 6 respondents (3%) somewhat agreed, and 73 respondents (34%) strongly agreed (Appendix C). In Survey 3 a question about domestic dogs was asked in this way:

> *The goals of BRP are to: 1) Protect our drinking water supply, 2) Protect surrounding ecosystems including healthy forests, 3) Provide sustainable recreational opportunities. Research indicates that when humans are accompanied by dogs, both on and off trail, their area of influence (noise, scent, trash) increases significantly, impacting wildlife behavior and movement. How would you feel if a no dog policy was instituted (Strongly agree / neither agree nor disagree / Strongly disagree)?*

Of the 829 responses, 531 people (64%) disagreed, 95 respondents (11%) were neutral and 203 respondents (25%) agreed.

Table 12. This s an excerpt from the table respondents referred to when answering Public Survey 4 in February 2022. The table showed respondents the current regulation, the staff recommended update and the reason for the staff recommended update. The full table is in Appendix C.

Recommendations—Button Rock Preserve Code Updates City Municipal Code Section 13.20.060.

SECTION	CURRENT REGULATION	STAFF RECOMMENDED UPDATE	REASON FOR STAFF RECOMMENDED UPDATE
1.	Current, Temporary Rule (2019): One leashed dog per person.	Except for service animals, prohibit dogs and domestic animals at Button Rock Preserve.	The goals of Button Rock Preserve are to 1) Protect our drinking water supply, 2) Protect surrounding ecosystems including healthy, resilient forests, 3) Provide sustainable recreational opportunities. Scientific research indicates that when humans are accompanied by dogs, both on and off trail, their area of influence (noise, scent, urine, feces) increases significantly, impacting wildlife behavior and movement from ground-nesting birds to small mammals and native carnivores.
2.	Current, Temporary Rule (2019): Carry a pet waste pick up bag, pick up all pet waste.	Except for service animals, prohibit all dogs and domestic animals at Button Rock Preserve.	This use does not fit with the purpose of the Preserve.
1-A.	(Rule before 2019: Allow dogs off leash under voice control, except as posted otherwise).	Except for service animals, prohibit all dogs and domestic animals at Button Rock Preserve.	This use does not fit with the purpose of the Preserve.
2-A.	(Rule before 2019: Can leave pet waste if more than 1,000 from water).	Except for service animals, prohibit all dogs and domestic animals at Button Rock Preserve.	This use does not fit with the purpose of the Preserve. Pet waste accumulation pollutes the Preserve, especially when some do not leave pet waste 1,000 feet from the water, which is the City's majority drinking water supply; increases with high visitor numbers; and detracts from other staff duties when the highest number of ranger contacts are spend on dog violations.

WATERSHED RANGERS SUMMARY OF FINDINGS - CODE ENFORCEMENT DATA (2017-2022)[1]

- Since 2017, dog-related code violations account for the majority of watershed ranger enforcement contacts at the Preserve
- Between the second half of 2019 through 2022, after City Council's temporary Button Rock Preserve dog rule went into full effect in May 2019, the top visitor violations have been off-leash dogs and more than one dog per visitor. Other prominent violations include:
  - Entering areas posted as closed to the public
  - Bicycles on Preserve roadways or trails
  - Swimming or water contact
  - Parking violations
- Recorded dog off-leash violations decreased from 2017 to 2021 (2019 data set is missing)
- A temporary camera survey point on Sleepy Lion Trail (SLT) at the Hall Ranch Open Space/Button Rock Preserve boundary measured dog on-leash compliance:
  - 2019 (Mid-Sept. to mid-Nov.), 83% compliance
  - 2020 (Late June to early July), 88% compliance
  - Both the 2019 and 2020 survey show single digit violations of the multi-dog restriction
- A camera study with 2 survey points, one on SLT at the Hall Ranch Open Space/Button Rock Preserve boundary and the other adjacent to LDR near Longmont's drinking water intake on the North St. Vrain (Mile 0.5), measured dog on-leash compliance:
  - 2022 (Mid-May to Mid-Sept.), 81% compliance on SLT, 97% compliance on LD
- Watershed rangers began manually estimating annual visitor numbers to the Preserve in 1988. In 2018, counting was automated and rangers also began collecting vehicle count data (Table 13, Figure 71).
- In 2020, during the first year of the COVID-19 pandemic, many open spaces surrounding Button Rock Preserve were closed to the public for several months. During this time, Button Rock Preserve received heavier visitor traffic than in any previous year where counts were kept (Table 13, Figure 71).

[1] Over the years, watershed rangers kept track of visitors via manual counting. In 2018, watershed rangers began using TRAFx infrared trail and vehicle counters to count the number of annual visitors and vehicles to the Preserve.

Table 13.[2] Manual and Automated Visitor and Vehicle Counts between 1988 and 2021 at Button Rock Preserve. (2022 full-year data is flawed and is not included in this table).

YEAR	VISITORS (ANNUAL COUNT TOTAL)	VEHICLES (ANNUAL COUNT TOTAL)
1988	~3,200	-
1992	~8,750	-
1995	~11,050	-
1998	~18,000	-
2000	~13,000	-
2003	~11,200	-
2006	~15,100	-
2009	~13,800	-
2011	30,396	-
2012	31,052	-
2018	51,777	32,308
2019	49,999	32,491
2020	71,332	56,939
2021	57,608	42,699

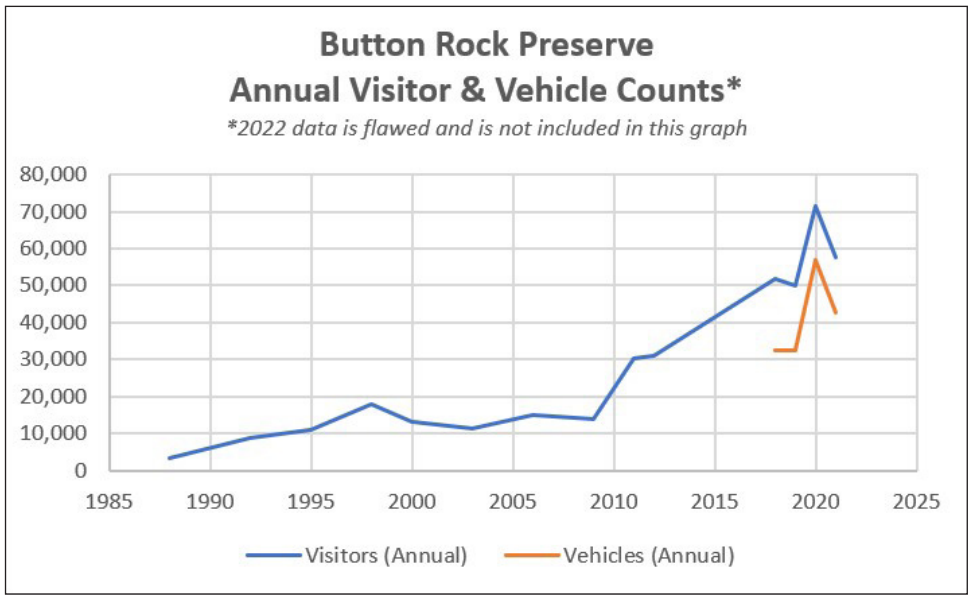


Figure 71. Graph showing the general upward trend of visitor numbers at to Button Rock Preserve over the last 33 years.

[2] Due to a counter malfunction, 2022 full-year data is flawed and is not included in this dataset.

3.6.2 VISITOR SERVICES AND INFRASTRUCTURE

The following describes Preserve operations and management as well as infrastructure associated with visitor services. (Water supply and delivery infrastructure is described in Section 3.5.3).

EMERGENCY SERVICES

Longmont's Ranger Program serves Longmont's municipal public lands system from Button Rock Preserve in the west to Union Reservoir in the east. At the Preserve, visitor accidents primarily occur on trails, near water and on rock climbing routes. Often during non-emergency visitor contacts, watershed rangers educate visitors about outdoor safety at the Preserve including locations of emergency call boxes, trail wayfinding signs and the ranger station. Preserve safety information is also included in the preserve brochure, which is available at the main trailhead kiosk in English and Spanish.

Watershed rangers coordinate emergency response with the Boulder County Sheriff's Office, Boulder County Parks and Open Space rangers and Lyons, Big Elk and Pinewood Springs Fire Protection Districts (FPDs). In 2021, in response to an increased volume of calls throughout the system, rangers enhanced their medical training standard. Now, full-time rangers maintain Emergency Medical Responder (EMR) certification and as needed for their specific job duties, they acquire additional training in areas such as search and rescue (SAR), law enforcement and wildfire response. Currently, Button Rock Preserve watershed rangers respond to wildfire calls and in coming years, they may also participate in prescribed burning efforts, e.g., pile burning or broadcasting burning associated with the Preserve's forestry program.

Due to the complex terrain of the Preserve, radio and cell phone communications are limited. In 2020, rangers installed two emergency landline callboxes, one at the base of Button Rock Dam and one on the exterior of the Ranger Station. Since then, visitors have used the callboxes to report multiple EMS and SAR incidents. Staff use the callboxes for backup communications. In 2021, a project to install a series of cell phone towers along the U.S. Highway 36 corridor between Lyons and Estes Park began. When complete, this, may expand cell coverage to a greater area of the Preserve.

In 2021, Longmont updated the communications system at the ranger station, which now allows watershed rangers to communicate directly with Longmont Emergency Communications Center (LECC). This has improved ranger ability to report emergencies and field calls from Longmont dispatch. Staff also renovated a permitted communications site on USFS property by salvaging obsolete equipment and installing modern solar panels and batteries. This site presents an opportunity to further improve radio communications in the greater Button Rock Preserve area. Rangers began working with LECC and Boulder County in 2022 to research options for retrofitting the site's existing tower with a radio repeater that would serve rangers and the Lyons Fire Protection District during emergency operations.

Watershed rangers maintain a small fleet of patrol vehicles and rescue equipment at the Preserve including an all-terrain vehicle (ATV), a utility-terrain vehicle (UTV) and a patrol boat. The primary ranger patrol truck is outfitted with a Type 7 fire skid that holds 125 gallons of water and has been used extensively on prescribed burning operations throughout Longmont.

In 2020, watershed rangers evacuated visitors from the Preserve during the Cal-Wood Fire and again in 2021, during the Kruger Rock Fire. Additionally in 2021, watershed rangers responded to 18 emergency incidents including SAR operations, medical calls and wildfire starts. In 2021 and 2022, watershed rangers successfully contained two small wildfires in the vicinity of Button Rock Preserve, there was no impact to the Preserve.

In addition to Preserve and visitor safety, watershed rangers are also responsible for the daily operation and security of the raw water system. Watershed rangers conduct routine inspections of water utility sites, support raw water delivery operations at Button Rock Dam, and assist in flood response. If a water utility emergency occurs, watershed rangers follow the Button Rock Dam EAP (City of Longmont, 2019 (b)).

WATERSHED RANGER AND FORESTRY STAFFING

For many years, watershed ranger staffing consisted of one full-time watershed ranger and caretaker for the Preserve. As time went on and Preserve visitation increased, the need to supplement the single watershed ranger with one to two seasonal rangers became more pronounced. Most recently, from 2017 until late 2019, ranger staffing consisted of one full-time watershed ranger and two seasonal rangers. Then in late 2019, both Button Rock Preserve's full-time watershed ranger as well as one seasonal ranger left City employment. Staffing then consisted of only one seasonal watershed ranger to cover all Button Rock Preserve duties.

In summer 2020, with the COVID-19 pandemic having begun in March and only a single seasonal ranger on staff, Button Rock Preserve experienced unprecedented levels of visitation. In response, Longmont added a new full-time senior watershed ranger position and by spring 2021, Longmont

had two full-time watershed rangers and one seasonal ranger staffing the Preserve. Again, in summer 2021 the Preserve experienced extremely high visitor numbers, due largely to the ongoing COVID-19 pandemic and more people seeking to recreate outdoors. Now with two full-time watershed rangers at the Preserve as well as a seasonal ranger, staff have a greater ability to focus on enforcing rules and regulations as well as collecting consistent visitor use data.

Now, as forestry stewardship becomes a bigger and more complex job at the Preserve with additional upcoming projects, more cross-jurisdictional agency collaboration with the SVFHP and with more federal, state and local grant dollars available to fund these projects, there is a need to hire a watershed forestry technician at Button Rock Preserve (Section 3.3.4, Forestry).

MAIN TRAILHEAD AND PARKING

Button Rock Preserve's main parking lot is a 650-foot long, gravel lot at the east entrance to the Preserve, downstream of Longmont Reservoir along County Road 80/LDR (Figure 72). The parking lot has space for 65 vehicles and includes four ADA-accessible parking spaces near the Preserve entrance and kiosk. Vehicles park head-in along the south edge of the lot, facing North St. Vrain Creek. There is no parking along the north side of the lot, allowing for emergency vehicle, staff and resident vehicle access to the Preserve.

There are an additional approximately 30 parking spaces in the overflow parking area located 0.9 miles east of the main trailhead parking area. Public use hours for the parking lot have recently been updated in the LMC to be between one hour before sunrise to one hour after sunset, seven days a week; are between 3:00 a.m. and 10:00 p.m., seven days a week; it is prohibited to leave a vehicle in this parking lot outside these hours (LMC, Section 13.20.090, Hours of Use). From the parking lot, visitors enter the Preserve on foot past the main entrance gate and trailhead kiosk (Figures 72 and 73). Vehicle access west of the entrance gate is only for the private residents that live along LDR west of the entrance gate as well as Longmont staff vehicles, other utility or construction vehicles and emergency vehicles.

During summer months between Memorial Day and Labor Day, which is peak visitor season at the Preserve, the parking lot and overflow parking area often fill to maximum capacity early in the day. When parking is full, some visitors park along the shoulder of LDR, which is prohibited. Rangers strictly enforce parking regulations as parking along LDR and outside designated spaces causes access issues for emergency vehicles and disturbs residents.

Figure 72. (Left): View of the Preserve's main parking lot from the east. Boulders along the south side keep visitors from pulling too far forward. Parked cars can be seen in the distance. (Right): View of the main trailhead entrance gate. Visitors enter the Preserve on foot to the left of the gate.

SIGNAGE

An informational kiosk, displaying a map of the Preserve and informational brochures, greets visitors at the main parking lot and trailhead. The permanent map takes up most of the kiosk, leaving little room to post other informational items. Rangers often use the kiosk's support beams to post information about volunteer opportunities, trail closures, and fire restrictions. Other wayfinding and rules and regulations signs are found throughout the Preserve, mainly along trails and roads and to delineate boundaries. The kiosk map and most wayfinding signs have not been updated in many years (Figures 73 and 74).

In 2022, rangers conducted a comprehensive sign inventory documenting all parking, regulatory, wayfinding, informational, and public safety signs in Button Rock Preserve. Rangers recorded over 160 signs in the Preserve. The purpose was to document the type, condition, location, and accuracy of signs in order to support future improvements, identify damaged or outdated signs, and inform design of new sign standards.

Figure 73. (Left): An informational kiosk showing a map of the Preserve is located at the west end of the main trailhead and parking area. (Right): A large rules and regulations sign and other informational signage is just inside the main trailhead gate along LDR.

Figure 74. Examples of wayfinding signs at Preserve trails and along roads.

FISHING PIER

The fishing pier is located west of the main trailhead entrance gate, along the north bank of North St. Vrain creek. The pier was built after the 2013 flood. It is ADA-accessible with a flat, eight-foot-wide crusher fine path, flanked on three sides by large boulder rip rap. On the west end of the pier, stone steps connect LDR to the pier. The pier allow visitors to get close to the water and it is designed to allow two to three anglers to utilize the pier at one time (Figure 75).

Figure 75. Button Rock Preserve's accessible fishing pier was built after the 2013 flood. It is only a short distance from the main trailhead and parking lot.

RANGER STATION AND RESIDENCE

The Button Rock Preserve ranger station is located at 5092 Longmont Dam Road and encompasses a workshop, storage sheds and a former ranger/caretaker residence that was converted into a ranger office in fall 2021. Rangers maintain the facility as an operational base for public safety, resource protection, and natural resource management.

Button Rock Preserve is home to one or more resident rangers who live on-site and act as year-round caretakers for the property and raw water utility infrastructure. From the late-1980s until 2021, the ranger station building was used as a ranger/caretaker residence. Since 2021, the ranger residence has been located on Longmont Dam Rd. west of the ranger station. The residence underwent substantial renovation from 2020 to 2021 to address asbestos, radon, water quality, and other interior and exterior issues. The residence was hardened against wildfire danger in 2022 with removal of damaged wood decks, installation of fire-resistant exterior siding, xeriscaping with a noncombustible rock buffer, and thinning of the surrounding trees to establish a defensible space. This structure now supports resident ranger operations including after-hours response to emergency call outs.

SPILLWAY BRIDGE

A metal bridge spans the Button Rock Dam spillway channel and connects Fire Road 1/LDR to the access road leading to the crest of Button Rock Dam (Figure 76). The spillway bridge was rebuilt after the 2013 flood and completed in 2017. Hikers and anglers can cross the bridge on foot and when needed Longmont staff or emergency services personnel can remove the bollard on the north side of the bridge and cross in a vehicle.

GABION WALL

During the 2013 flood, Fire Road 1 was severely damaged as sheets of water flowed through the spillway channel and road corridor, washing most of the road material into the spillway channel and then downstream into North St. Vrain Creek. The multi-tiered gabion wall was built south of Fire Road 1 and along the north side slope of the spillway channel. It is designed to armor the channel, stabilize the road and decrease erosion during future natural disasters (Figure 77).

FENCING

There are a few different types of fencing throughout the Preserve including barbed wire, smooth wire, chain link and buck and rail. The fencing found in the Preserve has various purposes. For example, fencing can be found along parts of the Preserve perimeter to delineate property boundaries and restrict livestock movement onto the Preserve from adjacent properties. For public safety, there is a chain link fence around steep drop-offs near the spillway and the control house to keep people out of potentially dangerous area. Sometimes watershed rangers or other staff and volunteers build buck and rail fencing or erect temporary smooth wire fencing to protect a resource such as a newly seeded area or close a social trail that is being restored. Depending on the project the fencing is associated with, the fencing is often temporary and will be removed when restored areas are established and in less danger of being disturbed by humans or grazed by wildlife. Buck and rail fencing can be attractive and is not hazardous to wildlife, nor is smooth wire fencing. There are sections of barbed wire fencing in multiple locations in the Preserve. In most instances, this fencing no longer serves a useful purpose and rangers periodically work with volunteer groups to remove it to improve wildlife corridors and habitat.

Figure 76. Looking south at the spillway bridge and removable bollard.

Figure 77. Looking east at the gabion wall that was constructed after the 2013 flood to prevent future erosion of Fire Road 1.

GATES

There are two locking gates located along Fire Road 1/ LDR. There is a third gate located on Fire Road 2 that allows pedestrian access to adjacent Hall Ranch. The first gate, at the main trailhead and parking lot, experiences heavy use on a daily basis (Figure 72). The second gate is located on Fire Road 1 in the western Preserve. Both gates are manual. Replacing the gate at the main trailhead with an automated gate may be an efficient solution for staff and residents that need to pass through this area multiple times per day.

TRASH AND RESTROOMS

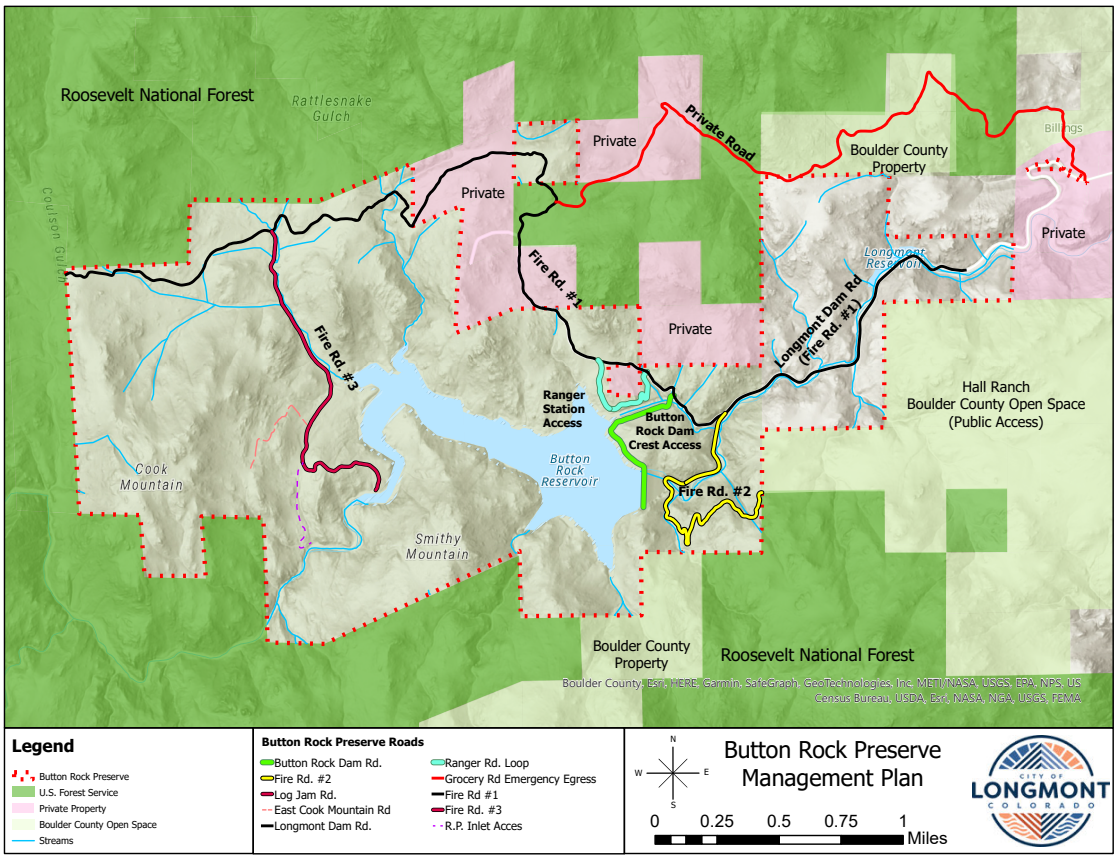
There are a number of trash receptacles throughout the eastern Preserve including at the main trailhead and at both restrooms. There are two ADA-accessible vault toilets along Fire Road 1, one close to the main trailhead entrance, the other is further west at the intersection of Fire Road 1/LDR and Fire Road 2. Both restrooms were rebuilt in 2015 after being damaged in the 2013 flood. In the second public survey, which had 983 respondents and took place in September and October of 2019, the two most popular responses to the question of 'what additional amenities would you like to see,' were more trash receptacles and more restrooms

3.6.3 ROADS AND TRAILS

ROADS

The Preserve has approximately 17 miles of road including three primary fire roads (Fire Roads 1, 2 and 3), two secondary two-track roads (North Cook and South Cook Mountain roads) and a network of maintenance and access roads (Map 10). For maintenance and patrol purposes, secondary routes provide access to the slopes of Cook Mountain and the inlet of Ralph Price Reservoir. The main access road into the Preserve is Fire Road 1/Longmont Dam Road, which is a regularly maintained gravel road suitable for cars, emergency vehicles and heavy equipment.

Preserve roads are maintained by Longmont watershed rangers and facilities staff. Historically, Longmont watershed rangers have plowed and maintained Fire Road 1/LDR year-round from the main trailhead to a high point at approximately 7,000 ft. in elevation. Longmont staff typically grade and maintain the road two times per year to maintain a usable condition for public safety, water resources and forest stewardship operations. Staff may also grade the road more frequently as needed. For instance, when forestry operations require access for heavy equipment to the less accessible west side of the Preserve, additional grading may be needed.



Map 10. Button Rock Preserve road network (Appendix A).

TRAILS

Button Rock Preserve's 6 trails add up to almost 8 miles of trails for recreational hiking (Map 11, Appendix A). The Preserve also has connector trails providing access to and from Boulder County's Hall Ranch and USFS's Coulson Gulch. The majority of Preserve trails are single track, compacted surface trails located east of Ralph Price Reservoir. There are also several two-tracks and former roadbeds in the Preserve's trail system.

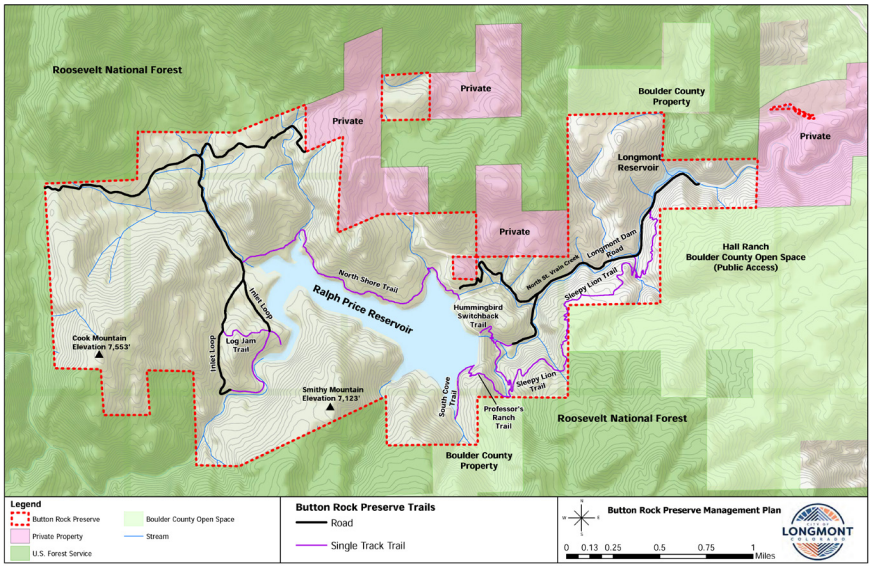
The Preserve's hiking trails were built over time beginning in the years after Button Rock Dam was completed in 1969. In some instances, roads that once provided access to homesteads, for dam construction or social trails created by anglers, started being used as trails. By the late 1980s and early 1990s, it was clear that a more formal trail system was needed. During this time, visitation started increasing at the Preserve because Ralph Price Reservoir opened to fishing and additionally, Boulder County opened Hall Ranch, a public open space adjacent to Button Rock Preserve's eastern boundary.

By utilizing the old road leading up to Hall Ranch's Antelope Park, the old Professor's Road and constructing a short section of new trail between the two, the Sleepy Lion Trail came to be (Ken Huson, personal communication). The story about how the trail got its name goes that during trail construction, as volunteers and rangers walked to the site each day, they observed a mountain lion on a nearby rock outcrop watching them but only sleepily opening one eye and never moving from the spot (Ken Huson, personal communication).

Sleepy Lion Trail is one of Button Rock Preserve's most popular trails but it has constant maintenance needs. The Hummingbird Switchback, South Cove and North Share trails were built to improve hiking access to Ralph Price Reservoir but became formalized versions of social trails and lacked technical planning. Sections of North Shore and South Cove trails have been undercut by wave action and the changing water levels of Ralph Price Reservoir. In the most severely impacted sections, entire pieces of trail have sloughed off into the reservoir. Professor's Ranch trail was built in 2017 to connect Fire Road 2 the crest of Button Rock Dam and provide firefighting access (Forest Stewardship Plan Update, 2017). It was built using modern trail techniques, including constructing a route that follows the topography of the land, allowing it to shed runoff and need less long-term maintenance.

Preserve trails have deteriorated over time. In the western Preserve, where visitation is lower, trails that were damaged in the 2013 flood including Log Jam Trail and the Inlet Loop, have become overgrown with vegetation. Present-day ongoing maintenance needs include stabilizing areas of active erosion, fixing drainage problems, removing vegetation or downed trees from the trail path, felling hazard trees and restoring social trails or trail reroutes. Trails in the eastern Preserve, especially Sleepy Lion and Hummingbird Switchback trails, are experiencing wear and tear from increasing visitation. Hummingbird Switchback trail is poorly defined and heavily braided into a network of unsustainable switchback-cutting social trails. South Cove and North Shore trails need reroutes built around undercuts and technical rockwork to fortify the trail from future erosion. However, with limited staff time and limited funding, only priority maintenance needs can be addressed in a given year.

Over the years, constructing additional trail routes has been considered. Currently, there are no new trail routes planned.



Map 11. Button Rock Preserve trail network (Appendix A).

Table 14. Button Rock Preserve Trails

TRAIL NAME	TRAIL LENGTH (MILES)	TRAIL SURFACE
Hummingbird Switchback Trail	0.2	Earth/Gravel
Log Jam Trail/Inlet Loop	2.1	Earth/Track
North Shore Trail	1.8	Earth
Professor's Ranch Trail	0.5	Earth/Gravel
Sleepy Lion Trail and Extension	2.5	Earth/Track
South Cove Trail	0.5	Earth/Gravel

3.6.4 EDUCATION AND VOLUNTEER OPPORTUNITIES

EDUCATION AND INTERPRETATION

There is a lot to learn about Button Rock Preserve's rich natural and human history. Currently, there are no permanent educational or interpretive sign installations at the Preserve. Educational messaging is limited to brochures distributed at the trailhead kiosk, temporary signage focused on on-going forestry projects, and ranger conversations with the public. This presents an opportunity to plan for interpretation that can convey the Preserve's important natural and anthropogenic history through bilingual signage at key landmarks, e.g., Longmont Reservoir, Chimney Rock Dam, Button Rock Dam. Signage also presents opportunities for educating the public about the function of a municipal water supply and the value of proactively protecting clean drinking water.

VOLUNTEER OPPORTUNITIES

Over the years, Longmont and area residents have made it clear that getting the chance to volunteer at Button Rock Preserve, to give back to the Preserve they love, is an important benefit of living in and around Longmont. The purpose of the Parks, Open Space and Trails (POST) Volunteer Program is twofold. First, the POST Program is enhanced by volunteers who assist Longmont staff and rangers with projects that ultimately improve visitor experience as well as the ecological health and water quality of Longmont's open spaces, natural areas and parks. Second, the POST Volunteer Program promotes stewardship, builds community connections and gives residents an opportunity to directly engage with their public lands.

In 2015, Longmont's Parks and Natural Resources Department had one temporary volunteer coordinator. This position ended in 2015 and with the exception of the Raptor Monitoring Program, which was carried on by other staff, the Volunteer Program essentially ended as well. In mid-2018, Natural Resources hired a half-time volunteer coordinator to build a POST Volunteer Program, including programming and opportunities at Button Rock Preserve. Between 2018 and 2020, volunteer programming at the Preserve was limited due, in part, to limited staffing in both the Volunteer Program and at Button Rock Preserve and also due to the COVID-19 pandemic. Only a handful of volunteer events were held at the Preserve during these years including a Boy Scout bluebird nest box project and a couple of noxious weed removal events. In October 2020, for the first time, a second full-time watershed ranger was hired for the Preserve and in July 2021, Natural Resources hired a full-time volunteer coordinator for the first time.

Now, due to these changes in staffing, capacity to plan and organize volunteer opportunities at Button Rock Preserve has increased. In 2023 and 2024, several high priority trail rerouting and maintenance projects are planned for the North Shore, Sleepy Lion and Hummingbird Switchback trails. Additionally in coming years, volunteers will get various seed collection opportunities at the Preserve. These are exciting educational opportunities for all ages. Depending on the year, volunteers may get opportunities to clean the seed they collect and then, in subsequent events, come back to the Preserve the following spring or fall and seed forestry mitigation disturbance areas using the ecotypic seed they collected and cleaned.

Volunteer programming at Button Rock Preserve will continue to grow in coming years. Longmont will review expanding the Volunteer Trail Ambassador Program to Button Rock Preserve, which would supplement watershed ranger job duties. After training, Volunteer Trail Ambassadors could greet Preserve visitors, help rangers collect visitor use data and walk the trails and roads, observing and reporting trail and other maintenance concerns. Additional, future volunteer opportunities at the Preserve could include trash clean ups, more opportunities for noxious weed removals and social trail restoration closures.

3.6.5 RECREATIONAL OPPORTUNITIES

Information on recreational hiking trails is in Section 3.6.3, Roads and Trails.

The criteria Longmont uses to evaluate recreational activities at the Preserve include visitor infrastructure data, visitor and vehicle count data, scientific literature, visitor feedback, watershed ranger observational, count and camera study data. If adequate information is not available or it is unknown, Longmont takes a 'do no harm' approach and prioritizes protecting water, natural and cultural resources first and recreational opportunities second. In cases of substantially increased levels of a previously approved activity, such as dog walking in a protected Preserve, benefits and impacts are reevaluated for the present day and the future..

RECREATIONAL FISHERIES

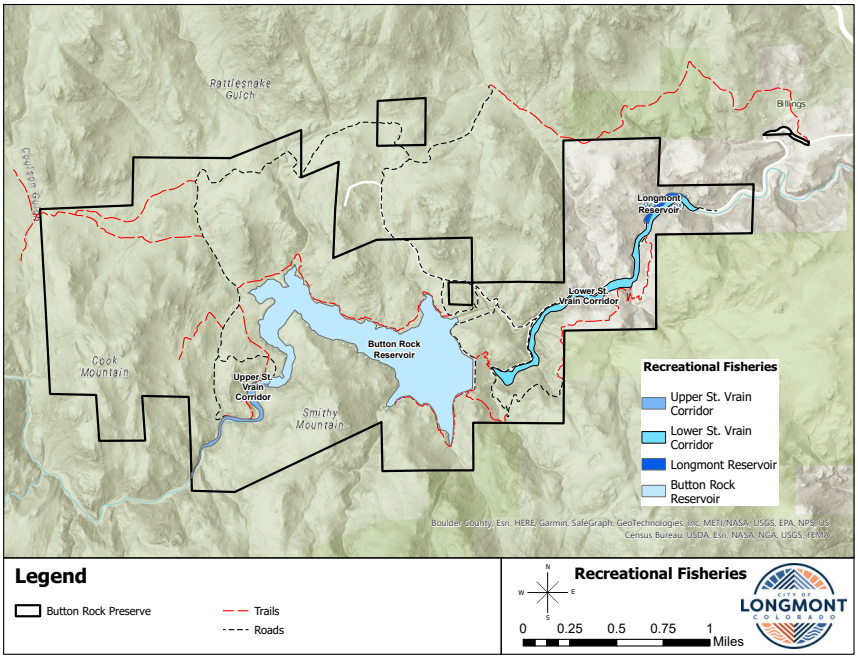
Recreational fisheries management recommendations are in Section 4.1, Plan Implementation.

In the 1970s and 1980s, following the construction of Ralph Price Reservoir, annual visitation numbers were small

compared to today. At this time, fishing was not allowed in RPR, only in North St. Vrain Creek and Longmont Reservoir. Today, the Preserve offers fishing opportunities on Ralph Price Reservoir, Upper and Lower North St. Vrain Creek and Longmont Reservoir (Map 12, Appendix A). On Ralph Price Reservoir, fishing is open to the public from May 1 through October 31 with the purchase of a Button Rock Preserve-specific permit. A permit can be either annual or daily and can be purchased either in person or online, starting on April 1 each spring. Longmont limits the number of annual permits sold each year to 600 permits. On North St. Vrain Creek, downstream of Button Rock Dam and upstream of RPR's inlet weir, fishing is permitted year-round in compliance with CPW state regulations and no Preserve-specific permit is required in addition to the state permit.

When asked in Public Survey 3, the majority of the people responded that they do not want to see the fishing permit program dismantled. In accordance with community feedback, Longmont will not eliminate Ralph Price Reservoir fishing permits. Ralph Price Reservoir fishing permits don't usually sell out, but during the pandemic, permits sold out in 2020 and came close to selling out in 2021. Keeping the permitting program in place, i.e., limiting the number of permits sold each year, will help regulate fishing levels, keepin the program more sustainable as Preserve visitation increases, Longmont will also continue to work with CPW on stocked fish management and data collection (Table 15).

For many years, Longmont has partnered with CPW to conduct fisheries monitoring and management at Button Rock Preserve. In this Plan, CPW's fish capture data includes data sets from 2004, 2005, 2008, 2009, 2014 and 2017 for Ralph Price Reservoir and North St. Vrain Creek. According to CPW, approximately 284,078 fish or 1,042,999 pounds of fish have been stocked in RPR since 2015 (Table 15).



Map 12. Recreational fisheries at Button Rock Preserve include Ralph Price and Longmont Reservoirs as well as Upper and Lower North St. Vrain Creek (Appendix A).

Table 15. Ralph Price Reservoir: Stocked Fish Species

SPECIES	NO. OF FISH STOCK (approx.)
Hofer Strain Rainbow Trout	36,232
Rainbow/Cutthroat Trout	11,397
Jumpers Rainbow Trout	25,004
Belaire/Cutthroat Trout	10,034
Eagle Lake Rainbow Trout	20,186
Hofer/Harrison Lake Rainbow Trout	29,080
Splake (Brook/Lake Trout Hybrid)	21,794
Hofer Harrison/Snake River Trout	129,989
Tiger Muskie	361

Ralph Price Reservoir

In six of the years between 2004 and 2017, CPW and Longmont staff conducted gill netting operations throughout the reservoir (Table 16). Splake, longnose sucker, rainbow trout and cutthroat trout had higher catch rates than brown trout, brook trout and walleye. The mean length of species varied from 12 to 16 inches with splake and cutthroat trout occurring in higher numbers on the upper end of the range.

Longmont Reservoir

Longmont Reservoir is a small narrow reservoir that offers easy water access for anglers. The last time CPW conducted gill netting in Longmont Reservoir was 2010. Species caught as part of that effort included splake, rainbow trout, brown trout and longnose sucker. Brown trout were captured in the highest numbers followed by longnose sucker, rainbow trout and splake, respectively. The short section of the North St. Vrain Creek upstream of Longmont Reservoir has good numbers of brown trout and according DHM Design's informational interviews conducted with anglers in 2019, fishing can be good immediately above the reservoir and throughout reservoir itself.

Lower North St. Vrain Creek

Lower North St. Vrain Creek was significantly impacted by the 2013 flood. Flood damage caused severe scouring and sediment deposition of the stream channel and associated riparian areas. These areas were subsequently restored as part of long-term flood recovery, which is detailed in Section 3.5.6. Before the flood, in 2004, 2005 and 2008 and after the flood in 2014 and 2017, CPW conducted electrofishing in this reach. Fish species captured include brown trout, rainbow trout, longnose sucker, longnose dace and creek chub. Brown trout were captured in the highest numbers with rainbow trout and longnose sucker with the second and third highest catch numbers.

Upper North St. Vrain Creek

CPW has not provided data for Upper North St. Vrain Creek. Immediately upstream of the RPR inlet, fewer macroinvertebrates were observed as compared to further upstream, above the historic gaging station. This is likely due to damage from the 2013 flood (DHM Design, 2019). Upstream of the historic gaging station, going west along Upper North St. Vrain Creek to the confluence with Horse Creek, CNHP observed a relatively high number of macroinvertebrates, particularly stonefly and caddis species (2019).

Table 16. Ralph Price Reservoir Fish Species between 2004 and 2017.

COMMON NAME	SCIENTIFIC NAME
Longnose Sucker	*Catostomus catostomus*
Splake (Brook x Lake)	*Salvelinus namaycush x Salvelinus fontinalis*
Rainbow Trout	*Oncorhynchus mykiss*
Cutthroat Trout	*Oncorhynchus clarkia*
Brown Trout	*Salmo trutta*
White Sucker	*Catostomus commersonii*
Walleye	*Sander vitreus, synonym Stizostedion vitreum*

Several areas of notable sediment deposition left over from the 2013 flood were observed and brown trout were feeding throughout this section during the survey (DHM Design, 2019). Overall due to the structure of the creek and proximity to bedrock in many areas, Upper North St. Vrain Creek appears to be functioning well from an ecological and fisheries standpoint (DHM Design, 2019).

ROCK CLIMBING

Button Rock Preserve offers a variety of sport, traditional and non-rope bouldering opportunities. In total, there are over 35 climbing routes located in the Preserve (Mountain Project, 2023; Pryce Hadley, personal communication). Preserve climbing areas are not maintained by Longmont staff but are accessible to the public at their own risk. At some point in the 1990s or early 2000s, Longmont began strictly enforcing its regulation that a person must have a permit to permanently install a fixed climbing anchor. Before this time, the majority of the approximately 20 sport routes were bolted in the Preserve. As of 2022, educational signs about resource protection regulations have been posted at all Preserve climbing areas.

Within the Preserve, the majority of climbing routes are concentrated on two walls known as the Bullet and River Wall (Mountain Project, 2022). The River Wall is the largest and most popular climbing area in the Preserve with about 22 official routes (Mountain Project, 2023). This area is accessed via a dirt path intersecting with Fire Road 1/LDR. It is a short distance from the Preserve's main trailhead parking area and restroom and it is easily accessible for most of the year. During spring runoff, when North St. Vrain creek downstream of Longmont Dam exceeds 200 cfs, access to most River Wall routes is challenging or impossible. Since 2020, there have been at least two climbing accidents at the River Wall resulting in hospitalization; one incident required a medical evacuation by helicopter (Pryce Hadley, personal communication).

With the exception of the River Wall, access to the Preserve's climbing areas currently requires either traveling cross-country or using unsustainable social trails. This situation presents an opportunity to build sustainable and official climber trails and to close and restore social trails that may have been eroding for years or are located in sensitive resource areas. Neighboring land managers offer lessons as to how partnerships with climbing advocacy groups and working with volunteers can be powerful tools in helping Longmont provide both resource protection, e.g., riparian habitat protection, sustainable trails and a safe and fun climbing experience for the public. City of Boulder for instance, partners with climbing advocacy groups who help them with bolt replacement applications, new route establishment and trail maintenance. Longmont already works with volunteers on a variety of projects at Button Rock Preserve and adding trail maintenance or other resource protection projects in and around the Preserve's climbing areas would expand and diversify project choices for Longmont's dedicated volunteers.

3.6.6 PLANNING AND ZONING

Introductory detail about updating Preserve rules and regulations is in Section 2.5, Rules and Regulations. Public survey summaries are in Section 3.6.1 and full public engagement results are in Appendix C.

PARKING CAPACITY SYSTEM AND PRESERVE DASHBOARD

In late 2020 and early 2021, when the Preserve saw record numbers of visitors and cars due in part to COVID (Table 13), the Town of Lyons generously allowed Longmont to post Button Rock Preserve messaging on their digital roadside sign. The messaging was temporary, but for a time it provided Preserve visitors information about the Preserve before leaving Lyons and driving further toward the Preserve and it helped control high traffic levels, noise and dust for neighbors along County Road 80 (Figure 78). Two other communication mechanisms employed during this time included 1) Posting pop-up signs in the Preserve's main parking lot and overflow parking area as well as at the intersection of U.S. Highway 36 and County Road 80, 2) Temporarily increasing staffing levels at the Preserve with staff working exclusively in the main and overflow parking lots directing traffic and answering visitor questions. The extra staff, which included Longmont Police and Natural Resources employees, was a temporary measure employed during a time of unprecedented visitation and when other

Figure 78. Town of Lyons digital sign displaying messaging about Button Rock Preserve in May 2020 two months into the COVID-19 pandemic.

area open spaces were closed to the public due to the COVID-19 pandemic. Rangers continue to deploy pop-up parking signs and mobile traffic barricades as needed to control traffic and close areas during emergencies.

Presently, with the exception of the pop-up signs and traffic barricades, there are no effective communication mechanisms in place to publicize information about the Preserve so visitors can plan their visit and know ahead of time when the parking lot is full. Longmont does not have a web-based dashboard communication tool or parking lot cameras that can give live views of the Preserve parking lots similar to those used by other nearby Open Space systems including Larimer and Boulder counties.

ENTRANCE FEE AND SHUTTLE

Currently, Longmont does not charge a fee to park in the parking lots or to enter the Preserve. Charging an entrance fee is one option that staff considered and surveyed the public about during this Plan's planning process. In Public Survey 3 (May - August 2020), 822 respondents were asked whether they 'strongly agree,' 'neither agree nor disagree,' or 'strongly disagree' with charging a Preserve entrance fee on weekends during busy summer months. The majority of respondents (55%) answered that an entrance fee could be a reasonable way to disburse use and high visitation numbers of people, dogs and vehicles, while 28% said 'maybe' and 17% said 'no' (Appendix C).

Also in this survey, 820 people answered the 'yes/no' question about if they would ride a shuttle to and from Button Rock Preserve to relieve parking congestion. The majority of respondents (72%) said 'no' while only 28% said 'yes.' Public

Survey 3 was conducted during months three through six of the COVID-19 pandemic, a time when Button Rock Preserve was open to the public but many public open spaces around it were not. It is possible that responses to the shuttle question were influenced by the timing of the survey, i.e., it was available during the first months of the COVID-19 pandemic when we knew little about the virus and riding on a shuttle may not have felt like a safe choice. Ultimately in 2020, Button Rock Preserve hosted 71,332 visitors and 56,939 vehicles.

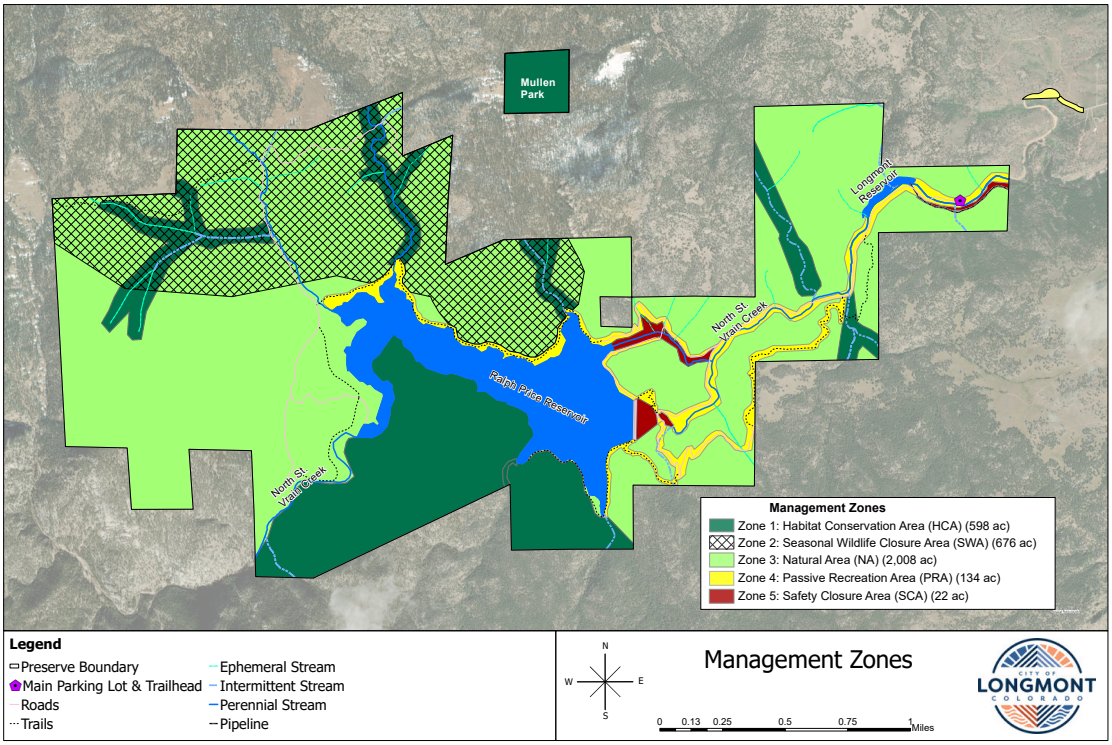
To date, only preliminary data, i.e., survey questions and comments pertaining to charging and entrance fee or providing a shuttle service, has been gathered (Appendix C). In order to evaluate either of these options further, more data is needed.

MANAGEMENT ZONES

Button Rock Preserve is a protected preserve with diverse ecosystems, critical wildlife habitat and much of Longmont's source drinking water. Average visitor numbers to the Preserve have climbed steadily since the late 1980s (Table 13, Figure 71). As visitor use continues to climb, managers must strike a balance between protecting the water and the greater Preserve while also supporting sustainable, passive recreation in appropriate areas. By utilizing this Plan's baseline data (locations of sensitive plant communities, distinctive gulches, areas that should remain unfragmented, critical wildlife habitat, wildlife travel corridors), CPW wildlife and fisheries data and ranger data (human use patterns), management zones were identified (Map 13, Appendix A).

Each management zone type has a unique set of desired conditions, which is the optimal range of natural, cultural, recreational and development influences for a particular area. As described below, the Passive Recreation Areas (PRA) zone is best for the heaviest recreational use while other zones are appropriate for prioritizing conservation or limiting public access due to safety concerns near utility sites. Conservation and safety areas may be closed either year-round or seasonally, depending on the zone's purpose. Closures are enforceable per the language in LMC 13.20.060, Section D (Appendix C).

Management zones are adaptable and may change or be updated in the future as new data becomes available. If the results of a future monitoring study add to our knowledge about wildlife travel corridors for instance, zone boundaries may shift to better protect the resource. Or, if a future management action such as a new trail is proposed, a planning process would include a resource impact review, which could also result in changes to zone boundaries.



Map 13. Management zones at Button Rock Preserve include Habitat Conservation Areas, Seasonal Wildlife Closure Areas, Natural Areas, Passive Recreation Areas and Safety Closure Areas (Appendix A).

Table 17. Management Zones and Desired Conditions at Button Rock Preserve.[1,2]

ZONE	PURPOSE	DESIRED CONDITIONS				
		LOCATION	NATURAL RESOURCES	CULTURAL RESOURCES	VISITOR OPPORT.	DEGREE OF DEVELOPMENT[2]
Zone 1 (598 ac) Habitat Conservation Area (HCA)	Protected areas closed to the public for resource protection and in some cases, for public safety.	1) Cottonwood Gulch 2) Johnny Park Gulch 3) Long Gulch 4) Mullen Park 5) Rattlesnake Gulch 6) Ponderosa Pine/Spike Fescue Woodland (G3/S3) 7) Smithy Mountain 8) Southeast Watershed Gulch	1) Promote conservation of sensitive plant communities, wetlands, perennial gulches, mines, cliff faces, wildlife habitats 2) In some areas, encourage natural systems and processes to occur/recover undisturbed (without human influence) 3) In other areas, engage ecological restoration techniques as needed to enhance/restore natural ecosystem functions 4) Leave unstable or sensitive soils undisturbed	Promote prehistoric and historic cultural landscapes, structures, or artifacts with cultural or historic relevance to be identified, catalogued and preserved.	N/A	N/A
Zone 2 (676 ac) Seasonal Wildlife Closure Area (SWA)	Seasonally closed to the public for wildlife or habitat protection or recovery, e.g., raptor nest, resource restoration, elk winter concentration.	1) Elk Winter Concentration & Severe Winter Range Area (Z2/Z3) SWA	1) Elk Winter Concentration Area The part of elk winter range with population densities that are at least 200% greater than the surrounding winter range density during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site-specific period of winter as defined for each 'Data Analysis Unit.' For BRP and per CPW's recommendation, Zone is closed between Dec. 1 and Mar. 31, reopening in the spring on April 1. 2) Elk Severe Winter Range Area The part of the range where 90% of the individuals of that species are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two out of the ten worst winters. To enforce these closures, a gate would be added to Fire Road 3 north of North Shore Trail's western terminus. A gate may also be needed at the Coulson Gulch entrance at the northwest property boundary.	Allows certain prehistoric/historic landscapes, structures, or artifacts with cultural or historic relevance to be preserved. May consider interpretation for public education for part of the year.	Closed seasonally. Outside of its closed season, which is currently December through March, this zone is categorized as Zone 3.	1) Little to no development 2) No public access roads or trails 3) Some areas are surrounded by private land with no public access 4) Staff use only for scientific study, restoration, code enforcement, fire or other emergency services.

[1] Button Rock Preserve is 2,671 acres in size. Management zone acreage totals 3,438 acres. This is because in some places, management zones overlap, e.g., in zones 2 and 3. The acreages in this table represent the calculated area for all polygons comprising a particular management zone (Map 10, Appendix A).

[2] All management zones are always and fully open for water system operations, e.g., maintenance of the reservoir or water supply infrastructure, upgrades, etc.

Table 17. Management Zones and Desired Conditions at Button Rock Preserve.[1] [2]

ZONE	PURPOSE	DESIRED CONDITIONS				
		LOCATION	NATURAL RESOURCES	CULTURAL RESOURCES	VISITOR OPPORT.	DEGREE OF DEVELOPMENT[2]
Zone 3 (2,008 ac) Natural Area (NA)	Contains native ecosystems, wildlife habitats and plant communities that although they are generally not as sensitive as resources in Zones and 1 and 2, contribute natural intrinsic value to the greater Preserve. As conditions vary in this zone, there may be sensitive resources with potential for conservation or restoration. The goal is to balance resource protection with compatible passive recreation. To prevent visitor impact, trails and interpretive features should be well planned and regularly managed.	This zone comprises 2,008 acres (75%) of the Preserve's 2,671 acre landscape.	Focus on supporting/ promoting and protecting natural processes, landscapes and resources. Develop BMPs to minimize resource impacts from visitor use.	Allows certain prehistoric/ historic landscapes, structures, or artifacts with cultural or historic relevance to be preserved. Consider well planned interpretative areas for public education, e.g., Chimney Rock Dam.	Disbursed wildlife viewing, scenic viewing and discrete opportunities for interpretive education in a natural setting.	Promote limited or minimal development; development is designed to have minimal impacts on native plant and wildlife biodiversity and natural processes, e.g., educational signage, a well-planned and sustainable trail corridor.
Zone 4 (134 ac) Passive Recreation Area (PRA)	Open to the public for passive recreation and visitor engagement. Most of the Preserve's maintained trails are within this zone. Passive forms of recreation include hiking, fly fishing, fishing, wildlife viewing, and rock climbing.	1) Dam Access & Switchback Trail 2) Dam Road 3) Sleepy Lion Trail 4) North Shore Trail 5) Professor's Ranch Trail 6) South Cove Trail 7) Parking Areas	Zone 4 is relatively accessible and provides opportunities to experience Preserve resources in a semi-natural setting.	Allows certain prehistoric/ historic landscapes, structures, or artifacts with cultural or historic relevance to be preserved. Prioritize interpretation for public education.	Focus on visitor experience. Prioritize maintaining recreational amenities for the public to enjoy, e.g., roads and trails, restrooms, fishing areas and climbing areas. The majority of Preserve visitors utilize this zone.	Infrastructure in this zone includes the main and overflow parking lots, entrance gate and fencing, Longmont Dam Road, publicly accessible fire roads, trailheads, trails, fishing pier, bridges, trash cans, vault toilet restrooms, wayfinding and interpretive signage, kiosk, other fencing.
Zone 5 (22 ac) Safety Closure Area (SCA)	Closed to the public for safety concerns.	1) Spillway and Dam 2) Drinking Water Pipeline 3) Outlet Pool (base of Button Rock Dam) 4) Button Rock Dam	N/A	N/A	N/A	Allows operational structures for water storage and delivery or any other operations, maintenance or facilities needs at the Preserve.

[1] Button Rock Preserve is 2,671 acres in size. Management zone acreage totals 3,438 acres. This is because in some places, management zones overlap, e.g., in zones 2 and 3. The acreages in this table represent the calculated area for all polygons comprising a particular management zone (Map 10, Appendix A).

[2] All management zones are always and fully open for water system operations, e.g., maintenance of the reservoir or water supply infrastructure, upgrades, etc.

DOMESTIC DOGS IN A PROTECTED PRESERVE[1] [2]

Water and natural resources staff recommend changing Section G of LMC 13.20.060 to prohibit domestic dogs in Button Rock Preserve (Table 12, Appendix C).

Button Rock Preserve's purpose, and the reason Longmont owns a 2,671 acre Preserve in the foothills west of Lyons, is to protect Button Rock Preserve's source watershed and the natural resources integral to a healthy watershed (Section 2.2, Purpose and Goals). In addition to protection and conservation, Longmont is committed to offering public access to the Preserve so visitors can experience a variety of low impact activities while enjoying the Preserve's scenic beauty and protected resources. However, when visitor numbers of people, cars and dogs begin to impact protection and conservation of resources, managers have the difficult task of finding ways to continue to allow public access while limiting certain activities. Examples of management changes that have been instituted during this planning process or are proposed in this plan (current or future) include management zones, increased staffing, continuing with fishing permits, designing future trails to avoid public access to critical habitat areas and prohibiting domestic dogs.

(Two additional management changes, i.e., to charge an entrance fee and to offer a shuttle service to the Preserve, were preliminarily researched during this Plan's process).

A History of Dogs at Button Rock Preserve

Button Rock Preserve opened to the public in 1965 and slowly, over time, added more forms of recreation including rock climbing, dog walking and fishing. Dogs were first allowed in the Preserve in the early 1990s (Ken Huson, personal communication). Since that time, visitor use has changed rapidly. Today, Preserve resources are being more heavily impacted as a result of more people and more dogs visiting the Preserve.

In the recent past, the former watershed ranger would provide regular Water Board updates to communicate the impact of more people and more dogs in a protected preserve, which included qualitative estimates of how many pounds of dog fecal matter were being taken out of the Preserve each week and how this number was generally increasing over time (City of Longmont, 2018 (b)). During this same period, the former watershed ranger also reported on numbers of dog incidents, e.g., dog vs. dog conflicts, dog vs. human conflicts, off-leash dogs contacting the water and dogs accessing Boulder County's Hall Ranch (which has a dog moratorium) from Button Rock Preserve (Jamie Freel, personal communication). Based on these findings (estimates of visitor and car numbers, estimates of dog waste, tallies of dog incidents), staff proposed that policies pertaining to picking up dog waste and leashing dogs be updated. Ultimately, staff decided that the future management direction of the Preserve needed to be based on comprehensive and scientific data.

Between March 2019 and November 2022, the project team for this Plan engaged the community (Section 2.4, Public Engagement and Agency Collaboration), gathered and analyzed scientific data (Sections 3.3, Natural Resources; Section 3.4, Cultural Resources), developed science-based priorities and objectives for present-day conditions (Section 3.6.6, Management Zones; Section 4.1, Plan Implementation) and reviewed and compiled scientific literature pertaining to natural areas management and the impacts of people and dogs on local source water quality, ecosystems and wildlife habitat, wildlife fitness and wildlife behavior responses.

Dog Waste: Impacts on Water, Soil and Wildlife Health

- Dog waste is a non-point source pollutant that can add harmful bacteria and nutrients to water and soil and does not easily decompose (Scheler, 2000; *Lee, 2019; Allen, 2020; De Frenne, 2021*)[1]
  - This can affect aquatic ecosystems health by increasing nitrogen and phosphorus and promoting algae growth
  - It can decrease dissolved oxygen affecting the Preserve's recreational fisheries
  - It can promote invasive species establishment and decrease native species diversity
  - It can decrease soil microbial biomass and microbial richness

Dogs Impact Wildlife Behavior and Habitat

- Because many wildlife species interpret dogs as predators or can sense their instinct to chase, the presence of dogs impacts a variety of wildlife species from small mammals (mice, voles), to ungulates (deer, elk) to large mammals (bobcats, mountain lions) (Sime,

[1] The Cities of Longmont, Fort Collins, Loveland and Boulder as well as Boulder and Larimer Counties have many parks and open spaces where people and dogs can enjoy the outdoors together.

[2] Peer-reviewed journal authors are in italics.

1999; *Miller, 2001; Banks, 2007; Lenth, 2008; Parsons, 2016; Silva-Rodriguez, 2012*):

- Even passive recreation, such as hiking, has an impact on water, wildlife and ecosystems and this impact is intensified when domestic dogs are present.
- When dogs are present, many wildlife species will avoid areas or habitats temporarily or permanently, e.g., they may abandon a nest, stop using a travel corridor, or be otherwise stressed if access to food sources or cover is disrupted.
- The presence of dogs lowers the Preserve's carrying capacity for native wildlife and habitats.
- The presence of dogs decreases wildlife viewing opportunities for all visitors.
- The chase instinct in dogs can lead to direct and indirect mortality of wildlife.

Enforcement Considerations

- Due to increasing visitation, watershed rangers prioritize code enforcement, including dog leash and proper waste disposal requirements over daily collection of dog waste left behind by Preserve visitors. Rangers regularly empty Preserve trash cans and remove abandoned waste when visible.
- In the early years, when visitor numbers were low, Longmont slowly added in more types of recreation. Now visitation is high and dog-related code violations are the most common enforcement issue at the Preserve accounting for 151 ranger contacts in 2022 and 210 in 2021. If a 'no dog' policy is adopted, rangers could reduce their enforcement burden over time, allowing them more time for forest stewardship, educational programming and volunteer projects.
- A ' no dog' policy is more straightforward to communicate to visitors and more effectively enforceable than a mixed policy allowing dogs on certain trails or during certain times of year. It provides one, clear, easy-to-follow policy that does not require future educational campaigns or map changes.
- A 'no dog' policy is a proactive approach to resource protection given the acute problem of increasing visitor use (people, cars, dogs) and the present-day recreational pressures on the Preserve.

A Landscape Context

Neighboring and adjacent foothills open spaces that are ecologically similar to Button Rock Preserve include Hall Ranch (southeast of the Preserve) and Heil Valley Ranch. In 2006, after a seven-year data collection and public process, Boulder County made the decision to ban dogs at both its Hall and Heil properties (BCPOS, 2006; BCPOS, 2020). These two open spaces contain very similar ecosystems, wildlife species and critical habitat as those found within Button Rock Preserve (BCPOS 1996(a); 1996(b)). Since 2019, Longmont has gone through its own existing conditions evaluation and public process to conclude that a prohibition of dogs at the Preserve would be beneficial for Preserve resources. However, when considering the landscape context along with the Plan's scientific findings and those in the literature, i.e., the research and data results associated with adjacent and ecologically similar foothills open spaces, it follow that Button Rock Preserve's watershed and resources would also be best protected by its own dog moratorium.

When Boulder County designed it's Button Rock trail, the westernmost trail in Hall Ranch that connects with the Preserve's Sleepy Lion trail, they made it a 'hikers only' trail. This designation helps keep both equestrian and bike traffic off a trail leading directly into the Preserve (where bikers and equestrians are prohibited). In recent years, Boulder County has had to post signs at multiple points along the Hall Ranch/Button Rock Preserve boundary due to the increasing problem of Button Rock Preserve visitors hiking on Fire Road 2 or Sleepy Lion trail and continuing onto Hall Ranch with their dog. Prohibiting dogs at the Preserve would help Longmont be a good neighbor to Boulder County, who is an important partner when it comes to cross-jurisdictional forest stewardship, shared grant funding, open space acquisitions and much more.

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4. MANAGEMENT DIRECTION

4.1 Plan Implementation

To successfully implement the purpose and goals of the Button Rock Preserve Management Plan, including addressing the issues and opportunities brought forward by the community[1] the TAC and staff, recommended management actions are described below. Each action is ranked in terms of timing and level of priority (Table 18). Additional considerations include funding source and availability, level of action complexity, level of staff engagement and if there are associated rules or enforcement implications.

TIMING

- Short-Term (S): An action will occur in the next 1-3 years.
- Mid-Term (M): An action will occur in the next 3-5 years.
- Long-Term (L): An action will occur in more than 5 years.
- Ongoing (O): An ongoing action occurs at a regular interval. Some examples include annual road maintenance, annual noxious weed control or ongoing forestry mitigation work.

LEVEL OF PRIORITY[2]

After considering the following four questions, each action item is assigned a high, medium, or low priority ranking category:

1. How does this action improve or enhance Button Rock Preserve's ability to supply Longmont with its critical water supply?
2. How does this action improve/enhance the City's ability to manage, maintain and protect the health and resilience of the Preserve?
3. How does this action maintain/protect Button Rock Preserve's ecological health?
4. Does this action align with the Plan purpose and one or more of this Plan's 10 management goals (Section 2.2)?

    - High (1): A high priority action is essential and should be accomplished first. It is an important step toward protection of Preserve resources, it aligns with the Plan purpose and it meets multiple Plan goals.
    - Medium (2): A medium priority action is very important. It does not necessarily need to be completed as soon as possible. It is an important step toward protection of Preserve resources, it aligns with the Plan purpose and it meets one or more Plan goals.
    - Low (3): A low priority action is important but not crucial for resource protection. It may meet a Plan goal or it may be combined with another action to align with the Plan purpose or to meet one or more Plan goals.

[1] In February 2023, the three resident-based advisory boards for this Plan, Water, Parks and Recreation and Sustainability Advisory Boards, voted to recommend this Plan to City Council for acceptance. Although in support of accepting the overall plan (with a vote of 5 to 1), the Parks and Recreation board was split 3 to 3 split on the dog recommendation.

[2] In cases where a particular action is prioritized but baseline data is not sufficient and/or monitoring data needs to be collected, staff recommends implementing 'do no harm' best management practices based on best available science until data can be collected and the timing and priority of an action can be reprioritized if necessary.

Table 18. Management Action Priorities

1. Water Resources: Priority to protect and maintain water storage and delivery, including infrastructure, operations and maintenance. Priority to protect water quality and Preserve ecological health.

ACTION/OBJECTIVE	TIMEFRAME	PRIORITY
a. Establish baseline water quality data that informs future management actions.	M	1
b. Decide on next steps to continue riparian, wetland and open water habitat post-flood restoration. (Phases I and II ended in 2016-2017).	M	2
c. Continue to work with LWQL to 1) share data from their existing/ongoing water quality monitoring effort, 2) to re-establish baseline, post-flood water quality data. Both can inform future management actions.	M/O	2
d. Continue to plan the best ways to add raw water supply/storage to Longmont's system which may include increasing the storage capacity of Ralph Price Reservoir.	L	2

2. Vegetation: Protect, preserve, enhance and restore native plants, plant communities and ecosystems throughout the Preserve. Control noxious weeds.

ACTION/OBJECTIVE	TIMEFRAME	PRIORITY
a. Develop a Weed Management Plan. Include comprehensive weed mapping, a treatment schedule, a monitoring schedule, BMPs for all future ground disturbance (Cal-IPC, 2015 as in CNHP, 2019).	S	1
b. Continue to treat noxious weed along road and trail vectors annually.	S/O	1
c. Evaluate upland, riparian and wetland areas health and restoration needs. Implement where necessary.	M	2
d. Expand noxious weed treatment areas in accordance with a Weed Management Plan.	M	2
e. Conduct periodic rare plant inventories. Include species with habitat in the Preserve, i.e., Larimer aletes (G2G3/S2S3), white adder's-mouth orchid (G5/S1).	M/O	1
f. Assess upland/grassland plant communities and native species diversity as some areas recover from grazing.	M/L	2
g. Protect the piedmont grasslands, the ponderosa pine lower montane foothills shrublands and savannas from fragmentation when new disturbances are planned.	O	1

3. Forestry: Restore and maintain a healthy forest matrix that is resilient to wildfire and other natural disturbances.

ACTION/OBJECTIVE	TIMEFRAME	PRIORITY
a. Develop a Wildfire Emergency Action Plan. Include escape routes, safety zones, evacuation protocols.	S	1
b. Hire a watershed forestry technician at Button Rock Preserve.	S	1
c. Build partnerships with agencies that have the resources and personnel to support Longmont's prescribed burn efforts, e.g., USFS, BCSO, CSFS	S/M	1
d. Implement Longmont's prescribed burns including pile burning, broadcast burning. E.g., Burn the Log Jam forest stewardship project piles from 2020.	S/M/O	1
e. Continue securing grant funding for forest stewardship work.	S/M	1
f. Plan for post-treatment restoration and weed management. Use staff, volunteers, youth corps and/or contractors.	S/M	2
g. Increase forest acres treated per year.	S/M/O	1
h. To enhance water quality and protect critical wildlife shrub habitat, protect understory species including fire-resistant grasses and shrubs.	S/M/L/O	1
i. Continue to support staff training and equipment purchases for wildfire suppression at the Preserve.	M	1
j. Plan for slash from projects. Build capacity to treat slash using staff, volunteers, youth corps, contractors.	M/L	2

4. Wildlife: Protect, preserve, enhance and restore wildlife habitat and movement corridors.

ACTION/OBJECTIVE	TIMEFRAME	PRIORITY
a. Inventory wildlife populations. Include specific species from large mammals, small mammal (including bats), amphibian and reptile and bird (including raptor) groups.	S/M/O	1
b. Continue working with partner agencies to protect/restore cross boundary ecosystems and critical wildlife habitats that are experiencing damage and fragmentation from unauthorized use, e.g., Coulson Gulch.	S/M/L/O	2
c. Continue to remove barbed wire fencing and replace with wildlife-friendly fencing as needed.	M	3
d. Monitor changes in frequency, distribution and behavior of wildlife populations	M/O	2
e. Compile, analyze and organize data from wildlife cameras that rangers began operating in 2022.	M/O	2
f. Identify opportunities for wildlife habitat restoration and enhancement.	M/L	3

5. Cultural Resources: Identify and protect cultural resources and support indigenous cultures and traditions on open space lands.

ACTION/OBJECTIVE	TIMEFRAME	PRIORITY
a. Develop cultural resources BMPs for the Preserve.	S	1
b. Include cultural resources interpretation in education/interpretation and sign planning. Include Longmont's Land Acknowledgement.	M	1
c. Hire a contractor to do a comprehensive Cultural Resources Inventory of the Preserve. Include categorizing/documenting existing cultural resources with baseline data as a starting point.	M	2
d. Nominate eligible resources for the local, state or national registers, e.g., historic structure remains, etc.	O	3

6. Education, Interpretation & Volunteers: Provide equitable access to the Preserve's natural and cultural history. Offer varied volunteer opportunities that improve Preserve ecological health and allow the community to give back.

ACTION/OBJECTIVE	TIMEFRAME	PRIORITY
a. Develop a Signs Plan for the Preserve. Utilize the 2022 signs inventory information. Include interpretive, wayfinding, and rules/regulations signs.	M	2
b. Build out the Trail Ambassador program at the Preserve.	M	3
c. Plan for additional volunteer projects at Button Rock Preserve.	O	2

7. Visitor Use/Recreation: Where not inconsistent with water and natural resources goals, provide passive recreation opportunities that are compatible with the Preserve's Purpose and Goals.

ACTION/OBJECTIVE	TIMEFRAME	PRIORITY
a. Continue to conduct fish surveys in collaboration with CPW. (Last data was 2017).	S	2
b. Monitor for compliance with a 'no dogs and domestic animals' policy.	S/O	1
c. Develop a Rock Climbing Management Plan. Include BMPs for climber trails and access.	M	2
d. Develop an online Preserve Dashboard to get messages out before people drive to the Preserve, e.g., emergency announcement, parking lot full, muddy trail closures, etc.	M	2
e. Equip the main trailhead parking lot and the overflow parking lot with cameras that will be linked to the Preserve Dashboard to inform the public.	M	2
f. Begin talks with CPW biologists about stocking only native fish at the Preserve.	M/O	2
g. Develop Public Information Plan to evaluate information mechanisms, e.g., a dashboard, a digital sign in Lyons to inform the public e.g., parking lots capacity, emergencies, muddy trails information, etc.	L	3
h. Include spatial distribution and demographics data capture in visitor count data.	L/O	3
i. Continue to collaborate with CPW to stock fish at the Preserve.	O	2

8. Operations: Maintain and restore existing infrastructure and plan for renewals/replacements.

ACTION/OBJECTIVE	TIMEFRAME	PRIORITY
a. Complete near-term trail rerouting and maintenance on the North Shore, Sleepy Lion and Hummingbird Switchback trails.	S	1
b. Identify social trails, then develop and implement a plan for removal and reclamation.	S/M	2
c. Build capacity and apply for funding to support trail work beyond only the highest priority/ triage needs.	M	2
d. Develop a schedule and BMPs for trail maintenance and technical trail improvements to improve erosion, sloughing, etc.	L	3
e. Continue to maintain/grade primary and secondary roads annually in collaboration with Facilities. Maintain more frequently if needed on a per project basis.	O	2

4.2 RESOURCE MONITORING AND RESEARCH NEEDS

This Plan's natural resources methods and results are based on one season of data. While the data, along with current scientific literature, is extremely informative and has provided the basis for developing the Preserve purpose and goals, management zones and management actions, it is baseline-level data. It provides a detailed introduction to what natural resources exist within the Preserve, where data gaps remain and what data still needs to be gathered to comprehensively inform future Preserve land management and conservation goals. Immediate and ongoing next steps include additional resource monitoring to answer various research questions, addressing data gaps and determining if management actions/objectives are successful once implemented. Areas where more comprehensive data collection and analysis are needed to address gaps include 1) Noxious weeds, 2) Road and trail conditions, 3) Social trails including the Coulson Gulch access point and 4) Visitor use data including but not limited to demographics and spatial distribution.

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122) Jamie Freel. 2018-2019. Former Watershed Ranger, Button Rock Preserve. Public Works and Natural Resources. City of Longmont. *Conversations and site visits through 2019.*

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124) Joe Halseth. CPW Northeast Region Wildlife Biologist. May 24, 2022. *Conversation about migrating elk within Button Rock Preserve boundaries.*

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127) Shaun Linnihan. 2021. Restoration Maintenance Supervisor. Aloterra Restoration Services. *Conversations and reporting about 2021 noxious weed treatment results for Button Rock Preserve.*

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