ELDORA ENVIRONMENTAL

PRESERVATION PLAN

2012

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Prepared for:

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Approved by ECA Board of Directors
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1.0 INTRODUCTION

1.1 Social and Economic Setting of Eldora and Boulder County

The disincorporated town of Eldora is located in Colorado's Northern Front Range, approximately 34 miles northwest of Denver. Eldora is in the southwestern corner of Boulder County, with the eastern third of the county included in the Denver Metropolitan area. Thus, Eldora has a rugged mountain setting, but is not remote, being within a short drive of more than a million residents, and located in a prime regional and national vacation area.

Eldora was settled and developed approximately 115 years ago by natural resource extraction, primarily gold mining and supporting industries. Within 20 years, mining dramatically declined, and Eldora was dominated by vacation use, primarily summer residences used by families from Colorado and nearby states, and eventually by families throughout the United States.

Subsequently, Denver has developed into one of the major metropolitan areas in the country. The Boulder County economy is driven by state and national research and information management institutions in both the private and public sectors. This employment base, coupled with the natural setting, a large public land ownership, and restrictive land use policies, have contributed to a strong real estate investment market in the county.

Regional growth and development trends which made Nederland a suburb of Boulder over the last thirty years have extended to Eldora. This fact fundamentally changes Eldora from an isolated rural area to a community within the sphere of impacts of the rapidly expanding Front Range Urban Corridor. Although Boulder County regulations will keep the population of Eldora from growing substantially, the town may very well be overwhelmed by impacts from external sources such as continued growth in western Boulder and Gilpin counties, expansion of Eldora Mountain Resort, and increasing recreational use of surrounding public lands. A more subtle trend is the aging of Eldora's long-time residents coupled with the influx of new residents, which will slowly alter the nature of the community, severing it from its century of rootedness developed in isolation and turning it into a suburb of Nederland, Boulder and Denver. Eldora could successfully resist growth *per se* and still suffer community degradation through the loss of continuity and commitment to the traditional values of the community.

A majority of Eldora residents have lived in the community for over twenty years and many residents can claim family histories of residence going back two to five generations. This is unusual in Boulder County and accounts for the sense of history and community in Eldora. Eldora property owners continue to include summer vacation residents, but now there is a larger year-round resident sector than in the past. At the time of disincorporation in 1973, Eldora’s year-round population was estimated to be 23 individuals (Boulder County 1973); the 2000 census count for Eldora counted 170 (USDA Census Bureau 2011). This sector reflects regional development and employment trends, and these residents either commute to Nederland, Central City, Boulder or even Denver, are self-employed consultants, or operate cottage industries from their homes. Increasingly, year-round residents include those who have relative freedom to choose where they will live, and they have made a deliberate choice to live in Eldora. Whether descendents of the first miners, vacation property owners, or as members of the more recent influx of permanent residents, Eldora residents find common ground in maintaining the identity and life styles of "Happy Valley".

1.2 Development of the Eldora Environmental Preservation Plan 1994

To address growth and development issues, and continuing conflicts with recreational use of the area, the ECA Board of Directors had interacted for many years with governmental agencies and community organizations. In order to develop an organized and comprehensive framework for this effort, ECA directed the creation of the Eldora Environmental Preservation Plan (EEPP) in 1992.

Money was raised by the community to fund the hiring of a consultant to write the plan. Lee and Virginia Evans contributed a "challenge" gift which was matched by donations from other Eldora community members including Frank Abbott, Carl Athens, Elsie Bartelma, Robert Bartelma, Marjorie Bevlin, Pete and Sue Birkeland, Earl and Barbara Bolton, John and Willi Brocklehurst, Diane Brown, George Brownell, Scott Bruntjen, Todd Buchanan, Laura Callier, Mary Commers, James Cunningham, Jeff Duvall, Deb Evans, Peter and Karin Freymuth, Edythe Gaines, Nancy Goolsby, Bill and Mary Gross, Dave Hallock, Frederick Hansen, Dave and Louise Hausburg, Bob and Sheila Herron, Nick and Amy Hoffman, Dorothy Huntington, Jean Kindig, Ann Klenk, JoAnne Kready-Laudé, the Leever Family, Lisa Lopez, Mike and Pat McCoy, Mary McHenry, Virginia Menke, George and Genevieve Nahrgang, Gary Rottman, Louise Rouse, Phil and Romaine Rouse, Frieda Royer, Robert and Kathryne Sandquist, Marilyn Shaw, George Shopp, Jr., Jim and Beverly Swope, Laurence Tasaday, Henry Toll, Jr., and Gene and Lorene Vervalin.

The Eldora Civic Association initiated and guided the project, with Deborah Evans acting as project manager for ECA. The Boulder County Nature Association assisted in the administration of the project.

LREP, Inc. was hired to develop the plan. Mike Figgs, Nancy Lederer and Robert Ripple worked on the project, gathering existing information, conducting botanical field research, and meeting with community members.

Many individuals, who worked with governmental agencies, private companies, non-profit groups, universities, as well as community members, contributed valuable information and technical assistance in development of the 1994 Plan: Bob Allison, Bill Anthony, Dave Armstrong, Neal Artz, James Benedict, Alan Berryman, Kevin Berschneider, Marla Biberstine, Graham Billingsley, Pete Birkeland, Barbara Bolton, Earl Bolton, Michelle Bolyard, Deane Bowers, John Brocklehurst, Bob Brockman, Diane Brown, David Buckner, Michael Burney, Cynthia Carey, LeRoy "Lee" Carlson, Bob Carlson, Gary Carlson, Jasper Carlton, Carl Chambers, Mary Ann Chambers, Steve Compton, Steven Corn, Kirk Cunningham, Patt Dorsey, Jim Dunn, John Farrow, Pete Fogg, Mike Foley, Larry Gamble, Dave Gerhardt, Kathi Green, Dave Hallock, Jim Hartley, Rob Helmick, Tom Hendricks, Tim Hogan, Laura Hudnell, Tom Ingersoll, Jean Kindig, Rich Koopmann, Mary Kottenstette, Camilla Laughlin, Lauren Livo, Dennis Lowry, Dick Lyman, Joe Mantione, Henry "Hank" McCutchen, Carol Mehls, Steve Mehls, Ralph Meyerton, Clark Misner, Carl Mount, Jon Mulford, Tom Nesler, David Nettles, John Oppenlander, Chris Pague, Becky Parmenter, Eddie Perkins, Greg Policky, Linda Reekie, Laurie Rink, Lee Rozaklis, Charles "Binx" Rugg, Kirk Russell, Victor Sainz, Rick Sandquist, Howard Sargent, Carl Schmuck, Craig Skeie, Mark Sprague, Chris Stith, Amy Struthers, Rick Thompson, Dr. Henry Toll, Jr., Ron Trzepacz, Bonnie Tusinger, Anne Vickery, Joe Vranka, Ginger Watson, Dave Weber, Ann Wichmann, Dr. Shi Kuei Wu, and Karen Young.

The report was completed in early 1994 (LREP, Inc. 1994), reviewed by the community and submitted to Boulder County for inclusion into the Boulder County Comprehensive Plan.

1.2.1 Incorporation of EEPP into the Boulder County Comprehensive Plan

At a public hearing on July 19, 1995 the Boulder County Planning Commission adopted the following policies in the Mountain Subregion Element of the Boulder County Comprehensive Plan:

> MS 1.01 The county shall utilize the Eldora Civic Association as a referral entity for land use applications within the Eldora Preservation Plan study area that require or may require a public hearing pursuant to the provisions of the Boulder County Land Use Code. The Eldora Civic Association shall be responsible for insuring that such referrals are directed to any other committees or organizations charged with administration and management of the Eldora Environmental Preservation Plan.
>
> MS 1.02 Certain types of land use proposals regulated by the Boulder County Land Use Code such as “Areas and Activities of State Interest,” rezoning, special uses, and planned unit developments may have impacts reaching well beyond the proposal site. The county may refer such proposals to the Eldora Civic Association when they are located within an extended referral area bounded by the Continental Divide on the west, the Boulder/Gilpin county line to the south, the westerly corporate limits of the Town of Nederland on the east, and the Caribou Townsite/County Road 128 to the north.
>
> MS 1.03 The county recognizes the unique rural and historic character of the Eldora community. In addition, policy MPA 1.08 of the Boulder County Comprehensive Plan, Mountain Planning Area, authorizes the county to assist communities desiring to preserve their historic character. Therefore, future development proposals, which have potential visual, noise, or transportation impacts on the community from either within or outside the townsite shall be reviewed and acted upon by the county with significant weight being given to the compatibility of those proposals with the maintenance of that rural and historic character.
>
> MS 1.04 Where consistent with the Land Use Code and other goals and policies of the Comprehensive Plan, the county may work with the Eldora community and other land owners/managers in the area to further cooperative planning and land use management initiatives and actions.
>
> MS 1.05 As provided by the Eldora Civic Association from time to time, the county Land Use Department shall maintain a current edition of the Eldora Environmental Preservation Plan and attendant maps, tables, and figures for reference by county staff, other interested parties, and the public when reviewing land use proposals and plans in the Preservation Plan and extended referral areas.

1.3 Purpose of the Eldora Environmental Preservation Plan

The goal of the EEPP is to develop planning tools to be used by Eldora residents that will allow them to have standing and full consideration by the local, state, and federal planning agencies that control land use in the Eldora area. These agencies control land use development, both in private lands within Eldora, and on the adjacent public lands which comprise Eldora's natural setting. By having political standing with, and full consideration by these agencies, Eldora residents will have

- official recognition of community goals
- a stronger voice in land use issues
- the ability to implement community goals efficiently
- a basis for proactive interaction rather than continuously reacting to the agendas of others

A key element of EEPP is the development of documentation of important natural and cultural resources suitable for long range, comprehensive planning purposes. This documentation has been derived from field research, data base retrieval and community input. EEPP will be used for the following objectives:

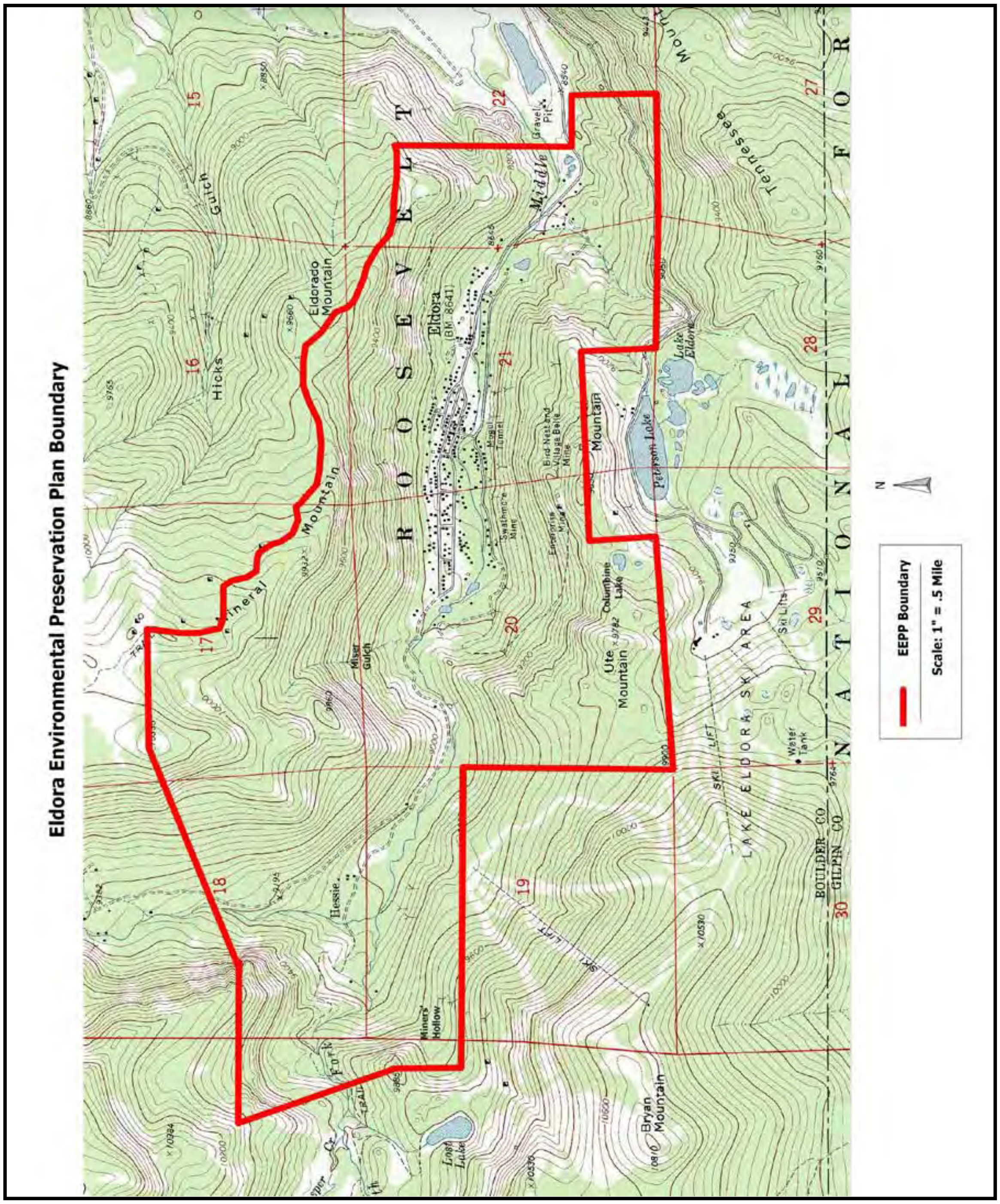
1. to form the basis for increased cooperation between ECA, private interests, and governmental agencies in the protection and management of sensitive natural and cultural resources identified in EEPP (including recognition of these resources in the Boulder County Comprehensive Plan and the Arapaho/Roosevelt National Forest Land and Resource Management Plan)
2. to develop recognition and direct the management of "buffer zones" between areas of intensive recreational and residential land use and areas having significant natural and ecological values
3. to guide the acquisition of real estate interests for conservation purposes by the Eldora Civic Association
4. to guide the management of those real estate interests as described above

1.3.1 Study Area Boundary

EEPP has been developed for the area within the boundaries as displayed in Figure 1.1. These boundaries are generally described as:

- Arapaho Ranch as the eastern boundary
- top of Eldorado and Mineral Mountains as the northern boundary
- Indian Peaks Wilderness Area as the western boundary
- Eldora Mountain Resort, as developed in 1993, as the southern boundary.

Figure 1.1. Eldora Environmental Preservation Plan Boundary



1.4 Eldora Civic Association Member Surveys

The Eldora Civic Association (ECA), which comprises a majority of Eldora residents and property owners, has periodically polled its members regarding community concerns and priorities for action (Appendix 1.1). With few exceptions, the surveys have shown that residents want to maintain their small, quiet, friendly town by discouraging new building and commercial activities, preserving old buildings and preserving the town and surrounding lands in a natural state.

In the 1982 survey, Eldora residents already perceived water pollution, traffic, growth, business activities, commercial activities on surrounding National Forest lands and encroachment on private lands to be primary issues. A majority (85%) felt growth of the community was undesirable, 74% felt increased usage of National Forest lands was undesirable and 52% felt it was undesirable to improve existing trails and facilities within the National Forest.

In the responses to the 1992 survey, zoning and building issues were ranked second in priority (after dog control) as a matter for ECA to focus on. Of the respondents who listed zoning and building as a priority, 80% wished for policies which would slow growth and keep Eldora small. Traffic and road maintenance continued to be of concern, particularly the parking problems at Hessie. Purchasing land and historical buildings for preservation and protecting wildlife were among the priorities listed for ECA attention by respondents.

The 2002 survey asked questions about a number of specific issues. A majority (73%) were against looking into the possibility of public sewer and water systems for the community while there was an evenly split vote about looking into extending natural gas into town. The acquisition of open space in and around Eldora was supported by 95% of respondents, while 92% were against a trail from Nederland through Eldora. The speed and volume of cars in Eldora has been a long standing concern. The most favorable suggestions for traffic control included placing a sign west of the ski area turnoff directing people to the ski area (favored by 64% of respondents), creating a Forest Service Recreational Fee Area west of Eldora with limited parking (47% in favor), and redesign Eldorado Ave to create a better defined entrance to town, more obvious speed limit signage and possible narrowing of the road to slow traffic (38% in favor). Regarding Eldora Mountain Resort Ski Area 82% of respondents were in favor of ECA monitoring the ski area activities and work with appropriate agencies, while 82% were not in favor of snowmobiling at the ski area.

The 2009 survey was also specific to a number of issues. A majority of respondents felt it was important to protect Eldora's rural and historic ambience by preserving open space (95%), limiting house size (81%) and encouraging historic preservation (87%). A majority of respondents favored the continuation of the Eldora Land Preservation Fund partnering with Boulder County to acquire open space around Eldora (94%), are satisfied with the current forestry zoning (76%) and were not in favor of changing Eldora's zoning to allow for commercial development (90%).

1.5 Eldora Environmental Preservation Plan 2012 – Update of the 1994 Plan

The 1994 EEPP recommended that the plan be updated every 3 to 5 years. Like with many planning documents, this timeframe was not met, though such an update was discussed numerous times by community members.

In 2008, ECA members approached the ECA Board of Directors and recommended that the update should be a priority. There was discussion of whether the update should be contracted out to a consultant or done as a volunteer community project.

It was eventually decided the update would be undertaken as a community volunteer project with help from governmental agencies having expertise in a particular subject matter. Local resident Dave Hallock, a professional conservation planner, was the project manager.

The 2012 Plan is largely a technical update of the information in the 1994 Plan. As much as possible, it follows the same organization and format, but reflects changes that have occurred during the intervening 18 years. Two new resource domains have been added: Land Conservation and Climate Change.

The tasks for the update were the following:

- Recruit knowledgeable individuals from within and outside the community to take the lead in researching and writing the particular resource domain of the report.
- Review the existing report and identify where there is new information that should be included.
- Gather the new information. In most cases these were existing sources of information. Additionally, field work was conducted to supplement the plant list.
- Write the individual resource domains and assemble into a draft report. This includes updating all tables, figures and photographs, maps and appendices.
- Have the draft report reviewed by individuals within and outside the community.
- Submit to the Eldora Civic Association Board for adoption.
- Submit to Boulder County as per Policy MS 1.05 to have on file.

1.6 EEPP 2012 Report Format

Each resource domain has a separate section and chapter heading in the EEPP report. Recommendations for each resource domain are found in the final section of each domain's text. The bibliography is divided for each resource domain. A list of community and agency contact people is provided as the final appendix under each resource domain's series of appendices.

1.7 EEPP 2012 Preparers

The report preparers are listed below in Table 1.1. The Acknowledgements section and the list of contact people for each resource domain contain additional names of those who contributed technical information and professional services to this report.

Table 1.1. EEPP Report Preparers

Report Task	Preparer
Project Manager:	Dave Hallock Earthwork Conservation Planning LLC
1.0 Introduction	Dave Hallock
2.0 Geology and Mineral Resources	Pete Birkeland Professor of Geological Sciences (retired), University of Colorado
3.0 Hydrology	Pete Birkeland and Mark Williams Environmental Health Program Boulder County Health Department
4.0 Vegetation and Soils	Dave Hallock
5.0 Wildlife Resources	Dave Hallock
6.0 Cultural Resources	Carol Beam Historic Preservation Specialist Boulder County Parks and Open Space Dave Hallock
7.0 Recreation Resources and Issues	Dave Hallock
8.0 Land Use Planning	Pete Fogg Boulder County Land Use Planning Dave Hallock
9.0 Land Conservation	Dave Hallock
10.0 Climate Change	Pete Birkeland Michael A. McCoy

1.8 Acknowledgements

The following individuals provided valuable information and technical assistance:

Hydrology: Caitlin Crouch (River Watch), John Drexler (University of Colorado Department of Geological Sciences), Shemin Ge (University of Colorado Department of Geological Sciences), John Pitlick (University of Colorado Department of Geography), Iris Sherman and Bonnie Greenwood (Boulder County Public Health Department), Sheila Murphy (U.S. Geological Survey, Water Resources Mission).

Vegetation and Soils: Diane J. Brown, Eldora resident with botanical interests, conducted field work to add to the plant list.

Wildlife Resources: Dave Hoerath (biologist, Boulder County Parks and Open Space, Tina Jackson, (herpetologist, Colorado Division of Wildlife), Lauren Livo (biologist).

Cultural Resources: Susan Becker (Carnegie Branch Library), Payson Sheets (University of Colorado Department of Anthroplogy).

Climate Change: We thank Greg Allum for getting the RMNP document for us, Mark Williams of INSTAAR for getting the Boulder Creek and Mountain Research Station reports for us, and Dave Mills, Stratus Consulting, Inc., for helping with the Boulder

Creek part of this report. Wes LeMasurier, INSTAAR, alerted us to the INSTAAR report, and SheminGe, Department of Geological Sciences at the University of Colorado, did a masterful job of putting all of this together.

Mike McCoy received considerable help when writing Appendix 10.1 on Climate Change from the following individuals:

David W. Pierce, Ph.D., Division of Climate, Atmospheric Science, and Physical Oceanography, Scripps Institution of Oceanography

Judy Visty, Research Administrator/Ecologist Continental Divide Research Learning Center, Rocky Mountain National Park

Kevin Crooks, Associate Professor Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO.

Missy Stults, Climate Adaptation Manager, ICLEI - Local Governments for Sustainability USA. Boston, MA

Nicola Hedge, International Development Specialist, San Diego Foundation, San Diego, CA

David Hanni, Science Director, Rocky Mountain Bird Observatory, Fort Collins, CO

Ross Lock, Mountain Plover Program Manager/Wildlife Biologist, Rocky Mountain Bird Observatory, Fort Collins, CO

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Mayda Winter, Project Manager, Southwest Wetlands Interpretive Association, Imperial Beach, CA

Jim Bell, Director, Ecological Life Systems Institute, San Diego, CA

Patricia McCoy, Council Member, City of Imperial Beach, CA

Lisa Friend, Sustainability Planner, Boulder County Commissioners' Office, Boulder Colorado.

Garry Sanfacon, Planner, Long Range Policy Team, Boulder County Land Use Department, Boulder, Colorado

James Benedict, Center for Mountain Archeology, Ward, CO.

Kristen Goodrich, Coastal Training Program Coordinator, Tijuana River National Estuarine Research Reserve, Imperial Beach, CA

Meredith Dutlinger, GIS/GPS Specialist for Boulder County Parks and Open Space, provided help with mapping. Diane J. Brown, Pete Birkeland, and Randy Leever edited the report.

2.0 GEOLOGY AND MINERAL RESOURCES

2.1 Introduction

The townsite of Eldora is located roughly six miles east of the Continental Divide in the Front Range of the Southern Rocky Mountains. Its geologic setting is the result of repeated episodes of uplift, erosion and subsidence from Precambrian time into Early Tertiary time. Most recently, renewed regional uplift and glaciation have shaped the rugged topography which characterizes the area today (Figure 2.1). At present, the valleys are being modified by stream erosion. Oversteepened valley walls lead to the movement of debris to the lower parts of the valley sides.

Figure 2.1. Glacial Valleys

Classic, glacially carved U-shaped valleys from Eldora west to the Continental Divide. (Photo by Dave Hallock)

2.2 Bedrock Geology

Most of the rocks in the Eldora area consist of Precambrain metamorphic rocks (Figure 2.2), called gneiss. These are crystalline rocks commonly layered dark and light due to the mineral composition of the layers. The rocks were originally a thick sequence of mainly sedimentary rocks. During a subsequent period of ancient mountain building the sedimentary rocks were taken to great depths and converted to gneiss under conditions of high temperature and pressure. The alteration to metamorphic rock took place while the rock remained in the solid phase, although in places there is evidence for local melting. At the same time there were intrusions of varying size and composition, with most widespread one being of granitic composition, the Boulder Creek granodiorite, prominent in the terrain between Nederland and Boulder. This rock is dated at 1.7 billion years old, so deposition of the sedimentary rocks and their metamorphism preceded this time. A younger intrusive granitic body extends from the headwaters of the South Fork of Middle Boulder Creek northeastward to the watershed, and has been dated at 1.4 billion years old.

The next events are preserved in the Boulder area, where a series of sedimentary rocks were deposited after about 320 million years ago. These rocks make up the familiar hogbacks in the area, and underlie the area farther east. For a time an ancestral range existed, and gravels, called the Fountain Formation, were deposited around its flanks. In time the mountains were removed by erosion and younger sedimentary rocks were deposited across what is now the present-day range.

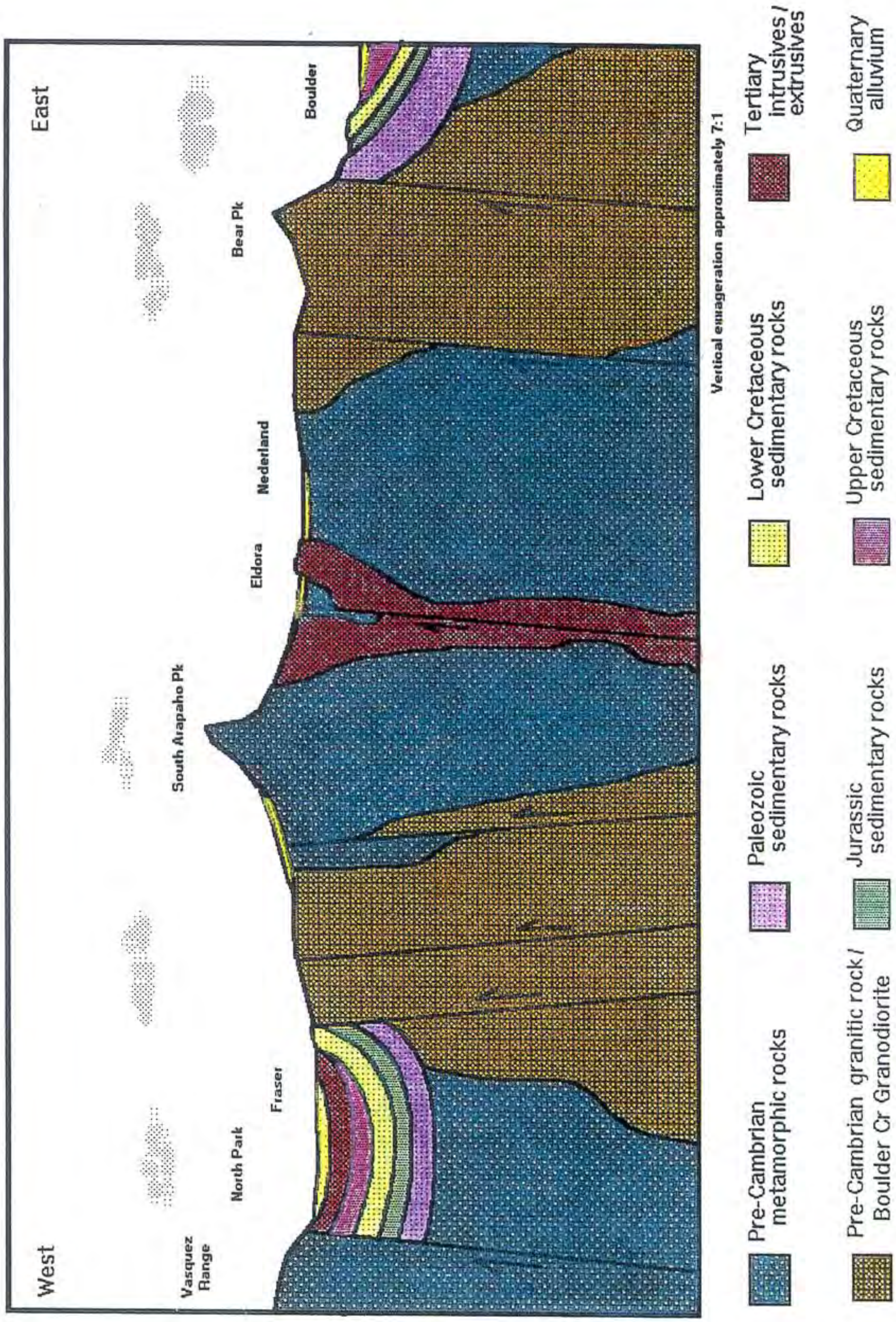
What followed next was the Laramide Orogeny, a major mountain building event during which the present Front Range took shape. The orogeny took place around the Cretaceous-Tertiary time boundary (66 million years ago), and lasted about 25 million years. The sedimentary rocks were eroded away across the range and exist only along the margins of the range.

During and after the Laramide Orogeny magma of various compositions formed relatively small intrusions into the overlying rock. Locally one body of these rocks make up Bryan Mountain and the Eldora Mountain Resort south of Eldora, and another makes up Caribou Hill and Bald Mountain in the Caribou area. The former has been dated at 61 million years ago, and the latter at about 67 million years ago. Ore-bearing veins and dikes are associated with these and other intrusive rocks. Collectively, these form the northern part of the Colorado Mineral Belt that formed between 68 and 27 million years ago and that extends across the state from north of Boulder to the western San Juan Mountains in southwestern Colorado.

2.3 Shaping the Landscape

Mountain building, river erosion and glaciation all contributed to form the local landscape. Following the Laramide Orogeny, erosion dominated in the Front Range. This removed the overlying sedimentary rocks and continued into the metamorphic and granitic rocks. Downward erosion slowed or nearly halted during part of the Tertiary and a vast low-relief erosion surface formed in the eastern part of the range. In places there is a fairly well preserved surface, but in most places and especially near Eldora and Nederland all that remains are ridges at similar elevations between the canyons. Examples are the ridge between Boulder and Left Hand canyons, and that between Boulder and South Boulder canyon. The original surface, as reconstructed, extends from north of Eldora southward to the vicinity of Colorado Springs. In this area the western edge of the surface is close to the position of the Peak-to-Peak Highway and it has a gentle slope to the east.

Figure 2.2. Geologic Transect, Fraser to Boulder



About 5 million years ago the Front Range rivers began to cut down in response to broad regional uplift, and form the present-day canyons. Because of the juxtaposition of the gently sloping remnants of the erosion surface and the steep-gradient streams, the canyons have their greatest relief at the range front (Boulder) and the least relief along the Peak-to-Peak Highway. In fact, going north along the highway one can view the ridges and envisage the reconstructed erosion surface, but there are few clues that large canyons lie farther to the east. The canyons all have the distinctive narrow V-shape that we associate with river erosion.

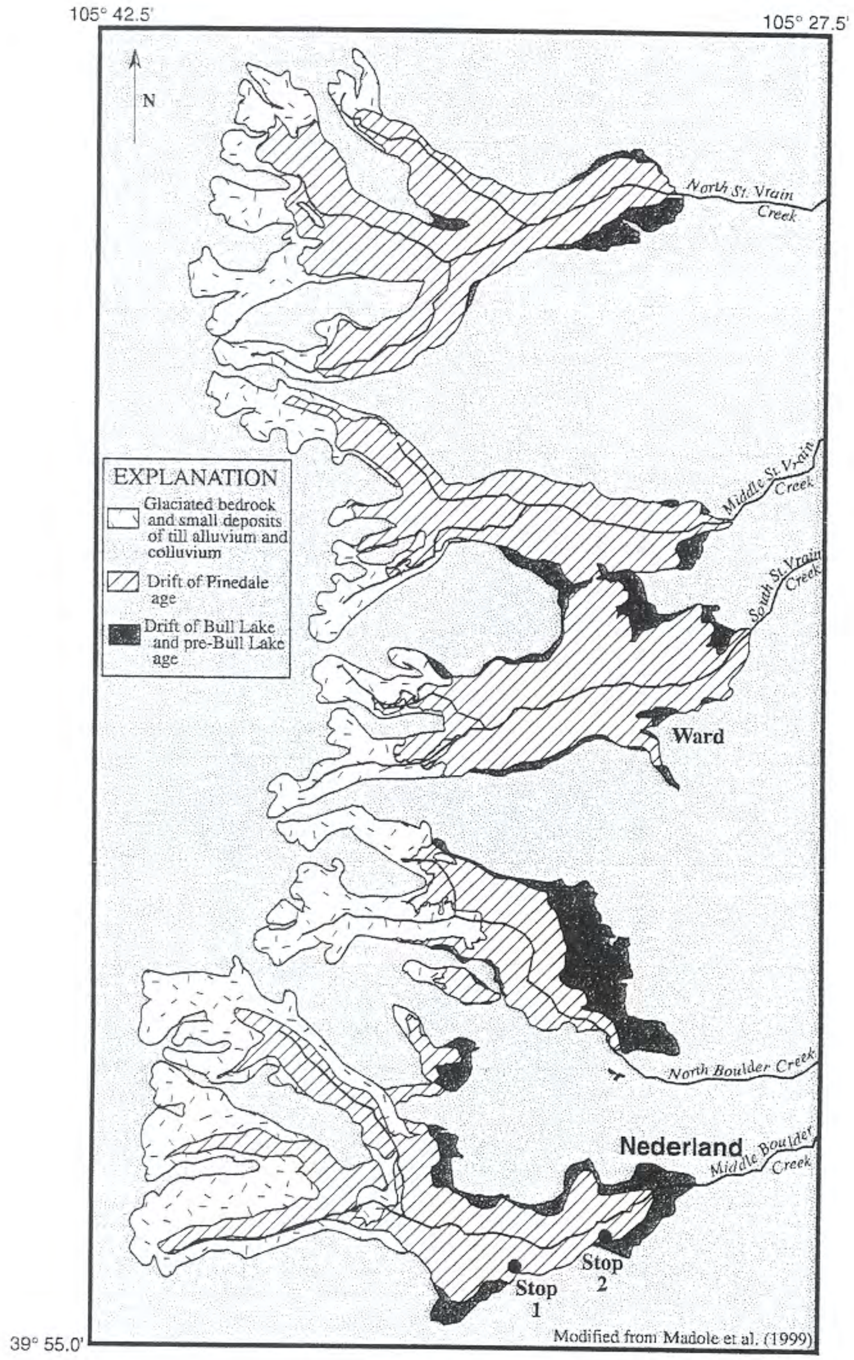
The high mountain ranges of the world underwent numerous glacial-interglacial cycles during the last about 2 million years, the Pleistocene. If each cycle represents approximately 100,000 years, the Front Range could have been impacted by 20 such cycles. Typical of glacial erosion in mountains are cirques (horse-shoe-shaped basins with steep walls) at the heads of the valleys, represented locally by the basins of Caribou Lake, Arapaho Glacier, Dorothy Lake and Upper Diamond Lake. Downvalley of the cirques the glacier erodes both vertically and laterally to form a steep sided, wide U-shaped valley. Local examples are most valleys west of the Peak-to-Peak Highway. Whereas rivers flow downvalley at a fairly even gradient, glaciers can gouge deep in the rock locally and leave behind a series of flat (e.g., Woodland Flat) and steep (e.g., west of Hessie) sections, and in some areas the flats are occupied by lakes.

Glacial erosion is fairly rapid and much debris is involved. Most of the debris (called till) is deposited under the ice and piles up around the lower parts of mountain glaciers, forming ridges that conform to the periphery of the glacier. These are called moraines, and the best local examples are the two forested, east-sloping ridges north of the creek at Arapaho Ranch. Till typically is poorly sorted (many sizes mixed together), and contains large boulders, measured in feet. A good local roadcut in till is just east of Nederland Middle/High School. Many of the large boulders around Eldora were melted out of ice of the last glaciation. Missing in the Front Range are large lakes impounded by large moraines at the downvalley extent of the glaciers; examples elsewhere are seen in New Zealand, and north of the Alps.

Glaciations impacting the Eldora area have been dated by examining the moraines. Study of the soils and boulder weathering show enough differences to identify moraines of two different glaciations, an older Bull Lake and a younger Pinedale (names from the Wind River Range, WY)(Figure 2-3). There are various ways to date moraines, and the latest method is complex but provides an age for the exposure of a boulder from the time it melted out of the ice. Along West Magnolia Road, Pinedale boulders date close to 20,000 years old, and Bull Lake ones older than 120,000 years old. These are well within the regional ranges for both glaciations, 12,000-30,000 years ago for the Pinedale and 120,000-170,000 years ago for the Bull Lake. Deposits of older glaciations are not recognized in the area, as they are either buried or were eroded away.

The glaciers filled the valley at Eldora and extended to the eastern edge of Nederland. This explains why the valley is U-shaped and rather straight, whereas the canyon to the east is V-shaped with many sharp bends. Within the canyon are isolated patches of river gravel at various elevations above Boulder Creek that were deposited mainly by the river draining the ice during the two glaciations.

Figure 2.3. Glaciation in the Eldora Area



Spatial relations of glacial deposits in five glaciated valleys of the Front Range, including Middle Boulder Creek (lowest of the five).

Glacier retreat began from the moraines near the high school about 20,000 years ago. The front had retreated to Hessie about 17,000 years ago and to the head of the valley about 13,000 years ago. During retreat, and at later times, river gravels were deposited locally along the valley bottoms. The older gravels form a terrace several feet above the river in the vicinity of Eldora (e.g., Eldorado Drive, Bryan Ave.), and the youngest form the floodplain adjacent to the river.

Moraines younger than the Pinedale were deposited in and just beyond the cirques at the heads of the local valleys. Jim Benedict, the late geologist and archeologist, identified five ages of moraines younger than 12,000 years old, with the youngest correlating with the worldwide Little Ice Age that lasted several centuries and ended over a century ago. Many of these deposits are well displayed in the Arapaho Pass area, as are archeological sites typical of the area.

Snowline position or elevation governs whether or not glaciers form in a mountain range and their downvalley extent. It is the elevation on a glacier above which snow and ice accumulate on an annual basis and below which they melt. In general, 70% of the area of a glacier lies above the snowline. Glaciers begin to form and advance downvalley when snowline drops and intersects a mountain, coincident with falling temperatures. In many parts of the western U.S., snowlines were over 3000 feet lower than present during the times of the Pinedale and Bull Lake maxima. For this area, snowline would have been in the area around Eldora and Eldora Mountain Resort. As snowline rises, glaciers retreat upvalley. Local snowline presently intersects the Arapaho Glacier. It follows, therefore, that vegetation zones shifted down and up a similar amount with the shifting snowline.

2.4 Soil Formation

Soils have been mapped in the national forest (Appendix 4.2). Here is a simplified description of the soils expected in the area based on observations over the years. Soils began to form in the Eldora area once the Pinedale glacier retreated and the landscape was exposed to the elements.

The soils that form are generally due to the materials they form from, as well as local conditions of climate, vegetation, age, and topographic position (see Figure 3.2 for the material the soils have formed from). Many soils in the area have rather similar A, B, and C horizons or layers, typical of soils formed on Pinedale and somewhat younger deposits over a large region. The bedrock of the valley sides is fairly resistant to weathering, so much is just rock. In places where weathered material has accumulated, a thin soil is present. Farther downslope soils have formed from sandy glacial deposits, some of which contain large boulders. The soil is about 3 feet thick and has the following horizons or layers, from the surface down. All horizons are sandy. The uppermost horizon (A horizon) is dark colored due to the relatively high content of decomposed organic matter or humus. In places the A horizon contains a high proportion of silt (smaller size than sand), brought into the area from the west by winds and deposited on the surface. The second horizon down (B horizon) is brown because weathering of the iron-bearing minerals has been sufficient to release iron which coats the sand grains that color. The lowest horizon, the C horizon, is similar to the above except the color is that of the unweathered glacial deposit, gray. In places there are alluvial fan deposits on top of the glacial deposits, and the soils on both are similar. There is a slight difference between soils on N-facing and S-facing slopes, with the N-facing soils having a thin surface layer of little decomposed organic materials, such as pine needles, overlying the A horizon.

Soils formed from river deposits can be variable. Those deposits forming the highest flat terrace in Eldora (the main part of town) are slightly younger but close in age to the glacial deposits. Hence, an A-B-C soil is expected. The gravel sizes are small as streams cannot carry the large sizes a glacier can. Although sand between the gravels is the most common, smaller sizes (silt and clay) locally can be present. Soils on floodplain deposits would have only a C horizon if deposited recently, or have a soil with an A over C horizon if slightly older as it takes considerably more time to form a B horizon.

Soils in bogs are much different. Gravel content could be low and instead of the common sandy soil, these can be finer grained with more silt and clay. The A horizons of these soils are quite thick and dark due to the organic environment in which they form, and they overlay a multicolored horizon indicative of the poorly drained conditions.

Because most of the soils within the village are sandy, water percolates downward relatively rapidly. These soils are said to be well drained. Hence, during a rainfall event, runoff of water across the surface is not expected to be common, nor is the accompanying erosion. Furthermore, such well-drained soils are suitable for septic drain fields, with the main drainage limitation being if a high water table is present.

2.5 History of Mining

Mining came to Boulder County in 1859; the Grand Island Mining District in southwest Boulder County was incorporated in 1861. Mining began in earnest in 1869 with the discovery of the Caribou Lode. The district included the town of Caribou and its mines as well as Eldora, whose boom began in 1897, and Nederland, which boomed last, during the First World War. Caribou produced large amounts of silver with some gold ($1.5 million and $4.3 million, respectively) in its heyday while Nederland produced $45 million of "black iron", that is, tungsten.

The Eldora boom was one of the last precious metals booms of the Old West. It was sparked by the discovery of gold tellurides, chiefly sylvanite and petzite, and gold sulphides on Spencer Mountain, leading to a speculative boom in 1897 (see Fig. 4.9 in the Vegetation and Soils section). The discoverers noticed the similarity to Cripple Creek ores and dreamed of another Cripple Creek. Claims had been staked in the Eldora vicinity as early as 1872 (Fourth of July claim), but no significant work was conducted. Work in the Eldora area resumed in 1887 and slowly increased until 1897. During this period, the valley of Middle Boulder Creek above Nederland was called Happy Valley and the settlement, consisting of as few as ten people, was known as Eldorado Camp. By 1896, digging was going on in the Lost Lake District (three-fourths of a mile southwest of Hessie) and on Spencer Mountain. The Mogul tunnel, one of the better planned and executed ventures, was initiated in 1897. The Fourth of July mine also saw sporadic work over a twenty year period but the silver ores were never rich enough to turn a consistent profit like the ores four miles southeast at Caribou.

By the summer of 1897, a boom, initiated mostly by favorable speculation in the regional press, was underway. By January 1898 the population topped 1300 and over 500 claims had been staked. The town of Eldora was incorporated in 1898 and, in an early example of city planning, the dance halls and bawdy houses were banished to a plot southwest of the town proper. No dollar figure for production at Eldora was found.

The veins of ore which fueled the boom were of Tertiary age, of hydrothermal origin and probably genetically related to the Bryan Mountain Stock two miles to the west. The ore veins were narrow and variable in quality. The highest quality ores were those enriched by surficial weathering processes; these small pockets assayed as high as ten thousand dollars of gold per ton but quickly gave out. The average ore was closer to five dollars per ton in value. At current prices, such low-grade ore would fetch roughly $600 per ton.

The better known mines, such as the Clara, Enterprise (the most productive mine in the district) and Village Belle, were worked extensively in the late 1890s and early years of the next century. The veins varied from four inches to over six feet in width and ranged from $15-300 per ton. At current prices, comparable veins would yield $1,900-38,000 per ton. However, the rich pockets were very limited in extent and operators contemplating mining today would be tied to the lower figure of $1900 or less per ton in calculating economic viability. Assays at a mine currently operating at Caribou, two miles north of Eldora, calculate to be $190 per ton.

The Mogul tunnel, begun in 1897, was the most extensive and best executed operation on Spencer Mountain. Its backers hoped that up-to-date technology, deep mining and a rail connection to mills in Boulder or Denver would make for a profitable enterprise. The narrow gauge railroad arrived in Eldora in 1904 but the local mines, including the Mogul Tunnel, continued to lose money. By 1905, the boom was over and Eldora was losing population. Mining activity virtually ground to a halt and many mines closed, never to reopen.

Since the boom mining continued in Eldora on a smaller scale, generally limited to one or two operations at a time for a short time period. The last venture occurred in the early 1990s, when Durango Metals leased the Mogul tunnel for gold mining, but this venture failed for various reasons.

Boulder County Parks and Open Space Department began acquiring mining claims on Spencer Mountain, on the south side of the community of Eldora in the year 2000 (see Figure 9.1 in Section 9 – Land Conservation). Since then, 11 transactions covering 44 mining claims and their mineral rights have been purchased, some with the assistance of the Eldora Civic Association and the Eldora Land Preservation Fund. These lands total approximately 132 acres and include the Mogul tunnel. It is likely that these acquisitions have closed the final chapter on mining in Eldora.

2.6 Geologic Hazards

Geologic hazard is defined as "a geologic condition or geologic process which poses a significant threat to health, life, limb or property". Some hazards are related to the mining history of the valley, including open shafts and the presence of mine tailings. More natural hazards include rockfalls, landslides and earthquakes.

2.6.1 Mine Shafts

Mines present some risk, principally shafts on Spencer Mountain and Bryan Mountain which may be a danger to the unwary and those not familiar with the area. Entry into old mines presents the risk of rockfall, cave-in or mine gas.

The Office of Active and Inactive Mines of the Colorado Division of Reclamation, Mining and Safety (DRMS) has an active program to close open mine tunnels and shafts. They have been active on Spencer Mountain closing many of the mine openings with metal grates, some allowing ingress and egress by bats (Figure 2.4). There is still more work to be done. The reclamation of the Mogul dump was also a DRSM project.

2.6.2 Mine Tailings

Mine tailings and open mine shafts have the potential to contaminate groundwater with heavy metals. Although no metal contamination of ground or surface water has been reported to date, periodic monitoring of water wells and Middle Boulder Creek should be undertaken. Particular attention should be paid to the unconsolidated stream terrace aquifers along the creek at Eldora. Several past milling operations at Eldora may have introduced toxic wastes and/or heavy metals into the groundwater and the old town dump lies next to the creek east of Eldora and is presumably in contact with the stream terrace aquifer. Neither the City nor County of Boulder has conducted routine or adequate water quality testing for metals in Middle Boulder Creek upstream of Barker Reservoir (for water quality data see Section 3.3 and Appendices 3.1 - 3.5). Downstream at Nederland, the Wolf Tongue Mill is being evaluated by the Environmental Protection Agency and the Colorado Department of Health regarding contamination of water by metals.

2.6.3 Rockfall and Landslides

The valley walls of the Middle Boulder Creek drainage above Sulphide Flats are oversteepened in places as a consequence of glaciation. Mass movements such as rockfall and landslide are a concern on these steep slopes and the run-out zones occupy the valley floor below. These threats are at their greatest during periods of high rates of precipitation in the spring and early summer that saturate and destabilize slopes, and when freeze-thaw cycles in the spring combine with snow loading. According to the Boulder County Comprehensive Plan (Boulder County 1995) the slopes of Mineral and Eldorado Mountains and Spencer Mountain are an area of "moderate constraint" of rockfall/soil creep to the town and especially to County road 140 where it passes along the north face of Tennessee Mountain. The Plan defines moderate constraint/provisional risk as "where geologic conditions are such that moderate geotechnical problems exist and there is provisional risk related to intensive land uses." Intensive land use is defined as "any structures used for supporting or sheltering any human occupancy; and/or facilities or improvements which tend to attract congregations of people." Under County policy, areas of geologic constraint are not discouraged from intensive development.

2.6.4 Earthquakes

All of Boulder County is in a zone of low seismic activity. The largest earthquake in Boulder history dates to 1882 when a quake of Modified Mercalli Intensity VII occurred. Abridged descriptions for Modified Mercalli Intensities V-VII:

V. Felt outdoors; sleepers awakened; liquids disturbed; unstable objects displaced

VI. Felt by all; glassware broken; books off shelves.

VII. Difficult to stand; noticed in motor cars; damage to some masonry; weak chimneys broken at roof line.

This quake was of unknown origin and its epicenter has been placed at various locations, the closest of which is Broomfield. Boulder County has been classified as a Seismic Zone 1 region ("minor damage; distant earthquakes may cause damage to structures with fundamental periods greater than one second; corresponding to intensities V and VI on the Modified Mercalli Intensity Scale"). The risk of a major temblor exceeding magnitude 6.5 on the Richter scale in Boulder County is low; the recurrence interval is estimated at 1,000-100,000 years. However, based on evidence of recent movement on regional faults, the intensity of the 1882 earthquake, the short length of the historical record and the fact that the Front Range has been uplifted over 5000 feet in the last few million years, some have argued that Colorado should be reclassified as Seismic Zone II with expected intensities up to VII on the Mercalli Scale.

2.7 Recommendations

1. Prevent access to old mine tunnels and shafts
2. Monitor Middle Boulder Creek and water wells periodically for potential metal contamination from mine tailings and mine shafts.

Figure 2.4. Closed Mine Shaft

The Office of Active and Inactive Mines of the Colorado Division of Reclamation, Mining and Safety (DRMS) has a program to close open mine tunnels and shafts, including this one on Spencer Mountain.

3.0 HYDROLOGY AND HYDROGEOLOGY

3.1 Drainage Basin, Precipitation, and Discharge

Middle Boulder Creek flows through Eldora, it heads at the Continental Divide, and has several main tributaries: North and South Forks of Middle Boulder Creek, Jasper Creek, and Woodland Creek. The river is dammed to form these reservoirs: Skyscraper Reservoir near the head of Woodland Creek, Jasper Lake near the head of Jasper Creek, and Barker Reservoir at Nederland. Drainage Basin size above Barker Reservoir is 23,000 acres or 36.2 square miles. Precipitation is about 22 inches/year at Nederland and close to 40 inches/year along the divide, based on data at the D-1 weather station on Niwot Ridge (Barry 1973). Some 60 % of the precipitation/year falls as snow, mostly in winter and spring, with April and May being the wettest months and January and February the driest months. Annual runoff is about 20.5 inches/year, or about 50 % of the basin wide precipitation; a similar amount returns to the atmosphere via evapotranspiration. Middle Boulder Creek is deepest during spring-summer runoff due to snowmelt and rainfall, and shallowest in the winter. Discharge (the volume of water passing by a point in a second, given in cubic feet/second, or cfs) has been measured by the U.S. Geological Survey at a gaging station at the inlet to Barker Reservoir since 1907 (Figure 3.1). The records at this station show maximum discharges near 700 cfs, usually in June, and minimum discharges of less than 5 cfs, usually in January. These values are the flows averaged over 24 hour days. The year around flow, again averaged over 24-hour days, is about 55 cfs.

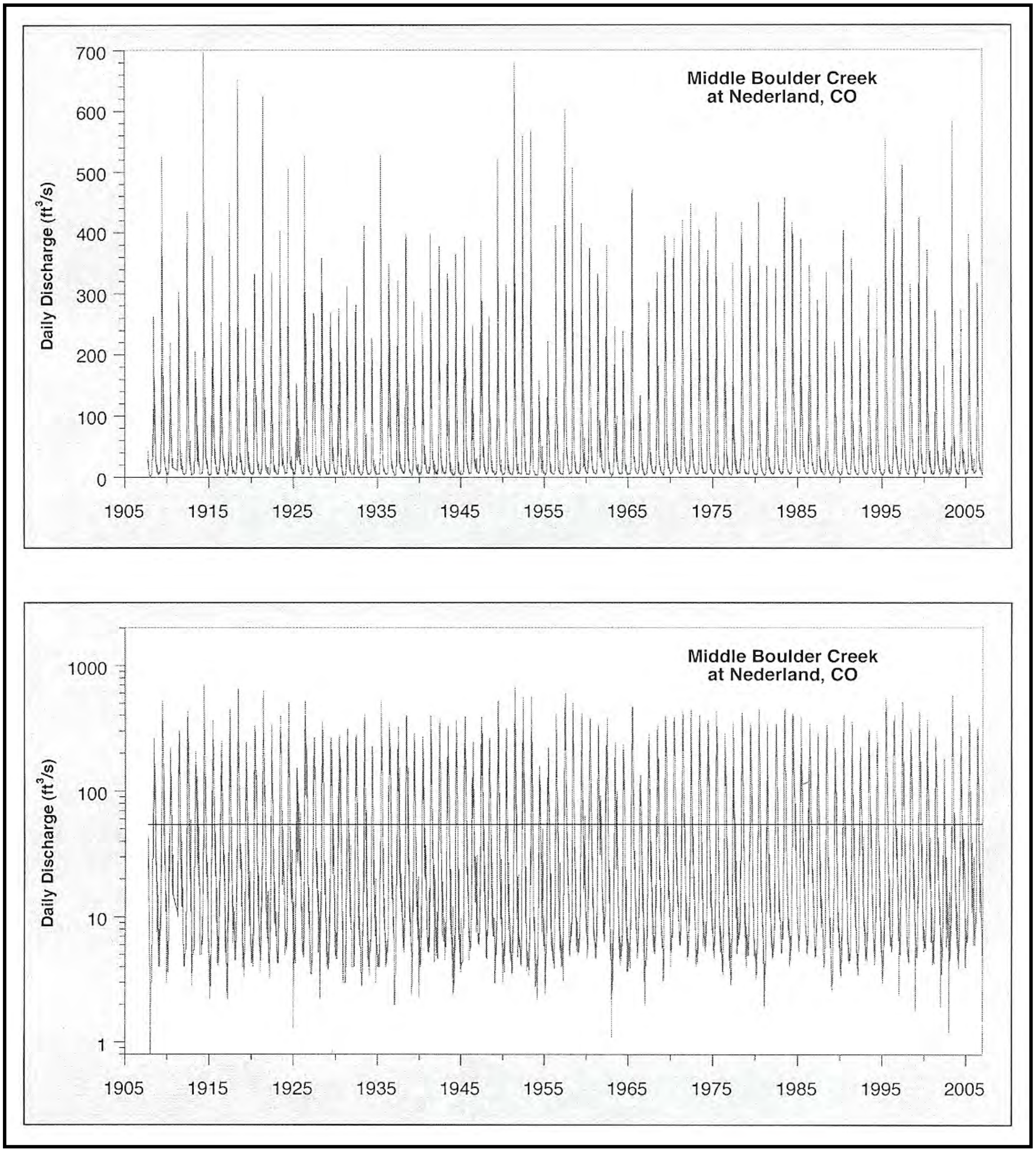
Water of Middle Boulder Creek is used by some Eldora residents, and downstream it is used by Nederland and Boulder. It is also used for irrigation in the plains. The Eldora Mountain Resort uses water in Peterson Lake and Lake Eldora primarily for snowmaking; they also divert water from Jenny Creek for snowmaking that ends up in Middle Boulder Creek.

Most floods in many nearby Front Range drainages result from rainfall events hitting the mountains downstream of the position of Nederland (Pitlick 1994). Hence rainfall events that produce floods are not expected in Eldora.

3.2 Aquifers, Water Table, and Water Yield

Most Eldora residents drill down to various aquifers for their water (Figure 3.2), and some get their water directly from Middle Boulder Creek. An aquifer is defined as rock or unconsolidated materials permeable enough to transmit significant amounts of water; all the voids are filled with water (said to be saturated), and the top of the water-saturated zone is called the water table. The zone above the water table is partially saturated. The deepest wells in Eldora bottom in the crystalline bedrock where the water resides in fractures (joints or faults) in the rock. This will be referred to as the confined bedrock aquifer. Shallower wells bottom either in glacial deposits, in overlying river deposits, or in local alluvial-fan deposits. These latter deposits have a sandy matrix between the gravels; collectively, they are here called the unconfined aquifer. Wide flat areas above and below Eldora also are similar unconfined aquifers. These include Hessie and Woodland Flat to the west, and Arapaho Ranch to Nederland to the east.

Figure 3.1. Middle Boulder Creek Discharge



Discharge records for Middle Boulder Creek at Nederland (Source: Colorado Division of Water Resources; figure provided by John Pitlick). Both charts display the same data, but the lower chart uses a log scale on the vertical axis so the low values are more easily read.

The sands and gravels of the unconfined aquifer have variable thicknesses in the Eldora Area. The thickness of the sand and gravel changes rapidly laterally and is difficult to predict. One well at Arapaho Ranch was reported to have over 200 ft of sand and gravel.

Water enters the aquifers from three sources. One is lateral and vertical flow from Middle Boulder Creek, mainly during the high flow of spring and early summer. Another source is from precipitation, including snowmelt, when water percolates vertically to the water table. A third source is from subsurface flow from upslope valley-side sources. The water table generally mimics the topography, and groundwater moves from higher to lower parts of the water table. During the low stream flow of the fall and winter, groundwater flow probably contributes to the discharge of Middle Boulder Creek. Vegetation also removes an unknown amount of water from the water table via transpiration.

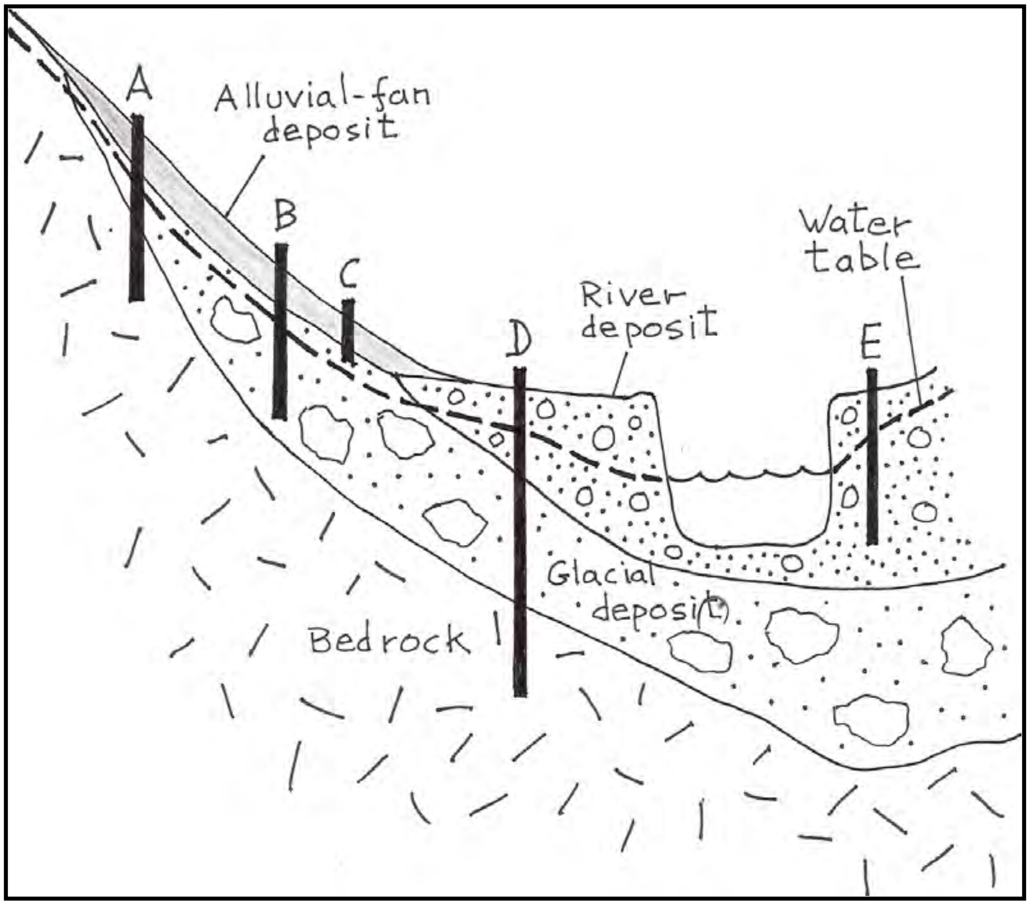
In June, 1996, Professor Shemin Ge's class at CU did some water table measurements of 10 wells near Klondyke and Eldorado. The wells are all less than 50 ft deep, and most are less than 30 ft deep. The materials the wells are in are unknown, but most are probably in sand and gravel of the unconfined aquifer (Figure 2). Depth to the water table was as much as 30 ft on the slopes north of Klondyke, and generally less than 10 ft on the flat terrace surface through the village. June is a time when high levels in the water table are expected, and it would be informative to have late-summer data also to know the low levels.

The maximum amount of water pumped from the unconfined aquifer without causing continued lowing of the water table, given in gallons per minute (gpm), is called water yield. The unconfined aquifer of Eldora has high permeability, meaning that water moves through it relatively rapidly, resulting in a high yield. Information in the following part of this paragraph comes from the State Engineer well records (LREP, Inc. 1994), and we do not know what kind of aquifer it relates to. Around 130 wells are within one mile of Eldora. Well yields range from 1.5 to over 50 gpm and typically are in the 6 to15 gpm range. Depths of the wells vary from 10 to 200 ft, and typically are in the range of 30 to 50 ft. The depth to the water table in the wells varies from 4 to 47 ft; water is typically encountered at 10 to 20 ft (season of year unknown). Virtually all of the water from these wells is for domestic use.

In contrast to the unconfined aquifer, the confined bedrock aquifer has a very low permeability, with the highest flows in areas of a high concentration of fractures. Yields in the latter are generally <15 gpm. We know of one well in bedrock at 360 ft depth that yields 15 gpm. In Boulder County, 55% of crystalline bedrock aquifers yield <3 gpm.

The 1994 Eldora Environmental Preservation Plan made certain assumptions on the daily consumption of the 130 wells in Eldora and concluded that Eldora residents consume the equivalent to a surface flow of 0.05 cfs. At this level of consumption no significant impact is seen on the groundwater supplies in the Eldora area, although isolated reservoirs within both aquifers could be drawn down locally.

Figure 3.2. Eldora Cross-Section



Schematic cross-section of bedrock and younger deposits in Eldora, as well as groundwater setting. Well E taps the groundwater from the river deposit. Wells B and C tap the glacial deposit, but because the base of well C is above the water table, no groundwater is available. Wells A and D tap the groundwater of the confined bedrock aquifer. There is no way to predict the potential yield of these latter two wells.

3.3 Water Quality

Surface water quality at Eldora is generally excellent, as would be expected from headwaters originating as snow and rain only eight or so river miles west of Eldora. Extremely limited sampling for major ions, trace elements, bacteria, and radiochemicals measured safe levels of all of these in Middle Boulder Creek.

3.3.1 Water Sampling Programs

In the past there was only sporadic and cursory sampling of water in Middle Boulder Creek above Nederland. Neither Nederland, the City of Boulder or Boulder County have conducted regular water quality sampling programs in the past and the analyses conducted were usually not adequate to completely evaluate water quality.

The U.S. Geological Survey (USGS) collected samples from Middle Boulder Creek in 1975 and 1976. A second unpublished set of water samples of Mogul Tunnel effluent was collected from Middle Boulder Creek below the confluence with the effluent in 1988 and 1989, by Hazen Research of Golden, Colorado, on behalf of Binx Rugg and James Kelly, owner and lessee, respectively, of the Mogul Tunnel (Appendix 3.3). The USGS again sampled the creek in 2000 (Murphy *et al*. 2003; Appendix 3.2).

River Watch is a statewide volunteer water-quality-monitoring program operated by the non-profit Colorado Watershed Assembly in cooperation with Colorado Parks and Wildlife (CPW). Their mission is to work with voluntary stewards to monitor water quality and other indicators of watershed health, and utilize these data to educate citizens and inform decision makers about the condition of Colorado’s waters. This program is unique in its statewide focus and frequency of data collection.

River Watch volunteers consist primarily of middle and high school students, but also include citizen groups, individuals, private schools, colleges, children’s homes, youth programs and nature centers. There are approximately 120 different organizations actively participating in the program, with new groups being added each year. Each volunteer group receives the training, support and supplies needed to monitor their respective rivers and provide consistent and accurate data. A plan is in place to ensure the quality of the data collected, and a staff member visits each group once a year in order to provide one-on-one support and technical assistance.

Volunteers agree to monitor on a monthly basis. Samples are collected which the volunteers analyze for hardness, alkalinity, dissolved oxygen, pH and temperature. Additional samples are collected to be analyzed for total and dissolved metals, which include Al, As, Ca, Cd, Cu, Fe, Mg, Mn, Pb, Se and Zn. This analysis is performed by our CWN (Colorado Watershed Network) analyst, Matt McIntyre, at the CDOW laboratory in Fort Collins. Twice a year volunteers collect nutrient samples that are analyzed for ammonia, chloride, sulfate, total suspended solids, total phosphorous, nitrate and nitrite. Volunteers perform one physical habitat assessment to accompany their annual macroinvertebrate sample which is sent to an outside lab for identification.

River Watch data are stored on an internet server and can be accessed by anyone (Appendix 3.4). All the data are reviewed and validated by the Division of Wildlife before it is made public. The River Watch data are currently utilized by the Water Quality Control Commission, CDOW, and many grass roots level watershed groups in the state for the management of Colorado’s waters.

John Drexler of the Laboratory of Environmental and Geological Studies of the Department of Geological Studies, University of Colorado, provided us with a total chemical analysis of Middle Boulder Creek water as part of a Field Environmental

Geochemistry class project (Appendix 3.1). These were collected over several years by students in his Environmental Field Studies class.

The Boulder Creek Watershed Initiative (BCWI) is also a volunteer effort taking water samples throughout Boulder County, including the Eldora area in 2008 and 2009 (Appendix 3.5).

3.3.2 Results of USGS Sampling and John Drexler's Sampling

Water quality data can be accessed by viewing the interactive water quality web map found at the Colorado Data Sharing Networks web site: http://www.coloradowaterdata.org/. Water samples from Middle Boulder Creek were collected in September and October 1975 and 1976 by the USGS at Nederland and at the west end of Eldora. The samples were collected in the early fall, a time of year when surface water contains both snowmelt/runoff and groundwater seepage. Samples were collected only once and were analyzed for major ions, trace elements, bacteria and radiochemicals. Specific conductance, a general indicator of water quality directly related to the concentration of dissolved solids, was less than 50 millimhos per centimeter (mmhos/cm) at Eldora and 60 mmhos/cm at Nederland. These values are indicative of water very low in dissolved solids, consistent with the snowmelt origin of water in the creek plus some water from the underlying unconfined aquifer. Since the sampling occurred in the early fall, a time of lower creek flow and relatively high groundwater inflow, this value probably reflects average annual values for dissolved solids in the surface water. Values in the spring and summer, when snowmelt runoff is at a peak, should be lower; winter values may be slightly higher. With regard to major ions and trace elements (fluoride, sulfate, iron, manganese, selenium, cadmium, copper, lead, mercury, zinc and overall hardness), the sample site above Eldora was below Colorado state water quality protection standards for all categories.

The data of Drexler and his students are the most detailed of all the data sets (Appendix 3.1). There is no concern for water quality as all values are within EPA guidelines.

The 2000 USGS data (Murphy *et al*. 2003; Appendix 3.2) were collected in June (high discharge) and October (low discharge). The limited data indicate no concerns except for the presence of low amounts of fecal coliform.

3.3.3 Results of Mogul Tunnel Sampling

The volume of Mogul Tunnel mine effluent, collected in 1988 and 1989, is a very small percentage of total Middle Boulder Creek discharge at the confluence point and is thus highly diluted after joining the creek. The effluent water itself was of generally very high quality when sampled. Twice it showed levels of potentially dissolved silver which exceeded proposed 30-day limit levels. The average silver level of both the effluent and the creek, recorded over six samples, also exceeded the proposed 30-day limit. Cadmium and zinc levels were higher than stream quality standards in the tunnel effluent, but were acceptable after dilution in the creek. The levels of arsenic, chromium, aluminum, lead and mercury were acceptable in both effluent and stream samples. Levels of fecal coliform and nitrates were below stream quality standards in both stream and effluent. Radionuclides were at or below the limits of detection. The pH of tunnel effluent is slightly more basic, on average, than the pH of the creek, although both are well within limits for stream water quality standards. No semivolatile organics (phenol and related compounds) were detected in either the effluent or stream samples. A summary of these analyses is included as Appendix 3.3. In 2006 the Mogul Tunnel was closed and the tailings re-vegetated.

Effluent water from mines is generally acidic in nature due to the chemical constituents of the rocks. However, the quartz monzonites present in the Eldora area are high in calcium and potassium which renders waste water flowing from mines in the area alkaline. Hendricks Mining reports their effluent mine water at Caribou to be quite basic, pH 8.5, but within their permitted limit of pH 9.0.

3.3.4 River Watch

The data collected by River Watch volunteers at the "Marysville" site and other locations along Middle Boulder Creek are valuable in establishing baseline conditions, determining if any water quality problems currently exist, and detecting future changes in water quality. These data are available at :http://wildlife.state.co.us/landwater/riverwatch/default.aspx by looking for station 2603 called "M Boulder Cr: Marysville" (Appendix 3.4).

Limited sampling on 7/27/2010 by River Watch volunteers indicate the presence of e. coli in Middle Boulder Creek. The value west of Eldora was 98.7 cfu/100 ml (0.1 liter), and that at Marysville was 81.3. Total coliform bacteria values were 214.3 and 159.7, respectively. For reference, any e. coli makes water unsafe for drinking, and values near 255 cfu/100 ml result in beach closures. Several sources could be responsible for these data.

3.3.5 Eldora Mountain Resort

The 2011 Eldora Mountain Resort Master Development Plan states that skier visits could increase about 2000 people/day (SE Group 2011). This will increase the amount of effluent handled by the waste treatment plant at the resort. The sewer system for the resort consists of a blower building and two lagoons. The lagoons provide primary treatment with a system capacity of 30,000 gallons per day and an annual output of around two million gallons. The Master Development Plan states that the current system is adequate for providing service of the planned ski area expansion. However, numbers provided in the Master Plan (an industry standard of 7 to 10 gallons per person per day of effluent), combined with the planned expansion from approximately 4,250 guests per day to over 6,580 guests per day (based on comfortable carrying capacity), appear to indicate the need for expansion of the waste treatment plant.

If the above is not addressed, this could affect the water quality of Peterson Lake, which receives the treated effluent. Peterson Lake is designated as High Quality Class 2 water by the State of Colorado and is classified for the following uses: Recreation, Class 2; Aquatic Life, Class 1 (Cold); Water Supply; Agriculture.

3.3.6 Water Testing for Carbaryl

In an attempt to combat the mountain pine beetle epidemic that began in the Eldora area around 2005, the insecticide carbaryl (1-naphthyl methylcarbamate) has been used to treat trees for protection. Carbaryl is a widely used broad-spectrum insecticide. It is classified as a likely human carcinogen and can cause overstimulation of the nervous system (US Environmental Protection Agency 2004). It is very highly toxic on an acute exposure basis to honey bees, estuarine/marine invertebrates, and other aquatic animals.
Due to these environmental concerns, a program was undertaken to see if carbaryl was making it into our local water systems. Known spraying was being conducted by individual property owners in Eldora and the North Fork, as well as at Eldora Mountain

Resort; the spraying at the ski area began in 2007 and is likely to be the largest volume use of carbaryl in western Boulder County.

Water sampling was conducted in 2009 and 2010 during and just after the time of carbaryl spraying (generally July). Eldora residents worked with the Boulder County Health Department, Colorado Department of Public Health and Environment, and the US Environmental Protection Agency to formulate a plan of water testing and to cover costs. Water testing focused on Marysville Gulch and Middle Boulder Creek at the junction with Marysville Gulch.

Carbaryl was detected in the waters of Marysville Gulch on two of the six tests taken in 2009. Values detected were 0.9 and 5.1 ug/liter; EPA suggests10 ug/liter/day as the maximum amount for safe drinking water. In 2010, there were no detections of carbaryl in either Marysville Gulch or Middle Boulder Creek (three tests in each creek). Due to the known adverse impacts of carbaryl on aquatic organisms, applicators are supposed to take precautions from having the insecticide enter streams or wetlands. Spraying should not occur within 50 feet of a body of water or 100 feet of a wetland, though the Forest Service guideline used for spraying on National Forest lands is 100 feet of a body of water or wetland. The detection of carbaryl in Marysville Gulch on two of the water samples taken in 2009 is cause for alarm.

As spraying will likely be occurring for another decade, water testing will continue and efforts made to reduce the amount of spraying and make sure applicators are following recognized guidelines.

3.4 Water Rights

The surface water in Middle Boulder Creek has been subjected to appropriation since Nederland claimed the first water for municipal use in 1863. Information from 1994 indicates total adjudicated surface water flow rights on Middle Boulder Creek and its tributaries above Barker Reservoir amount to approximately 385 cfs (Appendix 3.6). Of this total, 300 cfs are claimed by the City of Boulder for Skyscraper Reservoir near the headwaters of Woodland Creek. These rights are exchange rights which Boulder can use at Boulder Reservoir or Baseline Reservoir; water in amounts up to 300 cfs can be released at these downstream locations from storage in order to meet calls below these structures. This allows for the filling of Boulder-owned Skyscraper Reservoir by closing the outlet at a time when senior rights downstream would otherwise have first call on the water. Since Boulder is not using Skyscraper Reservoir at this time these decreed rights have not been invoked. However, it is worth noting that the exchange rights are senior to minimum flow rights for Middle Boulder Creek at Hessie and could prove contentious during a future drought if Boulder begins utilizing Skyscraper Reservoir.

Practically speaking then, the amount of decreed rights above Nederland is approximately 85 cfs. These rights are largely accounted for by a few major claims: Caribou Mill Pipeline on Middle Boulder Creek just above Nederland has rights to 40 cfs and Highland Mary Ditch Pipeline has rights to 10 cfs on Middle Boulder Creek just above Hessie. The appropriation dates for these rights are 1878 and 1906, respectively. These claims are the largest and among the most senior flow claims in the drainage.

The only other flow claims of consequence are minimum flow rights for Middle Boulder Creek at Hessie (12 cfs, 1978), the North Fork of Middle Boulder Creek near its source in Upper Diamond Lake (7 cfs, 1978) and the South Fork of Middle Boulder Creek just above Hessie (8 cfs, 1986). Other adjudicated flow rights are minor, mostly less than 1 cfs, and for domestic use.

At present, the use of water from surface sources above Nederland on Middle Boulder Creek is almost exclusively for municipal and domestic purposes. Consumption is within the active allocation of roughly 47 cfs and is, in fact, well below the figure. The actual total of diversions at any time is probably less than 10 cfs, well within the capacity of Middle Boulder Creek in all but the driest years.

3.4.1 Eldora Mountain Resort's Water Rights

The 2011 Eldora Mountain Resort Master Development Plan (SE Group 2011) states the following regarding water rights and water use:

> "Eldora Mountain Resort's water supply is derived from the Middle Boulder Creek basin and the South Boulder Creek basin, in Boulder County and Gilpin County, Colorado. Eldora owns or leases approximately 60.41 acre feet of fully reusable consumptive use credits in the Howard Ditch, the most senior water right on South Boulder Creek. These rights have been changed for use in Eldora's resort operations in Case Nos. W-7786-74, 02CW400 and 07CW231 (pending). In addition, Eldora Mountain Resort has 299 acre feet of junior fully reusable water storage rights, in Kettle Pond (40 acre feet, Case No. 02CW400) and Peterson Lake (259 acre feet, Case No. 09CW106 [pending]), as well as single-use water rights in Peterson Lake (259 acre feet, Case No. 82CW239) and Lake Eldora (33.3 acre feet, Case No. 92CW143). Accordingly, Eldora has a total of approximately 332.3 acre feet of water storage rights. (Note: Peterson Lake's total capacity is 259 acre feet. Therefore, the water stored under a Peterson lake water right will either be fully reusable or one-use, or some combination of each, depending upon the priorities under which the lake may fill in that year, but only one complete fill under a Peterson lake right is included in the foregoing total). In addition, Eldora Mountain Resort owns a surface diversion known as the Jenny Creek Pipeline water right (0.20 cfs, decreed in Case No. W-324).
>
> Fully reusable water is generally used in the resort's snowmaking operations. This water is diverted, stored in the on-mountain storage, and then pumped from storage for snowmaking. After the first use of its fully reusable water, Eldora recaptures the return flow, either directly, such as when the man-made snow melts into Peterson Lake and other on-mountain storage each spring, or by exchange up Middle Boulder Creek and South Boulder Creek, for those return flows that do not accrue directly into the on-mountain storage structures. The small amount of in-house commercial and landscape uses (2 to 3 acre feet annually, combined) are typically supplied via the Jenny Creek Pipeline water right. The Water Court has approved an augmentation plan for the resort (Case No. 02CW400), which allows Eldora Mountain Resort the flexibility to divert water out of priority and replace the depletions with its senior fully reusable consumptive use credits (60.41 acres feet). This augmentation plan, which utilizes storage and senior consumptive use credits, provides a reliable and dependable water supply for the resort."

Under the 2011 Eldora Mountain Resort Master Development Plan, which has been accepted by the Forest Service but specific improvements have not been approved, snowmaking coverage will increase from 170 acres to 258 acres. This includes all new lift-served developed trails and additional snowmaking coverage due to widening existing trails. All existing and planned snowmaking coverage can be accomplished within Eldora Mountain Resort's existing diversionary right.

The domestic water system for all the base area buildings and facilities at the ski area is a private system operated by a special district (Eldora Water and Sanitation District). The system consists of a Tank House, which is a buried concrete vault with 96,000 gallon storage capacity, the Jenny Creek vault, which supplies surface water to the system, and a back-up pump. The ski area states that the system is adequate for current demand and the expected demand that could result with implementation of the Upgrade Plan.

It is noted that during the 1993 ski area Master Plan Update and the 2011 Master Plan Update, initial conceptual drawings showed a water pump along Middle Boulder Creek west of Eldora. In both planning ventures, the water pump was dropped. Eldora Mountain Resort never expressed the purpose of the pump and if additional water rights were being taken out of Middle Boulder Creek above town. This potential desire of the ski area needs to be monitored.

3.5 Ground Water

The large majority of the wells in the Eldora area draw upon the water table in the unconfined aquifer. Water quality is generally excellent with some exceptions noted below. Groundwater in these aquifers is in direct communication with the surface flow in Middle Boulder Creek and is subject to appropriation under the same laws.

3.5.1 Ground Water Quality

The aquifer generally produces water suitable for drinking without further treatment. However, bacterial contamination from septic tank leach fields is a threat. Because of short residence times in the aquifers, little dissolved solids, sulfate or hardness is imparted to the water. These aquifers may pick up metals from contact with leachate from mines or tailings piles, but this has not been shown to be a problem in the Eldora area.

In 1975, the USGS analyzed water quality samples from 18 wells in the Eldora area, 3 downstream of Eldora and 15 in Eldora or upstream of the town and below Hessie. All but one of these wells appears to have sampled the unconfined aquifer. Full analyses, including field conductance measurement, lab analysis of major ions, trace elements and radiochemicals and lab and field measurement of coliform and fecal-coliform bacteria, were done on two wells. Partial analyses, including field conductance measurement, lab analysis of dissolved chloride and dissolved nitrite/nitrate and field and lab measurement of coliform and fecal-coliform bacteria, were done on the remaining 16 wells. Specific conductances in both the unconfined aquifer and crystalline rock aquifer sampled were below 250 mmhos/cm, indicating generally good water quality with respect to dissolved solids. Based on statistical extrapolation, none of the wells sampled were judged to have exceeded federal or state drinking water standards for dissolved solids, fluorides, chlorides, detergents, magnesium, sulfate or hardness.

Other chemical constituents sampled by the USGS in 1975 raised flags of caution. Some of the wells in the immediate vicinity of Eldora had nitrate and nitrite concentrations which exceeded 5 mg/l. Elsewhere in the Middle Boulder Creek drainage above Nederland values of nitrate were below 1 mg/l. The Colorado state and federal standards for drinking water stipulate a maximum of 10 mg/l for nitrate only; since nitrite and nitrate cause similar health problems they were measured together. Nitrate contamination is caused by biodegradation of human and animal waste and/or fertilizers in the aquifer. Most of this contamination in aquifers of the Eldora area is due to septic tanks/leach fields. Although the levels in the well waters did not exceed state drinking water standards, the situation may have changed since 1975 and should be monitored. Nitrate in excess of 10 mg/l can cause health problems in newborn infants, while levels in excess of 20 mg/l can cause problems in adults. In addition, one well in Eldora showed minor coliform and fecal-coliform bacterial contamination. Boulder County Public Health considers the presence of more than 1 coliform or fecal-coliform bacterium per 100 ml (0.1 liter) of water to be cause for remedial action, such as disinfection. The source of this contamination is probably septic tank leach fields. A second well, located below Eldora at the bend in the creek just above Sulphide Flats, is shown on a map accompanying the 1980 USGS report to have exceeded Colorado state drinking water standards for one or more chemical constituents. The constituents are not identified in the report; a likely guess would be nitrates.

Groundwater samples were analyzed by the USGS (year unknown) for trace elements (arsenic, barium, cadmium, copper, iron, lead, manganese, mercury, selenium and zinc) at two wells in the Eldora area. None of the trace elements exceeded state drinking water standards in either well. Neither of the two wells showed evidence of excessive radiochemical contamination.

Crystalline rock aquifers were sampled in the region of Eldora and were found to have generally the same water quality as the unconfined aquifer. In general, water quality in both crystalline and unconfined aquifers is excellent with the possible exception of water contaminated by onsite wastewater systems in and near Eldora. John Drexler of the Laboratory for Environmental and Geological Studies of the Department of Geological Studies, University of Colorado, provided us with an extremely detailed total chemical analysis of water from a well in the confined bedrock aquifer on Klondyke (Appendix 3.1). All values are within EPA guidelines for drinking water, except for values of SO_4— which are about 4 times too high, and high strontium (Sr).

In 2011 water from a well in an unconfined aquifer at the western junction of Klondyke and Eldorado reported the presence of e. coli. The well is about 10 feet from the river, both horizontally and vertically, and the water level was 10-15 feet from the well top. These data suggest a direct connection between the river water and the well water.

3.5.2 Septic Systems

Eldora is a high-risk area for water contamination from septic systems (dense housing, high number of unapproved and aging systems, seasonal high groundwater, proximity to surface water, rocky soil, and private wells for drinking water). Unapproved septic systems have not been reviewed by public health professionals; therefore, there is no guarantee that they were constructed to standards, and thus, they may be more likely to have negative water quality impacts in the long term. At present, Boulder County Public Health offers water bottles to residents for self-testing of well water.

The website, www.SepticSmart.org., describes the process for repairing or verifying septic systems that have not received final approval. If property owners are planning to make improvements to or sell their homes, it will be necessary that they first have an approved septic system. Getting an approved septic system requires a permit from Boulder County Public Health, and the work performed by a licensed installer. Approved and maintained septic systems help maintain clean, healthy water in Boulder County.

3.6 Flood Hazard

In general, hazards due to flooding are minor. Although Boulder has experienced five major floods since 1864, flash flooding is not a serious threat at Eldora, since the town is situated in the upper catchment area of Middle Boulder Creek. At this elevation the total area contributing to discharge is relatively small and the glacier-carved valley relatively broad. As a result, runoff from a precipitation event would be unlikely to create a dangerous quantity of water moving rapidly downvalley except in the case of a truly monumental storm, perhaps a thousand-year event. On balance, it would appear that flooding at Eldora and Nederland is a possible threat, though not a major one in the 100-year time frame.

3.7 Snow Avalanche Hazard

Snow avalanche zones exist in the upper reaches of the Middle Boulder Creek drainage although the hazard is lower than in many other mountain areas of the state. Few well-defined avalanche chutes are present anywhere in the drainage and they pose a large threat of avalanche mostly in the late winter and spring of heavy snow years mainly above timberline. An avalanche occurred probably in the late 1990s above Fourth of July Campground on the slope traversed by the trail to Arapaho Pass. Another occurred more recently at Lost Lake, which resulted in a fatality. The Boulder County Comprehensive Plan rates the hazard as major for the entire Middle Boulder Creek above Hessie. Avalanches pose little or no threat to Eldora because of the substantial tree cover of the steep slopes and high winter winds which usually preclude very deep accumulations of snow. However, the threat could increase if there is a massive die off of trees on the slopes. Homes built above Hessie should take the threat of rockfall, landslide and avalanche into account.

3.8 Recommendations

1. ECA should support and stay involved with existing water quality testing efforts, and may wish to institute its own testing, particularly of well water.

   - Cadmium: this metal was found to exceed standards for aquatic life in Middle Boulder Creek water sampled at Nederland in 1975-76, but not in more recent water quality samples.

   - Nitrates and bacteria (e. coli and coliform): Eldora has a shallow water table and locally high density of septic systems, with leach fields and drinking water wells sharing the same aquifer. Levels of nitrites and nitrates were acceptable in the 1970s, and again in more recent water quality samples. Bacterial contamination was noted in groundwater in the 1970s, although it appeared to be minor. Minor fecal coliform was present Middle Boulder Creek in the 2000 water quality testing. High levels of fecal coliform and e.coli were present in Middle Boulder Creek above and below Eldora in the 2010 water quality testing by River Watch. This situation needs ongoing monitoring and possible explanations for the source, as the amounts of bacteria were higher above Eldora.

   - Possible metal contamination from mine tailings and shafts: Middle Boulder Creek and water wells should be monitored periodically. Most wells in the area are part of the Middle Boulder Creek aquifer; thus, monitoring the creek would automatically monitor the wells. Some wells may be located in stream terrace aquifers that are isolated from the creek.

2. Water appropriations above Eldora, including Highland Mary Ditch, should be researched in order to determine whether significant decrees senior to minimum streamflow decrees still exist and whether these decrees present a threat to the community, being upstream.

4. The City of Boulder owns large exchange rights on Woodland Creek which may, if the city decides to utilize Skyscraper Reservoir in the future, present a threat of heavy seasonal demands on Woodland Creek. The issue merits further investigation.

5. Eldora Mountain Resort may propose to acquire water rights on Middle Boulder Creek for snowmaking. The ski area should be pressed to specify its plans for water withdrawals and present a mitigation scheme to minimize or obviate the need for withdrawals from the creek. Overall, ECA should oppose any proposal from the ski area to use water from Middle Boulder Creek above the community.

4.0 VEGETATION AND SOILS

4.1 Introduction

The Eldora area is located in the montane life zone, grading into the subalpine life zone towards the ridge tops, and is characterized by coniferous forests, aspen forests, meadows, wetlands and riparian communities (see Mutel and Emerick 1984 for discussions of these ecosystems). Field work and review of literature and other available information were undertaken to document and describe plant species and plant communities. Special emphasis was given to documenting riparian areas, other wetlands, and old-growth forests. Field surveys and aerial photographs were used to create the vegetation map and identify potential habitats of significant species and communities. Soils are briefly described in the discussion of each general plant community type, and a soils map is included as Appendix 4.2.

4.2 Historic Ecology

The vegetation in the Colorado Front Range has long been affected by human activities. Artifacts found in excavations above timberline suggest that Paleoindian hunters traveled and camped in the mountains over 11,000 years ago (Stone 1999). It is probable that early occupants of the Front Range influenced the disturbance regime by setting fires (Wright 1978, Higgins 1986). Also, the gathering of plants for food and other resources may have altered the species composition of some locations.

The vegetation of the area has been partially influenced by disturbance from the mining era, particularly from 1890 through around 1910, when Eldora became a gold mine camp. The center of mining activity was located on the north side of Spencer Mountain. This led to the disturbance of the surface and subsurface through the digging of mine adits and shafts, the creation of roads and trails, the cutting of timber, and the introduction of non-native plants. However, the vegetation on Spencer Mountain has recovered from this era, and except for the remains of mine dumps and holes, is within an expected range of natural variability in terms of species composition and structure.

4.2.1 Fire Regime

Fire ecologists are currently recognizing three periods for describing fire history of the Front Range (Veblen *et al*. 1996). The first is the Native American period, which is generally considered the pre-1850s period. Fires were a regular part of the landscape. The time interval between fire events generally increased with increasing elevation, or a change in aspect from south to north facing. Also, the type of fire generally changes from lower-intensity ground fire to higher-intensity crown fire with increasing elevation. Recent research in Front Range place a mean fire-return interval for the Native American period between 40 to 100 years for the upper montane zone and 100 to over 400 years for the subalpine zone (Veblen and Donnegan 2005).

The second period is the non-Native American settlement period from 1850s-1910. This was a time of increased timber cutting and fire impacts to local forests. The mining booms of this period resulted in heavy demands on the timber resources for fuel, mine props, and town construction (Fritz 1933, Kemp 1960). Sawmills were present at Woodland Flats, located several miles west of Eldora, during the mining era. Also during this period catastrophic fires had an equal, if not greater, impact than logging on the forests of the Front Range (Tice 1872, Fossett 1880, Fritz 1933, Wolle 1949, Kemp

1960). Many of these fires were intentionally set by humans so as to better expose the rocks to the observation by prospectors. Though this practice was outlawed in most mining districts, in 1871 in Boulder County there were 51 indictments for illegal fires (Tice 1872).

Early accounts and photographs indicate that Spencer Mountain had burned sometime before the mining boom in Eldora (Kemp 1960). The origin and date of the fire is unknown. Don Kemp and Jack Langley, in their book *Happy Valley* (Kemp and Langley 1945), write, "Tradition states that the forest fires which destroyed the forest growths on Tennessee, Spencer, Ute, and part of Eldorado Mountains, long years ago, were started by Indian hunting parties." Early prospecting parties, which had been visiting the valley since around 1859, might also have been the source.

The best-known fire of the area is the 1901 fire that burned an estimated 70,000 acres and is the largest recorded fire in Boulder County (articles from the *Daily Camera*, September and October, 1901). The fire began on Woodland Mountain, located several miles west of Eldora. Newspaper accounts state the fire began on September 15th. The cause of the fire is uncertain, though it was reported that a careless prospector was the cause and that many in Eldora knew the guilty party but would not say who it was. Westerly winds moved the fire toward Eldora. The fire spread to Guinn and portions of Bryan Mountain. It also spread to the south flank of Chittenden Mountain, burned some of the timber near Jasper Lake, jumped over much of the North Fork, burned up Mineral and Klondike Mountains, and the west part of Eldorado Mountain. It made it to within ½ mile of Eldora. People in town had to deal with heavy smoke; many helped fight the fire while some left with what possessions they could take. Several times the winds shifted from the west to a mild breeze out of the east, which calmed the fire down, but then the strong western winds would reappear and activate the blaze. The fire lasted over two weeks and was eventually put out by rain. Additionally, when the fire got to the top of Mineral and Klondike Mountains, it ran out of fuel in the Caribou area as most of the wood had been cut by miners or destroyed in an 1879 fire near Caribou Hill.

The post-1910 period is viewed as the time of fire suppression. It began in earnest after the devastating fires of 1910 in the northern Rockies (Plummer 1912) and the subsequent designation of the Forest Service's 10 A.M. policy of fire suppression which attempted to put all wildfires out by 10 A.M. of the next day (Pyne 1982).

Fires in the montane zone (the valley bottom and lower south-facing slopes) were primarily partially stand-replacing or stand-replacing in areas dominated by ponderosa pine or Douglas-fir. Fires often did not recur in less than 50 years and sometimes 100 years. These fires were mixed and variable in severity. Fire exclusion during the post-1910 period has had less impact on these forests. These denser stands reflect favorable episodes of tree regeneration that followed widespread stand-replacing fires and logging during the settlement period. Dense post-disturbance stands were an inherent feature of the mid and upper montane zone (Veblen and Donnegan 2005).

Fires in the subalpine zone (most of the north-facing aspect of Spencer Mountain and upper slopes of Eldorado and Mineral mountains) of spruce-fir, aspen and lodgepole pine forests are felt to have been infrequent, high-severity fires. Fires recur at over 100-year intervals. Fire suppression has had little impact on forest structure or fire return intervals. Fire is largely driven by large-scale drought (Veblen and Donnegan 2005). The forests on Spencer Mountain are proceeding through a successional process that began with the undated fire sometime before the mining boom in Eldora. Post-fire forests were dominated by aspen, which are now succeeding largely to Engelmann spruce and subalpine fir.

4.2.2 Adventive Plants

The movement of people and livestock west brought non-native plants into Boulder County (Weber 1995). Sometimes the transplanting was with purpose; often it was inadvertent as the seed was mixed with luggage or livestock. Livestock grazing was common in and around Eldora during the mining era as well as later times. Non-native plants, including several types of hay grass that were promoted by Federal conservation programs in the 20th century, were actively planted throughout western Boulder County as good forage crops for cattle and horses as well as land reclamation.

Adventive plants in the EEPP study area are more common in the settlement and the valley floor, less common on open south-facing hillsides, and least common on steep north-facing hillsides. Adventive plants are more common in meadows, aspen forests and wetland/riparian areas.

4.3 Plant Species

The Eldora area is floristically diverse, with a wide variety of habitats for numerous plant species. Appendix 4.1 lists the 401 plant species known to occur in the study area, with their typical habitats. The list is a composite of results from field work for this study, knowledge of town residents, a study done previously on the east end of Spencer Mountain (Colson 1966), and a study done of Boulder County Open Space lands on Spencer Mountain (Hallock 2010). It is not complete -- certainly more species could be found with more time in the field. Species lists for the adjacent Arapaho Ranch (Buckner 1987) and Eldora Mountain Resort (Pioneer 1993) contain several species that were not observed in this study. This is due in part to the more extensive grasslands on the ranch and its agricultural land use, and the higher elevation of the ski area. However, several of these species probably do occur in the study area.

4.3.1 Rare Plants

A records search for the vicinity of the EEPP study area was conducted of the online Colorado Natural Heritage Program (CNHP) database for threatened, endangered and sensitive plant species and other plants that are of concern due to rarity, declining numbers, or threats to habitat (Colorado Natural Heritage Program 2010a). Only one of these species (*Listera convallarioides,* broad-lipped twayblade) was found in the study area, but a few that have been found elsewhere in Boulder County or nearby could potentially be present (Table 4.1). It would be worthwhile for town residents with botanical interests to be aware of these plants and report on them to CNHP if found.

4.3.3 Other Species of Interest

There are a few species which, although not considered rare enough to be tracked by CNHP, are uncommon enough to be given special protection in the Eldora area. These include the orchids *Calypso bulbosa* (fairy slipper), *Listera cordata* ssp. *nephrophylla* (twayblade), *Lysiella obtusata*, *Coeloglossum viride* (green bog-orchid), *Corallorhiza trifida* (northern coral-root), and *Spiranthes romanzoffiana* (lady's tresses); the fern *Gymnocarpium dryopteris* ssp. *disjunctum* (oakfern); the dogwood *Chamaepericlymenum (Cornus) canadense* (bunchberry, Figure 4.1); and the saxifrage *Mitella stauropetala* (bishop's cap). Almost all these species grow in riparian areas, particularly on undisturbed mossy banks of small streams in shady forests where water flows are constant and with little flooding or erosion. This kind of habitat is often impacted by hiking trails, livestock, and camping, and it is important in the Eldora area to protect these areas as much as possible. An example of this habitat in good condition in the study area is the small stream flowing down east of Lost Lake through a basin known unofficially as Miners' Hollow (see Figure 1.1).

Table 4.1. Potential Rare Plants

Scientific Name	Common Name	Typical Habitat
Botrychium echo	reflected moonwort	Gravelly, rocky or grassy areas
Botrychium hesperium	western moonwort	Same as above
Botrychium lanceolatum	lance-leaved moonwort	Same as above
Cypripedium fasciculatum	purple lady's slipper	shaded slopes under fir trees
Goodyera repens	dwarf rattlesnake-plantain	Shady, moist conifer forest
Juncus vaseyi	Vasey bulrush	Wetlands (known from Lake Eldora)
Ligusticum filicinum	slender-leaf ligusticum	Moist subalpine meadows (found on Bald Mountain)
Lilium philadelphicum	wood lily	Moist aspen groves (found in 1966 by M. Colson)
Listera borealis	northern twayblade	Moist, shady spruce forests
Malaxis brachypoda	white adder's mouth	Mossy, wet streamsides
Mimulus gemmiparus	Weber monkeyflower	Granite cliffs with wet seeps
Pyrola picta	pictureleaf wintergreen	Montane forest in deep shade

Mountain ash (*Sorbus scopulina*, Figure 4.2), which is fairly common in the Eldora area, is significant due to its rarity on the east slope of the Front Range in Colorado (Buckner 1987).

The stand of *Populus balsamifera* (balsam poplar) along Middle Boulder Creek and Eldorado Avenue between 7th and 8th streets is unusual (Figure 4.4). Cooper and Cottrell, in their report on Front Range riparian vegetation, say "*Populus balsamifera* is the dominant plant species on floodplains in the boreal forest [i.e. far northern forests of Canada and Alaska] and most likely the Colorado populations are Pleistocene relicts. For this reason these stands are of considerable interest." (Cooper and Cottrell 1990).

4.3.4 Weeds

Today's ever increasing population, vehicular and foot access into wildlands, construction of new homes and leach fields, improvements to existing homes, and road maintenance, including snow plows, that bring with them soils and seed sources from outside the Eldora area, and a warming climate that allows weeds to prosper. Eldora is experiencing a marked increase in non-native plant species, which spread from the site of introduction into meadows, aspen groves and wetlands, much to the detriment of native plant and animal species. Canada thistle (*Breea arvensis*) is particularly prolific at the

Figure 4.1. Bunchberry

Bunchberry (*Chamaepericlymenum canadense*), an uncommon species growing in the valley. (Photo by Audrey Godell)

Figure 4.2. Mountain Ash

Mountain ash (*Sorbus scopulina*), an uncommon species in the Front Range, shown here on Spencer Mountain. (Photo by Diane J. Brown)

Marysville curve, along the ski area road, at Sixth Street bridge and along East Bryan Avenue. Musk thistle (*Carduus nutans* ssp. *macrolepis*) is present in sunny meadows throughout the town, along the ski area road and the Fourth of July Road and at Hessie townsite. Ox-eye daisy (*Leucanthemum vulgare*), houndstongue (*Cynoglossum officinale*), bouncingbet (*Saponaria officinalis*) and wild caraway (*Carum carvi*) are colonizing roadsides and meadows. Runoff from paved roads supports a cornucopia of weedy non-native plants such as sweet clover (*Melilotus* species) and scentless chamomile (*Matricaria perforate*). Residents sometimes unknowingly transplant invasive species like Dame's rocket (*Hesperis matronalis*), yellow toadflax (*Linaria vulgaris*) and common tansy (*Tanacetum vulgare*) in gardens. The continued spread of these invasive species is a threat to economic, agricultural and environmental values of the lands of the state of Colorado.

4.4 Plant Communities

A plant community is an assemblage of particular plant species that tend to grow together on a site which has the environmental characteristics (e.g. soil type, moisture, amount of sunlight) that all these species require. Plants do not grow at random, but are distributed in a pattern over the landscape (Daubenmire 1968). A given community can therefore be found in widespread locations, wherever the right environment occurs, and its function and dynamics will be similar wherever it occurs.

Plant communities in the study area were checked against the Colorado Natural Heritage Program's list of rare communities, and compared with published community classifications as closely as possible without intensive sampling. They appear to be common types found throughout the Front Range of Colorado as well as other parts of the state. A vegetation map (Fig. 4.3) derived from field surveys and study of aerial photographs, shows the major community types, which are discussed below.

4.4.1 Riparian and Wetland Communities

"Riparian" means associated with flowing water such as streams and rivers. Other wetlands that occur in the mountains include ponds and marshes with standing water. The vegetation of riparian and other wetland areas is of great importance for maintaining water quality, preventing flooding, stabilizing streambanks, and providing wildlife habitat. According to experts in riparian area management (Prichard *et al*. 1998) a riparian-wetland area is considered to be in proper functioning condition when adequate vegetation, landform, or large woody debris is present to:

- Dissipate stream energy associated with high waterflow, thereby reducing erosion and improving water quality;
- Filter sediment, capture bedload, and aid floodplain development;
- Improve flood-water retention and ground-water recharge;
- Develop root masses that stabilize streambanks against cutting action;
- Develop the channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses;
- Support greater biodiversity.

Figure 4.3. Vegetation Map

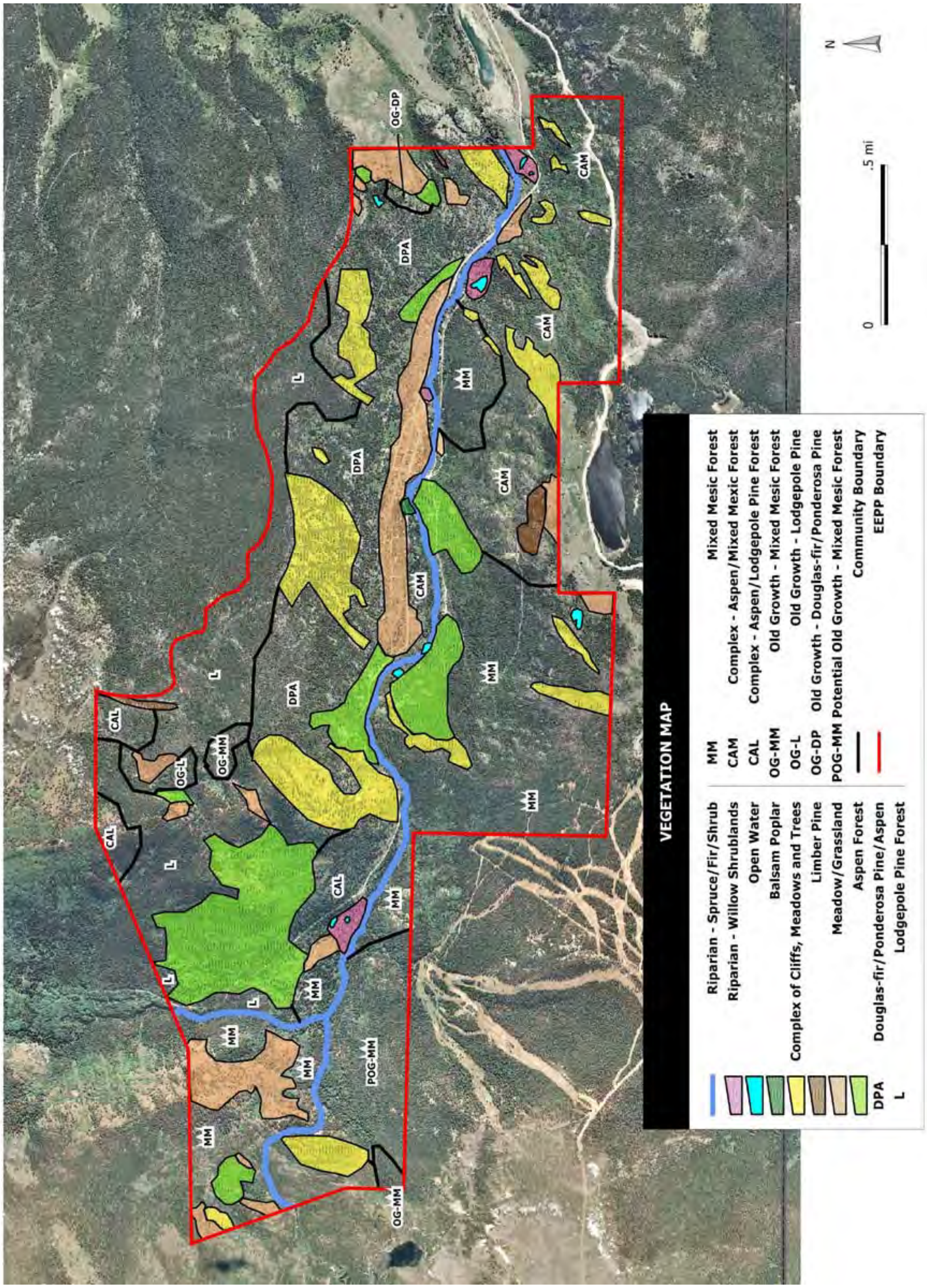


Figure 4.4. Balsam Poplars

A stand of balsam poplar (*Populus balsamifera*) between 7th and 8th streets on Eldorado Avenue. This Pleistocene relict species is uncommon in the Front Range. (Photo by Diane J. Brown)

Figure 4.5. Middle Boulder Creek Riparian Community

The riparian vegetation community along Middle Boulder Creek is dominated by Engelmann spruce, thinleaf alder and drummond willow. (Photo by Diane J. Brown)

Mining activities around the turn of the century had considerable impacts on the riparian zone of Middle Boulder Creek in town. Placer mining disturbed the channel and banks, as did the construction of cabins, roads and bridges. Fortunately, the vegetation has had a chance to recover naturally with mostly native species during the last several decades, and today the riparian zone in town is in fairly good condition. The Lazzarino Bird Sanctuary, located on the north bank of Middle Boulder Creek east of the intersection of Eldorado Avenue and Klondyke Avenue, is an especially high quality riparian area in town, with dense willows, grasses and forbs. However, there are some sections where much of the vegetation has been removed and even rock (riprap) has been brought in to secure the streambanks: in these sections most of the natural functions of the riparian zone have been lost.

The U.S. Fish and Wildlife Service (2010) is the principal Federal agency that provides information to the public on the extent and status of the Nation's wetlands. The agency has developed maps that show wetland habitat. These are developed using a combination of aerial photograph interpretation and field-testing. The maps covering the EEPP study area are found in Appendix 4.3. These indicate that the primary wetlands in the area are either along Middle Boulder Creek or are beaver ponds (which may also be associated with the creek). However, these maps should not be a substitute for field evaluations of each potential wetland. For instance, Columbine Lake on top of Spencer Mountain is mapped by Fish and Wildlife as open water and the perimeter wetland of emergent vegetation is not indicated, though it clearly exists. Additionally, much of Middle Boulder Creek through Eldora is not mapped as a wetland, but it is likely that specific locations, such as the Lazzarino Wildlife Preserve, would meet the criteria of being a wetland.

To qualify as a wetland the site must meet a three part test (U.S. Environmental Protection Agency 2010). First, it must contain soils saturated by surface or ground water during a specific period of the growing season. Hydric soils are those that form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic (lacking oxygen) conditions. Second, the site must exhibit evidence of wetland hydrology. An area has wetland hydrology if it is inundated or saturated to the surface for at least 5% of the growing season in most years. Third, the site must be dominated by hydrophytic vegetation which are those species tolerant of and specially adapted to live in saturated soil conditions. All three factors must be present to classify a site as a wetland.

Often, these conditions are difficult to meet in the arid West. In some cases, the hydrophytic vegetation might be present but either the wetland hydrology is lacking or the soils are too gravely or sandy to qualify as hydric. Although some of our drainages do not possess all three wetland characteristics, they support plants that are more diverse and more robust than surrounding upland sites. These "riparian" sites also support a more diverse group of wildlife species. Approximately 75% of the wildlife species known or likely to occur in Colorado are dependent on riparian areas during all or a portion of their life cycle. This is especially significant when we realize that riparian areas make up less than 1% of the land mass of Colorado (Colorado Division of Wildlife 2010).

4.4.1.1 Description of Communities Present

The band of riparian vegetation along Middle Boulder Creek is dominated by the trees Engelmann spruce (*Picea engelmannii*) with a little subalpine fir (*Abies lasiocarpa*), the shrubs thinleaf alder (*Alnus incana* ssp. *tenuifolia*), swamp honeysuckle (*Distegia involucrata),* and drummond willow (*Salix drummondiana*), and a rich forb understory of cow parsnip (*Heracleum sphondylium*), twisted-stalk (*Streptopus fassetti*), false solomon-seal (*Maianthemum amplexicaule, M. stellatum)*, field horsetail (*Equisetum arvense*), and others (Figure 4.5). This matches William Baker's *Abies lasiocarpa-Picea engelmannii/Alnus incana* ssp. *tenuifolia-Lonicera involucrata-Salix drummondiana* community which he found to be common in a study of riparian vegetation of the Western Slope of Colorado (Baker 1989).

Small tributaries to Middle Boulder Creek, flowing down the steep valley sides, are of two general vegetation types. Some are deeply shaded with Engelmann spruce and subalpine fir and have moist mossy banks with golden ragwort (*Senecio triangularis*), bittercress (*Cardamine cordifolia*), field horsetail, sedge (*Carex disperma*), chiming bells (*Mertensia ciliata*), brook saxifrage (*Micranthes odontoloma*), bishops cap (*Mitella pentandra*), twisted stalk, few-flowered false solomon's seal (*Maianthemum stellatum*), cow parsnip, swamp wintergreen (*Pyrola rotundifolia*), one-sided wintergreen (*Orthilia secunda*), cowbane (*Oxypolis fendleri*), and Canada violet (*Viola scopulorum*) common in the understory. Others are more open and sunny with aspen, alder, drummond willow and bebb willow in the upper canopy and a lush understory of cow parsnip, twisted stalk, swamp wintergreen, one-sided wintergreen, chiming bells, baneberry (*Actaea rubra*), tall coneflower (*Rudbeckia ampla*), fireweed (*Chamerion danielsii*), and lady fern (*Athyrium filix-femina*).

There are several large areas of beaver ponds with associated wetland vegetation of willow shrublands and wet sedge marshes (fens) that are significant in the study area. These areas are dominated by the willows *Salix drummondiana, S. planifolia, S. monticola, S. bebbiana*, and occasional *S. lucida* ssp. *caudata* (Figure 4.6). Other shrubs include alder and swamp honeysuckle. The common understory species are bluejoint reedgrass (*Calamagrostis canadensis*), beaked sedge (*Carex utriculata*), water sedge (*Carex aquatilis*), field horsetail, big-leaved avens (*Geum macrophyllum*), cow parsnip, arctic rush (*Juncus arcticus*), and veronica (*Veronica americana*). The open wet marshes without shrubs are dominated by water sedge, beaked sedge and bluejoint reedgrass. Soils are well-developed, silty and peaty. Water movement is slow due to dense vegetation and almost level ground surface; thus, sediments are deposited rather than washed away, and organic soil builds up over the years from decaying vegetation. This community is probably synonymous with Baker's *Salix drummondiana-S. monticola/Calamagrostis canadensis-Carex rostrata* community (Baker 1989), and is probably included in Cooper and Cottrell's *Salix monticola-Calamagrostis canadensis* Alliance, which is comprised of several related plant associations (Cooper and Cottrell 1990).

These beaver pond-associated communities are dynamic, changing over time due to successional processes. New beaver dams create new ponds, flooding previously vegetated areas, and old dams are breached, draining old ponds which then gradually become colonized by terrestrial plant species--first sedges, and later willows. These willow shrublands, sometimes called willow carrs, are extremely important to wildlife, with very high densities of breeding birds relative to other mountain habitat types, and several species of birds which are found only in this habitat type (Hallock *et al*. 1986).

Numerous mammals, reptiles, amphibians, and insects also are dependent on willow shrublands for many of their needs. Unfortunately, willow shrublands in the Front Range have been shrinking in the last century due to housing developments, reservoir construction, peat mining, and domestic livestock grazing. They comprise only about 1% of Boulder County's land above 8000 ft. (Hallock *et al*. 1986). Therefore, it is especially important to preserve what still remains.

Columbine Lake, the pond between Ute Mountain and Spencer Mountain northwest of Peterson Lake (see Figure 1.1; Figure 4.7), is ringed with beaked sedge, water sedge, bluejoint reedgrass, and some alder, aspen and planeleaf willow. The small pond above the easternmost switchback of the Caribou Road (Forest Service 505) is similar except that instead of planeleaf willow, which grows in very wet soils, it has drummond willow and bebb willow, which grow in rocky or better-drained soils. Most of the pond is vegetated with beaked sedge growing in the shallow water.

4.4.1.2 Soils

A soils map and soils information are included as Appendix 4.2. The USDA Natural Resources Conservation Service (2010) has mapped the soil type Cryaquolls-Gateview complex (6101A) along Middle Boulder Creek from the Arapaho Ranch west to Hessie, and the North Fork of Middle Boulder Creek. Information from the Natural Resources Conservation Service (NRCS) indicates that this soil type is found in floodplains, and on alluvial fans and terraces. The parent material is gravelly alluvium and/or gravelly glaciofluvial deposits derived from igneous and metamorphic rock. Cryaquolls, found in the floodplain, are composed of silt loam. Gateview Family, found on alluvial fans and terraces, is composed of loam to gravelly sandy loam and finally extremely gravelly sandy clay loam.

West of Eldora above Hessie, the soil along South Fork of Middle Boulder Creek is Cryaquolls-Leighcan family, till substratum complex (7103A). It is found in floodplains, and on outwash plains and mountainslopes. The parent material is gravelly glaciofluvial, gravelly till, residuum and/or till derived from igneous and metamorphic rock. Cryaquolls are composed of silt loam while Leighcan Family is composed of cobbly silt loam to extremely stony loamy sand.

4.4.2 Forest Community

During the active mining days of the previous century, most of the forest in the valley was destroyed by fire and logging, except some stands on very rocky areas on Eldorado Mountain (Figure 4.8). Indeed, even before the advent of white settlers to the area, fire was a natural part of Rocky Mountain forest ecosystems, as were insect attack and wind damage. Species composition and age structure of a given forest stand depend on its history of disturbance, both man-caused and natural (Peet 1981). Thus, the present-day forests are undergoing successional processes, and the character of these forests is changing from decade to decade.

A typical successional pattern for Front Range montane forest is as follows: After a fire, aspen and lodgepole pine are the first trees to come in, as they can grow in open sun on bare rocky soil, and the fire's heat opens lodgepole pine cones and releases their seeds. Later, the shade provided by these trees allows more shade-tolerant tree species to grow, and these eventually dominate the stand as they shade out the aspen and lodgepole (Figure 4.9). Lower elevations will be dominated by Douglas-fir, higher elevations by Engelmann spruce and subalpine fir, while limber pine may prevail on very windy rocky sites (Peet 1981).

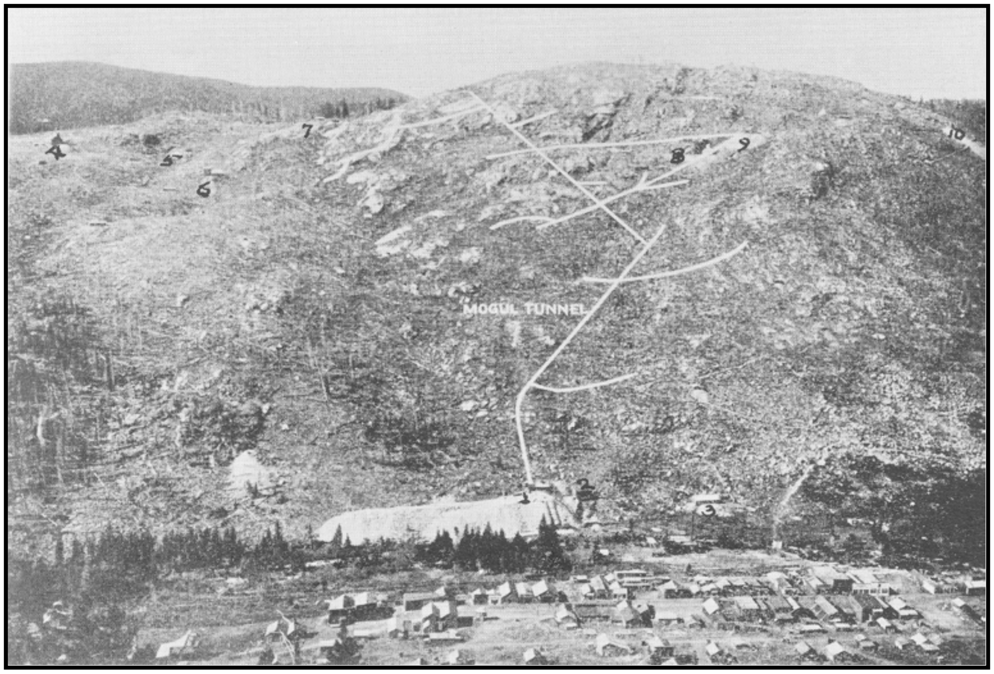
Figure 4.6. Beaver Pond Wetlands

Willow communities dominate broad level sections of the valley floor with beaver ponds. (Photo by Diane J. Brown)

Figure 4.7. Columbine Lake

Columbine Lake, located near the top of Spencer Mountain, is ringed with beaked sedge, water sedge, bluejoint reedgrass, and some alder, aspen and planeleaf willow. (Photo by Diane J. Brown)

Figure 4.8. Spencer Mountain in 1904



Spencer Mountain ca 1904, completely bare of forest due to fire and logging. (Photo from Kemp, D.C., 1960, Silver, Gold and Black Iron.)

Figure 4.9. Forest Succession

An example of forest succession: conifer trees taking over a forest stand historically dominated by aspen on Spencer Mountain. (Photo by Dave Hallock)

4.4.2.1 Description of Communities Present

The south-facing slopes of the valley, on Eldorado Mountain, contain two major forest communities depending on elevation, as described below.

The lower slopes are primarily Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) mixed with aspen (*Populus tremuloides*). All ages of Douglas-fir and ponderosa pine are present, indicating that these species are reproducing themselves and the species composition will remain similar in the future, although Douglas-fir may outcompete ponderosa pine in many areas as it reproduces better in shade. Aspen and a few lodgepole pine (*Pinus contorta*) will persist in openings, but these are early-successional species that usually become shaded out through time. The well developed shrub understory consists mainly of mountain maple (*Acer glabrum*), waxflower (*Jamesia americana*), ground juniper (*Juniperus communis*), kinnikinnik (*Arctostaphylos uva-ursi*), and rose (*Rosa woodsii*). Many stands of very large Douglas-fir and ponderosa pine, up to 30 inches dbh (diameter at breast height), persist on rocky crags on these slopes, where fire and logging activities did not reach them during mining days. Numerous large standing dead trees (snags), probably killed by insects, provide nesting sites for cavity-nesting birds. This forest type was described by Peet (1981) who called it "Foothill *Pseudotsuga*, *Pinus ponderosa* forest".

The upper slopes are covered with dense lodgepole pine, mostly small trees, with a sparse shrub understory of ground juniper and waxflower. For the time being the lodgepole are dense enough to prevent other tree species from growing. Over time, unless the lodgepole is perpetuated by future fires, the canopy will open gradually as old and diseased trees die, and other species will move in--probably Engelmann spruce and subalpine fir on higher, moister or more sheltered slopes; Douglas-fir on lower and drier slopes.

Exposed, rocky, windy ridges are dominated by limber pine (*Pinus flexilis*). This species will persist as the dominant tree in the rockiest and most exposed sites, while Engelmann spruce and subalpine fir may gradually increase in more protected areas.

The north-facing slopes of the valley, on Spencer and Ute mountains, were completely devastated by fire and logging during mining days (Figure 4.8). As a result, the present-day forest is young and contains large amounts of aspen. The conifer trees are gradually taking over and are mostly Engelmann spruce and subalpine fir, with some Douglas-fir and lodgepole pine at the lower elevations (Figure 4.10). The forest is presently dense, but will open up over the coming decades as some trees die. The dense shrub and forb understory is dominated by rattlesnake-plantain (*Goodyera oblongifolia*), twinflower (*Linnaea borealis*), buffalo-berry (*Shepherdia canadensis*), one-sided wintergreen, heart-leaved arnica (*Arnica cordifolia*), and blueberry (*Vaccinium myrtillus*), and also contains mountain maple, ninebark (*Physocarpus monogynus*), columbine (*Aquilegia coerulea*), bedstraw (*Galium septentrionale, G. triflorum*), and pipsissewa (*Chimaphila umbellata*). Soils are poorly developed and thin over the rocky substrate. This community type matches extremely well Peet's (1981) description of "Mixed Mesic Forest", of which he says: "After a disturbance such as fire, simultaneous establishment of *Populus tremuloides, Abies lasiocarpa, Pinus contorta, Picea engelmannii, Pseudotsuga menziesii*, and *Alnus tenuifolia* can occur, thus leading to high tree diversity. This wealth of tree species precludes description of any simple pattern of forest development. The steady-state forest can be composed of *Pseudotsuga* or *Picea*, *Abies* or a mixture depending on the site. *Pseudotsuga* can act as both a pioneer and climax species. Total understory cover is 50% but 30% of the total represents coniferous regeneration and another 30% Ericaceous shrubs, mostly *Vaccinium myrtillus*....*Linnaea borealis* is important as are *Rosa* and *Juniperus communis....Pyrola secunda* and *Goodyera oblongifolia* [are] characteristic."

4.4.2.2 Soils

In general, soils of the forest communities and mountainsides of the Eldora area are well-drained; water erosion hazard would only be high if vegetation were removed (Appendix 4.2).

The soils of the south-facing slopes of Eldorado and Mineral Mountains above town are dominated by Catamount family-Rubble land-Bullwark family complex (4758D). These soils are also present on the south and east slopes of Chittenden Mountain. This is a very stony to cobbly soil type of steep slopes (40% to 150%) with mixed conifers and nearly vertical escarpments of gneiss and schist. Its texture is typically very gravelly sandy loam, and it may be deep or shallow over bedrock. It is well-drained but has low water capacity, which combined with the steepness gives it a high water erosion hazard.

The Leighcan-Catamount families, moist-Rock outcrop complex (7757D) covers a large part of the study area--the north-facing slopes of Spencer and Ute Mountains as well as the northwest flank of Mineral Mountain. The setting of this soil type is 40% to 150% slopes on mountainsides, generally in the spruce-fir zone, though portions are currently vegetated with aspen due to historic fires. It develops from colluvium (talus and other rock material that is gradually moving downslope due to gravity). Its texture is very gravelly sandy loam or very gravelly loamy coarse sand over bedrock, and it can include talus slopes and bedrock outcrops. Leighcan-Catamount families, moist complex (7755B) is found on the very top of Eldorado and Mineral mountains. It occupies flatter and higher sites than the previous soil type and has lodgepole pine as the dominant forest type instead of spruce-fir, which occurs on the north-facing slopes.

Part of the north-facing slope of Bryan Mountain consists of Leighcan family soil (7700C) that occurs on cold (north-facing) slopes. Lower on Bryan Mountain as well as across the valley on the lower slopes of Chittenden Mountain is Leighcan family, till substratum (7201B). It is found on glacial moraines. Both these soils types have a texture of very cobbly silt loam to extremely stony loamy sand. Spruce-fir is the dominant forest type.

The east slopes and east- to south-facing aspects of Eldorado and Spencer mountains consist of Cypher-Wetmore-Ratake families complex, on slopes of 5% to 40% (2717B) and Ratake-Cathedral families-Rock outcrop complex, on slopes 40% to 150% (2705D). The texture of these soils is gravelly sandy loam. Open conifer woodlands with grass and shrub understories are present on these soils.

4.4.2.3 Forestry and Forest Pathogens

Early accounts and photographs indicate that Spencer Mountain had burned sometime before the mining boom in Eldora (Kemp 1960). The origin and date of the fire is unknown. Don Kemp and Jack Langley, in their book *Happy Valley* (Kemp and Langley 1945), write, “Tradition states that the forest fires which destroyed the forest growths on Tennessee, Spencer, Ute, and part of Eldorado Mountains, long years ago, were started by Indian hunting parties.” Early prospecting parties, which had been visiting the valley since around 1859, might also have been the source. Much of the burned timber as well as stands of the remaining living timber was cut for the mines and homes of Eldora. For the most part, much of the north-facing slope of Spencer Mountain was devoid of any living trees by 1900.

During the 1980s a western spruce budworm *(Choristoneura occidentalis)* epidemic caused mortality to many of the Douglas-fir trees in the Front Range. Dead Douglas-fir trees, killed during this epidemic, are found throughout the study area; many have been blown over by strong winter winds.

Currently, a mountain pine beetle (*Dendroctonus ponderosa*) epidemic is impacting lodgepole pine and limber pine trees throughout the West. Its presence in the study area, particularly on Spencer Mountain, began about four years ago. It appears to be initially attacking limber pine where present, and then moving on to lodgepole pine. Ponderosa pine is also being attacked.

4.4.2.4 Old Growth Forests

The definition of old-growth forest developed for the Arapaho and Roosevelt National Forests describes tree size and forest structure characteristics of old growth. It is not a rigid, either/or definition. The USDA (1990) notes "All of the characteristics listed below are seldom found in individual old growth stands. The more conditions met, the better the quality of old growth habitat. Therefore, there are degrees of old growth habitat quality ranging from excellent to marginal.

The old growth characteristics for coniferous forests include the following:

- Presence of at least 15 large live trees per acre (diameter varies by species)
- Presence of at least 2 large snags and 3 large dead fallen trees per acre (diameter varies by species)
- Presence of multi-storied canopy
- Overhead canopy closure greater than 20%
- Presence of large, old, declining live trees
- Presence of more than one tree species
- Presence of small openings with grasses, forbs or shrubs
- Presence of seedlings, saplings, or poles
- Little or no evidence of logging
- Little or no evidence of fire, insect or wind disturbance

An inventory was conducted in 1990 and 1991 by the Arapaho and Roosevelt National Forests to locate and assess all stands of old-growth forest (Lowry 1992). Only one stand was identified in the study area, on the northeast-facing slope of Bryan Mountain between Lost Lake and Hessie; this stand was considered to be "near old growth", meaning a mature stand with potential to become old growth within 100 years. While conducting field work for this study (LREP, Inc. 1994), several small stands of forest were found (described below) that are believed to have enough of the above characteristics to be considered fair to good old growth (See vegetation map, Figure 4.3).

As mentioned in the previous section, several stands of large Douglas-fir and ponderosa pine persist on steep rocky areas on south-facing slopes of Eldorado and Mineral Mountain. These have numerous snags and fallen dead trees, which are probably due to insect infestations. The canopy closure is generally less than 20%. One of these stands, a small area but containing impressively large trees, is located at the switchback on Caribou Road at the east end of the study area (Figure 4.11; also see Figure 4.3).

Figure 4.10. Spencer Mountain

North-facing slope of Spencer Mountain with mix of aspen and conifer forest. Engelmann spruce, subalpine fir, and Douglas-fir are gradually replacing the aspen. (Photo by Dave Hallock)

Figure 4.11. Old Growth

Old-growth ponderosa pine and Douglas-fir stand at the switchback on the Caribou Road at the east end of the study area. (Photo by Diane J. Brown)

A small stand of Engelmann spruce-subalpine fir forest in Miners' Hollow, 1/4 mile east of Lost Lake (see Figure 1.1), is fairly good quality old growth, with numerous large live and dead trees, a canopy closure of well over 20% but with some openings, and presence of seedlings and saplings. The area shows evidence of past logging, but has much coarse woody debris left, and organic soils at least 1 ft deep. This stand is contained in the "near old growth" unit identified by the Forest Service on Bryan Mountain.

Engelmann spruce-subalpine fir forest in the upper part of Miser Gulch, the large south-facing drainage just west of town (see Figure 1.1), has large-diameter trees, snags and deadfall.

The Engelmann spruce-subalpine fir forest along Middle Boulder Creek at Hessie has numerous large live trees (spruce up to 30" diameter-at-breast-height, fir up to 18"), and some snags and down dead logs. The overall canopy closure is dense and there are some openings. However, this area has been heavily impacted by past logging and recent camping activities.

A stand of lodgepole pine near the upper end of Miser Gulch fits several of the characteristics of old growth, having numerous large-diameter trees (some 24", many per acre over 10"), a fairly dense average canopy cover but several openings with herbaceous vegetation, presence of more than one tree species, and presence of seedlings and saplings. However, it has few standing or down dead trees. Engelmann spruce and subalpine fir are present in the stand and will probably eventually dominate it.

4.4.3 Grassland and Meadow Communities

Grasslands and meadows are small and mainly limited to the residential areas, rocky forest openings on the valley sides and the south-facing slopes of Spencer Mountain. They are also present at Hessie and on the east end of the study area just before the Arapaho Ranch.

4.4.3.1 Description of Communities Present

Typical grasses include Thurber fescue (*Festuca thurberi*) (Figure 4.12), mountain muhly (*Muhlenbergia montana*), needlegrass (*Stipa nelsonii*), needle-and-thread grass (*Stipa comata*), Agassiz bluegrass (*Poa agassizensis*), Canada bluegrass (*Poa compressa*), timber oatgrass (*Danthonia intermedia*), and Parry oatgrass (*Danthonia parryi*). Typical forbs include golden banner (*Thermopsis divaricarpa*), butterweed (*Senecio integerrimus*), milkvetch (*Astragalus flexuosus*), penstemon (*Penstemon virens*), wild buckwheat (*Eriogonum umbellatum*), geyer onion (*Allium geyeri*), aspen daisy (*Erigeron speciosus*), and scarlet paintbrush (*Castilleja miniata*).

4.4.3.2 Soils

Areas dominated by grass and forb meadows have Rogert family (6731C) and Pachic Argiustolls (2101B). Small meadows may also have Cryaquolls-Gateview complex soils along Middle Boulder Creek. These are mostly very gravelly sandy loam over very cobbly sandy clay loam, either shallow or deep to gneiss bedrock, which crops out in places. These are well drained soils with slight runoff and water erosion hazard.

Figure 4.12. Grassland Community

Thurber Fescue (*Festuca thurberi*) on the south slope of Spencer Mountain. (Photo by Diane J. Brown)

4.4.4 Potential Conservation Areas for Plant Communities and Rare Plants

The Colorado Natural Heritage Program (CNHP) recently completed an inventory of critical biological resources in Boulder County (Neid *et al*. 2009). The objective was to inventory and prioritize specific areas for conservation efforts through the delineation of Potential Conservation Areas (PCAs) (Figure 5.9). The goal of a PCA is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence (a rare plant or animal) depends for its continued existence. The best available knowledge about each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; vegetative cover, and current and potential land uses. In developing the boundaries of a PCA, scientists consider a number of factors that include, but are not limited to:

- ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the PCA and surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater;
- land intended to buffer the PCA against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

The PCA boundaries do not confer any regulatory protection, nor do they automatically recommend exclusion of all activity. It is hypothesized that some activities will prove degrading to the ecological processes while others will not. The boundaries represent the best professional estimate of the primary area supporting the long-term survival of the targeted species or plant communities and are presented for planning purposes.

One PCA that is primarily based on plant communities or rare plants is partially within the EEPP study area and two are nearby (Figure 5.9). Several other PCAs are primarily based on animal species and are described in Section 5 of this report. More information about the PCAs can be found in Appendix 4.4.

Middle Boulder Creek PCA supports an occurrence of the globally vulnerable and state rare Parry's oatgrass (*Danthonia parryi*) montane grassland, and an occurrence of the globally vulnerable and state critically imperiled sedge (*Carex oreocharis*). These occurrences are on the Arapaho Ranch. The boundary of the PCA includes the occurrences, adjacent potential habitat and the local mosaic of plant communities. The buffer includes a portion of Marysville north of County Road 130 that is within the EEPP study area.

Caribou Townsite PCA supports occurrences of the globally secure and state critically imperiled Mingan's moonwort (*Botrychium minganense*), the globally secure and state imperiled western moonwort (*Botrychium hesperium*), the globally vulnerable and state imperiled pale moonwort (*Botrychium pallidum*), the globally vulnerable and state rare reflected moonwort (*Botrychium echo*), the globally secure and state critically imperiled Parry's crazyweed (*Oxytropis parryi*), and the globally secure and state critically imperiled Rocky Mountain arctic jutta butterfly (*Oeneis jutta reducta*). The boundary includes the occurrences and the immediate watershed.

Chittenden Mountain PCA supports an occurrence of the globally vulnerable and state rare Thurber's fescue (*Festuca thurberi*) montane grassland. The boundary contains a landscape mosaic of spruce-fir forest, aspen stands and grassland meadows that contain element occurrences and adjacent suitable habitat.

It is also noted that the south-facing aspect of Spencer Mountain, overlooking Peterson Lake, contains sizeable patches of Thurber's fescue montane grassland (Hallock 2010). Thurber fescue is an abundant grass in these meadows, growing over 3 feet in height during the growing season. There are few nonnative grasses.

4.5 Recommendations

1. Search for and document rare plant species noted in Table 4.1 that could potentially occur in the Eldora area.

2. Monitor known rare plant populations every five to ten years.

3. Monitor the Colorado Natural Heritage Program's lists of rare plant species and communities to keep up-to-date on possibly changing status of those found in the Eldora area.

4. ECA's Noxious Weed Committee should continue its efforts to control the establishment and spread of noxious weeds in the community and surrounding areas, as well as educating and working with local residents.

5. Protect riparian plant communities that border Middle Boulder Creek and ponds. The willow shrublands surrounding ponds and the narrow bank of Engelmann spruce-subalpine fir/alder-drummond willow that lines Middle Boulder Creek (see

vegetation map, Figure 4.3) should be recognized as important plant communities. High priority could be given to the relatively large willow shrubland/beaver pond complexes just east of the Hessie meadow, west of Marysville Road on the south side of County Road 130, and east of Marysville Road on the north side of County Road 130. Activities such as road maintenance, trail construction, livestock grazing, peat mining, or home-building that could destroy vegetation in any riparian area or cause soil compaction, erosion, or other impacts, should be restricted.

6. Develop a program to protect, and where appropriate restore, riparian areas and wetlands along Middle Boulder Creek. Such a program could include the use of conservation easements through donation, purchase or sale of development credits, and the encouragement of revegetation.

7. The balsam poplar (*Populus balsamifera*) stand located along Middle Boulder Creek and Eldorado Ave. between 7th and 8th streets should be protected from activities that would damage the trees or the understory vegetation.

8. Protect old-growth and potential (within 100 years) old-growth forest stands. These stands, which are shown on the vegetation map, Figure 4.3, should not be subject to Forest Service management prescriptions which would involve cutting of trees or other significant impacts to vegetation or soil.

5.0 WILDLIFE RESOURCES

5.1 Introduction

The Eldora area is located in the montane life zone, grading into the subalpine life zone towards the ridge tops, and is characterized by coniferous forests, aspen forests, meadows, wetlands and riparian communities (see Mutel and Emerick 1984 for discussions of these ecosystems). These habitats are home to a wide variety of wildlife, both resident and migratory. The Eldora area was rich in wildlife in prehistoric times, a fact attested to by the remains of Indian hunting camps, game drives and arrowheads from Sulphide Flats up to Arapaho Pass (Benedict 1985, Kemp 1960). Early settlers in Colorado noted a variety of wildlife in the area and exploited the fauna to the extent of extirpating many of the large mammalian and predator species in the process. Widespread logging accompanied the initial wave of settlers and miners, removing much of the old-growth forests (Kemp 1960). In recent decades, the increasing human population, road construction, and recreational use have adversely impacted many wildlife species. Regional and global environmental degradation may also be adversely impacting the fauna of the Eldora area, particularly birds and amphibians (Ehrlich *et al*. 1992, Hammerson 1999).

5.1.1 Historic Ecology

Since Euro-American settlement of the Eldora area, several animal species, some of them major faunal components of the pre-settlement landscape, have been lost. Others have been reduced in number. Still others have been introduced or have prospered from the increasing presence of humans.

One species of large ungulate that used the area has been lost. Bighorn sheep (*Ovis canadensis*) were present in pre-settlement times and were commonly seen in Boulder Canyon (Buchholtz 1983). They were eliminated from the county due to disease and over-hunting in the early part of the 20th century. They were reintroduced into the North St. Vrain drainage in Boulder County where a small population still persists. Some are occasionally seen throughout the mountains of Boulder County; two young rams were seen just above Eldora on the jeep road to Caribou several years ago.

Bison (*Bison bison*) were once present on the plains (Long 1988), and have since been locally extirpated. How much they utilized subalpine and montane ecosystems in Boulder County is unknown, and there is no reliable archaeological evidence to suggest that they consistently used the Front Range mountains in Colorado during prehistoric times (Benedict 1999).

Some carnivores that utilized the Eldora area were eliminated from the landscape. Generally, those that have been extirpated were perceived as threats or competed for resources with humans. These included gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos*), and river otter (*Lutra canadensis*). Wolverine (*Gulo gulo*) has not been confirmed in Boulder County for a long time. Lynx (*Felis canadensis*) have recently been reintroduced into Colorado and individuals have been documented in western Boulder County.

Elk (*Cervus elaphus*) were eliminated from the county, but through reintroduction have repopulated. During pre-settlement they were common on the plains and mountains. They were virtually eliminated from the county by the end of the 19th century due to over-hunting but were reintroduced from 1913 to 1917 with animals brought in from the Yellowstone National Park region (Thomas and Toweill 1982). Their current numbers in Boulder County are probably between 2,000 and 3,000. A herd of approximately 300 animals use the Eldora area as transitional range and a movement corridor (Hallock 1991).

For other groups of animals, the impact of Euro-American settlement can be seen in community shifts. Avian populations have seen community shifts toward those species that can take advantage of greater human influences to the landscape along with the decline of other species. Mid-sized mammals, such as the introduced house cat, domestic dog, and fox squirrel (*Sciurus niger*), and some native animals such as raccoon (*Procyon lotor*), are increasing in number as they take advantage of current landscape changes, and have the potential of causing significant adverse effects to many native animals.

5.2 Mammals

Approximately 58 species of mammal could call the Eldora area home (Appendix 5.1). This represents about 60% of all mammal species found in the county. Forty mammal species have been documented. The most common mammal is probably the deer mouse, often seen in our cabins. Other common ground dwelling rodents include several chipmunk species (*Tamias* sp.) (least (*T. minimus*) and Uinta (*T. umbrinus*)) and golden-mantled ground squirrel (*Spermophilus lateralis*). Pine squirrels (*Tamiasiurus hudsonicus*) are common. Mountain lion (*Felis concolor*), black bear (*Ursus americanus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), and red fox (*Vulpes vulpes*) are regularly seen. The most common ungulates are elk, moose (*Alces alces*) and mule deer (*Odocoileus hemionus*).

5.2.1 Natural Diversity Information Source

The Natural Diversity Information Source (NDIS) is the primary state level source of data and analysis used for decisions on land-use affecting Colorado's wildlife. The lead agencies for NDIS are the Colorado Division of Wildlife, the Colorado Natural Heritage Program, Colorado Department of Natural Resources, Colorado State University, and local governments. The NDIS information included herein was current as of January 2010.

The primary NDIS data sources used for this section of the report came from the Wildlife Resource Information System (WRIS), the Boulder County wildlife species list, federal and state listed endangered and threatened species, State of Colorado listed Species of Special Concern, and the Colorado Natural Heritage Program.

5.2.2 WRIS Wildlife Habitat Maps

Wildlife Resource Information System (WRIS) maps indicates the ranges and activity areas of various wildlife species, particularly wide-ranging species and big game animals. A number of the species congregate in herds, where specific geographic areas may be important for a large number of animals. The maps, where applicable, depict overall, winter and summer ranges, and other activity areas of importance, including concentration and production areas and migration corridors. The WRIS database was searched for species with mapped ranges and activity areas occurring on or near the study area with the selected results displayed in Table 5.1 (NDIS 2010).

Table 5.1. WRIS Wildlife Ranges and Activity Areas

Wildlife Species	***Habitat***
Black Bear (*Ursus americanus*)	Overall Range
Mountain Lion (*Felis concolor*)	Overall Range
American Elk (*Cervus elaphus*)	Overall Range Movement Corridor
Mule Deer (*Odocoileus hemionus*)	Overall Range Summer Range

5.2.2.1 American Elk

Elk were the subject of a study by Hallock and Reddinger in 1988-1990 (Hallock 1991), assisted by the Colorado Division of Wildlife (CDOW) and paid for by the Lake Eldora Ski Company (LESC), with additional support from the Boulder County Nature Association, Boulder County Audubon Society, and Indian Peaks Group of the Sierra Club.

In response to planned expansion at the Eldora Ski Area, the study was designed to

1) "ascertain information about the geographic locations used by elk as their total range and all key subparts - winter and summer range as well as calving grounds, concentration areas and movement corridors;

2) know general dates for elk being on certain range or making key movements; and

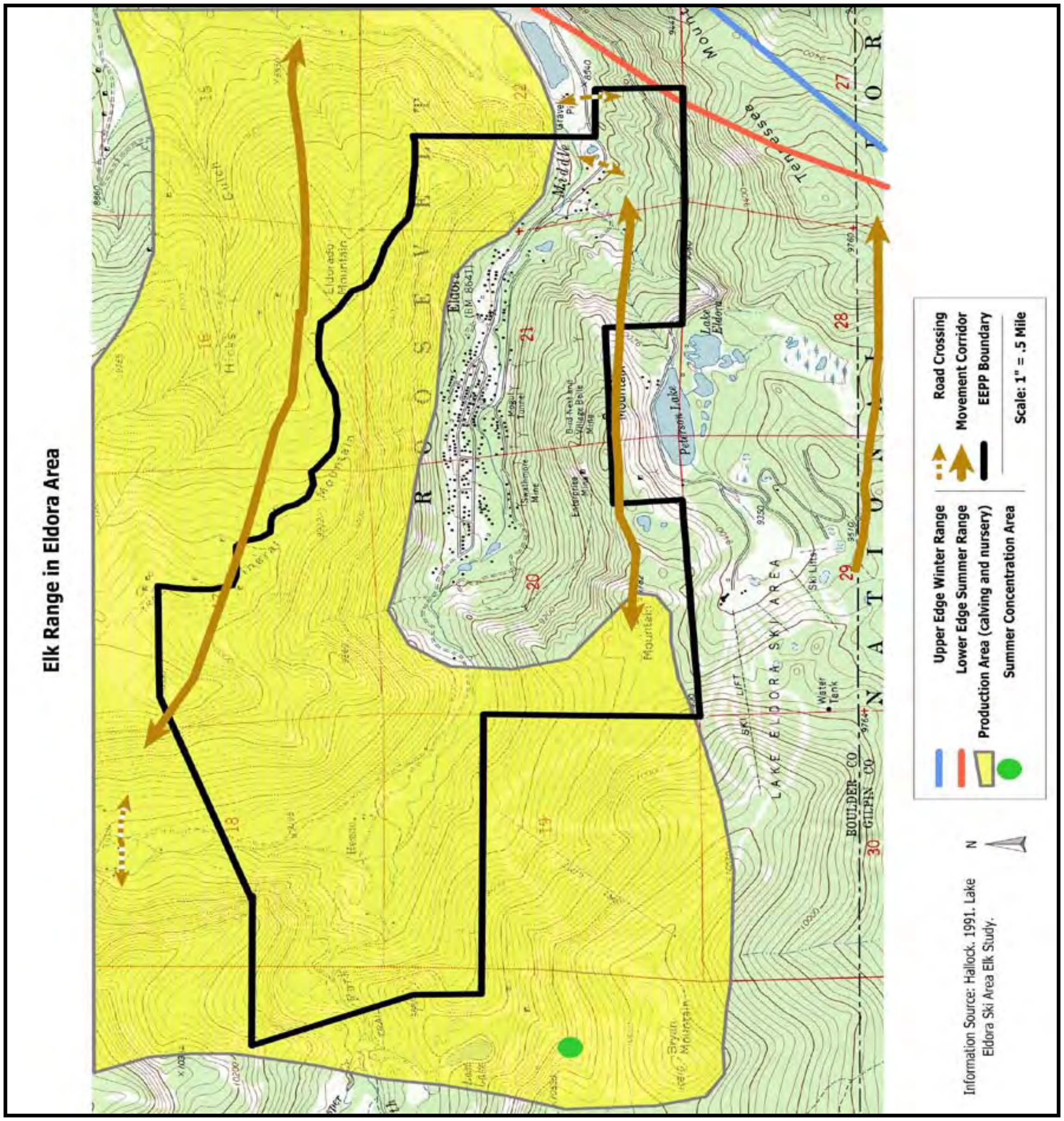
3) establish how the land used by the ski area fit into the spatial and temporal patterns of local elk."

Figure 5.1 shows elk usage of the Eldora area. The study found that the Winiger Ridge herd, named for the geographic location of the primary critical winter range, could be divided into two groups, named the Tolland Valley and Arapaho Ranch Herds, based on their use of calving areas and transition range. The Arapaho Ranch herd is of importance to the EEPP study area. The two herds intermingle on winter range at Winiger Ridge. High counts for each herd were obtained on the same day in 1988: 200 for the Arapaho Ranch Herd and 70 for the Tolland Valley Herd. These numbers increased during the 1990s and stabilized or slightly declined from 2000-2010.

The summer range for the Arapaho Ranch Herd is centered on Woodland, Chittenden and Bryan Mountains, including the western portion of the EEPP study area. The Tolland Ranch Herd is centered somewhere in the vicinity of South Boulder Creek above East Portal. The Arapaho Ranch Herd moves to summer range along Eldorado/Mineral Mountains or Spencer/Ute Mountains.

Both herds move down to transitional range at Arapaho Ranch and Los Lagos Reservoir, three miles south of Nederland, and then farther east to lower elevation winter range at Winiger Ridge in response to heavy snowfall events, typically in November and December. Some elk pass through the ski area during this migration. In the winter, some elk remain in the Buckeye Mountain and Tennessee Mountain areas.

Figure 5.1. Elk Range in the Eldora Area



The Arapaho Ranch Herd uses a large part of the Middle Boulder Creek drainage, from Arapaho Ranch westward, for calving. Confirmed sites are on Arapaho Ranch and at Grand Island, north of Hessie. The Ute/Bryan Mountain area and the west flank of Mineral Mountain are also candidates for calving areas, based on indirect evidence. Some historical data point to the use of the Tennessee Mountain/Buckeye Mountain area for calving although the study was unable to confirm this. Primary areas for calving are aspen benches.

The Eldora Mountain Resort is utilized by both herds of elk, mostly during the summer and during movement between ranges. A movement corridor from Spencer west to Ute and Bryan Mountains is used by part of the Arapaho Ranch Herd. The area from Ute Mountain west to Bryan Mountain is part of the area where elk are present during the calving season. Though direct evidence for calving in this area is lacking, it may be used as a nursery, based on sightings of calves in the area. A portion of the Zarlengo Property (leased to the ski area) is in the calving area of the Tolland Herd. The entire ski area is part of the summer range of both herds and there is some use of the area by elk during fall movement (November). Some of the cross-country ski trails near Tennessee Mountain Cabin are on the western edge of (mild) winter range.

Sightings since the 1990 study have not indicated significant changes to spatial use or movement patterns in and around the EEPP study area (Hallock, personal information).

5.2.2.2 Black Bear

Despite the absence of bears from any list of sensitive species, bears on the east slope of the Front Range from Indian Peaks north should be considered a species of concern. McCutchen, working in Rocky Mountain National Park (RMNP) from 1986 through 1992, established that only nine bears (including cubs) inhabited an area of 90,000 acres east of the Continental Divide within the park, a density of one bear per 9.7 square miles of suitable habitat (McCutchen 1993). No adult males were found east of the Divide; only two adult females were identified. Bears did not reproduce until they were about 7 years old and the litter size averaged 1.7 cubs. The survival rate of cubs to the age of one year was 43%. The reproductive success of black bears in RMNP is among the lowest on record in North America. Although McCutchen believes the overall park population of 30 to 35 bears is slowly expanding, the loss of only two or three adult females would put the population onto a downward trend. He describes the park population "at risk" due to:

- human occupation of historic bear habitat and travel corridors along and outside the eastern edge of RMNP. Towns, summer homes, golf courses and other development have forced the bears into marginal subalpine habitat.

- During the course of the study, no male bears on the east side of the park lived to adulthood, principally due to human predation. Hunting pressure has been reduced by the CDOW since 1986 in recognition of this fact.

- Large areas of the park itself are functionally off-limits to the bears due to human disturbance at trails, roads and facilities. Many of the most important bear habitats (such as aspen groves and riparian areas), are most heavily used by humans.

- the historic policy of fire suppression in the park has reduced the vegetative diversity of the park and reduced the carrying capacity for bears. The park is developing a fire management program which will include prescribed burning designed to improve the carrying capacity for a number of species.

These conditions exist in the Eldora area as well. Although the CDOW believes black bear to be common on the east slope of the Front Range, population densities in the Eldora area are likely similar to RMNP densities and should be correspondingly vulnerable. Black bears may use north-facing slopes above 9000 feet in elevation for denning purposes. Such slopes exist in the drainage above Hessie and on the north side of Bryan Mountain.

5.2.2.3 Mule Deer
Mule deer are habitat generalists, occupying any habitat which provides adequate browse. Typically they do not compete with elk for forage, but will feed on grasses if abundant, in addition to their usual diet of shrubs, other woody vegetation and mountain residents' gardens (Fitzgerald *et al*. 1994). Mule deer prefer "edge" habitat, thus allowing them to benefit from anthropogenic (human-caused) disturbance. Mule deer are common in the Eldora area in the summer and fall, moving to lower elevations in the winter. Mountain lions, coyotes and packs of domestic dogs prey upon mule deer.

5.2.2.4 Mountain Lion
Mountain lions are occasionally seen in and around Eldora from spring through fall. While lions tend to be secretive and prefer secluded areas, there has been an increase in encounters with humans over the past two decades that has warranted considerable media attention. Lions are found throughout the mountains, and occasionally the plains, but favor where deer, their favorite prey, are most plentiful (Fitzgerald *et al.* 1994). In Boulder County they are more common at elevations lower than Nederland, but are present here in the summer when deer return, and may be found at other times as they have taken a liking to other food sources, including raccoons, house cats and domestic dogs. Elk can also be prey, and in some places make up almost a quarter of their diet.

The Colorado Division of Wildlife began studying mountain lions between Lyons and Evergreen west to the Continental Divide (which includes Eldora) in 2007 (Mat Alldredge, Colorado Division of Wildlife, personal communication). With the help of Boulder and Jefferson counties and the City of Boulder, they are putting radio-collars on as many lions as they can to learn more about how they move around and use a fragmented landscape like the northern Front Range. A lion’s territory is quite large, with females averaging around 40 square miles and males averaging five times that amount. While lions tend to favor secluded areas, the sheer size of their territory and the fragmented nature of the landscape imply that homes and roads will be within their range and they will come around humans on occasion, particularly when following prey. Of the 50 lions worked with so far on the project only 16 were still living by March of 2010. The remainder had died, primarily by being shot or hit by a car. The high mortality rate of lions can lead to an unstable social structure. The project will continue for an additional 3 years.

5.2.2.5 Moose
Moose are the largest ungulates found in the study area. Historically, moose were occasional visitors to Colorado, apparent stragglers that wandered into the northern part of the state from Utah or Wyoming (Armstrong 1972). They were introduced into Colorado by the Division of Wildlife in 1978 in North Park. Some wandered over the Continental Divide in the mid- to late-1980s and now there is a growing breeding population in western Boulder County.

Moose are less social than other ungulates (Fitzgerald *et al.* 1994). They are reclusive and have strong attachments to specific home ranges, although some populations make seasonal migrations and many individuals will wander considerable distances in search of suitable new habitat. Deep snow appears to trigger most movements in fall and winter although they can paw through up to 18 inches of snow in search of forage.

For food, moose require a plentiful supply of browse. Typical moose range in the Rocky Mountains includes a mixture of willow, spruce, fir, aspen, or birch. Willows are a winter staple.

Locally, the Arapaho Ranch appears to be a concentration area for moose, having an abundance of wetlands with willow and birch. In 2009 there were an estimated 8-9 moose on the ranch (Doug Gibney, Arapaho Ranch caretaker, personal communication). Moose are frequently seen in and around Eldora, particularly along Middle Boulder Creek and in Marysville Gulch. Beaver ponds, wetlands and riparian areas are favored sites. A significant moose movement corridor across County Road 130 exists at Marysville (Greg Massey, former Marysville resident, personal communication). During the winter moose have been staying at the Arapaho Ranch. They have also been reported to stay near the entrance to the City of Boulder Watershed along the Rainbow Lakes Road during winter, indicating they can stay quite high in elevation in fairly deep snow (Craig Skeie, City of Boulder Watershed Caretaker, personal communication).

5.2.2.6 Beaver

Beaver (*Castor canadensis*) are the largest rodent in North America (Fitzgerald *et al.* 1994). They are semiaquatic mammals, constructing complex dams, lodges, and canal systems in order to minimize time spent on land foraging for food. They are common in areas with abundant aspen or willow especially in broad glacial valleys with low stream gradient.

Beaver are largely responsible for creating and maintaining ponds and willow shrublands, which provide extremely important habitat for a wide variety of animal species. Densities of breeding birds in willow shrublands, or carrs, are very high relative to other mountain habitat types, and several species of birds are found only in this habitat type (Hallock *et al.* 1986).

Beaver colonies are present along Middle Boulder Creek from Nederland west into the Indian Peaks Wilderness. Colonies are active in Woodland Flats, up the North Fork, at Hessie, directly in and around Eldora at several locations, and on the Arapaho Ranch (Hallock, personal information). Population levels have varied over the years. Currently the population appears to have recently expanded.

Historically there has been a beaver population associated with Peterson Lake, Lake Eldora and Buckeye Basin and lodges were present at all three sites. In the early 1990s beaver disappeared from Peterson Lake as there were no longer any sightings and the lodge started to decay. As of 2010 the lodge is fully decayed and no longer visible. In the late 1990s and early 2000s the beaver colony on Lake Eldora also disappeared. It is also questionable if there is currently an active colony in Buckeye Basin as the pond on the north end of the basin has disappeared. Beaver and their signs (such as the cutting of aspen trees) are still found in the area but at a much reduced level. The disappearances from Peterson Lake and Lake Eldora appear to coincide with the winter water levels being taken lower due to increased snowmaking.

5.2.3 Mammal Species of Special Concern

Table 5.2 below is a list of potential federal and state listed species, state "Species of Concern," and imperiled species from the Colorado Natural Heritage Program's (CNHP) online database that are potentially found in the study area (see Appendix 5.2 for further definitions of federal, state and CNHP definitions).

Table 5.2. Mammal Species of Special Concern

Common Name	Federal Status[1]	State Status[2]	Colorado Natural Heritage Program[3]
Dwarf Shrew			S2
Townsend's Big-eared Bat subspecies		SC	S2
Lynx	FT	SE	
1. Federal Status Codes: FE = Federally Endangered; FT = Federally Threatened			
2. State Status Codes: SE = State Endangered; ST = State Threatened; SC = State Species of Concern (not a statutory category)			
3. Colorado Natural Heritage Program (CNHP) Status Codes: S1 = Critically imperiled in state; S2 = Imperiled in state; B = Breeding			
For further explanations of federal, state and CNHP status codes, refer to Appendix 5.2.			

Dwarf shrews (*Sorex nanus*) may be present in the Eldora area and inhabit coniferous forests. They are known in Colorado above 5,500' elevation, and are the state's smallest bodied mammal.

Townsend's big-eared bats (*Plecotus townsendii*) occupy semidesert shrublands, pinyon-juniper woodlands and open montane forests; they generally use caves or abandoned mines for hibernacula and conduct nighttime foraging over water (Fitzgerald *et al*. 1994). They have been found on Caribou Ranch Open Space, located 2 miles northeast of the EEPP study area (Boulder County Parks and Open Space 2002).

Lynx (*Lynx canadensis*) have been reintroduced into the mountains of western Colorado; they have very wide ranges, but typically are found in upper montane and subalpine forests with their principal prey, snowshoe hare (Fitzgerald *et al*. 1994). There have been some recent unconfirmed sightings of lynx in the Nederland/Eldora area.

5.3 Birds

Approximately 134 avian species have been documented in the EEPP study area (Appendix 5.1). Given the transitory nature of birds, this number could be higher and species not listed could be encountered. During the breeding season the avian community is dominated by neo-tropical migrants that are insectivores or omnivores, feed in the foliage of trees or shrubs, gather their food by gleaning or foraging, and nest in a tree.

Some of the more common species are generalists that can utilize the resources of several habitats. These species include broad-tailed hummingbird (*Selasphorus platycercus*), dark-eyed junco (*Junco hyemalis*), and American robin (*Turdus migratorius*). Common forest dwellers include pine siskin (*Carduelis pinus*), yellow-rumped warbler (*Dendroica* *coronate*), hairy woodpecker (*Picoides villosus*), mountain chickadee (*Poecile gambeli*), red-breasted nuthatch (*Sitta Canadensis*), ruby-crowned kinglet (*Regulus calendula*), and Steller's jay (*Cyanocitta stelleri*). Species specific to aspen forests include warbling vireo (*Vireo gilvus*) and red-naped sapsucker (*Sphyrapicus nuchalis*).

5.3.1 Avian Species of Special Concern

Table 5.3 below is a list of potential federal and state listed species, state "Species of Concern," imperiled species from the Colorado Natural Heritage Program's (CNHP) online database, and Boulder County Nature Association (BCNA) Avian Species of Special Concern (Boulder County Nature Association 1999) that are potentially found in the EEPP study area (see Appendix 5.2 for further definitions of federal, state, CNHP, and BCNA definitions). Twelve potential avian species of special concern are listed.

Table 5.3. Avian Species of Special Concern

Common Name	Federal Status (1)	State Status (2)	Colorado Natural Heritage Program (3)	Boulder County Nature Association (4)
Northern Goshawk				4,5
Golden Eagle				4
Prairie Falcon				4
Peregrine Falcon		SC	S2B	
Boreal Owl				4,5
Long-eared Owl				1
Three-toed Woodpecker				4
Olive-sided Flycatcher				4
Golden-crowned Kinglet				4
Ovenbird			S2B	3,5
MacGillivray's Warbler				PIF
Western Tanager				PIF
1. Federal Status Codes: FE = Federally Endangered; FT = Federally Threatened				
2. State Status Codes: SE = State Endangered; ST = State Threatened; SC = State Species of Concern (not a statutory category)				
3. Colorado Natural Heritage Program (CNHP) Status Codes: S1 = Critically imperiled in state; S2 = Imperiled in state; B = Breeding				
4. Boulder County Nature Association (BCNA) Status Codes: 1 – Rare and Declining; 2 – Declining; 3 – Rare; 4 – Isolated or restricted population; 5 – Needs more research; PIF – Partners in Flight declining species				
For further explanations of federal, state, CNHP, and BCNA status codes, refer to Appendix 5.2.				

Northern goshawk (*Accipiter gentilis*) is of federal interest, which, due to evidence of decline throughout the western United States, was under consideration for formal listing under the Endangered Species Act. Their nesting sites are considered restricted in Boulder County, preferring isolated locations, and need additional research. They have been regularly observed around Eldora, but no nest sites are known in the EEPP study area (Hallock, personal information). The most common locations for observation are Miser Gulch, Arapaho Ranch and Eldora Mountain Resort.

Golden eagles (*Aquila chrysaetos*) are a species of concern in Boulder County due to their restricted habitat requirements. An old golden eagle nest, now unrecognizable due to decay, is located on the steep cliff on Chittenden Mountain overlooking the North Fork Road at the west end of the study area. It was used by eagles until sometime in the 1960s, according to residents. Sightings of pairs of golden eagles in the North Fork valley just north of this nest site are frequently reported by the Indian Peaks Bird Count (Hallock, personal information), and in 1990 an eagle was seen bringing some tree branches to the old nest, although it was not subsequently used. In addition to the presence of pair-bonded adult eagles, young of the year have been seen. Based upon sightings over a 28-year period, it is reasonable to conclude that there is a breeding territory centered on the North Fork that extends west to Diamond Lake, north to Bald Mountain, south to Hessie, and east to Arapaho Ranch.

Prairie falcon (*Falco mexicanus*) and **peregrine falcon** (*Falco peregrinus*) are infrequently seen in the area (Hallock, personal information). They are more commonly observed above tree line.

Boreal owl (*Aegolius funereus*) is considered a restricted species in Boulder County, favoring old-growth subalpine forests. Historically, they have been heard calling at and around Hessie in the EEPP study area (February and March 1988, April 1996, September 2010, April 2011) and on Chittenden Mountain (June 1988) (Hallock, personal information).

Three-toed woodpecker (*Picoides tridactylus*) is generally considered a species of old-growth subalpine forests, but will also frequent areas with bark beetle infestations. They are currently fairly common on Spencer Mountain as they are feeding on the limber and lodgepole pine trees infested with mountain pine beetle (Hallock 2010). It is likely they are breeding in the EEPP study area.

Olive-sided flycatcher (*Contopus cooperi*) is considered a restricted species in Boulder County. They commonly breed in the solitude of the forests where their breeding habitat has three basic components: snags, conifers, and openings. They are regularly observed in the EEPP study area, particularly along Forest Service Road 505 at the "Arapaho Ranch overlook" and on the southeast side of Spencer Mountain. They have been present at these locations for many years (Hallock, personal information).

Golden-crowned kinglet (*Regulus satrapa*) is considered a restricted species in Boulder County. They favor coniferous forests with old-growth characteristics. They are regularly seen in the EEPP study area and breed locally, one nest being found along Middle Boulder Creek at the base of Bryan Mountain (Hallock, personal information). Locally, they particularly favor the riparian habitat along Middle Boulder Creek and the north-facing forests of Spencer and Bryan Mountains.

Ovenbird (*Seiurus aurocapillus*) is considered a rare species in Boulder County. They breed in ponderosa pine woodlands or mixed conifer forests with shrub understories. One was heard singing during the summer of 1982 in an aspen grove between Spencer Mountain and Middle Boulder Creek (Hallock, personal information).

MacGillivray's warbler (*Oporornis tolmiei*) is considered declining in Colorado. They nest in shrublands. They are fairly common in the EEPP study area (Hallock, personal information). They favor shrublands along Middle Boulder Creek, around beaver ponds and some of the dry patches of shrubland on the south-facing slope of Eldorado Mountain.

Western tanager (*Piranga ludovicians*) is considered declining in Colorado. In Boulder County, they generally nest in ponderosa pine and aspen forests. They are fairly common in the Eldora area (Hallock, personal information). They are found on the south-facing slope of Eldorado Mountain and the aspen groves on the lower portion of the Enterprise trail.

5.3.2 Indian Peaks Four Season Bird Counts

The Indian Peaks Four Season Bird Counts provide on-the-ground information about birds in the Eldora area. Originated in 1982, the counts are organized by the Boulder County Nature Association (2010). They are conducted four times a year, and cover an area in western Boulder and Gilpin counties that runs from the South St. Vrain Creek south to Rollinsville, and from the Continental Divide east to Castle Rock. The count circle is divided into 25 subareas, one being Eldora and its surroundings on Eldorado and Spencer mountains. The Arapaho Ranch is a separate count area, as are the drainages to the west: North Fork, Arapaho Pass, Diamond Lake, King Lake, Woodland Lake, and Jasper Lake. Volunteers, including a number of Eldora residents, spend a portion of one day within a defined count period during each of the four seasons recording all the birds seen or heard. The information is kept in a database maintained by the Nature Association. The bird list in Appendix 5.1 is derived from this database.

Following are some trends detected during the first 28 years of the count:

- The overall numbers of individual birds on the summer count have been generally increasing, interrupted by shorter-term downward periods. This has the potential of being related to short- or long-term climate change. The declines in total numbers coincide with wet and cool periods. This suggests, and there is some corroborating evidence from a more specific study that partially occurs within the count circle, that the availability of water is less of a limiting factor for breeding birds in the upper montane and subalpine lifezones on the east slope of the Front Range.

- Many migrating birds are arriving earlier in the spring than they were 28 years ago. This may also be related to short- or long-term climate change.

- There is some evidence that bird species on the upper edge of their range are moving higher in elevation over the period of the count. This is particularly evident for yellow warbler (*Dendroica petechia*), which at first was uncommon on the Arapaho Ranch but is now common on the ranch and is now being seen in Eldora and up at Hessie. This change also suggests short- or long-term climate change.

5.4 Amphibians and Reptiles

Five amphibian and reptile species have been seen in the EEPP study area (Appendix 5.1). The most common amphibian in the Eldora area is western chorus frog (*Pseudacris triseriata*). The most common snake is the western terrestrial garter snake (*Thamnophis elegans*).

5.4.1 Amphibian and Reptile Species of Special Concern

Table 5.4 below is a list of potential federal and state listed species, state "Species of Concern," and imperiled species from the Colorado Natural Heritage Program's (CNHP) online database that are potentially found on the Property (see Appendix 5.2 for further definitions of federal, state and CNHP definitions).

Table 5.4. Amphibian and Reptile Species of Special Concern

Common Name	Federal Status[1]	State Status[2]	Colorado Natural Heritage Program[3]
Amphibians			
Boreal Toad		SE	S1
Northern Leopard Frog		SC	S3
1. Federal Status Codes: FE = Federally Endangered; FT = Federally Threatened			
2. State Status Codes: SE = State Endangered; ST = State Threatened; SC = State Species of Concern (not a statutory category)			
3. Colorado Natural Heritage Program (CNHP) Status Codes: S1 = Critically imperiled in state; S2 = Imperiled in state; B = Breeding			
For further explanations of federal, state and CNHP status codes, refer to Appendix 5.2.			

Boreal toads (*Bufo boreas*) typically live in damp conditions in the vicinity of marshes, wet meadows, streams, beaver ponds, glacial kettle ponds, and lakes interspersed in subalpine forest. Breeding occurs in still or barely flowing water in marshy areas with sedges and shrubby willow and along gently sloping edges of large and small lakes, beaver ponds, glacial kettle ponds, roadside ditches, ponds resulting from excavations by humans, and even small puddles (Hammerson 1999). Boreal toads are considered an endangered species in Colorado due to declining populations. The decline of boreal toads likely began in the early 1970s. They were widespread and common in western Boulder County in the 1960s but scarce by the end of the 70s. While theories as to the cause of the decline abounded, the likely culprit was only discovered about ten years ago. The chytrid fungus *Batrachochytrium dendrobatidis* (commonly called Bd) causes the disease chytridiomycosis, which has devastated amphibian populations on several continents, including ours. Historically, local populations were known from Buckeye Basin (up by the ski area) and Lost Lake. An effort to reintroduce them into Lost Lake began in the mid-1990s with the release of thousands of metamorphs and tadpoles over a two-year period. While some over wintered the initial release, there has been no evidence of breeding. Currently, none have been seen in Lost Lake (Boreal Toad Recovery Team 2006; Lauren Livo, biologist, personal communication). Historic sites for the boreal toad are mapped on Figure 5.2, while a photograph is displayed in Figure 5.3.

The **northern leopard frog** (*Rana pipiens*) may occur near wet meadows and the banks and shallows of marshes, ponds, lakes, reservoirs, streams, irrigation ditches, stock ponds, and stock tanks, as well as playas with fairly regular water. They typically do not range far from wet areas, but they may wander far from permanent water during wet weather (Hammerson 1999). There were historic accounts of northern leopard frog in Lake Eldora, but no recent accounts (LREP, Inc. 1994; Lauren Livo, biologist, personal communication). Historic sites for the northern leopard frog are mapped on Figure 5.2, while a photograph is displayed in Figure 5.4.

Figure 5.2. Wildlife Species of Concern Locations

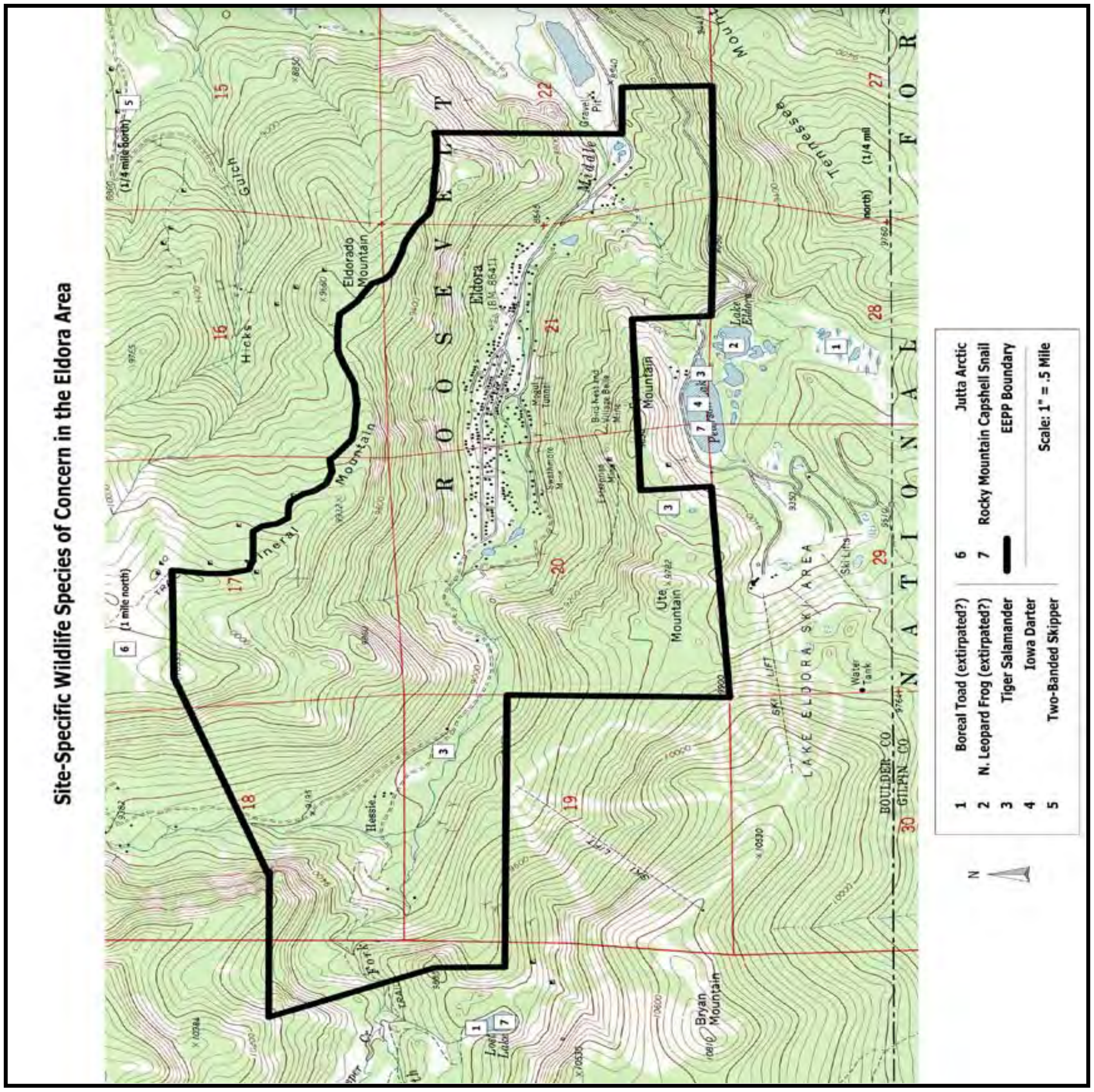


Figure 5.3. Boreal Toad

The boreal toad (*Bufo boreas*), a species of concern, has historically been found at Lost Lake and Buckeye Basin, but now may be locally extirpated. (Photo by Lauren Livo)

Figure 5.4. Northern Leopard Frog

The northern leopard frog (*Rana pipiens*) has declined over much of its range and may be locally extirpated. (Photo by Lauren Livo)

While **tiger salamander** (*Ambystoma tigrinum*) is not a listed species of concern, there is some indication in the Eldora area that they are less common than in the past based on accounts from long-time residents (Evans 2002). They have recently been observed on the small pond on top of Spencer Mountain (Audrey Godell, Eldora resident, personal communication) as well as Peterson Lake and the beaver ponds near Hessie (Hallock, personal information). Current sites are displayed in Figure 5.2, while a photograph is displayed in Figure 5.5.

5.5 Invertebrates

There has been an increased interest in butterflies and other invertebrates. Butterflies are most active during the summer. Parnassians, blues, sulphurs and commas are some of the most common.

5.5.1 Invertebrate Species of Special Concern

Table 5.5 below is a list of federal and state listed species, state "Species of Concern," and imperiled species from the Colorado Natural Heritage Program's (CNHP) online database that have been documented in the area (see Appendix 5.2 for further definitions of federal, state and CNHP definitions).

Table 5.5. Invertebrate Species of Special Concern

Common Name	Federal Status[1]	State Status[2]	Colorado Natural Heritage Program[3]
Rocky Mountain Capshell Snail		SC	S1
Two-banded Skipper			S3
Rocky Mountain Jutta Arctic			S1
Snow's Skipper			S3
1. Federal Status Codes: FE = Federally Endangered; FT = Federally Threatened			
2. State Status Codes: SE = State Endangered; ST = State Threatened; SC = State Species of Concern (not a statutory category)			
3. Colorado Natural Heritage Program (CNHP) Status Codes: S1 = Critically imperiled in state; S2 = Imperiled in state; B = Breeding			
For further explanations of federal, state and CNHP status codes, refer to Appendix 5.2.			

The **Rocky Mountain jutta arctic** (*Oeneis jutta*) inhabits openings in lodgepole pine forests and is considered critically imperiled in Colorado. It has been documented approximately 1 mile north of the EEPP study area near Caribou townsite (Figure 5.2).

Two-banded skippers (*Pyrgus ruralis*) inhabit mountain meadows and openings in cool coniferous forests. There are considered rare in Colorado. They have been documented approximately 1.25 miles northeast of the EEPP study area (Figure 5.2).

Snow's skippers (*Paratrytone snowi*) inhabit high elevation moist openings in forests. They are considered rare in Colorado.

Figure 5.5. Tiger Salamander

The tiger salamander (*Ambystoma tigrinum*), has been found at Columbine Lake, Peterson Lake and Hessie. (Photo by Lauren Livo)

Figure 5.6. Rocky Mountain Capshell Snail

Rocky Mountain Capshell Snail (*Acroloxus coloradensis*) has been found in Peterson Lake and Lost Lake. (Photo courtesy of Pioneer Environmental Services)

5.5.1.1 Rocky Mountain Capshell Snail

Peterson Lake is the type locality for the Rocky Mountain Capshell Snail (*Acroloxus coloradensis*); the first specimens of the species were collected from Peterson Lake in the 1920s (Figures 5.2 and 5.6). Prior to 1993 the snail (actually a limpet) was known from a total of two populations in the U.S. (Peterson Lake and Lost Lake, Montana) and 8-9 locations in Canada. In 1993, four additional populations were located in Colorado, one of them at Lost Lake near Hessie. Both of the known populations in the Eldora area are small; Peterson Lake is estimated to host fewer than 100 individuals of the species.

The Peterson Lake population has declined precipitously since 1970 although the current trend is uncertain. Various reasons for the decline have been advanced: fluctuations in the lake level due to snowmaking activities by the ski area and drought, pollution, or the drawdown associated with the construction of a wall designed to raise the lake's capacity in 1978. The habitat requirements of the snail are poorly known but appear to include suitable rocky substrate, water high in dissolved oxygen and calcium carbonate and a generally alkaline pH (S. Compton, pers. comm.). Peterson Lake at present meets all of these requirements.

A survey by University of Colorado researchers in 1967 at Peterson Lake estimated a population density of 72 snails per square meter in areas of favorable substrate. By 1992, the population had declined to the point that a two-day dive survey yielded only three specimens.

In order to develop a conservation strategy for the snail, the Rocky Mountain Capshell Snail Working Group (RMCSWG) was convened with representatives from the USFWS, USFS, CDOW, Pioneer Environmental Services, Inc. (the consultant to Eldora Mountain Resort), Joe Fox, representing the Ertl family, and Dr. Shi-Kuei Wu of the University of Colorado. The working group suggested that a survey be carried out in the spring and summer of 1993 for additional populations of the snail; the work was funded in equal parts by Eldora Mountain Resort, CDOW and ERTL, Inc.

Prior to the survey, a USFWS/National Park Service team in Rocky Mountain National Park located a third Colorado population of the snail in Finch Lake, in the park. The Pioneer survey examined 27 lakes in the Front Range, most of them east of the Continental Divide, and located 3 additional populations of the snail. No estimates were made of the populations, which appeared to be in good shape with a range of age classes present and easy location of additional individuals (S. Compton, pers. comm.). The RMCSWG met on the 5th of November 1993 to formulate further plans regarding the snail. At the meeting, the CDOW recommended that the capshell retain its current status, that of a "species of special concern" and recommended the use of pre-listing recovery monies to fund further field surveys in 1994. These surveys will also be used to examine the status of amphibians in the lakes surveyed.

As of April 2010, the RMCSWG had held no meetings since the late 1990s and no additional field surveys had been conducted in Peterson Lake or Lost Lake since the mid-1990s (Tina Jackson, herpetologist for Colorado Division of Wildlife, personal communication).

Current sites for the capshell snail are mapped on Figure 5.2, while a picture is displayed in Figure 5.5.

5.6 Fish

Fish serve as indicators of the quality of aquatic habitat because of their high sensitivity to increased turbidity and runoff contamination.

There are no species in the Eldora area which are candidates for formal listing as threatened or endangered, although one is considered to be of concern: the Iowa Darter (*Etheostoma exile*) is listed by the State of Colorado and the CNHP. Native fish known to be present on the reach of Middle Boulder Creek above Barker Reservoir are the Longnose Sucker (*Catostomus catostomus*), White Sucker (*Catostomus commersoni*), Longnose Dace (*Rhinichthys cataractae*) and Creek Chub (*Semotilus atromaculatus*). Introduced species present and naturally reproducing in Middle Boulder Creek include Brook Trout (*Salvelinus fontinalis*), Brown Trout (*Salmo trutta*) and Rainbow Trout (*Oncorhynchus mykiss*). A 1992 survey by CDOW identified native fish present in Peterson Lake and Eldora Lake as White Suckers and Fathead Minnows (*Pimephales promelas*). Peterson Lake also contains the Johnny Darter (*Etheostoma nigrum*). The Johnny Darter is rarely found at elevations as high as Peterson Lake and may have been introduced at some point in the past. The Iowa Darter is also reported as being present in the Peterson Lake Basin by CNHP; it is possible that the two species of darters have been confused. The Johnny Darter feeds on immature aquatic insects and requires water low in turbidity for the health of its prey as well as for successful breeding. Introduced species present in the lakes are Brown Trout and Rainbow Trout, the latter having been stocked regularly from 1970 through 1985 in Peterson Lake.

The native Greenback Cutthroat Trout (*Oncorhychys clarkia stomias*) is not known to inhabit the Middle Boulder Creek drainage above Barker Reservoir. Although a fairly extensive survey above Hessie found no Greenbacks, the Forest Service does not rule out the possibility that Greenbacks may exist in the drainage (D. Gerhardt, Colorado Division of Wildlife, personal communication). Hybridized strains of cutthroat trout do exist in the North Fork of Middle Boulder Creek; the purity of the strain is unknown.

While Middle Boulder Creek from Hessie to Barker Reservoir is not stocked, Barker Reservoir is stocked with trout. Stocking also occurs above Hessie.

5.7 Boulder County and CNHP Mapped Sites

Boulder County and the Colorado Natural Heritage Program (CNHP) have identified several significant sites based on the presence of critical animal species and/or habitat in and around the EEPP study area (Figures 5.7, 5.8 and 5.9).

5.7.1 Critical Wildlife Habitats

The loss of wildlife habitat leads to the inevitable disappearance of wildlife species themselves. Boulder County is working towards avoiding wildlife species depletion through the preservation and conservation of critical habitats and to recognize the importance of an ecosystem approach in protecting all species and habitat types currently found in Boulder County in order to balance natural systems and human use.

Figure 5.7 depicts Critical Wildlife Habitats designated by Boulder County in the Environmental Resources Element of the Boulder County Comprehensive Plan (Boulder County 1995). The sites are described below.

Arapaho Ranch/Tucker Homestead Critical Wildlife Habitat (#30 on Figure 5.6) contains elk concentration area for transitional range, elk calving, riparian habitat and willow carr wetlands. Densities of breeding birds in willow shrublands, or carrs, are very high relative to other mountain habitat types, and several species of birds are found only in this habitat type (Hallock *et al.* 1986).

Woodland Flats Willow Carr Critical Wildlife Habitat (#53 on Figure 5.7) contains a large subalpine willow carr.

Chittenden Meadows Critical Wildlife Habitat (#29 on Figure 5.7) contains an old-growth subalpine forest (Hallock 1988) and a subalpine willow carr.

Peterson Lake Critical Wildlife Habitat (#57 on Figure 5.7) contains the Rocky Mountain Capshell Snail, a state species of concern (see Section 5.5.1.1 above).

Buckeye Basin Critical Wildlife Habitat (#54 on Figure 5.7) contains a subalpine willow carr.

Caribou Park Willow Carr Critical Wildlife Habitat (#49 on Figure 5.7) contains a subalpine willow carr.

Upper Caribou Park Willow Carr Critical Wildlife Habitat (#50 on Figure 5.7) contains a subalpine willow carr.

Relevant goals and policies for Critical Wildlife Habitats from the Boulder County Comprehensive Plan are:

B.3: Critical wildlife habitats should be conserved and preserved in order to avoid the depletion of wildlife and to perpetuate and encourage a diversity of species in the county.

B.5: Wetlands which are important to maintaining the overall balance of ecological systems should be conserved.

B.6: Unique or critical environmental resources identified pursuant to Goals B.1, B.3, B.4, and B.5 shall be conserved and preserved in a manner which assures their protection from adverse impacts, with the private sector, non-county agencies and other governmental jurisdictions being encouraged to participate.

B.9: Riparian ecosystems, which are important plant communities, wildlife habitat and movement corridors, shall be protected.

ER 4.03: The *Boulder County Comprehensive Plan* and attendant regulations shall be formulated to insure that proposed land uses, including structures, shall be compatible with the ecosystem of critical wildlife habitats and not pose immediate and potential detrimental impacts to such habitats.

ER 4.04: Boulder County, under the auspices of the Parks and Open Space Department shall establish a critical wildlife habitat management program, in direct cooperation with land owners. The program shall deal with, but not be limited to, the following situations:

ER 4.04.01: The use of buffer zones to further insulate critical wildlife habitats from detrimental human uses in instances of potential land use encroachments;

ER 4.04.02: The retention of existing non-detrimental land uses and vegetative cover occurring within or adjacent to critical wildlife habitats: and

ER 4.04.03: Mitigation where detrimental land uses currently exist adjacent to critical wildlife habitats.

5.7.2 Environmental Conservation Areas

The Environmental Conservation Areas, Natural Landmarks and Natural Areas Map of the Environmental Resources Section of the Boulder County Comprehensive Plan (Boulder County 1995a) designates the north and west portions of the EEPP study area as being within the Indian Peaks Environmental Conservation Area (Figure 5.8). Environmental Conservation Areas (ECAs) are large and relatively undeveloped areas of Boulder County that possess a high degree of naturalness. Their size, quality, and geographic location make them an important tool for combating the affects of habitat fragmentation. Animal species such as black bear, elk, mountain lion, and other wide-ranging mammals, favor large blocks of unfragmented land (Noss and Cooperrider 1994).

The Indian Peaks ECA is approximately 1,000,000 acres in size and is the largest ECA in the county. Its qualities and uniqueness include:

- largest quantity of old-growth forests;
- high number of significant wetlands;
- summer elk concentration areas;
- elk calving areas.
- important east/west and north/south large-mammal movement corridors;

Relevant goals and policies for Environmental Conservation Areas from the Comprehensive Plan are:

B.8: Environmental Conservation Areas (ECAs) should be conserved and preserved in order to perpetuate those species, biological communities, and ecological processes that function over large geographic areas and require a high degree of naturalness.

ER 9.01: The county shall encourage the removal of development rights from ECAs through transfer, donation, acquisition or trade.

ER 9.02: Development within ECAs shall be located and designed to minimize impacts on the flora and fauna of the area.

ER 9.03: Development outside of ECAs shall be located and designed to minimize impacts on ECAs and connectivity between ECAs.

ER 9.05: Management of ECAs shall encourage use or mimicry of natural processes, maintenance or reintroduction of native species, restoration of degraded plant communities, elimination of undesirable exotic species, minimizing human impacts, and development of long-term ecological monitoring programs.

Figure 5.7. Boulder County Critical Wildlife Habitats

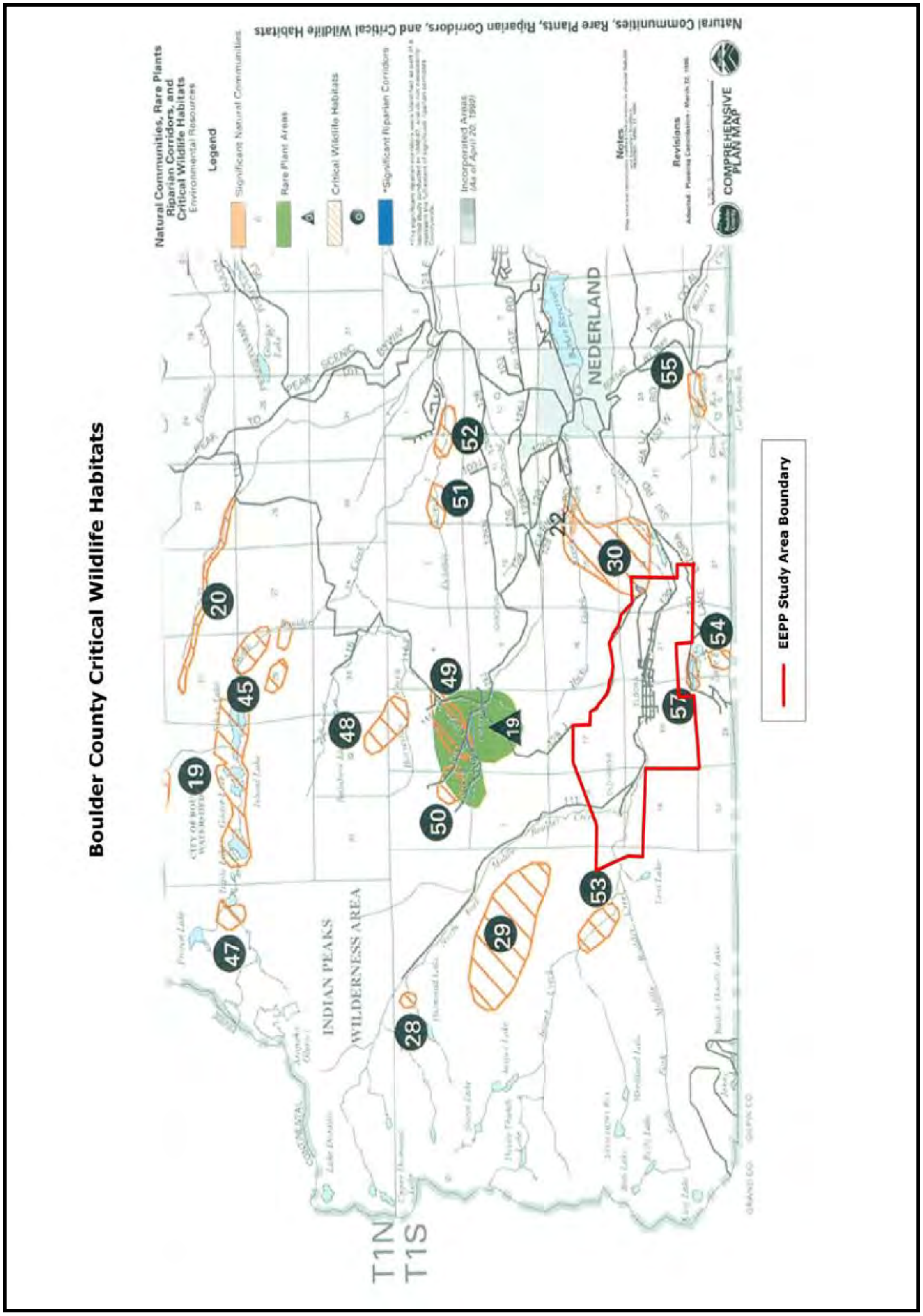


Figure 5.8. Boulder County Environmental Conservation Areas

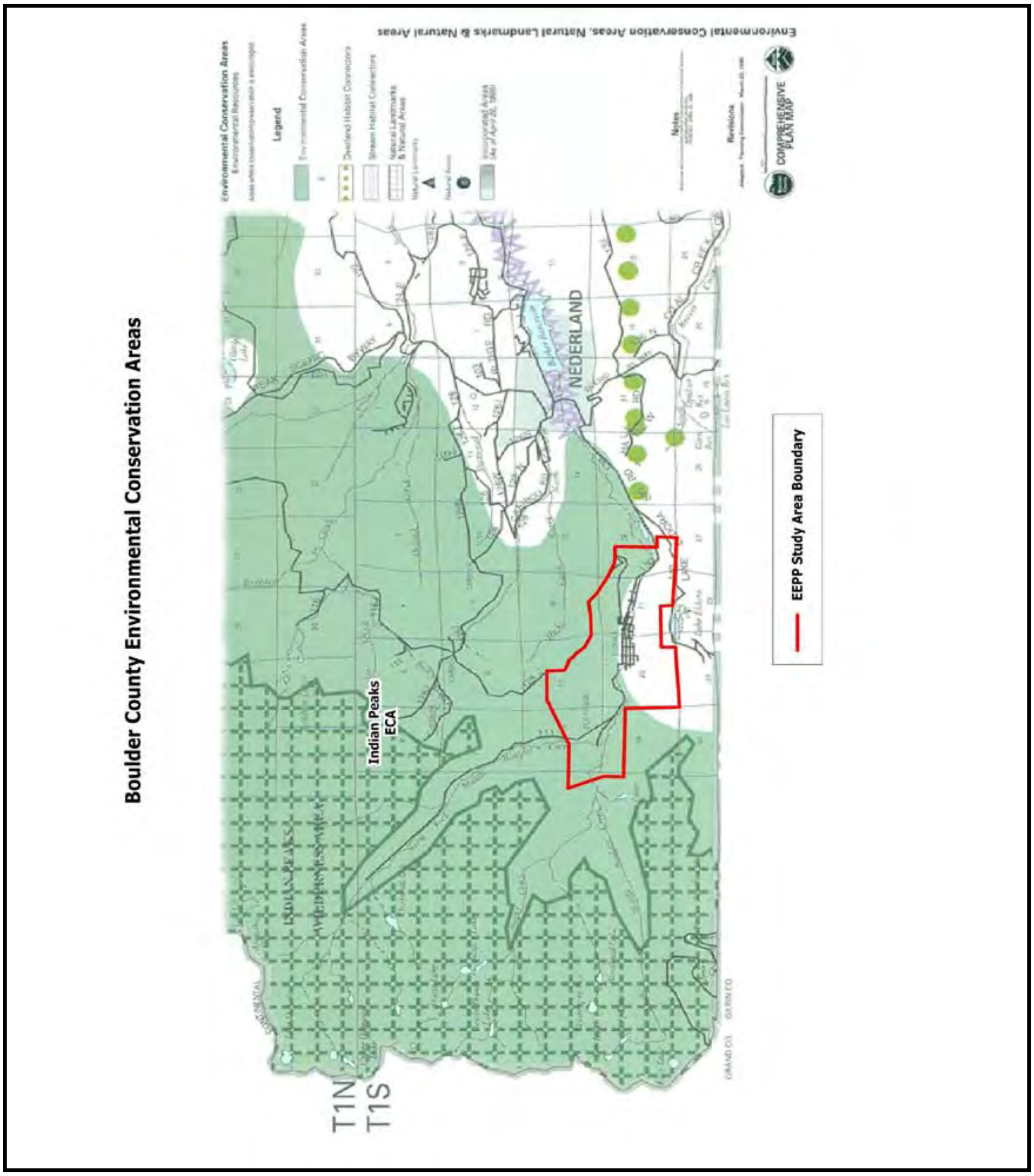
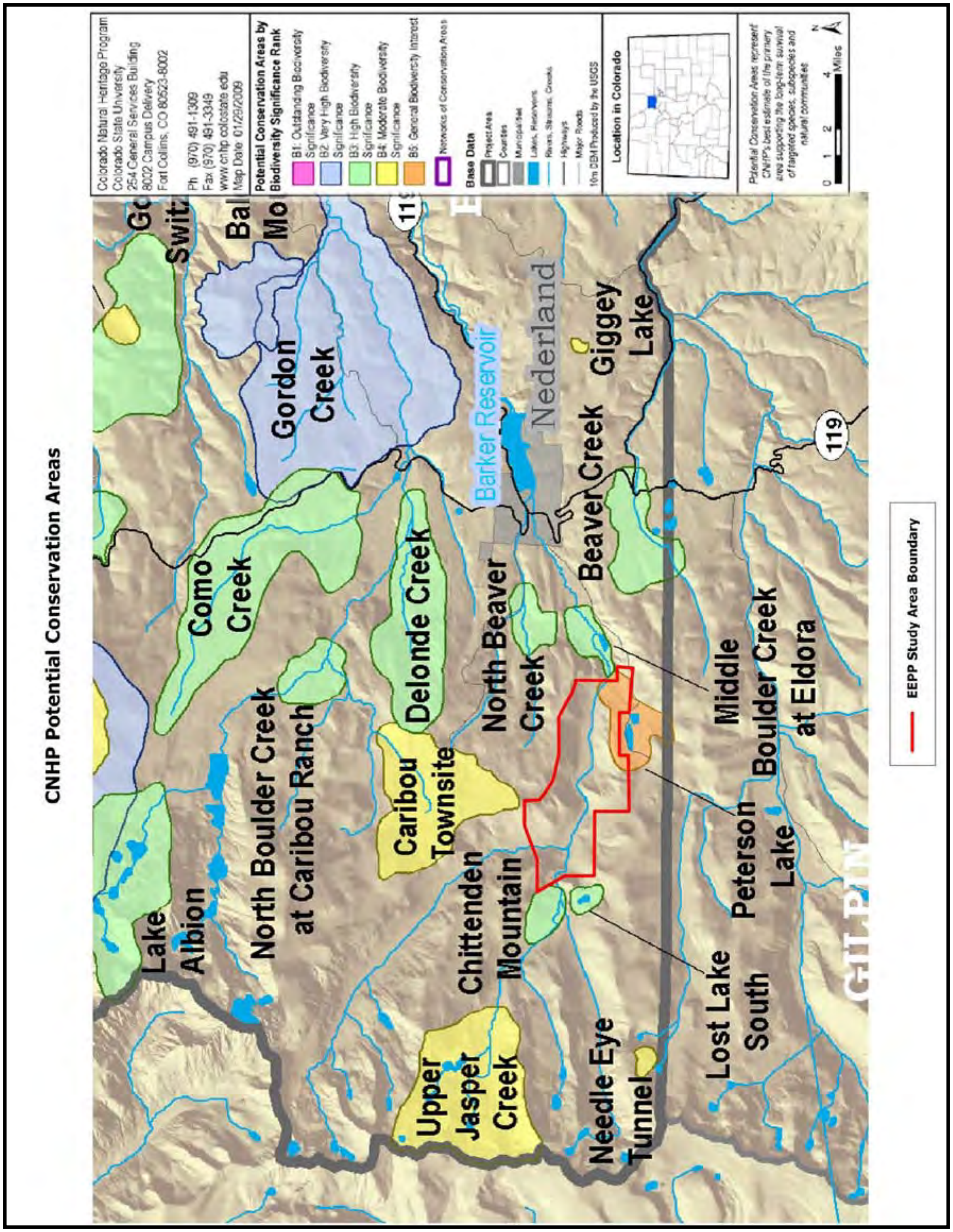


Figure 5.9. CNHP Potential Conservation Areas



5.7.3 Potential Conservation Areas for Wildlife

The Colorado Natural Heritage Program (CNHP) recently completed an inventory of critical biological resources in Boulder County (Neid *et al*. 2009). The objective was to inventory and prioritize specific areas for conservation efforts through the delineation of Potential Conservation Areas (PCAs) (Figure 5.9). The goal of a PCA is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence (a rare plant or animal) depends for its continued existence. The best available knowledge about each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; also vegetative cover, and current and potential land uses. In developing the boundaries of a PCA, scientists consider a number of factors that include, but are not limited to:

- ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the PCA and surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater;
- land intended to buffer the PCA against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

The PCA boundaries do not confer any regulatory protection, nor do they automatically recommend exclusion of all activity. It is hypothesized that some activities will prove degrading to the ecological processes while others will not. The boundaries represent the best professional estimate of the primary area supporting the long-term survival of the targeted species or plant communities and are presented for planning purposes.

One PCA that is primarily based on animals is partially within the EEPP study area and another is nearby (Figure 5.9). Several other nearby PCAs are based primarily on plant communities or rare plants and are described in Section 4 of this report. More information about the PCAs can be found in Appendix 5.3.

Peterson Lake PCA supports an occurrence of the globally vulnerable and state critically imperiled Rocky Mountain capshell snail (*Acroloxus coloradensis*), and an occurrence of the state rare broad-leaved twayblade (*Listera convallaroides*). Historical occurrences of the state rare sharp sprite (*Promenetus exacuous*) and the state rare umbilicate sprite (*Promenetus umbilicatellus*) were documented in the 1960s. The boundary of the PCA includes Peterson Lake, Lake Eldora and the entire wetland complex and a terrestrial buffer. The buffer includes Marysville Gulch within the EEPP study area.

Lost Lake South PCA supports an occurrence of the globally vulnerable and state critically imperiled Rocky Mountain capshell snail and a historical record of the boreal toad (*Bufo boreas*). Boreal toads were last documented breeding in 1998. The boundary includes the lake and an approximately 300 meter buffer to protect local processes.

5.8 Recommendations

1. Maintain a database and develop research and monitoring programs for species of special concern listed in Tables 5.1 – 5.5. This work should be coordinated with Boulder County Nature Association, Boulder County, Colorado Natural Heritage Program, Colorado Division of Wildlife, U.S. Forest Service, and U.S. Fish and

Wildlife Service. The database should be updated every three years. Research and monitoring findings should be submitted to the above agencies/organizations as appropriate.

2. Through ECA's Land Preservation Committee, continue working to protect areas containing important wildlife habitat. Riparian areas, wetlands, migration corridors and old-growth forests should be priorities as these habitats are consistently the most important, most limited, and in need of protection for wildlife conservation in the Front Range.

3. Continue working with Boulder County and Colorado Parks and Wildlife to identify key wildlife movement corridors crossing County Road 130 and making them safer for animals and motorists.

6.0 CULTURAL RESOURCES

6.1 Introduction

The federal government, the State of Colorado, and Boulder County recognize that important archaeological and historical resources are valuable, non-renewable representations of our cultural heritage. These tangible remains are protected under federal, state and county laws as discussed in Section 6.5, Regulatory Framework. Cultural resources are defined as the physical remains of past human activity having demonstrable association with prehistoric, historic events, individuals or cultural systems. Cultural resources may include such things as archaeological sites, districts and objects; standing historical structures, objects or groups of resources; locations of important historic events; or places, objects and living or non-living things that are important to the practice and continuity of traditional cultures.

6.1.1 Cultural Context

The Colorado Council of Professional Archaeologists and the Colorado Historical Society through the Office of Archaeology and Historic Preservation (OAHP) have published several prehistoric and historic contexts for Colorado and its northeastern region. An archaeological perspective of ancient Colorado was written by David Noble (2000). Kevin Gilmore *et al.* (1999) authored the prehistoric context of the Platte River basin. Minette Church *et al*. (2007) authored the context for historical archaeology in Colorado.

6.2 Prehistoric Resources

Sources useful in reviewing the prehistoric resources of northeastern Colorado are Anderson, (1985), Buckles (1968), Burney (1987, 1989), Butler (1981, 1986, 1988), Caldwell and Henning (1978), Cassells (1983), Chase (1980), Conner (1968), Eddy and Windmiller (1977), Eighmy (1984), Frison (1978), Gilmore *et al.* (1999), Gunnerson (1987), Guthrie *et al.* (1984), Haug (1968), Morris and Kainer (1978), Morris and Mayo Wedel (1961), Stone (1999), Wendland (1978), Wood (1967), and Wood (1971).

When reviewing the archaeological record, it is important to keep in mind the transitional nature of the Front Range region. Three zones, the plains, foothills, and alpine, are intrinsically intermingled when defining archaeological complexes.

Prehistoric habitation and use of northeastern Colorado and adjacent regions spans approximately 12,000 years from the late Pleistocene epoch through historic contact. Although the preponderance of reliably dated archaeological sites in the regions represent the past 5,000 years, evidence of occupation is nearly continuous throughout this 12,000 year span. A detailed chronological outline for northeastern Colorado has been prepared by Tate and Gilmore (1999) (Table 6.1).

Table 6.1. Prehistoric Chronology Applicable to the Northern Front Range

Cultural Episode		Age Range (Before Present)	Environmental Conditions
Stage	**Period**		
Protohistoric		400-100	Cooler and wetter conditions with expansion of mountain glaciers
Late Prehistoric	Middle Ceramic	800-400	Xeric conditions initially, followed by slightly cooler and wetter conditions
	Early Ceramic	1800-800	Initial period of warmer and drier conditions followed by conditions slightly wetter and cooler than present
Archiac	Late Archaic	3000-1800	Warmer and drier conditions, possibly changing to periods of increased precipitation and cooler temperatures
	Middle Archaic	5000-3000	Increased effective moisture, punctuated by discontinuous periods of aridity
	Early Archaic	7500-5000	Once thought to be a period of universal aridity throughout the West and Southwest (Altithermal), now considered to have included two drought periods separated by a period of increased effective moisture
Paleoindian	Plano	10,000-7500	Continued drying and warming with increasing aridity toward the latter part of the Plano period
	Folsom	11,000-10,000	Continued warming and drying, shrinking of pine-spruce woodlands in foothills, and expansion of mixed tallgrass/shortgrass prairie
	Clovis	12,000-11,000	Warming trend, with possible drought during the late Clovis period (11,300-10,800 B.P.)
	Pre-Clovis	18,000-12,000	Full glacial conditions at the outset, with gradually ameliorating climatic conditions

Ethnographic data indicate that the foothills region was the western boundary for protohistoric plains Indian occupations, with the Utes occupying the western portion of the state. Until approximately A.D. 1700, the Apache dominated the entire eastern portion of the state. Following the Apache movement south, the Comanche and Ute claimed this area until about A.D. 1750. Between A.D. 1750 and A.D. 1820, the Comanche and Ute split the state in half, with the Comanche remaining east of the Rocky Mountains. By A.D. 1830 the Arapaho and Cheyenne were dominant in the northeastern quarter of Colorado. The last major transition occurred with the Cheyenne and Arapaho dominating the entire eastern half of the state by the mid-1800s (Cassells 1997). Although the Ute tribe fiercely defended the mountains, the plains tribes often ventured into the mountains to hunt, make war, cut tepee poles, and collect medicinal and ceremonial herbs.

6.2.1 Prehistoric Records

A file search at OAHP produced one recorded prehistoric site form for the EEPP study area (5BL.33). It was an artifact found on the surface. The alpine areas just west of the study area contain numerous, well documented campsites, trails and game drive features that date to the paleo-Indian period onward to the protohistoric period (Benedict 1981, 1979, Benedict and Olson 1978). Benedict (pers. comm.) indicates that a local artifact collection, including extensive items from Sulphide Flats (Arapaho Ranch) indicates intermittent occupation in the Eldora area from the late paleo-Indian period to historical contact.

6.3 Historic Resources

Settlement of the Eldora valley in historical times is broadly described by two major events. The first is mining and early settlement, from approximately 1887 to 1919. Text for this section is derived from Kemp (1960). The second is the utilization of the town as a summer vacation haven, from the decline of mining through the World War II years. Text in this section is derived from the National Register of Historic Places Registration Form, Eldora Historic District (appended in full in Appendix 6.3) and the Eldora Historical and Architectural Survey 2007-08 (Thomas 2008). Recent history since the 1940s will be discussed under Section 6.3.3.

6.3.1 Mining and Early Settlement

The mineral resources at Eldora did not receive attention during the original Pike's Peak rush of 1859, or the 1870 silver boom at Caribou, just two miles north of Eldora. Not until late in the 1880s were claims filed, and Eldora's brief boom was over by 1900. The primary mineral resources were gold tellurides and gold sulphides, neither of which were either rich or long lasting.

On August 8, 1887, Charles H. Firth of the nearby Sugar Loaf Mining District staked the Huron Lode, located during a prospecting and hunting trip that summer. The Clara Lode was staked on June 7, 1889, by John A. Gilfillan, a mining engineer from St. Louis. Gilfillan and a partner named Dwinell built log cabins both at the mine site on Spencer Mountain and in the valley bottom below. After exploratory surveys during the summers of 1890-91, the Happy Valley Placer was staked on September 5, 1891, by John H. Kemp, a mine operator from Central City. The valley became known by the name given the placer claim.

The summers of 1892-93 brought accelerated prospecting in the area, and hydraulic operations on the Happy Valley Placer began washing tons of gravel from the bank of Middle Boulder Creek. During 1892 the miners named their camp Eldorado. By the end of 1892 some 20 claims had been filed on Spencer Mountain.

Population reached 300 by 1897, and a post office was established on February 13. Based upon greatly exaggerated reports on early ore shipments, 40 to 50 newcomers began arriving in Eldorado daily. The population mushroomed to 1300 by January 1898, and the number of claims was estimated at 500.

After a protracted legal battle with a competitor, the Happy Valley Company was granted a plat and the Town of Eldora was incorporated on March 9, 1898. The last two letters of Eldorado had been dropped in order to avoid confusion with a mining camp in California.

The period 1897-99 marked the peak of mining activity in Eldora. The veins of ore were typically small, marked by occasional pockets of rich ore. Compounding the low economic returns of the low grade ores was the generally unsuccessful treatment of the ores at local mills, and the constant effort to keep water out of the deeper shafts.

During July of 1897 work began on the Mogul Tunnel at the base of Spencer Mountain. This project was designed to tap the veins which surfaced high on the mountain, and increase mining efficiency. Like the other mines on Spencer Mountain, returns from ore sales failed to cover production costs.

6.3.2 Post Mining Development

During the late nineteenth and early twentieth centuries, the accessible domain of the American tourist increased dramatically. This phenomenon increased the development of the mountain region of Boulder County until, by the late 1800s, vacation travel combined with the prospecting and other outdoor pursuits, was attracting hundreds of people to the area. As is true of modern times, many of these tourists returned and settled in the mining towns of the region. As the mining economy declined in the early twentieth century and residents of mountain communities began to search for alternate income sources, the importance of tourism grew rapidly. Local merchants and entrepreneurs quickly capitalized on the attractive location of the communities; relatively short distances to areas of larger population; the availability of transportation; and the distinctive natural as well as manmade features of the mining settlements. Under the influence of this change in economic emphasis, many mining communities shifted to a tourist based economy during the 1900s.

Although tourism grew dramatically in the early 20th century, the Middle Boulder Valley had been a well known and popular recreation spot for some time. Before mining injected itself into the local economy, the Middle Boulder Valley had been a favorite vacation and recreation destination for residents of nearby communities such as Central City, Boulder and Rollinsville. During the mining era, scenic mountain locations and first-class commercial establishments such as the Gold Miner Hotel in Eldora continued to attract visitors to the area. The 1905 entrance of the railroad to the economic scene (with service to Eldora) was the major impetus for the development of the tourist industry.

Railroad lines in the area had originally been built to provide service between mining communities. Unfortunately, the completion of the necessary network of track and support systems came too late to be of any benefit to the mining industry. But what was mining's loss became tourism's gain. The railroad linked Eldora with the growing tourist markets of the nation. Because of the economic lifeline of tourism, construction continued at Eldora from 1905 to 1910 despite the decline of mining operations. During this five year period, several dozen homes were built which, because of their small size and inexpensive log construction, were perfect for mountain retreats for owners and renters.

Following World War I, Colorado's highway system was substantially improved, which brought about a rapid increase in the number of motoring vacations taken by Americans. The improved roadways reduced Eldora's isolation and increased the seasonal flow of visitors and cabin owners to the area. A record number of tourists came to Colorado's mountain region during the late 1920s and the 1930s. During that period, Eldora became a popular vacation spot and, in the span of a decade or less, two dozen seasonal homes were added to the community. The Great Depression of 1929 and gas rationing during the World War II era from 1939 through 1945, took a heavy toll on tourism in America and Eldora's vitality waned. By the mid-twentieth century, Eldora's population was reduced to a handful of die-hards who were willing to weather the community's erratic economic fortunes. Many of Eldora's early buildings were dismantled or destroyed through lack of use during this time.

6.3.3 Recent History

By the end of the World War II, Eldora had lost all but a handful of residents; mining was at an end and tourism had all but dried up. The town was reborn in the 1950s as America prospered and the Front Range urban corridor began to grow. Tourism provided a steady stream of visitors in the 1960s, and the Eldora Ski Area opened in 1963. By 1973, Eldora residents were concerned enough about growth to voluntarily disincorporate the town in a foresighted attempt to stem growth by placing themselves under forestry zoning in the county.

Nevertheless, slow growth continued in the 1970s as young people moved into small mountain towns throughout Colorado, and road improvements and maintenance made the drive from Boulder more convenient. The Eldora Ski Area became more popular in the 1970s as well. The backpacking boom swelled the crowds using public lands west and north of Eldora, and parking problems began at Hessie and Buckingham Campground.

During the period 1980 - 2010 Eldora gained a number of residents who commuted to work in Nederland, Boulder or Denver, and saw an increasing number of workers who worked from home. Residents resisted the commercialization of the townsite successfully under the forestry zoning designation. The Eldora Ski Area closed briefly as skier use shifted to bigger areas on the west slope with the opening of the Eisenhower Tunnel, then reopened and use increased due to traffic congestion at the tunnel on Interstate 70, as well as a growing Front Range population. Recreational use of Indian Peaks saw a shift from overnight to day use.

6.4 Eldora Historic District 1989

The Eldora townsite has been listed by the National Park Service as a Historic District on the National Register of Historic Places (NRHP). The District, created in 1989, is one of the most completely preserved historic mining communities remaining in Boulder County. The District is located between the 400 and 1000 blocks of Huron, Washington, Klondyke and Eldorado Avenues and Eaton Place in the central and northern portions of the original townsite. The documentation submitted for the nomination of the District is found in Appendix 6.1.

The boundaries of the District include the early commercial core as well as the best remaining residential buildings constructed during the period from 1878 to 1935. As is typical of building that occurred in communities throughout Boulder County during this period, construction in Eldora contains elements from all periods of its history and reflects the varied nature of the early settlement of most mining communities. Replacement and infill construction which took place in subsequent years is also evident.

Despite the effects of time and fortune on Eldora, the community has retained its architectural significance and its historic physical integrity. Historic buildings remaining in the town bear testimony to the influence of metal mining and tourism on the development of the mountain region of Boulder County. Unchanged by modern development, Eldora provides physical evidence of historic settlement patterns and the growth and decline of the American West. Both individually and as a collection, the buildings of the Eldora Historic District exemplify the features that distinguish the

Pioneer Log Cabin, Rustic Tourist Dwelling and Vernacular Commercial building. These building types together not only characterize Boulder County, but are historically representative of the development of the State of Colorado and, indeed, the American West.

The oldest building in the Eldora Historic District is the pioneer log home located at 601 Eldorado Avenue. The building, now known as Brookside, was constructed in 1878. It was during this decade that gold strikes in the neighboring communities of Caribou and Gold Hill attracted a large number of prospecting parties and placer operations to the Middle Boulder Valley. Because little construction of any permanent nature occurred during this period, these initial buildings were limited in number and crude in nature.

During the 1870s and 1890s, Eldora grew slowly. By the early 1890s, when numerous mining operations started up on Spencer, Eldorado, Tennessee and Ute Mountains, development activity increased. By 1897 when the town was officially platted, the population of Eldora had grown to 300. Over the next year, vigorous promotion of the positive qualities of the town and a preponderance of exaggerated stories about the value of mining claims in the area caused the population to swell to 1300.

The dramatic increase in population that had occurred by 1898 stressed Eldora's infrastructure to the point where several dozen commercial buildings had to be quickly constructed to support the burgeoning population. Logs and sawn lumber from mills that operated within five miles of the community were used in building the main structures. To give the illusion of permanence to the town, false fronts were attached to many of the buildings. The Gold Miner Hotel, constructed in 1897, still retains its hewn log sidewalls and clapboard front.

To meet the increasing demand for housing, numerous simple, small log homes were built on the streets to the north and south of the commercial center along Eldorado Avenue. The size of intact homes from this period ranges from approximately 200 to 800 square feet. The majority of the log dwellings were single story, rectangular shaped buildings with a low pitched gable roof. In many cases, vertical boards were installed on the corners of the houses to cover the poor quality of the corner log notchings. A wide variety of non-permanent materials like chinking (sticks or rocks) or daubing (mud) were used to fill voids between logs. Most Eldora homes of this period lacked foundations, plumbing and any architectural features or ornamentation considered to be non-essential.

When the railroad line to Eldora was completed in 1905, another population surge occurred. The addition of the railroad created a tourism boom and twenty-five new log tourist cabins were added between 1905 and 1910. By 1920, tourism had become the economic base of Eldora. Motoring vacations were becoming increasingly popular by this time and during the summer months, many tourists purchased land for the purpose of building weekend and summer retreats. From 1920 to 1935, two dozen vacation homes were built. Although these homes were somewhat larger than early dwellings (400-1200 square feet), and because they were constructed for use during the summer months only, they still lacked bathrooms. Many excellent examples of the Rustic Tourist Dwelling construction style from this period remain intact.

The Rustic Tourist Dwelling style was similar to the Pioneer Log Dwelling construction of the late 1800s. Because of these similarities, the Eldora Historic District retained its cohesive appearance throughout the 1920s. In both construction styles, log is the predominant building material. Foundations were either non-existent or built of stone. During the Pioneer Log Dwelling era, roofs were covered with corrugated metal, wood shingles, or tar paper. In the tourist dwelling of the 1920s, composition shingles made their appearance as the medium of choice. Rock remaining from mine excavation and other mill wastes was the most common building material in the 1920s and was also used for the construction of additions, for re-siding log walls, and to enclose porches.

The Eldora Historic District illustrates historic building types that have developed in Colorado mountain communities that grew up around the mining and tourism industries. The District is included in the Metal Mining and Tourist Era Resources of Boulder County Multiple Property Listing. The document lists four subtypes of associated building styles as being present in the District:

1) Vernacular Domestic Dwellings
2) Pioneer Log
3) Vernacular Commercial Buildings
4) Rustic Tourist Dwellings

These building types meet the registration requirements of the Multiple Property Listing. The history of the District is part of the Multiple Property's associated historic context, Early Settlement and Community Development in the Mountain Region of Boulder County, 1858-1910 and Tourism and Recreation in Boulder County's Mountain Region, 1900-1935.

Within the Eldora Historic District are 55 buildings considered to be contributing to its historic character. These are listed in Appendix 6.2. The Gold Miner Hotel is the only individually listed property by the National Register of Historic Places in Eldora.

The National Register of Historic Places listing gives a label to the resource, but in the absence of federal undertakings, the listing does not provide substantive protection to the historic resources. Individual property owners may petition OAHP to remove the designation or declare *de facto* changes without penalty. To remain listed on the register, there must be restrictions on the alteration of historic buildings and the construction of new buildings or structures within the district. The next section will explore additional designations that will serve to protect historic resources.

6.5 Federal Regulations

A number of federal laws, regulations, executive orders and guidelines have been established that deal specifically with consideration of our cultural heritage in the planning process for Federal undertakings. Federal undertakings apply to all actions taken by the federal government, such as issuing a permit (an Army Corps of Engineers 404 permit, for example, or a special use permit by the Forest Service), or the use of federal money in state or local projects (such as highway funds). Federal undertakings require compliance with the following federal statutes, orders, and policy guidance regarding cultural resources:

Antiquities Act of 1906
Historic Sites Act of 1935
Reservoir Salvage Act of 1960
National Historic Preservation Act of 1966, as amended (NHPA)
National Environmental Policy Act of 1969
General Authorities Act of 1970
Executive Order 11593 of 1971. This is now in NHPA.
Archaeological and Historic Preservation Act of 1974
Archaeological Resources Protection Act of 1979, as amended
Native American Graves Protection and Repatriation Act 1990

The National Historic Preservation Act (NHPA) of 1966 (P.L. 89-665; 16 USC 470, as amended; 80 Stat. 915) mandates that all federal agencies must consider the effects of their projects and programs on cultural resources listed on the NRHP. Later amendments (P.L. 91-243; P.L. 93-54; P.L. 94-422; P.L. 94-458; P.L. 96-199; P.L. 76-244; P.L. 96-515) required that all federal agencies:

a) Inventory, evaluate, and where appropriate, nominate to the NRHP all significant cultural resources under agency ownership or control (Section 110(a)(2)).

b) Prior to agency approval of activities, a project's impact on eligible or potentially properties must be considered. The Advisory Council on Historic Preservation (ACHP) must be allowed a reasonable opportunity to comment on the proposed project (Section 106).

c) A data recovery program on eligible or listed archaeological properties must be completed prior to damage or destruction (Section 110(b)), as reported by the House Committee on Interior and Insular Affairs, 96th Congress, 2nd session, House Report, No. 96-1457, p. 136-37.

The 1969 National Environmental Policy Act (NEPA) (P.L. 91-190; 83 Stat. 851; 42 USC 4321) required that all environmental aspects, including important historic properties, be considered during the planning of federal action and as part of the process and review of environmental impact statements.

Agencies have interpreted these laws and issued regulations and policy statements to assist in compliance with these laws and orders. A number of regulations have been promulgated by the Department of Interior, primarily through the National Park Service, the agency charged with administration of the National Register of Historic Places (NRHP) program. Among those potentially pertinent to EEPP are:

36 CFR 60	National Register of Historic Places
36 CFR 63	Determinations of Eligibility for Inclusion in the National Register of Historic Places
36 CFR 800	Protection of Historic Properties
43 CFR 3	Preservation of American Antiquities
43 CFR 7	Protection of Archaeological Resources: Uniform Regulations

Guidelines for Federal Agency Responsibilities, Under Section 110 of the National Historic Preservation Act (Federal Register 53.31, February 17, 1988)

Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines (Federal Register 48:190, September 29, 1983)

In addition to the resource management oriented legislation and regulations, federal legislation also requires that Native American Indian sacred and cultural values be considered in the cultural resource planning process. NEPA mandates that Native American sacred areas be identified for potential adverse impact. NHPA deals with identification of American cultural resources. The American Indian Religious Freedom Act of 1978 (AIRFA) (P.L. 95-341; 92 Stat. 469) provides for legalized status for sacred places, animals, artifacts, and plants of Native Americans. In addition, Native Americans are guaranteed access to sacred sites on public lands under AIRFA. Additional clarification is provided by the Council on Environmental Quality which allows for Indian tribal participation in the planning process (40 CFR 1501.7; 40 CFR 1503.1). The

Native American Graves Protection and Repatriation Act (NAGPRA) requires consultation with "appropriate" Tribes prior to intentional excavation or removal of an inadvertent discovery of human remains and associated cultural items.

6.6 State of Colorado

Concern for cultural resources has been expressed by the Colorado state legislature in the Colorado Register of Historic Places Act (CRS 24-80.1 as amended). This law recognizes the importance of the state's cultural heritage and takes steps to insure that this heritage is considered adequately in the planning process for undertakings. The state law tends to mirror the NEPA provisions for protection of cultural resources at the state, county, and local level. The State Historical Preservation Office (SHPO) is the administering agency for all actions and is therefore responsible for compliance at the state, county and local levels. The State of Colorado passed statutes encouraging counties and local governments to protect cultural resources. House (Colorado) Bills 1034 and 1041 require that cultural resource values be considered when development plans are begun.

Other Colorado state legislation of interest to EEPP is:

CRS 24-80 1201-1202	Ghost Town Statute
CRS 24-80 401ff	Historical, Prehistorical and Archaeological Resources
CRS 24-80 1301ff	Unmarked Human Graves
CRS 24-80 501-502	State Historical Monuments

6.7 Boulder County

Boulder County is active in the identification and protection of significant cultural resources. Cultural resource inventories have been sponsored by the county since 1976. The Historic Preservation Advisory Board (HPAB) promotes Boulder County's cultural history. Historic Preservation Regulations influence alterations to older structures. Landmarking recognizes those structures and districts with historic significance.

6.7.1 Cultural Resource Inventories

Boulder County began surveying its historic resources in 1976 as a result of the Boulder County Bicentennial Commission, which suggested "a program which identifies and designates scenic, historic, archaeological, geological, vegetative and other landmarks." In 1977 Robert Rosenberg surveyed in the western portion of the county. In 1981 Manuel Weiss conducted an intensive-level survey of approximately 170 properties around the county. From 1994 through 2002 Carl McWilliams conducted the Boulder County Historic Site Survey that focused on properties in the county 50 years of age or older. Funding came from Boulder County as well as three State Historical Fund grants. Through these efforts approximately 90 properties in Eldora were surveyed.

In 2007 and 2008 the Eldora Historical and Architectural Survey was undertaken (Adams 2008; Appendix 6.3). Spearheaded by Carol Beam, Historic Preservation Specialist, Boulder County Parks and Open Space pursued a Certified Local Government grant to conduct an intensive-level survey of 50 properties that had not been previously inventoried. The County selected Historitecture, an Estes Park-based architectural history consulting form. Architectural historian and managing principal Adam Thomas conducted the survey. Of the 50 properties, one was field determined eligible for individual listing in the National Register of Historic Place, and 13 were field determined eligible as Boulder County Landmarks. Historitecture found no new districts and did not recommend any changes to the existing Eldora Historic District.

6.7.2 Building Permits

Boulder County Land Use regulations require that a property owner or authorized agent who intends to construct, enlarge, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical or plumbing system, or anyone who is to cause any such work to be done, shall first make application to the Boulder County Building Division and obtain the required permit prior to commencing work.

Once the application is submitted to the Building Division, the department checks the date the building was constructed through the assessor's records. If this date indicates that the building if 50 years of age or older, the application is reviewed for possible impacts to historically significant properties.

6.7.3 Historic Preservation Advisory Board

Boulder County took the first steps towards its own historic preservation program on December 17, 1991, when the Board of County Commissioners approved an amendment to the Zoning Resolution which required a permit for demolition, remodel, or other alteration of structures 50 years of age and older. By September of the following year, Boulder County developed its official historic preservation program and the first Historic Preservation Advisory Board (HPAB) meeting was held in January 1993.

The HPAB derives its authority from the regulations governing historic preservation as adopted and may be amended by the Board of County Commissioners in Article 15 of the Boulder County Land Use Code.

The purpose of the HPAB is to promote Boulder County's cultural history by assisting in the designation of historic districts, sites, and structures; advising the Land Use Department, Parks and Open Space Department, and Board of County Commissioners on decisions relating to historic preservation; and carrying out the duties stated in the Historic Preservation Regulations and other governing documents.

Once a month, the HPAB meets to review these types of alteration and demolition permit applications. The HPAB determines if:

- The building to be altered would qualify for historic landmarking, and
- If the proposed alteration would be detrimental to the building.

If the HPAB feels that a building qualifies for landmarking, and feels that the proposed action will destroy its significance, the HPAB may request that the Land Use Department delay issuing the permit for up to 180 days. This time period allows the property owner and the County to discuss alternatives to the destruction of a historic building. If no solution for is reached within the 180 day period, the permit will be issued regardless of the historic preservation issues. However, if the applicant is going through another type of Land Use review, it could become a condition of that approval to retain the historic building.

6.7.4 Landmark Designation

As part of Boulder County's Historic Preservation Program, Article 15 of the Boulder County Land Use Code also outlines the procedure for designating historically significant structures, sites, or districts as a Boulder County Landmark.

Boulder County landmark designation is a voluntary process that helps to preserve the character of historically significant structures, sites and districts. Designation does not change the zoning. Benefits of landmark designation include assurance that the designated features of the structure, site, or district will be preserved in the future, and the ability to request financial benefits. In exchange for these benefits, the owner agrees to limitations on alterations to historically important features. Each application is reviewed by the Boulder County Land Use Department's Planning Division, the Historic Preservation Advisory Board and final approval is determined by the Board of County Commissioners.

If a structure, site, or district is landmarked, then physical alterations to the exterior will need to be approved by the HPAB prior to any work beginning. The HPAB does have the authority to deny a request for alteration if they feel that the proposed work would be destructive to the historic character of the landmark. Should the HPAB deny a request for alteration, HPAB's decisions can be appealed to the Board of County Commissioners.

If your property is landmarked as a site, you may also need permission from the HPAB to change important site features if it is within the landmarked boundary areas.

As of March 2010 9 buildings are designated as Boulder County Landmarks in Eldora. There are a total of 78 in Boulder County. A list of Landmarked properties in Eldora can be found in Appendix 6.2.

6.8 Funding for Historic Preservation

Several funding sources available for historic preservation are described below.

6.8.1 State Historical Fund

The State Historical Fund was created by the 1990 state constitutional amendment allowing limited stakes gambling in the towns of Cripple Creek, Central City and Black Hawk. This amendment directs that a portion of the tax revenue generated from gaming in those towns to be paid into the State Historical Fund for historic preservation activities statewide. The Colorado Historical Society is statutorily designated by the Colorado General Assembly to administer the State Historical Fund as a statewide historic preservation grants program under the Limited Gaming Act of 1991 as amended, CRS 12-47.1-1201 and 1202.

Only public entities and non-profit organizations may directly apply for State Historical Fund grants. Private individuals and for-profit businesses may participate but must find an appropriate public entity or non-profit organization willing to apply for and administer a grant on their behalf.

Funds are distributed through a competitive grant process and include a wide variety of preservation projects that include rehabilitation of historic buildings, architectural assessments, archaeological excavations, designation and interpretation of historic places, preservation planning studies, and education and training programs. All projects must demonstrate strong public benefit and community support.

6.8.2 State and Federal Tax Credits

Federal and state laws provide tax incentives for historic preservation projects that follow the Secretary of the Interior's Standards for Rehabilitation. The Federal Historic Preservation Tax Incentives program offers a 20% investment tax credit for the approved rehabilitation of more than $5,000 or more of approved preservation work on buildings already listed on National Register of Historic Places or buildings considered eligible for listing on the National Register or buildings contributing to a National Register historic district. These buildings must be income-producing properties, including commercial, industrial, agricultural, or rental residential. In addition there is a 10% investment credit for buildings built before 1936 that are not individually eligible for listing in the National Register; and not contributing to a historic district, but they still must be non-residential income-producing to qualify.

The state offers a similar 20% state income tax credit based on $5,000 or more of approved preservation work on designated properties. The building must be more than 50 years old, listed in the State Register or landmarked by Boulder County.

6.8.3 Boulder County Historic Landmark Rehabilitation Grant Program

The Boulder County Historic Landmark Rehabilitation Grant Program was designed to assist owners with the costs of rehabilitating their locally landmarked properties or contributing buildings in local landmark districts. Eligible applicants include properties designated by Boulder County in the unincorporated areas of the County or in towns with intergovernmental agreements with the county that allow historic landmarking through Boulder County Landmark Designation.

Projects must involve the physical preservation, restoration or rehabilitation of the landmarked building’s exterior and must preserve the historic character of the property. All work will be reviewed for compliance with the Secretary of Interior’s Standards for the Treatment of Historic Properties. The maximum grant amount for any project is $10,000 and there is no minimum grant amount. Grant recipients must provide at least an equal amount of funds to match funds received from the County.

6.8.4 Private Funding

Private funding sources include foundations that target funding for historical preservation, private historic organizations, and grass roots fundraising from a large donor base. These funds are generally for non-profit organizations and public entities.

Funding for complicated projects can be arranged in a sequential manner, in order to avoid competing for the limited number of large grants. For example, the first grant for a particular preservation project can be applied to survey and analysis work, and funding obtained at a later date can be used for the restoration aspect of the project. If the restoration can be broken into distinct phases, funding may then be applied to individual phases.

Funding from the above sources can be applied to any project in the Eldora area, however funding for projects within and in support of the Eldora Historic District will generally be of greater interest to funding entities. On public lands, the US Forest Service has a primary influence on historic preservation projects. The Forest Service may have funds available, though limited, for historic preservation projects, and its approval and sponsorship should always be attained for projects on Forest lands.

6.9 Oral History

Oral history is an important component of any historic preservation program. Many families have three or four generations of residence in Eldora. Many of these residents are advanced in years, and there is a critical need to retain their knowledge for future generations.

Oral history interviews are not difficult to conduct, and may be done by amateurs if simple procedures are followed. It is important that at least two recording participants are present to provide "independent ears" for accurate interpretation of the information. Interviewers should be familiar with the area of residence of the interviewee. The interview is tape recorded, and should be transcribed by an independent participant. Although it can be helpful, it is not required to video tape the interview.

After the interview, the interviewee should be sent a courtesy copy of draft transcript for review and correction. The interviewee should review and sign a release form in order for the interview to pass into the public domain. Copies of the tape recording and transcript should be submitted to a library or appropriate museum.

A list of the oral histories of people associated with Eldora can be found in Appendix 6.4.

6.10 Recommendations

1. ECA should work cooperatively with Boulder County, Nederland Area Historical Society, Carnegie Branch Library for Local History, Colorado Office of Archaeology and Historic Preservation, and other historic preservation organizations to further the research of Eldora’s history and foster the protection of significant historical resources.

2. ECA’s History Committee should continue to organize and compile a formal cultural resources database for the Eldora area.

3. ECA should investigate the most appropriate location(s) for the collection and storage of prehistoric and historic artifacts from Eldora, including the possibility of a site in the community. This information can also be used to advise community members wishing to donate historical items.

4. ECA should support the historic designation of structures in the community, including Boulder County landmarking and National Register of Historic Places designation, as well as the rehabilitation of such structures.

5. To support cooperative relationships and promote cultural resource education, ECA’s History Committee should create a public relations packet that provides an overview of cultural resources and preservation needs in the Eldora area.

6. ECA should work with local, county and state repositories of historical information about Eldora for increased and less costly accessibility when using the information for the Eldora community.

7. ECA’s History Committee should work to increase the access to Eldora’s historical information on the Eldora web site.

7.0 RECREATION RESOURCES

7.1 Introduction

The community of Eldora is a gateway for popular recreation areas on the Boulder District of the Arapaho-Roosevelt National Forest and on private lands. Eldora is surrounded by intensively used recreation areas: the Eldora Mountain Resort to the southwest averages approximately 270,000 skiers per season, and desires additional expansion. The Indian Peaks Wilderness, west of Hessie, is one of the most intensively used wilderness areas in the country. The travel corridors to the wilderness through Eldora to Hessie and the North Fork to Buckingham Campground are popular for scenic drives in the summer and cross-country skiing or snowshoeing in the winter. The Caribou Flats area to the north is a popular motorized vehicle use area, with some of the traffic passing through town. To the east, the Peak-to-Peak Highway (State Highway 119) is a designated Scenic Byway, and provides one of the primary travel corridors in Colorado for hundreds of thousands of tourists each year.

Recreational use was little managed or regulated in the 1960s and 1970s. As use levels increased through these decades, and impacts became severe, the Forest Service, Boulder County and interested parties attempted to address the adverse recreation impacts; in part they were successful. Limited research has been conducted in the past decade to quantify and assess recreational use levels and patterns, and no work has been done to assess the cumulative environmental impact of recreational use on lands in western Boulder County.

The Forest Service has set itself an ambitious agenda for meeting recreational demand on the Forest. Traditional uses of the Forest, such as grazing, timber cutting (except for wildfire hazard mitigation and healthy forest initiatives) and mining, are being diminished, and the Boulder District of the Arapaho-Roosevelt National Forest is emphasizing recreational use. However, the Forest is under-funded in critical areas such as land acquisition and recreational facilities maintenance and it is unable to meet many of the goals it has set for itself.

7.2 Eldora Mountain Resort

The ski area at Eldora began operation in December of 1962. The ski area occupies approximately 1,160 acres of land, including 480 acres of leased National Forest, 220 acres of private landed owned by the resort, and 460 acres of leased private land (SE Group 2011).

Eldora currently operates eight chairlifts, one surface lift, and two beginner conveyor lifts (SE Group 2011; Figure 7.1). Developed skiable terrain includes 49 maintained alpine trails totaling 188 acres. The remainder of Eldora’s skiable terrain is comprised of undeveloped and developed glades that total approximately 165 acres. Skier support facilities include the Indian Peaks Lodge and Timbers Lodge, and associated buildings, at the main base area; and The Lookout restaurant at the summit. Day skier parking is provided at the base area. Snowmaking covers nearly all of the developed, groomed terrain. Summer activities are limited to special events, conferences, weddings, and races. Nordic ski trails were opened at Eldora in 1975 and have grown through the years to a system of over 45 kilometers.

Figure 7.1. Ski Area 2011 Master Plan Upgrade Plan

Existing ski runs are in white; new proposed ski runs are in green.

The ski area's market is primarily composed of day skiers from Boulder and the Front Range. They do a significant portion of their business during weekends and holidays.

Following is a chronology of some important events for the ski area:

- 1961: George Sweeney, Gabor Cseh, Frank Ashley, and Donald Robertson bought 400 acres encompassing where the ski area lodge and parking facilities currently stand.

- 1962: The Shelf Road (County Road 140) is constructed along the north slope of Tennessee Mountain.

- December 1962: Lake Eldora ski area opens with a new lodge, newly paved access road and 2 T-bars serving 12 trails.

- 1963: Ski runs are expanded onto 480 acres of Roosevelt National Forest with a Forest Service special use permit.

- 1967: Tell Ertl family purchases the ski area.

- 1968: Lake Eldora becomes one of the first ski areas in Colorado to make snow.

- 1973: There is a major upgrade of ski lifts and runs, including the creation of Corona lift and the new Cannonball lift. This year the Eisenhower Tunnel along I-70 opens, providing easier access for skiers to the ski areas on the west slope. Eldora's visitor numbers decline.

- 1976: First Master Plan for ski area is approved by the Forest Service and Boulder County. This plan contemplated a destination resort with overnight lodging.

- 1983: Ertls put ski area up for sale for $10 million, citing losses of $500,000 per year for 3 years.

- 1985: Ertls lease ski area to O.Z. Minkin, who agrees to purchase it for $5.2 million. Minkin runs up large operating deficits during 1985-86 ski season.

- 1986: Minkin defaults on loan and property reverts to Ertls. Ski area closed for 1986-87 ski season.

- 1987: Andy Daly, from Copper Mountain Resort, takes over as president of Lake Eldora Ski Corporation. They submit new Master Development Plan to Boulder County that continues to include overnight lodging. The plan is conditionally approved.

- 1989: Vail Associates, Inc. announces purchase of controlling interest in Lake Eldora Ski Corporation. The ski area's name is changed to Eldora Mountain Resort.

- 1991: Vail Associates announces they will not renew their lease to operate the ski area from Lake Eldora Ski Corporation, owned by the Ertl family.

- June 1991: Eldora Enterprises Ltd. Liability Company, headed by Chuck Lewis, purchases Eldora Mountain Resort, including 223 acres. The Ertl family keeps 280 acres.

- 1993: The Master Development Plan is updated and approved by the Forest Service and Boulder County. It includes the addition of snowmaking on Corona and the development of the Indian Peaks pod (which was built in 1997). The Indian Peaks Lodge is also approved. Overnight lodging is no longer part of the plan. There is significant opposition from the community of Eldora towards the expansion of lifts and snowmaking on the backside.

- 1997: The 1997 Revision of the Land and Resource Management Plan for Arapaho and Roosevelt National Forests states "There will be no expansion of the area outside the boundaries currently specified in the Master Development Plan."

- 1999: Major improvements are made to the Shelf Road; the $1.3 million in costs are split between the ski area and Boulder County.

- 2011: An update to the Master Development Plan is accepted by the Forest Service. It plans significant expansion of the ski area on its backside, with lifts and runs coming down towards Middle Boulder Creek and Hessie.

As noted above, the financial viability of the ski area was in question since it first opened. The opening of the Eisenhower Tunnel made it easier for skiers from the Front Range to make it to the ski areas west of the Divide, where there is generally better snow and less wind. However, over the last 10-15 years, traffic congestion on I-70 at the tunnel has resulted in more skiers coming back to Eldora Mountain Resort.

Particularly since the mid-1990s, the ski area has been expanding the amount and quality of the ski terrain on its backside. This includes creation of the Indian Peaks pod and the addition of snowmaking on the Corona ski runs. The Eldora Mountain Resort 2011 Master Plan contemplates additional expansion on the backside.

The ski area has a significant impact on the Eldora area in terms of noise, visual impacts and traffic it brings to the valley. The contemplated future expansions, if carried out, will only increase the level of impact to the valley.

7.2.1 Eldora Mountain Resort 2011 Master Plan

The Eldora Mountain Resort 2011 Master Plan was accepted by the Forest Service in February 2011 (see Figure 7.1 – Upgrade Plan). The process for acceptance of the plan was negotiated between the ski area and the Forest Service; there was no formal public review process or environmental impact analysis.

The ski area is trying to remain competitive in the local skier market, better retain existing guests and attract new visitors, as well as respond to several deficiencies in the product they provide, including:

- Inadequate uphill capacity due to old and slow ski lifts.

- The amount of intermediate terrain is below industry standards.

- The frequent closure of lifts and ski runs due to high winds.

- Inadequate facilities, support facilities and services.

As seen in Figure 7.1, major expansion is envisioned on the backside where new lifts and ski runs will come all the way down the north side of Bryan Mountain to near Middle Boulder Creek and Hessie. Two new lifts are planned to be constructed on the backside (Placer Express and Moose Glade Express), along with 14 ski runs and several new glades. A new lift, called Jolly Jug, and associated runs is also planned on the south side of the ski area.

The total acreage of ski runs at the ski area will increase from 188.5 acres to 276.7, a 47% increase. Snowmaking coverage will increase from 170 acres to 258 acres, a 52% increase. Higher speed and larger capacity lifts will be used for new lifts and replace most existing lifts. Intermediate terrain will be increased. The existing Indian Peaks Lodge and Lookout Restaurant will be renovated and expanded, and a new on-mountain guest services facility will be constructed in the Indian Peaks pod. The planned upgrade will increase the comfortable carrying capacity (CCC) of the ski area from an existing 4,250 guests to 6,580, increase trail capacity from 5,862 guests to 7,232, increase parking from 5,862 guests to 6,979, increase guest services from 3,204 guests to 6,801, and increase food service from 2,077 guests to 6,909.

The ski area hopes to better deal with the high winds of the area that frequently causes partial or full closure. First, the new and heavier lifts will be able to stay operating at higher wind speeds than the existing lifts. Second, the ski area feels that the new ski runs on the lower portion of the north side of Bryan Mountain will be better protected from the wind as they will be lower on the hill and narrower in design, retaining more trees for wind protection.

Figure 7.2. Hessie and Existing Corona Pod

Looking across Hessie at the Corona Pod (Photo by Dave Hallock)

This is looking south across Hessie to the existing Corona ski runs from the Fourth of July road. The planned ski runs will come down the forested slope across the center of the photo.

7.2.2 Areas of Concern

The proposed expansion of the ski area will have significant impacts on the community of Eldora and the Hessie/Eldora access area to the Indian Peaks. The collective impacts outweigh the benefits to the ski area and downhill skiers. There will be adverse impacts to the existing ecology, scenery, acoustics and community values. The present terminal location of the Corona and Indian Peaks lifts and ski runs appears appropriate as it provides a visual and acoustic buffer for recreationists using the Fourth of July road and the community of Eldora, as well as providing a 980 foot buffer to Middle Boulder Creek that can remain as a functioning wildlife movement corridor.

The potential to Eldora and the Hessie area include the following:

- Community of Eldora
    - Noise Impacts. Snowmaking noise will increase in the community. Noise from snowmaking already exceeds normal county standards (55 decibels during the day and 50 decibels at night within residential areas 10' from the property line). Bringing runs and snowmaking down further to the valley floor will increase the noise.
    - National Historic District. The Eldora townsite has been listed by the National Park Service as a Historic District on the National Register of Historic Places (NRHP; 5BL.758). Eldora community and Boulder County policy is to review future development proposals, including those outside the townsite, which have potential visual or noise impacts, with significant weight to the compatibility of the proposals with the maintenance of the rural and historic character.
    - Increased Use of Carbaryl. The community has been concerned about adverse impacts to the environment from the use of carbaryl to fight mountain pine beetles. Expansion of the ski area down to Middle Boulder Creek increases the possibility that more carbaryl will be used upstream and closer to the creek.
    - Increased Traffic. Increasing the number of visitors at the ski area will increase the amount of auto traffic on CR 130 east of Town.

- Hessie/Eldora Access to Indian Peaks Wilderness
    - Scenic Impacts. Will impact the scenic backdrop for visitors accessing the Indian Peaks. The lifts and runs will come down the last slope to the south edge of Middle Boulder Creek and move the visual impacts of the ski runs from the midground to the foreground.
    - Noise Impacts. Will impact the acoustic experience of visitors to the Indian Peaks. Cross-country skiers and snowshoers will now hear the sounds of snowmaking and lifts operating as they head west from the community of Eldora for approximately 2 miles. At its closest, snowmaking will be within 150 feet of recreationists using the Fourth of July road.
    - Increased Summer Use of South Side of Middle Boulder Creek. It will be difficult to stop people from accessing the south side of Middle Boulder Creek and the hillside above by use of the new bridge. This has the potential of opening up a new area to summer recreation that has had little human use and ties into increased environmental impacts (wildlife displacement).

- Environmental
  - Displacement of Wildlife. Forest Service Sensitive Species documented within the area proposed for expansion include American marten, American three-toed woodpecker and boreal owl. Moose, black bear, mink, mountain lion, and elk also use the area.
  - Disruption of Wildlife Movement. Will impact a landscape linkage for wildlife movement through this area, as lands to the south and north already have a high level of human use. Development of this area could create a migration bottleneck for animal movement along Middle Boulder Creek.
  - Landscape Fragmentation. The existing ski runs and lifts already fragment the north side of Bryan Mountain from its top to within 980 horizontal feet of the bottom. The width of the fragmented area is approximately ½ mile. Dropping the final 980 horizontal feet to Middle Boulder Creek completes a ½ mile swath of fragmented landscape from top to bottom.
    - Not only may this impact movement of animals like American marten, but also smaller animals and organisms such as small mammals, ground dwelling insects, plants, lichen, and microorganisms.
  - Wetlands. There are wetlands and riparian areas between the bottom of the Indian Peaks and Corona lifts and Middle Boulder Creek that will likely be directly and indirectly impacted from the ski runs and fragmentation of the forest.
  - More Snowmaking Means More Water. Expansion of the ski terrain will require more snowmaking on National Forest lands and the use of more water. This will likely impact the ecology of the water sources, such as the Rocky Mountain capshell snail in Peterson Lake and the riparian habitat along Jenny Creek.
  - Runoff and Sedimentation. There is a possibility that sediment will increase in Middle Boulder Creek and its associated wetlands and riparian zone. The current buffer along Middle Boulder Creek below the existing Corona and Indian Peaks ski runs is 980 horizontal feet; this will be reduced to less than 50’ in locations by the new ski runs and lifts.
  - Sustainability. Ski areas are growth-based industries, as shown by the proposed expansion of Eldora Mountain Resort. This goes against the concepts of sustainability and limiting spatial footprints, an emphasis of land use regulations in Boulder County. Homes in the community of Eldora were recently limited to 1,500 square feet. There needs to be a limit placed on the ski area.

7.2.3 Town of Eldora’s Role

The ski area’s focus on expansion on its backside down towards Middle Boulder Creek and Hessie is of great concern to the community of Eldora. The community worked on getting specific language in the 1997 Forest Plan to stop the expansion of the ski area outside its current permit boundary.

Eldora residents need to be vigilant in fighting the proposed expansion of the ski area through the following steps:

- Working with Boulder County and the Forest Service to limit the eventual size and operation of the ski area, particularly on its backside.

- Developing a comprehensive plan for management of the area west of Eldora, working with all entities (Forest Service, Boulder County, ski area, City of Boulder, North Fork Council, and appropriate citizen groups) as equal partners.

- Developing political alliances with other organizations concerned about the area west of Eldora in order to demonstrate a broad base of concern regarding the impacts of the ski area.

- Monitoring the operations of the ski area and documenting adverse impacts and non-compliance with the terms and conditions of the Forest Service and Boulder County special use permits.

7.2.4 Proposed Ski Area Expansion EIS

In July 2012, the Forest Service initiated the scoping process for the Environmental Impact Statement concerning the proposed expansion of the ski area. The ski area is proposing to expand on the backside, called Placer lift, which is a portion of what is shown in the accepted Master Development Plan. They are also proposing an expansion on the south side, called Jolly Jug, as well as improvements to lifts and other services.

ECA joined with a group of other organizations, including Indian Peaks Group of the Sierra Club, Boulder County Audubon Society, Colorado Environmental Coalition, Rocky Mountain Wild, Boulder County Nature Association, Western Resource Advocates, Defenders of Wildlife, and North Fork Council to form the Middle Boulder Creek Coalition (MBBC) in fighting the ski area expansion. A web site and contact list were developed. Scoping comments were submitted by MBCC and many Eldora residents raising concerns and issues that the Forest Service will have to address in the EIS.

MBCC has hired an individual experienced with Forest Service and ski area expansion issues and has obtained legal help. The Draft EIS is scheduled to come out during the summer of 2013.

7.3 Indian Peaks Wilderness Area

The Indian Peaks Wilderness Area, established by Congress in 1978, lies west of Hessie along the Continental Divide (Fig. 7.3). The wilderness area comprises approximately 76,000 acres and is contiguous with Rocky Mountain National Park on the north; its southern boundary is at Rollins Pass west of Eldora. Indian Peaks is one of the most intensively used wilderness areas in the nation (USDA Forest Service 1997); principal activities occur during the summer and are day-hiking and backpacking/overnight camping. The Indian Peaks is close to an urban population base of more than 3 million people with quick highway access; the majority of use occurs on the east side of the Continental Divide. Between 1992 and 2004 an average of 93,000 annual visitors were present on the east side of the Continental Divide; approximately 86% of the visitors were day hikers and 14% backpackers.

7.3.1 Present Management

As stated in the 1997 Forest Plan (USDA Forest Service 1997), wilderness areas are managed to protect and perpetuate their natural conditions while providing opportunities for solitude and self reliance. The physical and biological attributes will be managed to allow natural processes to perpetuate the included ecosystems. Fire is one of the primary natural processes serving an integral role in the maintenance of the wilderness ecosystem. The areas are managed to provide opportunities for primitive and unconfined recreation, featuring solitude and cross-country travel in an environment where success or failure depends directly on ability, knowledge, and initiative. The setting appears natural. Administrative actions to maintain the desired condition of wilderness are to develop and implement "limits of acceptable change programs" and "wilderness implementation schedules," as funding and resources allow.

Figure 7.3. Indian Peaks Wilderness from Arapaho Pass

Looking at Caribou Lake in the Indian Peaks Wilderness (Photo by Dave Hallock)

Human impacts are minimized in wilderness by considering:

- Limiting the number of private and outfitter/guide camps.
- Encouraging the use of self-contained stoves and discouraging the use of wood-fueled fires (wood fires are prohibited in the Indian Peaks Wilderness).
- Use of a permit system for either day use or overnight use, or other measures (such as area closures) to manage use-levels and use-patterns (overnight camping is conducted via a permit system in the Indian Peaks Wilderness from June 1 through September 15; permits are $5 per group; camping is allowed only at designated campsites).

- Limitations on party size and pack animals. Maximum party size is 12 (combination of people and recreational stock). Recreational livestock cannot be within 100 feet of lake shores and streambanks except for watering and through travel.

- Prohibiting dogs or requiring all dogs to be on a leash (dogs must be on a leash in the Indian Peaks Wilderness).

- Implementing minimum-impact suppression tactics when managing wildland fires.

The Area Direction for the Indian Peaks Wilderness Geographic Area, as stated in the 1997 Forest Plan (USDA Forest Service 1997) is:

> "Emphasize protection of the area for its wilderness character and values while providing opportunities for quality wilderness experiences.
>
> Emphasize old-growth retention. Allow fire to play an active role in maintaining natural conditions within the wilderness whenever possible. This includes using fire to alter vegetative conditions on an opportunity basis. The wildland fire management strategy is prescription control. Allow insect and disease outbreaks to run their course. Rehabilitate disturbed areas as needed to restore habitat quantity and quality for native plant and animal species.
>
> Continue the monitoring program initiated in 1986 to determine the impacts and effects of acid rain in the Indian Peaks through partnerships with state and local regulatory agencies and local interest groups. Current monitoring sites include Blue, Crater, King, No Name and Upper Lakes.
>
> Manage the area for both primitive and semiprimitive, year-round backcountry use. Protect wilderness ecosystems and opportunities by continuing the permit system for overnight use implemented in 1984 and combining the Peak and Four Lakes Travel Zones. Manage this continued travel zone for day use only from May 1st through November 30th. Monitor visitor use to determine if current capacities are still appropriate and to ensure that wilderness values and physical resources are not being compromised. Adjust capacities, as necessary, by considering actions like adjusting trailhead parking capacity or location and modifying the current permit system.
>
> The travel management strategy for the wilderness will be to retain most of the trail network in the area. Consider trail closures where excessive resource damage is occurring, rights-of-way are lacking, or routes are not maintainable due to environmental conditions. One of the routes that might be considered for closure is the Chittenden Mountain trail. Minimize impacts to other riparian areas and wilderness resources…
>
> Pursue land acquisition to consolidate landownership on an opportunity basis."

Standards and guidelines applicable to the Indian Peaks accessed from Hessie and Fourth of July include: prohibit recreation livestock on the Diamond Lake Trail; and prohibit camping within 100 feet of lake shores, streambanks, and trails.

7.4 Non-Wilderness National Forest Lands

National Forest lands outside of the Indian Peaks Wilderness area, which includes all of the National Forest land within the EEPP boundary, primarily fall within the Boulder Creeks Geographic Area (USDA Forest Service 1997). Geographic areas within the Forest Plan apply management direction that is specific to the area. They also identify what forestwide and management area direction will generally receive most emphasis.

The lands are also designated as a type of management area (USDA Forest Service 1997; see Figure 7.4). Management areas define where differing kinds of resource and use opportunities are available to the public and where different management practices may be carried out. An important function of delineating a management area is to define spatially where differing types of resource-use opportunities are available to the public.

7.4.1 Boulder Creeks Geographic Area

The Area Direction for the Boulder Creeks Geographic Area, as stated in the 1997 Forest Plan (USDA Forest Service 1997), which is relevant to the Eldora area, is:

> "Emphasize motorized and nonmotorized recreational opportunities, downhill skiing, and the protection of areas recommended for addition to the Indian Peaks Wilderness.
>
> Restore, enhance, or maintain mountain grassland and aspen communities. Emphasize old-growth recruitment and retention. Manage vegetation to achieve desired flora and fauna goals in the area. The fire suppression strategy varies from direct control to perimeter control.
>
> Manage the area for year-round recreational use. Minimize recreational impacts to riparian areas and visual corridors by considering the implementation of designated dispersed campsites at Lost Lake…Improve the quality of recreational opportunities and reduce impacts to riparian areas by reconstructing and relocating the western portion of the Jenny Creek trail.
>
> Reduce impacts to known historic sites, restore meadow and wetland habitats, and eliminate congested roadside parking by developing a trailhead with safe parking between Eldora and Hessie for the Devils Thumb trail. This could include actions like working with Boulder County to address current parking issues along the main road, addressing sanitation concerns, and perhaps developing a trail for people to use to get from the parking area to the Devils Thumb trail. Other actions that might be considered could be to designate dispersed campsites along the South Fork of Middle Boulder Creek and to develop interpretive signing for the Hessie Townsite.
>
> Consider actions that limit use at established wilderness trailheads (Hessie and Fourth of July) to established capacities. This could include controlling use levels by limiting the number of parking spaces…
>
> Pursue rights-of-way for the Devils Thumb trail, the Guinn Mountain and Jenny Creek Ski Trails, and the Jenny Creek Road. Resolve access issues associated with the Caribou Flats Road network…
>
> The travel management strategy for the area will be to allow passenger car travel to key access points on a network of county roads suited primarily for passenger car travel. Motorized travel will be allowed on some of the 4WD routes that

currently exist, and most of the trails in the area will be retained. Some road and trail closures and obliterations can be expected. Routes in the area that may be considered for possible closure include the western portion of the Jenny Creek Road between its intersection with FDR 502.2 and Yankee Doodle Lake and the Chittenden Mountain trail…

Consolidate landownership patterns by disposing of isolated tracts of National Forest System land in and adjacent to the town of Eldora. Also consider acquiring isolated, undeveloped patented mining claims west of Eldora, in the 4th of July Valley, and adjacent to the Indian Peaks Wilderness.

Manage recreational uses and road and trail networks to reduce erosion or deterioration of riparian areas and watershed conditions. Evaluate road and trail impacts to aquatic and riparian ecosystems during travel-management planning. Cooperate with other agencies to determine the presence or absence, status, and genetic purity of greenback cutthroat trout in area streams.

Regarding Eldora Ski Area: Continue authorization of downhill skiing at Eldora Ski Area under their special-use permit and master development plan. Further improvements of the base facilities, infrastructure, and ski runs with the current boundary are expected. There will be no expansion of the area outside the boundaries currently specified in the Master Development Plan. It is anticipated that actual use levels will increase. There will, however, be no increase in the established maximum daily capacity.

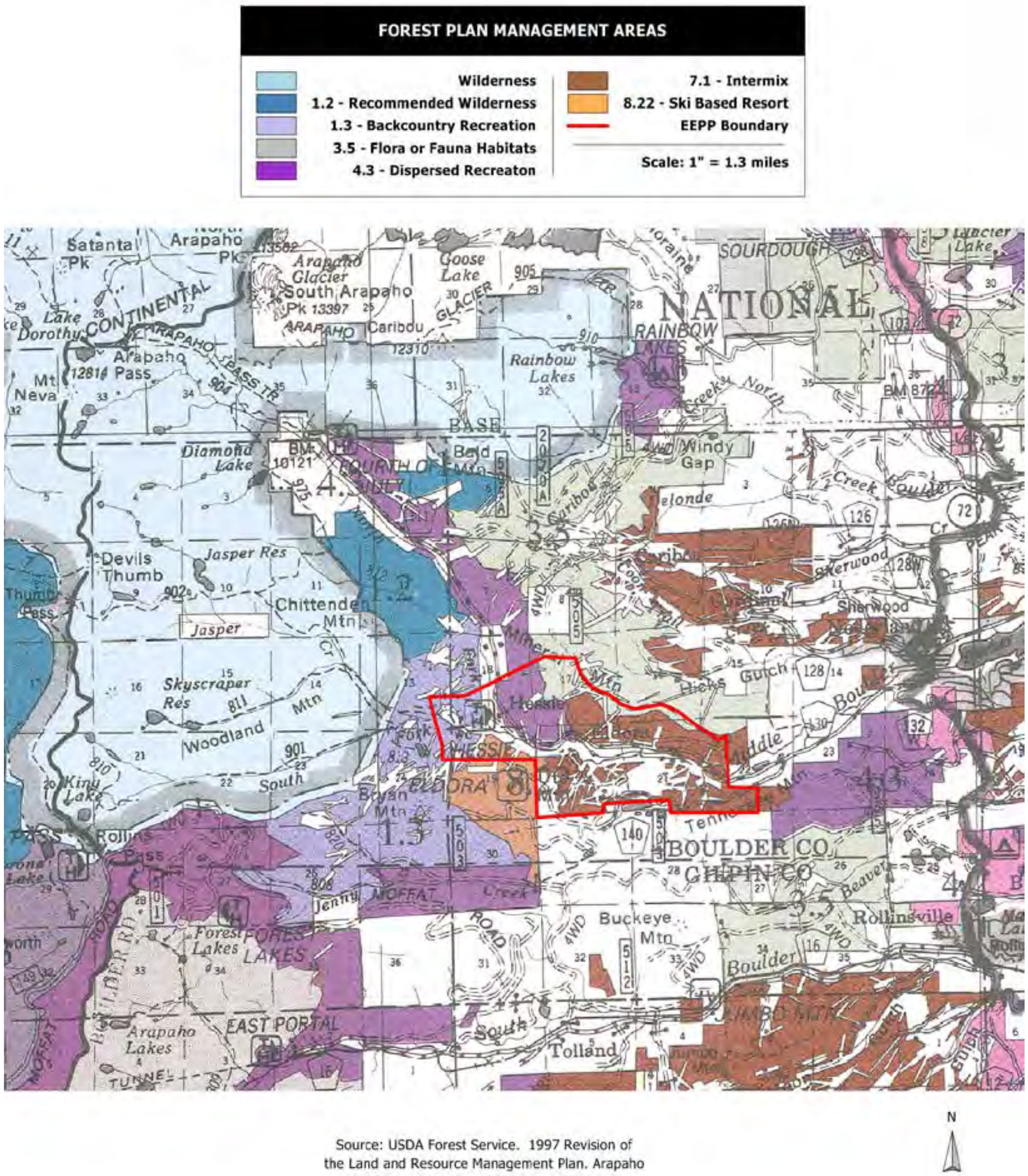
Work and cooperate with the Eldora Mountain Resort to develop a sustainable vegetation management plan for the Eldora Ski Area and to formalize access through the ski area for the Jenny Creek cross-country ski trail."

7.4.2 Forest Plan Management Areas

The Forest Service lands on Spencer and Eldorado Mountains are designated as Residential-Forest Intermix (7.1 on Figure 7.4). They are characterized by an interface between residential private lands and National Forest System lands. They are managed to protect natural resources, provide compatible multiple uses, and maintain cooperative relationships between the landowners and other levels of governmental jurisdiction. Opportunities to consolidate land ownership patterns are pursued. Developed residential use blends into relatively undeveloped natural environments. Dispersed recreation is not encouraged but access to existing areas of high use is provided.

The Forest Service lands along the Fourth of July road are primarily designated as Dispersed Recreation (4.3 on Figure 7.4). This does not apply to private lands or the Toll parcel, which was purchased by the Forest Service after the completion of the 1997 Forest Plan. They are characterized by relatively easy access and heavy use which may be motorized, nonmotorized or both. They are managed to provide recreational opportunities in natural or nearly natural-appearing landscapes. Biological communities are maintained or improved to provide a pleasing appearance for visitors, complement the recreational values and provide varied plant communities, structural stages and associated wildlife. Frequent contact between individuals or parties is acceptable and sounds from other people and motorized equipment are common. Opportunities for solitude or isolation are limited. Blend existing improvements into the landscape where feasible. Directional, regulatory and informational signs are present and foster safe use, identify requirements for use of the area, and provide route information.

Figure 7.4. 1997 Forest Plan Management Areas



Source: USDA Forest Service. 1997 Revision of the Land and Resource Management Plan. Arapaho and Roosevelt National Forests and Pawnee National Grasslands.

The Forest Service lands west of Hessie to the boundary with the Indian Peaks Wilderness are primarily designated as Backcountry Recreation (1.3 on Figure 7.4). They are managed to provide nonmotorized recreational opportunities in a natural appearing landscape. A variety of plant communities, structural stages, and associated wildlife occur in patterns maintained primarily through ecological processes. Encounters between individuals or parties are most common on travelways. Fewer contacts and improved opportunities for solitude occur away from trails. Subtle on-site regulations and controls are used.

The Forest Service lands that include the backside of the ski area down to the Toll parcel are designated as Ski-Based Resorts (8.22 on Figure 7.4). These lands are managed to provide for skiing and related recreational uses. Vegetation composition and structure are maintained or improved to provide a pleasing appearance. The scenic resources are managed so that the character is one of forested areas interspersed with openings of varying widths and shapes. Ski operations that affect water, including snowmaking and other water-depleting activities, will be compatible with maintenance of healthy aquatic ecosystems.

The Forest Service lands on a portion of the west slope of Fourth of July Valley are primarily designated Recommended for Wilderness (1.2 on Figure 7.4). These are areas that the Forest Service will recommend to Congress for inclusion in the Wilderness System and are managed to protect wilderness characteristics until Congressional action is taken. The physical and biological attributes are managed to protect and perpetuate ecosystems native to the region. The setting appears natural. This is an area where the natural processes and conditions are protected from unacceptable change by human use.

The Forest Service lands on top of Caribou Flats are primarily designated Forested Flora and Fauna Habitats (3.5 in Figure 7.4). The management emphasis is on providing adequate amounts of quality forage, cover, escape terrain, solitude, breeding habitat, and protection for a wide variety of wildlife species and associated plant communities. Insect and disease losses are generally accepted unless they threaten communities which are providing important habitat components. Dispersed recreation opportunities are provided outside critical periods for wildlife. Restrict recreational use to the extent necessary to protect the values for which the area is designated. Discourage motorized recreation away from primary travelways, but allow or provide access to existing areas of high use.

It is noted that the Toll parcel, located just west of Eldora along Middle Boulder Creek and through Hessie (see Figure 9.1 in Section 9 for location), has no Management Area prescription. It was acquired by the Forest Service after the 1997 Forest Plan was finalized.

7.5 Hessie

While conditions in Indian Peaks have been slowly improving over the past three decades, USFS land and private land which borders the eastern edge of Indian Peaks has seen increasing levels of use and conflict. Of particular interest to Eldora residents is the situation at Hessie, just over one mile west of Eldora townsite. Hessie is located at the junction of the North Fork and South Forks of Middle Boulder Creek and is the site of an old placer claim and some abandoned cabins.

The trailhead is one of six principal access points to the wilderness on the east side of the Continental Divide. It accounts for approximately 8% of all visits to the wilderness area (1989 figures). The trailhead provides summer access to three different drainages in the wilderness and one non-wilderness destination, Lost Lake. More detailed data collected in 1992 by the Forest Service show that the level of use at Hessie trailhead was far higher than actual use of the wilderness; of 12,000 visitors to the trailhead only some 4000 walked as far as the wilderness boundary. Thus, the greatest recreation use occurred on a narrow corridor of private and Forest lands outside of the designated wilderness. In 2001 there were approximately 12,000 hikers at Hessie over the course of 12 weeks during the summer. In winter, cross-country skiing is a popular activity. On peak winter weekends over 75 cars may be parked at the limit of winter maintenance at the west end of Eldora townsite.

7.5.2 Hessie Trailhead Planning Efforts

Parking and public access from Hessie to National Forest lands to the west has been a growing concern due to increased visitation and poor parking conditions. A chronology of the issue assembled by Boulder County Parks and Open Space and the Forest Service is found in Appendix 7.1. Following are some highlights:

- 1983-84: The Indian Peaks Access Group, through a series of meetings, develops a list of recommendations to mitigate issues that affect the Eldora/Hessie area. Actions focus on summer and winter parking congestion, related pedestrian safety, and emergency access, including:
    - the construction of a 60 car parking lot at Hessie by widening the existing road to avoid encroachment on the meadow and to preserve historic structures and repairing Dr. Toll's fences through the meadow area;
    - widening the junction of County Roads 111 and 130 at Hessie 5 feet onto Forest land for a length of 50-100 feet to allow for parking and emergency vehicle access;
    - continuing present winter parking arrangements in Eldora and improve signing.

  The re-fencing of the Hessie meadow and better signage were accomplished, while the lot construction in Hessie and widening of County Roads 111 and 130 were not.

- 1996: The Forest Service initiates acquisition of the Toll parcel and prepares a strategy to use portions of the property for resolving parking and trail access issues. The key focus is on restoration of damaged resources and providing parking for 80 vehicles. Acquisition of the Toll parcel is completed, but the parking lot is never constructed.

- 1997: The Forest Plan is updated. It considers actions to limit use at established Wilderness Trailheads, including Hessie. And work with Boulder County to resolve roadside parking congestion issues in the area.

- 2001: The Forest Service initiates a formal planning process that includes the design and location for three alternatives that considered parking for up to 160 vehicles. Due to planning complexities, funding constraints and other priorities, the project was put on hold.

- 2004: The Forest Service initiates the Hessie Winter Trailhead Project, with the intent to construct winter trailhead parking, restrooms and trash receptacles. The project was put on hold due to funding constraints and other priorities.

- 2005: The David property is purchased by Boulder County with the intent to transfer ownership to the Forest Service as part of a future land exchange (see Figure 9.1 in Section 9 for location).

- 2006-2011: The Forest Service, Boulder County Transportation Department and Boulder County Open Space Department work to resolve inadequate parking/access on County Road 130, vehicle congestion, public safety concerns, and pedestrian safety issues. One alternative conceptualizes using a portion of the David property for a parking lot. Other alternatives include widening of County Road 130 at the Hessie junction and the use of a shuttle from Nederland. One goal is to prohibit vehicles from driving down into Hessie to reduce water pollution, impacts to cultural resources, and impacts to wetlands.

- 2012: Boulder County begins use of a shuttle from the Nederland High School parking lot to Hessie. The shuttle is free and runs during the summer on weekends and holidays. They made modifications to the parking east of the Hessie "Y" by widening the road and using on-road parking for approximately 50 vehicles. There is strict enforcement of the parking spaces at Hessie. An electronic sign is used at the High School to inform people when the parking at Hessie is full and advising people to use the shuttle. In 2012 the shuttle recorded 5,040 boardings (both ways counted) for about 6.34 passengers per hour. Weekend peak passenger loads hovered near or over 600. Boulder County estimates approximately 8,248 vehicle miles saved based on an average 2.7 people per vehicle and a round trip of 8.44 miles. the County plans to operate the trail use parking and shuttle serviced in 2013.

7.6 North Fork

The North Fork of Middle Boulder Creek joins the South Fork at Hessie. Above Hessie, County Road 111 continues for approximately four and one-half miles up to Buckingham Campground and Fourth of July trailhead. This trailhead is an access point to the Indian Peaks Wilderness, and accounted for 14% of all 1989 visits to the wilderness (some 15,000 visitors). In 2001 there were approximately 13,500 hikers at the Fourth of July trailhead over the course of 12 weeks during the summer. County Road 111 has seasonal vehicular access and generally receives snow removal in the spring (usually by Memorial Day in May) and is generally bladed once per year. Access in winter is by crosscounty skiing, snowshoeing, foot or snowmobile only.

The valley's numerous private inholdings make it the longest "cherry-stem" into Indian Peaks Wilderness Area, confining the wilderness mainly to areas above timberline in this area. Most of the cabins in the drainage are built on small patented mining claims with the major exception being the 276 acre Farris parcel at the upper end of the valley southwest of Buckingham Campground. North Fork property owners prefer that the valley remain largely undeveloped and most apparently plan to retain their properties in a semi-primitive state for the foreseeable future.

As another consequence of the large number of summer cabins and access for wilderness visitation, traffic is heavy from June through September on the North Fork road and is sometimes constricted at the Hessie junction by roadside parking. Figures from the summer of 2001 showed an average of 175 vehicles per weekend day and almost 400 vehicles per week use the roads.

There is a mixture of private and Forest Service land along the North Fork. The North Fork Council has been working with the Forest Service to prohibit camping and campfires on the intermixed Forest Service land.

7.6.1 Fourth of July Campground

Fourth of July Campground, which is owned and managed by City of Boulder Open Space and Mountain Parks, is an inholding of approximately 35 acres deeded to the city in the early 1900s by the Buckingham family. Fourth of July Campground is the only developed recreation site in the North Fork drainage, containing 5 designated campsites that are used on a first come, first serve basis. No fires are allowed and there is a 4 day camping limit. There is an outhouse and trash bins that are maintained by the City. Fourth of July is also used as a trailhead by backpackers and day hikers accessing Diamond Lake, Arapaho Peak, Arapaho Pass and other sites in the Indian Peaks Wilderness. The upper parking lot holds approximately 16 cars, with additional parking along the road. The City patrols the area about every two weeks, relying on Forest Service personnel to patrol on a more regular basis (Dave Berry, City of Boulder Open Space and Mountain Parks, personal communication).

7.7 Caribou Area

Caribou Flats, two miles north of Eldora, is a popular area for four-wheel drive enthusiasts. The Forest Service locates it within the Caribou Geographic Area and gives it the Forested Flora and Fauna Habitat prescription. The desired condition for the land emphasizes protection of native flora and fauna while providing summer motorized recreational opportunities. The travel management strategy for the area is to maintain the road network that allows through-travel from Eldora to Rainbow Lakes (Forest Service Road 505). There may be significant road closures and obliterations in the geographic area to help rehabilitate and restore important meadows and wetland habitats. The goal is to provide primitive motorized recreational opportunities on the road system through the core of the area during the summer and fall and to minimize human-wildlife conflicts and potential for resource damage during snowmelt by closing the road system to motorized vehicles in the winter and spring.

Beginning around the year 2000, significant work has been done to implement the Forest Plan goals for the Caribou area. Forest Road 505 is gated at the edge of Eldora and closed from the start of winter until spring, sometimes not opening until after the 4th of July due to late snowmelt. One purpose of the closure is to protect calving and migrating elk that utilize the area, stretching from the Arapaho Ranch west over the top of Eldorado and Mineral Mountains. Many of the spur roads off of 505 on top of Caribou Flats have been obliterated and closed by a joint project carried out by the Forest Service, Tom Hendricks, City of Boulder, and four wheel drive clubs. Boulder County has been acquiring much of the private land on top of Caribou Flats, which have been traded to the Forest Service.

7.8 Eldora Recreation Issues

Polls of the community's year-round and summer residents (Appendix 1.1) have shown that the community cherishes its peaceful, undeveloped, off-the-beaten track feel. The majority of Eldora Civic Association (ECA) members polled has opposed further development of surrounding public lands for recreation and did not wish to see increased use of public lands in the area. The majority of poll respondents have opposed the construction of a large parking lot west of town and the creation of a trail from Nederland through town. Traffic volume and speeds are major concerns. There appears to be some support for the use of a shuttle from Nederland High School to Hessie and creating a Forest Service Recreational Fee Area west of town.

7.8.1 Tourism

Although the town of Eldora, with its mines and historic structures, has the potential for attracting tourists, residents have chosen to not emphasize this possibility. Most public lands users pass through the townsite of Eldora without stopping and there is only one active business in town, the Gold Miner Hotel.

The Peak-to Peak Highway (State Highway 72) was designated as a National Scenic and Historic Byway on December 14, 1989. It is also designated as a Colorado State Scenic Byway and a National Forest Scenic Byway. The Peak to Peak Scenic and Historic Byway Corridor Management Plan was developed and approved in 1998, a project developed by The Peak to Peak Scenic Byway Interest Group and the Tourism and Recreation Program of Boulder County (Whiteman & Taintor 1998).

While the Peak-to-Peak Highway and the communities it goes through are the focal point of the management plan relative to tourism, attractions off the highway are also noted, including the Indian Peaks Wilderness and its trailheads, Eldora, Hessie "ghost town" and Eldora Mountain Resort. Hence, the highway, being designated as a National, Colorado and Forest Service scenic and historic byway, attracts tourists, some of which will follow directions to side attractions and can increase the amount of traffic coming to and through town. The plan encourages the incorporation of mountain roads to the Continental Divide into the corridor, as well as defining pathways into the landscape and the experiences offered.

7.8.2 Traffic Control

The most frequently heard public lands related concern expressed by Eldora residents is regarding traffic, including speed and parking. Numerous solutions have been discussed and debated, few have been carried out.

In the summer of 2011, after working with a group of Eldora residents, Boulder County Transportation took the following steps to try and slow up traffic:

- Signs were placed at both ends of town to better define and inform motorists that they were entering a community, a more densely settled area. There were also additional speed limit signs.
- A series of yellow traffic-cones were located at several locations throughout town in the middle of County Road 130 to restrict the flow lanes in an effort to slow traffic. The traffic-cones are up only during the summer and fall months.

It appears that this effort has had some success in slowing traffic through town. The county conducted speed measurements over a weekend in August 2011 and again in 2012. At the west end of town, west-bound vehicles averaged 27 miles per hour (mph) both times, whereas east-bound average speeds decreased from 30 to 26.4 mph. At the east end of town, west-bound average decreased from 30 to 28 mpg, and east-bound decreased from 31 to 28 mph. Another way of viewing the speeds is to look at the speed below which 85% of the vehicles travel. For all of the above categories, speeds have decreased between the 2 years of measurement by 2 to 5 mph.

The most direct recreational parking impact on the town occurs during winter, when County Road 130 is plowed only to the west end of town. The west end of town becomes the parking lot for the many snowshoers, cross-country skiers and hikers that venture up the Fourth of July road in the winter. Over 100 cars may be parked there on a nice, weekend winter day. The parking is restricted to the west to south side of the road and is all parallel parking, which extends south and east from the end of the road for quite a distance. The 1984 Indian Peaks Access Committee recommended keeping winter parking at the west end of Eldora. However, use levels have increased and it may be time to consider other alternatives. A winter parking lot, to be located about 1/3 miles to the west of the end of the pavement, has been considered.

7.9 Nederland Recreation Issues

The Town of Nederland views itself as being a central hub for recreation that can radiate out in all directions. In 2001 they developed the Nederland and Surrounding Areas Parks, Recreation, Open Space and Trails Master Plan (Town of Nederland 2001). Eldora residents were involved with this plan. The plan is now (2012) being updated.

The Nederland Plan considered a conceptual trail that would run west from the town to the Indian Peaks Wilderness, with a strong possibility of running through Eldora. There was strong opposition from Eldora residents. The 2002 ECA membership survey found that 92% of the responding households were against a trail from Nederland through Eldora (Appendix 1.1). In the end, the plan recommended "Linkages should focus on regional connections identified by the community such as – Nederland to Indian Peaks Wilderness Area." The more recent Town of Nederland Trails Master Plan (Town of Nederland 2005) shows a trail linking the town to Nederland Junior/Senior High School; there is no mention of a trail extending farther west.

7.10 Boulder County Recreation Issues

Boulder County has acquired 44 mining claims on Spencer Mountain that total approximately 160 acres of open space. In the near future Boulder County Open Space will develop a management plan for these lands through a public process. The community of Eldora will need to be involved in the planning process. The plan will address such issues as trail system (is the current system adequate or not), trailhead (should there be one), and dogs (on leash or not).

The Boulder County Trails Plan (Boulder County 1995; Appendix 7.2) shows a Conceptual Trail Corridor that is mapped running through Eldora. The Trail Corridor is part of a regional trail that could connect Eldorado Springs to Walker Ranch and continue west to the Indian Peaks Wilderness. The Conceptual Trail Corridor "is a general course that usually links specific destinations, but no landscape feature or specific location has been determined for the trail itself. Corridors are depicted on the map with a dotted symbol in order to portray their inexact location." Hence, there is no current alignment, simply a concept of linking Eldorado Springs to the Indian Peaks Wilderness. However, since a trail running through Eldora has been a "hot button" issue in the past (see section 7.9 of this report), the community needs to be involved in any further planning for this Conceptual Trail Corridor.

Boulder County will also be a significant player with regards to dealing with traffic issues on County Road 130, as well as parking and traffic control on the Fourth of July road.

7.11 Planning for Recreation Use – Philosophy of Treatment

Eldora is situated within an area with significant recreational force and its attendant facilities: major access portal to the Indian Peaks Wilderness to the west with associated capacity, parking and traffic issues; Town of Nederland to the east with desires for a trail linking to the Indian Peaks; ski area to the south that desires to expand; Boulder County Open Space lands on Spencer Mountain with an unknown future; and traffic and parking problems in town. One thing in common about all of the issues is that they are being dealt with individually, as if they function on their own and in a vacuum. Another thing in common is that they are all occurring in the same valley.

Continued management and regulation of recreational resources will be a critical issue in the Eldora area. There is no legislative mandate to provide easy access to all public lands for recreation. Public land management agencies do have a mandate to responsibly manage their lands; this includes balancing recreational demands with the ecological health of the land.

There needs to be consideration for a comprehensive planning process that looks at all the recreational issues together. They are interrelated, both in terms of geography and cause. An important ingredient is defining capacities for the Indian Peaks Wilderness, as alluded to in the Forest Plan. The capacities should be supported by determining the cumulative impacts of current and proposed recreational use, monitoring of existing conditions and the continuing evolution of recreation use. Using this data base with continued ecological research in the area, reasonable limits of recreational use can be determined.

If a policy is followed that continually accommodates increased recreational use along with dispersal, and featuring construction of new parking lots and trails to greatly improve access, the result will be greatly increased recreational use in the Eldora area. While general dispersal techniques can work well on public lands which receive relatively little visitation, they are not effective on heavily-utilized lands near major urban areas. This is because recreation demand fundamentally exceeds the carrying capacity of the public lands in the Front Range. Each improvement in access and facilities simply brings out more visitors as the local population and tourism continue to increase. Accordingly, none of the areas experiencing overuse ultimately gains relief by opening more terrain to visitation. The net effect of general dispersal under this demographic situation is to draw down the condition of more pristine areas to the level of the most heavily used areas, which has occurred throughout the state.

In creating a recreation plan for western Boulder County, one approach would be to focus intensive recreational activities at a relatively few high-use sites, such as on the edge of Nederland or at Nederland High School, in order to minimize impacts. These high-use sites would be the focus for further investment of infrastructure and expansion of facilities in order to deal with the growing Front Range population. Existing trailheads would be maintained at current or even lower use levels, but facilities could receive limited improvement to address specific problems. Low-use areas would be retained in their current condition, with discouragement of additional recreational use. A shuttle system would be needed to move people during high use periods (weekends and holidays) from Nederland to the trailheads.

Another approach would be to bring all parking back to Nederland with a shuttle system to trailheads. A third approach would be to make the area west of Eldora a fee recreation area, like Brainard Lake, which would provide the funding for more intensive management of the area.

7.12 Recommendations

1. ECA should initiate a comprehensive planning process that establishes a desired future condition for recreational use of the entire Middle Boulder Creek valley from Nederland to the Continental Divide. Establishing a visitor experience and environmental carrying capacity for the Indian Peaks Wilderness is an important

ingredient. The carrying capacity would be used to influence the size of needed parking and visitor movement facilities, as well as their location.

2. ECA should monitor and stay involved with trail planning efforts conducted by Boulder County and the Town of Nederland.

3. ECA should work towards limiting the eventual size and operations of the ski area. There should be no expansion of the ski area outside their current permit boundary and no expansion below the existing Corona and Indian Peaks pods. Operations at the resort should be monitored along with the documentation of adverse impacts and non-compliance with the terms and conditions of the Boulder County special use permit and the Forest Service permit. Goals include:

    a. Protection of all threatened, endangered and sensitive species, species of concern, wetlands, riparian areas, watershed and stream quality, and old-growth forests.
    b. No use of water by the ski area from Middle Boulder Creek above the community of Eldora and strict enforcement of minimum stream flows on Middle Boulder Creek in the winter.
    c. Reduce existing noise impacts from snowmaking and grooming on the community of Eldora.
    d. No access for any activities associated with the ski area from the Fourth of July road or Hessie.
    e. No summer use of the backside (north slope of Bryan Mountain) in order to protect elk and other wildlife.
    f. Acquisition of buffers and critical habitat between the resort and the community of Eldora.
    g. Monitor the quality of effluent from the ski area's wastewater treatment plant by working with State of Colorado and Boulder County water quality divisions.
    h. There should be no net loss of wetlands at the ski area and mitigation for the 32 acres lost since its creation. Any mitigation should occur on or in close proximity to the ski area.
    i. There should be no night skiing on the backside of the ski area.
    j. Boulder County's current limit on the ski area of 5,000 alpine tickets per day should remain and be enforced.

8.0 LAND USE PLANNING

8.1 Introduction

There are some 16,600 acres in the Middle Boulder Creek drainage from the east end of Eldora to the Continental Divide. Of this, 9,900 acres are in designated wilderness, 2,600 acres are private holdings (excluding Eldora townsite - 240 acres), 3,600 acres are other Forest Service holdings, 160 acres are owned by Boulder County as Open Space, and 35 acres (Buckingham Campground) belong to the City of Boulder. As a consequence, many political entities and private individuals must be involved in the management of land in the Eldora area.

Boulder County, including Boulder County Parks and Open Space, and the Arapaho-Roosevelt National Forest have the principal responsibility for land use management in the Eldora area. These agencies implement management and regulatory strategies after extensive planning processes which provide the public with opportunities for input.

Eldora must build alliances with other community and citizens groups interested in ecosystem management, wilderness protection, water quality, historic preservation, and the protection of aesthetic resources. Private landowners and non-profit organizations can be engaged in planning issues to implement EEPP in a manner that maximizes consensus.

Other local governments and nonprofit organizations with which the Eldora Civic Association (ECA) should cooperate include the Town of Nederland, the North Fork Council, the Boulder County Nature Association, and the Indian Peaks Working Group. These groups may have interests and goals which are complementary to ECA's goals; cooperation will increase Eldora's effectiveness on these issues. It is possible that the EEPP will act as a catalyst for planning in southwestern Boulder County, thus creating new constituencies for community planning and new interest groups with missions similar to those of ECA.

According to the 2010 Census, the population of the Eldora area is 142. There are 253 housing units, of which 83 are owner-occupied, 33 renter-occupied, and 170 are seasonally-occupied. The average household size is 1.9 persons for owner-occupied dwellings and 1.4 persons for renter-occupied dwellings. The largest age group for Eldora is 50-64 (44%), while the lowest is 20-24 (7%).

The Boulder County Assessor information indicates 217 homes in Eldora. The average house size is 1,085 square feet (minimum = 144 sq. ft., maximum = 6,010 sq. ft., median = 893 sq. ft.)

8.2 Boulder County Planning Process

All counties in Colorado, by virtue of C.R.S. 30-28-106, are authorized to create and adopt a master or comprehensive plan for the management of the physical development of the unincorporated territory of the county. The Boulder County planning process is governed by the Boulder County Planning Commission.

The Boulder County Comprehensive Plan (BCCP) was adopted by the Planning Commission on March 22, 1978 and accepted by the County Commissioners on April 6th that same year. It has undergone incremental updates since that time, most notably in 1983, 1994, and most recently in 2007 with the inclusion of the Sustainability Element. Currently the Plan is undergoing a full cover-to-cover update to make it a more contemporary and accessible document, with greater emphasis being placed on connecting all the Elements with a set of Guiding Principles based on the platform of sustainability – economic, social and environmental. The Planning Commission approved the Guiding Principles on January 18, 2012:

> “In shaping and navigating our future, Boulder County supports the following Guiding Principles:
>
> 1. Consider and weigh the interconnections among social, environmental, and economic areas in all decisions.
>
> 2. Encourage and promote the respectful stewardship and preservation of our natural systems and environment by pursuing goals and policies that achieve significant reductions in our environmental footprint.
>
> 3. Create policies and make decisions that are responsive to issues of social equity, fairness, and access to community resources for all county residents.
>
> 4. Encourage and support a dynamic, stable, and flexible local economy that distinguishes between urban and rural economies, and directs uses to appropriate locations.
>
> 5. Maintain the rural character and function of the unincorporated area of Boulder County by protecting environmental resources, agricultural uses, open spaces, vistas, and the distinction between urban and rural areas of the county.
>
> 6. Encourage and promote regional cooperation and coordination in working with other entities and jurisdictions.
>
> 7. Actively engage the public in the planning process."

The BCCP provides direction for the formulation and application of the County’s land use regulations…zoning, subdivision, special uses, Site Plan Review, and so forth. In fact, the relationship between the BCCP and land use regulations is explicitly described in Article 1-300 of the Land Use Code:

> “Enactment, amendment and administration of this Code shall be in accordance and shall serve to implement the goals and policies of the Boulder County Comprehensive Plan…”.

Not surprisingly, the matching of BCCP goals and policies with the provisions in the Code is not perfect. Trends or unforeseen issues in land use activities that appear inconsistent with or unaddressed by the BCCP may need to be dealt with in a more immediate or time-sensitive fashion by adopting amendments to the Code through public notices and hearings before the County Commissioners. Thus, comprehensive plans should be written to capture the basis, intentions and essential values of the jurisdiction’s planning vision and philosophy so that changes in codes or regulations can be made when necessary without having to also amend the comprehensive plan every time. The BCCP is this type of plan.

Boulder County is the direct administrator of the community of Eldora and is the most important governmental entity with which Eldora interacts. As such, the Boulder County planning process exerts tremendous influence over the future of Eldora.

8.2.1 Boulder County Comprehensive Plan

It's important to reiterate at the outset of this section that state statutes give the authority to make, adopt and amend county comprehensive plans to county planning commissions. County commissioners can then accept and recognize the plan, ask their planning commission to make changes to the plan (which the planning commission may or may not choose to do) or not accept the plan. At the same time, statutes empower the county commissioners with the authority to make, adopt and amend the tools such as zoning and other land use regulations that implement land use decisions. It follows that the goals and policies of a comprehensive plan can only be put into action if the land use regulations and other mechanisms are designed, written and administered to complement it. One can rightly think of this as a form of "checks and balances" system between appointed and elected officials and between an intention (the plan) and an action (the regulations). In Boulder County, this relationship has been a strong and collaborative one for over 34 years.

Since the BCCP's initial adoption in 1978, the overall philosophy has changed very little…growth should be channeled to municipalities, agricultural lands should be protected, and preservation of our environmental and natural resources should be a high priority in making land use decisions. However, the tools used to accomplish the goals and policies of the Plan, such as land use regulations, open space acquisitions, and intergovernmental agreements, have been transformed and expanded in response to the environmental, social and economic factors impacting Boulder County and the expressed desires and needs of the County's residents.

The BCCP consists of:

"broad-based land use goals, policies and proposals intended to guide future development. . . The Boulder County Comprehensive Plan consists of four major components intended to guide current and future land use decisions of the County. The first component, County Goal Statements, is regarded as the cornerstone of the Comprehensive Plan since it forms the framework for public and private decision-making. . . .

The second major component is the Policies, relatively detailed statements that determine particular courses of action to follow to move toward the attainment of particular goals. Whereas the goal statements indicate "where we are going" with our comprehensive planning approach, the policy statements determine "how we get there".

The third component of the Plan is the Comprehensive Plan Maps, the graphic illustration of the Plan. BCCP maps overlaying portions of the EEPP Area include:

- Moderate Geologic Hazards
- Environmental Conservation Area 1 – Indian Peaks
- Archaeological Resources – travel corridor along Middle Boulder Creek
- Mineral Resources – lode mineral formations to the north, west and south of the Townsite

- Critical Wildlife Habitats – Arapaho Ranch, Peterson Lake, Buckeye Basin, potential lynx habitat
- Natural Landmark 6 – Continental Divide
- Open Roadside Corridor – County Roads 130 and 111
- Open Streamside Corridor – Middle Boulder Creek (N and S Forks)
- Rare Plant Area – near Caribou townsite on north edge of the EEPP referral boundary

The fourth component of the Plan consists of the background information or Elements, which served as the foundation or base from which Policies and Maps have been formulated." The Elements include Geology, Environmental Resources, Open Space, Transportation, Housing, Solid Waste, Natural Hazards, Cultural Resources, Sustainability, Economics, Fire Protection, Telecommunications, and Land Use Surrounding Airports. Four Subregional Elements are also included: Southeast, Niwot/Lefthand/Boulder Creek, Longmont/Lyons/St. Vrain, and Mountains, which also now includes the 1994 Eldora Environmental Preservation Plan, the Gold Hill Townsite Plan, and the Eldorado Springs Townsite Plan.

The Mountain element of the BCCP defines policy governing commercial, business and industrial activity in the Forestry zone. Policies on mountain transportation, mineral resources, environmental impacts and the assessment of such impacts, natural resource utilization, recreation, wells and sanitation and intergovernmental relations policies are also stated.

The town of Nederland has a municipal plan for its incorporated area and has signed an intergovernmental agreement with Boulder County in March of 2002 that defines the planning responsibilities, planning areas, and relationships between the two governments. Eldora’s 1994 Environmental Preservation Plan was recognized and incorporated into the BCCP via five policy statements about its use and applicability to land use decision making within the boundaries of the EEPP by the Boulder County Planning Commission on July 19, 1995 in Docket BCCP-95-003.

8.2.2 Boulder County Land Use Code

8.2.2.1 Forestry Zoning

Zoning for different areas of the county is developed from the goals and policies of the comprehensive plan and by established land use patterns or attributes such as municipalities, agricultural areas, and floodplains. The vast majority of the unincorporated mountain areas of the county, including Eldora, are designated as Forestry Zoning District. By direction of the BCCP, the Forestry zone is intended to discourage sprawl, high density development (creating new buildable parcels requires a minimum lot size of 35 acres each), and other more urban, service intensive uses. It is also to provide for "...efficiently using land to conserve forest resources, protect the natural environment, and preserve open areas" (Article 4-101 Forestry (F) District, Boulder County Land Use Code). In addition, other County regulations permit the transfer of residential densities out of the mountains to the plains through a Planned Unit Development process. This process can allow greater efficiency and flexibility in planning development and minimize the need for new services and infrastructure.

Article 4-101 describes in detail permitted uses in the Forestry District. Eight principal and twelve accessory or temporary uses not requiring special permits or hearings before the County Commissioners are specified along with lot, building and structure requirements such as building height and setbacks. More detailed descriptions of these uses are found in Article 4-500, Use Regulations. In addition, 33 uses requiring special-use permits are specified. Special-use permits must be reviewed by the Planning Commission and approved by the Board of County Commissioners in public hearings. The Site Plan Review process, a requirement for most development proposals on vacant land, for additions significantly increasing the floor area of existing homes or other structures, for grading permits over 50 cubic yards, for activity requiring a floodplain development permit, and other specific land use proposals, is spelled out in detail in Article 4-800. The particulars to be included in the site plan are described as is the review process for the submitted site plan. Review is coordinated by the Zoning Administrator (the Boulder County Land Use Director) with the Transportation, Health, Parks and Open Space Departments and the local fire district providing analysis. Minimum standards for site plan acceptance are specified and describe conditions of approval which may be attached to approval of the site plan by the Zoning Administrator. Site Plan Review approvals are usually given administratively, meaning no hearings or County Commissioner action is required. The primary exceptions to an administrative approval are when an applicant does not like the conditions attached to his/her Site Plan Review or when adjacent property owners make known that they have concerns about the proposal's impacts on their area. In the first instance the applicant can ask for an appeals hearing before the County Commissioners. In the second case, the Commissioners may "call up" the proposal for a hearing.

Of particular significance are the presumptive neighborhood compatibility house size standards in the current Site Plan Review regulations (Article 4-806 A. 2). For the mapped townsite of Eldora, as well as for Allenspark, Raymond, Riverside, and Eldorado Springs, "…it is presumed that structures of a size within…a total residential floor area of 1,500 square feet…" are compatible with the existing developed character of these townsites. Proposals to build a new structure or expand an existing one beyond 1,500 square feet are required to provide reasons why the additional square footage will not be incompatible with the area. Criteria for overcoming the presumptive 1,500 square foot limitation are spelled out in Article 4-806 A. 2.b. of the county Land Use Code.

8.2.2.2 Rural Community District and Townsite Planning Initiative

In 2007 the county held several public hearings to develop regulations concerning size limitations for new residential construction in the unincorporated portions of Boulder County. The impetus for this was to establish some thresholds that would maintain a degree of size compatibility with existing residences in neighborhoods, rural areas, and old platted townsites. It was also to promote sustainability in reducing the consumption of materials and other impacts associated with the building of larger and larger homes, which had become increasingly prevalent in the county over the previous decade or so. Public reaction and participation in the hearings was often heated, particularly from some residents in mountain communities. While size limitations were ultimately adopted, the county made a commitment to inaugurate Townsite Planning Initiatives with county staff support in Eldorado Springs, Gold Hill, Allenspark, Raymond/Riverside, and Eldora. The objectives were to ask residents to identify issues of interest and concern in their respective communities beyond just home size, to gauge their interest in coming together to develop more specific plans for addressing them at a grassroots level, and to help facilitate a planning process if the community chose to pursue one. Existing county regulations already included a zoning category called "Rural Community District", designed "To encourage flexibility in the land use patterns of established rural communities in order to achieve the objectives of the *Boulder County Comprehensive Plan"* (Article 4-115, Land Use Code). The Townsite Planning Initiative went a step further, inviting residents to take the lead in planning on a variety of topics to maintain and enhance the special character of their area.

Staff first met with Eldora residents on August 11, 2007 to discuss the options of pursuing a Rural Community District zoning overlay or a Special Character Area planning process for the community. During the discussions and question/answer period, it became clear that a majority of those present could not come to any consensus about initiating either process, and that the more pressing concerns in Eldora were focused on vacating rights-of-way, setback encroachments, and difficulty in locating approved wastewater disposal systems on the small lots that make up most of the properties in the townsite *(the average lot size is 25 wide by 100 feet long or 0.05 acres, but the setback requirements in the Forestry Zone District are 15 feet for both the front and rear yards and 25 feet for each side yard, meaning that a property owner would need three lots to meet the side yard setbacks alone).* The county subsequently decided to offer a planning process option to residents for addressing roadway vacations and their related issues.

8.2.2.3 Vacation of Rights-of-Way in the Eldora Townsite

Many of the streets and alleys platted in Eldora in 1898 were never developed for access purposes. This has caused confusion over time as to their status; are they still public rights-of-way or have they lapsed due to their undeveloped condition? If they are no longer public, who “owns” the underlying lands, who can use them, and for what purposes? When Eldora disincorporated in 1973 the public rights-of-way came under the jurisdiction of the county.Since then individual property owners have submitted 41 vacation applications to the county for review and action. Thirty-five were approved, five denied, and one put on indefinite “hold”. These applications were made to clear property title problems, building encroachments into the rights-of-way, and to meet setback requirements for making additions to cabins or improving wastewater systems.

In 2007, with the support of the Eldora Civic Association, the County Commissioners concluded that it was a disservice to property owners, the Eldora community and the public at large to continue to process and review piecemeal, incremental vacation applications in Eldora without fully understanding how these decisions were impacting the community as a whole as well as individual property owners’ opportunities to come into compliance with county setbacks and preserve access to their holdings. In short, vacations were “chopping up” the community. On November 13 the Commissioners enacted a moratorium directing the Land Use Department to not accept applications for vacations of public ways in Eldora and to concurrently begin an analysis of rights-of-way issues and options for resolving them with the active participation of the Eldora community. Upon adoption of a plan, including language to amend Article 10– Vacations of Public Roads, Alleys and Easements of the Boulder County Land Use Code, the moratorium would be lifted.

County staff proceeded to prepare a mailing and E-Mail list of all property owners within the study area, compiled data and developed maps to provide an accurate and up-to-date picture of existing conditions within Eldora, and made this material available to the community for review so that errors and omissions could be identified and suggestions for additional data points could be compiled. The research included the following findings:

- 203 parcels were adjacent to unimproved platted rights-of-way;
- 24 parcels contained structures that encroached into those rights-of-way;
- 74 unapproved septic systems and 25 vault systems were adjacent to unimproved platted rights-of-way;
- 117 parcels had approved onsite wastewater systems while 109 did not.

Staff also prepared an access study to determine how each parcel in and adjacent to the Eldora townsite could be accessed by existing public roads or unimproved roads and alleys. This work would be used by staff and decision-makers to confirm whether a vacation could legally occur by not leaving any adjoining property without access to an established public road.

Three community meetings were held between June 3rd and July 30th 2009. Seven primary issues were identified for discussion, option analysis, and recommendation for resolution:

1. Preserve access to properties;
2. Enable onsite wastewater system improvements;
3. Resolve encroachments into rights-of-way;
4. Correct rights-of-way to match actual road alignments (e.g. Bryan, Eaton Place, 4th/Huron, Eldorado, and Klondyke);
5. Provide public access to and along Middle Boulder Creek;
6. Establish a wildlife movement corridor;
7. Preserve current density via house size limitations and numbers of houses/lots.

Public hearing were held with the Planning Commission and County Commissioners between August 19th and October 20th 2009. In brief, staff's recommendation was that the county retain specific alleys and roads that have a public purpose, defined as facilitating access to Middle Boulder Creek, public lands, or private lands. Although some community members advocated that additional rights-of-way be preserved because of their rural, historic and environmental attributes, staff replied that existing land use regulations (Forestry zoning, Site Plan Review, the 1,500 square foot house size presumption, Comprehensive Plan, and other Land Use Code stipulations) were sufficient to preserve and protect those valued community qualities. With regard to the option of the county initiating large-scale vacations, staff stated that such a project would require a significant commitment of staff time and resources, could be a potentially divisive and contentious process within the community when defining which rights-of-way should be concluded, and questioned whether or not that approach was an appropriate one for the county to initiate. In staff's opinion, the new vacation criteria proposed for adoption provided property owners with sound information with which to submit vacation applications individually or as a group. On November 3, 2009 the County Commissioners adopted the staff recommendations in Resolution 2009-144 for amending Article 10 of the Land Use Code and rescinded the moratorium on accepting applications for vacations in Eldora. In summary, the amendment includes a list of factors that favor a vacation request, disfavor a request, and are grounds for not approving one, the last of which identifies those rights-of-ways that should be maintained for "…facilitating access to Middle Boulder Creek, public lands, or private property…" (Article 10-101 E. 3)

8.2.3 Building Code

Building codes are written and enforced through on-site inspections to insure that construction follows sound design and structural practices that protect the occupants, their investment, and adjacent property owners. Boulder County regulations state that *"No person shall erect, construct, reconstruct, alter, or change the use of any building or other structure without first obtaining a building permit."*There are a variety of exceptions to this mandate, but the point to keep in mind is that a person should contact the Land Use Department's Building Safety and Inspection Services Division before beginning any construction or remodeling project to determine if a building permit is needed.

8.2.3.1 BuildSmart

In 2005 the Boulder County Commissioners adopted a resolution (2005-137) initiating a sustainable energy path program for all county operations, infrastructure, and departments. In 2007, the Sustainability Element of the Boulder County Comprehensive Plan was adopted which included specific policy guidance for what was referenced as “Green Building.” These actions led to the development of the county’s BuildSmart program, which affects all new residential construction, remodeling, and additions in the unincorporated county. This includes Eldora.

BuildSmart regulations promote development that will create energy efficient structures that reduce both the production of greenhouse gases from residential buildings and the amount of material sent to landfills, conserving water, and other natural resources in the homebuilding process; and insure proper indoor air quality. BuildSmart also furthers the goals and measures outlined in the Colorado Climate Action Plan and the County's Sustainable Energy Plan. The production and efficient use of energy will continue to play a central role in the future of Colorado and the nation as a whole.

The current Boulder County BuildSmart regulations include both a performance and a prescriptive option for compliance, providing choices in selection of the most cost-effective design for each project.

- **Performance Path Option:** Construction of conditioned space where compliance is measured using the RESNET (Residential Energy Services Network) system to determine anticipated energy consumption and energy efficiency, (HERS, or Home Energy Rating System). A RESNET model prepared by a Certified Energy Rater must be provided with the building permit application showing compliance with the required HERS Index rating. The Performance Path Option allows greater flexibility in choosing what options best suit the needs and desires of homeowners and builders.
- **Prescriptive Path Option:** Construction of conditioned space where compliance is achieved by applying minimum standards to the dwelling's thermal envelope, fenestration, lighting, and air leakage. The Prescriptive Path Option includes mandatory measures for compliance and can be used when looking at other options or alternatives is not something the homeowner or builder wants to pursue.

More information for compliance is available on line in the Boulder County BuildSmart Users Guide and other Boulder County BuildSmart publications.

Part of Eldora’s distinctive character, and one which the county values and respects, is attributable to the many historic and eclectic cabins and homes that make up the community. Contemporary building codes and BuildSmart, if applied “by the book” and without exceptions, could have a significant impact on the community’s built environment. The Land Use staff is committed to working closely with homeowners in Eldora to assure as best as possible that building permit requirements are administered in a way to maintain the historic and distinctive integrity of structures on a case-by-case basis.

8.3 Arapaho-Roosevelt National Forest

As the largest land-owner in western Boulder County, the federal government makes land-use decisions which can greatly affect the community of Eldora. By participating in the Forest Service planning process, Eldora can play a significant role in determining the policies governing surrounding federal lands. Participation in the Forest Plan revision provides Eldora residents the most efficient method of having community goals recognized and addressed by the Forest Service.

8.3.1 Land and Resource Management Plan

The Forest Service is required by statute to engage in a planning process for the lands under its jurisdiction. The Forests and Rangelands Renewable Resources Planning Act (RPA) of 1974 and the National Forest Management Act (NFMA) of 1976 required the agency to set and project policy designed to manage the national forests in a sustainable, multiple-use fashion for the citizens of the United States for a 50-year period. As a result, the Forest Service developed the Arapaho-Roosevelt National Forest Land and Resource Management Plan, which were completed and approved in 1984 and revised in 1997. Much of the plan is covered in Section 7 (Recreation Resources) of this report. The plan is likely to be updated in the next few years.

8.4 Recommendations

1. ECA should initiate a comprehensive planning process that establishes a desired future condition for land use of the entire Middle Boulder Creek valley from Nederland to the Continental Divide.

2. ECA should monitor and stay involved with land use planning in Boulder County, including the Boulder County Comprehensive Plan and the Boulder County Land Use Code, and the Boulder County Building Code.

3. ECA should monitor and stay involved with future updates to the Revised Arapaho-Roosevelt National Forest Land and Resource Management Plan.

9.0 LAND CONSERVATION

9.1 Introduction

Modern conservation of land within and around Eldora began with the creation of the Medicine Bow Forest Reserve in 1897. This forest reserve was split in 1910, with the portion in Colorado being renamed the Colorado National Forest, which was finally renamed Roosevelt National Forest in 1932. Creation of the original forest reserves was in response to the cutting of vast acreages of timber by miners and timber operations, and a growing national perception that traditional users were laying waste to a national resource (Wyckoff 1999). Since creation of Roosevelt National Forest, and particularly over the past 25 years, land conservation has continued in the valley.

9.2 Recent Land Conservation Activities

The Eldora Environmental Preservation Plan 1994 made several recommendations regarding land conservation, including:

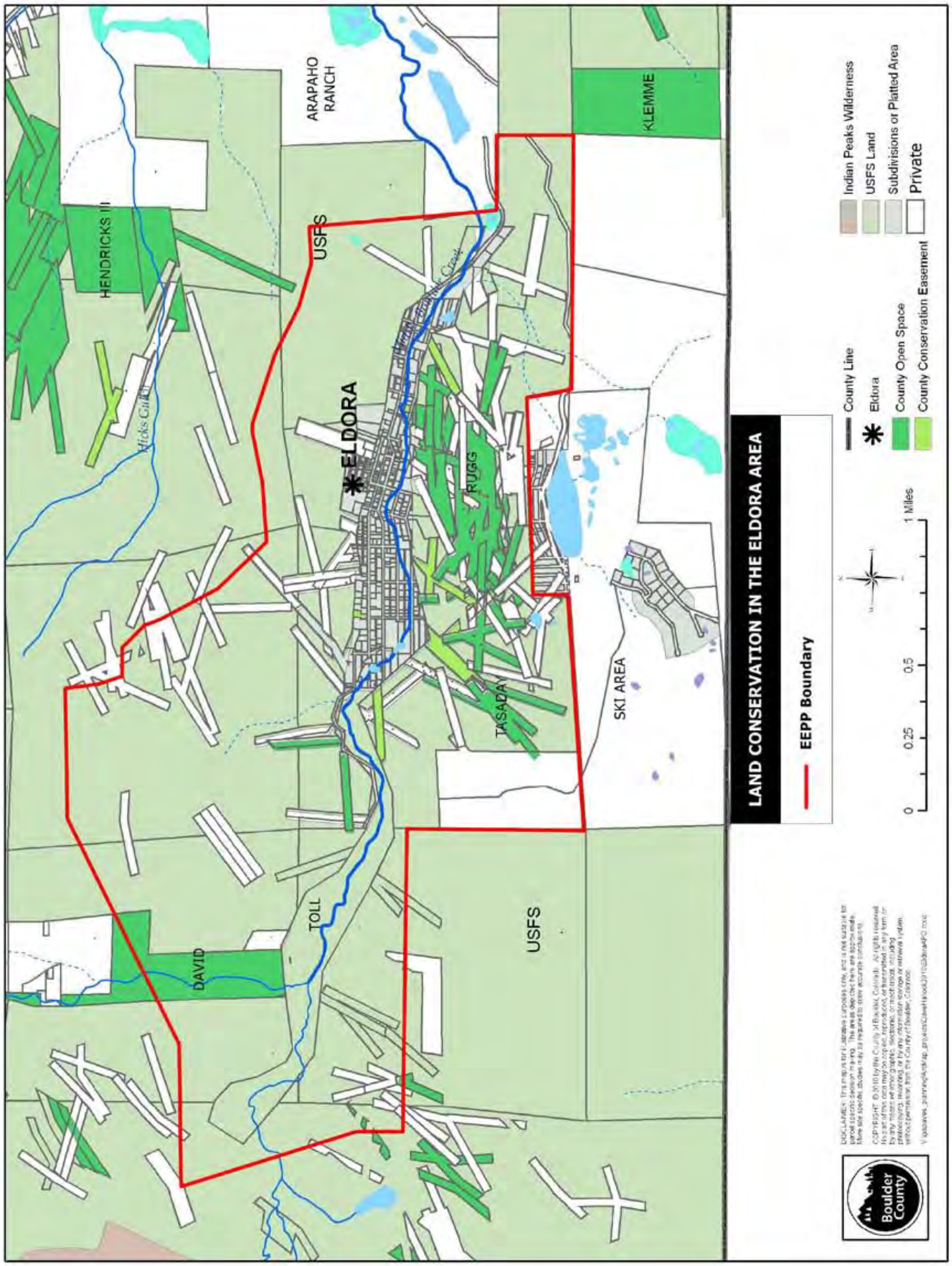
- Appoint a land conservation committee to interact with public and private land conservation agencies, and implement land conservation priorities.
- Assemble a database of mineral claims and prioritize claims in sensitive areas for acquisition.
- Protect critical wildlife habitats, with initial priority given to riparian areas, wetlands, aspen groves, and old-growth forests.
- Acquire land use buffers to the south and west of the community of Eldora.

Land conservation actions, beginning in the mid-1980s and continuing today, have achieved many of the EEPP 1994 recommendations. These are highlighted below and depicted on Figure 9.1. Boulder County Parks and Open Space Department, U.S. Forest Service, Eldora Civic Association, and actions by private property owners in the valley have contributed to protection of the natural and scenic resources.

9.2.1 Lazzarino Wildlife Preserve

This land donation that occurred in 1986 protected a portion of a high quality riparian area in town (Figure 9.2). Grace Lazzarino, a language professor at the University of Colorado, had acquired the property at a tax sale from Boulder County in 1977. She knew Deb Evans, then president of ECA, and asked if the association would be interested in receiving the property as a donation. ECA worked with the Boulder County Land Trust, the real estate arm of the Boulder County Nature Association (BCNA), to assist with the transaction. As BCNA is a 501(c)(3) organization, they performed the role as the grantee in the donation so Grace Lazzarino could receive an income tax deduction for a charitable contribution. Glenna Carline, a local real estate agent, assisted with establishing the value of the land. The donation was made on September 5, 1986. Several years later, BCNA deeded the property over to ECA with a restriction limiting the use of the property to being a natural area. The Lazzarino Wildlife Preserve is located on the north bank of Middle Boulder Creek east of the intersection of Eldorado Avenue and Klondyke Avenue.

Figure 9.1. Land Conservation in the Eldora Area



9.2.2 Arapaho Ranch Wildlife Refuge

A project undertaken in the mid-1980s at the Arapaho Ranch is an excellent example of the use of buffers in land use shaping. At present, the ranch comprises some 700 acres. Because the ranch has been little altered in the past century, its riparian areas support the second largest montane willow carr complex in Boulder County (Hallock *et al*. 1986). The ranch's position at the montane/subalpine ecotone results in a diversity of vegetation type and structure which support a variety of wildlife. The montane meadows and forests are vital to elk in the spring and fall as transitional range and calving grounds. The ranch is designated by Boulder County as the Arapaho Ranch/Tucker Homestead Critical Wildlife Habitat (see Section 5.7.1) and mapped by the Colorado Natural Heritage Program as the Middle Boulder Creek Potential Conservation Area (see Section 4.3.4).

The scenic quality of the ranch is outstanding due to the width of the glacially-carved valley and the diversity of vegetation seen on the valley floor and opposing slope (Figure 9.3). The vista is enjoyed by travelers on County Road 130 which traverses the property for about one mile.

In order to preserve these qualities, the Evans family worked with Colorado Open Lands, a land trust based in Colorado, to place a conservation easement on the ranch. The easement was executed in 1987, following inventories on the ranch which led to recommended management stipulations for inclusion in the easement. The easement restricts further residential development. The easement is perpetual, that is, it will continue to restrict use of the land even if the ranch changes ownership.

The easement has created a significant buffer zone between the towns of Nederland and Eldora. At one point in the 1980s, the town of Nederland had proposed residential zoning at urban densities for Arapaho Ranch. Without this buffer, Nederland may well have expanded up to Eldora's eastern boundary.

9.2.3 Toll Property Purchase by U.S. Forest Service

The Toll property began at the west end of Eldora and ran west of Hessie, totaling approximately 160 acres. In 1996, the Eldora Civic Association, working with the Boulder County Land Trust, approached Dr. Toll about acquiring the land to buffer the west side of town. There were also concerns about the ski area utilizing the property for their venture; they had just undertaken an update to their master plan and had proposed taking water out of Middle Boulder Creek just above town (these plans were eventually dropped). Phil Rouse, Sr. met several times with Dr. Toll to negotiate a deal. At the same time the Forest Service had an interest in purchasing the property partially to solve parking problems at Hessie. Boulder District Ranger Bill Anthony made a significant move by getting the Toll property to rank #1 on the Forest Service regional list for land acquisition. When the Forest Service appraisal came in at a higher value than what ECA and the Boulder County Land Trust wanted to offer, it became obvious that the Forest Service would acquire the land. Eldora community members then helped contact Colorado congressional members to support the appropriation of funds. The land was acquired by the Forest Service in 1997 for the purposes of solving parking and trail access issues.

Figure 9.2. Lazzarino Wildlife Preserve

The Lazzarino Wildlife Preserve is a willow carr located along Middle Boulder Creek. (Photo from Diane J. Brown)

Figure 9.3. Arapaho Ranch Wildlife Refuge

The Arapaho Ranch Wildlife Refuge is under conservation easement with Colorado Open Lands. (Photo by Diane J. Brown)

9.2.4 Preservation of Spencer Mountain by Boulder County

Boulder County Parks and Open Space Department began acquiring mining claims on Spencer Mountain in the year 2000 (Figure 9.4). Since then, 11 transactions covering 44 mining claims and their mineral rights have been purchased, some with the assistance of the Eldora Civic Association. Thirty-two claims were acquired with the Rugg acquisition. In addition, in April 2005 the mineral rights under the Rugg acquisition were also purchased.

Along with Boulder County Parks and Open Space involvement, preservation of Spencer Mountain has occurred through numerous land saving actions involving many people. Mining claims have been acquired from Rugg, Tasaday, Snyder, Walcott, DALCO, Wild Bear (mostly through the work of Scott Bruntjen), Morse, Skinner/Morris, Bernart, and Ebel-Sabo. Conservation easements have also been obtained by Boulder County on several of the mining claims through donation or purchase from Boylston, Tillotson and Lawler-Tasaday. To date, approximately 160 acres of Spencer Mountain have been protected. When combined with Forest Service parcels on the mountain, much has been achieved toward protecting an important viewshed for Eldora and the recreating public heading to the Indian Peaks Wilderness, a wildlife movement corridor across the top of the mountain (see Section 5.2.2.1 and Figure 5.1), and providing a buffer on Eldora's south side.

9.3 Eldora Land Preservation Fund

The Eldora Land Preservation Fund (ELPF), a committee of the Eldora Civic Association (ECA), was created as a mechanism for assembling money intended to be used for purchasing and preserving undeveloped land in its natural state in the Eldora area for passive use by Eldora residents. Most of the land in Eldora is privately owned, except for platted road right-of-ways. Although Eldora is surrounded in part by national forest, many undeveloped parcels on the slopes above Happy Valley are mining claims, which may be legal building sites.

The stated purpose of the ELPF is:

> To preserve those natural areas that contribute to and enhance the natural heritage of Eldora and its surroundings, generally defined as the Middle Boulder Creek drainage from the Continental Divide to Nederland. Of highest priority for preservation are those lands identified by the Eldora Environmental Preservation Plan, the Boulder County Comprehensive Plan and the Forest Plan for Roosevelt National Forest, which encourage protection of riparian areas; wetlands, rare and significant plants; plant communities and animals; old growth forests; and scenic areas.
>
> To protect lands by acquiring or receiving donations of land or interest in land for conservation purposes; and working with and participating with governmental and private agencies on conservation related to Eldora and its surroundings.
>
> To acquire property or interest in property, both real and personal, by purchase, lease, donation or bequest. Properties that meet conservation purposes shall be held and retained as natural areas. Properties that do not meet conservation purposes may be sold or leased, with any derived income and principal used to further land conservation in the Eldora area.

Even before the Eldora Land Preservation Fund was initiated in June of 1996, the Eldora Civic Association had embraced the concept of land preservation when it accepted the donation of the Lazzarino property just east of the Rugg pasture. This property, which is a remnant willow carr, belongs to ECA and is being preserved in its natural state. The possibility of adding to the Lazzarino Sanctuary presented itself when the Rugg pasture was informally put on the market. It was at this point that the need for a nest egg was realized.

In June of 1996 the Eldora Civic Association accepted its first donation to the Land Preservation Fund as a memorial to Isabel Cross, former proprietress of the Log Cabin Corner Store. Since then contributions have been made in the memory of many people who held Eldora dear to their hearts.

Summer fundraising events such as slide shows, nature walks, historic tours, and garden tours have been held to help raise money for the fund. The sale of Historic Eldora Coverlets, Eldora T-shirts, note cards, Happy Valley cookbooks and community yard sales have contributed to the fund. So far close to $60,000 has been raised.

In October 2005 The Eldora Land Preservation Fund partnered with Boulder County Parks and Open Space to purchase 2 mining claims on the east flank of Spencer Mountain, preserving 7.1 acres from development (Figure 9.5). In October 2006 ELPF again partnered with Boulder County to purchase three more mining claims, totaling 6.6 acres, at the top of Spencer Mountain, preserving a portion of an elk migration route.

ECA's involvement in jointly purchasing with Boulder County some of the mining claims on Spencer does several things: 1) it keeps the County focused on Spencer and the Eldora area; 2) if any future Board of County Commissioners want to sell or transfer the mining claims to another entity, ECA has veto power; and 3) it will give ECA a strong say when the County develops a management plan for Spencer Mountain. In addition, the protection of Spencer Mountain is a way to mitigate some of the impacts of the settlement being located in the valley bottom, by retaining an animal movement corridor on the south side.

In July 2007 members of the ECA Board, Diane Brown and Dave Hallock met with Rich Koopmann, Co-chair of the Boulder County Parks and Open Space Foundation to explore the possibility of using the Foundation's 501(c)(3) status for accepting donations to the Eldora Land Preservation Fund so that donors could receive charitable donation tax benefits. This was set in place in time for end of year 2007 charitable donations (Appendix 9.1 contains the agreement between ELPF and the Boulder County Parks and Open Space Foundtion).

In August 2007 an anonymous donor came forward with a matching grant challenge of $25,000, encouraging Eldorans to support the Boulder County Parks and Open Space Foundation/Eldora Land Preservation Fund concept. The total raised in response to this challenge was $2730, which was matched to bring the final tally to $5660.

A more detailed chronology of ELPF activities can be found in Appendix 9.2.

Figure 9.4. Spencer Mountain Open Space

Boulder County Parks and Open Space Department has acquired many of the mining claims on Spencer Mountain. (Photo by Dave Hallock)

Figure 9.5. Snyder Acquisition on Spencer Mountain

The Snyder mining claims (outlined in red) were a joint acquisition between Boulder County and ECA on the east flank of Spencer Mountain. (Photo by Dave Hallock)

9.4 Private Land Conservation

In general, any private land owner has the option to forego development; however, to realize financial benefits for doing so and to guarantee the land will remain in its current state into the future, certain conditions must be met. In order to encourage private land owners to make donations of real estate interests and development rights, the Internal Revenue Service (IRS) has established criteria for real estate interest donations which, if met, entitle the property owner to reduce the value of the affected property. These requirements are also recognized by the State of Colorado and Boulder County.

This reduction in value of the property may qualify the property owner for tax benefits. The IRS allows tax deductions for donations of easements in five categories:

1. public recreation and/or education
2. significant natural habitat
3. scenic enjoyment
4. pursuant to local governmental policy
5. historic preservation

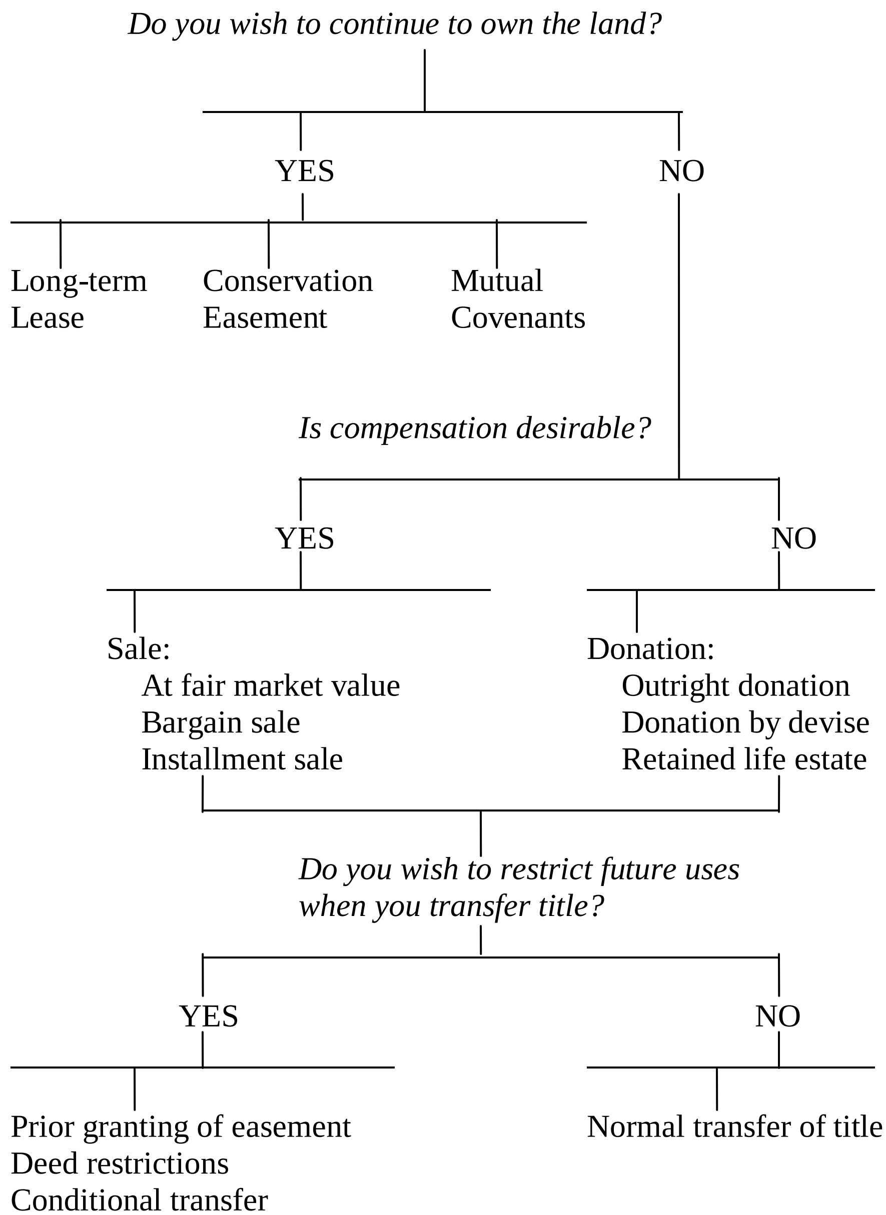
Donations apply to raw land, appropriate undeveloped areas of developed land, and historic structures.

In general, the key to tax deductions is that the donation must have a clearly recognizable value to the public. This does not necessarily imply that the property must be open to the public; donations granted for the purposes of habitat, scenic value or historic preservation frequently require no public access or only that they be visible to the public.

There are several methods by which real estate interests can be acquired in the interest of conservation (Figure 9.6). These interests have been compared to a bundle of sticks where each stick represents a right associated with ownership of the property. These rights may be things such as the right to cut timber, the right to build a residence, or any other activity not prohibited by law. These rights can be separated from the "dominant estate," that is the rest of the bundle of rights, and transferred to other parties as "less-than-fee-interests". A conservation easement is one kind of less-than-fee-interest; remainder and undivided interests are two other kinds.

Basically, three types of real property exist: surface rights, mineral rights and water rights. Each of these rights can be severed and conveyed separately. Surface rights include surface occupancy and development subject to deed restrictions and applicable regulations. Surface rights convey ownership of structures, soil, timber, etc. to the purchaser along with the rights to exploit these resources. Water rights are a commodity which can be claimed and traded subject to Colorado Water Law. Water rights in Colorado are subject to the doctrine of prior appropriation which can be summarized as "first in time, first in right". Water rights are thus valuable in direct proportion to their seniority. The appropriation and/or purchase of water rights for non-consumptive, conservation purposes is recognized as a valid use of water in Colorado. The State of Colorado and federal agencies have made acquisitions of water rights for this purpose in recent years.

Figure 9.6. Options for Protecting Special Land



(From Land-saving Action, edited by R.L. Brenneman and S.M. Bates, Island Press.)

A conservation easement is an agreement in which the property owner agrees to give up some of the rights in a property. The deed of easement is a legally binding document which is recorded with the appropriate local government. For example, a land owner can sell the mineral rights to a mining company or grant a neighbor the right to cross a field. Under a conservation easement, the owner gives up some or all rights associated with construction or extraction of resources on the property- what are commonly called "development rights". The property owner continues to use the land in the same fashion as before and can sell, rent, bequeath or otherwise transfer the property subject to the stipulations of the easement. A conservation easement generally "runs with the land," which is to say that it exists in perpetuity, whereas covenants tend to be in force for a specified period of time.

A property can be acquired "fee simple", that is, through outright purchase of all of an owner's interest in a property. Or, a property owner may sell the property at a price well below the appraised value; the difference between the sale price and the appraised value is treated as gift, which is tax deductible subject to legal requirements. Other times a property will be donated outright through bequest or a reserved life estate, also called a life tenancy. This device allows the donor to live on the property until their death or the deaths of specified heirs, at which time the property is transferred to the land trust or government agency. A management or conservation easement can be executed to ensure that the land is kept in the condition promised by the donor prior to the death of the donor or heirs. The donor is allowed to deduct the value of the gift at the time the gift is made, even though the recipient will not take control until the donor or donor's designated heirs die.

In the Eldora area, property owners desiring to conserve their property generally either sell or donate the entire property, or sell or donate a conservation easement. The recipient is generally either the government (Boulder County or the U.S. Forest Service) or a private land trust (such as Colorado Open Lands). These options are explored below.

9.4.1 Boulder County

Since the year 2000, Boulder County has been the most significant land conservation player in the valley. They have been purchasing land and conservation easements on Spencer Mountain, around Lost Lake, up the North Fork, and in the Indian Peaks. Some of the purchased land will remain as Boulder County Open Space and some of it will be traded to the Forest Service. The conservation easements will remain private with restrictions on future development.

A conservation easement may also be donated to Boulder County. The conservation easement generally restricts the size and location of structures and protects significant natural and cultural resources. Such donations are viewed as charitable contributions by the State of Colorado and IRS. They generally reduce the value of the property, which can lower property taxes, receive a Colorado Gross Conservation Easement Tax Credit (see more on this in Section 9.4.4 below), and can lower Federal income taxes.

A third Boulder County program is called Transferable Development Credits (Transferable Development Clearinghouse 2011). Owners of vacant parcels or smaller homes in unincorporated Boulder County can obtain Transferable Development Credits by keeping the parcel vacant or restricting the size of the residence. Additional credits can be obtained by conserving the property, particularly if it contains some significant resources, such as a creek and wetland, rare animal or plant species, or is part of a scenic corridor. The credits are sold on the private market, such as through the Transferable

Development Credits Clearinghouse, to those who wish to build large residences (generally greater than 6,000 square feet) in unincorporated Boulder County.

9.4.2 U.S. Forest Service

From time to time the U.S. Forest Service has engaged in the protection of land, generally through purchase or acceptance of a donation. Their only outright purchase occurred in 1997 with the acquisition of the Toll Property west of town (see Section 9.2.3). Purchases of land by the Forest Service are difficult to accomplish as the lands to be acquired must have a high national significance and require the appropriation of funds by Congress.

More recently, the Forest Service has been working with Boulder County to acquire land. Through the Open Space program, Boulder County is better situated to acquire land. The Forest Service provides a list of properties they are interested in purchasing. Generally, these lands are private inholdings (surrounded by Forest Service land) or key properties that can provide better access. The County will contact the owners and, if they are willing to sell, will carry out the acquisition. The County will then trade the land for a piece of Forest Service land that is more logical for Boulder County to manage, like a parcel near Caribou Ranch.

The Forest Service will also accept donations of private land, if it is a parcel that they desire, such as an inholding. The donation is a charitable contribution that can be applied against federal and state income taxes.

9.4.3 Eldora Land Preservation Fund

As noted in Section 9.3, the Eldora Land Preservation Fund (ELPF), a committee of the Eldora Civic Association, was created in 1996 and has raised over $60,000 for the preservation of natural areas in and around Eldora. To stretch this money further, ELPF has partnered with Boulder County Open Space to help acquire five mining claims on Spencer Mountain as open space.

The role of ECA and ELPF has been primarily to facilitate the preservation of local natural areas through partnering with other organizations.

9.4.4 State of Colorado

Conservation easements that are donated to a qualified organization (a certified land trust or a government) are eligible for Colorado Gross Conservation Easement Tax Credits. The value of the conservation easement (the value that the land has been diminished through the restrictions placed on it by the conservation easement) can be reimbursed, for up to $350,000 per year, either by the State of Colorado when they have a budgetary surplus, or on the private market through the transfer of the tax credits from landowners to taxpayers with Colorado income tax liabilities at a rate of 80% of the full value of the conservation easement.

Another state program that can potentially assist Eldora with land conservation is Great Outdoors Colorado (GOCO). It was created by Colorado voters in 1992 through a citizen's initiative. Using a portion of Lottery dollars, GOCO helps preserve, protect, enhance, and manage Colorado's wildlife, park, river, trail, and open space heritage through a grant program. The grants are allocated on a competitive basis to qualified counties, municipalities, other political subdivisions of the state, or non-profit land conservation organizations. As neither Eldora nor ECA are qualified organizations to apply for a GOCO grant, the community would have to work with Boulder County or a qualified non-profit organization.

9.4.5 Private Land Trusts

Private land trusts are another vehicle for achieving local land conservation. They primarily accept donations of conservation easements on lands that meet the goals and objectives of the land trust.

While there are over 40 land trusts in Colorado, Colorado Open Lands is probably the most appropriate one to deal with projects in the Eldora area. They accepted the conservation easement on the Arapaho Ranch, and hold several others in Boulder and Gilpin Counties. To date, they have protected 10,983 acres through 38 projects in Denver and the surrounding six counties. However, their main interest would likely be properties of at least several acres with significant ecological features.

9.5 Recommendations

1. ECA and the Eldora Land Preservation Fund should continue work to preserve those natural areas that contribute to and enhance the natural heritage of Eldora and its surroundings, generally defined as the Middle Boulder Creek drainage from the Continental Divide to Nederland. Of highest priority for preservation are those lands identified by the Eldora Environmental Preservation Plan, the Boulder County Comprehensive Plan and the Forest Plan for Roosevelt National Forest, which encourage protection of riparian areas; wetlands, rare and significant plants; plant communities and animals; old growth forests; and scenic areas.

2. ECA and the Eldora Land Preservation Fund should protect lands by acquiring or receiving donations of land or interest in land for conservation purposes; and working with and participating with governmental and private agencies on conservation related Eldora and its surroundings.

3. ECA and the Eldora Land Preservation Fund should continue to work cooperatively with Boulder County to complete the acquisition of mining claims on Spencer Mountain.

4. ECA should work with Boulder County in the creation of a management plan for the acquired lands. These lands should not be traded to the Forest Service, which would allow for possible use by the ski area and the staking of mining claims.

5. ECA and the Eldora Land Preservation Fund should continue to raise funds for the conservation of lands in and around Eldora.

10.0 CLIMATE CHANGE

10.1 Colorado Front Range and Eldora in a Changing Future Climate

In writing this document it was decided to include something about the potential future changes in the Eldora area in a warming world. For an in-depth discussion of climate change, see Appendix 10.1.

Here are included three studies by other workers that discuss forecasts of future changes. One is for Boulder Creek, and the other two are for nearby similar environments. One is the Mountain Research Station of the University of Colorado, and it could be a prediction for what might take place higher in the watershed above Eldora. The second is RockyMountain Park, and it encompassed a similar elevational range as our watershed. There are similarities in all three reports.

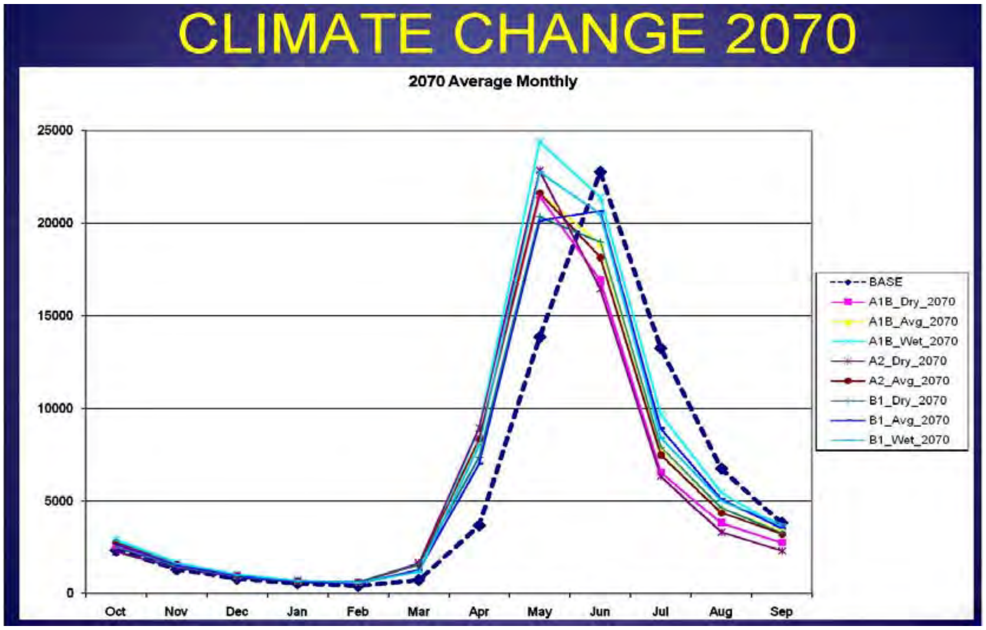
10.2 Boulder Creek

The City of Boulder commissioned a study of the effects of long-term climate variability on the city's water supply. This is an in-depth study using the latest models and a 437-year reconstruction of streamflow for Boulder Creek. They examined what was expected for 20-year periods centered on 2030 and 2070. Their findings are summarized here.

Both temperature and precipitation could change in the future. All models predict higher temperatures. However, the data are not as clear for precipitation, as half of the models predict higher precipitation, and half lower.

Climate change could influence future stream runoff and the yearly pattern of runoff. If a temperature increase is the main variable, this could have little effect on the total volume of runoff per year. What direction precipitation goes will influence the latter. The main prediction is that there would be a change in the pattern of monthly runoff of the creek (Figure 10.1). Runoff from October to February could remain about the same. Note, however, that in the interval from March to May the models predict that runoff is greater than at present. One can think of either rain or high enough temperatures to melt part of the snowpack as causing the latter. All the results presented show runoff lesser than present from June to September. For people interested in managing water, an important date is the month of highest runoff, and one can see that it shifts from June at present to May.

Figure 10.1. Boulder Creek Runoff



Boulder Creek runoff under current climate and climate change in 2070 (Smith et al., 2009).

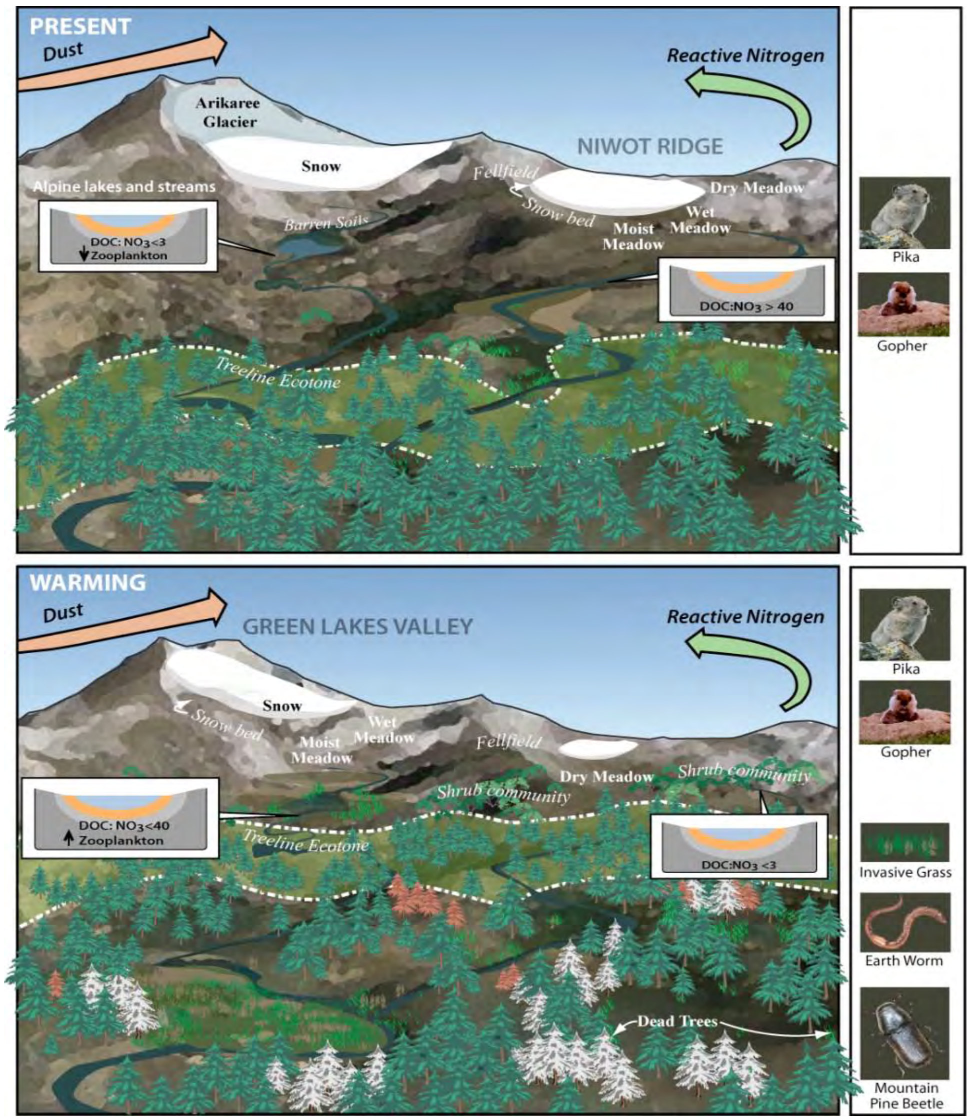
10.3 University of Colorado Mountain Research Station

Scientists at the Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, have speculated on future changes from the Mountain Research Station, located at 9400 ft between Nederland and Ward, to the Continental Divide (Robertson and others 2012).

Increasing air temperatures, along with increasing dust deposition from the west, will likely result in earlier snowmelt, as well as a longer snow-free season (Figure 10.2). It is possible that this could cause Arikaree Glacier to disappear in 20 years. Every river has a time when the discharge is at its highest value, usually sometime in the Spring. The date of this peak value probably will happen sooner in the year andstream discharge might decrease. Note also that treeline is predicted to move to higher elevations.

Another aspect of climate warming in the area is that permafrost might be melting in the alpine zone (Caine 2010). Permafrost is permanently frozen ground, essentially above treeline, and commonly contains ice. It is mainly expected on north-facing slopes, and the top of the ice is thought to be about 10 feet below the surface. The amount that has melted might not be great as the main indicator is a slight increase in stream discharge.

Figure 10.2. Landscape Changes



Major landscape types and plant communities at present and under a warmingclimate scenario. Alpine communities are controlled by the hydrological connectivity driven by the duration and timing of the seasonal snowpack and snowmelt. We expect that under a warming climate, along with increases in N deposition and dust, that we willlose the Arikaree Glacier in the Green Lakes Valley, snowmelt will occur earlier,snowline will move up in elevation, and hydrologic connectivity will decrease. In turn,species diversity will decrease, shrubs will expand, and the landscape will become morehomogeneous. The Mountain Pine Beetle outbreak is expected to remove a large portionof the subalpine forest, facilitating the introduction of invasive species.

10.4 Rocky Mountain National Park

In 2007, Rocky Mountain National Park had a 2-day workshop to address the ecological implications of climate change on the park resources. A document entitled "Climate change in Rocky Mountain National Park: preservation in the face of uncertainty" resulted from the workshop. Sixty-one people from various entities participated: National Park Service, U.S. Forest Service, U.S. Geological Survey, U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, University of Colorado, University of Northern Colorado, Colorado State University, Metropolitan State University, University of Kansas, Colorado Division of Wildlife, Denver Zoo, and Stratus Consulting, Inc. Each part of the document has two parts: the first part is entitled "What we expect", and the second part "For further considerations" (i.e., future research or actions). Here we take from their text the introduction to each part, plus the "What we expect" part. We thank the National Park Service for allowing us to use part of the document here.

Climate Change Workshop: Executive Summary

On November 13 and 14, 2007, Rocky Mountain National Park (RMNP) convened a two-day workshop on the ecological implications of climate change for the park. With the help of the Center of the American West, University of Colorado, RMNP brought together many of the region’s leading biologists, physical scientists, and climatologists to assess the state of the science on the ecological consequences of climate change for the park, to determine priorities and needs in monitoring and research, and to suggest possible mitigation strategies. Over two days of presentations and deliberation, workshop participants worked toward a consensus view of the changes that the park will likely undergo as the region experiences climate warming.

These scientists broke into eight working groups organized around species or ecosystem designations: birds, mammals, hydrology, wetlands, lakes and streams, the montane, the subalpine, and the alpine. Forest fi re, with its high potential for catastrophic impact, was the focus of a ninth working group. In each group, a designated specialist gave a short introductory presentation, which was followed by open discussion.

This document is a synthesis of the presentations and discussions at the November 2007 workshop. The findings identified here were not reviewed by conference participants and should not be viewed as the beliefs or statements of individual scientists. We gratefully acknowledge the insights of all the attendees, while the following authors take full responsibility for this document and any errors of interpretation.

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Center of the American West
University of Colorado at Boulder
Turning hindsight into foresight™

Judith Visty, Ecologist
Cheri Yost, Park Ranger
Gregg Serenbetz, Environmental Protection Specialist U.S. Environmental Protection Agency (on detail to RMNP)
National Park Service

Climatology of the Region

based on presentation by Jason Vogel, Stratus Consulting, Inc.

The earth has always experienced fluctuations in temperature and climate, with extremes of glacial ice and extended periods of warming and drought. Human activity is now playing a role in these fluctuations.

"The future rate of change and intensity of change for the Front Range of Colorado are not reliably predictable with current climate change models."
--Jason Vogel
Stratus Consulting

Since humans began large-scale industrial activity around 1850, our emissions of carbon dioxide, methane, nitrous oxide, and other greenhouse gases have contributed to the warming of the world's climate by trapping heat in the earth's atmosphere. There is broad consensus that rapid climate change is a present reality, although the future rate of change and intensity of change for the Front Range of Colorado are not reliably predictable with current climate change models.

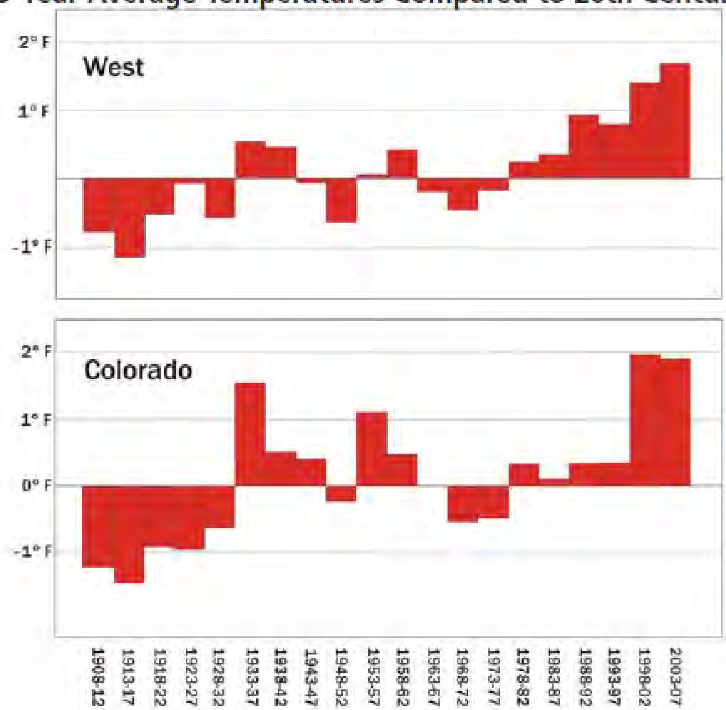
The American West is experiencing change with the rest of the globe, but the rate of warming here has been somewhat accelerated. The West's temperatures have risen at a greater rate than the rest of the globe, with some areas of the West receiving greater rainfall and others receiving less.

Rocky Mountain National Park appears to be situated between two zones, a southern region experiencing less precipitation, and a northern one that appears likely to receive more moisture as the climate changes. It may be that this Rocky Mountain National Park region will receive more annual precipitation, but the increase will likely arrive in infrequent, intense weather events. With the park located on this transitional latitude, climatologists are hard pressed to make reliable predictions about the effects of climate change on precipitation. Harder still is to project what these changes will mean to the park's flora and fauna.

A complex array of interactions make climate predictions difficult and sometimes even contradictory in mountainous terrain. However, a scientific "best guess" is that this region will likely experience: an increase in temperature especially in the spring and winter and especially for minimum temperatures; reduced snowpack; earlier snowmelt; increased dryness due to increased evapotranspiration; and an increase in intense storms.

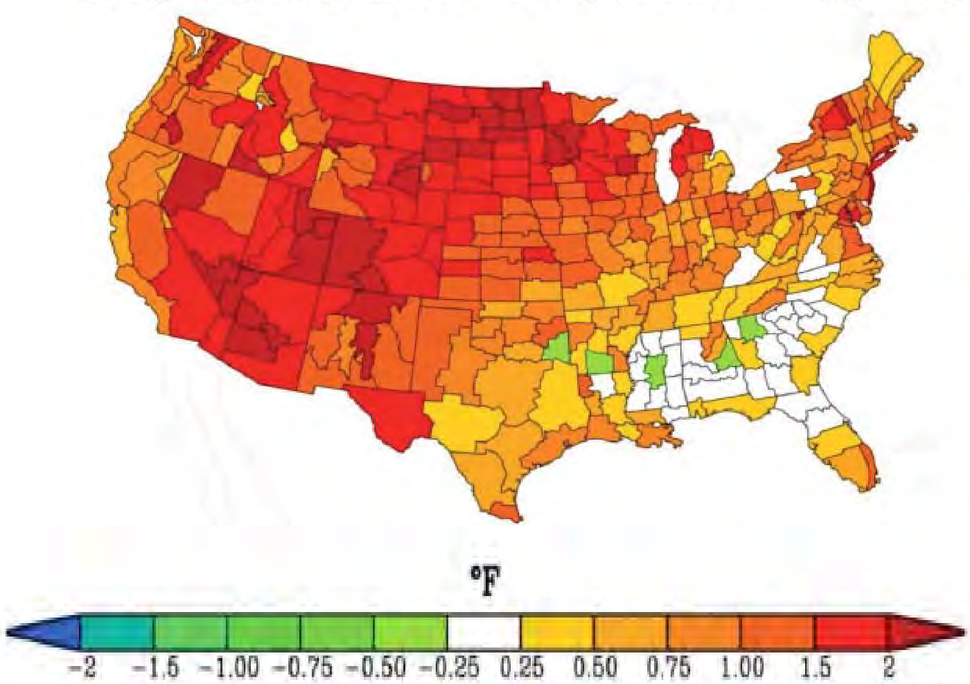
- **an increase in temperature, especially in winter and early spring, and especially for minimum temperatures**
- **reduced snowpack**
- **earlier snowmelt**
- **increased dryness due to increased evapotranspiration**
- **increase in intense storms**
- **Climate modeling is evolving at a rapid pace. The park can benefit from working with partners to stay apprised of model refinements and emerging trends.**

Temperature Change, 1908-2007
5-Year Average Temperatures Compared to 20th Century Average



Data from the National Oceanic and Atmospheric Administration's climate division series.
Analysis by the Rocky Mountain Climate Organization.

The Interior West: Epicenter of Warming in the Contiguous United States
Average Temperatures in 2000-2006 Compared to 20th Century Averages



Source: M. Hoerling and J. Eischeid. 2007. Past Peak Water in the West. *Southwest Hydrology*, Vol. 6, No. 1, 18-19.

Rocky Mountain National Park's Response to Climate Change

based on presentation by John Gross, National Park Service

Rocky Mountain National Park's ecosystems have been wildly different than today's. At one time the region was home to Columbian mammoths, short-faced bears, dire wolves, sabertooth tigers, American lions, and camels.

Climate change impacts are either indirect or direct. For instance, warming causes an increase in pine beetles (direct), which then kill trees (indirect). Increased dryness might cause a change in habitat (direct), which then causes changes to mammal food sources (indirect).

The passing of these species into extinction reminds us that the region is not static. However, the acceleration of change from anthropogenic climate change presents the park's caretakers with new questions and unique challenges.

A difficult aspect of addressing the impact of climate change on Rocky Mountain National Park is the broad uncertainty of what the actual climate changes will be. Even if we accept the presumption that the park's climate will likely become warmer and drier, scientists still struggle to build into their predictions all the variables that might possibly influence the outcomes for individual species and whole ecosystems. The complexity of the biological, climate, and geological matrix in which any one species lives exceeds the modeling capacity of science. Researchers at this workshop invariably prefaced their remarks with the statement that their predictions were highly speculative, and that additional monitoring and research is needed to clarify the nature and extent of the impact of climate change.

Much of climate-related research and monitoring relevant to the park is already underway, and those studies have begun to inform local climate understanding. The National Park Service Rocky Mountain Inventory & Monitoring (I&M) Network, consisting of units in Montana and Colorado, is monitoring common ecological vital signs such as air quality and wetlands health.

Park managers must also ask how the changes wrought by climate change can be managed in context of General Management Plans, existing laws, and administrative policies. Will climate change render the National Park Service incapable of meeting legislated ecosystem mandates, such as prescribed by the Endangered Species Act? The 1916 Organic Act of the National Park Service, environmental laws of the 1960s and 1970s, and the 1998 National Parks Omnibus Management Act did not anticipate anthropogenic climate change, and in some cases their conception of the natural world may be inadequate in an era of rapid transformations.

Park managers will also have to consider how to interpret climate change for their visitors. As the park gains and loses species and as its forests and other habitats evolve, the park will be challenged with making these changes comprehensible to a public that might be shocked or dismayed. This need to educate the public on the effects of climate change will challenge interpreters to make a complex, multivariate phenomenon understandable.

Budgetary constraints will likely prevent the park from single-handedly undertaking more than a few of the research and monitoring projects important to understanding climate change impacts. Given this limitation, the sharing of resources within a consortium, such as the Rocky Mountain I&M Network, and benefiting from knowledge gained at other locations, such as the University of Colorado's Mountain Research Station, will be essential.

Policy guidance is needed to determine to what degree NPS efforts will be devoted to protecting individual species, and current ecological communities, versus embracing newly arrived species and evolving species assemblages.

A modeling study suggests ptarmigan will become less abundant in RMNP as the climate warms. (NPS-RMNP photo)

Birds

Climate change will have a mixed impact on the 258 bird species in the park, favoring some and adversely affecting others.

What we expect:

- **Some species will likely use their flight mobility to move to higher elevations and more northern latitudes.**
- **Decreased food availability due to drying will affect nesting and breeding rates. Because plants and birds may be using different environmental cues, food availability may not coincide with time of need during nesting.**
- **The most vulnerable bird species are expected to be those with long migration patterns, those dependent on a narrow range of plants and climate conditions, and those which are physiologically more sensitive to environmental change.**
- **Warmer temperatures may expose birds to new diseases such as the West Nile virus.**

Mammals

While some species are physiologically sensitive to warming temperatures, climate change will affect most mammals indirectly through changes in habitat.

What we expect for large mammals:

- **Habitat generalists (coyote, elk) will likely fare better than specialists (moose).**
- **Elk numbers are expected to increase due to milder winters and better calf survival.**
- **Bighorn sheep numbers may decrease over the long-term due to loss of open alpine habitat.**
- **Mammals at the southern end of their range are among the most vulnerable. With warmer temperatures, for example, the duration of snow cover decreases and models show lynx habitat shrinking or disappearing.**

What we expect for small mammals:

- **Habitat generalists (raccoon) will likely fare better than specialists (pika and snowshoe rabbits).**
- **Within the park, species will likely move up in elevation, leading to possible extirpation or reduction of some high-altitude species. Some species may shift their range northward.**
- **New species may colonize lower elevations and animals like the rock mouse and raccoon, currently at the upper end of their elevation range, may expand further.**
- **Some mammal species may physiologically adapt, for example, by adjusting body size. However, plasticity in species varies. Pikas, for instance, are not successfully adapting to warming in some parts of their range.**
- **Greater numbers of rodents may increase incidence of diseases such as hantavirus and the bubonic plague.**

Pika are sensitive to warming temperatures. (NPS-RMNP photo)

More precipitation will likely fall as rain rather than snow.
(NPS-RMNP photo)

Hydrology

On average, the onset of spring snowmelt and runoff in Colorado is beginning about two weeks earlier than in the late 1970s.

What we expect:

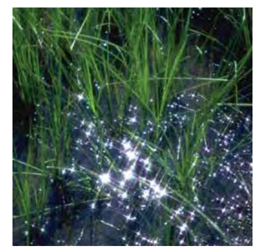
- **More precipitation is expected to fall as rain instead of snow, significantly decreasing snowpack.**
- **Glaciers and perennial snowfields are believed to have recently shrunk back to around their 1940s extent.**
- **In the short term, melting permafrost may supplement stream flows during dry periods. Over time, this "stored water" will diminish and streams will dry.**
- **Spring flooding may negatively affect trails, bridges, roads, and visitor safety.**

Wetlands

Already stressed wetlands are highly responsive to changes in climate.

What we expect:

- **A drier climate will decrease or even eliminate some wetlands. Up to 32% of the park's plants are known to either need or tolerate wet soils. Likewise, a disproportionate number of birds and mammals use wetlands, making them a center for biodiversity.**
- **Wetland species may be "trapped" in disappearing habitats, leading to their local extinction.**
- **Amphibians, due to their close association with water, are especially vulnerable to climate-induced wetland change.**
- **Climate change impacts on soil chemistry, snowmelt, and soil saturation are expected to make wetlands vulnerable to invasive species.**



A drier climate will likely eliminate some wetlands in the park. (NPS-RMNP photo)

Greenback cutthroat trout may adapt to warmer stream temperatures, but they may have difficulty surviving in shallower waters.(Chris Kennedy, USFWS photo)

Lakes and Streams

Lake and stream temperatures will rise along with warmer air temperatures.

What we expect:

- **Changing water temperature, water chemistry, longer ice-free periods, changing run-off patterns, and light availability along riparian banks, among other factors, will affect fish and other aquatic species.**
- **Cutthroat trout may benefit from warmer water temperatures, but other factors, such as habitat loss at lower elevations and new diseases, may offset this advantage.**
- **As in other ecosystems, problems may arise due to prey responding to temperature changes in one way, while predators respond in another. This may result in insufficient food at a key time in a predator's life cycle.**
- **Native species are likely to persist under climate change, but the associative effects of warming may increase opportunities for invasive species, diseases, and parasites in lakes and streams.**

Fire

Forest fires will increase in intensity and frequency in the near term with warming and drying of the climate.

What we expect:

- More extreme fire behavior due to drying will pose greater threats to human life and structures in and adjacent to the park.
- Diseases and insect infestations associated with climate change may result in a "window" when dying lodgepole forests are especially vulnerable to fire. However, this window may close quickly as dead needles fall to the ground and crown fire become less likely.
- Beetles, whose prevalence is likely a direct effect of climate change, will play a significant role, perhaps greater than that off fire, in shifting forest structure.
- In the long term, a drier climate may decrease fire incidence because of a decrease in fuel accumulation.
- Ponderosa pine forests are likely to expand within the park, unless elk continue to impair seedling establishment.

In the short term fi res may be more frequent. (NPS-RMNP photo)

Non-native plants and Animals will likely have more opportunities to invade the montane life zone. (NPS-RMNP photo)

Montane Ecosystem

The timing of natural annual events such as snowmelt run-off; plant, insect, and animal reproduction; spring green-up; and first frost in the fall will change.

What we expect:

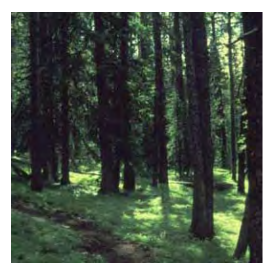
- Climate change will have complex ramifications for the ecological interactions of plant, insect, and animal species.
- Invasive non-native flora and fauna will likely find more opportunities to invade and thrive.
- Animals may move to higher elevations before plant communities shift.
- Climate change will create hybrid ecological communities consisting of new mixes of species, dubbed "novel" ecosystems.

Subalpine Ecosystem

The subalpine ecosystem will change due both to dramatic disturbances such as fire and insects and from more gradual processes such as warming temperatures.

What we expect:

- Limber pine, lodgepole, and spruce-fir forests may be especially susceptible to abrupt change from fire, insects, and disease.
- The subalpine ecosystem is expected to shift up in elevation and decrease in total acreage.
- Tree community composition will likely shift within the subalpine zone. For instance, north-facing hillsides may no longer be moist enough to support Douglas fir regeneration.
- Limber pines are facing the triple threat of climate change, bark beetles, and blister rust.



Tree communities will shift within the subalpine. (NPS-RMNP photo)

The extent of the park's tundra will likely shrink with warmer temperatures. (NPS-RMNP photo)

Alpine Tundra Ecosystem

Warming is most likely to occur in winter and early spring, and in minimum temperatures; that is overnight low temperatures will not be as cold.

What we expect:

- **Permafrost area will shrink even with minimal warming. This may impact vegetation communities and park visitor facilities.**
- **Potential encroachment of trees may be slowed by lack of moisture.**
- **New plant and animal species will likely encroach into the tundra as growing season lengthens and soil becomes saturated with nitrogen. Grasses are expected to increase.**
- **Tundra animal and insect species, living on mountaintop "islands," are especially vulnerable to extirpation.**
- **In the short term, changes in plant species due to nitrogen pollution from urban and agricultural sources will likely be more significant than changes due to warming.**
- **Perennial plants of the tundra are long-lived and communities have a type of ecological inertia, making them slow to change.**

Park Research and Monitoring Priorities

Given budget considerations, visitor interests, management concerns, and the workshop findings, these projects should be of first priority:

- **Verify the presence and extent of permafrost. Identify any associated vegetative communities and begin to assess risks to buildings and roads resulting from the melting of permafrost.**
- **Collect baseline information on pika populations, their locations, habitat characteristics, and temperature regimes. Work with others in the region to understand the vulnerability of this species.**
- **Develop lists of park plants at the southern end of their range and those with exclusive pollinator relationships. Based on this "watch list," consider developing monitoring plans for one or two plant species that are likely to be susceptible to climate change.**
- **Provide strong support to the Rocky Mountain Inventory and Monitoring Network in launching a Global Observation and Research in Alpine Environments (GLORIA) site within the park.**
- **Collect limber pine seed and identify potential blister rust resistant seed stock in anticipation of future revegetation efforts in the region.**
- **Model effective fuel treatment options and determine the likely structure of park forests after insect infestations.**
- **Revisit plots established during the Global Climate Change Program in the early 1990s to determine if they can be relocated. Review project files and**

Partnerships and Collaboration

The generous and open participation of the representatives from federal and state agencies, the private sector, and non-profit entities in this workshop demonstrated the great potential for future cooperation. Here were a few ideas that emerged from this complement of park stakeholders:

- **Because of their shared boundary, the park and the Forest Service have the opportunity to continue to strengthen ties. The park in particular stands to learn from the Forest Service's ambitious and coherent forest ecology research program.**
- **Rocky Mountain National Park is fortunate in having one of the world's premier alpine research institutes, the University of Colorado at Boulder Mountain Research Station (MRS), less than twenty miles to the south. Although researchers from MRS have worked in the park, and some research results filter back to park staff, this information flow can be improved so that valuable insights are not lost and so that park staff does not duplicate research efforts.**
- **For most visitors, large mammals continue to represent the essence of the park. Although the Colorado Division of Wildlife and the National Park Service have worked together in the past, holding more frequent joint workshops could benefit both agencies. Likewise, the Denver Zoo brings expertise in mammal conservation biology and a connection to our urban neighbors that are quite valuable.**
- **The park has the opportunity to involve park volunteers in tracking and publicizing the emerging patterns of climate change. For instance, the ten-year, volunteer-led study of park butterflies is a model for future efforts.**

Education and Interpretation

Developing a realistic understanding of climate change impacts, among park staff, managers, and the general public is fundamental to adapting to the future. Here are ways that information from this climate workshop will be shared:

- **This report will serve as a general outline of expected climate change impacts and collaboration opportunities.**
- **The information gained through the workshop will be presented to park staff during a one-day workshop and at the park's 2008Biennial Research Conference.**
- **The Continental Divide Research Learning Center will distribute this information in other formats and with other audiences as opportunities arise.**

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APPENDIX 1

INTRODUCTION

APPENDIX 1

ELDORA CIVIC ASSOCIATION

MEMBER SURVEYS

Explanation: The following are the results of ECA member surveys conducted in 2002 and 2009. Each vote represents a household.

ELDORA CIVIC ASSOCIATION
MEMBER SURVEY 2002

Voting Rights

The Eldora Civic Association has always been a homeowners= association with one vote per property. Tenants and extended family members can join the association, but have no voting rights. Would you be in favor of extending voting rights to all individuals who live in Eldora on a full or part-time basis as long as they pay $20 dues? For example, a cabin with twenty family members would have 20 votes, a cabin with 2 family members would have 2 votes, and tenants as well as their landlords would have as many votes as there are people associated with a property.

Check only one:

___ Only one vote per property	67
___ All full and part-time residents and family members have one vote each	6
___ No opinion	1

Membership Dues

Currently only those who pay ECA membership dues receive the newsletter and are allowed to vote. Would you be in favor of extending these privileges to property owners who do not pay dues? And would you be willing to pay higher dues to cover to cost of printing extra newsletter for them ($9 each per yr.)?

___Yes	10
___ No	62
___ No opinion	2

Public Sewer and Water System

Currently Eldora residents use private septic systems and water wells. Some systems are inadequate and cause localized problems. Many cabins are used for only a small portion of the summer season, thus putting little strain on the systems. Would you be in favor of looking into the possibility of a public sewer and water system to be funded in part by grants. This would probably not cover individual hook-ups to the system.

Check one or two:

___ Yes, look into a public sewer system.	17
___ No, leave things as they are.	54
___ No opinion	3

Natural Gas Line to Eldora

A natural gas pipeline follows Eldora Road to the Arapaho Ranch and then on up the ski area road to Eldora Mountain Resort and over the divide. Natural gas is a cleaner burning fuel than firewood and could improve air quality in Eldora. Should ECA investigate the possibility and expense of extending the natural gas line into Eldora?

Check only one:

___ Yes, look into the feasibility of natural gas for Eldora.	37
___ No, leave things the way they are.	35
___ No opinion	2

Open Space Acquisition Around Eldora

Boulder County Parks and Open Space has purchased approximately 105 acres of mining claims on Spencer Mountain for wildlife habitat preservation and is working on purchasing a five acre mining claim just west of Eldora on the Fourth of July Road. These parcels help protect Eldora=s view shed. The Eldora Environmental Preservation Plan encourages ECA to work with Boulder County to acquire land buffers to the south and west of Eldora. The Eldora Land Preservation Fund is raising money for the preservation of open space around Eldora. Do you support the acquisition and preservation of open lands around Eldora?

Choose only one:

___ Yes, we support acquiring open space in and around Eldora.	70
___ No, we do not support acquiring open space in and around Eldora.	3
___ No opinion	1

Trail Corridor Through Eldora:

Last summer the Town of Nederland completed its new open space and recreation master plan. They proposed a trail from Nederland to the Indian Peaks Wilderness that has a strong possibility of going through Eldora. Many Eldorans attended public hearings before Nederland town trustees to object to the trail corridor, the result being that the trail corridor will receive further study. While a specific trail has not been chosen, one of the more likely routes would run along the road from Nederland to Eldora; through Eldora it may follow either Eldorado Avenue (with the potential need for widening) or Klondyke Avenue (using the existing dirt road). Are you in favor of such a trail from Nederland through Eldora to the Indian Peaks?

Choose only one:

___ Yes, we are in favor of a trail from Nederland through Eldora to the Indian Peaks.	3
___ No, we are not in favor of a trail from Nederland through Eldora.	68
___ No opinion	3

Transportation

The speed and volume of cars in Eldora has been a concern for many years. Part of the problem lies with us, while much of the traffic is from people going to the Indian Peaks Wilderness west of town. Several methods have been suggested by citizens to help alleviate the traffic problem. Please check possible ways of controlling traffic and speed that you would support:

Choose as many as you like:

___ Make the road from the ski area turnoff through Eldora (including Eldorado Avenue) dirt. (The feeling of some is that a dirt road may discourage cars from heading up the road and it may slow traffic. Air quality may be affected.) 2

___ Place a sign west of the ski area turnoff directing people looking for the ski area to turn around. 47

___ Build a bike trail from Nederland to Eldora to encourage people to use bicycles. (This would require widening the road.) 5

___ Work with RTD to get bus service to Eldora. 6

___ Redesign Eldorado Avenue to create a better defined entrance to town, more obvious speed limit signage and possible narrowing of the road (people tend to drive slower on narrow roads). 28

___ Place removable traffic circles on Eldorado Avenue in summer. 17

__ Make Klondyke Avenue one-way going west and Eldorado Avenue one-way going east. (This would spread out the burden of dealing with traffic. It may require the paving of Klondyke.) 5

___ Create raised pedestrian crossings at 8th and 10th Streets with stop signs. 18

__ Get more enforcement by Boulder County Sheriff=s Department. Use radar machines that post each car′s speed. Create a special tax district to pay for the additional services. 24

___ Create a U. S. Forest Service Recreational Fee Area west of Eldora with limited parking for Indian Peaks Wilderness. (Brainard Lake near Ward has this system; many systems like this require parked vehicles to have a sticker or pass with normal fees being $20 per season or $ 5 per day.) 35

__ Encourage a concessioner to provide weekend shuttle service from Nederland High School to trails off of the Fourth of July Road. 25

Eldora Mountain Resort Ski Area

In summer 2001 there was an ECA survey about the Eldora Environmental Preservation Plan which asked the ECA membership to rank 8 of the plan′s recommendations according to importance. The #1 recommendation was that ski area impacts be controlled at or below the levels permitted in the resort′s current master plan. Recently the ski area has added snowmobiling as a night time activity. It is unclear as to whether their agreement with the county allows this activity. Out of bounds skiing has been occurring from the ski area down into Hessie and Lost Lake. Other problems include noxious weeds in disturbed areas and trash blowing from the ski area onto adjacent lands. Should ECA work with the County and the U. S. Forest Service to monitor ski area activities and make sure they adhere to their master plan?

Choose only *one:*

__Yes, ECA should monitor ski area activities and work with appropriate agencies. 61

__ No, ECA should not get involved with monitoring ski area activities. 10

__ No opinion 3

Commercial Snowmobile Business at Eldora Mountain Resort:

Eldora Mountain Resort has introduced snowmobiling to its 2002 recreational program, although it is not specifically allowed in its Boulder County special use permit. There may be impacts to wildlife and the environment in the Eldora area because of air, noise and water pollution. Are you in favor of snowmobiling at the ski area?

Check only one:

__ Yes, we are in favor of snowmobiling at the ski area. 4

__ No, we are not in favor of snowmobiling at the ski area. 61

__ No opinion 9

Upper Middle Boulder Creek Coalition

A group called the Upper Middle Boulder Creek Coalition (UMBCC) is in its formative stages. It plans to help monitor and resolve present and future recreation issues impacting private, county and federal lands west of Eldora in the Fourth of July Valley. It will include groups such as ECA, North Fork Council, Indian Peaks Working Group, U. S. Forest Service, Boulder County Land Use Department, Nederland Fire Protection District and the City of Boulder. Should ECA participate in this coalition?

Choose only one:

__ Yes, ECA should participate in this coalition. 60

__ No, ECA should not participate in this coalition. 8

__ No opinion 6

Results of the Eldora Civic Association Member Survey July 2009

202 surveys were sent out.
63 surveys (32%) came back.

1. How large should new homes and homes with new additions in Eldora be?
   - (5) less than 1000 square feet
   - (35) 1500 square feet (current Boulder County regulation)
   - (5) 2500 square feet
   - (0) 3500 square feet
   - (0) 4500 square feet
   - (2) no limit on size
   - (12) based upon a percentage of lot size
   - (4) No answer

2.Should the above square footages include:
   - storage sheds Yes (16) No (47)
   - garage Yes (24) No (34) No answer (5)
   - basement Yes (21) No (41) No answer (1)

3. How much building setback should there be from the property line?
   - (25) 25 feet side and 15 feet front and rear (current forestry zoning regulation)
   - (2) 15 feet side and 10 feet front and rear
   - (4) 10 feet side and 5 feet front and rear
   - (28) variable, depending upon lot size
   - (4) No answer

4. How great should the height limit for new homes and additions be?
   - (12) less than 25 feet
   - (12) 25 feet
   - (37) 30 feet (current forestry zoning regulation)
   - (0) 40 feet
   - (1) 50 feet
   - (1) No answer

5. Should the ECA pursue updating the Eldora Environmental Preservation Plan at a cost to ECA of approximately $2000 to $4000?
   - (41) Yes
   - (15) No
   - (7) No answer

6. There is a good chance Boulder County may help with part of the cost of an update of the Eldora Environmental Preservation Plan. In order to fund the Eldora community portion of the update of the EEPP, which options do you prefer?
   - (6) Community donations
   - (3) Using a portion of the CDs in the ECA bank account
   - (42) Both of the above
   - (12) No answer

7. Should the Eldora Land Preservation Fund continue to partner with Boulder County in acquiring undeveloped land around Eldora for open space?
   - (59) Yes (1) No (3) No answer

8.Are you satisfied with the current forestry zoning that Eldora has?
   - (48) Yes (4) No (11) No answer

9. Are you in favor of changing Eldora's zoning to allow for commercial development?
   - (4) Yes (57) No (2) No Answer

10. Do you feel it is important to protect Eldora's rural and historic ambiance by preserving open space?
   - (60) Yes (1) No (2) No answer

11. Do you feel it is important to protect Eldora's rural and historic ambiance by limiting house size?
   - (51)Yes (9) No (3) No answer

12. Do you feel it is important to protect Eldora's rural and historic ambiance by encouraging historic preservation? (55) Yes (5) No (2) No answer

13. Should platted undeveloped roads be vacated to resolve building encroachments?

(43) Yes (9) No (11) No answer

14. Should platted undeveloped roads be vacated to allow for building leach fields to correct septic problems? (44) Yes (10) No (9) No answer

15. Should some platted undeveloped roads be left as public open space to provide for wildlife corridors and preservation of native plant communities?

(48) Yes (11) No (4) No answer

16. How should Eldora solve its septic waste problems?

(5) connect Eldora to Nederland's treatment plant and become part of their tax district

(1) central sewage treatment system in Eldora paid for by a new tax district

(12) communal septic systems for clusters of smaller properties

(51) work individually on creative solutions with Boulder County Health Department such as allowing holding tanks for seasonal cabins.

(4) No answer

17. Should sensitive wetlands and creek frontages be protected from development?

(54) Yes (4) No (5) No answer

18. Is it important to protect the views from your property and not allow them to be blocked by new construction? (47) Yes (7) No (9) No answer

19. Are you in favor of building a 100-car public parking lot in relatively pristine forest that overlooks the North Fork of Middle Boulder Creek on County open space along the Fourth of July Road above Hessie?

(14) Yes (42) No (7) No answer

20. Should parking continue to be allowed along the 4th of July Road in addition to this parking lot?

(17) Yes (39) No (7) No answer

21.Would you be in favor of a small, quiet, clean burning shuttle bus from Nederland High School to Eldora and up the Fourth of July Road as an effort to reduce traffic through Eldora?

(40)Yes (17) No (6) No answer

22.Are cars speeding through Eldora with their impacts on children, pets and wildlife a concern for you?

(50) Yes (8) No (5) No answer

23. Are you willing to drive the posted 25 mph limit through Eldora yourself?

(59)Yes (0) No (4) No answer

24. Are you concerned about the health risks from air and water contamination due to pesticide spraying in Eldora Townsite and at the Eldora ski area? (32)Yes (23) No (8) No answer

25. Should ECA work with the US Forest Service to find alternatives to the use of pesticides?

(45)Yes (14)No (4) No answer

26. Are you interested in looking into ways of increasing home energy efficiency in our community?

(38) Yes (21) No (4) No answer

27. Are you interested in exploring off the grid, self-sufficient, energy-wise technology like solar power?

(34)Yes (25) No (4) No answer

28. How do you prefer to receive the Eldora High Country newsletter?

(25) hard copy – black and white   (2) hard copy – full color (at extra charge)

(24) electronically   (10) both electronically and hard copy

29. Which Eldora social activities do you enjoy attending?

(36) Eldora Town Picnic   (30) Eldora History Night

(14) Eldora Night at the Pioneer Inn   (19) Eldora Community Yard Sale

Many thanks to those who took the time to fill out this survey!

APPENDIX 2

GEOLOGY AND

MINERALS

APPENDIX 2

GEOLOGY AND MINERAL RESOURCES

List of Contact People

Name, Affiliation, Address, Phone	Field of Expertise
Bureau of Land Management, Colo. State Office 2850 Youngfield, Broomfield, CO 80215 303-239-3600	Unpatented mining claims
Peter Birkeland Geological Sciences Department University of Colorado Boulder, CO 80309 303-442-0304 birkelap@colorado.edu	Geology
Colorado Division of Reclamation, Mining and Safety Office of Active and Inactive Mines Abandoned Mines Program The Centennial Building 1313 Sherman Street, Room 215 Denver, CO 80203 303-866-3567 http://mining.state.co.us	Abandoned mines

APPENDIX 3

HYDROLOGY

Appendix 3.1. Water Quality Data for Middle Boulder Creek and a Well in Eldora

Data collected and analysed by John Drexler, Lab of Enfironmental and Geological Studies of the Department of Geological Studies, University of Colorado

Parameter	Middle Boulder Creek	Well
Temp-C	2.7	
pH	6.7	
DO mg/l	11.4	
Fe+2 mg/l	0	
Fe Total mg/l	0.05	
Conductivity mS/cm	0.05	
TDS g/l	0.024	
Alkalinity mg/l CaCO3	51	
Anions mg/l		
F	0.1	1.2
Cl	0.45	4.7
Br	0.04	0.09
NO2	ND	ND
NO3	0.8	0.06
PO4	0.6	ND
SO4	4.6	1028
Cations mg/l		
Si	6.3	14.4
Mg	1.2	33.8
Ca	5.3	
Na	0.8	93
K	0.6	3.1
Fe	0.06	0.19
Mn	0.008	0.19
Ni	0.008	0.006
Zn	0.016	1.8
Cu	0.001	0.012
Al	0.013	0.1
Pb (ppb)	0.3	0.21
Sn		0.00009
Tl		0.00005
Sb		DL
Cd (ppb)		0.08
As (ppb)		1.46
Sr		9.8
Rb		0.017

Appendix 3.2. Middle Boulder Creek Water Quality Data 2000

Basic water quality parameters and constituents

Data from U.S. Geological Survey (Sheila Murphy) and analysed by City of Boulder Laboratory

[Units are milligrams per liter unless otherwise indicated; alkalinity and hardness reported as $CaCO_3$, distance, distance from Boulder Creek/Saint Vrain Creek confluence; m^3/s, cubic meters per second; Lab, city of Boulder laboratory that analyzed sample; T_{air}, air temperature; T_{water}, water temperature; BC, degrees Celsius; DO, dissolved oxygen; %, percent; SC, specific conductance; µS/cm, microsiemens per centimeter; TDS, total dissolved solids; TSS, total suspended solids; NTU, nephelometric turbidity units; cols/100 mL, number of colonies per 100 milliliters; NO_2+NO_3-N, nitrite plus nitrate as N; NO_2, nitrite as N; NH_3-N, ammonia as N; Org-N, organic N; P, phosphorus as P; --, not measured; <, less than; DW, Drinking Water Laboratory; WW, Wastewater and Environmental Laboratory; discharge measurements from Murphy and others, 2003]

Site	Distance (meters)	Discharge (m^3/s)	Sample date	Sample time	Lab	T_{air} (BC)	T_{water} (BC)	DO	DO saturation[1] (%)	SC (µS/cm)	pH (units)	TDS	Alkalinity	Hardness	TSS	Turbid-ity[2] (NTU)	Fecal coliform (cols/100 mL)	NO_2+ NO_3-N	NO_2-N	NH_3-N	Org-N	P (total)	P (ortho)
Middle Boulder Creek upstream of Eldora																							
Jun-00	69590	3.7	--	--	[3]	--	--	--	--	--	--	--	--	40	--	0.56	2	--	--	--	--	0.03	<0.03
Oct-00	69590	0.40	--	--	[2]	--	--	--	--	--	--	8 [3]	--	40	2 [3]	0.22	1	--	--	<0.1	<0.1	<0.02	<0.03
Middle Boulder Creek near Nederland Water Treatment Plant																							
Jun-00	62970	--	6/12/2000	1216	DW	--	8.2	8.5	100	25	7.57	15 [4]	10	12	2	1.0	<1	0.08	--	--	--	0.01	--
Oct-00	62970	--	10/9/2000	1204	DW	--	4.0	9.7	100	48	7.48	29 [4]	17	19	4	0.66	<1	0.09		--		0.01	--

[1] Calculated from dissolved oxygen, temperature, and elevation.

[2] All turbidity measurements analyzed by DW.

[3] Samples for these sites were collected during USGS sampling and analyzed for hardness, total phosphate, and orthophosphate by WW, and for fecal coliform and turbidity by DW.

[4] Estimated from specific conductance.

Appendix 3.3. Mogul Tunnel Water Quality Testing

999

Mine Engineering and Environmental 303-449-8076 *fox*

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DMG

FAX

3 Pages including this page

Date: November 8, 1995

To: Andy Moore, P.E. - Division of Minerals and Geology

From: Richard Fox, Consultant - Representing Durango Metals Inc.

Subject: File M-95-076; Mogul Tunnel - Water sample results and questions regarding Mining Permit application

Mr. Moore:

I am enclosing the water samples that were taken at the Mogul on Friday, October 27th. We did not have a conductivity or pH meter so these values were not taken. The Huron Shaft spring is, as we understand, water that comes from a shaft that is buried under old Mogul dump material and is the first water sample that you collected outside. This "spring" has been flowing off and on for years. We do not know if there is any connection to the Mogul Tunnel water.

The Dela spring is at the bottom of the Mogul dump and corresponds to the second water sample that you took outside. As you know, the water appeared to be coming from material that looked like natural overburden and topsoil. We also do not know whether this spring is related to any past mining in the area.

The Mogul Tunnel water sample was taken from the same location that you took the water sample inside the Mogul Tunnel.

The Huron Tunnel sample was taken from water taken in the ditch coming out of the Huron adit.

The Boulder Creek sample was taken from water flowing in Middle Boulder Creek above the outfall of the "spring" water that flows into Boulder Creek.

Since I was not able to reach you or Carl Mount yesterday, I have several questions that are pertinent to the permit. They are:

1) We have not heard whether there are any areas regarding adequacy of responses that we can comment on. If there are areas that need to have clarification or additional work, please let us know so that we can respond in a timely manner

2) In your recent bond calculations, you have put in a cost of $6,000 for a portal seal and demolition. There are no costs to back this up and we would hesitate to put in a permanent seal in the Mogul Tunnel since the tunnel provides access to underground workings for many of the claims under Spencer Mountain. We believe that permission from the landowners would be required before a permanent seal could be placed in the Mogul

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Tunnel. The law also provides for adequate locking gates as a part of closure. We have no idea what demolition would be involved beyond the items spelled out in the bond calculations that were submitted with the permit application. Please clarify your costs and the reason for requiring a permanent seal.

3) There are two task descriptions involved which include 1000 BCY for slope reduction and 600 BCY for moving dump material out of water drainage. The source of the volumes are supposedly field measurements, however we do not know where the measurements came from or at what point in time the measurements refer to. At this point we do not know of any material that is in a water drainage and 1000 BCY seems excessive for slope reduction on the area that has been disturbed by currently active work on the Mogul dump. Please clarify the source of the volumes.

If you can make a list of responses to my questions, I would appreciate a faxed response to me at 469-8076. You will need to call before faxing so that I can turn on the fax machine.

Sincerely,

Richard Fox

Richard Fox, P.E.

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Reference No.: 950305
November 2, 1995

ANALYTICAL DATA - FIVE WASTEWATER SAMPLES

From Rinehart Laboratories, Inc.

Parameter		Boulder Creek	Dela Spring	Huron Shaft Spring	Huron Tunnel	Mogul Tunnel
		mg/1				
Sulfate	(375.3)	0.55	33.4	157	99.8	167
Hardness	(130.2)	10.4	124	220	134	193
Arsenic	(206.2)	<0.0001	0.0056	0.0084	0.0029	0.0069
Cadmium	(213.1)	0.0007	0.0020	0.0018	0.0031	0.0013
Chromium	(218.1)	0.0050	0.027	0.0060	0.0060	0.0048
Hex. Cr	(3500 D)	0.0041	0.0014	0.0028	0.0014	0.0028
Copper	(220.1)	0.0042	0.052	0.0050	0.015	0.0036
Iron	(236.1)	0.055	28.6	0.58	1.48	0.16
Lead	(239.1)	0.0062	0.035	0.022	0.011	0.0061
Manganese	(243.1)	0.050	0.41	0.018	0.019	0.22
Mercury	(245.1)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	(249.1)	0.0020	0.028	0.014	0.0072	0.014
Selenium	(270.2)	0.0008	0.012	0.0072	0.0072	0.012
Silver	(272.1)	<0.0010	0.0010	0.0033	0.0012	0.0010
Zinc	(289.1)	0.016	0.16	0.21	0.025	0.10

STATE OF COLORADO

DIVISION OF MINERALS AND GEOLOGY
Department of Natural Resources

1313 Sherman St., Room 215
Denver, Colorado 80203
Phone: (303) 866-3567
FAX (303) 832-8106

DEPARTMENT OF NATURAL RESOURCES

Roy Romer
Governor

James S. Lochhead
Executive Director

Michael B. Long
Division Director

November 6, 1995

Mr. Thames Hartley, President
Durango Metals, Inc.
P.O. Box 19255
Boulder, CO 80308-2255

RE: Mogul Tunnel, November Board Hearing Materials, File No. M-95-076

Dear Mr. Hartley:

I have enclosed several documents that the Division of Minerals and Geology received after the Board Hearing of October 18, 1995. These documents have been provided to the Board members.

If you have any questions, please contact me.

Sincerely,

Carl B. Mount

Carl B. Mount
Senior Environmental Protection Specialist

cc: Andrew Moore, DMG

STATE OF COLORADO

DIVISION OF MINERALS AND GEOLOGY
Department of Natural Resources

1313 Sherman St., Room 215
Denver, Colorado 80203
Phone: (303) 866-3567
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DEPARTMENT OF NATURAL RESOURCES

Roy Romer
Governor

James S. Lochhead
Executive Director

Michael B. Long
Division Director

October 27, 1995

Mr. Thames Hartley, President
Durango Metals, Inc.
P.O. Box 19255
Boulder, CO 80308-2255

RE: Mogul Tunnel, NOI No. P-92-026, File No. M-95-076, Board Action.

Dear Mr. Hartley:

At the October 18, 1995 meeting of the Mined Land Reclamation Board (Board), the Board decided to hold open the item concerning possible notice of violation, cease and desist order, corrective actions, and civil penalties for mining without a permit at the Mogul Tunnel. The Board directed Durango Metals to provide to the Division of Minerals and Geology (Division) several items:

1) Existing cross sections and plans of the mine as it is today;

2) The program for underground exploration and secondary escapeway plans as approved by the Mine Safety and Health Administration (MSHA);

3) Any previous MSHA inspection reports regarding the Mogul Mine;

4) Legal evidence that the documents provided to the Board by the Division are forgeries or fraudulent (a copy of the complaint may be sufficient for this);

5) Documents from MSHA about the need for an escapeway.

These items must be provided to the Division on or before 5 P.M. on November 8, 1995 so we may mail copies to the Board members.

If you have any questions, please contact me.

Sincerely,

Carl B. Mount
Senior Environmental Protection Specialist

cc: Andrew Moore, DMG

Appendix 3.4 River Watch Water Quality Data

Date / Time (24 hr)	Recorded By	Comments	Flow (ft^3/s)	Water Temp (°C)	pH (SU)	ATC Temp (°C)	Phen. Alkalinity (mg/L $CaCO_3$)	Total Alkalinity (mg/L $CaCO_3$)	Hardness (mg/L CaCO3)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat.)
7/11/2010 11:00	Bob Rowland	31 °C	20.3	18	8.18	23.3	16	230	248	7.1	89
8/29/2010 9:00	Bob Rowland	None	21	15.5	8.13	18.8	20	214	216	7.4	76
1/16/2011 10:00	Bob Rowland	None	12	8	8.34	10.7	80	282	310	10	84
5/1/2011 9:30	Bob Rowland	None	0.645	9	8.29	11.9	16	242	No Data	10	90
7/9/2011 13:30	Bob, Bob, Caitlin, and trainees	33 °C and partly cloudy	59.5	23	No Data	No Data	27.6	128.2	178	6.2	78

Table 1. Coal Creek 2600

Date / Time (24 hr)	Data Recorded By	Comments	Flow (ft^3/s)	Water Temp (°C)	pH (SU)	ATC Temp (°C)	Phen. Alkalinity (mg/L $CaCO_3$)	Total Alkalinity (mg/L $CaCO_3$)	Hardness (mg/L CaCO3)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
5/8/2010 9:15	Brian C. Vickers	40F / Clear sky	24.2	5	No data	No data	0	48	74	9.5	75
6/24/2010 18:40	Brian C. Vickers	90F	No data	15.5	No data	No data	0	28	32	7.2	80
7/8/2010 18:40	Brian C. Vickers	Low 70° / Clear sky / sunny	12.9	14	No data	No data	0	42	48	7.5	78
8/12/2010 18:40	Brian C. Vickers	85° Partly Cloudy	12.2	16.5	7.52	27.2	0	20	26	6.6	70
9/11/2010 9:15	Brian C. Vickers	None	7.6	12	7.71	20.8	0	30	32	7.7	72
10/9/2010 9:15	Brian C. Vickers	50F Partly cloudy	2.75	10	7.64	24.5	0	44	34	8.25	73
11/13/2010 9:15	Brian C. Vickers	36° F, sunny	No data	3	7.08	20.2	0	72	82	9.1	70
12/11/2010 9:45	Brian C. Vickers	Low 30's (estimate)	No data	2	No data	No data	0	79	82	5.3	39
1/8/2011 9:45	Brian C. Vickers	None	No data	0	No data	No data	0	28	30	10.85	78
2/5/2011 9:45	Brian C. Vickers	4° C	No data	0	No data	25	0	58	98	9	62
3/5/2011 9:45	Brian C. Vickers	Cloudy, 30°	No data	3	8.61	25	0	63	118	9.5	70
4/2/2011 9:45	Brian C. Vickers	None	0	9	7.63	20.8	0	62	102	7.5	66
5/14/2011 9:45	Brian C. Vickers	41° F / cloudy	8.5	9	7.88	24.6	0	38	58	8.6	76

Table 2. S. Boulder Creek 2601

Date / Time (24 hr)	Recorded By	Comments	Flow (ft^3/s)	Water Temp (°C)	pH (SU)	ATC Temp (°C)	Phen. Alkalinity (mg/L $CaCO_3$)	Total Alkalinity (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
5/2/2010 14:30	Katie Alexander	Rainy and Cloudy	390	10	8.13	25	14	100	160	4.55	40
6/5/2010 15:00	Ashwin Ravikumar	Hot and Sunny	No data	11	8.05	No data	No data	40	65	6.45	62
7/3/2010 16:00	Katie Alexander	Sampled following t-storm, sunny	472.3	22	8.19	25	8	88	150	No data	No data
8/8/2010 16:00	EJZ	Hot sunny about 80	No data	25.6	8.46	25	20	190	330	5.15	60.1
9/6/2010 16:00	EJZ	About 75F Wildfire burning to West. Sunny + smoky	No data	19	8.35	25	36	246	390	7	78.5
10/2/2010 11:00	Caitlin Crouch and KBA	None	No data	13	8.5	25	22	238	404	8.8	82
11/7/2010 16:00	EJZ / EG	About 60F sunny, windy. Just had afternoon rain	No data	12	9.1	25	41.6	144	282	9.6	90
12/5/2010 10:30	EJZ	30° partly sunny	79.1	3	8.42	25	22	164	262	11.1	82
1/13/2011 12:20	EJZ	45° sunny icy/melt	No data	0	8.24	25	1.2	130	222	11.3	78
2/4/2011 15:00	EJZ	40F - sunny, icy	No data	0.5	8.05	25	16	150	244	9.6	77
3/4/2011 17:00	EJZ	45 - partly cloudy / sun	No data	8.5	8.86	25	18	132	218	8.3	70
4/13/2011 18:30	EJZ	50F, cloudy	No data	11.7	8.7	25	8	190	340	No data	No data

Table 3. Boulder Creek 2602

Date / Time (24 hr)	Recorded By	Comments	Flow (ft^3/s)	River Temp (°C)	pH (SU)	ATC Temp (°C)	Phen. Alkalinity (mg/L $CaCO_3$)	Total Alkalinity (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
5/8/2010 13:00	Bonnie Greenwood, Tony Farace	40° mostly cloudy. Windy. Snow showers	27	No data	7.78	25	0	18	18	9.1	81
7/3/2010 13:15	Bonnie Greenwood	75F and Sunny	No data	9.5	7.5	25	0	12	10	8	70
8/15/2010 12:30	Bonnie Greenwood	73° Sunny	35.6	12	7.68	25	0	10	14	7.5	70
9/9/2010 13:43	Bonnie Greenwood, Elizabeth Freeman, Fionna Samuels	78F Sunny, clear	19.4	11	8.06	11	0	18	22	7.7	70
10/30/2010 12:15	Bonnie Greenwood	Sunny 60F	32.4	2	7.79	14	0	20	24	9.5	69
3/12/2011 14:00	Bonnie Greenwood	51F Partly cloudy	5.3	-1.1	7.73	10	0	16	38	10.4	71
4/23/2011 13:08	Bonnie Greenwood	32F cloudy, snowing	27	0	8.08	19	0	16	30	10.4	84

Table 4. M. Boulder Creek 2603

Date / Time (24 hr)	Recorded By	Comments	Flow (ft^3/s)	River Temp (°C)	pH (SU)	ATC Temp (°C)	Phen. Alkalinity (mg/L CaCO3)	Total Alkalinity (mg/L CaCO3)	Hardness (mg/L CaCO3)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
7/8/2010 17:30	Aubie Douglas + Yasmin Anoushiravani	70C (probably F) / light rain + sunshine	2.52	15	8.08	25	32	122	170	5.41	54
8/2/2010 12:30	Yasmin, Aubie, Megan	91°, partly cloudy	1.93	20	7.1	27.4	No data	No data	170	6.6	78
9/6/2010 14:00	Yasmin, Megan, Aubie	Cloudy, windy, wildfire (ash & smoke) Air temp=79F	10.21	16	No data	No data	68	236	266	6.4	66
10/3/2010 10:10	Yasmin, Megan	None	0.55	15	No data	No data	28	266	352	6.7	64
11/7/2010 12:12	Yasmin, Megan, Aubie	68F cloudy/windy/sprinkling	0.58	10	No data	No data	24	270	364	8.9	80

12/5/2010 13:00	Megan, Sarah, Yasmin, Haley	clear, sunny day. Construction site nearby, lots of trash	1.02	7	No data	No data	60	228	376	9.9	81
2/13/2011 13:10	Megan, Kia, Aubie	61F very warm and windy, lots of snowmelt & runoff. Lots of garbage and constructon debris in & around creek	7.61	5	No data	No data	0	61.8	136	8.9	71

Table 5. Goose Creek 2604

Metals Data

NB: A value of zero indicates that the amount of metal was below the instrument's detection limit.

Date / Time (24 hr)	Al, Dissolved µg/l	Al, Total µg/l	As, Dissolved µg/l	As, Total µg/l	Ca, Dissolved µg/l	Ca, Total µg/l	Cd, Dissolved µg/l	Cd, Total µg/l	Cu, Dissolved µg/l	Cu, Total µg/l	Fe, Dissolved µg/l	Fe, Total µg/l	Pb, Dissolved µg/l	Pb, Total µg/l
7/11/2010 11:00	0	664	0	0	56844	58234	0.31	0.42	2.8	3	18	517	0	0
8/29/2010 9:00	0	503	0	0	45568	50848	0.25	0.48	0	2.3	0	256	0	3.9
10/3/2010 10:20	0	441	0	0	60353	60851	0.15	0	0	1.2	14	332	0	0

Date / Time (24 hr)	Mg, Dissolved µg/l	Mg, Total µg/l	Mn, Dissolved µg/l	Mn, Total µg/l	K, Dissolved µg/l	K, Total µg/l	Se, Dissolved µg/l	Se, Total µg/l	Na, Dissolved µg/l	Na, Total µg/l	Zn, Dissolved µg/l	Zn, Total µg/l	Total µg/l
7/11/2010 11:00	27383	27999	19	29.8	6282	6349	0	0	80979	114187	8.6	29.8	208013.02
8/29/2010 9:00	22000	23600	0	0	6505	6890	0	0	93800	104000	0	0	186103.68
10/3/2010 10:20	31604	32184	14.5	23.2	8419	8475	0	0	149478	153363	9.8	13.4	255683.8

Table 6. Coal Creek 2600 Metals

Date / Time (24 hr)	Al, Dissolved µg/l	Al, Total µg/l	As, Dissolved µg/l	As, Total µg/l	Ca, Dissolved µg/l	Ca, Total µg/l	Cd, Dissolved µg/l	Cd, Total µg/l	Cu, Dissolved µg/l	Cu, Total µg/l	Fe, Dissolved µg/l	Fe, Total µg/l	Pb, Dissolved µg/l	Pb, Total µg/l
6/24/2010 18:40	20	166	0	0	8812	9208	0	0	1	1.3	64	248	0	0
7/8/2010 18:40	17	96	0	0	12764	12747	0	0	1.1	1.2	132	268	0	0
8/12/2010 6:40	23	108	0	0	7138	7670	0	0	0	0	81	197	0	0
9/11/2010 9:15	0	45	0	0	9016	9420	0	0	0	0	115	210	0	0
10/9/2010 9:15	0	32	0	0	9878	9724	0	0	0	0	174	270	0	0

Date / Time (24 hr)	Mg, Dissolved µg/l	Mg, Total µg/l	Mn, Dissolved µg/l	Mn, Total µg/l	K, Dissolved µg/l	K, Total µg/l	Se, Dissolved µg/l	Se, Total µg/l	Na, Dissolved µg/l	Na, Total µg/l	Zn, Dissolved µg/l	Zn, Total µg/l	Total µg/l
6/24/2010 18:40	2586	2628	9.4	16.5	879	905	0	0	4119	4099	0	0	17271.8
7/8/2010 18:40	4007	4114	14.7	20.1	1495	1428	0	0	9393	9242	0	0	27916.3
8/12/2010 6:40	2114	2209	9	16	829	911	0	0	3413	3551	0	0	14662
9/11/2010 9:15	2538	2710	19	24	920	1016	0	0	3999	4195	0	0	17620
10/9/2010 9:15	2846	2861	24	29.6	1242	1271	0	0	4587	4577	0	0	18764.6

Table 7. S. Boulder Creek 2601 Metals

Date / Time (24 hr)	Al, Dissolved µg/l	Al, Total µg/l	As, Dissolved µg/l	As, Total µg/l	Ca, Dissolved µg/l	Ca, Total µg/l	Cd, Dissolved µg/l	Cd, Total µg/l	Cu, Dissolved µg/l	Cu, Total µg/l	Fe, Dissolved µg/l	Fe, Total µg/l	Pb, Dissolved µg/l	Pb, Total µg/l
6/5/2010 12:00	0	1203	0	0	14527	14516	0	0	1.1	3.5	66	1502	0	4.2
7/3/2010 16:00	0	517	0	0	28557	29152	0	0	1.2	1.6	37	572	0	0
10/2/2010 11:00	0	259	0	0	58541	59932	0	0	1.3	1.9	17	249	0	0
11/7/2010 16:00	0	158	0	0	51569	52099	0	0	3.4	3.6	26	294	0	0

Date / Time (24 hr)	Mg, Dissolved µg/l	Mg, Total µg/l	Mn, Dissolved µg/l	Mn, Total µg/l	K, Dissolved µg/l	K, Total µg/l	Se, Dissolved µg/l	Se, Total µg/l	Na, Dissolved µg/l	Na, Total µg/l	Zn, Dissolved µg/l	Zn, Total µg/l	Total µg/l
6/5/2010 12:00	6037	6184	11.4	68.3	2152	2380	0	0	13277	13701	0	8.8	39570.8
7/3/2010 16:00	17408	17538	13.4	35.1	3303	3424	0	0	31886	32875	0	0	84114.7
10/2/2010 11:00	51602	53389	24.6	37.5	6595	6860	0	0	100333	102868	0	0	223596.4
11/7/2010 16:00	31772	32024	9.7	21.5	9079	8939	0	0	92693	92555	9.7	12.8	186106.9

Table 8. Boulder Creek 2602 Metals

Date / Time (24 hr)	Al, Dissolved µg/l	Al, Total µg/l	As, Dissolved µg/l	As, Total µg/l	Ca, Dissolved µg/l	Ca, Total µg/l	Cd, Dissolved µg/l	Cd, Total µg/l	Cu, Dissolved µg/l	Cu, Total µg/l	Fe, Dissolved µg/l	Fe, Total µg/l	Pb, Dissolved µg/l	Pb, Total µg/l
7/3/2010 13:15	24	53	0	10	2685	2847	0.22	4.1	2.4	0	32	85	0	0
8/15/2010 12:30	0	0	0	0	4340	4692	0	0	1.2	0	77	114	0	0
9/19/2010 13:43	0	0	0	0	5268	5296	0	0	0	0	122	156	0	0
10/30/2010 12:15	0	0	0	0	4908	5168	0	0	0	0	69	104	0	0

Date / Time (24 hr)	Mg, Dissolved µg/l	Mg, Total µg/l	Mn, Dissolved µg/l	Mn, Total µg/l	K, Dissolved µg/l	K, Total µg/l	Se, Dissolved µg/l	Se, Total µg/l	Na, Dissolved µg/l	Na, Total µg/l	Zn, Dissolved µg/l	Zn, Total µg/l	Total µg/l

7/3/2010 13:15	579	595	0	0	206	224	0	0	368	431	0	175.5	4424.6
8/15/2010 12:30	884	918	8.8	10.8	459	592	0	0	1070	1210	0	0	7536.8
9/19/2010 13:43	1063	1065	11.9	12.7	493	638	0	0	1233	1360	0	0	8527.7
10/30/2010 12:15	1070	1029	6.9	8.3	609	545	0	0	1280	1134	0	0	7988.3

Table 9. M. Boulder Creek 2603 Metals

Date / Time (24 hr)	Al, Dissolved µg/l	Al, Total µg/l	As, Dissolved µg/l	As, Total µg/l	Ca, Dissolved µg/l	Ca, Total µg/l	Cd, Dissolved µg/l	Cd, Total µg/l	Cu, Dissolved µg/l	Cu, Total µg/l	Fe, Dissolved µg/l	Fe, Total µg/l	Pb, Dissolved µg/l	Pb, Total µg/l
7/8/2010 17:30	0	738	0	0	50007	50133	0	0	1.1	2.5	20	644	0	0

Date / Time (24 hr)	Mg, Dissolved µg/l	Mg, Total µg/l	Mn, Dissolved µg/l	Mn, Total µg/l	K, Dissolved µg/l	K, Total µg/l	Se, Dissolved µg/l	Se, Total µg/l	Na, Dissolved µg/l	Na, Total µg/l	Zn, Dissolved µg/l	Zn, Total µg/l	Total µg/l
7/8/2010 17:30	12869	12947	6.1	22.5	2085	2456	0	0	19545	19653	0	6.6	86602.6

Table 10. Goose Creek 2604 Metals

Nutrients Data

Date / Time	Ammonia, (as N) µg/l	Chloride mg/l	Nitrate/Nitrite mg/l	Phosphorus, Total mg/l	Sulfate mg/l	Total Suspended Solid mg/l
9/29/2010 0:00	0	738	0	0	0	0

Table 11. Coal Creek 2600 Nutrients

Date / Time	Ammonia, (as N) µg/l	Chloride mg/l	Nitrate/Nitrite mg/l	Phosphorus, Total mg/l	Sulfate mg/l	Total Suspended Solid mg/l
9/29/2010 0:00	0	5.88	0	0.0056	11	5.1

Table 12. S. Boulder Creek 2601 Nutrients

Date / Time	Ammonia, (as N) µg/l	Chloride mg/l	Nitrate/Nitrite mg/l	Phosphorus, Total mg/l	Sulfate mg/l	Total Suspended Solid mg/l
9/29/2010 0:00	0.38	62.6	2.6	0.689	159	7.1

Table 13. Boulder Creek 2602 Nutrients

Date / Time	Ammonia, (as N) µg/l	Chloride mg/l	Nitrate/Nitrite mg/l	Phosphorus, Total mg/l	Sulfate mg/l	Total Suspended Solid mg/l
9/29/2010 10:00	0	1	0.058	0.0116	4.03	0

Table 14. M. Boulder Creek 2603 Nutrients

Date / Time	Ammonia, (as N) µg/l	Chloride mg/l	Nitrate/Nitrite mg/l	Phosphorus, Total mg/l	Sulfate mg/l	Total Suspended Solid mg/l
9/29/2010 10:55	0	71.6	1.05	0.0334	33.7	8.5

Table 15. Goose Creek 2604 Nutrients

Macroinvertebrates Data

Date	Total Cfu/100mL	E. Coli Cfu/100mL
7/26/2010	>2419.6	613.1
6/30/2010	>2419.6	238.2
8/25/2010	>2419.6	410.6
9/29/2010	>2419.6	517.2
10/18/2010	>2419.6	187.2

Table 16. Coal Creek 2600 Macroinvertebrates

Date	Total Cfu/100mL	E. Coli Cfu/100mL
6/30/2010	1413.6	93.2
7/27/2010	1046.2	22.8
8/25/2010	1413.6	16
9/29/2010	>2419.6	39.5
10/18/2010	1046.2	146.7

Table 17. S. Boulder Creek 2601 Macroinvertebrates

Date	Total Cfu/100mL	E. Coli Cfu/100mL
7/26/2010	>2419.6	128.1
6/30/2010	>2419.6	117.8
8/25/2010	>2419.6	101.7
9/29/2010	>2419.6	410.6
10/18/2010	>2419.6	69.1

Table 18. Boulder Creek 2602 Macroinvertebrates

Date	Total Cfu/100mL	E. Coli Cfu/100mL
6/30/2010	87.5	32.3
7/27/2010	159.7	81.3
8/25/2010	235.9	3
9/29/2010	127.4	3.1
10/18/2010	83.3	13.4

Table 19. M. Boulder Creek 2603 Macroinvertebrates

Date	Total Cfu/100mL	E. Coli Cfu/100mL
6/30/2010	>2419.6	185
7/27/2010	>2419.6	155.3
8/25/2010	>2419.6	143.9
9/29/2010	>2419.6	113.7
10/18/2010	>1732.9	8.5

Table 20. Goose Creek 2604 Macroinvertebrates

Date	Total Cfu/100mL	E. Coli Cfu/100mL
7/26/2010	2419.6	214.3
6/30/2010	1553.1	30.9
8/25/2010	2419.6	53.7

Table 21. Four Mile Creek 2605 Macroinvertebrates

Appendix 3.4. River Watch Water Quality Data

Measurements – What Data We Collect and Why

Data collected in situ

a. **Water Temperature** strongly affects the metabolism and reproduction of aquatic organisms, as most are cold-blooded. In addition, temperature can affect the growth rates of bacterial colonies and the amount of dissolved oxygen in the water. Extreme changes in temperature can disrupt metabolic cycles and even kill aquatic organisms. Water temperature is measured in units of degrees Celsius either directly in the river or, if conditions require, in the composite bucket.

b. **pH** (percent hydrogen) is a measure of the concentration of hydrogen ions dissolved in the water. The pH scale ranges from 0 to 14. 0 is most acidic (highest concentration of hydrogen ions), 7 is neutral (distilled water, for example), and 14 is most basic (lowest concentration of hydrogen ions). It is negatively logarithmic, meaning that each integer step downward (towards 0) is ten times as acidic as the previous number. In natural waters, pH ranges from 6 to 8.5. pH can be affected by human activities such as acid mine drainage and increased carbon dioxide (CO_2) emissions from factories and vehicles, as well as cellular respiration from aquatic organisms. Waters with pH values beyond the range of 6.5 to 8.5 can irritate or kill aquatic organisms, depending on how sensitive they are. pH is measured in standard units (S.U.) with a calibrated handheld pH meter. Because pH is also affected by temperature, these meters automatically adjust the measured pH value using the **ATC Temperature** (Automatic Temperature Compensator; measured by a separate probe).

c. **Flow** is the volume of water that moves past a point in a given time. It affects the concentration of dissolved oxygen, nutrients, and pollutants in a river. Flow is measured in units of cubic feet per second (cfs) and is determined from the velocity of the water and the area of the river's cross section at a given point. Flow can be hard to measure, as deposition and erosion on the riverbed can change the river's cross sectional area.

d. **Alkalinity** is the balance of carbon dioxide in the water, and is representative of the water's buffering capability. A solution maintains a stable pH through buffering by neutralizing added H^+ (acid) or OH^- (base). Waters with higher concentrations of bicarbonates (HCO_3^-) and carbonates (CO_3^{2-}) better resist changes in pH. These negatively charged molecules combine with added positively charged H^+ ions, thus using them up and preventing them from acidifying the water. This is very important to the survival of sensitive aquatic organisms. In addition, high alkalinity is thought to mitigate the levels of toxic dissolved metals, because HCO_3^- and CO_3^{2-} can combine with metallic ions (for example, dissolved iron: Fe^{2+}) and keep them from harming aquatic life. Alkalinity can be affected by the substrate the river runs through, warmer or cooler climate, irrigation, and farming. It generally varies seasonally, tending to be low during runoff and high during low flow, as well as increasing down a river. Alkalinity is measured in units of mg/L $CaCO_3$ (concentration of calcium carbonate). Although river water does not contain $CaCO_3$, in water, it disassociates into Ca^{2+} and CO_3^{2-}. In this case, the Ca^{2+} is irrelevant, and so $CaCO_3$ acts the same as dissolved CO_3^{2-} by itself. Alkalinity is determined by titrating river water with phenolphthalein added from pink to clear with sulfuric acid (H_2SO_4), and then continuing the titration with BGMR indicator from turquoise to pink-grey. Note that if the pH of the sample is greater than 8.3, the phenolphthalein alkalinity is 0.0 mg/L $CaCO_3$.

e. **Hardness** is the concentration of multivalent cations (ions with a charge greater than +1) in water. These ions are generally calcium (Ca^{2+}) and magnesium (Mg^{2+}). Like alkalinity, hardness is measured in units of mg/L $CaCO_3$. However, in this case, the concentration of Ca^{2+} represents the concentration of all the multivalent cations, and the CO_3^{2-} is irrelevant. Water hardness is usually described on a scale from soft to very hard (see Table 1). In rivers and streams, hard water generally increases primary productivity, species diversity, and total dissolved biomass. Like high alkalinity, harder water also tends to mitigate the effects of toxic dissolved metals on aquatic life. This could be a result of the higher concentrations of Ca^{2+} and Mg^{2+} out competing toxic metals such as cadmium (Cd^{2+}) and iron (Fe^{2+}) on the gill sites of fish. In other words, the more dissolved calcium and magnesium there is in the water, the more likely fish are to absorb them and not toxic dissolved metals. Like alkalinity, hardness can be affected by the stream substrate, climate, precipitation, and land use, as well as fluctuating seasonally and increasing downstream. Hardness is measured by titrating a solution containing stream water with EDTA (acid) until all the available calcium and magnesium ions are used up.

Table 1. Levels of Water Hardness mg/L CaCO3 (EPA 1976)

Soft	0-75
Moderate	75-150
Hard	150-300
Very Hard	300+

f. **Dissolved Oxygen** (DO) is the amount of molecular oxygen (O_2) dissolved in the water (not air bubbles). Oxygen is either directly absorbed into the water from the surrounding air, or added to the water by photosynthetic plants and algae. Many aquatic organisms “breathe” by absorbing DO through gills. Temperature (colder water absorbs more DO), flow rate, elevation, and biological activity affect DO concentration. Human activities including runoff from roads, sewage discharge, and removal of riparian vegetation can also affect DO concentration. DO is measured indirectly with the Winkler method.

g. **Comments** generally include the air temperature, weather conditions, and remarks on recent natural events (for example, heavy rain the previous night).

Data collected in the lab

h. **Metals** samples are used to measure the concentrations of the following metals: aluminum (Al), arsenic (As), calcium (Ca), magnesium (Mg), selenium (Se), zinc (Zn), cadmium (Cd), copper (Cu), lead (Pb), iron (Fe), and manganese (Mn). Metals can enter rivers through mines; runoff from factories, roads, and farms; and from the air. Metals samples are collected pairs of sample bottles preserved with nitric acid (HNO_3). One sample will be filtered in the lab and the other will remain non-filtered. Filtration removes metals that are bound to other chemical elements, such as iron sulfate ($FeSO_4$). Therefore, metal concentrations in the filtered sample represent the amount dissolved or free metal ions (for example, Fe^{2+}), whereas metal concentrations in the non-filtered sample are the total amounts of free and bound metals. An Inductively Coupled Plasma Atomic Emission Spectrophotometer (ICP) is used to measure metal concentrations in units of µg/l (ppb).

   a. **Aluminum** is naturally occurring and is used in consumer products as well as for water treatment. The State Department of Health Basic Standards list aluminum at 750 µg/l acute and 87 µg/l chronic thresholds.
   b. **Arsenic** naturally occurs in fresh water and soils and can be toxic to humans and aquatic organisms. The State Health Department Basic Standards list 360 µg/l acute and 150 µg/l chronic thresholds for arsenic.

c. As in humans, **calcium and magnesium** help build and maintain bone structure and strength. Neither calcium nor magnesium is thought to be toxic.
d. **Selenium** is required by aquatic organisms and humans, but only in very small amounts, as too much destroys brain tissue and nerves. In Colorado, the Mancos shale and the Pierre shale are the only natural sources of selenium.
e. **Zinc** is necessary for cellular reproduction and enzymes. It is toxic to aquatic life in concentrations of 50-200 μg/L.
f. **Cadmium** is a nonessential metal. It is toxic to fish at concentrations of 1.4 μg/L.
g. **Copper** is necessary for metabolism, oxygen transport, and some enzymes. It is toxic to fish at concentrations of 20 μg/L.
h. **Lead** is a nonessential metal. It is toxic to aquatic life at concentrations of 10-100 μg/L.
i. **Iron** is necessary in small amounts but toxic above 1,000s μg/L.

i. **Nitrogen** is a key component of the chain-like structures of proteins and nucleic acids. However, most living organisms cannot use gaseous nitrogen (N_2) from the air. Instead, bacteria in the soil and water use gaseous nitrogen to create proteins, which are then absorbed by the roots of plants. Animals must obtain their nitrogen by eating plants or other animals. This process is called the nitrogen cycle and is summarized in Equation 1. Nitrogen is a necessary component of aquatic nutrients, but large amounts can be harmful. Excess ammonia in the bloodstream can cause brain damage, so fish transport it to their gills, where it is washed away. However, waters with high ammonia concentrations inhibit this secretion method. In addition, high concentrations of nitrite or nitrate prevent the hemoglobin molecule from carrying oxygen, which can cause asphyxiation. Concentrations of ammonia and nitrite/nitrate are influenced by irrigation and fertilizer runoff, untreated human and animal wastes, pH, hydrology, and nitrogen concentrations in the air. Nitrogen concentrations are measured in the lab with a Lachat auto-analyzer.

Equation 1. Summary of the Nitrogen Cycle

N_2	↔	NH_3	↔	NO_2^-	↔	NO_3^-
Nitrogen (in air)		Ammonia		Nitrite		Nitrate

j. **Phosphorus** is required for nucleic acid production and energy transformations using adenosine triphosphate (ATP). Phosphorus generally exists in water as the polyatomic anion PO_4^{3-}, but also forms polyphosphates or becomes bound to organic matter. High concentrations of phosphorus in the water cause the proliferation of algal blooms, which compete with other aquatic organisms for dissolved oxygen. Phosphorus levels depend on domestic wastewater runoff, fertilizer use, irrigation runoff, and soil type. Phosphorus levels are measured by adding molybdenum (Mo) and ascorbic acid (Vitamin C) to the water to create a blue color. The amount of light absorbed by the blue solution is directly proportional to the amount of phosphorus.

k. **Sulfur** is required by cells to form energy transformation proteins. However, the sulfate anion (SO_4^{2-}) lowers the pH of water, which may be harmful to aquatic life. Sulfur levels are affected by volcanic eruptions, mining, and the burning of fossil fuels. Sulfate is measured by adding soluble barium chloride (BaCl) to the water, forming barium sulfate ($BaSO_4$) precipitate. The amount of precipitate is measurable with a spectrophotometer.

l. **Chloride** is used by cells to regulate osmosis and maintain the integrity of the cell membrane. Very high concentrations can make it difficult for cells to regulate their cellular ionic balance. Chloride concentrations can be increased by salt drainage, evaporation, and water treatment. Chloride concentrations are measured by measuring the amount ferric thiocyanate formed from mercuric thiocyanate, chloride ion, and ferric iron.

m. **Total suspended solid** is the total amount of non dissolved mineral materials and sediment suspended in the water column. Too much suspended material can damage gills, smother spawning beds and macroinvertebrate habitats, and darken the water (reducing visibility and raising temperature). Total suspended solid can be influenced by non point source runoff, geology, natural disasters, changes or destruction in the riparian barrier, and reservoir releases. It can fluctuate seasonally and generally increases downstream. Total suspended solid is determined by measuring the mass change of a glass fiber filter before and after filtering with river water.

n. **Macroinvertebrates and Escherichia coli** concentrations are measured in colony forming units per 100 mL (cfu/100mL). CFU/100mL is a measure of the number of viable (living and able to reproduce) bacterial cells in a water sample. Macroinvertebrate and E. coli analysis is performed by the Boulder County Public Health department.

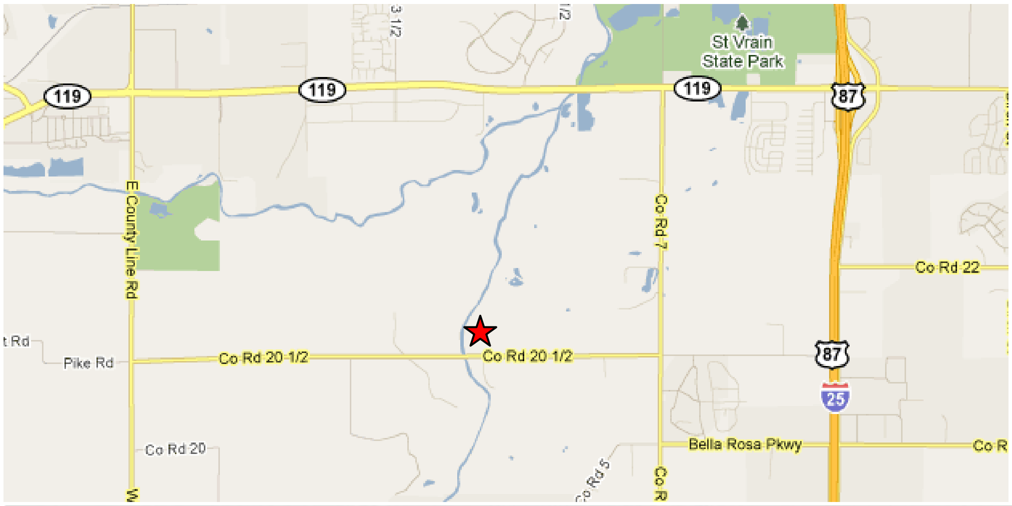
Site Locations

Boulder Creek at County Road 20.5 (2602)

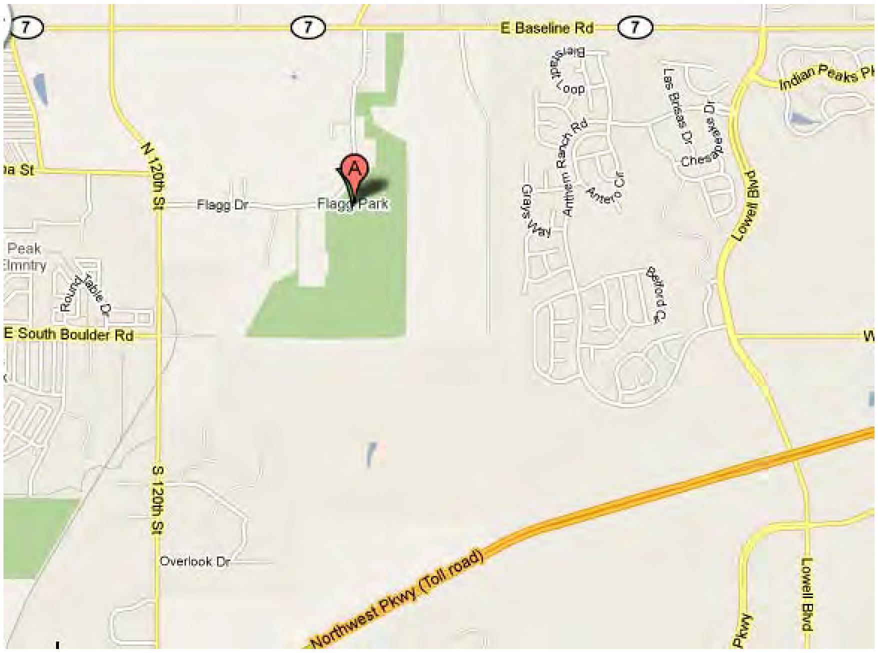
East of Longmont, Colorado

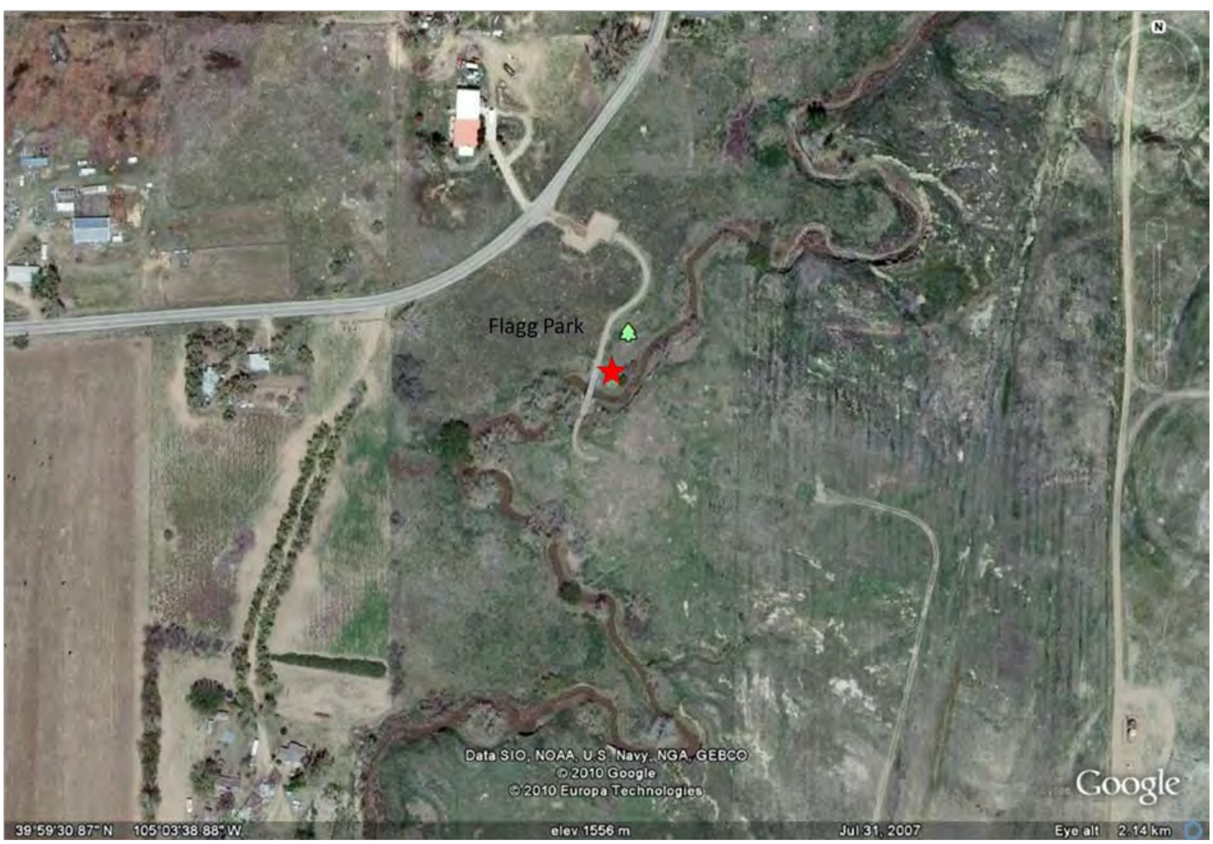
40.13881667 N/ 105.0199556 W (WGS84)

Access: north side of Co Rd 20.5 on the east side of the Creek.

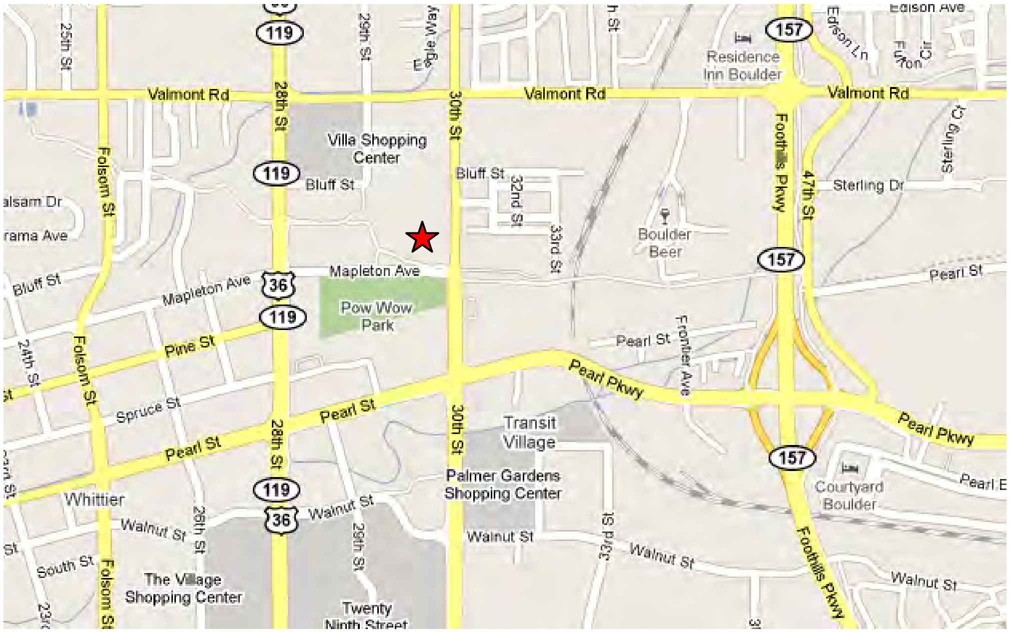


Coal Creek just below confluence with Rock Creek (2600)
At Flagg Park near Lafayette, Colorado (BCWI's "Louisville" Team)
39.99190833 N/ 105.0608 W (WGS84)
Access: Path through Flagg Park to a bridge over the creek - sample at bridge.



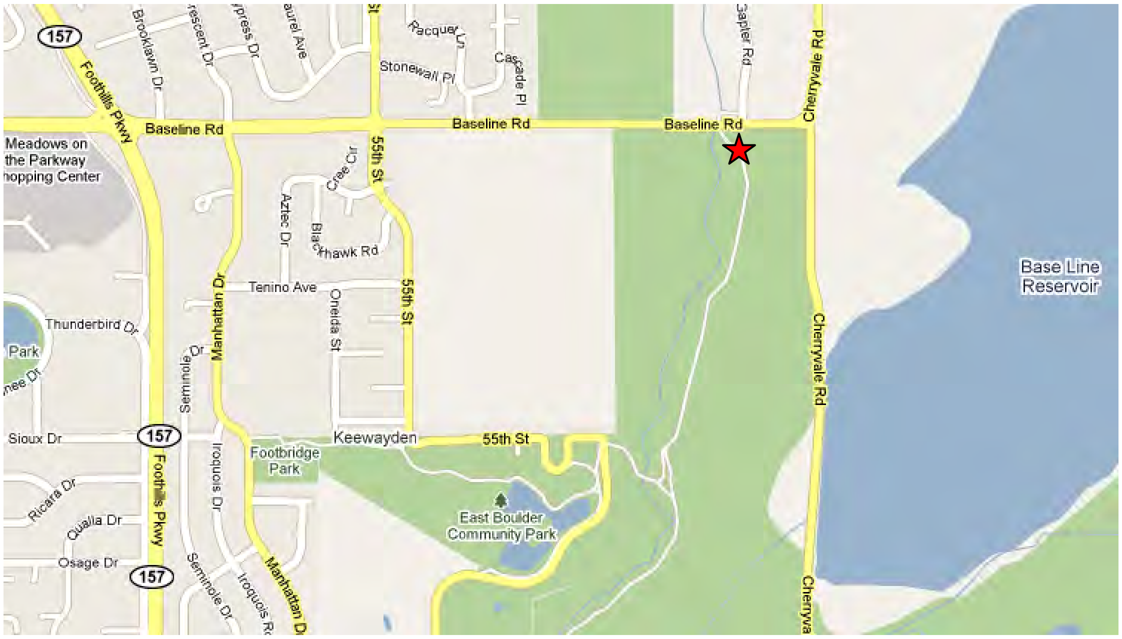


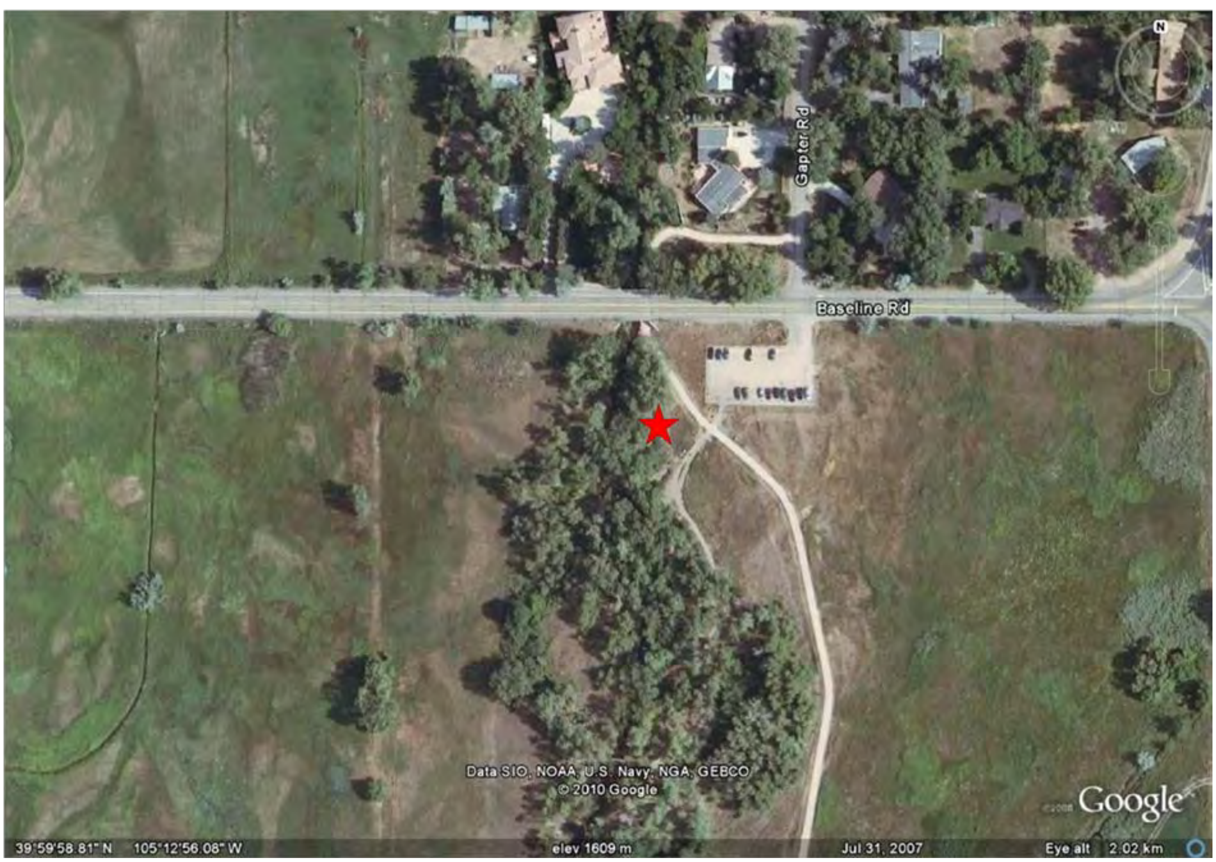
Goose Creek at Mapleton Ave and 30th Street (2604)
City of Boulder, Colorado
40.02583056 N/ 105.2546139 W (WGS84)
Access: from the Goose Creek Path; parking available along Mapleton Ave



Middle Boulder Creek at Maryville Bridge (2603)
Between Eldora and Nederland, Colorado
39.94836389 N/ 105.5559194 W (WGS84)
Access: from pullout along the south side of the highway immediately west of the bridge

South Boulder Creek at Bobolink Trailhead (Baseline Road) (2601)
(East) Boulder, Colorado
39.99966944 N/ 105.2155778 W (WGS84)
Access: from the trail (parking at trailhead)





Analysis of Data

Figure 1. Flow vs. Time for Selected Stations

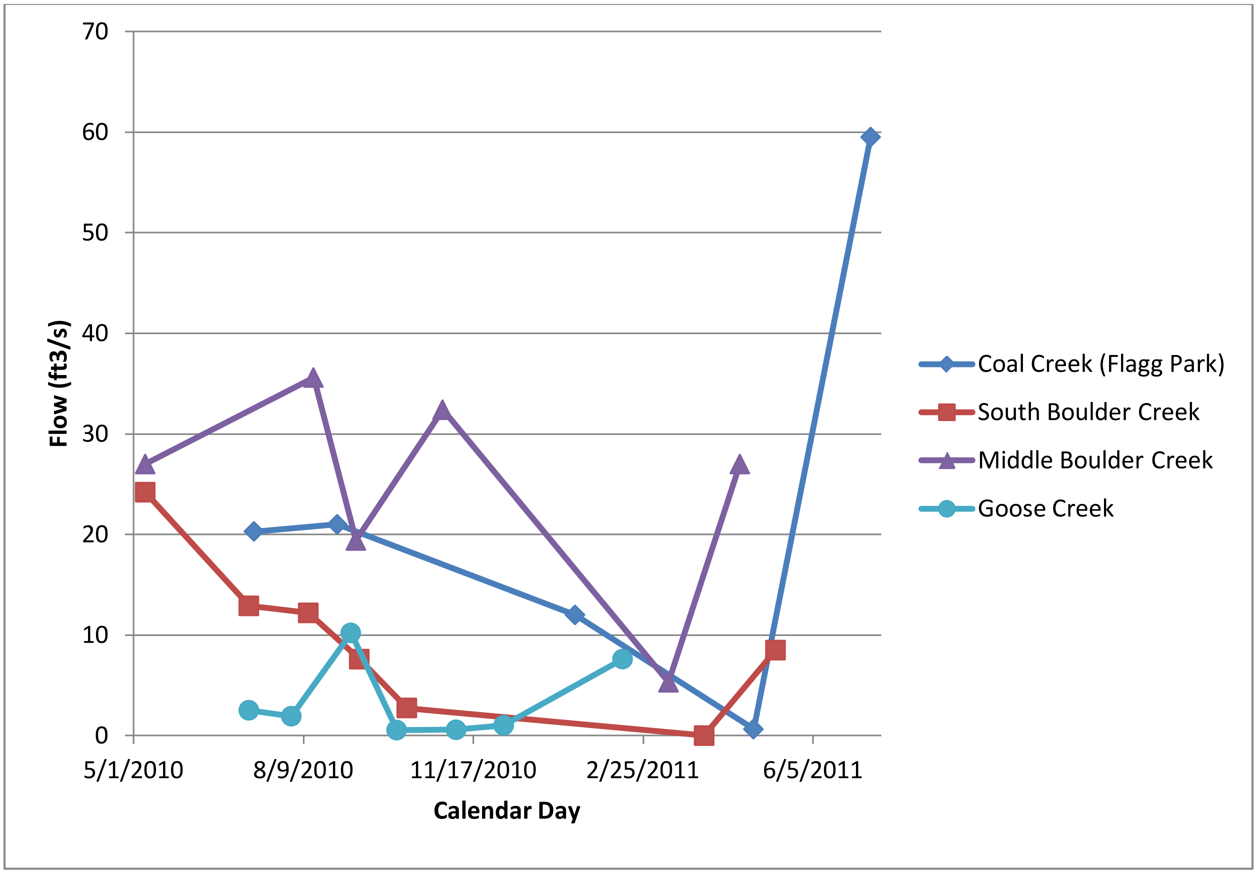


Figure 1 above shows flow vs. time for stations 2600, 2602, 2603, and 2604. Boulder Creek was not included as there were insufficient data to produce a graph. Figure 1 indicates that Coal Creek and Middle Boulder Creek are both relatively normal in terms of flow, with high flow during spring snowmelt and low flow during the winter. However, South Boulder Creek and Goose Creek have low overall flows and therefore freeze over in the winter. Goose Creek also remains almost stagnant during the end of summer between July and September.

Figure 2. pH vs. Time for Selected Stations

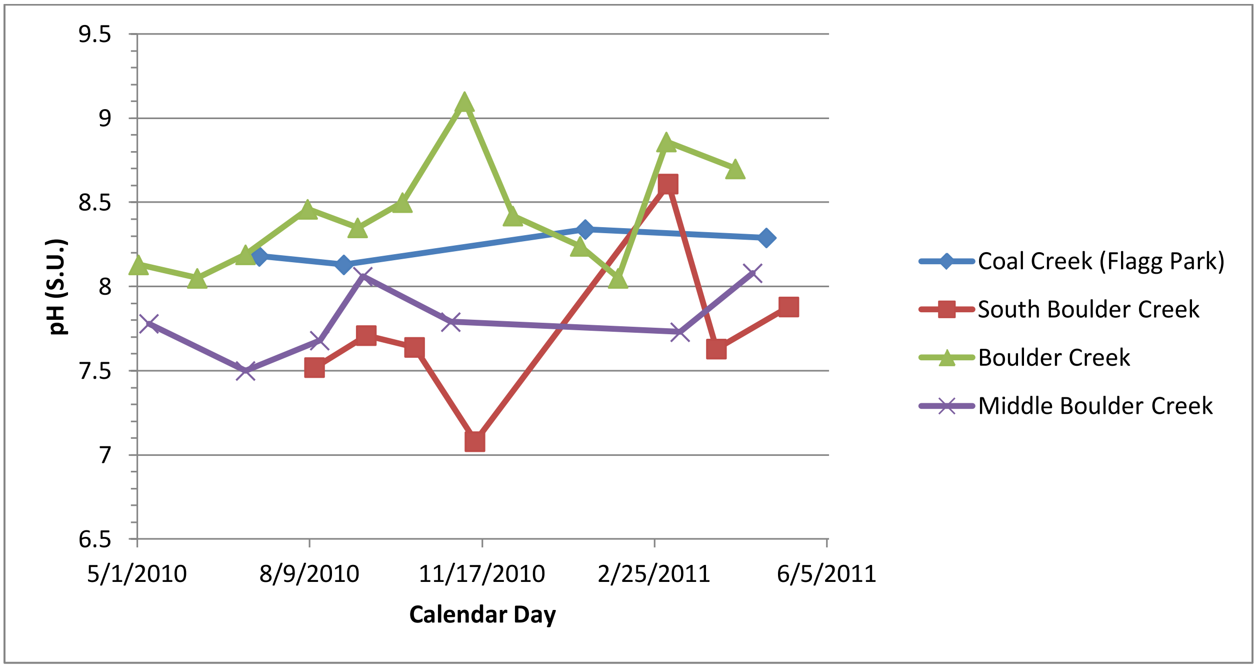
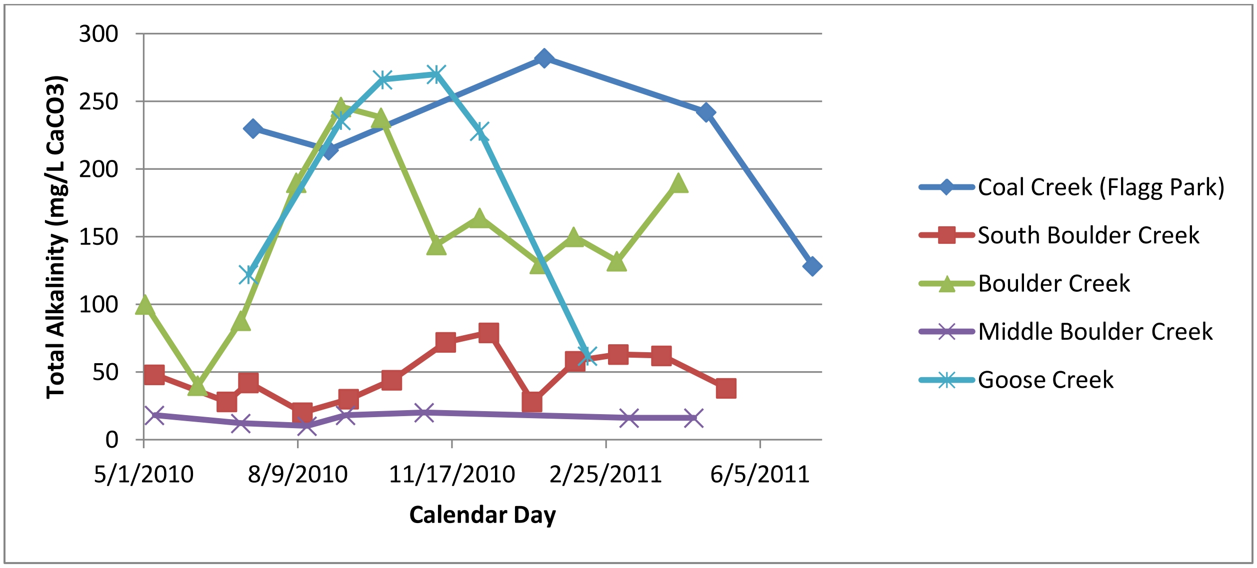


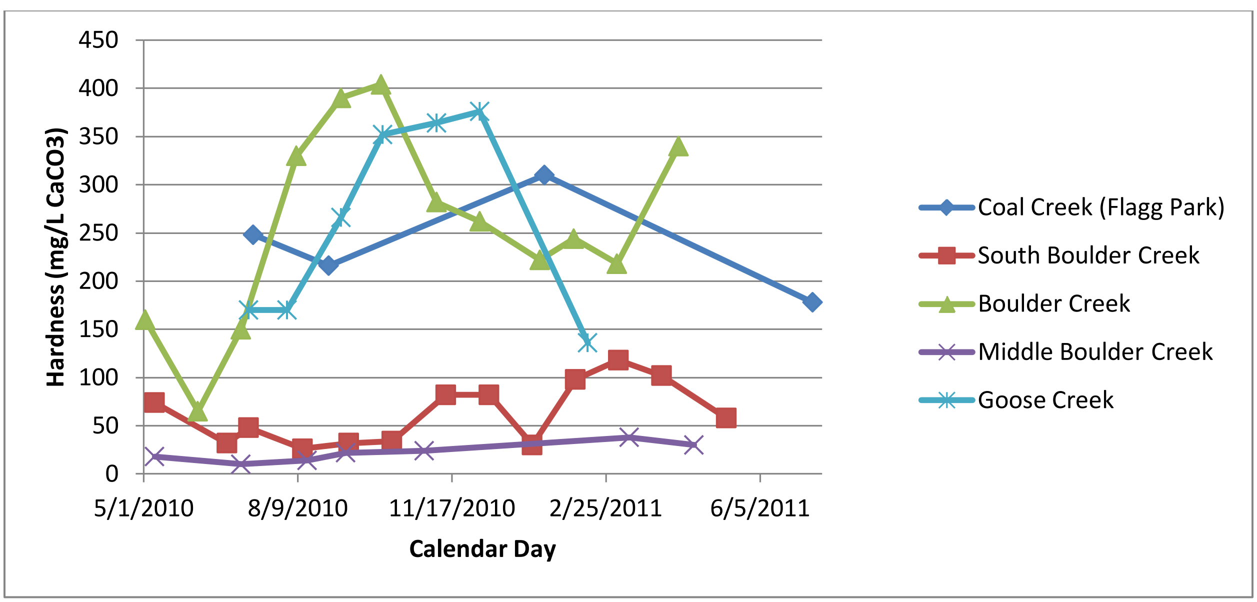
Figure 2 shows pH (SU) vs. time for stations 2600, 2601, 2602, and 2603. Both Coal Creek and Middle Boulder Creek have stable pH in the natural range of 6.5-8.5. However, Boulder Creek and South Boulder creek have extreme variations in pH, particularly around November 13, 2010. This is indicative of relatively poor or erratic buffering capability. Figure 3 below shows total alkalinity (which is representative of buffering capability) over time. As South Boulder Creek's total alkalinity never rises above 100 mg/L $CaCO_3$, it is clear this low concentration of buffer allows for the extreme changes in pH shown in Figure 2. Although Boulder Creek's total alkalinity remains relatively high, it ranges from less than 50 to 250 mg/L $CaCO_3$. This, too, would allow for the erratic pH changes of Boulder Creek. Finally, it is important to note that although Middle Boulder Creek has a total alkalinity consistently less than 25 mg/L $CaCO_3$ (less than South Boulder Creek), its pH remains relatively stable. This may be a result of the high elevation and close proximity to the river's source of the Middle Boulder Creek sampling station. At this sampling station, the river does not yet reflect the pH changes caused by runoff from fields, industry, and fertilizers seen downstream.

Figure 3. Total Alkalinity vs. Time for Selected Stations



Because hardness is related to alkalinity, Figure 4 below, which shows hardness over time, appears very similar to Figure 3. Coal Creek, Boulder Creek, and Goose Creek all follow typical seasonal patterns, with low ion concentrations during spring runoff and high concentrations during the summer as flow decreases. Middle Boulder Creek remains low in terms of hardness the whole year, as it is so close to the water source that significant concentrations of calcium and magnesium ions have not yet entered the river.

Figure 4. Hardness vs. Time for Selected Stations



Appendix 3.5. Boulder County Watershed Stream Team Data

Eldora, Marysville Bridge, BCWI Stream Team Data 2008-2009

Parameter	7/12/08	9/20/08	11/2/08	11/2/08*	3/1/09	5/3/09	7/5/09	8/9/09	9/7/09	10/18/09	11/7/09
Water Temp 'C	15.7	15.0	5.0	7.8	1.7	5.2	9.7	12.6	12.3	4.6	3.0
pH	7.84	7.56	7.81	7.75	6.95	7.09	6.82	6.65	6.98	6.80	6.57
DO (ppm)	8.170	8.410	9.395	9.599	9.407	8.690	8.132	7.603	8.167	8.724	9.182
Nitrate (ppm)	0.108	0.114	0.124	0.14	0.169	0.109	0.120	0.127	0.111	0.122	0.173
Phosphate (ppm)	0.020	0.109	0.056	0.000	0.030	0.000	0.000	0.067	0.036	0.000	0.017
Conductivity (uS/cm)	22.40	49.40	-	-	61.87	53.50	36.80	30.80	36.80	28.30	45.20
Flow (cfs)	117.0	38.2	13.6	34.7	6.2	93.5	248.2	47.4	47.4	37.5	21.9

Marysville samples taken upstream from bridge and upstream from large culvert on west side of creek.

** 11/2/2008 Samples taken at Fisher property at west end of Eldora, where pavement ends on County Rd. 140.*

Appendix 3.6. Water Rights

Major surface flow and storage water rights on Middle Boulder Creek above Barker Reservoir
(Data from 1994)

Name of Structure	Decreed Amount		Use	Appropriation
	Acre-ft	cfs	Code	Date
1. Flow				
Skyscraper Res/Baseline		50.0000	M	1954
Skyscraper Res/Baseline		50.0000	M	1954
Skyscraper Res/Boulder Res		200.0000	M	1954
Caribou Mill Pipeline		40.0000	NDO	1878
Highland Mary Ditch Pipeline		10.0000	D	1906
Middle Bldr Cr min flow		12.0000	m	1978
N Fk M Bldr Cr min flow		7.0000	m	1978
S Fk M Bldr Cr min flow		8.0000	m	1986
2. Storage				
Nederland Reservoir	11626.9		CD	1906
Nederland Reservoir	100.0		IM	1973
Jasper Reservoir	820.0		IN	1896
Peterson Lake	221.0		MN	1961
Peterson Lake	38.0		MN	1976
Skyscraper Reservoir	146.4		MC	1940
Bob Lake min level	425.0		m	1976
King Lake min level	374.0		m	1976
Devil's Thmb Lk min level	213.0		m	1976
Lost Lake min level	110.0		m	1978
Up Diamond Lk min level	51.0		m	1976
Betty Lake min level	47.0		m	1976
Woodland Lk min level	25.0		m	1976
Storm Lake min level	15.0		m	1976
Totals	14212.3`	377.0000		

Use Codes:

I	irrigation
M	municipal
C	commercial
N	industrial
D	domestic
O	other
m	minimum streamflow

APPENDIX 3.7

List of Contact People

Name, Affiliation, Address, Phone	Field of Expertise
Peter Birkeland Geological Sciences Department University of Colorado Boulder, CO 80309 303-442-0304	Geology
Bob Carlson Colo. Water District 6 Commissioner P.O. Box 380, Erie, CO 80516 303-438-9303	Water infrastructure, water rights
Carl Chambers US Forest Service, Arapaho-Roosevelt Supervis. Office 240 W. Prospect Rd., Fort Collins, CO 80526 303-498-1093	Hydrology
Sheila Murphy U.S. Geological Survey, Water Resources Mission 3215 Marine Street, Suite E-127 Boulder, CO 80303 303-541-3023 sfmurphy@usgs.gov	Water quality
Lee Rozaklis Hydrosphere 1002 Walnut St., Suite 200, Boulder, CO 80302 303-443-7839	Hydrology, water law/rights
Iris Sherman Boulder County Public Health 3450 Broadway Boulder, CO 80304 303-441-1143	Septic systems
Craig Skeie Boulder City Water Dept. City of Boulder Watershed Caretaker	Water rights, Boulder water system

Amy Struthers Boulder City/Water Treatment Plant P.O. Box 791, Boulder, CO 80306 303-441-3974	Water quality
Mark D. Williams Water Quality Program Coordinator Boulder County Public Health 3450 Broadway Boulder, CO 80304 303-441-1143 mwilliams@bouldercounty.org	Water quality

APPENDIX 4

VEGETATION AND

SOILS

APPENDIX 4.1

PLANT SPECIES LIST FOR ELDORA AREA

(Nomenclature follows Weber and Wittmann 2002)

Species (synonym in parentheses if applicable)	Common name	Typical Habitat/Location (Alien = non-native)
TREES		
Abies bifolia	Subalpine Fir	North-facing slopes, shady drainages
Picea engelmannii	Engelmann Spruce	North-facing cold drainages
Picea pungens (hybrid w/ P. engelmannii)*	Colorado Blue Spruce	Riparian, MBC
Pseudotsuga menziesii	Douglas-fir	Dry slopes
Pinus contorta ssp. latifolia	Lodgepole Pine	Dry slopes, and moist slopes at high elevations
Pinus flexilis	Limber Pine	Exposed sites, ridges
Pinus ponderosa ssp. scopulorum	Ponderosa Pine	South-facing montane slopes
Populus balsamifera	Balsam Poplar	Riparian, MBC from 7th to 8th St.
Populus deltoides	Plains Cottonwood, Alamo	One small tree at Marysville Bridge
Populus tremuloides	Quaking Aspen	Ubiquitous
Sabina scopulorum (=Juniperus scopulorum)	Rocky Mountain Juniper	South facing hillsides, Eldorado Mt.
SHRUBS AND VINES		
Acer glabrum	Mountain Maple	Moist forests, Eldorado Mt. among boulders
Alnus incana ssp. tenuifolia	Thinleaf Alder	Riparian, MBC, ponds
Amelanchier alnifolia	Serviceberry	Forests
Arctostaphylos uva-ursi ssp. coactilis	Kinnikinnick; Bearberry	Gravelly forest openings
Atragene columbiana (= Clematis columbiana)	Rocky Mountain Clematis	Open forests
Ceanothus fendleri	Buckbrush	Foothills and dry montane forests
Ceanothus velutinus	Sticky Laurel	Steep canyon slopes
Cerasus pensylvanica (= Prunus pensylvanica)	Pin Cherry	Gulches and canyonsides
Distegia involucrata	Swamp Honeysuckle;	Riparian, MBC

(= Lonicera involucrata)	Black Twinberry	
Humulus lupulus	Wild Hops	Rocky slopes, garden vine 6th & Huron
Jamesia americana	Waxflower	South-facing forest slopes
Juniperus communis ssp. alpina	Ground Juniper	Forests, especially lodgepole
Mahonia repens	Oregon-grape; Holly-grape	Open coniferous forests
Oreobatus deliciosus (= Rubus deliciosus)	Boulder Raspberry	Among boulders in canyons
Padus virginiana ssp. melanocarpa	Chokecherry	Riparian, moist gulches
Pentaphylloides floribunda	Shrubby Cinquefoil	Moist meadows, aspen forests
Physocarpus monogynus	Ninebark	Dry forests
Ribes cereum	Wax Currant	Dry gulches and canyonsides
Ribes inerme	Mountain Gooseberry	Canyons
Ribes lacustre	Prickly Currant	Streamsides, wet meadows, willow fens
Ribes montigenum	Red-fruited Gooseberry	Spruce-fir forests, along streams, subalpine Just above Hessie near old cabins along stream
Rosa woodsii	Wild Rose	Ubiquitous
Rubacer parviflorum (= Rubus parviflorus)	Thimbleberry	Moist shaded forests
Rubus idaeus ssp. melanolasius	Red Raspberry	Moist forests, rocky openings
Salix bebbiana	Bebb Willow	Riparian
Salix drummondiana	Drummond Willow	Riparian
Salix exigua	Coyote Willow	Riparian
Salix geyeriana	Geyer Willow	Riparian
Salix lucida ssp. caudata	Whiplash Willow	Riparian
Salix monticola	Yellow-twigged Willow	Riparian
Salix planifolia	Plane-leaf Willow	Riparian
Salix scouleriana	Scouler Willow	Forests, away from streams
Sambucus microbotrys (= S. racemosa)	Red-berried Elder	Roadsides, meadows
Shepherdia canadensis	Buffaloberry	Dry forests especially lodgepole, SM
Sorbus scopulina	Mountain Ash	Shaded moist gulches
Swida sericea (= Cornus stolonifera)	Red-osier Dogwood	Riparian, seepy hillsides
Symphoricarpos rotundifolius (= S. oreophilus)	Snowberry; Buckbrush	Steep canyonsides, aspen forests
Vaccinium myrtillus	Blueberry	Spruce-fir forests
Viburnum edule	Bush-cranberry	Riparian, MBC

FORBS

Acetosella vulgaris (= Rumex acetosella)	Sheep Sorrel	Disturbed areas (Alien)
Achillea lanulosa	Yarrow	Meadows, roadsides
Aconitum columbianum	Monkshood	Riparian, aspen forests
Acosta diffusa	Diffuse Knapweed	Disturbed meadows, roadways (Alien)
Actaea rubra ssp. arguta	Baneberry	Shaded moist montane forests
Adenolinum lewisii (= Linum lewisii)	Western Blue Flax	Meadows
Adoxa moschatellina	Moschatel	Spruce-fir forests
Agoseris glauca	False Dandelion	Meadows
Agoseris aurantiaca	Burnt Orange False Dandelion	Montane and subalpine meadows
Allium cernuum	Nodding Onion	Dry meadows
Allium geyeri	Geyer Onion	Moist meadows
Alyssum alyssoides	Yellow Alyssum	Disturbed areas (Alien)
Amerosedum lanceolatum (= Sedum lanceolatum)	Yellow Stonecrop	Stony ground
Anaphalis margaritacea	Pearly Everlasting	Meadows, forest openings
Androsace septentrionale	Rock Jasmine	Bare ground
Anemone multifida var. globosa	Windflower, Globeflower	Dry open forests
Anemonidium canadense (= Anemone canadensis)*	Windflower	Meadows, riparian
Angelica ampla	Giant Angelica	Riparian
Antennaria parvifolia	Pussytoes	Open montane forests
Antennaria rosea	Pussytoes	Forested areas
Anticlea elegans (= Zygadenus elegans)	Death Camas	Subalpine meadows, Bryan Ave.
Apocynum androsaemifolium	Spreading Dogbane	Gravelly soil, open pine woods
Aquilegia caerulea	Colorado Blue Columbine	Open forests, meadows, aspen groves
Arabis hirsuta	Hairy Rock-cress	Disturbed areas, meadows (Alien)
Arceuthobium americanum	Mistletoe	On lodgepole pine, sometimes ponderosa pine
Arnica chamissonis*	Leafy Arnica	Wet meadows, lake shores, upper montane, subalpine
Arnica cordifolia	Heart-leaved Arnica	Dry montane and subalpine forests
Arnica fulgens	Meadow or Orange Arnica	Montane meadows, 8th Street meadow
Arnica mollis	Soft Arnica	Spruce-fir forest openings

Arnica parryi	Parry Arnica	Meadows, open forests
Arnica rydbergii	Rydberg Arnica	Rocky slopes, subalpine
Artemisia frigida	Silver or Fringed Sage	Dry meadows, hillsides
Artemisia ludoviciana ssp. incompta	Prairie Sage, Western Mugwort	Rocky slopes, dry meadows
Asclepias speciosa	Showy Milkweed	Marysville along roadside
Aster foliaceus	Subalpine Aster	Wet meadows
Aster hesperius	Willow-leaved Aster	Wet meadows
Aster porteri	Porter Aster	Dry meadows, roadsides
Aster spathulatus	Western Aster	Dry meadows
Astragalus adsurgens var. robustior	Standing Vetch	Foothills
Astragalus alpinus	Alpine Milkvetch	Streamsides, moist forests and meadows
Astragalus eucosmus	Artic Milkvetch	Upper montane and subalpine streamsides
Astragalus flexuosus	Limber Vetch	Dry meadows, hillsides
Astragalus miser var. oblongifolius	Field Milkvetch	Meadows, forest openings
Astragalus parryi	Parry Milkvetch	Rocky slopes
Astragalus tenellus	Loose-flowered Milkvetch	Dry montane and subalpine forests
Bahia dissecta	Ragleaf Bahia	Rocky slopes
Barbarea orthoceras	Wintercress	Wet meadows
Bistorta bistortoides	American Bistort	Subalpine meadows
Boechera divaricarpa (= Arabis divaricarpa)	Rockcress	Open woods
Boechera drummondii (= Arabis drummondii)	Drummond Rockcress	Montane forests
Boechera fendleri (= Arabis fendleri)*	Fendler Rockcress	Foothills
Breea arvensis	Canada Thistle	Moist areas, roadsides, leach fields (Alien)
Brickellia grandiflora	Brickellia or Tasselflower	Rocky canyonsides
Calochortus gunnisonii	Mariposa Lily; Sego Lily	Meadows, aspen groves
Calypso bulbosa	Fairy Slipper	Deep moist forests, SM, UM, MH
Camelina microcarpa	False Flax	Disturbed areas, roadsides (Alien)
Campanula parryi	Parry Harebell	Subalpine
Campanula rotundifolia	Mountain Harebell	Dry mountainsides
Capsella bursa-pastoris	Shepherd's Purse	Disturbed meadows (Alien)
Cardamine cordifolia	Heart-leaved Bittercress	Riparian, MH, MG
Carduus nutans ssp. macrolepis	Musk Thistle	Roadsides, disturbed meadows (Alien)
Carum carvi	Caraway	Roadsides, Hessie (Alien)

Castilleja linariifolia	Wyoming Paintbrush	Aspen forests, dry hillsides
Castilleja miniata	Scarlet Paintbrush	Forests
Castilleja rhexifolia*	Paintbrush	Meadows in spruce-fir forests
Castilleja sulphurea	Yellow Paintbrush	Aspen-spruce forests
Cerastium strictum (= C. arvense)	Mouse-ear Chickweed	Meadows
Chamaepericlymenum canadense (= Cornus canadensis)	Bunchberry	Subalpine forests, MH
Chamerion danielsii (= Epilobium angustifolium)	Fireweed	Roadsides, burned areas
Chenopodium capitatum	Strawberry Blite	Shaded woods, trailsides (Alien)
Chenopodium fremontii	Fremont Chenopod	Dry hillsides
Chimaphila umbellata ssp. occidentalis	Pipsissewa; Prince's plume	Cool north-facing forests, UM
Chlorocrepis albiflora	White Hawkweed	Dry montane forests
Chlorocrepis tristis ssp. gracilis	Slender Hawkweed	Subalpine spruce-fir forests
Cilaria austromontana (= Saxifraga bronchialis ssp. austromontana)	Spotted Saxifrage	Dry rocky forests
Cirsium centaurae	American Thistle	Hillsides
Claytonia rosea	Spring Beauty	Hillsides
Coeloglossum viride ssp.bracteatum	Green Bog Orchid	Riparian, seeps, MG
Collinsia parviflora	Blue-eyed Mary	Forests, meadows
Collomia linearis	Collomia	Foothills, montane
Conringia orientalis	Hare’s-ear Mustard	Meadows, roadsides (Alien)
Convolvulus arvensis	Field Bindweed	Disturbed meadows, leach fields (Alien)
Corallorhiza maculata	Spotted Coralroot	Dry pine forests
Corallorhiza trifida	Coralroot	Subalpine forests, MH
Corydalis aurea	Golden Smoke	Roadsides, dry forest openings
Crunocallis chamissoi (= Montia chamissoi)	Water Spring Beauty	Riparian in spruce-fir forests
Cynoglossum officinale	Houndstongue	Disturbed meadows (Alien)
Delphinium nuttallianum (= D. nelsonii)	Nelson Larkspur	Open woods, meadows
Delphinium ramosum	Tall Mountain Larkspur	Open sites
Descurainia sophia	Tansy Mustard	Meadows (Alien)
Dianthus deltoides	Grass pink, carnation	Town, roadsides (Alien)
Disporum trachycarpum	Bellwort	Deep shade in conifer forests
Dodecatheon pulchellum	Shootingstar	Riparian

Draba aurea	Golden Draba	Forests or meadows
Draba crassifolia	Thick-leaved Draba	Rocky slopes and meadows
Draba nemorosa	Forest draba	Disturbed woodland (Alien)
Draba streptocarpa	Twisted-pod Draba	Open ground
Dracocephalum parviflorum	American Dragonhead	Dry rocky meadows, aspen, burned areas
Drymocallis fissa	Leafy Cinquefoil	Meadows, along rock outcrops
Epilobium ciliatum	Northern Willowherb	Riparian
Eremogone fendleri (= Arenaria fendleri)	Fendler Sandwort	Forests
Erigeron compositus	Cutleaf Daisy	Gravelly soil
Erigeron elatior	Beautiful daisy	Aspen and spruce-fir forests
Erigeron eximius	Forest or Pale Daisy	Aspen and spruce-fir forests
Erigeron flagellaris	Whiplash or Trailing Daisy	Dry montane meadows
Erigeron peregrinus ssp. callianthemus	Subalpine Daisy	Subalpine meadows, rocky slopes
Erigeron speciosus	Aspen or Showy Daisy	Forests, meadows
Erigeron vetensis	Early Blue Daisy	Gravelly slopes, dry meadows
Eriogonum subalpinum	Subalpine Buckwheat	Subalpine meadows, forest openings
Eriogonum umbellatum	Sulphurflower	Forests and forest openings
Erysimum capitatum (= E. asperum)	Western Wallflower	Meadows, open woods
Erythrocoma triflora (= Geum triflorum)	Prairie Smoke or Pink Plumes	Dry meadows under aspen
Eucephalus glaucus	Glaucous or Hairless Aster	Rocky slopes, Eldorado Mt., Caribou Rd.
Fragaria vesca ssp. bracteata	Woodland Strawberry	Moist forests
Euphorbia esula (= F. americana)	Leafy Spurge	Above Eldora Road at Marysville (Alien)
Fragaria virginiana ssp. glauca (= F. ovalis)	Wild Strawberry	Dry forests, meadows
Frasera speciosa	Green Gentian; Monument Plant	Pine forests, meadows
Gaillardia aristata	Blanketflower	Meadows
Galium septentrionale	Northern Bedstraw	Moist meadows, woodlands
Galium triflorum	Fragrant Bedstraw	Deeply shaded woodlands
Gastrolychnis drummondii (= Melandrium drummondii)	Drummond Catchfly	Dry slopes
Gentianella acuta (= Gentiana amarella)	Little or Rose Gentian	Moist meadows
Gentianopsis barbellata	Fringed Gentian	Subalpine grassy slopes, SM
Gentianopsis thermalis	Rocky Mountain Fringed Gentian	Wet meadows, SM

Geranium caespitosum (= G. fremontii)	Fremont Geranium	Meadows
Geranium richardsonii	White or Richardson Geranium	Aspen groves, spruce-fir forests
Geum macrophyllum	Large-leaved or Bur Avens	Riparian
Geum rivale	Purple Avens	Swamps, wet meadows, subalpine
Goodyera oblongifolia	Rattlesnake Plantain	Duff on dry forest floors, SM, UM
Grindelia subalpina	Mountain Gumweed	Dry slopes
Hackelia floribunda	Stickseed Forget-me-not	Mountain clearings, roadsides
Harbouria trachypleura	Whiskbroom Parsley	Dry south-facing slopes
Helianthella quinquenervis	Five-nerved or Aspen Sunflower	Roadsides, aspen forests
Heliomeris multiflora (=Viguiera multiflora)	Showy Goldeneye	Montane roadsides
Heracleum sphondylium ssp. montanum (= H. lanatum)	Cow Parsnip	Riparian
Hesperis matronalis	Dame's Rocket	Moist areas (Alien)
Heterotheca villosa	Golden Aster	Roadsides, meadows
Heuchera parvifolia	Littleleaf Alum-root	Cliffs, rock outcrops
Hydrophyllum fendleri	Fendler Waterleaf	Riparian montane woodlands
Hypericum formosum	Western St. Johnswort	Wet meadows, streamsides, subalpine
Ipomopsis aggregata ssp candida (= Gilia candida)	Fairy Trumpets	Dry foothills
Iris missouriensis	Wild Iris	Wet meadows
Lappula redowskii	Stickseed	Dry rocky hillsides
Lactuca serriola	Prickly Lettuce	Roadsides (Alien)
Lepidotheca suaveolens	Pineapple Weed	Roadsides
Lesquerella montana	Mountain Bladderpod	Dry meadows
Leucanthemum vulgare	Ox-eye Daisy	Town, roadsides (Alien)
Ligularia bigelovii var. hallii(= Senecio bigelovii)	Bigelow Senecio	Aspen groves, roadsides
Ligularia pudica	Butterweed	Montane and foothill canyons
Ligusticum porteri	Osha or Porter Lovage	Forested ravines, aspen groves
Lilium philadelphicum*	Wood Lily	Moist woods, wet meadows
Limnorchis dilatata ssp.albiflora	White Bog Orchid	Riparian, seeps, MG, MH
Limnorchis hyperborea	Northern Bog Orchid	Riparian, seeps, MG
Limnorchis stricta (= L. saccata)	Green Bog Orchid	Riparian, seeps, MG, MH
Linaria vulgaris	Butter-and-eggs	Disturbed sites (Alien)
Linnaea borealis	Twinflower	Spruce-fir forests, SM, UM
Listera convallarioides	Broad-lipped Twayblade	Moist mossy streamsides, SM

Listera cordata ssp. nephrophylla	Heartleaf Twayblade	Moist mossy streamsides, MH
Lithospermum multiflorum	Many-flowered Puccoon	Pine forests
Lupinus argenteus	Mountain Lupine	Meadows
Lysiella obtusata	Oneleaf Orchid	Riparian, spruce-fir forests, MG, MH
Machaeranthera bigelovii*	Tansy Aster	Town roadsides
Machaeranthera pattersonii	Tansy Aster	Town roadsides
Madia glomerata	Tarweed	Roadside seep (Alien)
Maianthemum amplexicaule (= Smilacina racemosa)	False Solomon's-seal	Moist forests
Maianthemum stellatum (= Smilacina stellata)	Few-flowered false or Solomon's-seal	Moist forests, meadows
Matricaria perforata	Scentless Chamomile	Roadsides (Alien)
Medicago lupulina	Black Medic	Roadsides, meadows (Alien)
Medicago sativa	Alfalfa	Roadsides, meadows (Alien)
Melilotus albus	White Sweetclover	Roadsides, meadows (Alien)
Melilotus officinale	Yellow Sweetclover	Roadsides, meadows (Alien)
Mentha arvensis	Field Mint	Riparian
Mertensia ciliata	Chiming Bells; Bluebells	Riparian, MBC, MH
Mertensia lanceolata	Narrow-leaved Bluebells	Meadows
Micranthes odontoloma (= Saxifraga odontoloma)	Brook Saxifrage	Riparian
Micranthes rhomboidea (= Saxifraga rhomboidea)	Snowball Saxifrage	Moist open ground
Microseris nutans	Microseris	Dry wooded subalpine slopes and meadows
Mimulus gemmiparus*	Weber Monkeyflower	Granitic seeps
Mimulus guttatus	Common Yellow Monkeyflower	Riparian
Mitella pentandra	Bishop’s Cap	Riparian, moist spruce-fir forests
Mitella stauropetala	Bishop’s Cap	Riparian, moist spruce-fir forests
Monarda fistulosa var. menthifolia	Pink Bergamot; Horsemint	Meadows, canyonsides
Moneses uniflora	One-flowered Wintergreen	Mossy forests near streams, MH
Neolepia campestre	Field Cress	Roadsides, meadows (Alien)
Noccaea montana (= Thlaspi montanum)	Wild Candytuft	Ubiquitous
Oenothera coronopifolia	Cut-leaf evening Primrose	Gravelly meadows, roadsides
Oenothera villosa (= O. strigosa)	Yellow Evening Primrose	Meadows

Oligosporus caudatus (= Artemisia campestris)	Tarragon	Dry meadows
Oreobroma pygmaea (= Lewisia pygmaea)	Pygmy Bitterroot	Stony subalpine meadows
Oreocarya virgata (= Cryptantha virgata)	Miner’s Candle	Gravelly foothill slopes
Oreochrysum parryi (= Haplopappus parryi)	Parry Goldenweed	Spruce-fir and aspen forests
Orthilia secunda (= Ramischia secunda)	One-sided Wintergreen	Moist shaded forests
Orthocarpus luteus	Yellow Owl Clover	Mountain meadows
Osmorhiza depauperata	Sweet Cicely	Moist forests
Oxypolis fendleri	Cowbane	Riparian
Oxytropis deflexa	Drop-pod Loco	Dry, gravelly meadows
Oxytropis lambertii	Lambert or Colorado Loco	Meadows
Oxytropis multiceps	Tufted Loco	Gravelly soil, open pine forests
Packera cana	Pursh Senecio	Open forests, gravelly moraines, Marysville
Packera fendleri (= Senecio fendleri)	Fendler Golden Ragwort	Gravelly soil, open forests
Packera werniifolia (= Senecio werniifolia)*	Groundsel	Rocky subalpine and alpine ridges
Pedicularis groenlandica	Elephantella	Wet meadows
Pedicularis parryi	Parry Lousewort	Dry subalpine slopes
Pedicularis procera	Fernleaf Lousewort	Aspen groves
Pedicularis racemosa ssp. alba	Parrotbeak; Curled Lousewort	Spruce-fir forests
Penstemon glaber	Mountain Beard-tongue	Dry meadows
Penstemon virens	Green Penstemon	Montane forests and meadows
Penstemon virgatus ssp. asa-grayi	Tall Penstemon	Meadows, roadsides
Penstemon whippleanus	Whipple Penstemon	Moraines and gravelly subalpine slopes
Phacelia heterophylla	Scorpionweed	Open ground, dry slopes
Phacelia sericea	Purple Fringe	Gravelly open subalpine slopes, Ski Area Rd.
Phlox multiflora	Many-flowered Phlox	Forests
Plantago major	Plantain	Roadsides (Alien)
Pneumonanthe parryi	Parry or Bottle Gentian	Meadows
Polygonum douglasii	Knotweed	Disturbed sites
Potamogeton gramineus	Pondweed	Aquatic, Columbine Pond
Potentilla effusa	Branched or Woody Cinquefoil	Rock outcrops
Potentilla hippiana	Silvery Cinquefoil	Dry hillsides
Potentilla norvegica	Rough Cinquefoil	Disturbed meadows (Alien)
Potentilla pulcherrima	Beauty Cinquefoil	Meadows
Potentilla pulcherrima x hippiana	Hybrid Cinquefoil	Meadows, rocky slopes

Potentilla rupincola*	Rocky Mountain Cinquefoil	Spencer Mt., granitic outcrops
Pseudocymopteris montanus	Mountain Parsley	Forests, meadows
Pseudognaphalium viscosum	Sticky Cudweed	Disturbed soil, montane forest clearings
Psychrophila leptosepala (= Caltha leptosepala)	Marsh Marigold	Riparian, wet meadows
Pterospora andromedea	Pinedrops	Dry pine forests
Pulsatilla patens ssp. multifida	Pasqueflower	Meadows, open forests
Pyrola chlorantha	Green-flowered Wintergreen	Spruce-fir forests, MH
Pyrola minor	Lesser Wintergreen	Spruce-fir forests, MH
Pyrola rotundifolia ssp. asarifolia (= P. asarifolia var. purpurea)	Swamp Wintergreen	Spruce-fir forests, marshy streambanks
Ranunculus glaberrimus var. ellipticus	Sagebrush Buttercup	Forests or meadows
Ranunculus inamoenus	Least or Homely Buttercup	Pond borders, meadows
Ranunculus macounii	Macoun Buttercup	Riparian
Ranunculus pedatifidus	Birdfoot Buttercup	Pond borders, wet meadows
Ranunculus reptans	Trailing Buttercup	Muddy pond shores
Rorippa curvipes var. alpina	Mountain Yellowcress	Muddy pond shores
Rorippa palustris ssp. hispida	Cress	Muddy pond shores, MBC
Rudbeckia ampla (= R. laciniata var. ampla)	Tall or Cutleaf Coneflower	Riparian
Rudbeckia hirta	Black-eyed Susan	Dry meadows
Rumex sp.	Dock	Moist areas
Sagittaria sp.	Arrowhead	Aquatic, Columbine Pond
Saxifraga rivularis	Saxifrage	Under riparian boulders, MBC
Scrophularia lanceolata	Lance-leaf Figwort	Marysville
Scutellaria brittonii	Britton Skullcap	Dry sloping meadows
Senecio eremophilus ssp. kingii	Western Golden Ragwort	Roadsides, trailsides, gravelly slopes
Senecio integerrimus	Early or Lambstongue Groundsel	Moist meadows
Senecio serra admirabilis	Toothed Ragwort	Riparian aspen/spruce fir forests
Senecio triangularis	Arrowleaf Senecio	Subalpine swamps and forest streamsides
Senecio serra var, admirabilis	Toothed Ragwort	Infrequent along montane streams; Hessie
Sidalcea candida	White Checkermallow	Wet montane meadows
Silene vulgaris	Campion	Marysville (Alien)
Sisyrhinchium montanum	Blue-eyed Grass	Moist meadows
Solidago missouriensis	Goldenrod	Meadows
Solidago spathulata var. neomexicana	Goldenrod	Meadows

Sparganium angustifolium	Burreed	Aquatic, Columbine Pond
Spiranthes romanzoffiana	Lady's Tresses	Wet seeps, MG, subalpine meadows
Stellaria longifolia	Longleaf Starwort	Dry gravelly areas
Streptopus fassetti (=. S. amplexifolius)	Twisted-stalk	Moist deeply shaded forests near streams
Tanacetum vulgare	Common Tansy	Meadows (Alien)
Taraxacum officinale	Dandelion	Roadsides, meadows (Alien)
Thalictrum fendleri	Fendler Meadowrue	Forests, riparian
Thlaspi arvense	Fanweed or Pennycress	Disturbed meadows (Alien)
Thermopsis divaricarpa	Golden Banner	Meadows
Tithymalus esula (or uralensis)	Leafy Spurge	Mountain meadows, Marysville (Alien)
Tithymalus montanus (= Euphorbia montana, E. robusta)	Rocky Mountain Spurge	Dry open slopes
Tragopogon dubius ssp. major	Salsify	Roadsides, moist meadows (Alien)
Tragopogon pratensis	Salsify; Oysterplant	Meadows (Alien)
Trifolium parryi	Parry Clover	Subalpine forest openings
Trifolium pratense	Red Clover	Meadows, roadsides, (Alien)
Trifolium repens	White Dutch Clover	Meadows, roadsides, (Alien)
Tryphane rubella (= Arenaria rubella)	Equalstem Sandwort	Rocky subalpine slopes
Turritis glabra	Tower Mustard	Montane meadows
Urtica gracilis (= U. dioica ssp. gracilis)	Stinging Nettle	Riparian
Utricularia vulgaris	Great Bladderwort	Aquatic, Columbine Pond
Valeriana edulis	Tall or Edible Valerian	Moist meadows
Verbascum thapsus	Mullein	Roadsides, disturbed sites (Alien)
Veronica americana	American Brooklime	Muddy riparian areas
Veronica catenata (= V. anagallis-aquatica)*	Speedwell	Muddy riparian areas
Veronica nutans (= V. wormskjoldii)*	Alpine Speedwell	Subalpine meadows
Veronicastrum serpyllifolium	Thyme-leaf Speedwell	Muddy ground
Viola adunca	Hook Violet	Meadows
Viola biflora	Northern Yellow Violet	Deep spruce-fir forests in moss
Viola labradorica	Blue Violet	Deeply shaded riparian forests
Viola macloskeyi ssp. pallens	Swamp White Violet	Streamsides, wet subalpine forests
Viola rydbergii (= V. rugulosum)	Canada or Rydberg Violet	Riparian, moist forest close to streamsides
Viola scopulorum (= V. canadensis)	Canada Violet	Foothill canyons
Virgulus campestris	Meadow Aster	Meadows

GRASSES

Achnatherum nelsonii	Nelson Needlegrass	Dry montane forests
Agropyron cristatum	Crested Wheatgrass	Roadsides (Alien)
Agrostis exarata	Spike Bentgrass, Redtop	Moist meadows, roadsides
Agrostis scabra	Ticklegrass, Rough Bentgrass	Roadsides, trails, burn sites
Alopecurus aequalis	Short-awn Foxtail	Wet meadows, marshes, along streams/ponds
Anisantha tectorum	Cheatgrass	Dry meadows, south facing hillsides (Alien)
Blepharoneuron tricholepis	Pine Dropseed	Rocky meadows, open gravelly forests
Bromelica spectabilis	Purple Oniongrass	Subalpine, Hessie
Bromopsis inermis (= Bromus inermis)	Smooth Brome	Roadsides, meadows (Alien)
Bromopsis canadensis (= Bromus ciliatus)	Fringed Brome	Roadsides, trails, forests
Bromopsis lanatipes	Woolly Nodding Brome	Roadsides, trails, forests
Bromopsis porteri (= Bromus porteri)	Nodding Brome	Roadsides, trails
Calamagrostis canadensis	Bluejoint Reedgrass	Riparian, especially around ponds
Ceratochloa carinata	Rescuegrass	Disturbed meadows (Alien)
Dactylis glomerata	Orchardgrass	Disturbed areas, pastures, meadows (Alien)
Danthonia intermedia	Timber Oatgrass	Subalpine meadows
Danthonia parryi	Parry Oatgrass	Dry gravelly hillsides, meadows
Deschampsia cespitosa	Tufted Hairgrass	Wet meadows
Elymus glaucus	Blue Wild Rye	Aspen groves
Elymus elymoides (=Sitanion hystrix)	Squirreltail	Dry hillsides and meadows
Elymus longifolius (= Sitanion longifolium)	Squirreltail	Roadsides, disturbed sites
Elymus trachycaulus	Slender Wheatgrass	Meadows, roadsides
Elytrigia albicans	Griffiths Wheatgrass	Dry hillsides and meadows
Elytrigia intermedia	Intermediate Wheatgrass	Meadows (Alien)
Festuca thurberi	Thurber Fescue	Meadows
Glyceria elata	Tall Mannagrass	Aspen thickets, pond borders
Glyceria striata var. stricta	Fowl Mannagrass	Riparian
Hesperostipa comata (=Stipa comata)	Needle-and-thread Grass	Grasslands
Koeleria macrantha	Junegrass	Dry meadows
Leymus ambiguous	Colorado Wild Rye	Rocky mountainsides
Leymus triticoides	Beardless Wild Rye	Dry hillsides

Muhlenbergia montana	Mountain Muhly	Meadows
Phleum pratense	Timothy	Meadows, roadsides (Alien)
Poa agassizensis	Agassiz Bluegrass	Dry open forests
Poa compressa	Canada Bluegrass	Dry hillsides (Alien)
Poa nemoralis	Wood Bluegrass	Disturbed meadows (Alien)
Poa palustris	Swamp Bluegrass	Wet meadows and woods
Poa pratensis	Kentucky Bluegrass	Moist meadows, riparian (Alien)
Stipa nelsonii	Nelson Needlegrass	Dry montane forests
Thinopyrum intermedium (= Agropyron intermedium)	Intermediate Wheatgrass	Roadsides (Alien)
Trisetum spicatum ssp. molle	Marmot-tail Grass	Forests, forest openings

SEDGES, RUSHES		
Carex aquatilis	Water sedge	Wet meadows, riparian
Carex athrostachya	Sedge	Wet meadows
Carex aurea	Golden sedge	Wet meadows
Carex canescens	Sedge	Marshes, pondshores
Carex disperma	Sedge	Riparian, shaded spruce-fir forests
Carex foenea	Sedge	Dry gravels
Carex geyeri	Elk sedge	Spruce-fir forests
Carex microptera	Sedge	Meadows
Carex norvegica ssp. stevenii	Sedge	Aspen groves, riparian
Carex utriculata (= C. rostrata)	Beaked sedge	Pond edges, in water
Eleocharis palustris	Creeping spike-rush	Riparian
Juncus ater (= J. arcticus, J. balticus)	Arctic rush, Baltic rush	Wet meadows, riparian
Juncus effusus	Rush	Roadside seep, MG (Alien)
Luzula parviflora	Woodrush	Moist forests
Scirpus pallidus	Bulrush	Wet pondshores
FERNS AND FERN ALLIES		
Athyrium filix-femina	Lady-fern	Moist forests
Cheilanthes fendleri*	Lipfern	Granitic rocks
Cryptogramma acrostichoides	Rock Brake	Rocks
Cystopteris fragilis	Brittle-fern	Rocks
Equisetum arvense	Field Horsetail	Riparian, MBC, MH
Gymnocarpium dryopteris ssp. disjunctum	Oakfern	Wet seeps, SM
Selaginella densa	Club-moss	Rocks, soil
Woodsia oregana	Woodsia	Rock crevices

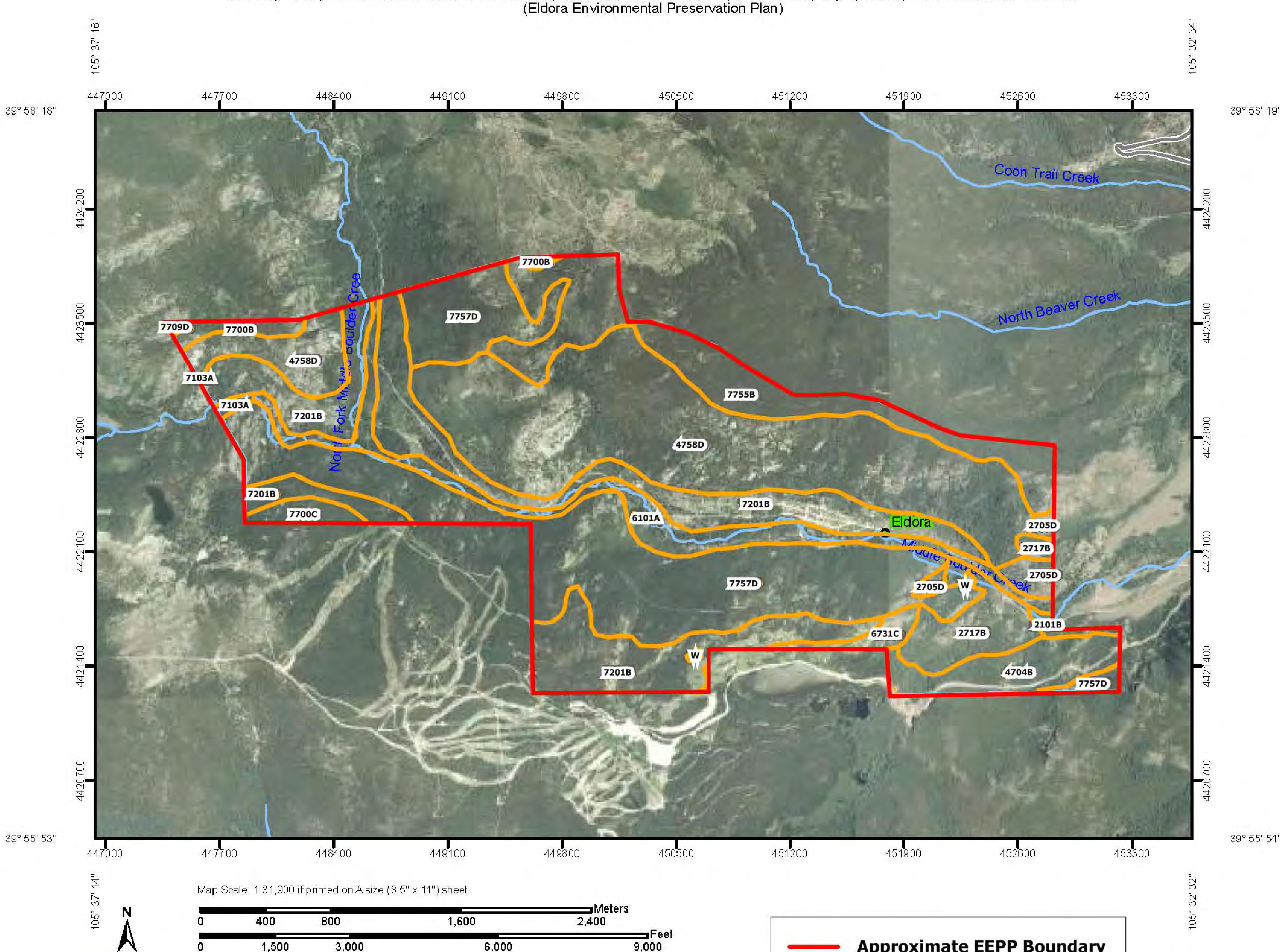
KEY TO LOCATION CODES:

MBC	Middle Boulder Creek
MG	Miser Gulch
MH	Miners' Hollow
SM	Spencer Mtn.
UM	Ute Mtn.

* Needs confirmation

Appendix 4.2. Soils Information

Soil Map—Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park and Larimer Counties
(Eldora Environmental Preservation Plan)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:31,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park and Larimer Counties
Survey Area Data: Version 2, Feb 4, 2008

Date(s) aerial images were photographed: 7/11/2005; 7/23/2005; 7/13/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park and Larimer Counties (CO645)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
2101B	Pachic Argiustolls, 5 to 25 percent slopes	8.4	0.4%
2705D	Ratake-Cathedral families-Rock outcrop complex, 40 to 150 percent slopes	26.5	1.2%
2717B	Cypher-Wetmore-Ratake families complex, 5 to 40 percent slopes	80.4	3.6%
4704B	Bullwark-Catamount families-Rubble land complex, 5 to 40 percent slopes	80.2	3.6%
4758D	Catamount family-Rubble land-Bullwark family complex, 40 to 150 percent slopes	622.4	28.2%
6101A	Cryaquolls-Gateview complex, 0 to 15 percent slopes	129.5	5.9%
6731C	Rogert family, 40 to 75 percent slopes	20.1	0.9%
7103A	Cryaquolls-Leighcan family, till substratum complex, 0 to 15 percent slopes	5.0	0.2%
7201B	Leighcan family, till substratum, 5 to 40 percent slopes	430.7	19.5%
7700B	Leighcan family, 5 to 40 percent slopes	20.1	0.9%
7700C	Leighcan family, 40 to 75 percent slopes	22.2	1.0%
7709D	Leighcan family, warm-Rock outcrop complex, 40 to 150 percent slopes	1.9	0.1%
7755B	Leighcan-Catamount families, moist complex, 5 to 40 percent slopes	207.9	9.4%
7757D	Leighcan-Catamount families, moist-Rock outcrop complex, 40 to 150 percent slopes	550.3	24.9%
W	Water	2.2	0.1%
Totals for Area of Interest		**2,207.8**	**100.0%**

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park and Larimer Counties

2101B—Pachic Argiustolls, 5 to 25 percent slopes

Map Unit Setting

Elevation: 6,500 to 8,000 feet
Mean annual precipitation: 16 to 25 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Pachic argiustolls and similar soils: 85 percent

Description of Pachic Argiustolls

Setting

Landform: Stream terraces
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Properties and qualities

Slope: 5 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Other vegetative classification: Arizona fescue - mountain muhly (FEAR2-MUMO) (G1902), Needleandthread - mountain muhly (HESPE11-MUMO) (G3106)

Typical profile

0 to 10 inches: Gravelly loam
10 to 21 inches: Gravelly loam
21 to 31 inches: Gravelly sandy clay loam
31 to 42 inches: Gravelly sandy clay loam
42 to 60 inches: Very gravelly sandy clay loam

2705D—Ratake-Cathedral families-Rock outcrop complex, 40 to 150 percent slopes

Map Unit Setting

Elevation: 6,500 to 9,000 feet
Mean annual precipitation: 16 to 25 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Ratake family and similar soils: 50 percent
Cathedral family and similar soils: 20 percent
Rock outcrop: 15 percent

Description of Ratake Family

Setting

Landform: Mountain slopes
Parent material: Colluvium and/or residuum derived from igneous and metamorphic rock

Properties and qualities

Slope: 40 to 75 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.2 inches)

Interpretive groups

Other vegetative classification: Ponderosa pine/true mountain mahogany (PIPO/CEMO2) (C1107), Ponderosa pine/Arizona fescue (PIPO/FEAR2) (C1109)

Typical profile

0 to 8 inches: Very gravelly sandy loam
8 to 18 inches: Very gravelly sandy loam
18 to 26 inches: Weathered bedrock

Description of Cathedral Family

Setting

Landform: Mountain slopes
Parent material: Residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 40 to 75 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 0.9 inches)

Interpretive groups

Other vegetative classification: Ponderosa pine/true mountain mahogany (PIPO/CEMO2) (C1107), Ponderosa pine/antelope bitterbrush (PIPO/PUTR2) (C1120)

Typical profile

0 to 0 inches: Slightly decomposed plant material
0 to 6 inches: Very stony sandy loam
6 to 11 inches: Extremely stony sandy loam
11 to 17 inches: Extremely stony sandy loam
17 to 26 inches: Unweathered bedrock

Description of Rock Outcrop

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank

Properties and qualities

Slope: 60 to 150 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Typical profile

0 to 60 inches: Unweathered bedrock

2717B—Cypher-Wetmore-Ratake families complex, 5 to 40 percent slopes

Map Unit Setting

Elevation: 6,500 to 8,500 feet
Mean annual precipitation: 16 to 25 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Cypher family and similar soils: 30 percent
Wetmore family and similar soils: 30 percent
Ratake family and similar soils: 20 percent

Description of Wetmore Family

Setting

Landform: Mountain slopes, benches
Parent material: Residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 1.5 inches)

Interpretive groups

Other vegetative classification: Ponderosa pine-Rocky mountain juniper/true mountain mahogany (PIPO-JUSC2/CEMO2)

(C1115), Ponderosa pine/antelope bitterbrush (PIPO/PUTR2) (C1120)

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 3 inches: Gravelly sandy loam
3 to 11 inches: Very gravelly sandy loam
11 to 17 inches: Very gravelly sandy clay loam
17 to 19 inches: Weathered bedrock
19 to 23 inches: Unweathered bedrock

Description of Cypher Family

Setting

Landform: Mountain slopes
Parent material: Residuum and/or slope alluvium derived from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: 4 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0.6 inches)

Interpretive groups

Other vegetative classification: Ponderosa pine/antelope bitterbrush (PIPO/PUTR2) (C1120), Ponderosa pine/elk sedge (PIPO/CAGE2) (C1105)

Typical profile

0 to 4 inches: Very gravelly coarse sandy loam
4 to 10 inches: Very gravelly coarse sandy loam
10 to 14 inches: Unweathered bedrock

Description of Ratake Family

Setting

Landform: Mountain slopes
Parent material: Colluvium and/or residuum derived from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.2 inches)

Interpretive groups

Other vegetative classification: Ponderosa pine/true mountain mahogany (PIPO/CEMO2) (C1107), Ponderosa pine/Arizona fescue (PIPO/FEAR2) (C1109)

Typical profile

0 to 8 inches: Very gravelly sandy loam
8 to 18 inches: Very gravelly sandy loam
18 to 26 inches: Weathered bedrock

4704B—Bullwark-Catamount families-Rubble land complex, 5 to 40 percent slopes

Map Unit Setting

Elevation: 8,000 to 9,500 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 40 to 70 days

Map Unit Composition

Bullwark family and similar soils: 50 percent
Catamount family and similar soils: 25 percent
Rubble land: 15 percent

Description of Bullwark Family

Setting

Landform: Mountain slopes
Parent material: Colluvium and/or residuum derived from igneous and metamorphic rock

Properties and qualities

Slope: 10 to 40 percent
Depth to restrictive feature: 40 to 59 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.5 inches)

Interpretive groups

Other vegetative classification: Douglas-fir/Ross sedge (PSME/CARO5) (C1204), Lodgepole pine/common juniper (PICO/JUCO6) (C0905), Lodgepole pine/kinnikinnick (PICO/ARUV) (C0901)

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 3 inches: Very cobbly sandy loam
3 to 11 inches: Very cobbly sandy loam

11 to 20 inches: Very cobbly sandy loam
20 to 24 inches: Extremely cobbly sandy loam
24 to 32 inches: Extremely stony sandy loam
32 to 40 inches: Extremely stony sandy clay loam
40 to 49 inches: Extremely stony sandy loam
49 to 53 inches: Unweathered bedrock

Description of Catamount Family

Setting

Landform: Mountain slopes
Parent material: Residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 10 to 40 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 20 to 40 inches to lithic bedrock
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 0.9 inches)

Interpretive groups

Other vegetative classification: Lodgepole pine/kinnikinnick (PICO/ARUV) (C0901), Lodgepole pine/common juniper (PICO/JUCO6) (C0905)

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 2 inches: Gravelly loam
2 to 5 inches: Very gravelly sandy loam
5 to 11 inches: Extremely cobbly sandy loam
11 to 15 inches: Extremely cobbly sandy loam
15 to 26 inches: Weathered bedrock
26 to 30 inches: Unweathered bedrock

Description of Rubble Land

Setting

Landform: Fans, mountainsides
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Parent material: Colluvium and/or residuum derived from igneous, metamorphic and sedimentary rock

Typical profile

0 to 60 inches: Stones

4758D—Catamount family-Rubble land-Bullwark family complex, 40 to 150 percent slopes

Map Unit Setting

Elevation: 8,000 to 9,500 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 40 to 70 days

Map Unit Composition

Catamount family and similar soils: 40 percent
Rubble land: 30 percent
Bullwark family and similar soils: 15 percent

Description of Catamount Family

Setting

Landform: Mountain slopes
Parent material: Residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 40 to 75 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 20 to 40 inches to lithic bedrock
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 0.9 inches)

Interpretive groups

Other vegetative classification: Lodgepole pine/common juniper (PICO/JUCO6) (C0905), Lodgepole pine/kinnikinnick (PICO/ARUV) (C0901)

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 2 inches: Gravelly loam
2 to 5 inches: Very gravelly sandy loam
5 to 11 inches: Extremely cobbly sandy loam
11 to 15 inches: Extremely cobbly sandy loam
15 to 26 inches: Weathered bedrock
26 to 30 inches: Unweathered bedrock

Description of Rubble Land

Setting

Landform: Fans, mountainsides
Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Side slope
Parent material: Colluvium and/or residuum derived from igneous, metamorphic and sedimentary rock

Typical profile
0 to 60 inches: Stones

Description of Bullwark Family

Setting
Landform: Mountain slopes
Parent material: Colluvium and/or residuum derived from igneous and metamorphic rock

Properties and qualities
Slope: 40 to 75 percent
Depth to restrictive feature: 40 to 59 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.5 inches)

Interpretive groups
Other vegetative classification: Douglas-fir/common juniper (PSME/JUCO6) (C1210), Lodgepole pine/common juniper (PICO/JUCO6) (C0905)

Typical profile
0 to 1 inches: Slightly decomposed plant material
1 to 3 inches: Very cobbly sandy loam
3 to 11 inches: Very cobbly sandy loam
11 to 20 inches: Very cobbly sandy loam
20 to 24 inches: Extremely cobbly sandy loam
24 to 32 inches: Extremely stony sandy loam
32 to 40 inches: Extremely stony sandy clay loam
40 to 49 inches: Extremely stony sandy loam
49 to 53 inches: Unweathered bedrock

6101A—Cryaquolls-Gateview complex, 0 to 15 percent slopes

Map Unit Setting
Elevation: 8,000 to 9,500 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 30 to 70 days

Map Unit Composition
Cryaquolls and similar soils: 50 percent
Gateview family and similar soils: 40 percent

Description of Cryaquolls

Setting

Landform: Flood plains
Parent material: Gravelly alluvium and/or gravelly glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.1 inches)

Interpretive groups

Other vegetative classification: Booth's willow-willow/reedgrass (SABO2-SALIX/CALAM) (S1498), Booth's willow-willow/Northwest Territory sedge (SABO2-SALIX/CAUT) (S1417)

Typical profile

0 to 4 inches: Moderately decomposed plant material
4 to 16 inches: Silt loam
16 to 24 inches: Silt loam
24 to 30 inches: Silt loam
30 to 40 inches: Sandy loam
40 to 64 inches: Silt loam

Description of Gateview Family

Setting

Landform: Alluvial fans, terraces
Parent material: Gravelly alluvium and/or gravelly glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Other vegetative classification: Quaking aspen/kinnikinnick (POTR5/ARUV) (D0521), Quaking aspen/Fendler's meadowrue (POTR5/

THFE) (D0512), Thurber's fescue - Idaho fescue (FETH-FEID) (G2201)

Typical profile

0 to 3 inches: Loam
3 to 11 inches: Gravelly sandy loam
11 to 22 inches: Gravelly sandy loam
22 to 34 inches: Very gravelly sandy loam
34 to 54 inches: Extremely gravelly sandy loam
54 to 62 inches: Extremely gravelly sandy clay loam

6731C—Rogert family, 40 to 75 percent slopes

Map Unit Setting

Elevation: 8,400 to 9,400 feet
Mean annual precipitation: 22 to 40 inches
Mean annual air temperature: 36 to 41 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Rogert family and similar soils: 85 percent

Description of Rogert Family

Setting

Landform: Hillslopes, mountainsides, structural benches
Parent material: Colluvium and/or residuum derived from granite

Properties and qualities

Slope: 40 to 75 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0.7 inches)

Interpretive groups

Other vegetative classification: Mountain big sagebrush/Idaho fescue (ARTRV/FEID) (S0506), Mountain big sagebrush/spike fescue (ARTRV/LEKI2) (S0508)

Typical profile

0 to 6 inches: Very stony sandy loam
6 to 11 inches: Extremely cobbly sandy loam
11 to 18 inches: Weathered bedrock
18 to 28 inches: Unweathered bedrock

7103A—Cryaquolls-Leighcan family, till substratum complex, 0 to 15 percent slopes

Map Unit Setting

Elevation: 9,000 to 11,000 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Cryaquolls, till substratum, and similar soils: 50 percent
Leighcan family, till substratum, and similar soils: 40 percent

Description of Cryaquolls, Till Substratum

Setting

Landform: Flood plains
Parent material: Gravelly glaciofluvial deposits and/or gravelly till derived from igneous, metamorphic and sedimentary rock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.1 inches)

Interpretive groups

Other vegetative classification: Diamondlead willow/water sedge (SAPL2/CAAQ) (S1496), Geyer's willow-willow/reedgrass (SAGE2-SALIX/CALAM) (S1495)

Typical profile

0 to 4 inches: Moderately decomposed plant material
4 to 16 inches: Silt loam
16 to 24 inches: Silt loam
24 to 30 inches: Silt loam
30 to 40 inches: Sandy loam
40 to 64 inches: Silt loam

Description of Leighcan Family, Till Substratum

Setting

Landform: Mountain slopes, outwash plains
Parent material: Residuum and/or till derived from igneous and metamorphic rock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/myrtle whortleberry (ABLA-PIEN/VAMY2) (C0320), Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIEN/VASC) (C0321)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 inches: Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam
28 to 45 inches: Extremely stony loamy sand
45 to 60 inches: Extremely stony loamy sand

7201B—Leighcan family, till substratum, 5 to 40 percent slopes

Map Unit Setting

Elevation: 9,000 to 10,500 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Leighcan family, till substratum, extremely bouldery, and similar soils: 85 percent

Description of Leighcan Family, Till Substratum, Extremely Bouldery

Setting

Landform: Mountain slopes, moraines
Parent material: Residuum and/or till derived from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/ myrtle whortleberry (ABLA-PIEN/VAMY2) (C0320), Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIEN/VASC) (C0321)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 inches: Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam
28 to 45 inches: Extremely stony loamy sand
45 to 60 inches: Extremely stony loamy sand

7700B—Leighcan family, 5 to 40 percent slopes

Map Unit Setting

Elevation: 9,000 to 11,200 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Leighcan family and similar soils: 85 percent

Description of Leighcan Family

Setting

Landform: Mountain slopes
Parent material: Colluvium over residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/ moss (ABLA-PIEN/MOSS) (C0311), Subalpine fir - Engelmann spruce/myrtle whortleberry (ABLA-PIEN/VAMY2) (C0320), Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIEN/VASC) (C0321)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 inches: Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam

28 to 45 inches: Extremely stony loamy sand
45 to 60 inches: Extremely stony loamy sand

7700C—Leighcan family, 40 to 75 percent slopes

Map Unit Setting

Elevation: 9,500 to 11,500 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Leighcan family and similar soils: 85 percent

Description of Leighcan Family

Setting

Landform: Mountain slopes
Parent material: Residuum and/or slope alluvium derived from igneous and metamorphic rock

Properties and qualities

Slope: 40 to 75 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/moss (ABLA-PIEN/MOSS) (C0311), Subalpine fir - Engelmann spruce/myrtle whortleberry (ABLA-PIEN/VAMY2) (C0320), Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIEN/VASC) (C0321)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 inches: Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam
28 to 45 inches: Extremely stony loamy sand
45 to 60 inches: Extremely stony loamy sand

7709D—Leighcan family, warm-Rock outcrop complex, 40 to 150 percent slopes

Map Unit Setting

Elevation: 9,500 to 11,500 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F

Frost-free period: 30 to 50 days

Map Unit Composition

Leighcan family, warm, and similar soils: 50 percent
Rock outcrop: 35 percent

Description of Leighcan Family, Warm

Setting

Landform: Mountain slopes
Parent material: Residuum and/or slope alluvium derived from igneous and metamorphic rock

Properties and qualities

Slope: 40 to 75 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/ myrtle whortleberry (ABLA-PIEN/VAMY2) (C0320), Subalpine fir/ elk sedge (ABLA/CAGE2) (C0201)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 inches: Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam
28 to 45 inches: Extremely stony loamy sand
45 to 60 inches: Extremely stony loamy sand

Description of Rock Outcrop

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank

Properties and qualities

Slope: 60 to 150 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Typical profile

0 to 60 inches: Unweathered bedrock

7755B—Leighcan-Catamount families, moist complex, 5 to 40 percent slopes

Map Unit Setting

Elevation: 8,000 to 11,000 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Leighcan family, moist, and similar soils: 45 percent
Catamount family, moist, and similar soils: 40 percent

Description of Leighcan Family, Moist

Setting

Landform: Mountain slopes
Parent material: Residuum and/or slope alluvium derived from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/ grouse whortleberry (ABLA-PIEN/VASC) (C0321), Subalpine fir - Engelmann spruce/myrtle whortleberry (ABLA-PIEN/VAMY2) (C0320)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 inches: Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam
28 to 45 inches: Extremely stony loamy sand
45 to 60 inches: Extremely stony loamy sand

Description of Catamount Family, Moist

Setting

Landform: Mountain slopes
Parent material: Residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 5 to 40 percent

Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 20 to 40 inches to lithic bedrock
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 0.9 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/ myrtle whortleberry (ABLA-PIEN/VAMY2) (C0320), Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIEN/VASC) (C0321)

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 2 inches: Gravelly loam
2 to 5 inches: Very gravelly sandy loam
5 to 11 inches: Extremely cobbly sandy loam
11 to 15 inches: Extremely cobbly sandy loam
15 to 26 inches: Weathered bedrock
26 to 30 inches: Unweathered bedrock

7757D—Leighcan-Catamount families, moist-Rock outcrop complex, 40 to 150 percent slopes

Map Unit Setting

Elevation: 9,500 to 11,000 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 30 to 50 days

Map Unit Composition

Leighcan family, moist, and similar soils: 50 percent
Catamount family, moist, and similar soils: 25 percent
Rock outcrop: 15 percent

Description of Leighcan Family, Moist

Setting

Landform: Mountain slopes
Parent material: Residuum and/or slope alluvium derived from igneous and metamorphic rock

Properties and qualities

Slope: 40 to 75 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/moss (ABLA-PIEN/MOSS) (C0311), Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIEN/VASC) (C0321)

Typical profile

0 to 2 inches: Cobbly silt loam
2 to 9 inches: Very cobbly silt loam
9 to 28 inches: Very cobbly sandy loam
28 to 45 inches: Extremely stony loamy sand
45 to 60 inches: Extremely stony loamy sand

Description of Catamount Family, Moist

Setting

Landform: Mountain slopes
Parent material: Residuum weathered from igneous and metamorphic rock

Properties and qualities

Slope: 40 to 75 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock; 20 to 40 inches to lithic bedrock
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 0.9 inches)

Interpretive groups

Other vegetative classification: Subalpine fir - Engelmann spruce/myrtle whortleberry (ABLA-PIEN/VAMY2) (C0320), Subalpine fir - Engelmann spruce/grouse whortleberry (ABLA-PIEN/VASC) (C0321)

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 2 inches: Gravelly loam
2 to 5 inches: Very gravelly sandy loam
5 to 11 inches: Extremely cobbly sandy loam
11 to 15 inches: Extremely cobbly sandy loam
15 to 26 inches: Weathered bedrock
26 to 30 inches: Unweathered bedrock

Description of Rock Outcrop

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank

Properties and qualities
Slope: 60 to 150 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Typical profile
0 to 60 inches: Unweathered bedrock

W—Water

Map Unit Setting
Elevation: 6,000 to 12,000 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 30 to 70 days

Map Unit Composition
Water: 100 percent

Data Source Information

Soil Survey Area: Arapaho-Roosevelt National Forest Area, Colorado, Parts of Boulder, Clear Creek, Gilpin, Grand, Park and Larimer Counties
Survey Area Data: Version 2, Feb 4, 2008

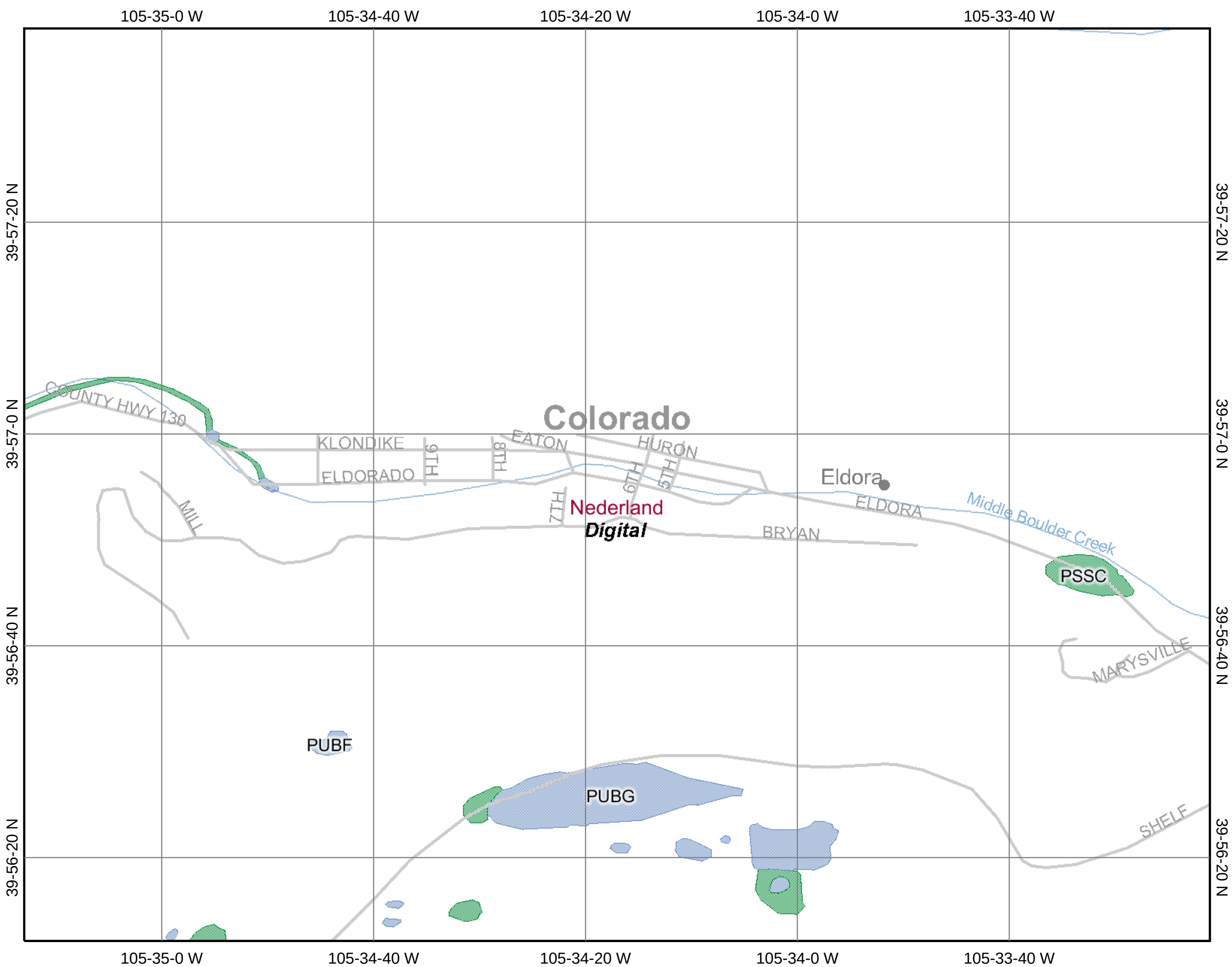
APPENDIX 4.3

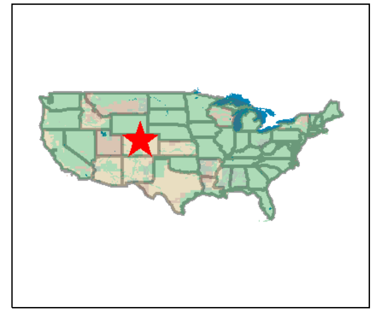
U.S. FISH AND WILDLIFE SERVICE

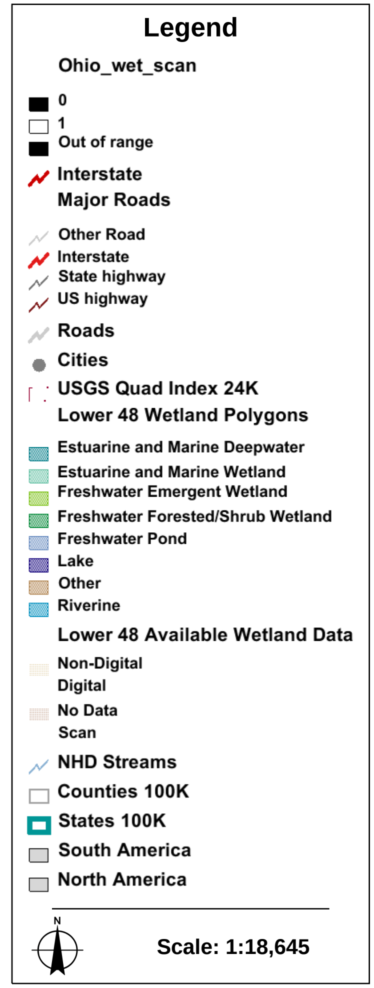
NATIONAL WETLANDS INVENTORY

Explanation: The following maps covering the EEPP study area were downloaded from the National Wetlands Inventory (U.S. Fish and Wildlife Service 2010).

Internet Mapping Framework



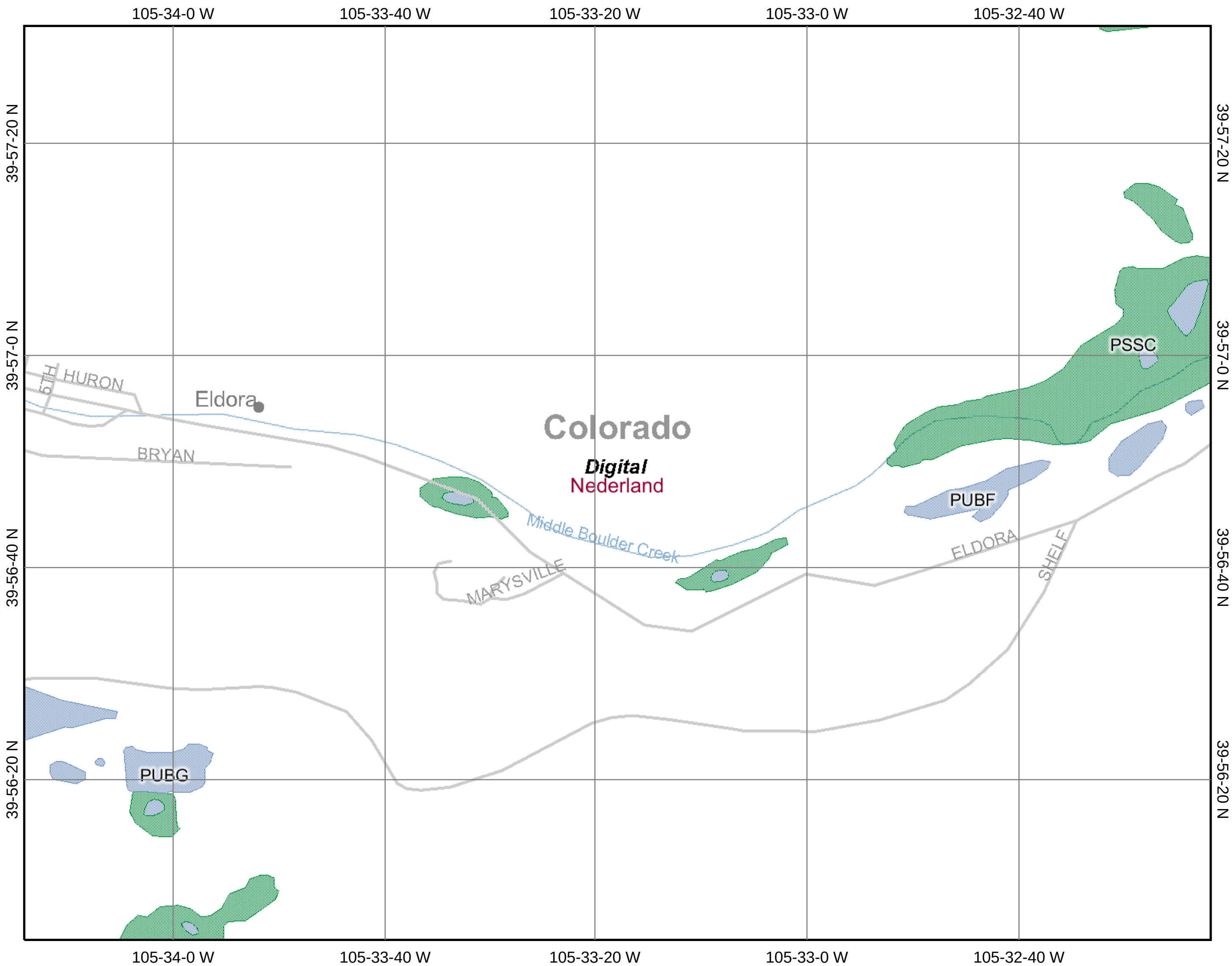


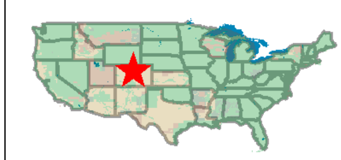


Map center: 39° 56' 55" N, 105° 34' 17" W

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

Internet Mapping Framework





Map center: 39° 56' 48" N, 105° 33' 18" W

Legend

Ohio_wet_scan

- 0
- 1
- Out of range

Interstate

Major Roads

- Other Road
- Interstate
- State highway
- US highway

Roads

Cities

USGS Quad Index 24K

Lower 48 Wetland Polygons

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Lower 48 Available Wetland Data

- Non-Digital
- Digital
- No Data
- Scan

NHD Streams

Counties 100K

States 100K

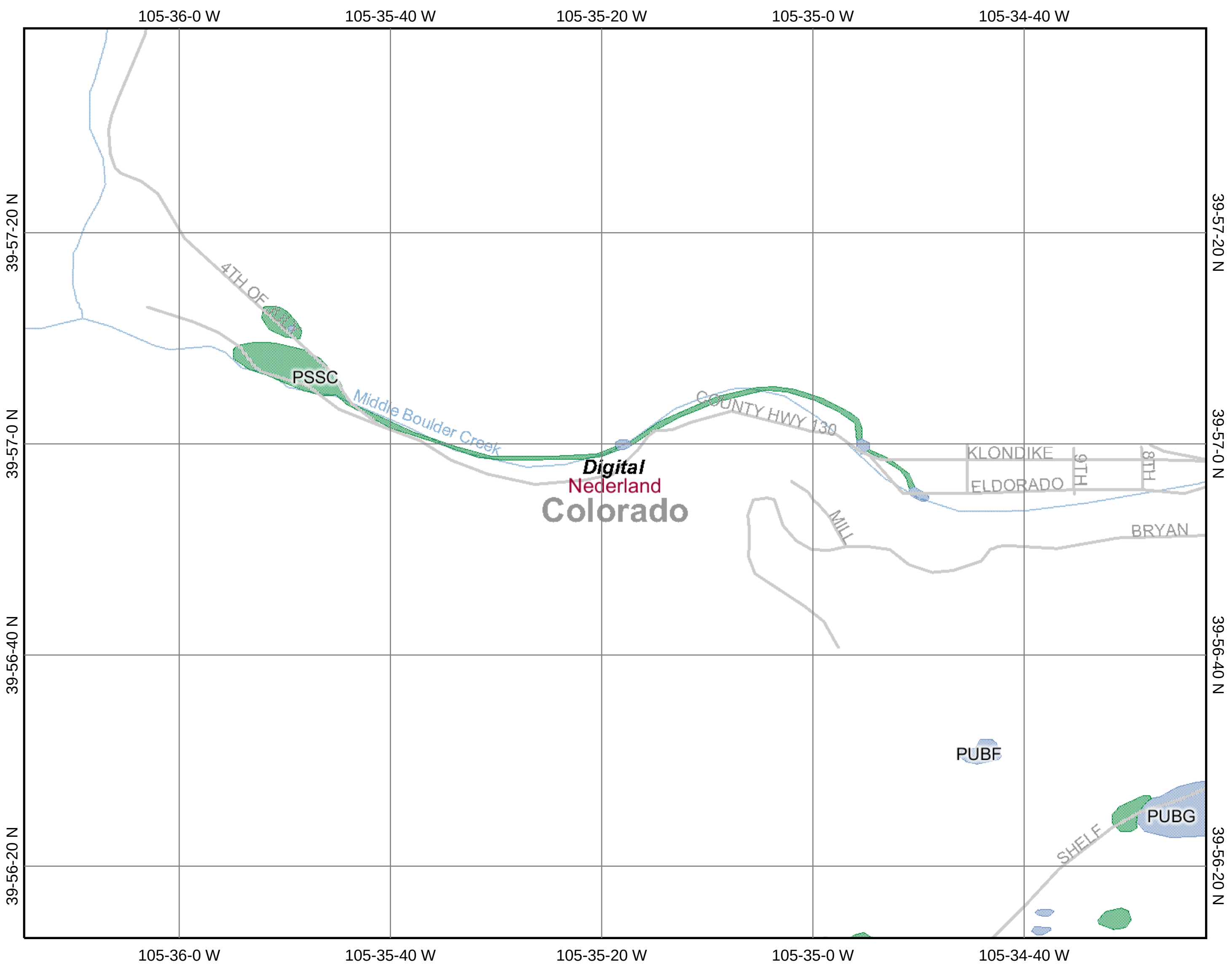
South America

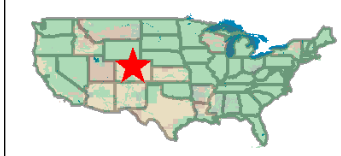
North America

N

Scale: 1:18,645

Internet Mapping Framework





Legend

Ohio_wet_scan

- 0
- 1
- Out of range

Interstate

Major Roads

- Other Road
- Interstate
- State highway
- US highway

Roads

Cities

USGS Quad Index 24K

Lower 48 Wetland Polygons

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Lower 48 Available Wetland Data

- Non-Digital
- Digital
- No Data
- Scan

NHD Streams

Counties 100K

States 100K

South America

North America

N

Scale: 1:18,645

Map center: 39° 56' 56" N, 105° 35' 19" W

APPENDIX 4.4

COLORADO NATURAL HERITAGE PROGRAM

POTENTIAL CONSERVATION AREA REPORTS

Explanation: The following three reports are excerpted from *Survey of Critical Biological Resources in Boulder County, Colorado 2007-2008* (Neid *et al*. 2009). They cover Middle Boulder Creek PCA, Caribou Townsite PCA and Chittenden Mountain PCA.

Caribou Townsite

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future

U.S.G.S. 7.5-minute quadrangles: Nederland

Size: 1,743 acres (705 ha)

General Description: The site is located in southwestern Boulder County, about four miles northwest of Nederland. The site encompasses the area around Caribou Hill, including Caribou Flat to the south, and the open valley of Caribou Park to the north. Within the site, Caribou Creek and Coon Track Creek originate in glacial drift at the southeast foot of Caribou Peak. The area supports three separate, large wetlands located within 0.5 miles of Caribou Hill. Each wetland is slightly different, but they are all primarily dominated by diamondleaf willow (*Salix planifolia*) and water sedge (*Carex aquatilis*), and are all sloping, groundwater-fed fens with thick organic soil and a dense ground layer of moss. 1) Northwest wetland (Upper Caribou Creek). This wetland is located at the headwaters of Caribou Creek and is a diverse wetland that includes multiple plant communities. One section of the wetland along the creek hosts an active beaver colony with several dams along the creek. The soil beneath these dams is not organic, but accumulated silt and clay. Tall willows, primarily park willow (*Salix monticola*) and beaked sedge (*Carex utriculata*) grow around the beaver dams. Above these dams, the wetland is nearly level and dominated by a mix of diamondleaf willow and bog birch (*Betula glandulosa*), both growing approximately 1m tall. The understory is dominated by water sedge over a dense moss layer that includes *Aulacomnium palustre, Sphagnum warnstorfii, Tomenthypnum nitens, Climacium dendroides, Helodium blandowii,* and species of *Drepanocludus, Plagiomnium,* and *Calliergon*. All around the edges of this open shrub fen, the wetland contains a perimeter of forested fen with Engelmann spruce (*Picea engelmannii*) and very high species diversity. 2) Northeast wetland (Caribou Park). This wetland is located lower on Caribou Creek, but the hydrology is driven more by groundwater discharge from the surrounding slopes than by the creek itself. This wetland is dominated by a mix of low shrubs, including diamondleaf willow, resin birch, and wolf's willow (*Salix wolfii*). Water sedge dominates the understory with a diverse array of wetland herbs and a dense moss layer. This wetland was historically mined for peat and one section of the wetland remains highly disturbed. 3) South wetland (Caribou Flat). This wetland is at the headwaters of Coon Track Creek, which drains east towards North Beaver Creek and Nederland, and not into Caribou Creek. This wetland has the steepest slope (5-7%) and contains dense willow cover of diamondleaf willow and bog birch. Willows in this wetland are taller, growing to 2m tall. The understory is dominated by a mix of water sedge and beaked sedge along with mixed forbs. The surrounding slopes contain a mix of subalpine fir (*Abies lasiocarpa*), Engelmann spruce, limber pine (*Pinus flexilis*), and lodgepole pine (*Pinus contorta*).

Key Environmental Factors: Though creeks runs through the valleys, the wetlands are permanently saturated by groundwater discharge from the surrounding slopes that eventually drains into the creek, and are not necessarily associated with overflow from the active creek channel. Because of this hydrologic distinction, the wetlands are not true riparian areas. Instead, they are sloping fens with organic soil formed over hundreds and thousands of years.

Land Use History: The surrounding uplands have been used heavily in the past 150 years for mining. There is a network of dirt roads that cross the landscape and there are small piles of tailings and other evidence of mining. There are also old structures, either from the mines or the old historic town. The northwest wetland was mined for peat in the 1940s and a crane left over from mining remains in the wetland. In this section of the wetland, the peat is thin or scraped down to the underlying mineral soil. The vegetation is disturbed and differs from the rest of the wetland. To further compound the impact of past disturbance, there was a large, illegal gathering of 4x4 vehicles in 2002 that drove in and around the wetland and tore up the soil. Restoration efforts have mitigated some of the effects.

Biodiversity Significance Rank Comments (B4): This site contains an excellent (A-ranked) occurrence of a globally common (G5/S4) riparian willow carr, *Salix planifolia / Carex aquatilis* shrubland. The presence of such an excellent example of this plant association indicates that the hydrologic processes in this site are intact. The wetlands are primarily ground-fed fens. There are also several historical and extant occurrences of globally and state rare moonworts (*Botrychium pallidum, B. echo, B. minganense,* and *B. hesperium*). More precise and current information is needed to confirm the specific locations and qualities of the rare plant populations. In 1999, CNHP zoologists documented 3 northern leopard frog (*Rana pipiens*) tadpoles, a species on CNHP's "watch list".

Natural Heritage element occurrences at the Caribou Townsite PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Insects	Oeneis jutta reducta	Rocky Mountain Arctic Jutta	G5T4	S1				E	1990-06-30
Natural Communities	Salix planifolia / Carex aquatilis Shrubland	Subalpine Riparian Willow Carr	G5	S4				A	2007-08-01
Vascular Plants	Botrychium echo	reflected moonwort	G3	S3				E	1989-06-29
Vascular Plants	Botrychium pallidum	pale moonwort	G3	S2				H	1984-08-03
Vascular Plants	Botrychium hesperium	western moonwort	G4	S2				E	1989-06-29
Vascular Plants	Botrychium minganense	Mingan's moonwort	G4	S1				E	1989-06-29
Vascular Plants	Oxytropis parryi	Parry's crazy - weed	G5	S1				H	1962-07-28

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary includes the occurrences and the immediate watershed, allowing for the operation of normal hydrological and ecological processes that support the wetlands, and providing a buffer against direct disturbance. The boundary includes all of the known occurrences and a significant downslope buffer. The amphibians documented in the boundary may leave the area.

Protection Urgency Rank Comments (P3): The area is predominantly in federal (USFS) ownership, but there are numerous small private inholdings. National Forest Service land around the old Caribou Townsite is primarily used for recreation. The Caribou Mine is still active. The mine operators are conscious of environmental protections and try to limit the mine's impact.

Management Urgency Rank Comments (M4): Current management limits off-road vehicles to certain roads. However, severe trespass incidents have occurred in the past. Roads need to be managed and campsites identified in order to concentrate impacts away from sensitive species. Preventing vehicle access to the wetlands is essential to maintaining their integrity. Additionally, this site falls within patented mining claims. The extent and location of mining impacts need to be evaluated and mitigated.

Land Use Comments: No evidence of grazing was noted.

Exotic Species Comments: Invasive species are absent from the wetlands.

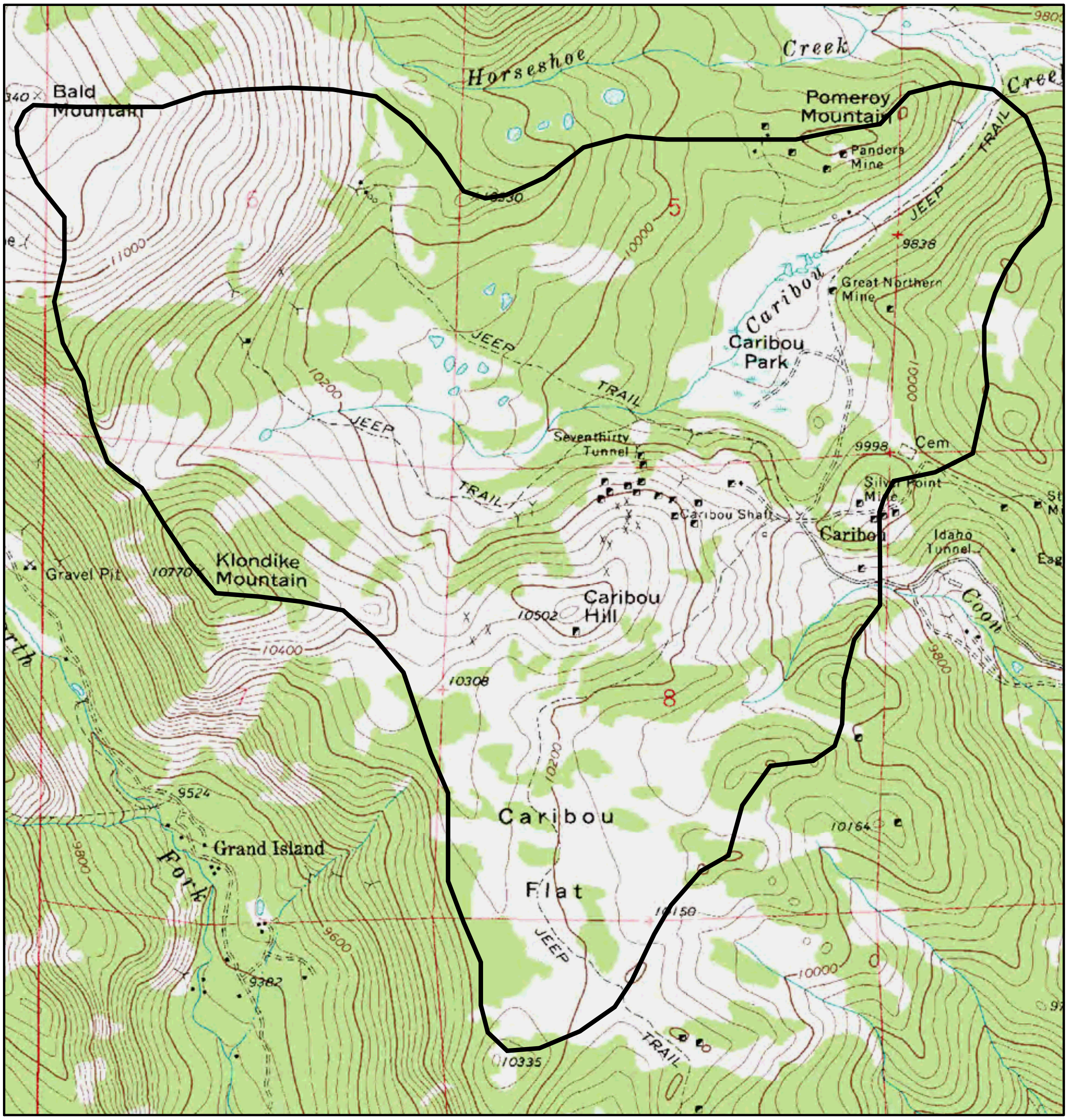
Information Needs: Need additional field work to evaluate rare plants populations.

References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Decker, K.L. and J.M. Lemly

Version Date: 06/10/2008



Miles
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Fort Collins, CO 80523-8002

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Fax (970) 491-3349
www.cnhp.colostate.edu

Map Date: 11/03/2008

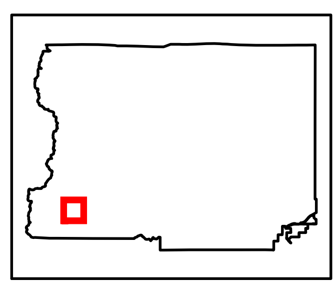
Legend

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Caribou Townsite Potential Conservation Area, B4: Moderate Biodiversity Significance

Chittenden Mountain

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P4: No Threat or Special Opportunity

Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future

U.S.G.S. 7.5-minute quadrangles: Nederland, East Portal

Size: 239 acres (97 ha) **Elevation:** 9,564 - 10,312 ft. (2,915 - 3,143 m)

General Description: This site is in the lower subalpine elevation zone at the Wilderness Area boundary above Hessie. Vegetation in the area is a mosaic of aspen (*Populus tremuloides*) groves and patches of spruce - fir (*Picea engelmannii - Abies lasiocarpa*) forest on the east-west trending ridges and slopes with grassland meadows in the valleys. North-facing slopes are predominantly spruce - fir with areas of cliff and talus and south-facing slopes have mixed spruce - fir - aspen forests. The vegetation transitions to alpine tundra within 0.5-1 mile from the site. Aspen occurs in smaller stands on the Front Range rather than as a wide-ranging matrix system. Aspen stands tend to have very high herbaceous diversity, like this stand, which means they contain a disproportionately high percentage of the biodiversity of forests for their size on the Front Range. This site has excellent regeneration beneath a dense canopy of aspen, although there are several spruce trees that emerge well above the aspen. The stand transitions to a subalpine grassland in the meadow at the toeslope of the ridge. The grassland has abundant Parry's oatgrass (*Danthonia parryii*) and Thurber's fescue (*Festuca thurberi*), two species that indicate good habitat quality. Additional grasses include poverty oatgrass (*Danthonia intermedia*), junegrass (*Koeleria macrantha*), and sedges (*Carex* species). Forb diversity is very high. The meadow is dotted with small clusters of young spruce, aspen, and limber pine (*Pinus flexilis*), especially around rock outcrops. Swales in the meadow tend to have shrubby cinquefoil (*Dasiphora fruticosa*) and baltic rush (*Juncus balticus*). There is significant pocket gopher activity in both the meadow and adjacent aspen forest and minor amounts of Canada bluegrass (*Poa compressa*), likely introduced from the pack trail that runs through the meadow. The riparian corridor of the South Fork of Middle Boulder Creek is a moderately-wide valley with several anastamosing channels. The riparian vegetation is a mosaic of spruce - fir forest and diamond-leaf willow (*Salix planifolia*) shrublands with lush herbs along the stream channels.

Key Environmental Factors: Subalpine elevation zone; metamorphic bedrock.

Biodiversity Significance Rank Comments (B3): This site is drawn for an excellent (A-ranked) occurrence of a globally vulnerable (G3/S3) Thurber's fescue (*Festuca thurberi*) subalpine grassland herbaceous vegetation and a good (B-ranked) occurrence of the globally apparently secure (G4/S4) aspen / Thurber's fescue (*Populus tremuloides* / *Festuca thurberi*) forest. There is a common (G5/S4) *Salix planifolia / Carex aquatilis* subalpine riparian willow carr in excellent condition, but this community is not the focus of the site.

Natural Heritage element occurrences at the Chittenden Mountain PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Festuca thurberi Subalpine Grassland Herbaceous Vegetation		G3	S3				A	2007-08-22
Natural Communities	Populus tremuloides / Festuca thurberi Forest	Aspen Forests	G4	S4				B	2007-08-22

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary contains a landscape mosaic of spruce - fir forest, aspen stands, and grassland meadows that contain element occurrences and adjacent suitable habitat.

Protection Urgency Rank Comments (P4): This site spans the boundary of the Indian Peaks Wilderness Area and Arapaho-Roosevelt National Forest. There is a small, private mining claim at the top of the ridge above the occurrences that are within the site.

Management Urgency Rank Comments (M4): There is a pack/hiking trail through the meadow at this site. Some Canada bluegrass (*Poa compressa*) has established along the trail and in small gopher disturbance areas in the forest above. These are not large, but could be monitored and expansion of non-natives mitigated. Encouraging a single trail rather than multiple parallel trails through the valley will likely reduce the opportunity for weed infestation and expansion.

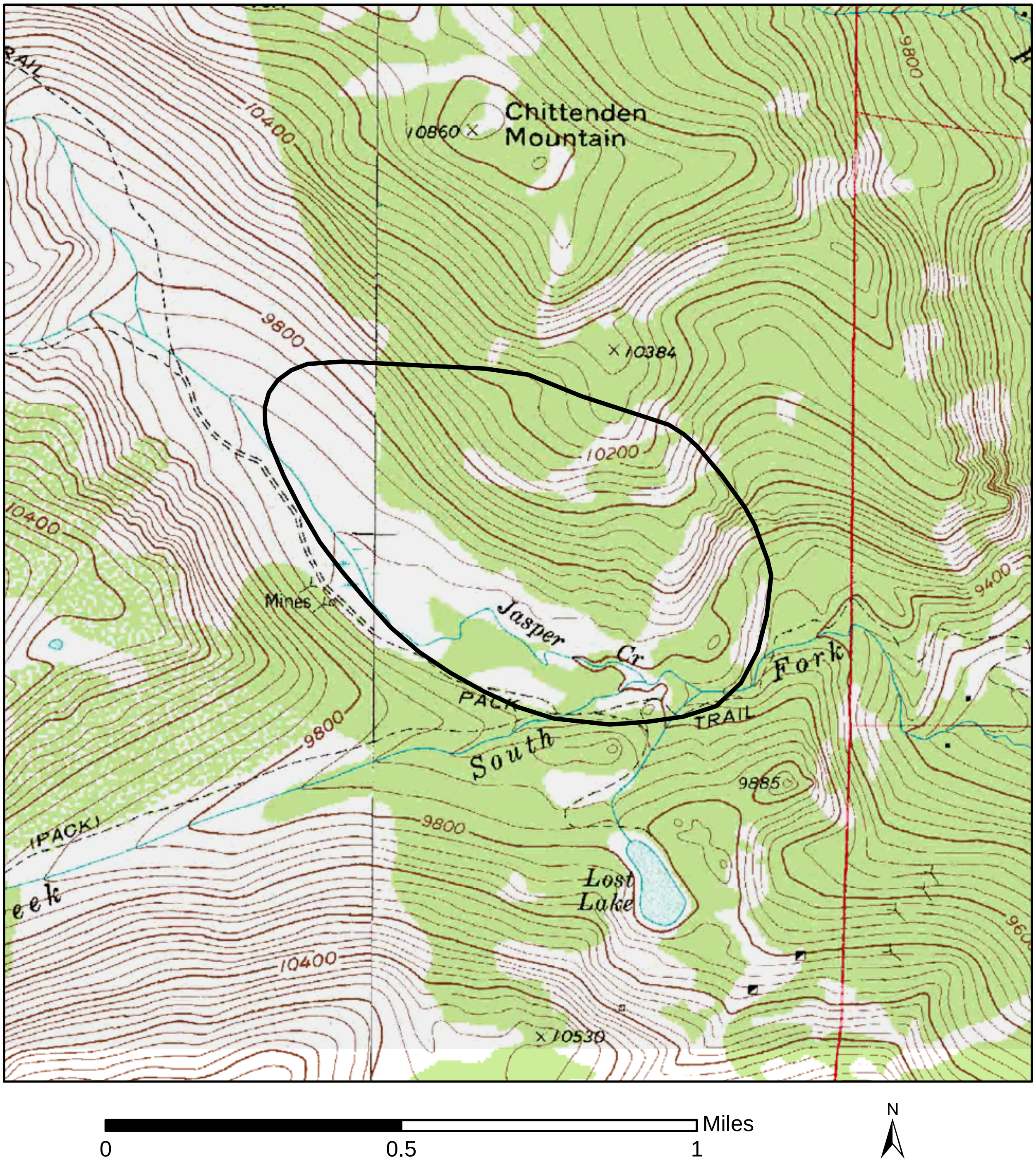
Exotic Species Comments: Some Canada bluegrass (*Poa compressa*) has established along the trail.

References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Neid, S.L.

Version Date: 10/20/2008



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www.cnhp.colostate.edu

Map Date: 11/13/2008

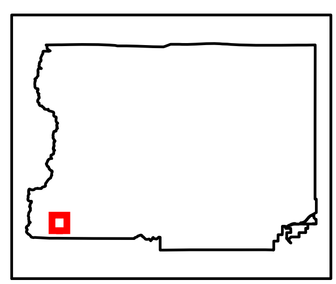
Legend

PCA Boundary

Nederland, 39105-H5
East Portal, 39105-H6

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Chittenden Mountain Potential Conservation Area, B3: High Biodiversity Significance

Middle Boulder Creek at Eldora

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P4: No Threat or Special Opportunity

Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future

U.S.G.S. 7.5-minute quadrangles: Nederland

Size: 255 acres (103 ha)

General Description: The site consists of a flat open floodplain terrace and a montane grassland which supports mountain muhly (*Muhlenbergia montana*), Parry's oatgrass (*Danthonia parryi*), needle-and-thread grass (*Hesperostipa comata*), thickspike wheatgrass (*Elymus lanceolatus*), fringed sage (*Artemisia frigida*), hairy false goldenaster (*Heterotheca villosa*), and sulphur-flower buckwheat (*Eriogonum umbellatum*). Additional associated plant species include sun sedge (*Carex heliophila*), Rocky Mountain fescue (*Festuca saximontana*) and lesser spikemoss (*Selaginella densa*). The parent material is igneous, silver plume granite decomposing to a gravelly sandy loam within a glaciated mountain valley.

Biodiversity Significance Rank Comments (B3): This site includes a good (B-ranked) occurrence of a globally vulnerable (G3/S1) sedge, *Carex oreocharis*, and an unranked occurrence of a globally vulnerable (G3G4/S2?) *Muhlenbergia montana* - *Danthonia parryi* montane grassland.

Natural Heritage element occurrences at the Middle Boulder Creek at Eldora PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Danthonia parryi Herbaceous Vegetation	Montane Grasslands	G3	S3				E	1995-08-24
Vascular Plants	Carex oreocharis	a sedge	G3	S1				B	1995-08-24

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary is drawn to include the occurrences, adjacent potential habitat, and the local mosaic of plant communities.

Protection Urgency Rank Comments (P4): Conservation easement precludes housing and other development.

Management Urgency Rank Comments (M4): The hydrology of the site should be maintained and the occurrence should be considered during modifications within the watershed. Light horse and elk grazing. No threats to the occurrence reported.

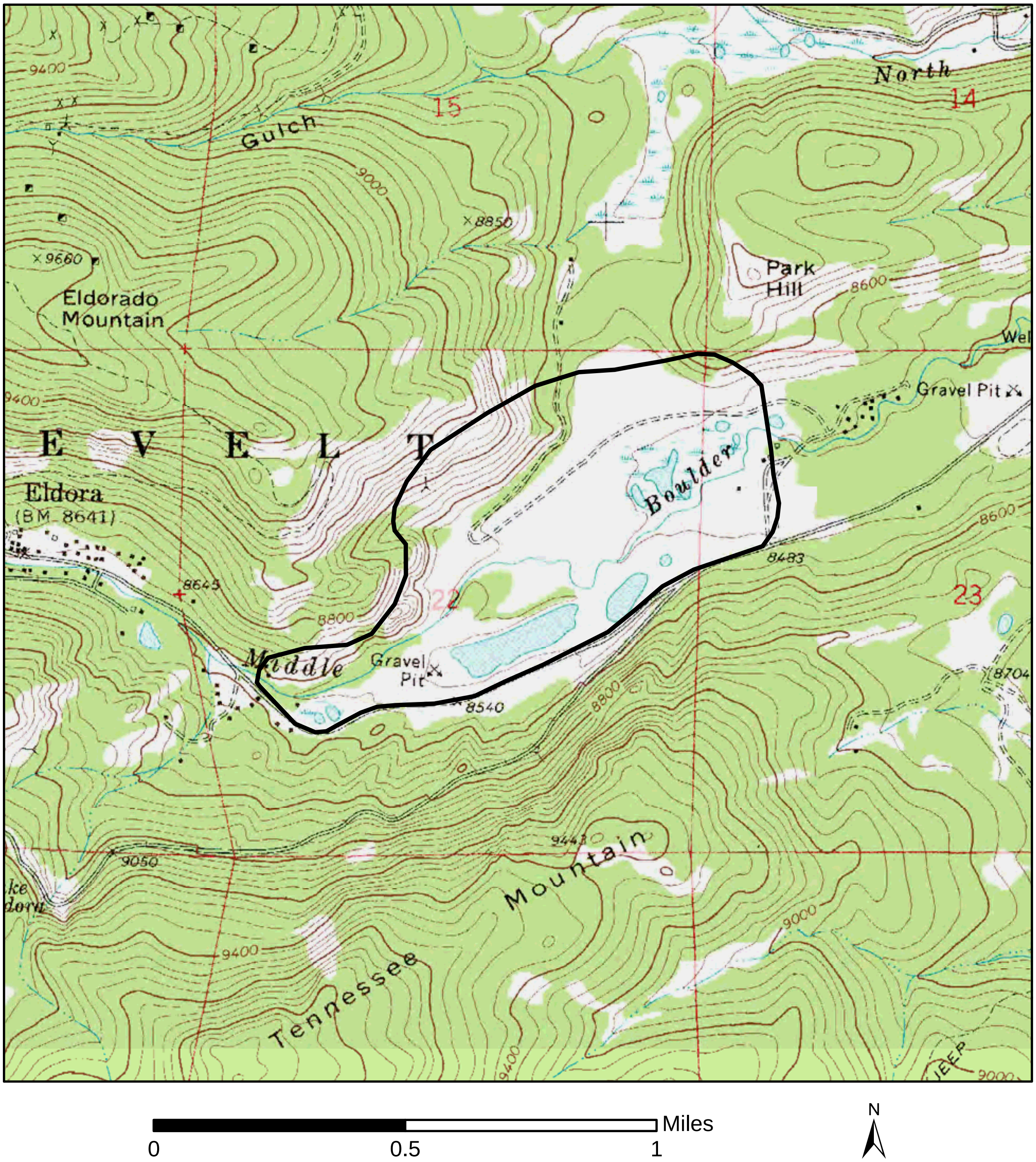
Off-Site Considerations: Two large, partially-restored gravel mines are immediately south of the site.

References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Fayette, K.K.

Version Date: 02/10/1997



Colorado Natural Heritage Program
Colorado State University
254 General Services Building
8002 Campus Delivery
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Map Date: 11/13/2008

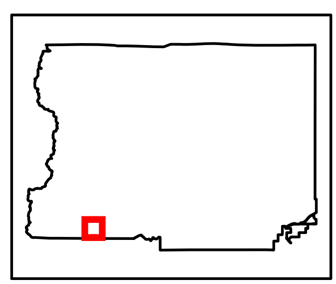
Legend

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Middle Boulder Creek at Eldora Potential Conservation Area, B3: High Biodiversity Significance

APPENDIX 4.5

List of Contact People

Name, Affiliation, Address	Field of Expertise
Pete Birkeland Geology Dept., University of Colorado Boulder, CO 80309 303-492-6985 birkelap@colorado.edu	Soils scientist
Diane J. Brown 2478 Eldora Road Nederland, CO 80466 303-258-3672 eldoradh1@rmi.net	Eldora botany
David Buckner ESCO Associates, Inc. P.O. Box 18775, Boulder, CO 80308 303-499-4277 http://www.esco-associates.com/	Reclamation, botany
Colorado Natural Heritage Program Colorado State University 254 General Services Building 1474 Campus Delivery Fort Collins, CO 80523 970-491-1309 CNHP@colostate.edu http://www.cnhp.colostate.edu/	Status of rare plants and plant communities
Claire DeLeo Boulder County Parks and Open Space Dept. 5201 St. Vrain Road Longmont, CO 80503 303-678-6205 cdeleo@bouldercounty.org	Plant ecology

Tim Hogan — Field botany, taxonomy
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APPENDIX 5

WILDLIFE

WILDLIFE SPECIES LIST FOR ELDORA AREA			
Sorted by taxon.			
A list of Occurrence and Abundance Classification Criteria are found at the end of this list.			
Species in **Bold** have been documented.			
AMPHIBIANS			
Common Name	**Scientific Name**	**Occurrence Code**	**Abundance Code**
Tiger Salamander	Ambystoma tigrinum	Rh	Locally Common
Boreal Toad	Bufo boreas	Rh	Extirpated?
Western Chorus Frog	Pseudacris triseriata	Rh	Common
Northern Leopard Frog	Rana pipiens	Rh	Extirpated?
BIRDS			
Common Name	**Scientific Name**	**Occurrence Code**	**Abundance Code**
Great Blue Heron	Ardea herodias	S	Rare
Canada Goose	Branta canadensis	M,S	Uncommon
Green-winged Teal	Anas crecca	S	Fairly Common
Mallard	Anas platyrhynchos	S	Common
Cinnamon Teal	Anas cyanoptera	S	Rare
Blue-winged Teal	Anas discors	S	Rare
Ring-necked Duck	Aythya collaris	S	Uncommon
Common Merganser	Mergus merganser	M,S	Rare
Turkey Vulture	Cathartes aura	S	Uncommon
Osprey	Pandion haliaetus	S	Uncommon
Bald Eagle	Haliaeetus leucocephalus	R	Uncommon
Northern Harrier	Circus cyaneus	M	Rare
Sharp-shinned Hawk	Accipiter striatus	R	Uncommon
Cooper's Hawk	Accipiter cooperii	R	Uncommon
Northern Goshawk	Accipiter gentilis	S	Uncommon
Swainson's Hawk	Buteo swainsoni	M	Rare
Red-tailed Hawk	Buteo jamaicensis	R	Fairly Common
Ferruginous Hawk	Buteo regalis	M	Rare
Rough-legged Hawk	Buteo lagopus	W	Rare
Golden Eagle	Aquila chrysaetos	R	Uncommon
American Kestrel	Falco sparverius	S	Rare
Prairie Falcon	Falco mexicanus	S	Rare
Peregrine Falcon	Falco peregrinus	S	Unknown
Blue Grouse	Dendragapus obscurus	R	Fairly Common
Sora	Porzana carolina	S	Uncommon
Killdeer	Charadrius vociferus	S	Rare
Spotted Sandpiper	Actitis macularia	S	Fairly Common

Common Name	**Scientific Name**	**Occurrence Code**	**Abundance Code**
Common Snipe	Gallinago gallinago	S	Uncommon
Band-tailed Pigeon	Columba fasciata	S	Fairly Common
Mourning Dove	Zenaida macroura	S	Fairly Common
Great Horned Owl	Bubo virginianus	R	Fairly Common
Northern Pygmy-Owl	Glaucidium gnoma	R	Uncommon
Boreal Owl	Aegolius funereus	R	Rare
Northern Saw-whet Owl	Aegolius acadicus	R	Uncommon
Common Nighthawk	Chordeiles minor	S	Fairly Common
Black Swift	Cypseloides niger	S	Rare
Magnificent Hummingbird	Eugenes fulgens	M	Rare
Calliope Hummingbird	Stellula calliope	M	Rare
Broad-tailed Hummingbird	Selasphorus platycercus	S	Abundant
Rufous Hummingbird	Selasphorus rufus	M	Fairly Common
Belted Kingfisher	Ceryle alcyon	Rh	Uncommon
Lewis's Woodpecker	Melanerpes lewis	M	Rare
Red-naped Sapsucker	Sphyrapicus nuchalis	S	Fairly Comoon
Williamson's Sapsucker	Sphyrapicus thyroideus	S	Fairly Comoon
Downy Woodpecker	Picoides pubescens	R	Fairly Comoon
Hairy Woodpecker	Picoides villosus	R	Fairly Common
Three-toed Woodpecker	Picoides tridactylus	R	Uncommon
Northern Flicker	Colaptes auratus	Rh	Common
Olive-sided Flycatcher	Contopus cooperi	S	Uncommon
Western Wood-Pewee	Contopus sordidulus	S	Fairly Common
Hammond's Flycatcher	Empidonax hammondii	S	Fairly Common
Dusky Flycatcher	Empidonax oberholseri	S	Fairly Common
Cordilleran Flycatcher	Empidonax occidentalis	S	Fairly Common
Say's Phoebe	Sayornis saya	M	Rare
Western Kingbird	Tyrannus verticalis	M	Rare
Horned Lark	Eremophila alpestris	M	Uncommon
Tree Swallow	Tachycineta bicolor	S	Common
Violet-green Swallow	Tachycineta thalassina	S	Common
Barn Swallow	Hirundo rustica	S	Fairly Common
Gray Jay	Perisoreus canadensis	R	Uncommon
Steller's Jay	Cyanocitta stelleri	R	Common
Blue Jay	Cyanocitta cristata	M	Rare
Pinyon Jay	Gymnorhinus cyanocephalus	M	Rare
Clark's Nutcracker	Nucifraga columbiana	R	Fairly Common
Black-billed Magpie	Pica pica	R	Common
American Crow	Corvus brachyrhynchos	R	Fairly Common
Common Raven	Corvus corax	R	Common

Common Name	Scientific Name	Occurrence Code	Abundance Code
Black-capped Chickadee	Poecile atricapillus	R	Fairly Common
Mountain Chickadee	Poecile gambeli	R	Abundant
Red-breasted Nuthatch	Sitta canadensis	R	Fairly Common
White-breasted Nuthatch	Sitta carolinensis	R	Fairly Common
Pygmy Nuthatch	Sitta pygmaea	R	Uncommon
Brown Creeper	Certhia americana	R	Fairly Common
House Wren	Troglodytes aedon	S	Common
American Dipper	Cinclus mexicanus	Rh	Fairly Common
Golden-crowned Kinglet	Regulus satrapa	R	Fairly Common
Ruby-crowned Kinglet	Regulus calendula	S	Abundant
Western Bluebird	Sialia mexicana	M	Uncommon
Mountain Bluebird	Sialia currucoides	S	Common
Townsend's Solitaire	Myadestes townsendi	Rh	Common
Swainson's Thrush	Catharus ustulatus	S	Fairly Common
Hermit Thrush	Catharus guttatus	S	Common
American Robin	Turdus migratorius	Rh	Abundant
Brown Thrasher	Toxostoma rufum	W	Rare
American Pipit	Anthus rubescens	S	Uncommon
Bohemian Waxwing	Bombycilla garrulus	W	Uncommon
Cedar Waxwing	Bombycilla cedrorum	M	Unknown
Loggerhead Shrike	Lanius ludovicianus	M	Rare
Northern Shrike	Lanius excubitor	W	Uncommon
European Starling	Sturnus vulgaris	S	Rare
Warbling Vireo	Vireo gilvus	S	Common
Orange-crowned Warbler	Vermivora celata	S	Rare
Virginia's Warbler	Vermivora virginiae	S	Uncommon
Yellow Warbler	Dendroica petechia	S	Rare
Yellow-rumped Warbler	Dendroica coronata	S	Common
Ovenbird	Seiurus aurocapillus	M	Rare
MacGillivray's Warbler	Oporornis tolmiei	S	Fairly Common
Common Yellowthroat	Geothlypis trichas	S	Rare
Wilson's Warbler	Wilsonia pusilla	S	Fairly Common
Western Tanager	Piranga ludoviciana	S	Fairly Common
Rose-breasted Grosbeak	Pheucticus ludovicianus	M	Rare
Black-headed Grosbeak	Pheucticus melanocephalus	S	Fairly Common
Spotted Towhee	Pipilo maculatus	M	Uncommon
Green-tailed Towhee	Pipilo chlorurus	S	Fairly Common
American Tree Sparrow	Spizella arborea	M	Uncommon
Field Sparrow	Spizella pusilla	W	Rare
Chipping Sparrow	Spizella passerina	S	Fairly common

Common Name	**Scientific Name**	**Occurrence Code**	**Abundance Code**
Brewer's Sparrow	Spizella breweri	M	Rare
Vesper Sparrow	Pooecetes gramineus	S	Uncommon
Lark Bunting	Calamospiza melanocorys	M	Rare
Fox Sparrow	Passerella iliaca	S	Fairly Common
Song Sparrow	Melospiza melodia	S	Fairly Common
Lincoln's Sparrow	Melospiza lincolnii	S	Fairly Common
White-throated Sparrow	Zonotrichia albicollis	W	Rare
White-crowned Sparrow	Zonotrichia leucophrys	S	Fairly Common
Dark-eyed Junco	Junco hyemalis	R	Common
Red-winged Blackbird	Agelaius phoeniceus	S	Fairly common
Brewer's Blackbird	Euphagus cyanocephalus	S	Fairly common
Common Grackle	Quiscalus quiscula	S	Uncommon
Brown-headed Cowbird	Molothrus ater	S	Common
Gray-crowned Rosy Finch	Leucosticte tephrocotis	W	Uncommon
Black Rosy Finch	Leucosticte atrata	W	Uncommon
Brown-capped Rosy Finch	Leucosticte australis	R	Uncommon
Pine Grosbeak	Pinicola enucleator	R	Fairly Common
Cassin's Finch	Carpodacus cassinii	R	Fairly Common
Red Crossbill	Loxia curvirostra	R	Fairly Common
Common Redpoll	Carduelis flammea	W	Rare
Pine Siskin	Carduelis pinus	R	Common
Lesser Goldfinch	Carduelis psaltria	M	Uncommon
American Goldfinch	Carduelis tristis	M	Uncommon
Evening Grosbeak	Coccothraustes vespertinus	R	Uncommon
MAMMALS			
Common Name	**Scientific Name**	**Occurrence Code**	**Abundance Code**
Masked Shrew	Sorex cinereus	R	Fairly Common
Merriam's Shrew	Sorex merriami	R	Very Rare
Montane Shrew	Sorex monticolus	R	Common
Dwarf Shrew	Sorex nanus	R	Unknown
Water Shrew	Sorex palustris	R	Uncommon
Western Small-footed Myotis	Myotis ciliolabrum	Rh	Common
Long-eared Myotis	Myotis evotis	Rh	Fairly Common
Little Brown Myotis	Myotis lucifugus	Rh	Common
Long-legged Myotis	Myotis volans	Rh	Fairly common
Hoary Bat	Lasiurus cinereus	Rh	Unknown
Silver-haired Bat	Lasionycteris noctivagans	Rh	Uncommon
Big Brown Bat	Eptesicus fuscus	Rh	Common
Towensend's Big-eared Bat	Plecotus townsendii	Rh	Rare

Common Name	**Scientific Name**	**Occurrence Code**	**Abundance Code**
American Pika	Ochotona princeps	R	Rare
Mountain Cottontail	Sylvilagus nuttallii	R	Abundant
Snowshoe Hare	Lepus americanus	R	Fairly Common
White-tailed Jackrabbit	Lepus townsendii	R	Rare
Least Chipmunk	Tamias minimus	Rh	Common
Uinta Chipmunk	Tamias umbrinus	Rh	Fairly Common
Yellow-bellied Marmot	Marmota flaviventris	Rh	Fairly Common
Wyoming Ground Squirrel	Spermophilus elegans	Rh	Common
Golden-mantled Ground Squirrel	Spermophilus lateralis	Rh	Fairly Common
Abert's Squirrel	Sciurus aberti	R	Rare
Fox Squirrel	Sciurus niger	R	Uncommon
Pine Squirrel	Tamiasciurus hudsonicus	R	Abundant
Northern Pocket Gopher	Thomomys talpoides	R	Abundant
American Beaver	Castor canadensis	R	Fairly Common
Deer Mouse	Peromyscus maniculatus	R	Abundant
Bushy-tailed Woodrat	Neotoma cinerea	R	Fairly Common
House Mouse	Mus musculus	R	Abundant
Southern Red-backed Vole	Clethrionomys gapperi	R	Fairly Common
Heather Vole	Phenacomys intermedius	R	Rare
Long-tailed Vole	Microtus longicaudus	R	Fairly Common
Montane Vole	Microtus montanus	R	Common
Meadow Vole	Microtus pennsylvanicus	R	Common
Common Muskrat	Ondatra zibethicus	R	Uncommon
Western Jumping Mouse	Zapus princeps	R	Unknown
Common Porcupine	Erethizon dorsatum	R	Uncommon
Coyote	Canis latrans	R	Common
Red Fox	Vulpes vulpes	R	Common
Gray Fox	Urocyon cinereoargenteus	R	Uncommon
Black Bear	Ursus americanus	Rh	Fairly Common
Raccoon	Procyon lotor	R	Common
American Marten	Martes americana	R	Uncommon
Ermine	Mustela erminea	R	Fairly Common
Long-tailed Weasel	Mustela frenata	R	Fairly Common
Mink	Mustela vison	R	Rare
Wolverine	Gulo gulo	R	Extirpated
American Badger	Taxidea taxus	M	Rare
Striped Skunk	Mephitis mephitis	Rh	Unknown
Northern River Otter	Lutra canadensis	R	Very Rare
Lynx	Lynx canadensis	R	Unknown

Common Name	**Scientific Name**	**Occurrence Code**	**Abundance Code**
Mountain Lion	Felis concolor	S	Fairly Common
Bobcat	Lynx rufus	R	Fairly Common
American Elk	Cervus elaphus	S	Common
Mule Deer	Odocoileus hemionus	S	Common
Moose	Alces alces	R	Fairly Common
Bighorn Sheep	Ovis canadensis	M	Rare
REPTILES			
Common Name	**Scientific Name**	**Occurrence Code**	**Abundance Code**
Smooth Green Snake	Liochlorophis vernalis	Rh	Rare
Gopher Snake	Pituophis catenifer	Rh	Rare
Western Terrestrial Garter Snake	Thamnophis elegans	Rh	Fairly common

OCCURRENCE CLASSIFICATION CRITERIA

The following are categories used to classify species occurrence in the Eldora area. They depict the normal season a species will be seen.

CATEGORY	DEFINITION
R	Resident species. Can be seen year-round.
Rh	Resident species, however during the winter may hibernate, be inactive or conduct a vertical migration to lower elevation during bad weather.
S	Present during the summer. This generally includes the breeding season and can extend from spring to fall.
W	Present during the winter.
M	Present during migration

SPECIES CLASSIFICATIONS FOR ABUNDANCE

The following are the abundance classes which will be used to categorize species abundance. These were developed by NDIS for county information. The categories have been tailored to the Eldora area. The categories are intended to be objective in the sense that specific numbers of individuals or groups are used to define the abundance class.

AMPHIBIANS

CATEGORY	DEFINITION
Common	10 or more individual adults or 4 or more breeding aggregations can usually be observed, and the species can usually be found in 75-100% of areas surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Fairly Common	5 to 10 individual adults or 2 to 3 breeding aggregations can usually be observed, and the species can usually be found in 50-75% of areas surveyed in a single day by standard techniques and in appropriate seasons and habitats.

AMPHIBIANS (continued)

Locally Common	10 or more individual adults or 4 or more breeding aggregations can usually be observed, and the species can usually be found in 0-33% of sites surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Sparsely Common	1 individual adult or 1 breeding aggregation can usually be observed in 67-100% of areas surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Uncommon	Fewer than 5 individual adults or at most 1 breeding aggregation can usually be observed, and the species can usually be found in less than 50% of areas surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Rare	Fewer than 5 individual adults or 1 to 2 breeding aggregations can usually be observed, and the species can usually be found in less than 50% of areas surveyed in a single season by standard techniques and in appropriate seasons and habitats.
Very Rare	Fewer than 10 records (including all historic records) for the state.
Extirpated	Known to have historically occurred, but known to no longer be present in a natural and free roaming condition.
Unknown	Cannot be placed in any of the abundance categories above due to lack of information.

BIRDS

CATEGORY	**DEFINITION**
Abundant	Observed daily; >100/day in appropriate season and habitat
Common	Observed daily; 25-100/day in appropriate season and habitat
Fairly Common	Observed daily; 10-25/day in appropriate season and habitat
Uncommon	Usually observed daily in appropriate season and habitat; 1-10/day OR species may be gregarious so that a large group may be observed at one time, but usually only 1-2 groups per day is observed.
Rare	Usually not observed daily in appropriate season and habitat; 1-5/day and 1-10/season OR species may be gregarious so that a large group may be observed at one time, but usually only 1 group is observed.

BIRDS (continued)

Very Rare	10-40 records (includes all historical records) for the state as a whole
Casual/Accidental	1-9 records (includes all historical records)
Extirpated	Known to have historically occurred, but known to no longer be present
Unknown	Known to occur, but can't be placed in any of the abundance categories above

MAMMALS

CATEGORY	DEFINITION
Abundant	Observed daily; >100/day in appropriate season and habitat OR the dominant species (in terms of number) collected by standard techniques in appropriate season and habitat
Common	Observed daily; 25-100/day in appropriate season and habitat OR one of the most common species collected by standard techniques in appropriate season and habitat
Fairly Common	Observed daily; 10-25/day in appropriate season and habitat OR expected to be collected daily in small numbers by standard techniques in appropriate season and habitat
Uncommon	Usually observed daily in appropriate season and habitat; 1-10/day OR species may be gregarious so that a large group may be observed at one time, but usually only 1-2 groups per day is observed OR usually collected daily in appropriate season and habitat
Rare	Usually not observed daily in appropriate season and habitat; 1-5/day and 1-10/season OR species may be gregarious so that a large group may be observed at one time, but usually only 1 group is observed OR usually not collected daily in appropriate season
Very Rare	10-40 records (includes all historical records) for the state as a whole
Casual/Accidental	1-9 records (includes all historical records) for the state as a whole
Extirpated	Known to have historically occurred, but known to no longer be present
Unknown	Known or Likely to occur, but can't be placed in any of the abundance categories above.

REPTILES

CATEGORY	DEFINITION
Common	10 or more individual adults can usually be observed, and the species can usually be found in 75-100% of areas surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Fairly Common	5 to 10 individual adults can usually be observed, and the species can usually be found in 50-75% of areas surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Locally Common	10 or more individual adults can usually be observed, and the species can usually be found in 0-33% of sites surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Sparsely Common	1 individual adult can usually be observed in 67-100% of areas surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Uncommon	Fewer than 5 individual adults can usually be observed, and the species can usually be found in less than 50% of areas surveyed in a single day by standard techniques and in appropriate seasons and habitats.
Rare	Fewer than 5 individual adults can usually be observed, and the species can usually be found in less than 50% of areas surveyed in a single season by standard techniques and in appropriate seasons and habitats.
Very Rare	Fewer than 10 records (including all historic records) for the state.
Extirpated	Known to have historically occurred, but known to no longer be present in a natural and free roaming condition.
Unknown	Can not be placed in any of the abundance categories above due to lack of information.

2-Dimensional Depiction of Amphibian and Reptile Abundance Classes

	0-33% of Sites	34-66% of Sites	67-100% of Sites
10 Individual/Sites	Locally Common	Fairly Common	Common
2-10 Individuals/Sites	Uncommon	Fairly Common	Fairly Common
1 Individual/Site	Rare	Uncommon	Sparsely Common

Note: Above table created by Hammerson (1999) to more easily depict Abundance Criteria.

APPENDIX 5.2
FEDERAL, STATE, COLORADO NATURAL HERITAGE PROGRAM, AND BOULDER COUNTY NATURE ASSOCIATION SPECIES STATUS CODE DEFINITIONS

Federal Status:

U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)

FE Listed Endangered: defined as a species, subspecies, or variety in danger of extinction throughout all or a significant portion of its range.

FT Listed Threatened: defined as a species, subspecies, or variety likely to become endangered in the foreseeable future throughout all or a significant portion of its range.

State Status:

The Colorado Division of Wildlife has developed categories of imperilment for nongame species (refer to the Colorado Division of Wildlife's Chapter 10 – Nongame Wildlife of the Wildlife Commission's regulations).

SE Endangered: those species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy, as determined by the Commission.

ST Threatened: those species or subspecies of native wildlife which, as determined by the Commission, are not in immediate jeopardy of extinction but are vulnerable because they exist in such small numbers, are so extremely restricted in their range, or are experiencing such low recruitment or survival that they may become extinct.

SC Special Concern: those species or subspecies of native wildlife that have been removed from the state threatened or endangered list within the last five years; are proposed for federal listing (or are a federal listing "candidate species") and are not already state listed; have experienced, based on the best available data, a downward trend in numbers or distribution lasting at least five years that may lead to an endangered or threatened status; or are otherwise determined to be vulnerable in Colorado.

Colorado Natural Heritage Program (CNHP) Imperilment Ranks

Global Rank (G): Based on the range-wide status of a species

G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction. (Critically endangered throughout its range).

G2 Imperiled globally because of rarity (6-20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).

G3 Vulnerable throughout its range or found locally in a restricted range (21-100 occurrences). (Threatened throughout its range).

G4 Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GX Presumed extinct.

G#? Indicates uncertainty about assigned global rank.

GU Unable to assign rank due to lack of available information.

GQ Indicates uncertainty about taxonomic status.

G#T# Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.

State Rank (S): Based on the status of a species in an individual state. S ranks may differ between states based on the relative abundance of a species in each state.

S1 Critically imperiled in state because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extirpation from the state. (Critically endangered in state).

S2 Imperiled in state because of rarity (6-20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered throughout its range).

S3 Rare in state (21 to 100 occurrences).

S#B Refers to the breeding season imperilment of elements that are not permanent residents.

S#N Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding population, a rank of SZN is used.

SZ Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.

SH Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when no inventory has been attempted recently.

SX Presumed extirpated from state.

S#? Indicates uncertainty about an assigned state rank.

SU Unable to assign rarity rank, often because of low search effort or cryptic nature of the element.

SA Accidental in the state.

SR Reported to occur in the state, but unverified.

S? Unranked; some evidence that species may be imperiled, but awaiting formal rarity ranking.

Note: Where two numbers appear in a state or global rank (for example, S2S3), the actual rank of the element falls between the two numbers.

Boulder County Nature Association (BCNA) Avian Species of Special Concern

BCNA maintains a list of species for Boulder County that are rare, appear to be declining and/or are restricted in distribution to a few locations or habitats. Rarity is defined as three or fewer known sites. The list generally focuses on breeding status.

Categories:

1. Rare and Declining: three or fewer known nesting sites or wintering locations, and evidence of long-term non-cyclical decline.

2. Declining (but not yet rare): Evidence of long-term non-cyclical decline.

3. Rare: three or fewer known nesting sites or wintering locations.

4. Isolated or Restricted Populations: Species that are found only at certain locations and/or have narrow habitat niches.

5. Needs Research: Species needing more local research to more fully determine the appropriate category.

6. Extirpated: Species no longer found in Boulder County.

APPENDIX 5.3

COLORADO NATURAL HERITAGE PROGRAM

POTENTIAL CONSERVATION AREA REPORTS

Explanation: The following two reports are excerpted from *Survey of Critical Biological Resources in Boulder County, Colorado 2007-2008* (Neid *et al*. 2009). They cover Lost Lake South PCA and Peterson Lake PCA.

Peterson Lake

Biodiversity Rank - B5: General Biodiversity Interest
Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years
Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Nederland

Size: 566 acres (229 ha) **Elevation:** 8,600 - 9,600 ft. (2,621 - 2,926 m)

General Description: The site is a wetland complex within the subalpine zone on the east slope of the Front Range. It contains Peterson Lake, Lake Eldora and nearby associated wetlands which support the Rocky Mountain capshell (*Acroloxus coloradensis*) as well as the broad-leaved twayblade (*Listera convallarioides*). Historical occurrences of the sharp sprite (*Promenetus exacuous*) and the umbilicate sprite (*Promenetus umbilicatellus*) were documented in the 1960s.

Biodiversity Significance Rank Comments (B5): This site supports a poor (D-ranked) occurrence of the globally vulnerable (G3/S1) Rocky Mountain capshell (*Acroloxus coloradensis*) and an unranked occurrence of the state rare (G5/S2) broad-leaved twayblade (*Listera convallarioides*). Historical occurrences of the state rare (G5/S2) sharp sprite (*Promenetus exacuous*) and the state rare (G4/S3) umbilicate sprite (*Promenetus umbilicatellus*) were documented in the 1960s, but current field surveys are needed to verify the existence of these populations.

Natural Heritage element occurrences at the Peterson Lake PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Mollusks	Acroloxus coloradensis	Rocky Mountain Capshell	G3	S1		SC	USFS	D	1993-06-99
Vascular Plants	Listera convallarioides	broad - leaved twayblade	G5	S2					1993-08-29

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary includes the entire wetland complex and a narrow terrestrial buffer. Some ecological processes that support this site originate outside of the boundary.

Protection Urgency Rank Comments (P3): A large portion of the site, and all of the element occurrences, are on private land that could be developed. One of the large gravel parking areas at Eldora Ski Area is within the site, while all of the parking and base developments drain into Peterson Lake. Water-bourne pollutants from these areas certainly enter the lake. Most of the mining claims on the north side of the site have been acquired by the county, while other lands on Spencer Mountain are managed by the U.S. Forest Service.

Management Urgency Rank Comments (M3): There is an access road through the site; use is heavy in winter, with moderate (bike use) in summer. Effects of any cattle grazing in the area should be determined.

Information Needs: Specimens of two state rare mollusks, sharp sprite (*Promenetus exacuous*) and umbilicate sprite (*Promenetus umbilicatellus*), were collected in the 1960s. Further field work could locate current populations.

References

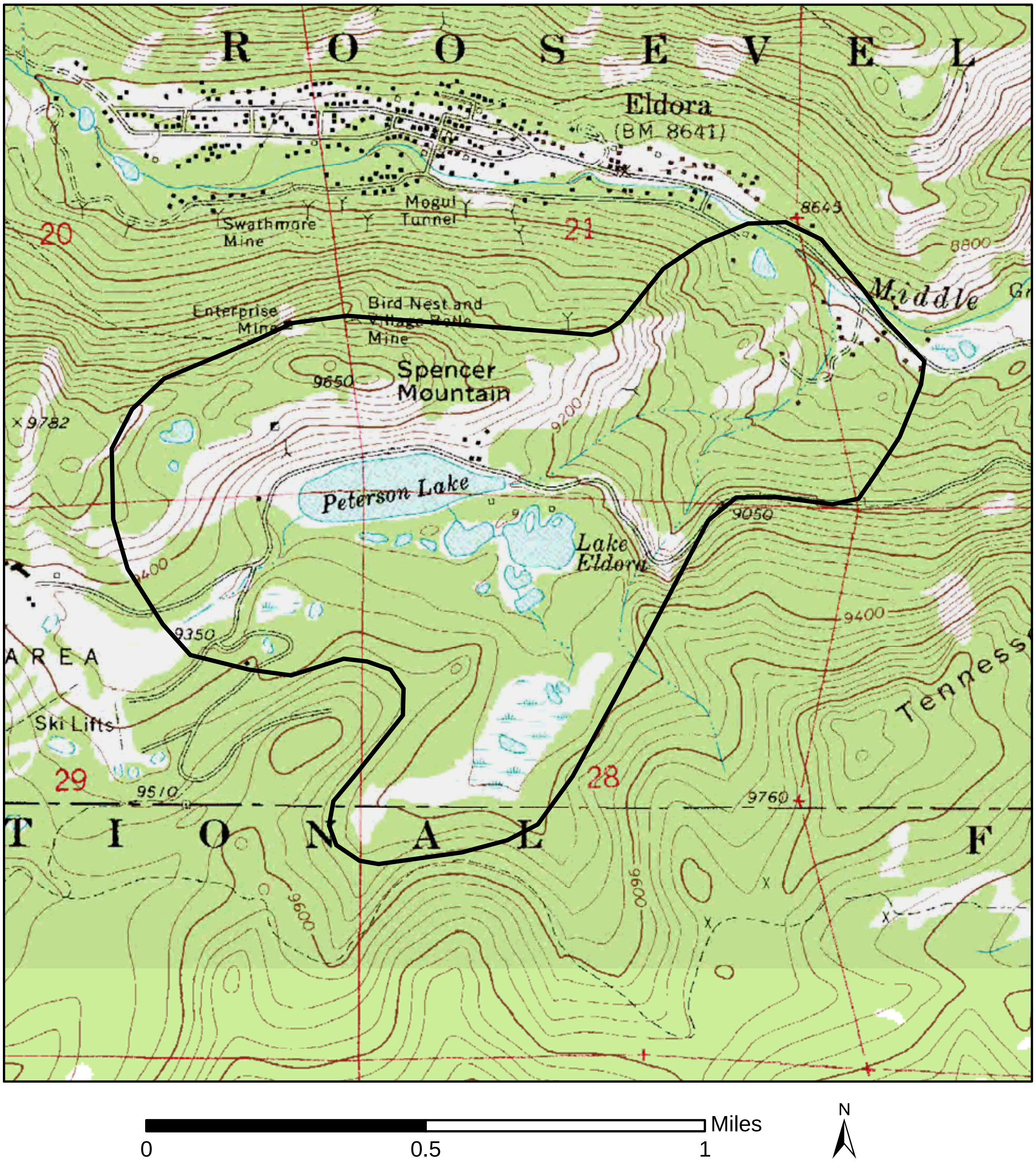
Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

PIONEER ENVIRONMENTAL SERVICES INC. 1993. BIOLOGICAL ASSESSMENT, PROPOSED IMPROVEMENTS AT ELDORA MOUNTAIN RESORT. PREPARED FOR USFS, ROOSEVELT NF, BOULDER RD.

Pioneer Environmental Services, Inc. 1993. Results of survey for the Rocky Mountain Capshell Snail in Colorado alpine lakes.

Version Author: Siemers, J. L.

Version Date: 10/28/2008



Colorado Natural Heritage Program
Colorado State University
254 General Services Building
8002 Campus Delivery
Fort Collins, CO 80523-8002

Ph (970) 491-1309
Fax (970) 491-3349
www.cnhp.colostate.edu

Map Date: 10/28/2008

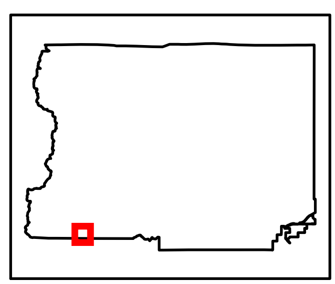
Legend

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Peterson Lake Potential Conservation Area, B5: General Biodiversity Interest

Lost Lake South

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P?: Unknown

Management Urgency Rank - M?: Unknown

U.S.G.S. 7.5-minute quadrangles: Nederland

Size: 99 acres (40 ha) **Elevation:** 9,680 - 10,200 ft. (2,950 - 3,109 m)

General Description: The site surrounds a moderate-sized subalpine lake at the edge of the Indian Peaks Wilderness Area that contains a population of the Rocky Mountain capshell (*Acroloxus coloradensis*) and a historical breeding record of the boreal toad (*Bufo boreas*). Boreal toads were last documented breeding at this site in 1998.

Biodiversity Significance Rank Comments (B3): This site contains a good (B-ranked) occurrence of the globally vulnerable (G3/S1) Rocky Mountain capshell (*Acroloxus coloradensis*).

Natural Heritage element occurrences at the Lost Lake South PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Mollusks	Acroloxus coloradensis	Rocky Mountain Capshell	G3	S1		SC	USFS	B	1993-07-20

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary includes the lake and approximately 300 meter buffer to protect local processes.

Protection Urgency Rank Comments (P?): Insufficient data to rank.

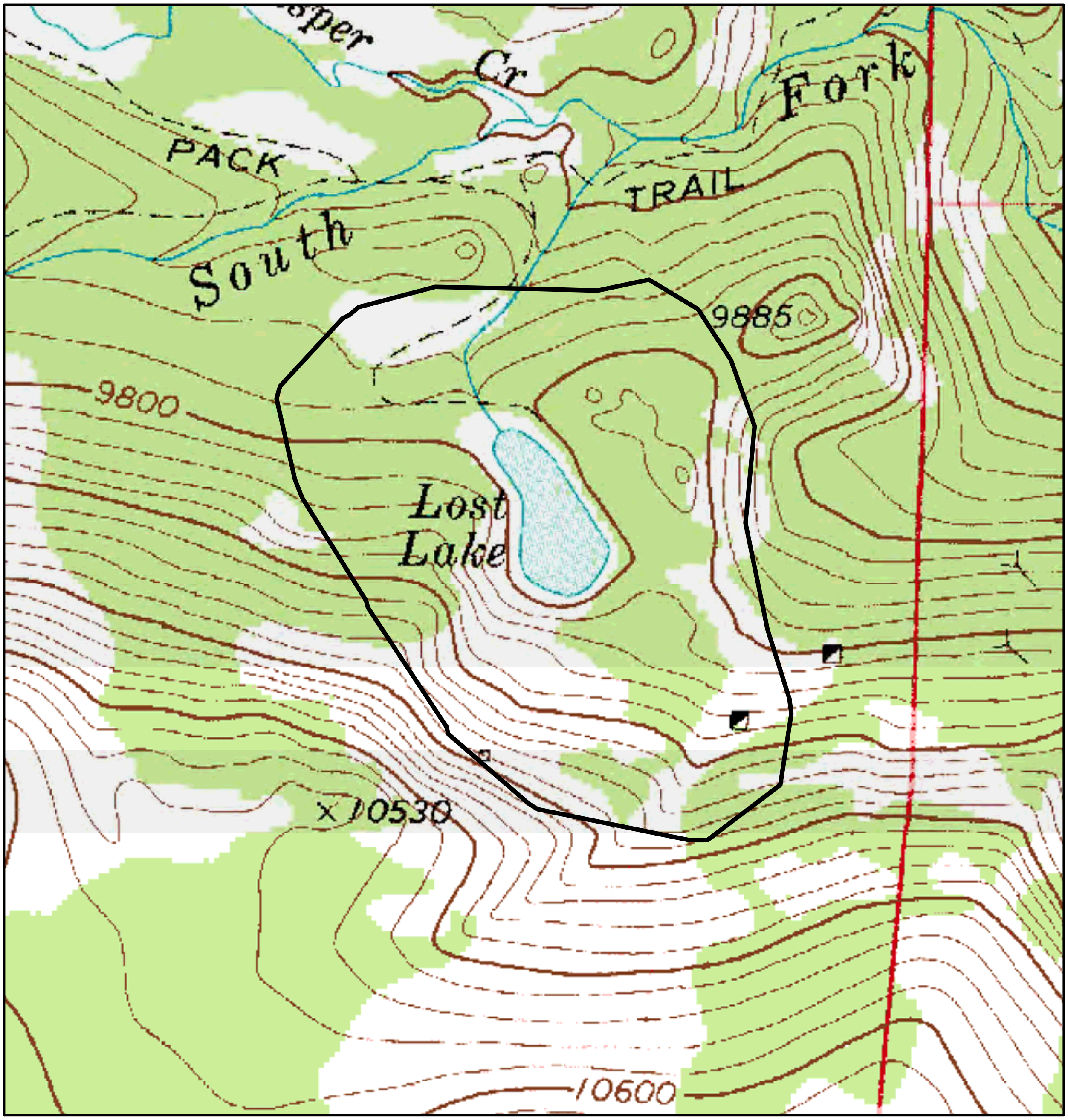
Management Urgency Rank Comments (M?): Insufficient data to rank.

References

Neid, S., J. Lemly, K. Decker and D. Culver. 2009. Final Report: Survey of Critical Biological Resources in Boulder County 2007-2008. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Seimers, J.L.

Version Date: 10/31/2008



0 0.25 0.5 Miles

N

Colorado Natural Heritage Program
Colorado State University
254 General Services Building
8002 Campus Delivery
Fort Collins, CO 80523-8002

Ph (970) 491-1309
Fax (970) 491-3349
www.cnhp.colostate.edu

Map Date: 10/29/2008

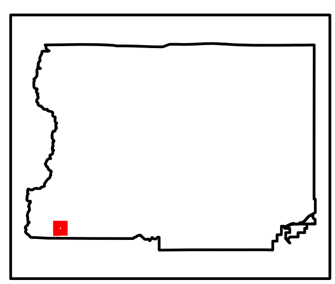
Legend

PCA Boundary

Nederland, 39105-H5

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Boulder County



Lost Lake South Potential Conservation Area, B3: High Biodiversity Significance

APPENDIX 5.4

List of Contact People

Name, Affiliation, Address	Field of Expertise
Dave Armstrong EPO Biology Dept., University of Colorado 303-492-7965 David.armstrong@colorado.edu	Mammals of Colorado
Bev Baker US Forest Service, Boulder District 2140 Yarmouth St. Boulder, CO 80301 303-444-6600 bbaker@fs.fed.us	Biologist
Colorado Bat Society 2525 Arapahoe Ave. Boulder, CO 80302 Rick Adams, President http://www.coloradobats.org	Bat biology
Colorado Division of Wildlife:	
Claire Sechrist 303-422-1794 claire.sechrist@state.co.us	District Wildlife Manager
Kristin Cannon 303-877-6094 kristin.cannon@state.co.us	District Wildlife Manager
Ben Swigle 970-472-4364 ben.swigle@state.co.us	Aquatic Area Biologist
Sherri Huwer 970-472-4466 sherri.huwer@state.co.us	Area 2 Terrestrial Biologist

Colorado Natural Heritage Program Colorado State University 254 General Services Building 1474 Campus Delivery Fort Collins, CO 80523 970-491-1309 CNHP@colostate.edu http://www.cnhp.colostate.edu/	Status of rare animals
Dave Hallock Earthwork Conservation Planning LLC 2478 Eldora Rd, Nederland, 80466 303-258-3672 eldoradh@rmi.net	Wildlife Conservation planning
Dave Hoerath Boulder County Parks and Open Space Dept. 5201 St. Vrain Road Longmont, CO 80503 303-678-6204 dhoerath@bouldercounty.org	Wildlife specialist Large mammals and fish
Lauren Livo 1215 S. Osceola St., Denver, CO 80215 303-936-0440 ljlivo@aol.com	Amphibian/reptile biologist
Susan Spaulding Boulder County Parks and Open Space Dept. 5201 St. Vrain Road Longmont, CO 80503 303-678-6292 sspaulding@bouldercounty.org	Senior Wildlife Specialist Birds
Rick Thompson Western Ecosystems, Inc. 905 West Coach Rd., Boulder, CO 80302 303-442-6144	Wildlife biologist
U.S. Fish & Wildlife Service Colorado Ecological Services Field Office 134 Union Blvd., Suite 670 Lakewood, CO 80228 303-236-4773 http://www.fws.gov/mountain-prairie/endspp/	Endangered species

APPENDIX 6

CULTURAL

APPENDIX 6.1

NATIONAL REGISTER OF HISTORIC PLACES

REGISTRATION FORM FOR ELDORA HISTORIC DISTRICT, 1989

[redacted]

NPS Form 10-900
(Rev. 8/86)
NPS/CHS Word Processor Format
(Approved 03/88)

OMB No. 1024-0018

NR listing
10/4/89

United States Department of the Interior
National Park Service

**NATIONAL REGISTER OF HISTORIC PLACES
REGISTRATION FORM**

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable". For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries. Use letter quality printers in 12 pitch. Use only 25% or greater cotton content bond paper.

1. Name of Property

historic name: Happy Valley / Eldorado Camp
other names/site number: Eldora Historic District 5BL.758

2. Location

street & number: Huron, Washington, Klonkyke, Eldora (NA) not for publication
city, town: Eldora (x) vicinity Boulder
state: Colorado code: CO county: Boulder code:013 zip code:80302

3. Classification

Ownership of Property	Category of Property	No. of Resources within Property		
		contributing	noncontributing	
(x) private	( ) building(s)	55	12	buildings
( ) public-local	(x) district			sites
( ) public-State	( ) site			structures
( ) public-Federal	( ) structure			objects
	( ) object	55	12	Total

Name of related multiple property listing:

Metal Mining and Tourist Era Resources of Boulder County

No. of contributing resources previously listed in the National Register 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this (x) nomination ( ) request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property (x) meets ( ) does not meet the National Register criteria. ( ) See continuation sheet.

Barbara Sudler ______ 6-15-89
Signature of certifying official ______ Date

State Historic Preservation Officer, Colorado Historical Society
State or Federal agency and bureau

In my opinion, the property ( ) meets ( ) does not meet the National Register criteria. ( ) See continuation sheet.

______ ______
Signature of Commenting or Other Official ______ Date

______
State or Federal Agency and Bureau

5. National Park Service Certification

I, hereby, certify that this property is:

( ) entered in the National Register.
( ) See continuation sheet ______ ______

( ) determined eligible for the National Register. ( ) See continuation sheet ______ ______

( ) determined not eligible for the National Register. ______ ______

( ) removed from the National Register. ______ ______

( ) other, (explain:) ______
______

Signature of the Keeper ______ Date of Action

6. Functions or Use

Historic Functions (enter categories from instructions)	Current Functions (enter categories from instructions)
DOMESTIC DWELLING / camp	DOMESTIC DWELLING / camp
COMMERCE / restaurant	DOMESTIC DWELLING / hotel
DOMESTIC DWELLING / hotel	COMMERCE / restaurant
COMMERCE / restaurant	

7. Description

Architectural Classification (enter categories from instructions)	Materials (enter categories from instructions)	
	foundations	Stone
Late 19th and Early 20th Century	walls	Wood / Log
American Movements		
Other: Rustic Tourist	roof	Asphalt / Wood
Vernacular Commercial	other	
Pioneer Log		

Describe present and historic physical appearance.

The Eldora Historic District is a significant collection of late nineteenth and early twentieth-century Log and Rustic Tourist buildings located in the heart of Eldora, a small former mining town in western Boulder County, Colorado. The district consists primarily of dwellings constructed for its early mining population and later adapted for the vacationers who came on a seasonal basis. Additionally, the district contains several turn-of-the century vernacular Commercial Buildings from the mining era and a significant amount of open space, a distinctive component of the district's rural character. The district and most of its historic buildings possess integrity of location, design, materials, workmanship and setting. The minimal changes to the buildings and their surroundings make the Eldora Historic District one of the most intact historic mining communities that exist in Boulder County. Eldora is located in a glacial valley drained by the Middle Boulder Creek, approximately nine miles from the Continental Divide in the Colorado Rockies and twenty-two miles from the metropolitan area of Boulder. The valley is less than a mile in width and is surrounded by mountains that rise to over 11,000 feet above sea level. Eldora's elevation is about 8,600 feet. The built-up area of the unincorporated town consists of several hundred buildings. This development is located on both the level land adjacent to the creek and the hillsides and steep slopes of the surrounding mountains. The townsite and the surrounding land contain a mix of open fields and wooded areas. The mountainsides are covered with stands of pines and spruce, interspersed with cliffs and rocky outcrops.

The Eldora Historic District contains 67 buildings, located between the 400 and 1000 blocks of Huron, Washington, Klondyke, and Edorado Avenues and Eaton Place in the central and northern portions of the original townsite. The

(x) See continuation sheet

district boundaries were drawn to include the early commercial core of the historic mining community as well as the best intact residential buildings from its 1878 to 1935 period of significance.

Eldora is sparsely developed. The original townsite, which was platted in 1897, was extended along its northern boundary with the small Ben Hur Addition. The town's buildings are scattered throughout the platted area, with a minor concentration of structures between 4th and 10th Street. The buildings are situated on sites of varying sizes, their arrangement related to landform and views rather than street orientation. Fencing is limited and most blocks contain large tracts of vacant lands. Roads are unpaved and there are no sidewalks or street lighting. Due to these conditions, which have remained virtually unchanged since the town's early development, plus the natural vegetation and open space of the town's setting, Eldora and the district has a character that is distinctly rural.

Building within Eldora is not limited to a single period. Instead, the community contains structures from all periods of its history with no discernible geographic concentrations related to age or style of building. This distinctive feature of Eldora's character is typical of the building that occurred in communities throughout Boulder County. It reflects the scattered nature of the early development of most mining settlements as well as the replacement and infill construction which took place in subsequent years. The Eldora Historic District illustrates this important pattern by including a range of buildings from 1878 to 1935.

Settlement Period

The oldest building in the Eldora Historic District, the pioneer log dwelling at 601 Washington, dates from 1878. During this decade, strikes in the neighboring communities of Caribou, Gold Hill, and others brought a variety of prospecting parties and placer operations to the Middle Boulder Valley. Like other areas of the county, the development associated with the initial settlement of Eldora was limited and crude. Tents and rudimentary log structures served as the buildings for the camp. Little of permanence was constructed during this period and even less remains.

Mining Era

Eldorado grew slowly during the 1870s and 1880s, but building activity and development picked up in the 1890s when numerous mining operations were started on Spencer, Eldorado, Tennessee and Ute Mountains. In 1897, with a population of

300, the town of Eldora was platted. By 1898, due to the promotion and exaggerated claims about the mineral values within the area, the town's population had escalated to 1300.

Vernacular Commercial Buildings

To accommodate the growth, several dozen commercial buildings were hastily constructed. This construction used logs as well as sawn lumber from several sawmills that operated within five miles of the growing community. To give Eldora a semblance of permanence, false fronts were attached to many of the commercial buildings erected during this time. The Gold Miner Hotel, a prominent business and building constructed in 1897, still retains its hewn log sidewalls and clapboard front.

Pioneer Log Dwellings

On the streets to the north and south of the commercial center which developed along Eldorado Avenue numerous log dwellings were built to meet the turn-of-the-century demand for housing. These dwelling were quite simple in their form and appearance. They also were quite small. Within the historic district the size of intact buildings from this period ranges from about 200 to 800 square feet. For the most part, the houses were constructed with a single story, a rectangular shape, and a low pitched gable roof. Indicative of the limited skills that were available for local construction, even at this time, vertical boards were installed on the corners of many of the houses to cover the inadequacies of the corner notching of the logs. Like other 1800s log construction, a variety of non-permanent materials were used to fill the spaces between the logs. Additionally, Eldora homes of this period usually lacked foundations, plumbing, and non-essential architectural features or ornamentation.1 Many of these early log houses remain intact and provide an excellent illustration of the features of the Pioneer Log property type. The most common alterations are log additions and front porches, which in most cases do not detract from the original integrity.

Rustic Tourist Dwellings

Early twentieth century construction in Eldora was influenced by the shift to a tourist economy, the construction of the railroads, and the popularity of the automobile. With the collapse of the local mining industry and a disastrous fire in 1899 that destroyed 70,000 acres of timber on the nearby mountainsides, building came to a standstill in Eldora. Growth, however, was briefly stimulated again with the completion of the railroad line to Eldora in 1905. To meet the demand for accommodations for tourist who were brought to the area on rail excursions, approximately twenty-five new buildings were added to the community during the next five years. Similar to the Pioneer Log Dwellings in materials and plan, these tourist cabins were quite small, ranging in size from 400 to 800 square feet.

By the 1920s, tourism had become firmly established as the economic base for Eldora. The popularity of motoring vacations brought a substantial number of people to the mountain community during the summer months and many bought land for weekend dwellings. Reflecting the seasonal influx of visitors, approximately two dozed vacation homes were constructed in Eldora during the period 1920 to 1935. Most of these dwellings were somewhat larger in size than those built in the teens and twenties, which is reflected in the building size from approximately 400 to 1200 square feet. Though indicative of their seasonal use, the majority of these buildings also lacked bathrooms at the time of their construction. This group provides many excellent examples of the Rustic Tourist Dwelling property type.

The Rustic Tourist Dwelling is similar in plan, size and materials to the Pioneer Log Dwelling. These similarities are the reason for the cohesive appearance of the Eldora Historic District. Initially, most dwellings of this period are constructed with a rectangular plan, one story high with gabled roofs. Log is the predominant material. Field stone and occasionally brick is used for chimneys. Foundations are stone or non-existent. Roofs, originally covered with corrugated metal, wood shingle, or tar paper, now usually have composition shingles. Millwaste is probably the most common material used for tourist dwelling built in the early 1900s. Millwaste was also used for the construction of additions, to enclose porches or for residing log walls.

Milled lumber is much less common for seasonal dwellings in Eldora. There are only two in the district. Usually the lumber was finished with a rough texture and left unpainted so that it weathered to resemble the other rustic materials. One of these Eldora buildings has a vertical board and batten pattern and the other has simple horizontal lapped siding.

Porches are a prominent feature of the Rustic Tourist Dwelling and they distinguish the Rustic Tourist from the Pioneer Log Dwelling which is usually porchless. Initially these porches were open then, later, low walls and screens or windows were added. Other alterations which occurred to this building type are one or more small shed roofed additions faced with matching materials for bathrooms, kitchens, and bedrooms.

The Eldora Historic District is included in the Metal Mining and Tourist Era Resources of Boulder County Multiple Property National Register Nomination because it illustrates the historic building types that developed in the mountain communities in association with the mining and tourist industries. The significant resources within the district are Pioneer Log Dwellings and Rustic Tourist Dwellings and Vernacular Commercial Buildings as described in Section F. Associated Property Types. The following list provides specific information for each building within the district that was constructed during the district's period of significance, its property type or subtype, its date of construction, and the predominant building material. There are a total of 66 buildings in the Eldora Historic District. There are 55 or 82% contributing buildings and 12 or 18% noncontributing. Of the 12 noncontributing, 7 have suffered a loss of integrity through extreme alterations and additions and 5 are less than 50 years old.

CONTRIBUTING BUILDINGS

PIONEER LOG DWELLING

425 Huron - 1899 758.46
445 Huron - 1899 758.48
585 Huron - 1899 758.50
598 Huron - 1900 758.62
601 Huron - 1899 758.7

535 Washington - 1901 ?
545 Washington - 1901 758.54
601 Washington - 1878 (on the map it appears as though this address is on Pennslyvania, however Pennslyvania was never realized at this address) 758.56

599 Klondyke - 1900 758.35
675 Klondyke - 1900 758.17
685 Klondyke - 1899 758.18
702 Klondyke - 1898 758.22
715 Klondyke - 1893 758.23
725 Klondyke - 1893 758.63
785 Klondyke - 1900 758.25
965 Klondyke - 1899 758.34

602 Eldorado - 1901 ?
666 Eldorado - 1899 758.51

VERNACULAR COMMERCIAL BUILDING

601 Klondyke - 1897 (Log with Clapboard Facade) 758.2
602 Klondyke - 1900 (Millwaste) 758.11

599 Eldorado - 1900 (Log with False Front) 758.44
601 Eldorado - 1905 (Log and Millwaste) 758.64

RUSTIC TOURIST DWELLING (MILLED LUMBER)

501 Washington - 1909 (Lapped Siding) 758.65
585 Klondyke - 1905 (Board and Batten) 758.10

RUSTIC TOURIST DWELLING (LOG AND MILLWASTE)

501 Huron - 1910 (Log) 758.49
525 Huron - 1905 (Log) 758.66
599 Huron - 1919 (Log) 758.52

551 Washington - 1905 (Log) 758.58
620 Washington - 1932 (Log) 758.67
645 Washington - 1920 (Log) 758.68

565 Klondyke - 1920 (Log) 758.9
603 Klondyke - 1909 (Log) 758.12
605 Klondyke - 1909 (Log) 758.13
606 Klondyke - 1920 (Log) 758.14
680 Klondyke - 1919 (Log) 758.69
699 Klondyke - 1920 (Log) 758.20
701 Klondyke - 1909 (Log) 758.21
745 Klondyke - 1919 (Log) 758.24
759 Klondyke - 1929 (Log) 758.70
765 Klondyke - 1929 (Log) 758.71
775 Klondyke - 1929 (Board and Batten) 758.72
881 Klondyke - 1909 (Shingle) 758.26
885 Klondyke - Date Unknown (Board and Batten) 758.27
905 Klondyke - (Millwaste) 758.29
925 Klondyke - (Millwaste) 758.30
945 Klondyke - (Millwaste) 758.31

644 Eldorado - 1934 (Log) 758.73
698 Eldorado - 1922 (Log) 758.74

190 N. 8th - (Log)

765 Eaton Place - 1924 (Millwaste) 758.76
775 Eaton Place - 1909 (Board and Batten) 758.36
803 Eaton Place - 1909 (Millwaste) 758.40
815 Eaton Place - 1909 (Log) 758.41
821 Eaton Place - Date Unknown (Board and Batten) 758.42
825 Eaton Place - Date Unknown (Shingle) 758.43

NPS Form 10-900a
(Rev. 8/86)
NPS/CHS Word Processor Format
(Approved 03/88)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACE
CONTINUATION SHEET

Section number 7 Page 8

Eldora Historic District

NON CONTRIBUTING BUILDINGS

ALTERED

566 Washington - 1914 758.55
585 Washington - 1914 758.[illegible]
611 Washington - 1924 758.77

608 Klondyke - 1899 758.15
624 Klondyke - 1909 758 16
689 Klondyke - 1924 758 ——— ?
750 Klondyke - 1924 758.78

LESS THAN FIFTY YEARS

525 Washington - 1950 758.79

555 Huron - 1955 758.80

710 Klondyke - 1939 758.61
770 Klondyke - 1941 758.81
795 Klondyke - 1950 758.82

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties: ( ) nationally ( ) statewide (X) locally

Applicable National Register Criteria (x) A ( ) B (x) C ( ) D
Criteria Considerations (Exceptions) ( ) A ( ) B ( ) C ( ) D ( ) E ( ) F ( ) G

Areas of Significance (enter categories from instructions)	Period of Significance	Significant Dates
ARCHITECTURE		1893
EXPLORATION AND SETTLEMENT	1878 - 1910	1897;1898
ENTERTAINMENT AND RECREATION	1900 - 1935	

Cultural Affiliation
N/A

Significant Person
N/A

Architect/Builder
Multiple - Unknown

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The Eldora Historic District meets criteria C for its architectural and historical examples of the Pioneer Log, Commercial Vernacular, and Rustic Tourist building traditions of the mountain region of Boulder County. Additionally, the district is significant under criteria A because its history and physical plan provide evidence of the pattern of settlement and community development from 1878 to 1935 that was associated with the growth and decline of the region's metal mining industry and the spread of tourism during the late nineteenth and early twentieth centuries.

The Eldora Historic District is being nominated as part of the Multiple Property nomination of Metal Mining and Tourist Era Resources of Boulder County. The district contains a number of the associated building types described in the nomination overview - Vernacular Domestic Dwellings subtype, Pioneer Log, Vernacular Commercial Buildings, and Rustic Tourist Dwellings. The associated building types found in the district meet the registration requirements of the Multiple Property nomination. The history of this historic district is part of the Multiple Property's associated historic context, Early Settlement and Community Development in the Mountain Region of Boulder County, 1858 - 1910 and Tourism and Recreation in Boulder County's Mountain Region, 1900 - 1935.

Eldora is typical of the communities that grew up in Boulder County in the latter stages of the state's industrial metal mining development. During the last decades of the 1800s, hundreds of settlements were established in the mountain regions of Colorado in hopes that the earlier rich strikes of Central City, Gold Hill, Caribou, and Leadville would be repeated. While many towns were started, few survived and even fewer prospered. Eldora is historically significant because it represents the less fortunate communities associated

(x) See continuation sheet

with metal mining. Its settlement and early growth was related to speculation, rather than actual mineral production. As such, Eldora is a valuable example of the range of community development that occurred with the spread of precious metal mining.

The early discovery of gold at Gold Hill in 1859 followed by subsequent strikes in its vicinity brought a steady flow of prospectors to Boulder County during the last decades of the nineteenth century. As a result of this activity, several claims and placer operations were established in the upper region of the Middle Boulder Valley during the 1870s and 1880s. Settlement did not occur, however, until the 1890s when gold tellurides and gold sulfides were discovered on Spencer Mountain. Beginning in the summer of 1892 dozens of claims were staked in the area and a camp was established to serve the growing mining population. Originally, the settlement took its name from the valley, known as the Happy Valley after an early placer claim owned by John Kemp. Kemp worked in the mining operations of Central City and initially visited the area on a hunting trip in 1883. Mr. Kemp was one of the first to explore the mining opportunities of the valley seriously. He also guided much of the early mining and community development of Eldora. The Kemp home, constructed in 1893, was the settlement's second permanent building. The simple dwelling, a two story log cabin with a log workshop behind it, still stands today at 715-25 Klondyke and is included in the historic district to represent this period of settlement.

During the 1890s, hydraulic mining was conducted along the Middle Boulder Valley Creek and its North Fork and surface digging occurred along the mountainsides. This mining produced little more than occasional nuggets of gold or small ore veins of varying quality. Nonetheless, the population of the settlement slowly grew as the similarities between the ores of Cripple Creek and Eldora were touted and the possibilities for a rich strike continued to entice prospectors to the area. By 1897, with a population of several hundred, a post office was established for the camp. Then called the Eldorado Camp, the name was shortened to Eldora because of the mail service confusion with a camp in California with the same name. That same year saw the formal organization of the town and the creation of a governing body to replace the club of businessmen who initially managed the affairs of the settlement.

The development of Eldora was undertaken by the Happy Valley Company, as title to the land was part of Kemp's original placer claim. The company laid out the townsite, platted the lots and incorporated the town in March of 1898. Citizens were appointed to conduct the business of the community and organize into committees for finance, roads and bridges, mining, and town affairs. With the formal organization of the settlement, some residents turned from mining to the active promotion of the town, recognizing the potential for gain that real estate speculation represented within a boom town. As part of that promotion, exaggerated claims as to the area's mineral wealth were used to lure settlers and investors to Eldora. Pamphlets, brochures, newspaper articles, and mining prospectuses boasted of Eldora's amenities; the innovative technologies employed in its local mining operations, such as the Mogul Tunnel, and the riches that would be forthcoming. Sporadic strikes briefly sustained the optimism for the area, as did many unscrupulous practices that falsified or overrated the value of recovered ore. Eldora's population quickly grew and buildings sprang up in anticipation of the boom that was to come. Unfortunately, this wealth never materialized. After depleting the surface deposits, the ores of the Eldora mines proved to be low-grade and too expensive to refine and transport profitably. As a consequence, Eldora's boom subsided as quickly as it had begun and most of its mining operations ceased during the first years of the 1900s. Because of this, the period of significance for Exploration and Settlement has been ended at 1910.

The development of the mountain region of Boulder County was greatly influenced by the spread of the tourist frontier during the late nineteenth and early twentieth century. In the late 1800s, vacation travel, which combined prospecting with other outdoor pursuits, brought hundreds of people to the area. Many of these early visitors returned to settle in the mining towns of the region. The importance of tourism grew in the twentieth century as the mining economy declined and local residents began to search for alternate livelihoods. The tourist potential represented by the mountain location, the relatively short distances to population centers, the availability of transportation, and the distinctive natural and man-made features of the mining settlements did not go unnoticed by the entrepreneurs and merchants who lived in the region. Consequently, during the 1900s, the economies of many of the metal mining communities shifted to tourism.

During the twentieth century, Eldora, like other metal mining communities, turned to tourism to support its economy. Prior to the development of the local mining activities, the Middle Boulder Valley had been a popular recreation spot for residents of nearby communities such as Central City, Boulder, and Rollinsville. During the period of active mining, the scenic mountain location and the first-class commercial establishments, like the Gold Miner Hotel, continued to attract visitors to the area. The major impetus for the development of the local tourist industry, however, was the establishment of the railroad service to Eldora in 1905. Ironically, the extension of the Colorado and Northwestern Railroad line had been planned and constructed to serve the area's mines. Although it arrived too late to be of any benefit in this respect, the railroad did link Eldora with the growing tourist markets of the nation. The resulting influx of vacationing travellers sustained the community's businesses as Eldora's population decreased rapidly during the first decade of the twentieth century. The economic support provided by the tourism during this time allowed construction to occur despite the decline of the mining operations. During the period 1905 to 1910, several dozen dwellings were built in Eldora. These cabins were perfect for mountain retreats for owners and renters because of their small size and their log construction.

Although it was not quite as short-lived as Eldora's mining boom, the economic support provided by railroad tourism proved to be relatively brief. Even before service began to Eldora, the Colorado and Northwestern Railroad was in financial trouble. It went bankrupt in 1909 as the traffic generated by the rail excursions and the dwindling production of the local mining industry was not sufficient to cover the costs of its operations. Resurrected as the Denver, Boulder, and Western Railway, its vitality was further weakened during the next decade by the popularity of the automobile. A flood destroyed the railroad line in 1919, and it was never rebuilt.

Fortunately for Eldora, the years following World War I brought many improvements for Colorado's mountain highway system and a rapid rise of motoring vacations. The improved roadways reduced the community's isolation and increased the seasonal flow of visitors and cabin owners to the area. The 1920s and early 1930s saw a record number of tourists come to Colorado's mountain region. Eldora's popularity during this period is evidenced by the construction that occurred with two dozen seasonal homes added to the community during this time.

The Depression, followed by gas rationing during World War II curtailed automobile tourism and Eldora's vitality, once again, suffered. By the mid-twentieth century, Eldora was a quiescent community, its population reduced to a handful because of its erratic economic fortunes. Many of its early buildings were gone, dismantled or destroyed through lack of use. Never-the-less, Eldora has architectural significance because the remaining buildings in the community are a testimony to the influence of metal mining and tourism in the development of the mountain region of Boulder County. Unchanged by modern development, Eldora provides physical evidence of the historic settlement patterns, growth, and decline. Individually, and as a collection, the buildings of the Eldora Historic District exemplify the features that distinguish the Pioneer Log Cabin, Rustic Tourist Dwelling, and Vernacular Commercial Building; building types which together characterize Boulder County and Colorado.

The building and development in Eldora during the first decades of the twentieth century had little impact of the rustic character that had been established during the earlier mining period. With the transition to a tourist economy, the existing buildings continued to be used in the same way as they had been. The early commercial establishments such as hotels, stores, and saloons, continued to operate. Miner's cabins were converted to seasonal residences, the rudimentary form and lack of appointments of the cabins were considered part of their rustic charm. In areas which were successful in attracting a substantial tourist trade, various mining era commercial, industrial, and institutional buildings also were converted to tourist housing facilities and tourist cabins, also occurred in the more popular vacation spots such as Gold Hill and Eldora. The more commonplace development at this time, however, was the abandonment or demolition of buildings that occurred as the populations of the county's mining centers dwindled.

The increase in automobile tourism was a major component of the growth of the county's tourist trade during the period 1910 - 1930. The improvement the roads that served the Colorado mountains was successful in attracting large numbers of vacationing travellers to the region. Specialized automobile facilities, such as service stations, motor courts, roadside parks, and picnic grounds, began to appear throughout the state. In Boulder County the vacation travel generated by the automobile plus the rail excursions to the area brought a measure of prosperity for some of the early metal mining communities. Other towns simply managed to survive, albeit on a seasonal basis.

The Great Depression brought to a halt the growth of the tourist industry in the country, state, and nation. By 1935, the period of significance ended when economic conditions severely curtailed vacation travel and development within the mountain communities came to a standstill. With the loss of their seasonal population, most of the metal mining communities became virtual ghost towns and remained as such until the 1960s.

9. Major Bibliographical References

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(x) See continuation sheet

Previous documentation on file (NPS):
- ( ) preliminary determination of individual listing (36 CFR 67) has been requested
- ( ) previously listed in the National Register
- ( ) previously determined eligible by the National Register
- ( ) designated a National Historic Landmark
- ( ) recorded by Historic American Buildings Survey # ____________
- ( ) recorded by Historic American Engineering Record # __________

Primary location of additional data:
- (x) State Historic Preservation Office
- ( ) Other State agency
- ( ) Federal agency
- (x) Local government
- ( ) University
- ( ) Other

Specify Repository:
Boulder County Planning Department

10. Geographical Data

Acreage of property: ____________________

UTM References

	Zone	Easting	Northing
A	1 3	4 5 1 6 0 0	4 4 2 2 2 0 0
B	1 3	4 5 1 6 0 0	4 4 2 2 0 8 0
C	1 3	4 5 1 3 1 0	4 4 2 2 0 4 0
D	1 3	4 5 0 6 6 0	4 4 2 2 1 7 0

(x) See continuation sheet

Verbal Boundary Description
See Boulder County Tax Assessor's Map.

Boundary Justification
District incorporates part of the original townsite. The boundary was drawn to eliminate blocks and areas with a significant number of non-contributing resources and large expanses of vacant land.

( ) See continuation sheet

11. Form Prepared By

Name/Title: Deborah Edge Abele, Consultant / Edited Barbara Norgren
Organization: N/A
Date: 10/1987/Revised 10/88
Street & Number: P.O. Box 6367
Telephone: (719) 635-2065
City or Town: Colorado Springs
State: CO Zip Code: 80934

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E 13 450 660 4422 240
F 13 450 920 4422 270
G 13 451 370 4422 290

PHOTOGRAPHER: Deborah Abele
DATE OF PHOTOGRAPH: November, 1986
LOCATION OF NEGATIVE: 1502 N. Custer Ave, Colorado Springs CO

Photograph #24
Date: November, 1986
Pioneer Log Dwelling
585 Huron Avenue, Eldora Historic District
Viewing North

Photograph #25
Date: November, 1986
Pioneer Log Dwelling
602 Eldorado Ave. Eldora Historic District
Viewing Southeast

Photograph #26
Date: November, 1986
Pioneer Log Dwelling with Rustic Tourist Alterations
601 Huron Ave., Eldora Historic District
Viewing Northwest

Photograph #27
Date: September, 1987
Vernacular Commercial Building
Gold Miner Hotel
601 Klondyke Ave., Eldora Historic District
Viewing Northwest

Photograph #28
Date: November, 1986
Vernacular Commercial Building
602 Klondyke Ave., Eldora Historic District
Viewing Southwest

Photograph #29
Date: November, 1986
Vernacular Commercial Building
601 Eldorado Ave., Eldora Historic District
Viewing Northwest

Photograph #30
Date: September, 1987
Streetscape with Vernacular Commercial Buildings
500 Block Eldorado Ave., Eldora Historic District.
Viewing Northeast

Photograph #31
Date: September, 1987
Streetscape with Pioneer Log and Rustic Tourist Dwellings
500 Block Klondyke Ave,. Eldora Historic District
Viewing Northeast

Photograph #32
Date: November, 1986
Rustic Tourist Dwelling
599 Huron Ave., Eldora Historic District
Viewing Northwest

Photograph #33
Date: November, 1986
Streetscape with Rustic Tourist Dwellings
500 Block Washington Ave., Eldora Historic District
Viewing North Northwest

Photograph #34
Date: September, 1987
Streetscape
500 Block Klondyke, Huron and Washington Avenues
Eldora Historic District Viewing North Northeast

APPENDIX 6.2

NRHP and Boulder County Landmarked Properties in Eldora

National Register of Historic Places - Eldora Historic District

Listed 10/4/1989

<u>Contributing Buildings</u>

190 N. 8th

765 Eaton Place
775 Eaton Place
803 Eaton Place
815 Eaton Place
821 Eaton Place
825 Eaton Place

599 Eldorado
601 Eldorado
602 Eldorado
644 Eldorado
666 Eldorado
698 Eldorado

425 Huron
445 Huron
501 Huron
525 Huron
599 Huron
585 Huron
598 Huron
601 Huron

565 Klondyke
585 Klondyke
599 Klondyke
601 Klondyke
602 Klondyke
603 Klondyke
605 Klondyke
606 Klondyke
675 Klondyke
680 Klondyke
685 Klondyke
699 Klondyke
701 Klondyke
702 Klondyke
715 Klondyke
725 Klondyke
745 Klondyke
759 Klondyke
765 Klondyke
775 Klondyke
785 Klondyke
881 Klondyke
885 Klondyke
905 Klondyke
925 Klondyke
945 Klondyke
965 Klondyke

501 Washington
535 Washington
545 Washington
551 Washington
601 Washington
620 Washington
645 Washington

<u>Non Contributing Buildings</u>

555 Huron
608 Klondyke
624 Klondyke
689 Klondyke
710 Klondyke
750 Klondyke
770 Klondyke
795 Klondyke
525 Washington
566 Washington
585 Washington
611 Washington

National Register of Historic Places - Individually Listed Properties

Gold Miner Hotel – Listed 7/3/1997, Amendment 8/1/2007

Boulder County Landmarks

Gold Miner Hotel, 601 Klondyke Ave. Listed 1/28/1997

Peek-A-Boo (Gilfillan/Gross) Cabin, 675 Huron Ave., Listed 12/16/1999

Neva Cabin, 765 Klondyke Ave., Listed 8/17/2004

Rocky Ledge Cabin, 601 Huron Ave., Listed 7/19/2005

Woods’ Cabin, 795 Bryan Ave., Listed 2/21/2006

Aspenola, 825 Eaton Place, Listed 3/29/2007

Rockwall Lodge, 551 Washington Ave., Listed 3/29/2007

Bryan–Gaines Cabin, 603 Klondyke Ave., Listed 4/26/2007

Alex Ryan Cabins and William Gustafson Cabin (aka Kladstrup Family Cabins) 305 Eldorado Ave., Listed 7/9/2009

APPENDIX 6.3

ELDORA HISTORICAL AND

ARCHITECTURAL SURVEY, 2007-08

Boulder County

Colorado Cultural Resource Survey Report

Eldora Historical and Architectural Survey, 2007-08

Prepared by:

Adam Thomas,
HISTORITECTURE, L.L.C.

Historical Context by Sierra Standish

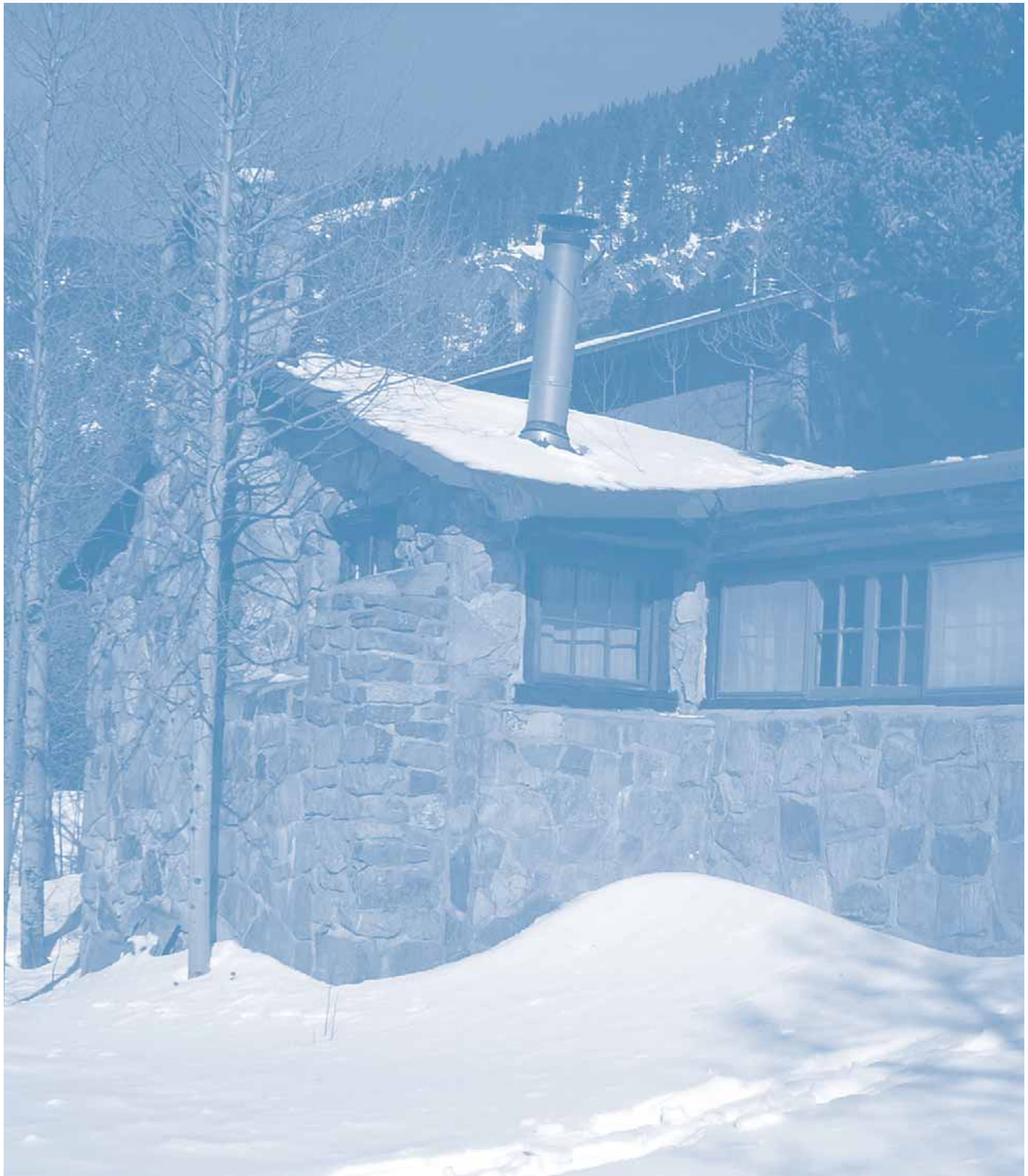
Prepared for:

Boulder County Parks and Open Space

Certified Local Government Grant
Project CO-07-012

June 2008

HISTORITECTURE LLC
architectural history | preservation planning | digital preservation media



Colorado Cultural Resource Survey Report

Eldora Historical and Architectural Survey, 2007-08

Prepared by:

Adam Thomas,
Architectural Historian
HISTORITECTURE, L.L.C.
Post Office Box 419
Estes Park, Colorado 80517-0419
www.historitecture.com

Historical Context by Sierra Standish

Prepared for:

Boulder County Parks and Open Space

Certified Local Government Grant
Project CO-07-012

June 2008

Boulder County

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architectural history | preservation planning | digital preservation media

Table of Contents

INTRODUCTION

Eldora Survey 2007-08

Like many of the small towns scattered in the mountains west of Boulder, Eldora began as a hopeful mining camp at the end of the nineteenth century. Despite claims of unimaginable wealth and enormous investments made to extract the precious ore, Eldora failed. But unlike most boomtowns in the area, it never became a ghost town. Tourists from Boulder, Denver, and across the Midwest found the union of spectacular scenery and rustic charm in Happy Valley to be particularly appealing. They returned again and again, making Eldora one of the most successful summer vacation destinations in Boulder County.

Much of the relatively densely settled area at the core of Eldora is now a National Register Historic District. But Eldora, particularly those properties outside of the district, faces a variety of threats requiring careful preservation planning. Brutal winters exact a heavy toll on the valley's historic buildings. As better utilities and high-speed internet connects the village to Boulder and the world, more and more people are living–and working–in Eldora year round. This change has altered the built environment as the small cabins of miners and tourists become sprawling, year-round residences.

Spearheaded by Carol Beam, Historic Preservation Planner, Boulder County Open Space pursued a Certified Local Government (CLG) grant to conduct an intensive-level survey of 50 properties in Eldora that had not been previously inventoried. The county reviewed proposals from a variety of cultural resource contractors and selected Historitecture, an Estes Park-based architectural history consulting firm. Architectural Historian and Managing Principal Adam Thomas conducted the survey.

The goals of the intensive-level survey were to:

- Inventory 50 of 58 possible properties;
- Determine the significance and eligibility of all properties surveyed;
- Analyze historic district potential and boundaries; and
- Develop a report summarizing the findings of the survey.

Of the 50 properties, one property (or two percent of the total) was field determined eligible for individual listing in the National Register of Historic Places, and 13 (or 26 percent) were field determined eligible as Boulder County Landmarks. Historitecture found no new districts and did not recommend any changes to the existing Eldora Historic District.

Based on these results, Historitecture made the following recommendations to Boulder County:

1. Nominate eligible properties; and
2. Complete the survey

The following report is organized as stipulated in the *Colorado Cultural Resource Survey Manual,* as revised in 2006.

SECTION 1

Project Area

The unincorporated town of Eldora is situated along Middle Boulder Creek, in a deep, generally east-west-oriented mountain valley. The elevation of the settlement is around 8,640 feet above mean sea level. Rising to the north are Eldorado Mountain, at 9,660 feet in elevation, and Mineral Mountain, at 9,932 feet in elevation. Punctuated by the adits and tailings of historic mines, Spencer Mountain comprises the southern rim of the valley, rising to 9,650 feet.

The town stretches along the length of Eldorado Avenue, a paved thoroughfare north of and parallel to Middle Boulder Creek. North of and parallel to Eldorado Avenue are Klondyke Avenue and Huron Avenue, both unpaved streets which ultimately terminate at the their east and west ends on Eldorado Avenue. Bryan Avenue is an unpaved road parallel to Eldorado Avenue, but south of the creek. Short, north-south-oriented streets connect Eldorado Avenue to the parallel streets to the north. These streets are numbered from First Street, to the east, to 11th Street, to the west. A bridge at Sixth Street connects Eldorado Avenue to Bryan Avenue. The intersection of Sixth Street and Eldorado Avenue marks the densest settlement in the village, with most buildings and structures irregularly spaced, generally along the east-west-oriented streets.

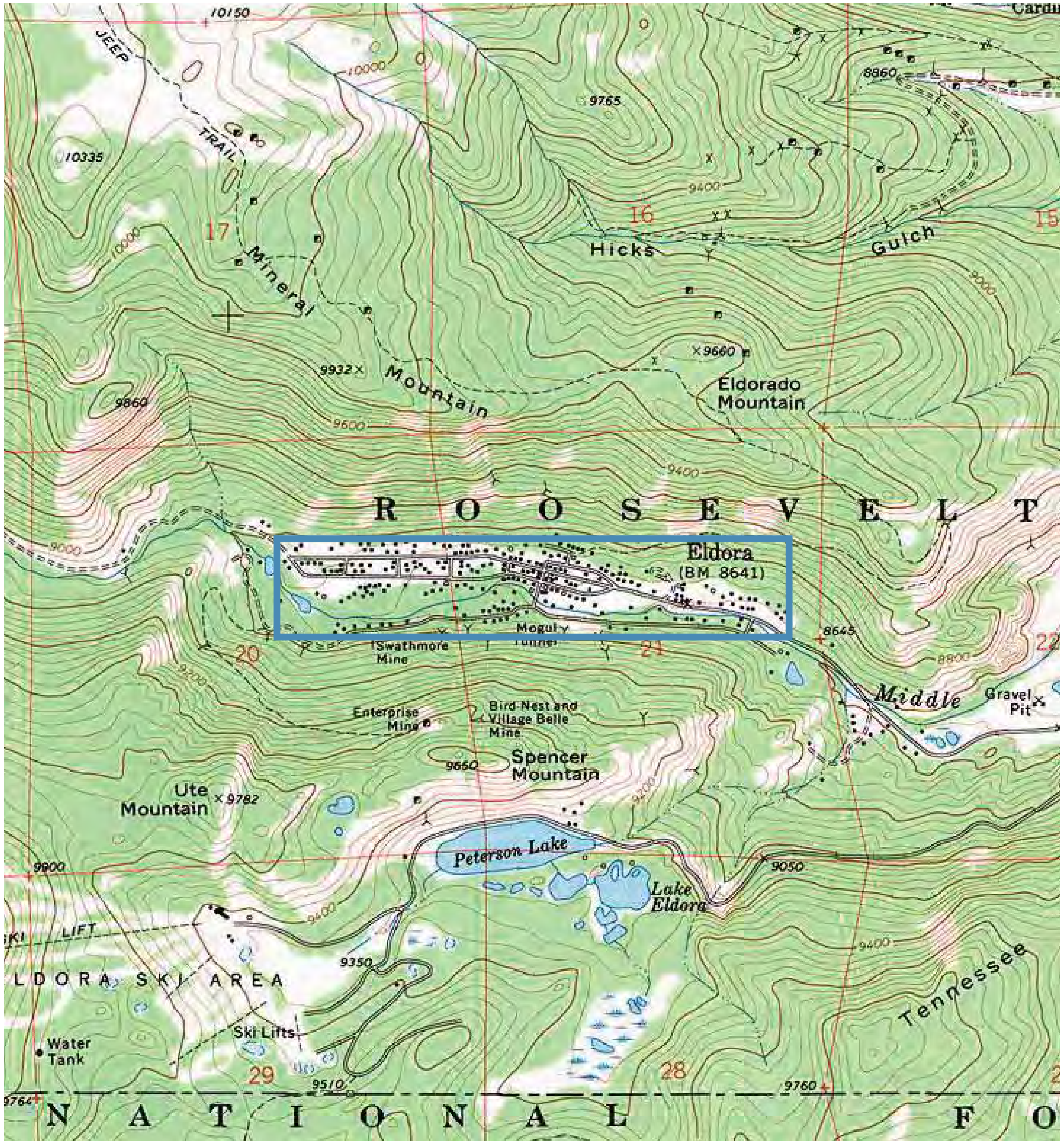
At the center of the survey area is the Eldora National Register Historic District (5BL.758). Centered at Klondyke Avenue and Sixth Street, the boundaries of the district extend eastward along Huron Avenue and westward along Klondyke Avenue (see map 4.1).

This survey included selected properties spanning the breadth and width of the valley, from First Street to Eleventh Street and Huron Avenue to Bryan Avenue.

The survey area was situated within sections 20 and 21 of township 1 south, range 73 west, depicted on the USGS 7.5-minute topographic map of the Nederland quadrangle (1972). The project area covered approximately 145 acres.

A map of the survey area is included on the following page.

Map 1.1. This segment of the USGS 7.5-minute topographic map for the Nederland quadrangle shows the geographic context of the Eldora area. The box represents the farthest extent of surveyed properties. A more precise demarcation of the survey and historic district boundaries are presented in map 4.1. *(USGS.)*



SECTION 2

Research Design and Methods

GOALS AND OBJECTIVES

The overall goal of this project was to collect and analyze architectural and historical data for properties in Eldora, completing cultural resource inventories for those properties not included in previous surveys. This accounted for 58 properties that were either less than 50 years old at the times of the previous surveys or were simply overlooked. More specifically, the project was intended as an intensive-level, selective survey of 50 of those properties. Subordinate to this goal were several objectives:

- Inventory 50 of the 58 possible properties;
- Determine the significance of surveyed resources and National Register, Colorado State Register, and Boulder County Landmark eligibility of all properties surveyed;
- Analyze historic district potential and boundaries; and
- Develop a report summarizing the findings of the survey.

SCOPE OF WORK

Boulder County developed the following scope of work for the Eldora survey:

A. Survey Work

1. Complete intensive-level historical and architectural survey for 50 select properties in the Eldora community.
2. The project will meet the standards and requirements set forth in the *Colorado Cultural Resource Survey Manual* (revised 2006) and meet the Secretary of the Interior's Standards and Guidelines for Identification and Evaluation (48 FR 44716).

B. Products

1. The contractor shall submit five draft architectural inventory forms with black and white photos for review and comment by both Boulder County and the Colorado Historical Society. In addition to the required field determinations of eligibility for the National Register of Historic Places, Boulder County landmark determination of eligibility, either individual or landmark district, should also be included in the architectural inventory forms.
2. Upon approval of the revised five draft architectural inventory forms the contractor shall submit the remaining 45 draft architectural inventory forms and draft survey report for review and comment by both Boulder County and the Colorado Historical Society.
3. The contractor shall submit with the draft survey report a USGS 7.5-minute quad map plus a city plat or planning map outlining the boundaries of the survey area with a key that identifies the boundaries of eligible districts (if any), contributing and non-contributing properties and individually eligible properties for the National Register

of Historic Places. Each resource recorded during the project should be clearly identified on the map by appropriate site number.

4. The contractor shall submit six hard copies of the final survey report, two sets of final 50 architectural inventory forms with properly processed, sleeved and labeled black & white photos, one digital copy of final survey report in each Microsoft Word and Portable Document Format (PDF) and one digital copy of final architectural inventory forms in each Microsoft Word or Portable Document Format to Boulder County.

C. Meetings

1. The contractor agrees to consult with the Office of Archaeology & Historic Preservation in person to discuss the methodology of the project prior to July 20, 2007.
2. The contractor shall attend the August 2, 2007 Boulder County Historic Preservation Advisory Board meeting to introduce the project.
3. The contractor shall attend one neighborhood meeting with Eldora residents to discuss the results of the project.
4. The contractor agrees to consult with the Office of Archaeology and Historic Preservation in person to discuss concurrence on eligibility and contributing/non-contributing status of surveyed properties and any other issues concerning the project prior to June 6, 2008.
5. The contractor shall attend the June 5, 2008 Boulder County Historic Preservation Advisory Board meeting to discuss the results of the project.

D. Reports

1. The consultant shall submit progress reports to Boulder County on October 24, 2007, January 23, 2008, April 21, 2008 and June 13, 2008.

FILE SEARCH AND PREVIOUS WORK

The first step in this survey project was to determine the extent and results of previous surveys and nominations within the survey area. Historitecture requested an official search of OAHP files, which was conducted on September 6, 2007.

The file search determined that 90 properties in the project area, including those in the Eldora Historic District (5BL.758), had been previously surveyed, dating to between 1987 and 2005. None of these properties were resurveyed for this inventory.

Of the previously surveyed properties, one district and one individual property were listed in the National Register of Historic Places. The Eldora Historic District (5BL.758) was listed on October 4, 1989. In addition to being a contributing resource within this district, the Gold Miner Hotel (5BL.758.2), 601 Klondyke Avenue, was individually listed on July 3, 1997. In addition, the Jack Spratt Cabin/Engblom Property (5BL.758.47), also a contributing resource within the district, was determined officially eligible for listing in the National Register on December 1, 1997. The Colorado State Historic Preservation Officer has not made any other official determinations of eligibility for previously surveyed properties. Like field determinations, official determinations of National Register eligibility are subject to change, particularly if the determination was made prior to extensive yet unrecorded modifications, which would affect physical integrity, or the revelation of further historical and architectural data, which would affect significance.

TABLE 2.1: FILE SEARCH RESULTS

Site Number	Property Name	Address	National Register Eligibility	District Eligibility
5BL.604	Dart Residence	895 Klondyke	Not Assessed	Not Assessed
5BL.758	Eldora Historic District	425 to 601 Huron Avenue 501 to 645 Washington Avenue 565 to 945 Klondyke Avenue 599 to 698 Eldorado Avenue 765 to 825 Eaton Place 190 North 8th Street	Listed 10/4/1989	Not Applicable
5BL.758.1	Pine Shadow Cabin/Kent Property	585 Washington Avenue	Not Assessed	Noncontributing
5BL.758.2	Gold Miner Hotel	601 Klondyke Avenue	Listed 7/3/1997	Contributing
5BL.758.7	Rocky Ledge Cabin/Rinderknecht Property	601 Huron Avenue	Field Eligible	Contributing
5BL.758.9	Lindeke Property	565 Klondyke Avenue	Field Eligible	Contributing
5BL.758.10	Lindeke Property	585 Klondyke Avenue	Field Eligible	Contributing
5BL.758.11	Fairman & Wilson Hardware Store/Jess Property	602 Klondyke Avenue	Field Eligible	Contributing
5BL.758.12	Bryan Property	603 Klondyke Avenue	Field Eligible	Contributing
5BL.758.13	Bluebird Cabin/Moose Lips Lodge/Greten Property	605 Klondyke Avenue	Field Not Eligible	Contributing
5BL.758.14	MacDougall Property	606 Klondyke Avenue	Field Not Eligible	Contributing
5BL.758.15	Morgan Property	608 Klondyke	Field Not Eligible	Noncontributing
5BL.758.16	Carpenter Property	624 Klondyke	Field Not Eligible	Noncontributing
5BL.758.17	Neu Property	675 Klondyke	Field Eligible	Contributing
5BL.758.18	Burton Property	685 Klondyke	Field Not Eligible	Contributing
5BL.758.19	Newens Property	698 Klondyke	Field Not Eligible	Noncontributing
5BL.758.20	Burns Property	699 Klondyke	Field Eligible	Contributing
5BL.758.21	Barrett Property	701 Klondyke	Field Eligible	Contributing
5BL.758.22	Zemanker Property	702 Klondyke	Field Not Eligible	Contributing
5BL.758.23	Happy Valley Placer Co. Headquarters/Billingsly Cabin		Field Eligible	Contributing
5BL.758.24	Dunn Cabin	745 Klondyke	Field Eligible	Contributing
5BL.758.25	Bark-een Cabin Freymuth Property	785 Klondyke	Field Eligible	Contributing
5BL.758.26	Cottage Daisy/Leever Property	881 Klondyke	Field Eligible	Contributing
5BL.758.29	Ideal Cabin/Tasaday Property	905 Klondyke	Field Eligible	Contributing
5BL.758.30	Place Cabin/Menke Property	925 Klondyke	Field Eligible	Contributing
5BL.758.31	Postlewait-Miller Property	945 Klondyke	Field Eligible	Contributing
5BL.758.34	Tipperary Cabin/Postlewait-Redle Property	965 Klondyke	Field Eligible	Contributing
5BL.758.35	Bungalhigh Cabin/Rouse Property	599 Klondyke	Field Eligible	Contributing
5BL.758.36	Lone Pine Cabin/Miller Property	775 Eaton Place	Field Eligible	Contributing
5BL.758.37	Pine Lodge Cabin/Miller Property	785 Eaton Place	Field Eligible	Not Assessed
5BL.758.38	Anderson Property	795 Eaton Place	Field Eligible	Not Assessed
5BL.758.39	Fox Den/Williams Property	801 Eaton Place	Field Eligible	Not Assessed
5BL.758.40	Williams Property	803 Eaton Place	Field Eligible	Contributing

Site Number	Property Name	Address	National Register Eligibility	District Eligibility
5BL.758.41	Laf-a-Lot Cabin	815 Eaton Place	Field Eligible	Contributing
5BL.758.42		821 Eaton Place	Field Eligible	Contributing
5BL.758.43		825 Eaton Place	Field Eligible	Contributing
5BL.758.44	Log Cabin Grocery/Log Cabin Café	599 Eldorado	Field Eligible	Contributing
5BL.758.45	Brookside Cabin/Nichols Property	602 Eldorado	Field Eligible	Contributing
5BL.758.46	Weeks Property	425 Huron	Field Eligible	Contributing
5BL.758.47	Jack Spratt Cabin/Engblom Property	435 Huron	Officially Eligible 12/1/1997	Contributing
5BL.758.48	David Property	445 Huron	Field Eligible	Contributing
5BL.758.49	Blaine Property	501 Huron	Field Eligible	Contributing
5BL.758.50	Spingdale Cabin/Bolton Property	585 Huron	Field Eligible	Contributing
5BL.758.51	Stepperud Property	666 Eldorado	Field Not Eligible	Contributing
5BL.758.52	Bungalog Cabin/Rouse Property	599 Huron	Field Eligible	Contributing
5BL.758.54	McCollum Property	545 Washington Ave	Field Eligible	Contributing
5BL.758.55	County Property	566 Washington Ave	Field Not Eligible	Noncontributing
5BL.758.56	Glenn Haven Cabin/Olson Cabin/Olsen Cabin	601 Washington Ave	Field Eligible	Contributing
5BL.758.57	Dart Property	533 Washington Ave	Field Eligible	Contributing
5BL.758.58	Rockwall Lodge/Ryan Property	551 Washington Ave	Field Eligible	Contributing
5BL.758.61	Neisler Property	710 Klondyke Ave	Field Eligible	Contributing
5BL.758.62		598 Huron	Not Assessed	Contributing
5BL.758.63		725 Klondyke	Not Assessed	Contributing
5BL.758.64		601 Eldorado	Not Assessed	Contributing
5BL.758.65		501 Washington Ave	Not Assessed	Contributing
5BL.758.66		525 Huron Ave	Not Assessed	Contributing
5BL.758.67		629 Washington Ave	Not Assessed	Contributing
5BL.758.68		645 Washington Ave	Not Assessed	Contributing
5BL.758.69		680 Klondyke	Not Assessed	Contributing
5BL.758.70		759 Klondyke	Not Assessed	Contributing
5BL.758.71		765 Klondyke	Not Assessed	Contributing
5BL.758.72		775 Klondyke	Not Assessed	Contributing
5BL.758.73		644 Eldorado	Not Assessed	Contributing
5BL.758.74		698 Eldorado	Not Assessed	Contributing
5BL.758.75		190 North 8th Street	Not Assessed	Contributing
5BL.758.76		765 Eaton Place	Not Assessed	Contributing
5BL.758.77		611 Washington Ave	Not Assessed	Noncontributing
5BL.758.78		750 Klondyke	Not Assessed	Noncontributing
5BL.758.79		525 Washington Ave	Not Assessed	Noncontributing
5BL.758.80		555 Huron Ave	Not Assessed	Noncontributing
5BL.758.81		770 Klondyke	Not Assessed	Noncontributing

Site Number	Property Name	Address	National Register Eligibility	District Eligibility
5BL.758.82		795 Klondyke	Not Assessed	Noncontributing
5BL.6947	Collins Property	550-554 Eldorado Ave	Field Eligible	Not Assessed
5BL.6949	Pond Grocery/Miner Property	588 Eldorado Ave	Field Eligible	Not Assessed
5BL.6964	Eldora Depot/Sandquist Property	602 Bryan Ave	Field Not Eligible	Not Assessed
5BL.6965	Wood Property	795 Bryan Ave	Field Eligible	Not Assessed
5BL.6966	Bolton Cabin	502 Eldorado Ave	Field Eligible	Not Assessed
5BL.6967	Aftermath Cabin/Chapman Property	265 Eldorado Ave	Field Not Eligible	Not Assessed
5BL.7296		325 Eldorado Ave	Field Needs Data	Not Assessed
5BL.7297		399C Eldorado Ave	Field Not Eligible	Not Assessed
5BL.7461	Uncle Joe's Cabin	235 Eldorado Ave	Field Not Eligible	Not Assessed
5BL.8175	Eisenhuth Cabin	197 Eldorado Ave	Field Not Eligible	Not Assessed
5BL.9081*	Northern Light/Aloha Lodge/Harris Property	895 Klondyke Ave	Field Eligible	Not Assessed
5BL.9082	Goolsby Ranch Property	411 Huron Ave	Field Eligible	Not Assessed
5BL.9083	Alta Vista Cabin/Naredo Property	901 Klondyke	Field Not Eligible	Not Assessed
5BL.9084	Conklin Management Trust Property	949 Klondyke	Field Not Eligible	Not Assessed
5BL.9085	Ebeling/Markins Property	955 Klondyke	Field Not Eligible	Not Assessed
5BL.9469	Markham Cabin/Platt Cabin	750 Eldorado	Field Not Eligible	Field Contributing
5BL.9566	Wee House/Phillips Residence	195 Bryan Ave	Field Not Eligible	Not Assessed
5BL.10073	"Virginia"/Matthew Phillips Cabin	175 South 7th Street	Field Not Eligible	Not Assessed
5BL.10230	Rest-Awhile Cabin/Phillips Cabin	215 Bryan Ave	Field Not Eligible	Not Assessed

NOTE: Determinations of National Register eligibility and district status are subject to change, particularly if the determination was made prior to extensive yet unrecorded modifications, which would affect physical integrity, or the revelation of further historical and architectural data, which would affect significance.

METHODS

This survey was organized in three major steps: fieldwork, archival research, and form completion.

Fieldwork

The first step was to physically visit each property to record its architectural features, photograph as many elevations of each building as possible, and interview the property owner or resident, when practical. A hand-held global positioning satellite receiver was used to pinpoint universal transmercator (UTM) coordinates.

During the fieldwork, archaeological potential was not considered because this was an architectural survey. However, some building ruins, clearly visible above the ground, were included as associated buildings or structures on the survey forms.

Historitecture generally surveyed properties on the east-west-oriented streets first, beginning on Eldorado Avenue, where the vast majority of properties were located. Recording every elevation of every building and structure was, in general, extremely difficult because of inaccessibility, dense foliage, and precipitous drop-offs or rises. Because much of the foliage was comprised of weedy, young aspens, views did not improve even when the trees dropped their leaves. As well, much of the survey work had to be conducted in winter, when considerable snow cover and drifting obscured architectural elements and, in some cases, entire elevations. Historitecture was, however, able to record at least the principal elevation of each major building.

Archival Research

Developing the property histories was based on constructing a chain of title for each property through legal records recorded at the office of the Boulder County Clerk and Recorder. Historic tax and ownership lists reinforced this research. Historitecture also gathered information from current and historic Boulder County Tax Assessor records.

Biographical information came from a variety of sources, including U.S. Census records, obituaries, the *Eldora Civic Association Newsletter* (1995-1999), and oral histories both previously conducted and gathered at the time of this survey. Particularly valuable for biographical and construction history information were a number of Eldora oral histories conducted through the Maria Rogers Oral History Program, housed at the Carnegie Branch for Local History of the Boulder Public Library.

Form Completion

The final step, form completion, was to combine the fieldwork and archival research onto the Colorado Cultural Resource Survey Architectural Inventory Form (OAHP 1403, revised September 1998). A form was generated for each property, with the appropriate photographs and maps attached.

THE PROCEDURE

Assisted by Field Technician Jeffrey DeHerrera and Historian Sierra Standish, Historitecture Architectural Historian Adam Thomas began this intensive-level, selective survey on September 4, 2007, and completed the fieldwork on February 28, 2008.

Photographs were captured on an Olympus Camedia C-

5500 digital camera with 5.1 megapixel resolution. They were printed according to the National Register's 75-year archival standard by way of a Hewlett-Packard Officejet 7410 inkjet printer. This included gray Vivera inks (cartridge number 100) on four-by-six-inch HP Premium photo paper. The photos were saved as four-by-six-inch, 300 pixel-per-inch images, in tagged image file format (TIF) and burned onto a 300-year, archival compact disc.

Forms were compiled and generated in Archbase, a FileMaker database.

Determination of Significance

Historitecture assessed Eldora properties for their historical and architectural significance and, thus, their individual eligibility for listing in the National Register of Historic Places, the Colorado State Register of Historic Properties, and as Boulder County landmarks. Initially, in consideration of National Register eligibility, Historitecture ranked each parcel on a scale that considered the combined levels of historical significance and physical integrity, based on the four National Register criteria of significance and seven standards of integrity. In turn, Historitecture applied local criteria for local landmark eligibility. Those rankings were, from low (not significant, low physical integrity) to high (very significant, high physical integrity):

- Not individually eligible
- Individually eligible, local landmark; and
- Individually eligible, National Register.

Local Landmark Eligibility. Boulder County standards for landmark designation are found in article 15-501, section A, of the Boulder County Land Use Code:

In determining whether a structure, site, or district is appropriate for designation as a historic landmark, the Historic Preservation Advisory Board (HPAB) and the Board of County Commissioners shall consider whether the landmark proposed for designation meets one or more of the following criteria:

1. the character, interest, or value of the proposed landmark as part of the development, heritage, or cultural characteristics of the county;
2. the proposed landmark as a location of a significant local, county, state, or national event;
3. the identification of the proposed landmark with a person or persons significantly contributing to the local, county, state, or national history;
4. the proposed landmark as an embodiment of the distinguishing characteristics of an architectural style valuable for the study of a period, type, method of construction, or the use of indigenous materials;
5. the proposed landmark as identification of the work of an architect, landscape architect, or master builder whose work has influenced development in the county, state, or nation;
6. the proposed landmark's archaeological significance;
7. the proposed landmark as an example of either architectural or structural innovation; and
8. the relationship of the proposed landmark to other distinctive structures, districts, or sites which would also be determined to be of historic significance.

State Register Eligibility. The Colorado General Assembly established the Colorado State Register of Historic Properties by statute in 1975. The State Register became an active program in 1991 and is a listing of the state's significant cultural resources worthy of preservation for the future education and enjoyment of Colorado's residents and visitors. The State Register program is administered by the Office of Archaeology and Historic Preservation (OAHP) within the Colorado Historical Society. The Society maintains an official list of all properties included in the State Register. Properties that are listed in the National Register of Historic Places are automatically placed in the State Register. Properties may also be nominated separately to the State Register without inclusion in the National Register. The criteria for listing are as follows:

Significance in history, architecture, archeology, and culture is present in buildings, sites, structures, objects, districts, and areas that possess integrity of location, setting, design, materials, workmanship, feeling, and association, and that meet one or more of the following criteria:

A. The property is associated with events that have made a significant contribution to history; or
B. The property is connected with persons significant in history; or
C. The property has distinctive characteristics of a type, period, method of construction or artisan; or
D. The property has geographic importance; or
E. The property contains the possibility of important discoveries related to prehistory or history.

NATIONAL REGISTER ELIGIBILITY. The National Historic Preservation Act of 1966, as amended, created the National Register of Historic Places, which the National Park Service administers. Criteria for National Register eligibility are set forth in Title 36, Part 60, of the Code of Federal Regulations and are summarized as follows:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
B. That are associated with the lives of persons significant in our past; or
C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. That have yielded, or may be likely to yield, information important in prehistory or history.

In addition to the criteria listed above, the National Register requires some additional considerations before a property can be listed:

Ordinarily cemeteries, birthplaces, graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

a. A religious property deriving primary significance from architectural or artistic distinction or historical importance; or
b. A building or structure removed from its original location but which is primarily significant for architectural value, or which is the surviving structure most importantly associ-

ated with a historic person or event; or

c. A birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building associated with his or her productive life; or

d. A cemetery that derives its primary importance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or

e. A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or

f. A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or

g. A property achieving significance within the past 50 years if it is of exceptional importance.In general, properties achieving significance within the past 50 years are not considered eligible for individual listing in the National Register.

DETERMINATION OF DISTRICT ELIGIBILITY

Because this project was a selective rather than comprehensive intensive-level survey, determinations of potential districts were difficult. The properties were generally not geographically contiguous, making an assessment of the density and distribution of properties difficult. None of the surveyed properties were within the official boundaries of the Eldora National Register Historic District.

SECTION 3

Historical Context

INTRODUCTION

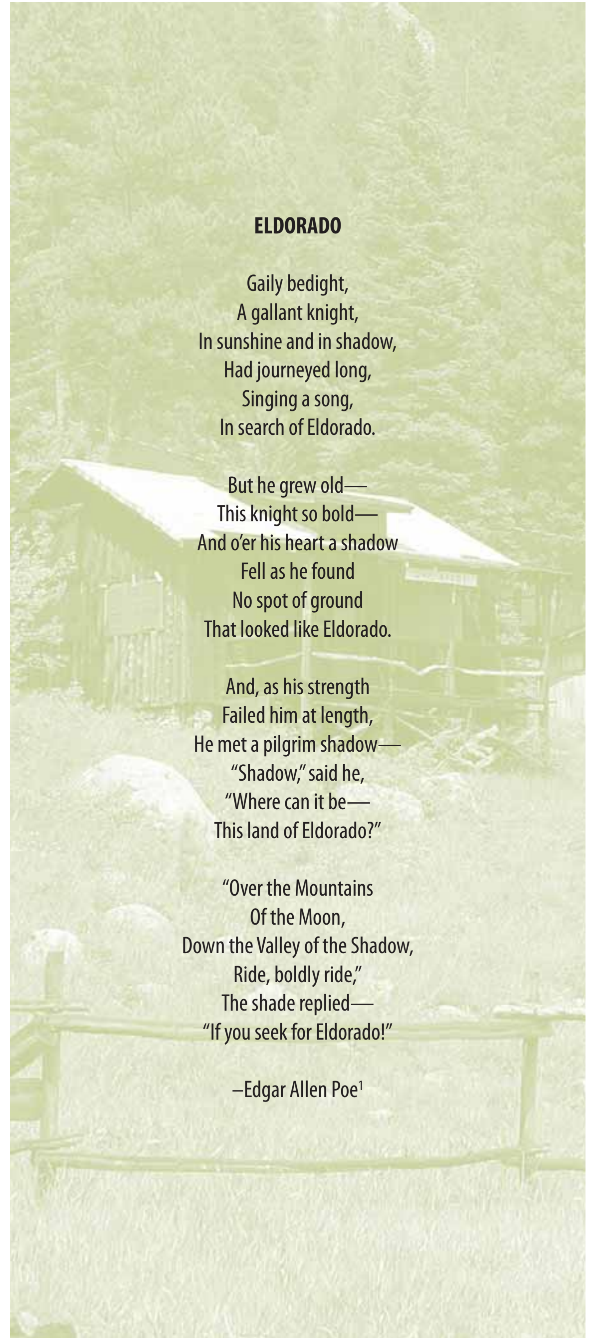
In 1896, most people agreed that the town of Eldora possessed a golden, glowing future. The *Boulder County Directory* identified the town as "a bright and promising gold camp. Surface indications in the district are ahead of any camp in Colorado." Not only did the town show hopeful diggings, it also enjoyed stunning scenery. "The town is beautifully located on Boulder creek, between Spencer mountain on the south and El Dorado hill on the north, with Bryan mountain facing the townsite on the west. The place is a lovely one, taking a gentle slope toward the south."[2]

Today, Eldora is still among the most beloved of Boulder County's mountain towns, even though it never amounted to much among Colorado's lucrative mineral fields. It did have a modest gold rush in the 1890s, accompanied by the usual proliferation of saloons, brothels, and rowdy characters. However, the imagination should be warned against classifying Eldora as a wild and wooly mining camp; the boom was short, the crowds were small, and a self-conscious class of citizens kept the undesirable element on the other side of the creek. The town is perhaps better remembered for its twentieth-century character: that of a seasonal, intimate resort community. The historically romantic valley full of old mines, mining structures, and miners' residences–combined with a gorgeously carved U-shaped mountain valley, sparkling Middle Boulder Creek, and the backdrop of the Continental Divide–began attracting pleasure-seekers long before the miners gave up.

I. A QUIET VALLEY IN A BUSY MINING DISTRICT, 1859-1891

In boomtown terms, the valley along the Middle Fork of Boulder Creek was a late bloomer. For 30 years, it existed in the heart of bustling mining country, yet was hardly populated. Naturally, prospectors had investigated such a potentially prime site during the initial frenzy of the Colorado Gold Rush. However, early surveys generated little interest, and miners and prospectors were easily distracted by substantial strikes in nearby mining camps.[3]

As late as the mid-1850s, this region had been principally known and valued by bands of Arapaho, Ute, and other Indians, and occasional Euro-American trappers. Then, news of the 1858 gold discovery on the grassy plains to the east sparked a different kind of interest in the region. Fortune-seekers flocked to the Front Range. Some of the earliest mountain gold-town settlements included Eldora's future neighbors: Central City, Jamestown, and Ward. In light of these local successes, prospectors deemed it prudent to include the drainage of Middle Boulder Creek in a mining district. In those years, the southern Rockies were distant from federal courts of law and other legal institutions; in their place, mining districts provided a local governing body to regulate and protect the pursuit of



ELDORADO

Gaily bedight,
A gallant knight,
In sunshine and in shadow,
Had journeyed long,
Singing a song,
In search of Eldorado.

But he grew old—
This knight so bold—
And o'er his heart a shadow
Fell as he found
No spot of ground
That looked like Eldorado.

And, as his strength
Failed him at length,
He met a pilgrim shadow—
"Shadow," said he,
"Where can it be—
This land of Eldorado?"

"Over the Mountains
Of the Moon,
Down the Valley of the Shadow,
Ride, boldly ride,"
The shade replied—
"If you seek for Eldorado!"

–Edgar Allen Poe[1]

Figure 3.1. Seen here are Mr. and Mrs. John Kemp. Founder of the Happy Valley Placer Company, John Kemp was also a father of what is today the town of Eldora. *(Eldora Civic Association.)*

mineral wealth. To this end, the Grand Island Mining District was formed on March 16, 1861, incorporating the future sites of Nederland, Eldora, and Caribou. The district allegedly was named for a thousand-foot island jutting out of North Boulder Creek in the neighborhood of what would become Caribou, although no evidence of this "Grand Island" is apparent today.[4]

The Grand Island Mining District initially proved disappointing–despite its auspicious location and the efforts of eager miners. As one historian states, "The region was thoroughly prospected and many claims were staked out…but the free gold was scarce and the sulphide ores too refractory and the district was abandoned." Impatient for better diggings, early prospectors moved on to more promising locales.[5]

Almost a decade later, local findings began to merit some excitement. The Caribou Mine, two and a half miles north of present-day Eldora, showed extensive deposits of silver. In September 1870, the strike proved sustainable enough to justify the creation of Caribou City, which, in turn, soon spawned nearby towns—some real, some only existing on paper. A settlement that would eventually become Nederland hosted the mill that processed Caribou's silver. Remarked one historian, "The rush which news of this find caused was the greatest the county ever witnessed."[6] Caribou's silver production continued for over a decade and put the Grand Island Mining District on the map.[7]

In the same time period, a new city sprung up approximately 22 miles downstream, where Boulder Creek flowed out of the mountains and onto the plains. Over the years, the city of Boulder proved to be among the most influential of Colorado's municipalities, serving as a cultural hub and home to the University of Colorado's original campus.[8]

In the final decades of the nineteenth century, a different kind of pioneer quietly sifted into the valley along Middle Boulder Creek. These newcomers staked their future on the land, not pay dirt, and homesteaded the meadows along the creek. The potential for agricultural output at approximately 8,600 feet above sea level, with notoriously short mountain summers, was limited; gardeners later demonstrated the potential to grow carrots, potatoes, lettuce and other cold-weather produce. The most successful high country crop was probably hay. Decades later, one local recalled a conversation with a pioneering mountain homesteader: "In 1946 Mrs. Burgess, in her 80s at the time, told me that she remembered three homesteads, including the Beach and Hannah properties, annually cutting 100 tons of hay each."[9]

If the homesteaders along Middle Boulder Creek were lonely, they would not remain so for long. As early as July 4, 1872, a silver prospector from Caribou staked the Fourth of July lode on a high country seam at the foot of Arapaho Peak, well above timberline. In the fall of 1875, the same prospector, C.C. Alvord, claimed two placers: the Alpha and the Alvord, high on Middle Boulder Creek. Thus, Alvord staked the first locations considered to be part of the Eldora mineral belt. Through the 1870s and '80s, minor lodes were discovered on Spencer Mountain (Eldora's southern wall) and on the North Fork of Middle Boulder Creek. Steadily, the valley was filling with opportunistic men and women staking their claims. It appeared that a settlement of some kind was on the horizon.[10]

II. ELDORA THE MINING CAMP, 1890-1910

Eldora's roots extend to the confident mineral claims of experienced mining men. On August 8, 1887, Charles H. Firth, from Boulder County's Sugarloaf Mining District, staked the

Huron Lode on Spencer Mountain. Upon the same mountain, mining engineer John A. "Jack" Gilfillan staked the Clara Mine in 1889. In 1891, John Kemp, a mining operator from Central City, staked the Happy Valley Placer. The apparent competence of Firth, Gilfillan, and Kemp likely encouraged further investment as the 1890s progressed.[11]

Ironically, none of these men would make their fortunes from Eldora's gold. Perhaps the most influential property was Kemp's Happy Valley Placer. In the summers of 1892 and 1893, Kemp initiated extensive hydraulic mining operations, hiring crews of workers and thus germinating a *bone fide* village on the valley floor. Soon, the valley along Middle Boulder Creek went by the idyllic name of Happy Valley, and the burgeoning community went by the same name.[12]

Before long, discord brewed in Happy Valley. The hydraulic mining along the valley floor did not pan out. Despite John Kemp's efforts, the creek produced only small flakes and nuggets of gold. The ultimate unsuitability for placer mining along Middle Boulder Creek rankled some, especially since the placer claim consumed some of the best building sites in the valley. One man interested in potential mine sites pointed an accusatory finger at Kemp and his associates:

> They…greedily gobble up several ranches and otherwise absorb the public domain…. It is nevertheless strange that they are proceeding to patent the land just at the time when some plucky miners have braved the rigors of the storm and snow and uncovered promising prospects…. It is to be hoped that the patent will not stand, but, of course, all this will be a matter of proof.[13]

It is unclear whether Kemp's motives derived from interest in real estate or whether he sincerely believed he could make his fortune extracting gold from Middle Boulder Creek. However, the legal claim to the Happy Valley Placer proved illegitimate. Indeed, as the town grew, Kemp and the other nominal owners of the placer claim stood to gain from land sales. In 1897 they surveyed their property for a townsite and proceeded to sell off lots.[14]

Perhaps for this reason, the name "Happy Valley" no longer appealed to locals. The first formal effort to create a true mining camp settled upon a different name. On May 27, 1892, the *Boulder Daily Camera* announced the formation of "A New Camp:"

> The miners and prospectors of Middle Boulder creek met in regular session last Tuesday, May 24th, for the purpose of organizing a camp and electing officers for same. H.W. Peck was elected chairman and J.L. Tucker secretary. On motion of Jas. Phillips, the name Eldorado was suggested and the citizens voted and the name was adopted…. The mountain south of the camp was named Spencer and the meeting adjourned.[15]

In this way, the new town assumed the grandiose name of Eldorado Camp. After all, some optimistic locals must have reasoned, why not name this precocious mining town after the site of legendary, unimaginable treasure? "Eldorado" was a common but poetic Victorian reference to any auspicious mining camp. "All mining camps are Eldorados" one local newspaper sardonically opined.[16]

Through the mid-1890s, Eldorado Camp was indeed pre-

Figure 3.2. Seen here in 1892, the first camp of the Happy Valley Placer Company was located at what would become the northwest corner of Eldorado Avenue and Tenth Streets in Eldora. The Penrose Lodge currently occupies the site. *(Eldora Civic Association.)*

Figure 3.3. Happy Valley Placer Company flume, 1892. *(Eldora Civic Association.)*

Figure 3.4. Eldorado Camp in 1895 was still relatively quiet. *(Eldora Civic Association.)*

cocious. The town became a much talked-about focal point in Boulder County's mining country. The local press fueled hopeful expectations and solicited investment in Spencer Mountain's mines. Reporters in Boulder already envisioned a substantial town; discussion revolved around the abundance of good timber and water, and the advisability of building a sawmill. Mentions of John Kemp frequently emerged in the press. He promised to bring in a fifty-stamp mill–which would allow mine operators to process their own ore locally–and he installed a steam hoisting plant to help divert water while investigating the bedrock below Middle Boulder Creek. It was too early to know that investments like Kemp's would ultimately bear little return. Meanwhile, the interest in the mining camp was infectious; miners and prospectors flowed in. In July 1893, the *Boulder Daily Camera* reported "over a hundred people in this camp."[17] By March 1895, there were 150. "Eldorado mines are strictly in it," predicted one journalist.[18]

For these newcomers, it was the Spencer Mountain lodes that energized the kind of spirit that came with the name "Eldorado." Mines like the Clara, Virginia, Village Belle, Bird's Nest, Terror, Bonanza, Gold Coin, and Enterprise gained fame and drew miners into the increasingly lively gold camp. The attractions were powerful enough to even retain some hardy souls through the long, windy winters. In 1894, a local estimate put the wintertime population of Camp Eldorado's prospectors at 60 at least, indicating a healthy-sized group of sufficiently zealous residents.[19]

> At Camp Eldorado sixty or more prospectors who have located there refused to avail themselves of the exemption from assessment work under the Bell act, but are sticking to their holes with Spartan courage, in view of the deep snow and rigorous weather of that section. Ore has been shipped in small quantities from these prospects.[20]

Meanwhile, the mining camp began to show more signs of becoming a real town. On August 5, 1896, the *Boulder Daily Camera* reported that Eldorado was being awarded its own voting precinct, on petition of a sufficient number of voters. Later that year, the Hotel Vendome, reputedly the town's "first hostelry," was erected. Early in 1897, the first post office opened in the cabin of J.K. McGinnis, administered by his sister, Mrs. Lois Holzhauser.[21]

By 1896, the fortunes of the celebrated neighboring mining town, Central City, were waning. The time was ripe for fortune-seekers to find the next hot spot–and it was natural that many residents responded to the news of the new "Eldorado" just miles to the north.[22]

If Kemp had been anticipating a local land boom, he was not the only one. Just miles to the east, on the banks of a little lake incorporated into today's Arapaho Ranch, a flurry of construction produced the new town of Sulphide. The site included commercial buildings, some cabins, and the 40-room St. Julian Hotel. However, the builders had apparently miscalculated their ability to drum up interest. The hotel was never completed, and the buildings gradually crumbled away.[23]

Another Cripple Creek?

Happy Valley contained a community primed for excitement. The quality of local ore mimicked the gold tellurides found in Colorado's legendary Cripple Creek district. The favorable comparison only fueled optimism. Eldorado Camp could be the next Cripple Creek.[24]

The exact dates of the Eldora gold boom are debatable. According to one old-timer who ran freight between Eldora and the plains cities, it happened in 1898:

> There appeared a write-up in a Denver paper which described in glowing phrases the wonderful showing of ore in the Enterprise Mine. That set things off. People swarmed into Camp. From then on, until the boom blew up, in 1899, I couldn't get enough teams or men to take care of the demands for hauling."[25]

More generous accounts place the boom between 1897 and 1904. The population peaked somewhere between 2,000 and 2,500 people.[26]

The year 1898 was momentous for the mining camp. On March 9, 1898, the town dropped "Camp" from its name and incorporated itself as "Eldora," also spelled "El Dora." The self-important boomtown had outgrown its previous name, tired of being confused with a settlement of the same name in California. According to local legend, envelopes addressed to "Eldorado, Col." appeared very similar to envelopes sent to "Eldorado, Cal." Unreliable mail delivery plagued the town.

Figure 3.5. Eldorado Camp in 1896 shows the beginnings of accelerated building activity associated with gold-mine boomtowns. *(Eldora Civic Association.)*

Figure 3.6. Pioneer Eldora miner John "Jack" Gilfillan established the Mogul Tunnel in 1896. *(Eldora Civic Association.)*

Worse yet, Eldorado Camp miners were not pleased when their paychecks arrived in California rather than in Colorado.

Serious Mining

Early in 1898, a publication in Golden issued a sober assessment of Eldora's boom:

> Eldora lies in the gold belt, it is accessible and well provided with timber and water, but so far the main excitement seems to be corner lots and building enterprises, and unless followed by more extended explorations such a boom cannot be sustained without its adjunct–serious mining.[27]

Indeed, Eldora experienced a boomtown frenzy without the adjunct "serious mining," namely the extraction of high-grade ore. The town frequently experienced new, exciting strikes that proved to be only flashes in the pan. No consistent, high-yield mine yet existed to justify the quick tempo of activity. But this was not through want of effort. For years Eldorans had approached their mines with a willingness to invest substantial capital and investigate various contemporary methods for enhancing mineral production.

Certainly the early-comers in Eldora's boom had the easiest time extracting their fortune. In a typical mine, the first, superficial ores required only simple processing. These free-milling ores–that is, gold in its metallic state–could be processed at any basic stamp mill. Here, the gold was crushed and run over a copper plate coated with mercury. The mercury adhered to the gold. The amalgam would then be heated and, as the mercury vaporized, pure gold was left behind, ready to be cast into ingots. Thus, Eldorans embraced the idea of erecting their own stamp mill; two of them were constructed in 1894.[28]

Even as stamp mills began to regularly process ore, mine operators faced other challenges that reduced mine productivity. The hub of all local mineral activity, Spencer Mountain, seemed to contain a tantalizing quantity of gold. Yet in order to access it, miners had to heave the ore to the surface via vertical shafts. The task would be much easier, reasoned mining engineer and owner Jack Gilfillan, with a tunnel bored horizontally into the mountain, intersecting the best veins. In February 1896, the *Boulder Daily Camera* reported that Gilfillan had secured enough capital to fund his bold venture.

> Mr. Gilfillan, the owner of the Clara mine at Eldorado, is known as "the man who had the nerve to drive through the cap." The same man is now going through Spencer mountain. The incorporation of the Pennsylvania Tunnel and Gold Mining Company by Philadelphia and Colorado parties, with a capitalization of $1,500,000 and J.A. Gilfillan as manager, means that a considerable enterprise, backed by ample capital, has been born in Eldorado.

With the help of air compressors, Gilfillan and his workers burrowed 2,600 feet into the granite within a year. Once finished, the Mogul Tunnel was undoubtedly the most spectacular bit of "serious mining" ever undertaken in the Eldora area. The tunnel stood eight feet tall by ten feet wide, accommodating a double track of rails for ore cars. Shafts were lit with electric light produced by a generator brought in for that specific purpose. Mine owners willingly paid a fee for the use of the tunnel.[29]

As a modern feat of engineering, the Mogul Tunnel must have lifted the miners' collective morale. But it could not improve the quality of ore scraped from within Spencer Mountain. At first blush, certainly, a mine might offer easy-to-mill free gold. But soon after, the ore retrieved from shafts and tunnels was mingled with tellurium or sulfur. These low-grade ores required much more specialized processing. However, the mills and smelters that could handle such ore were in distant Denver or Leadville, and it was not economically feasible to transport large quantities of ore long distances to extract relatively small amounts of gold. By the late 1890s, Eldora's golden future rested on the construction of a new, local, customized mill.[30]

The Eldora Mining and Milling Company responded to this need. The company completed a chlorination mill, the Bailey Mill, in 1899. The outlook was auspicious; Neil B. Bailey, president of the Bank of Eldora and manager of the mill, declared:

> It will have a capacity of seventy-five tons and we now have over 1,000 tons of ore waiting for us…. The mill does crushing, drying, and roasting, but will not do any refining or melting for bullion…. The indications are that Eldora will be one of the best camps in the state, and I look for a big crowd in the coming season.

The optimistic company even took out a franchise to provide water and electric service to the town. Eldora would move into the twentieth century as a modern municipality.[31]

Mine operators were pleased with the plans, and anticipated increased production once the Bailey Mill was available. But a chlorination mill was still technically limited. It could not entirely purify ore, despite several stages of processing available at the new mill. After being brought to the giant 228-foot by 100-foot mill, the ore was first finely ground and "roasted." This roasted ore was then treated with chlorine and converted into a slushy gold chloride. From the gold chloride, a brown powder was then extracted. This was as far as the chloride mill could refine ore; the powder had to be hauled to a Denver smelter and processed further in order to obtain bullion.[32]

High hopes did not meet economic reality. The chlorination mill was not efficient, and Bailey grew desperate. He solicited eastern relatives for further investment, and bought himself time–in exchange for ill will–by skipping his employees' paydays. Eventually, the mill workers, drunken and enraged, surrounded his house and demanded their wages. In the subsequent fracas, flames licked at Bailey's house. As the mill owner attempted to extinguish the flames, someone in the crowd shot him. At first Bailey's arm wound appeared relatively innocuous; however, the injury developed gangrene and the mill operator died days later. Thus, Neil B. Bailey gained the tragic distinction of being Eldora's only known fatal victim of boomtown gunplay. The mill closed and was eventually sold for salvage in 1916. With the mill's failure and Bailey's sad death, Eldora's once bright future dimmed.[33]

If Gilfillan's Mogul Tunnel and Bailey's chlorination mill could not make Eldora mines more profitable, maybe a railroad could. This appears to have been the view of Colonel Samuel B. Dick and W.J. Culbertson. The colonel had supported the construction of the Mogul Tunnel and, like many, perceived Spencer Mountain as "one great, low-grade ore-body." Efficient transportation to distant mills could potentially renew the viability of the mines.[34]

Figure 3.7. Miners gather outside the entrance to the Mogul Tunnel around 1900. *(Eldora Civic Association.)*

Figure 3.8. A Denver & Northwestern train arrives at the Eldora depot shortly before the narrow-gauge railroad's demise in 1919. The gentleman at left is Eldora's first mayor, William T. Harpel. *(Eldora Civic Association.)*

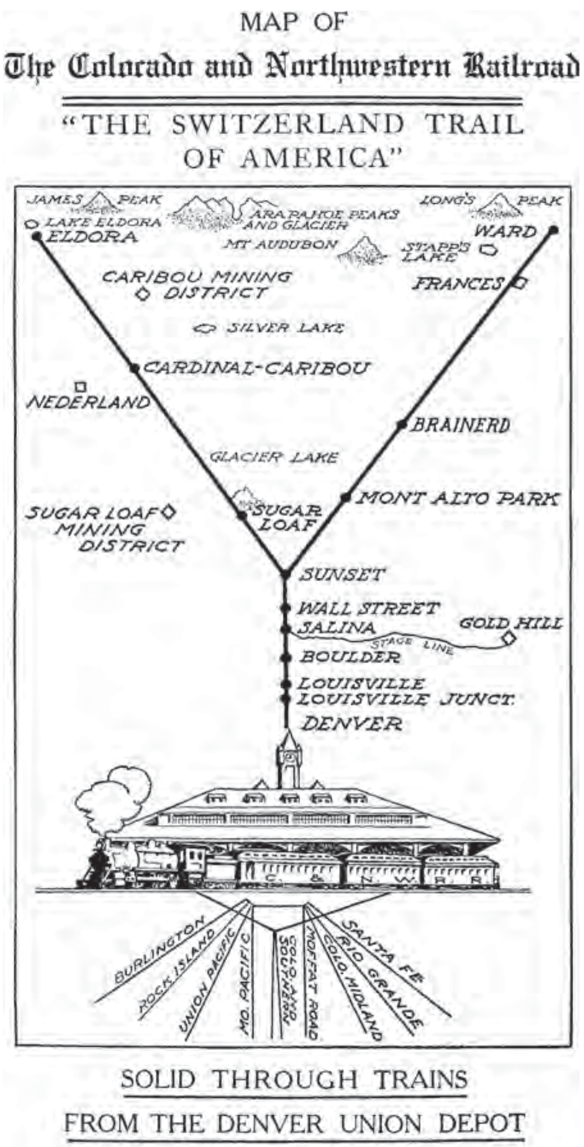


Figure 3.9. This route map from a 1906 promotional brochure is grossly simplified, betraying the Switzerland Trail's tortured route between Boulder and Eldora . *(Adam Thomas Collection.)*

Dick and Culbertson purchased the right-of-way of the former Greeley, Salt Lake & Pacific Railroad. The GSL& P was a narrow-gauge railroad that never connected any of its namesake cities but, rather, operated from Boulder westward 13 miles up Boulder and Four Mile canyons to Sunset. In 1899, Dick and Culbertson extended the railroad to Ward, reorganizing the company as the Colorado & Northwestern Railroad. With its scenic windings through Boulder County's foothills and mountains, breathtaking views, and rustic charm, the railroad became known as the "Switzerland Trail of America." It promised to be a great lure to tourists and, simultaneously, carry Boulder County's valuable mineral ores to smelters in Denver. But these grandiose prospects of fortune always seemed elusive to the railroad; it faced bankruptcy in 1904. Perhaps seeking a fresh economic start for his line, the Colonel turned his eyes toward the struggling mines at Eldora.[35]

The line to Eldora opened on January 1, 1905. While it connected Boulder and Eldora, the route was tortured and circuitous. It did not extend up Boulder Canyon, the most direct route between these two points. Rather, from Boulder the line plunged northwestward into the mountains, stopping at several other mining camps and tourist towns. Eventually it twisted southward, visiting Cardinal and, five miles further south, Eldora.

The railroad's arrival in Eldora did not, alas, save the mines. By 1905, the Mogul Tunnel closed and most miners moved away. The railroad served Eldora for 14 years, endured two reorganizations, and in 1919, ultimately yielded to a devastating flood from which it could not recover.[36]

Boomtown Society

Even through the heady boom days of the 1890s, Eldora maintained a degree of order and respectability. The town's leading citizens envisioned a community of permanence and sought the trappings of middle-class stability: clean, attractive streets; a visibly reputable citizenry; church services; and public education.

The town fathers articulated some of these goals from the beginning. On May 10, 1898, the town's board of trustees met for the first time. Within a matter of months, they had instituted regulations addressing vagrancy, loose dogs, offensive outhouses, manure piles, lewd women, and intoxicating liquors. A ladies club pressed the trustees to consider a curfew ordinance, which the trustees obligingly passed. In September 1899, a new city hall opened, providing quarters for the city clerk, police judge, and a free library with reading room.[37]

As Eldora's prominent men assumed roles in the town government, the women also sought out involvement in civic life. In an era before universal suffrage, clubs provided a forum for women to engage in public issues. The minute book for town trustees indicates that women's clubs functioned as a conduit through which to express their opinions to the town government. During the 1890s, at least three different women's clubs flourished within the town. Upon her visit to Eldora, Mrs. Jerome H. Baker, president of the State Federation of Women's Clubs, expressed "considerable surprise" that "Eldora could so ably maintain so many clubs so well-represented." Feminine influence was also visible in more superficial ways. Many Eldora residents wanted their streets to outwardly reflect virtue and beauty. As one old-timer recalls, "All the women, they had to have lace curtains on their log house, and their windows full of flowers–geraniums."[38]

In keeping with their sense of genteel identity, 1890s-era residents did not perceive themselves as primitive pioneers.

Rather, they were the more refined heirs of the earlier settlers. Tellingly, one of the women's club's afternoon discussions centered upon the rugged mountain experience of earlier settlers. They pitied and sympathized with the "Colorado Pioneers" who "lived, suffered and plodded upon that soil." For the club women, these "pioneers" were characters of the past whose resurrection necessitated historical reflection: "…[A]s the paper upon that subject was read it seemed as if the living characters were in close proximity to and nodding assent to their perilous, hazardous experience narrated in the discussion…."[39]

With so many young families in town and the residents' predilection toward order and upward mobility, a public school was clearly necessary to occupy and educate Eldora's children. The first schoolmistress, Mrs. Asa Campbell, taught pupils in her house. In 1896 a schoolhouse was built in the eastern section of town, and Mrs. Lucia Chapman was the first teacher to provide instruction within its modest walls. By 1898, approximately a hundred students attended; evidence suggested that expansion was necessary. Perhaps the Eldorans' civic pride and grand ambitions were best exhibited in the 1901 erection of a large, white-painted, two-story, four-room schoolhouse. Not only did the school accommodate swelling numbers of students, it also hosted weddings and other important social functions. Box socials–in which bidders competed for prepared lunches and the company of the preparer–were always popular. In the summer, the second story reputedly made an excellent dance floor.[40]

Although Eldorans dedicated funds to a grand school building, it appears that they never erected a church. This, however, did not reflect an impious population. Itinerant preachers often visited the town through the boom years, using the school for Sunday School and church services.[41]

While church services may have been attended by only the devout, nearly everyone turned out for the Fourth of July and Labor Day celebrations. Generations later, Eldora residents recollected these legendary, multi-day productions of the 1890s and 1900s; never again would the town experience the hubbub and mass excitement. The 1898 Labor Day celebration, hosted by the Eldora Miner's Union, was typically festive. The day began with an address by Mayor C.M. Webb and Rev. John Whisler, followed by a tug-of-war between the men of Gilpin and Boulder counties and the usual assortment of men's and women's foot races, sack races, and three-legged races. Most spectacular was the rock-drilling contest. A smooth, four-foot-high block of granite was unveiled, and miners competed to drill a hole in it in the shortest amount of time. Contestants traveled from as far as Central City, Gold Hill, and Ward to show their skills and compete for a generous cash prize. A typical miner could drill a hole with a single jack in nine to 10 minutes. Today, a block of granite at the intersection of Eldorado Avenue and Sixth Street bears evidence of one of these competitions.[42]

Citizens also embraced entertainment of a more cultured variety. In September 1899, *The Merry Cobbler,* a comic opera, was staged by "an excellent company of local amateur talent," followed by a dance and cakewalk. "Some very pretty steps were executed by all and the contest was so close that the judges were unable to make a decision and decided to call it a tie."[43]

Despite the inhabitants' aspirations toward a sophisticated lifestyle, Eldora retained some of the rough edges of a real mining town. During the boom years it remained a community disproportionately populated by single, working-class men; the requisite saloons, dance halls, and brothels were pre-

Figure 3.10. Built in 1896, Eldora's two-story, four-classroom schoolhouse may have been the most ambitious symbol of the community's boomtown hopes. It was demolished around 1939, and the materials were salvaged to build many cabins in the area. *(Eldora Civic Association.)*

Figure 3.11. Inside an Eldora School classroom, circa 1906. *(Eldora Civic Association.)*

Figure 3.12. Seasoned miners compete in a rock drilling contest during Eldora's 1899 Labor Day celebration. *(Eldora Civic Association.)*

pared to receive them. Some argued that a saloon was a necessary fixture in a mining town:

> Eldora, which is twelve miles from Wall Street Camp, and which is now attracting considerable attention, being now in the most interesting stage of the boom period of camp life, has already six flourishing saloons, with the prospects of a dozen more within a few days. In fact, the saloon has always played a conspicuous part in the development of mining camps….[44]

In an attempt to acknowledge these unavoidable economic demands and maintain a sense of propriety the town attempted to geographically isolate "indecent" businesses. The town trustees required that less-than-respectable females remain in the Monte Carlo Addition, on the (symbolically) shady south side of the creek.[45]

Eldora's more rambunctious neighbors also influenced the town. Mabel Smith Billingsly recalled:

> I well remember our first Saturday night in Eldora when all the Welsh miners who worked in the silver mines at Caribou about five miles from Eldora came walking down to the saloon singing all the way in their superlatively beautiful voices. The entire Valley rang with their music. After they had spent all their money and got sufficiently drunk, they walked all the way back to the top of the mountain in utter silence, and we never heard them again until the next payday.[46]

Boomtown Landscape

Boomtown Eldora's built landscape, then, reflected a town aspiring toward middle-class refinement while accommodating working-class tastes. The layout of the long, skinny town conformed to the narrow strip of good building sites in Happy Valley.

By 1899, the northwest end of town contained many of Eldora's important institutions and structures: Eldora Town Hall; the white-painted Eldora Bank; the house of Cassius M. Webb, Eldora's first mayor; the house of B.J. Hardin, justice of the peace; the hardware store of Fairman & Wilson; the Gold Miner Hotel; and the jail. North central Eldora was the hub of the commercial district, including several grocery stores, saloons, hotels, the post office, and the "new" two-story schoolhouse built in 1898. Northeast Eldora was principally residential, also incorporating a livery, the 1896 schoolhouse, and the Felch and Jones lumberyard.[47]

Nineteenth- and early twentieth-century Eldora bustled with the kind of commercial activity that it would never see again. The town was filled with the commotion of men moving mining equipment, operating mills, and running freight and lumber. Newcomers milled about and children played when they were not in school. The whole scene played out on an exposed stage; the majority of the immediate forest had recently been stripped away. Circa 1900 photos reveal a town punctuated by infrequent pines and spruces, with a narrow band of forest hugging the creek along the south side of the valley. Rising to the north, the minerally devoid but naturally craggy and dry Eldorado Mountain seemed to retain its trees. But to the south, Spencer Mountain, site of the residents' golden hopes and dreams, was dismally denuded by a massive forest fire and development. This exposure characterized Eldora for several decades to come. In the twenty-first century, old-timers marvel at the dense stands of trees that have only recently reclaimed Spencer Mountain and the Eldora townsite.[48]

Perhaps most telling of boomtown Eldora's landscape was the absence of enduring institutions to tend to the inhabitants' spirituality. Firstly, Eldora lacked a functional cemetery. This, however, could not be blamed on lack of vision. The town trustees had ensured that forty acres were set aside for the dead. Despite this local burial ground, however, Eldorans consistently used the Nederland graveyard. Secondly, and more significant, was the lack of a church. As one chronicler of Colorado's mining settlements notes, "The pride of every community–valley or gulch–was the church building or buildings, once erected. Nothing else seemed to indicate quite so surely the permanence of the town…."[49]

The Trouble with a Mining Town

Even as the town's claim to glory seemed to fade, dubious opportunists hyped its prospects. Long-winded advertisements sought out unwitting dupes. When potential investors wanted, reasonably, to examine a property, mine owners commonly "salted" their claims with good ore. One former mine laborer describes his experience on nearby Ute Mountain:

> The bore had been driven some 200 feet along a vein which carried no mineral values of any kind. One day the manager laid the crew off. "Take a coupla days with pay," he said. We asked no questions; and when we returned to work a heap of very fine-looking ore lay piled on the dump…. Then one day, came a party of stockholders from the big city, to inspect their reputed bonanza. 'All this here ore come from one big chunk we opened up in the tunnel,' beamed the manager.[50]

Figure 3.12. Even in the 1920s Spencer Mountain remained dismally devoid of trees. *(Eldora Civic Association.)*

This kind of deception could not sustain Eldora's boom. Despite the founders' optimistic hopes, Eldora's civic life contracted as prospectors, miners, investors, and their families left for greener pastures. The library, saloons, photography studio, and brothels disappeared. Between the early 1900s and the 1930s, the schoolhouse intermittently shut down as the youthful population dwindled; eventually the school closed entirely. Lifelong Eldoran Clara Rugg remembered watching her childhood friends leave with their families in the 1900s and 1910s: "That's the trouble with a mining town, you know. It loses out and then everybody leaves." Eldora's boom was over.[51]

III. ELDORA THE RESORT, 1890s-1960s

> And yet, Eldora survived, with old timers sunning themselves in front of a log cabin and with summer visitors returning year after year to spend a season in the mountain valley.[52]

In the long run, Eldora's biggest strike was tourism. Even as gold fever caught on in the 1890s, the town hosted visitors who were seemingly immune to that malady; these people sought scenery, healthful air, and a chance to "rough it." This impulse consistently boosted Eldora through the twentieth century, ultimately fostering a seasonal but informal and interconnected community.

From the outset, the town demonstrated the characteristic patterns of contemporary Colorado mountain destinations. Middle class to wealthy visitors traveled to the valley via stage lines, the railroad, and by automobile on improved roads, all previously established for mining purposes. But in some ways Eldora did not fit the mold. Only 20 miles to the east, Boulder offered some of the state's best-known cultural institutions. A short train ride past Boulder was the state capital, Denver, a modern American city in every respect. Thus, Eldora existed in urban Colorado's backyard. Inevitably, the town's rural, working-class character became diluted by a more sophisticated set of visitors.

The First Wave: Earliest Tourists Came to "Rusticate"

In August 1894, the *Boulder Daily Camera*'s social page reported on an expedition to the mountains:

> Tomorrow morning, bright and early, a jolly party will leave for Eldorado, where they will camp and take life easy for two or three weeks. The party will be Misses Eva, Jessie and Agnes Danford, Grace Williams, and Gerti Campbell, chaperoned by Mrs. A.J. Emerick.[53]

A burgeoning mining camp–with its attendant rough characters and lewd women–might have seemed an extraordinary place for a party of young ladies to take their summer vacation. However, these early, well-to-do tourists traveled to Happy Valley in substantial numbers. The young ladies could be confident that several other members of their social circle would be present; judges, professors, aldermen, and their families were all present that summer. Tourist infrastructure was modest at best, but the vacationers, who proved to be a self-sufficient and surprisingly hardy lot, camped, bought their own cabins or ranches, or made do with the existing accommodations. They came to fish, escape the symptoms of hay fever or tuberculosis, relax, and socialize. For those who sought good trout fishing, they could travel two miles south of town to Peterson Lake and rent a rowboat from homesteader Charley Peterson. Even the newspapers had to admit that the summertime offered more news than just new mining strikes:

> The past two weeks, however at Eldorado have been largely of a society turn. Nearly 300 people have been in camp after raspberries while the evenings have been taken up with dances, parties, candy pulls, and the like until Eldorado as a swell summer resort is no longer mere talk.[54]

The Second Wave: Becoming a Resort, 1900-1920s

The tourists who visited Happy Valley in the 1890s seemed largely indifferent to the mounting gold rush. Their summertime recreation involved the mountains and each other. Equally preoccupied, the mining community focused on developing mines. However, once the gold boom truly slumped and miners began processing out of town, some locals recognized that a livelihood could still be eked in Eldora.

Figure 3.13. A Japanese-inspired mansion and pagoda bridges lend an air of rustic sophistication to this 1917 photograph of Lake Eldora. *(Eldora Civic Association.)*

Figure 3.14. Pagoda bridges at Lake Eldora, circa 1917. *(Eldora Civic Association.)*

The boomtown might not become a ghost town after all. In 1914, a local paper reported that the prospective mayor of Eldora "wants all the tin cans and dump piles removed from the town, wants the roads repaired, and wants a poundmaster to keep stray cows and animals off the thoroughfares of the mining camp." According to the article, many residents believed in a new industry for Eldora. They were bent toward "making it an ideal summer resort."[55] The irony that tourists had already discovered the valley for themselves twenty years previous was not important.

Some locals adapted handsomely to the new economy. The Lilly family, who managed freight and stage services during the boom years, transitioned successfully into a livery and guiding company for tourists. By the early 1900s they not only ferried passengers between Boulder and Eldora, but they also operated a restaurant and hotel in town while conducted sightseeing tours into the high country, bringing wagonloads of visitors above timberline to the spectacular site of the Fourth of July Mine.

Perhaps the first business to aim squarely at the tourist trade was established by the Eldora Resort and Power Company. In 1902 the firm bought Peterson Lake, renamed it Lake Eldora, and built a hotel on the north shore. By the 1920s the hotel was known as the Pine Log Inn. Ensconced high in the hills to the south of town, the lake possessed an air of exclusivity. The inn attracted well-heeled vacationers who, conceivably, did not want to lodge among the lingering miners of Eldora.[56] In one of the first commercial efforts to describe the area's recreational attractions, the inn promoted tourist activities in its marketing literature:

> Hiking is a favorite sport in the mountains. The lake resort is only a few miles from the Arapahoe Peaks and Glaciers, and horses may be procured for those wishing to go to James Peak and other rides of a day's duration.... Close to the lake, which offers fishing, boating, swimming, and romancing, is the hotel, Pine Log Inn, and six cabins which will accommodate 40 with ease. West of the hotel is the dance hall....[57]

In later years, the arrival of the moneyed "Mrs. Brown" heightened the mystique of Lake Eldora. Her exact role at the lakeside operation was unclear, but locals' memories seem to agree on a few points. She was not the Denver's famous Unsinkable Molly Brown, of *Titanic* fame, but she did build an elaborate mansion based on Japanese motifs situated on the south side of the lake. Yet she spent little or no time in her beautiful retreat, but rather left in the hands of a caretaker until it eventually burned down.[58]

Lake Eldora's heyday paralleled the era of local railroad travel. As early as 1905, summertime guests could arrive by one of two daily trains from Boulder. Most people arrived at midday and, upon alighting from the train car, were typically greeted by the amiable John Lilly, who would offer either a buggy ride up to Lake Eldora or suggest the excellent lunchtime fare offered in the Lilly Restaurant. While some newcomers likely tested the Lilly lunches, many were wooed by Mrs. Martin, proprietor of the Home Dairy Restaurant, as she stood by the side-door of her establishment and blocked the walk. All of this lunchtime soliciting and hubbub could be avoided by arriving in Eldora via an entirely different route. Tourists could take the Denver & Salt Lake Railroad, known as "Moffat Road," from the company's own depot in Denver. They traveled westward toward Rollins Pass and got off at the small

Ladora stop, venturing by wagon or automobile the remaining four miles north to Lake Eldora.[59]

Although the resort at Lake Eldora dominated the early tourist trade around the former boomtown, other options also existed. Enterprising and crafty locals built numerous small cabins within the town of Eldora between 1905 and 1910; most likely these modest dwellings were built in order to be sold or rented to seasonal vacationers.[60]

The Third Wave: Informal Family Community, 1920s-1960s

In 1919, a devastating flood washed out the railroad tracks between Boulder and Eldora. A few years later, the resort at Lake Eldora was abandoned. From that time forward, the face of Eldora's tourism industry assumed an increasingly informal character. The failure of Eldora's railroad service coincided with increased reliance on an alternative mode of transportation: the automobile. After World War I, Americans with means embraced motoring vacations and sought out resort destinations with a new sense of independence. Vacationers increasingly set their own itineraries. Rather than taking the train, these tourists typically provided their own locomotion, driving up Boulder Canyon on the improved highway. Instead of booking hotel rooms, many visitors rented or bought their own cabins, and set up seasonal housekeeping. Social life had temporarily fragmented between the town and Lake Eldora, but now the town resumed possession of the tourist trade. The seasonal population swelled, the demand for cabins mushroomed, and the 1920s through the 1940s witnessed a steady stream of new construction, largely second homes and summer rentals. The newer buildings slightly outsized their more primitive predecessors, but remained devoid of modern conveniences such as electricity and plumbing.

Figure 3.15. Downtown Eldora in the 1920s was a summer tourist haven. The number of automobiles reveals how transportation and recreating had changed in Colorado and across the country. *(Eldora Civic Association.)*

For the decades between 1920 and 1960, Eldora slipped into a slow, predictable groove of summertime occupation. Season after season, a familiar cast of characters reassembled in Happy Valley. Most individuals could be categorized as either a vacationer–someone who whiled away their days in recreation–or a local–one who provided tourist services, obstinately pursued mining, or both.

Many of the locals clung to the days of Eldora's gold-mine boom. For better or worse, they had decided to stick around and perhaps continue mining. To make a better living, several of them also provided services to the tourists and summer residents. Perhaps the town's most visible citizen, William T. Harpel, served as Eldora's mayor for the last 30 years of his life. First elected in 1908, he assumed a title of diminished prestige since by this time the number of Eldora's residents had shrunk to an estimated 300 or 400. But Harpel, a widower whose married daughter, Clara, and her family would settle permanently in town, refused to leave Eldora. He typified the miner-come-service-provider: over the years he bought, sold and worked mining claims, meanwhile supplementing his income by cutting ice in the winter and selling it to tourists in the summer. Over the length of his mayoral tenure, Harpel proved faithful to his fellow locals, occasionally giving roadwork to down-and-out miners. Other locals like Mrs. Lilly and, later, Harpel's daughter Clara Rugg served as town treasurer through these years. Harpel's proudest achievement as mayor was to pay off the town's $30,000 debt, a balance that accumulated, according to Harpel's children, during John Kemp's brief stint as mayor during the boom period.[61]

When Mayor Harpel lost his wife around the time of the 1918 flu epidemic, he joined the ranks of local bachelors. Through the 1920s and '30s, nearly all of the year-round locals consisted of a small, motley group of single men. The only family to consistently pass the winter in Eldora were the Ruggs: Merle, Clara, and their three daughters and four sons. As the oldest of her siblings, Rose Rugg Northrup was the sole pupil in her first year at the Eldora School.[62]

The older bachelors–"very nice men," recalled Northrup–were friendly to the young Ruggs. These men, explained the eldest daughter in the family, had initially come to Eldora ostensibly to mine; they had also come, she insisted, to escape from family and former lives. Although Eldora's mineral prospects had faded, the bachelors found the Eldora lifestyle adequate, and stayed on in their little hand-built cabins.[63]

Despite their crude existence, the bachelors endeared themselves to the Ruggs. At Christmas, Mayor Harpel would acquire a quantity of oysters and his daughter, Clara Hornback, would fry them up and invite the "rest of the town." To Rose Rugg Northrup and the other children, the old men were "delightful" and provided companionship through the cold season. "You could always go talk to Mr. Schnaake," she said of Amos Schnaake, a gentleman who lived against the hillside near the Ruggs. Rose's brother, Charles "Binx" Rugg, regarded John Graff as a grandfather. "He used to give the kids hot cakes for breakfast and a jelly sandwich to my sister," he recalled.[64]

Amos Schnaake was a watch repairer from Philadelphia who had lost his brother in an terrible mining accident. John Graff, the man who cornered the local firewood business in the 1920s and '30s, reputedly buried his money in the chicken coop behind his house. Jay Rowley, was a "mountain man" who survived by trapping, growing a few potatoes, and making huckleberry jam and wine. Frank Anderson operated the Gold Miner Hotel. A mysterious Mr. Newton is barely mentioned in historical records.[65]

At various times other families stayed in town through all or part of the winter. The Hornbacks, Olsens, and Evanses all spent cold months in Eldora. Charles Hornback recalls the Christmas of 1937, when the community gathered in the schoolhouse to celebrate. Someone had cut a Christmas tree, and Charles and his brother performed an a cappella version of "Santa Claus is Coming to Town." Then Santa himself arrived, a big, tall man with a Swedish accent. The joyful Santa had apparently imbibed some spirits and knocked over the tree. Perhaps this was the tip-off; one of the Olsen girls saw through the disguise and cried out, "That ain't Santa Claus, that's Frank Andersen!"[66]

If the Ruggs were lonely in the winter, their schoolmarms must have been even lonelier. Teachers usually lived in the Gold Miner Hotel the entire season. In Rose Rugg Northrup's recollection, the typical teacher was a young girl, who had recently graduated from high school and was making between $50 and $100 per month. Turnover was high. But the job enabled the teachers to save enough money for college and, inevitably, to move away. The viability of the school must have seemed tenuous for many years before the town finally decided, in a tight vote, to close it in 1939. Later, Orin Markham bought the school and salvaged it to build a number of cabins in Eldora.[67]

For some locals like the Ruggs, Vern Hornback, Mayor Harpel, and the other bachelors, gold fever died hard. While such locals usually made their living off tourism, it was their passion for the gold hunt that kept them in Eldora. A few mines could still deliver a mediocre profit, and mining jobs were not hard to find.[68]

In Eldora, twentieth-century gold mining was not much easier than it had been in the nineteenth century, and most miners operated on a small scale. A typical day involved drilling eight two-foot holes, filling them with dynamite, and hoping that the resulting rubble would contain some lucrative ore. Miners would drill lowers (down into the rock), drifters (to the side), and uppers (to the top). More often than not, these miners labored six to seven days a week, ten hours a day, next to a single tallow candle. Sometimes miners worked for day wages, usually a few dollars, and sometimes for a percentage of the ore's value. The air in the mining shafts was dank and filled with dust from drilling and blasting. Bits of mica in the dust cut the lungs like tiny razor blades. Many miners, including Merle Rugg, Mayor Harpel, and Vern Hornbeck, died at an early age from lung maladies like tuberculosis or silicosis. "Every miner would go back to mining if he had his life to live over," Binx Rugg solemnly declared. "It's like gambling…, you want to see what's a foot ahead."[69]

At one point, a peculiar stranger briefly raised hopes of resurrecting Eldora's mining glory. According to one old-timer, an eccentric investor arrived in town in the 1930s. Mrs. Goodykoontz, a knickers-wearing newcomer with a Pierce-Arrow automobile, "colored" chauffeur, and Japanese cook, appeared to possess ample resources. She wanted to revive the Mogul Tunnel and employed several men to begin the effort. However, Eldora's supposed savior skipped town before paying her workers and probably knew better than to ever come back.[70]

Tourist Services

For tourists, the active but subdued mining industry did not detract from Eldora's charms. Even if Eldora never lived up to a true "Eldorado," it had the air of an old mining town. All the same, there was an important difference between the twentieth-century tourist town and its nineteenth century boom identity: the locals prepared for and welcomed vacationers.

First and foremost, tourists needed accommodations. Nineteenth-century visitors often made do with camping. By the 1920s and '30s, typical vacationers wanted a clean bed in a warm, dry room. They could stay at the Gold Miner Hotel, the fine old building that had somehow outlasted the mining bust, or the Penrose Lodge, located at Eldorado Avenue an Tenth Street. Another option was to rent or buy a cabin. These buildings were tiny, primitive dwellings. Many were remnants of the mining boom while more sophisticated cabins were constructed during the 1920s through the 1940s. The little dwellings bore whimsical names to remind their inhabitants that they were on vacation. Guests could check into "Mocolo," "Cloud-land," "Bonnie Brae," "Pooh's Corner," "Rest-a-While,"

Figure 3.16. Letter carrier Bob Roney delivers Eldora's mail to Woodring's Store in 1938. *(Eldora Civic Association.)*

"Smile-a-While," "Ideal," "Daisy," "Laf-a-lot," "Linger Longer," and "Avalon."[71] As one old-timer remembers, "In those days the cabins had names only, not numbered addresses." That meant that United Parcel, Sears Roebuck, and utility company drivers had to stop by at a grocery store to figure out where to deliver packages or install services.[72]

Tourists also needed a well-supplied grocery store, and Eldora often had more than one of them. Visitors could peruse the magazines, racks of candy, and a supply of chilled meat. These operations sometimes functioned more like a general store, offering postal services, postcards, and a place to write letters. From the 1920s through the 1950s, different families variously managed grocery stores: the Ponds, the Olsens, the Boltons (including a garage), and the Woodrings, who built a number of rental cabins in Eldora and managed them from their general store. Around 1930, the Woodrings' also assumed responsibility for the post office, and Margaret Woodring took the job of postmistress.[73]

Local children also profited from the tourist trade. Perhaps the most fundamental need of most tourists was fresh water. Because the town lacked a waterworks or even electricity to operate pumps, all household water had to be carried from Middle Boulder Creek. At the beginning of their stay, a tourist often would hire a boy to deliver water to their cabin each day. A typical "water route" involved the delivery of two buckets in the morning and two buckets in the evening, for 50 cents a week. A "real good" customer paid 75 cents to a dollar a week. Most residents found the creek water potable until some point in August, when you would, according to one local, begin to "get the runs."[74] Girls typically found work inside the cabins. In the early 1930s, Rose Rugg Northrup and her sisters used to clean tourist cabins for 25 cents an hour or babysit for 25 cents for four hours.[75]

Tourists spent most of their time in Eldora enjoying and exploring the mountains, and they could explore farther and faster on the back of a horse. To facilitate this activity, two liveries offered horses: Lilly Stables (the descendent of the Tallmadge and Lilly freight and stage line from the late 1890s) and Evans Stables. Lee Evans reflected on his childhood job of guiding "dudes:"

> An important part of becoming a dude wrangler was learning how to size up dudes when they arrived at the stable so that riders could be matched with horses. Put the flighty, nervous person on a quiet horse and the docile person on a horse with a little life. We had special horses for the "smart-ass" or the person who knew all about horses….
>
> Tourists asked hundreds of questions that required knowledge of each variety of flower, berry bush, pine tree, as well as mountain peaks, remains of old cabins, mines, dates of forest fires, and on and on. As I rode with a party I usually had to sit partially turned back in my saddle so that I could answer their questions–just like a tour bus driver![76]

Evans usually addressed his clients with regard. However, he occasionally found himself drawn into roguish plots to tease tourists. A particularly impish local, Andy Kuhn, managed rental cabins in partnership with the Woodrings. This put him in a position to maintain the town's tradition of harassing newlyweds. According to Lee Evans:

> [He would] advise 'all-concerned' when he had rented a cabin to newly-married honeymooners. Then he helped organize the 'shivaree' where everyone available gathered outside and made as much noise and commotion as they possibly could just as the kerosene lights were turned down or out. If Andy knew ahead of time when the people would arrive, he paid me a quarter to prepare the cabin for them. Being a small kid I had to crawl under the bed and wire a cowbell up in the springs with pliers and heavy wire.[77]

Not unpredictably, the area also harbored other kinds of mischief-makers. Around 1930, notably before the repeal of Prohibition, business acquaintances and friends Elizabeth Penrose and Jennie Evans went for an innocent ride through the woods.

> They rode on an indistinct trail through some fairly dense timber and came out in a small clearing on the tiny stream that ran through the area. They found themselves right in the middle of a large illegal whiskey still or distillery with barrels, bottles, and still equipment around them. No one was there, so they left in a hurry.[78]

The Vacationers

Although Evans mingled with vacationing dudes, he knew he was not on vacation himself. Like most of the locals, the Evans family struggled to make a living. In contrast, the majority of tourists could afford to spend their summer at leisure.

In some ways, Eldora's vacationers reflected the general body of Colorado's tourists. Some were from cities along Colorado's Front Range and many were from the Midwest. They sought out the high altitude climate for recreational and health purposes. As one local noted:

> A complaint of the pre-World War II period was there was no respite from the sweltering heat of the plains with air conditioning unheard of. Every cabin owner in Eldora had friends and family in the hot states–and they themselves were often escapees from Illinois, Iowa, Nebraska, Missouri, Texas, and Kansas. Friends and families would have thought Eldora residents were very selfish if invitations to cool off in Eldora were not extended.[79]

An Eldora vacation offered more than physical comfort, it also provided peace of mind:

> Mothers were terrified of polio epidemics. All that was known of polio was an association with summer heat and swimming pools, and everyone knew families whose children had died or been crippled. Consequently, many mothers would bring their children to Eldora for the summers, and the fathers would join them as time allowed.[80]

Polio was not the only dreaded disease that seemed to linger at lower altitudes. Tuberculosis and hay fever also drove people to the mountains. According to conventional wisdom of the day, mountain air helped cure the lungs. To this end, Eldora's cabins were outfitted with sleeping porches so that con-

Figure 3.17. Elizabeth "Penny" Penrose operated one of the most beloved lodges in Eldora, largely catering to successful, professional women. *(Eldora Civic Association.)*

sumptives could spend the whole night inhaling the cool, restorative air.[81]

Some individuals, couples, and families arrived in Eldora for happier reasons. Honeymooners were common. Others came to visit old friends. Army Captain Donald Kemp, son of the Happy Valley Placer Company's John Kemp and the author of two books about Eldora, hosted a variety of friends from his years in the military.[82]

Regardless of the initial reasons for visiting the town, many vacationing families, perhaps most, became repeat visitors. They bought cabins and began to sink deep, though still seasonal, roots. Echoing the status-conscious Eldorans of the late 1890s, they insisted on bringing some of their middle- and upper-class lifestyle to their summertime haven. For example, pianos, which were both costly and cumbersome to transport to the high-elevation summer town, were not infrequently shipped to Eldora.[83]

Although entire families typically established themselves in Eldora, it was the mothers and children who spent more meaningful time in the area. Tied to work obligations back home, many tourist fathers only spent a fraction of their summers in the mountains. This pattern was typical of Colorado's resort communities.

"The father would bring up the family," remembers Barbara Lilly Bolton of the summer vacationers. "He would stay for the weekend, or a few weeks, and then return. His wife and children would continue on through the summer, fishing, hiking, having picnics."[84]

However, the feminine presence was further augmented since an atypical number of successful, professional women also spent their summers in Eldora. It is not entirely surprising that a village like Eldora drew an above-average number of influential, often single women from the university and business worlds. The proximity of the University of Colorado in Boulder ensured that many of the state's female professors, college students, and other academics would seek summer retreat in the nearby mountains.[85]

The most prominent attraction for professional women was Elizabeth Penrose's Penrose Lodge. In 1924, Penrose, known to her friends as "Penny," bought the Woodlands Park Lodge and another cabin at Tenth Street and Eldorado Avenue. She immediately began working on both buildings, improving the kitchen and enhancing the dining and sleeping spaces. By Eldora standards, she operated a remarkably refined hostelry. According to her 1931 pamphlet, she provided her guests "modern cabins" and "new, modern showerbaths" for $50 to $75 per week. As one local recalls:

> Eventually Penny added a stone structure to the north of the main cabin for toilets and showers. As her business expanded, she built a new log cabin west of the other cabins. Then, she bought two small cabins across Tenth Street on lots that faced Klondyke and used them as overflow guest facilities.[86]

Although the Penrose Lodge advertisements did not indicate it, the lodge largely catered to women in academia, business, and entertainment. On rare occasions, men vacationed in the log cabins of Penrose Lodge, but their appearance was usually justified by their marriage to long-standing guests.

Interestingly, this exclusivity did not appear to create local conflict. This was an era in which segregation by gender for educational, social, and recreational purposes was still considered normal. Additionally, despite operating a summer tourist business Elizabeth Penrose appears to have integrated herself into the year-round Eldora community. Many locals reflected on the lodge with admiration for the grace of its accommodations and the charm of its proprietor. Years later Lee Evans, who as a child guided countless numbers of guests from the lodge, recounted Elizabeth Penrose fondly:

> Penny was of medium stature, had short naturally wavy blond hair, intense blue sparkling eyes, and an easy smile and laugh. Probably most people did not consider her to be a pretty woman, but she had a wonderful winning personality.[87]

Like most of Eldora's summer migrants, Penrose hailed from the Midwest. Trained as a dietician and home economist, she taught at Rockford College in Rockford, Illinois. This small women's college historically graduated a brilliant assortment of prominent women, including Jane Addams, founder of Hull House in Chicago and winner of the Nobel Peace Prize. Penrose linked Eldora to an elite community of influential women, providing a forum for them not to further distinguish themselves, but rather for them to escape their busy careers, relax, and informally mingle with other ambitious, intellectual members of their own gender. Penrose initially invited her students as guests. Her establishment was an excellent practical demonstration of her skills in nutrition and home economics. Over the years, the lodge developed a following of repeat visitors, attracting high-ranking women from multiple walks of life. Lee Evans discovered later that his childhood connections made at Penrose Lodge would eventually facilitate a fellowship application at Northwestern University.[88]

Although the Penrose Lodge's cabins mostly welcomed women, her restaurant was open to all for breakfast, lunch, and dinner–with prior reservations. While other eateries were also periodically available in Eldora, the Penrose Lodge was considered an elegant affair. Evans declared:

> I will not say that she operated a walk-in restaurant. It was something special… . Table settings were complete with orange place mats, orange napkins, and orange candles. Penny grew orange-colored African daisy flowers, and there was a perfectly matched orange bouquet at each small table. The room was fairly small, usually lit only with a sparkling fire in the fireplace, the candles, and several kerosene lamps.[89]

Not surprisingly, the restaurant at the Penrose Lodge was a place for celebratory meals. Summertime sweethearts like Mary Nell and Bill Gross had their wedding dinner there in August of 1947. Within in the next few years, Elizabeth Penrose left Eldora to operate Blanchard's Inn in Boulder Canyon. Her former Eldora lodge became a private summer residence and the associated cabins were sold off as separate parcels.[90]

The patronage of professional women was not unique to Eldora. Other regional vacation towns also hosted various influential women. To the north, Gold Hill's "most celebrated hostelry," a "sturdy log building…immortalized by Eugene Field in his poem 'Casey's Table d'Hote'" was eventually bought by Mrs. Jean Sherwood, founder and president of the Holiday House Association of Chicago. She renamed it Blue Bird Lodge and operated it as a "summer resthouse for business and pro-

Figure 3.18. Penrose Lodge in 2007. *(Historitecture.)*

fessional women." To the south of Eldora, Pinecliffe served as a summertime retreat for education success story Emily Griffith, the founder of the Emily Griffith Opportunity Schools in Denver.[91]

With this influx of prominent, affluent individuals, the divide between vacationers and locals was unmistakable. "When the summer was over, the 'upper crust' returned home to Texas, Oklahoma, Kansas, and Illinois," observed Lee Evans. "The remainder faced the winter."[92] The remainder clearly understood their status. "The tourists thought they were better than the home town people," remarked Clara Harpel Rugg, who grew up in Eldora and raised her children there.[93]

Side-Stepping the Great Depression

Some locals may have felt justifiably galled by the vacationers' sense of superiority. But it was the tourists' wealth and influence that largely sustained the whole town through the economic disaster of the 1930s. Certainly the Great Depression marched through Colorado, emptying bank accounts and undermining the financial security of countless families. Years of drought and economic downturn severely affected the state. However, Eldora was largely insulated from the worst of the crisis. Those who faced stiff financial troubles were effectively filtered out; only the well-to-do could afford to drive their shiny cars up to the high country and pass the season in the rustic little mountain town. Summer vacationers lived a breezy lifestyle of fishing, horseback riding, and porch-sitting.[94]

The tourist industry did more than keep Eldora afloat through the Depression years. The 1930s were, in fact, a period of growth for Eldora. Building records indicate an increase in cabin construction. The summertime population swelled with employed construction workers. The United States seemed to have a short supply of successful, wealthy businesspeople during the Great Depression, but summertime Eldora did not.[95]

All the same, the locals were not utterly dependent upon the tourist trade, exploring multiple other resources. The Rugg family managed to survive in part through the "dump" or tailings left from their gold mines. Essentially very low-grade ore, dump material was hauled south to the railroad station in Rollinsville and shipped to the Golden Cycle Milling Company in Colorado Springs. There, the mill extracted enough gold from the dump to send the Ruggs a check. Other nearby mining operations also employed miners during this period.[96]

Rose Rugg Northrup grew up during these years and believed that a strong sense of community sustained the locals. "If you needed something, you could always borrow it," she remembers. Grocery stores operated on credit, expanding her family's financial options. "I don't think we had truly the type of depression that was in the East…when people are on a standard of living which is almost poverty you don't really notice it too much…. In our family, no one literally went hungry."[97]

Figure 3.19. Eldora weathered the Great Depression relatively intact. While the buildings in this 1939 view of Eldorado Avenue are a bit deteriorated, they all appear to host businesses. *(Eldora Civic Association.)*

Compared to other parts of the United States, Eldora did not project an image of poverty. Far from major thoroughfares, the town's streets and alleyways were not frequented by hobos or tramps. For vacationers, summertime Eldora must have offered the perfect idyllic reprieve from work, school, and, especially, Depression-era scenes of hardship.[98]

IV. DAY-TO-DAY LIFE IN ELDORA

Many hardy miners of the 1890s braved the howling winds of Eldora winters, unwilling to leave mining. Vacationers, however, preferred to spend the cold season in the mild weather of lower elevations. By the 1930s, the town was almost entirely seasonal. Even locals abandoned the Happy Valley during part of the winter. When the school closed in 1939, the Rugg family, constituting the bulk of the students, moved to Nederland for the school year.[99]

Summertime

When the snows eventually melted away, locals would creep back to town, airing cabins and cleaning out the cobwebs before the tourist season began. Through most of the 1920s, Lee Evans and his mother, Jennie, arrived in May, accompanying their herd of dairy cows from Louisville, and prepared to provide the town's milk products for the warm season.[100]

Eldora's summer really started in late June. This was when green grass spread across vacant lots, and the columbines and other wildflowers adorned the roadsides. One woman recalled the hum of summertime activity: "…In earlier days almost every cabin was filled to capacity–or overcapacity. There were children everywhere, climbing rocks and playing games in big groups. Often groups of men pitched horseshoes."[101]

Vacationers could choose to lounge about their cabin or explore the nearby high country. A promotional pamphlet for the Penrose Lodge outlined other possibilities:

> Trail trips–afoot or on horseback to Arapahoe Pass on the Continental Divide only nine miles west of the Lodge; to Arapahoe Peak and Glacier; to Corona, the "Top of the World" on the Moffat Railroad; to historic Caribou, the rich silver mining camp of early days. Or just idle along nearby trails through the aspen and pine and spruce forests. You may even see a deer.[102]

The pamphlet also encouraged visitors to travel farther afield and take an automobile to more distant attractions north and south:

> Motor trips–choose one day round-trips by auto from the Lodge to Estes Park, Rocky Mountain National Park, the magnificent Trail Ridge Road to Grand Lake, Berthoud Pass, Echo Lake, Mt. Evans and the Moffat Tunnel, Red Rock and Brainard Lake. Explore Central City, only twenty miles away, where fabulous gold discoveries were made and see the famous Opera House there where plays are staged every summer. Attend the nationally known Arabian Horse Shows at the Van Vleet Ranch, nearby.[103]

Despite the distant temptations, many tourists preferred to pass their time in Eldora's more immediate neighborhood. In a typical experience, a group of sightseers would rent horses and travel up to the high country. Lee Evans guided many of these parties up to the Continental Divide, Arapahoe Peak, and good fishing lakes. He remembers a particularly memorable trip with some of Elizabeth Penrose's guests:

> Each summer we would take a few moonlight rides, one of which I will never forget. We had about ten people, most of them guests at Penrose Lodge. Around noon we all rode to Devil's Thumb Lake and that evening had a steak fry as the sun was setting. It was a beautiful cloudless and warm evening without wind, and the tantalizing aroma of the steaks frying over the open fire filled the valley. We started riding home after dark just as a great harvest full moon rose over the plains in the East. Then the opera star started singing with her powerful soprano voice reverberating in the valley. Others spelled her with their songs, and singing went on all the way back to Eldora. Some of the others in the group had good voices, too, both men and women. Don Cameron, for example, had been a soloist for many years with Sammy Kaye, one of the big bands. The trip made a tremendous impact on all of us, and even today I get emotional as I recreate that evening in my mind….[104]

Most Eldorans mingled with each other in town, rubbing elbows getting their mail or buying groceries. In the early years of tourism, U.S. Mail arrived on the 12:30 p.m. train. "Tourist girls got more mail than we did," remembered Clara Harpel Rugg, rather resentfully. One tourist girl refused to open her love letters at the train station, but instead took them back to Peterson Lake, rowing out to the middle before reading her beloved's words.[105]

After the end of rail service in 1919, the official mail usually arrived in a designated grocery store, which changed from time to time. Around midday, Eldorans of all stripes made their way to Klondyke Avenue to receive their mail. Recalled Evans:

> Mail time represented the best opportunity to observe and experience the mixture of townspeople– old timers, a few construction workers, miners, tourists, teachers, retired military officers, doctors, professional people and summer residents…. Mail time was a slice of life in the little summer resort town of Eldora at its finest time.[106]

Children also hovered near the candy-filled grocery stores. On summer nights, Guy Woodring operated a small gasoline-powered generator to light his grocery store. One light illuminated the front of the building, and kids played kick-the-can in the street. In the memories of old-timers, kick-the-can occupied much of the children's free time.[107]

When not playing games, youngsters found a plethora of open space and interesting buildings and structures to explore. The Ruggs, the only children living permanently in the valley in the 1930s, gained popularity because they had a stable full of horses to ride. Brother and sister Johnny and Jinny Jones often hiked over Spencer Mountain to roller skate on the porch of the big, empty lodge at Petersen Lake. Perhaps the most interesting destinations were the mills and mines. Their owners had simply abandoned many of the sites. Before World War II scrap drives salvaged abandoned mining and construction materials, an assortment of mysterious, cast-aside machinery just lay scattered about. "One found a lot of interesting objects in some of the mills," recalled Evans, "such as the pretty glass egg I brought home to Mother to use in chicken nests. It did look just like the glass eggs we used in the nests. It turned out, however, that this was a 'cyanide egg' used to leach out gold from crushed ore in the big redwood cyanide tanks in the mill!" [108]

Teenagers found other ways to congregate and pass the time. For decades, the second story of the schoolhouse hosted dances. Another venue opened up in the early 1930s when Orin Markham bought the Pond's Grocery store and turned it into a soda fountain, complete with player piano. "Between the booths and tables in the east wing of the building there was space with a hardwood floor where we could dance in the evening after the restaurant stopped serving."[109] Lee Evans spent most of his teenage summers laboring exhaustively to help his mother operate their livery stable. However, he came to appreciate some aspects of working with tourists: "I had the ideal opportunity to meet these girls because I rode with them when they rented horses from us."[110]

As a former vacationer recalled, "We had a very enjoyable young people's group from the summer of 1930 until about 1937, when various ones of us began getting married, going off to graduate school, or otherwise relocating away from our parents into our own lifetimes…." Popular activities in these years included bridge parties, picnic suppers, and piling into someone's large car and driving around to find clear radio reception.[111]

Eldorans lacked many forms of commercial entertainment and (with the exception of teenagers seeking radio signals) seemed to relish the isolation. In 1935, the local paper made the ironic observation: "No pool hall, no movie house not even a saloon–yes sir, the town's dead…."[112]

Figure 3.20. In direct contradiction to its summertime prosperity, Eldora in the winter was a desolate, isolated place. *(Eldora Civic Association.)*

Wintertime

Eldora's high season lasted only about six weeks. Some tourists and locals lingered longer, celebrating the yellowing aspens and autumnal beauty of Happy Valley. For Rose Rugg Northrup, however, September only signaled the advance of many cold and desolate months. Without access to a library or private collection of books, children did not have many options for indoor entertainment. When the weather permitted, they could skate or ski, sharing their equipment. However, the valley's notorious fierce winds often prohibited these activities. There was a lot of "horizontal snow;" ferocious gusts blew the snow into enormous drifts. Sometimes gigantic, wind-blown drifts even blocked the valley's outlet, trapping Eldorans in Happy Valley. At blessedly calm moments, the clouds dropped snow straight down. At those times, one could hear the train whistling as it chugged toward Moffat Tunnel, several miles to the south.[113]

V. EVOLVING THROUGH THE TWENTIETH CENTURY: THE MODERNIZATION OF ELDORA

Gradually, Eldora the boomtown became Eldora the summer resort as the community evolved through the twentieth century. With the closure of the school, the town relinquished one of its last real mining-era institutions. The oversized building had been unsuitable for decades. Even when school was in session, three of its four rooms stood empty. Not soon after, the demands of World War II cleared the hillsides of abandoned mine equipment. Even the bright yellow tailings of the Mogul Tunnel, long considered an Eldora landmark, were steadily hauled away for roadbeds.[114]

The town's economy rested firmly on tourism. In 1941, when Jack and Helen Langley first made Eldora their permanent summer home, Helen recalls that it was a sleepy summer village with two grocery stores and one restaurant. Change, however, was not far away. Little by little the town adopted twentieth century comforts and habits. By 1936, the Ruggs had already acquired their first radio.[115]

In 1947, electricity–a utility first franchised half a century before but never delivered to the former mining camp–finally arrived in Eldora. Each household paid $75 to bring the connection to town. For locals, it was a "day of celebration." Residents turned on their lights all over town. No longer did they have to pass the evenings trying to read by oil lamps. Nor did they have to rely on iceboxes to cool their food, putting the iceman out of business. Electricity also allowed residents to install electric pumps in wells. Now Eldorans did not have to rely upon the questionably clean Middle Boulder Creek for their drinking and household water. And with electric pumps, most Eldorans also installed indoor plumbing for the first time.[116]

Gradually, a different brand of summertime tourist came to visit the town. A paved and much more direct road in Boulder Canyon allowed for quicker, cleaner automobile trips. No longer was the journey up and down the canyon dusty, long, and so steep that stalled cars crowded the shoulder. Now an easy day's drive from cities like Boulder and Denver, Eldora was an obvious destination or through-point on the way to the high country. The local press printed glowing articles about the bumpy but passable road through Eldora, extending west and upward toward meadows, lakes, and the Fourth of July Picnic Area. The number of day visitors expanded.[117]

Officially Seeking Obscurity: The Town is "Abandoned"

In the 1960s and '70s, the character of the typical Eldora resident changed. "The improved road and the arrival of electricity made it more plausible to live full time in Eldora and commute to work," remarked one former vacationer. In the 1950s, only two to four people lived in Eldora through the winter. By 1972, 50 people claimed to live there year-round. In the 1950s, very few pets lived in town. In the 1970s, nearly every household had a dog, observed Helen Langley. Indeed. she credited the canine presence for the disappearance of deer, rabbits, and chipmunks in Eldora.[118]

Perhaps 400 or 500 people continued to rent or own cabins. However, repeat summer vacationers began to notice changes in the neighborhood. Certainly, some of the newcomers looked familiar–families and retirees looking for a mountain home. But some of the strange, bearded faces around town belonged to young people of a new generation. These "long-haired transients" would "camp in a tent along a creek" or perhaps rent a cabin through the winter.[119] Upon his return to the east coast, one man reflected on this transient sub-community:

> Now Phil and Lisa are gone. Everybody leaves, it seems. They come here to prove themselves against a storybook winter, then move on to something else. They have already left one home to look for a new one, but they usually don't find it in Eldora, which is sometimes defined as a place "to get your head together" but rarely as a place to settle down. Too damned windy, too much winter.[120]

One older resident perceived this new group as a threat. "The U.S. Supreme Court tells us that 18-year-olds can vote now, and all they have to do is say they plan to stay in Eldora and don't have some other legal residence and that they've been here 32 days."[121]

Eldorans were concerned about more than pesky hippies voting on their issues. Residents also had another and, perhaps, larger concern: Lake Eldora Ski Resort. Opened in the winter of 1962-63, the ski area signified growing interest in wintertime vacation real estate. Developers considered Happy Valley as a potential site for ski lodges and condominiums. The inhabitants feared that the new construction would bring tax increases and urbanization.[122]

Eldorans sought an extraordinary solution. On June 19, 1973, a local paper declared: "The mountain town of Eldora, which hasn't operated for more than twenty years, officially was declared abandoned Monday by the Colorado Supreme Court."123 By de-incorporating 85 years after incorporation, the town of Eldora returned to Boulder County rule. It also distinguished itself as the first Colorado municipality to ever de-incorporate. Then in February 1974, the Boulder County Commissioners zoned the town as forestry. Eldora's new legal status ensured that transient residents could not unduly influence the legal fate of the town, and made it difficult for developers to build new businesses or multi-family projects. Today, Eldora is located within Roosevelt National Forest. On October 11, 1978, President Jimmy Carter signed into law H.R. 12026, formally creating the Indian Peaks Wilderness area along the Continental Divide west of Eldora.[124]

The wilderness designation so close to Eldora's boundaries represented the end of a long journey. In the 1890s, Eldora was founded in the spirit of enterprise and exploitation. Less than a century later, Eldorans reversed course and squelched commercialism in the pursuit of a pristine recreational landscape.

NOTES

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11. *Ibid.,* 133-135.
12. *Ibid.,* 135-136.
13. "Eldorado gobbled up," *Boulder Daily Camera*, December 20, 1892.
14. Kemp, *Silver, Gold and Black Iron*, 139-140.
15. "A New Camp," *Boulder Daily Camera*, May 27, 1892.
16. *The Fort Collins Express*, Jan. 1, 1894.
17. *Boulder Daily Camera*, July 27, 1893.
18. "In Focus," *Boulder Daily Camera*, November 12, 1892; "A New Eldorado: A Camp Rich in Gold Found at the Snowy Range," *Boulder Daily Camera*, November 30, 1892; James McGinnis, "Camp Eldorado," *Boulder Daily Camera*, January 8, 1894; "Eldorado News," *Boulder Daily Camera*, March 29, 1895; *Boulder Daily Camera*, August 10, 1895; *Boulder Daily Camera*, August 31, 1895; "Eldorado News," *Denver Republican*, reprinted in the *Boulder Daily Camera*, March 29, 1895; "Camp Eldorado: Our Correspondent Reports Some Interesting News," *Boulder Daily Camera*, July 26, 1893, 1.
19. Kemp and Langley, *Happy Valley*, 20; Wolle, 498.
20. "Pad's Mining Review," *Boulder Daily Camera*, January 1, 1894.
21. *Boulder Daily Camera*, August 5, 1896; Kemp, *Silver, Gold and Black Iron*, 138, 163.
22. *Ibid.,* 181.
23. *Ibid.,* 169, 204-05.
24. *Ibid.,* 131.
25. Jay M. Church, interview with Donald C. Kemp, quoted in Kemp and Langley, *Happy Valley*, 37.
26. *Ibid.,* 11, 42, 54.

27. *Colorado Transcript*, Golden, April 6, 1898.
28. Kemp and Langley, *Happy Valley*, 21; "Camp Eldorado, Two Mills to be Placed in Operation at Once," *Boulder Daily Camera*, July 11, 1894.
29. Kemp and Langley, *Happy Valley*, 20; Wolle, 498; Kemp, *Silver, Gold and Black Iron*, 198; "Big Works Started: A Sale of Eldorado Property and What's to Come of it," *Boulder Daily Camera*, February 12, 1896; June 10, 1896; June 29, 1896.
30. *Boulder Daily Camera*, January 8, 1896.
31. *The Denver Republican*, March 28, 1899, quoted in Kemp, *Promoter's Paradise*, 22.
32. Kemp, *Silver, Gold and Black Iron*, 166.
33. Wolle, 500; Kemp, *Promoter's Paradise*, 22-23.
34. Kemp and Langley, *Happy Valley*, 40-41.
35. *Ibid.,* 40-41; *Longmont Ledger*, November 26, 1897; Kemp, *Silver, Gold and Black Iron*, 198-199.
36. Kemp, *Silver, Gold and Black Iron*, 218-219.
37. Minute Book of Trustees of the Town of Eldora, 1898-1916, 1, 8, 11-13, 15, 18, 32, 37; "New City Hall," *The Eldora Miner*, Vol. 3 No. 4, September 16, 1899.
38. "Women's Clubs Meet," *The Eldora Miner*, Vol. 3 No. 7, September 16, 1899; Clara J. Harpel Rugg, interview by Victoria Gits, April 22, 1976, Boulder Women's Oral History Project, Carnegie Branch for Local History/Boulder Public Library.
39. *The Eldora Miner*, August 27, 1898.
40. Rose Rugg Northrup, interview with Victoria Gits, April 8, 1976, Boulder Women's Oral History Project, Carnegie Branch for Local History/Boulder Public Library; Kemp and Langley, *Happy Valley*, 42-43; Kemp, *Silver, Gold and Black Iron*, 165; *Boulder Daily Camera*, June 5, 1895.
41. Kemp, *Silver, Gold and Black Iron*, 186.
42. Advertisement in *The Eldora Miner*, August 27, 1898; Charles Hornback and Barbara Lilly Bolton, video recorded interview with Anne Dyni, June 25, 2005, Carnegie Branch for Local History/Boulder Public Library; Kemp, *Silver, Gold and Black Iron*, 188.
43. "The Merry Cobbler," *The Eldora Miner*, September 16, 1899.
44. *Longmont Ledger*, February 25, 1898.
45. Kemp, *Silver, Gold and Black Iron*, 173, 184-86.
46. *Eldora Civic Association Newsletter*, Winter, 1996.
47. Kemp, *Silver, Gold and Black Iron*, 164-165.
48. *Ibid.,* 146-155; Charles Hornback and Barbara Lilly Bolton, video recorded interview with Anne Dyni, June 25, 2005, Carnegie Branch for Local History/Boulder Public Library.
49. Kemp, *Silver, Gold and Black Iron*, 220; Carl Ubbelohde, *A Colorado History*, Ninth Edition (Boulder: Pruett Publishing Com-

pany, 2006), 80.

50. Kemp, *Promoter's Paradise*, 30.
51. Northrup; Clara J. Harpel Rugg, interview by Victoria Gits, April 22, 1976, Boulder Women's Oral History Project, Carnegie Branch for Local History/Boulder Public Library.
52. Wolle, 501.
53. *Boulder Daily Camera*, August 6, 1894.
54. "Camp Eldorado: Our Correspondent Reports Some Interesting News," *Boulder Daily Camera*, July 26, 1893; *Boulder Daily Camera*, July 12, 1893; August 6, 11, 23, 27, 1894, August 31, 1895; "Judge O'Neil's Summer Home," *Boulder Daily Camera*, October 28, 1893, 1; Kemp, *Silver, Gold and Black Iron*, 211.
55. "The Eldora Muddle Before Judge Ingram," *The Boulder Daily Camera*, April 16, 1914.
56. Kemp, *Silver, Gold and Black Iron*, 169; "Is it Mineral Land? An Important Suit Involving Property at Eldorado," *Boulder Daily Camera*, March 26, 1894.
57. "Lake Eldora," *Boulder Daily Doings*, August, 1923.
58. "Memories of Lake Eldora," *Eldora Civic Association Newsletter,* April, 1996; "Remembering Lake Eldora," *Eldora Civic Association Newsletter,* April, 1996.
59. Kemp, *Silver, Gold and Black Iron*, 176-77, 213-15.
60. "Eldora Historic District," Nomination to the National Register of Historic Places, listed October 4, 1989, Section number 8, Page 4.
61. Clara Rugg; Charles "Binx" Rugg, interview with Anne Dyni, March 8, 2002, Carnegie Branch for Local History/Boulder Public Library; "Town of Eldora at Crossroads," *The Denver Post*, August 20, 1972; Lee Evans, 89.
62. *Ibid.,* 41; Clara Rugg.
63. Northrup.
64. *Ibid.*; Charles "Binx" Rugg, interview with Joan Plyley, June 26, 1989, Carnegie Branch for Local History/Boulder Public Library.
65. Northrup; Evans, 94, 157-159.
66. Earl and Barbara Bolton, video recorded interview with Anne Dyni, March 8, 2003, Carnegie Branch for Local History/Boulder Public Library; Hornback.
67. Northrup; Evans, 48-49, "Binx" Rugg.
68. *Eldora Echo*, July 12, 1935; "Binx" Rugg.
69. Norththrup; Hornback; Lee Evans, "An Exciting Day at the Eldora Post Office–About 1930," *Eldora Civic Association Newsletter,* February, 1996; "Binx" Rugg.
70. Phil Rouse, "The Mogul Tunnel," *Eldora Civic Association Newsletter,* February, 1996.

71. *Eldora Echo*, July 5, 1935; Evans, 90.
72. Isabel Hansen Cross and Alice Cross Anderson, "The Log Cabin Corner Store," *Eldora Civic Association Newsletter,* August, 1996.
73. Lee Evans, "An Exciting Day at the Eldora Post Office–About 1930," *Eldora Civic Association Newsletter,* February, 1996; Evans, *From Happy Valley to the Mountaintop,* 110-111.
74. Hornback; Earl and Barbara Bolton.
75. Northrup.
76. Evans, *From Happy Valley to the Mountaintop*, 81.
77. *Ibid.,* 91.
78. *Ibid.,* 82-85.
79. Ruth Huntington Williams, "Eldora in the 1930s and early 1940s," *Eldora Civic Association Newsletter,* August, 1996.
80. *Ibid.*
81. Northrup.
82. Evans, *From Happy Valley to the Mountaintop*, 107-111.
83. The local paper, *Eldora Echo,* reported the following society events: "Through the efforts of Mrs. Hockett a piano has been purchased for the clubroom. It is now in the club;" "Mr. and Mrs. Postlewaite went to Denver and bought a piano for Miss Ruth Postlewaite to enable her to continue her music while in Eldora," *Eldora Echo*, vol. 2 no. 2, July 12, 1935, 1.
84. Earl and Barbara Bolton.
85. Evans, *From Happy Valley to the Mountaintop*, 95; *Eldora Echo*, July 12, 1935, this entry exemplifies the typically female summertime visitors to Eldora: "Mrs. John Poage, from Lexington, Missouri, has rented Pinehurst and Junior for the summer. Her guests are Mrs. Kate Jennings and daughter, Rosa Lee Jennings, from Salisbury, Missouri." The *Echo* also reflects some of the professional women who visit Eldora: "Miss Maud Craig who is a member of the Colorado University faculty was a guest over the fourth of Mrs. A.E. Whiting," *Eldora Echo*, vol. 2 no. 1, July 5, 1935; "Mrs. Auld, of Fort Collins, Colorado, interviewed last week Mrs. Donald Kemp, who is the assistant training director at Marshall Field's, Chicago," *Eldora Echo*, July 12, 1935.
86. Evans, *From Happy Valley to the Mountaintop*, 82-85; "Penrose Lodge: A Resort in the Mountains," pamphlet, 1931.
87. Allen and Ena Jenner Bolton, interview with Anne Dyni, 1990, Carnegie Branch for Local History/Boulder Public Library; Evans, *From Happy Valley to the Mountaintop*, 82-85.
88. *Ibid.*, 82-85.
89. *Ibid.*
90. *Ibid.;* "Eldora Sweethearts," *Eldora Civic Association Newsletter,* February, 1996.
91. Wolle, 484; *Eldora Echo*, July 19, 1935.

92. Earl and Barbara Bolton.
93. Clara Rugg.
94. Evans, *From Happy Valley to the Mountaintop*, xii, 67-69.
95. *Ibid.,* 95.
96. *Ibid.,* Northrup.
97. Northrup.
98. Clara Rugg; Evans*, From Happy Valley to the Mountaintop*, 95.
99. *Ibid.,* 128.
100. *Ibid.,* 7-13.
101. Ruth Huntington Williams.
102. "Penrose Lodge: A Resort in the Mountains," pamphlet, 1931.
103. *Ibid.*
104. Evans, 82-85.
105. Clara Rugg.
106. "Eldora Sweethearts," *Eldora Civic Association Newsletter*, February 1996; Evans, 88-89, 95.
107. Earl and Barbara Bolton; "Eldora Sweethearts," *Eldora Civic Association Newsletter*, February 1996.
108. "Eldora Sweethearts"; Northrup; Evans, 44-45.
109. Earl and Barbara Bolton; Evans, *From Happy Valley to the Mountaintop*, 92.
110. Evans, *From Happy Valley to the Mountaintop*, 126.
111. Henry Cord Meyer, "Forever Young in Eldora," *Eldora Civic Association Newsletter,* June, 1996.
112. *Eldora Echo*, July 19, 1935.
113. Evans, *From Happy Valley to the Mountaintop*, 41; Norththrup; Hornback.
114. Hornback.
115. Helen Langley, interview with Rachel Homer, July 8, 1977, Carnegie Branch for Local History/Boulder Public Library; Clara Rugg.
116. Helen Langley; Clara Rugg; Earl and Barbara Bolton; Ruth Huntington Williams, "Eldora in the 1930s and early 1940s," *Eldora Civic Association Newsletter,* August, 1996.
117. Ruth Huntington Williams; "Eldora Trip is Charming Drive Into High Country on Rough, Narrow Road," *The Boulder Daily Camera*, August 19, 1957; "Eldora is Charming High-Country Drive," *Focus Magazine*, August 23, 1964.
118. Helen Langley; Ruth Huntington Williams.
119. "Town of Eldora at Crossroads," *Denver Post,* August 20, 1972.
120. Tom Huth, "The Searchers of Happy Valley," *The Washington Post Outlook,* September 28, 1975.

121. "Town of Eldora at Crossroads," *Denver Post,* August 20, 1972; Kemp, *Silver, Gold and Black Iron*, 8.
122. "Town of Eldora at Crossroads," *Denver Post,* August 20, 1972.
123. "State high court declares town of Eldora abandoned," *Rocky Mountain News*, June 19, 1973.
124. *Ibid.;* "Mountain Town of Eldora Returns to County Reign," *The Longmont Times-Call*, August, 10, 1973; "Eldora zoned forestry limiting growth," *Rocky Mountain News*, February 22, 1974; Letter from Timothy E. Wirth, United States House of Representatives, to Mr. and Mrs. Earl Bolton, October 11, 1978.

SECTION 4

Results

The Eldora Historical and Architectural Survey, 2007-08, resulted in the inventory of 50 properties, creating over 350 pages of geographical, architectural, and historical information, and over 235 photographs. Of these properties, one parcel (or two percent of the properties surveyed) was field determined as individually eligible for listing in the National Register of Historic Places and the Colorado State Register of Historic Properties. As for Boulder County Landmarks, 13 properties (or 26 percent) were field determined as eligible, including the one National Register-eligible property.

The study area lacked the distribution and density of resources necessary to constitute a district. The period of significance for the study area in general begins circa 1892, the approximate date of construction of the oldest cabin in the project area. It extends through 1958, when the town continued to serve as summer tourist retreat, but within the 50-year period generally required for listing in the National Register.

The results of this survey are summarized in the following tables. In general, the property naming convention used in the tables is first name, last name, and building type (e.g. cabin or house).

TABLE 4.1: SURVEY LOG SORTED BY ADDRESS

Address	Historic Property Name	Current Property Name	Site Number	Nat. Reg. Eligibility	State Reg. Eligibility	Local Ldmk Eligibility
150 South 6th Street	Paul Woodward Cabin (Southeast)	Scott and Joan Schumaker House	5BL.10457	Not eligible	Not eligible	Not eligible
125 South 7th Street	Anna Williams Cabin/Senator Stuart H. Lovelace Cabin	Lovelace-Pierce Cabin	5BL.10452	Not eligible	Not eligible	1, 4
150 South 7th Street	Charlene Spaulding Sheets Cabin	Daniel Payson Sheets Cabin	5BL.10453	Not eligible	Not eligible	Not eligible
125 South 10th Street	Ralph W. Harmon Cabin	Frandee Johnson Cabin	5BL.10456	Not eligible	Not eligible	Not eligible
355 Bryan Avenue	"Doctor's Rx" Cabin/Hershal and Tina Terrell Cabin	"Doctor's Rx" Cabin/Douglas and Scott Campbell Cabin	5BL.10458	Not eligible	Not eligible	Not eligible
635 Bryan Avenue	Lela Lounder Cabin	Mark William Johnson Cabin	5BL.10459	Not eligible	Not eligible	Not eligible
640 Bryan Avenue	Eldora Stationmaster's House/"Glen Eden" Cabin	"Glen Eden" Cabin/Gregory Allum Cabin	5BL.10454	Not eligible	Not eligible	Not eligible
645 Bryan Avenue	Rhoda G. Downing Moran Cabin	Johnson Family Cabin	5BL.10455	Not eligible	Not eligible	Not eligible
655 Bryan Avenue	T.J. Nelson Cabin	April Ellen Speidel Cabin	5BL.10460	Not eligible	Not eligible	Not eligible
660 Bryan Avenue	Erling Hansen Cabin	"Columbine Chalet" Cabin/Harriett Hansen Cabin	5BL.10461	Not eligible	Not eligible	Not eligible
675 Bryan Avenue	Woodring-Kuhn Cabin	Leo Thomas Gaukel Cabin	5BL.10462	Not eligible	Not eligible	Not eligible
695 Bryan Avenue	Leonard R. and Grace H. Eaton Cabin	Joe E. and Pam McDonald Cabin	5BL.10463	Not eligible	Not eligible	Not eligible
725 Bryan Avenue	Hugo and Ethel von Oven Cabin	Frieda K. Royer Cabin	5BL.10464	Not eligible	Not eligible	Not eligible
775 Bryan Avenue	"Casita de Roca"/Paul and Leona Hahn Cabin	"Casita de Roca"/John F. Lee Cabin	5BL.10465	Not eligible	Not eligible	Not eligible
755 Eaton Place	"Alma" Cabin/C. Waldo Cox Cabin	"Alma" Cabin/Dunnagan-Johnson Cabin	5BL.10466	Not eligible	Not eligible	Not eligible
125 Eldorado Avenue	Clara E. Nipher Cabin	Eleanor E. Busch Cabins	5BL.10467	Not eligible	Not eligible	1, 4
145 Eldorado Avenue	Phil and Leta Easterday Cabin	Kingdom-Young-Whitworth Cabin	5BL.10468	Not eligible	Not eligible	1, 4
185 Eldorado Avenue	Henry Jonasson Cabin	Bryce-Commons Cabin	5BL.10447	Not eligible	Not eligible	Not eligible
199 Eldorado Avenue	August Barkeen Cabin	"Golden-West" Cabin/Kready-Maxwell Cabin	5BL.10469	Not eligible	Not eligible	Not eligible
225 Eldorado Avenue	Phebus Cabin	"The Pumphouse" Cabin	5BL.10470	Not eligible	Not eligible	1, 4
305 Eldorado Avenue	Alex Ryan Cabins/William Gustafson Cabin/Martin Cabins	Kladstrup Family Cabins	5BL.10471	Not eligible	Not eligible	1, 4
315 Eldorado Avenue	Hornback Cabin	Hornback Cabin	5BL.10472	Not eligible	Not eligible	1, 4
335 Eldorado Avenue	Charles L. Stewart Cabin	Ruth F. Mander Cabin	5BL.10448	Not eligible	Not eligible	Not eligible
371 Eldorado Avenue	Charles S. Parsons Cabin/"Texanois" Cabin	"Texanois" Cabin/William Dale Pierson Jr. Cabin	5BL.10473	Not eligible	Not eligible	1, 4
375 Eldorado Avenue	Romiette Howard Cabin	Michael A. and Patricia McCoy Cabin	5BL.10474	Not eligible	Not eligible	Not eligible
385 Eldorado Avenue	Edith Simpson Cabin/"Nebraska" Cabin	"Butter 'n' Eggs" Cabin	5BL.10475	Not eligible	Not eligible	Not eligible
475 Eldorado Avenue	Lilly Cabin	Michael J. and Patricia Anne Audet Cabin	5BL.10476	Not eligible	Not eligible	Not eligible
498 Eldorado Avenue	Amos and Marie Entwistle Cabin	Carlson-Parrish Cabin	5BL.10449	Not eligible	Not eligible	1, 4
545 Eldorado Avenue	W.R. Guinn Cabin	Graves Cabin	5BL.10477	Not eligible	Not eligible	Not eligible
574 Eldorado Avenue	Paul Woodward Cabin (Northwest)	Moodie-Gordon Cabin	5BL.10478	Not eligible	Not eligible	Not eligible
702 Eldorado Avenue	Martin-Frazier Cabin	Frazier-Bruce Cabin	5BL.10479	Not eligible	Not eligible	Not eligible
745 Eldorado Avenue	Harry Z. and Leva C. Neal Cabin	"Honeywicke" Cabin/R. Edgar and Julia Carson Cabin	5BL.10480	Not eligible	Not eligible	Not eligible
798 Eldorado Avenue	William James and Nellie M. Bailey Cabin	Robert E. Anderson Cabin	5BL.10481	Not eligible	Not eligible	Not eligible
824 Eldorado Avenue	Ralph W. and Gladys O. Harlow Cabin	Calvin C. and Lee S.S. Miller Cabin	5BL.10482	Not eligible	Not eligible	Not eligible
825 Eldorado Avenue	Clifford and Vivian Grace Cabin	Grace Cabin	5BL.10483	Not eligible	Not eligible	Not eligible
855 Eldorado Avenue	William H. Gardner Cabin	John E.C. and Margaret A. Warren Trust	5BL.10484	Not eligible	Not eligible	Not eligible
895 Eldorado Avenue	Pleasant and Ann Hyson Cabin	Starkey-Ooyen Cabin	5BL.10451	Not eligible	Not eligible	1, 4

Address	Historic Property Name	Current Property Name	Site Number	Nat. Reg. Eligibility	State Reg. Eligibility	Local Ldmk Eligibility
920 Eldorado Avenue	Shaw-Connell Cabin/"Inn-Dianola" Cabin	"Inn-Dianola" Cabin	5BL.10485	Not eligible	Not eligible	1, 4
980 Eldorado Avenue	Joyce-Hill Cabin	"Deux West" Cabin	5BL.10450	Not eligible	Not eligible	Not eligible
1001 Eldorado Avenue	Gilbert Cabin/Woodland Park Lodge/Penrose Lodge	Penrose Lodge	5BL.10486	A,C	A, C	1, 4
1010 Eldorado Avenue	H. Reginald Platts Cabin	John R. Cohagen Cabin	5BL.10487	Not eligible	Not eligible	Not eligible
1025 Eldorado Avenue	"Overflowin'" Cabin	"Overflowin'" Cabin	5BL.10488	Not eligible	Not eligible	1, 4
1045 Eldorado Avenue	Penrose Lodge Guest Cabin	"Tenderfoot" Cabin/Jeffrey B. and Claire R. Haggin	5BL.10489	Not eligible	Not eligible	Not eligible
1104 Eldorado Avenue	Horace and Elizabeth Macintire Cabin	"Hoteldorado" Cabin/Richard and Marilyn Hartsell Cabin	5BL.10490	Not eligible	Not eligible	1, 4
1120 Eldorado Avenue	James J. and Margaret M. Yeager Cabin	John B. and Wilma Brocklehurst Cabin	5BL.10491	Not eligible	Not eligible	Not eligible
436 Huron Avenue	Harry L. King Garage and Shop	Anne Rogers David Cabin	5BL.10492	Not eligible	Not eligible	Not eligible
812 Klondyke Avenue	Hinshaw Cabin	Hinshaw Cabin	5BL.10493	Not eligible	Not eligible	Not eligible
856 Klondyke Avenue	Marshall and Armorel Reddick Cabin	Spruce Tree Cabin	5BL.10494	Not eligible	Not eligible	Not eligible
902 Klondyke Avenue	Rumley Cabin/Marron Cabin/"Bonita Casa" Cabin	Tasaday Cabin	5BL.10495	Not eligible	Not eligible	Not eligible
1060 Klondyke Street	Ada Lou Edge Cabin	Robert Roundtree Cabin	5BL.10496	Not eligible	Not eligible	Not eligible

TABLE 4.2: SURVEY LOG SORTED BY SITE NUMBER

Site Number	Historic Property Name	Current Property Name	Address	Nat. Reg. Eligibility	State Reg. Eligibility	Local Ldmk Eligibility
5BL.10447	Henry Jonasson Cabin	Bryce-Commons Cabin	185 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10448	Charles L. Stewart Cabin	Ruth F. Mander Cabin	335 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10449	Amos and Marie Entwistle Cabin	Carlson-Parrish Cabin	498 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10450	Joyce-Hill Cabin	"Deux West" Cabin	980 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10451	Pleasant and Ann Hyson Cabin	Starkey-Ooyen Cabin	895 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10452	Anna Williams Cabin/Senator Stuart H. Lovelace Cabin	Lovelace-Pierce Cabin	125 South 7th Street	Not eligible	Not eligible	1, 4
5BL.10453	Charlene Spaulding Sheets Cabin	Daniel Payson Sheets Cabin	150 South 7th Street	Not eligible	Not eligible	Not eligible
5BL.10454	Eldora Stationmaster's House/"Glen Eden" Cabin	"Glen Eden" Cabin/Gregory Allum Cabin	640 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10455	Rhoda G. Downing Moran Cabin	Johnson Family Cabin	645 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10456	Ralph W. Harmon Cabin	Frandee Johnson Cabin	125 South 10th Street	Not eligible	Not eligible	Not eligible
5BL.10457	Paul Woodward Cabin (Southeast)	Scott and Joan Schumaker House	150 South 6th Street	Not eligible	Not eligible	Not eligible
5BL.10458	"Doctor's Rx" Cabin/Hershal and Tina Terrell Cabin	"Doctor's Rx" Cabin/Douglas and Scott Campbell Cabin	355 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10459	Lela Lounder Cabin	Mark William Johnson Cabin	635 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10460	T.J. Nelson Cabin	April Ellen Speidel Cabin	655 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10461	Erling Hansen Cabin	"Columbine Chalet" Cabin/Harriett Hansen Cabin	660 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10462	Woodring-Kuhn Cabin	Leo Thomas Gaukel Cabin	675 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10463	Leonard R. and Grace H. Eaton Cabin	Joe E. and Pam McDonald Cabin	695 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10464	Hugo and Ethel von Oven Cabin	Frieda K. Royer Cabin	725 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10465	"Casita de Roca"/Paul and Leona Hahn Cabin	"Casita de Roca"/John F. Lee Cabin	775 Bryan Avenue	Not eligible	Not eligible	Not eligible
5BL.10466	"Alma" Cabin/C. Waldo Cox Cabin	"Alma" Cabin/Dunnagan-Johnson Cabin	755 Eaton Place	Not eligible	Not eligible	Not eligible
5BL.10467	Clara E. Nipher Cabin	Eleanor E. Busch Cabins	125 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10468	Phil and Leta Easterday Cabin	Kingdom-Young-Whitworth Cabin	145 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10469	August Barkeen Cabin	"Golden-West" Cabin/Kready-Maxwell Cabin	199 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10470	Phebus Cabin	"The Pumphouse" Cabin	225 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10471	Alex Ryan Cabins/William Gustafson Cabin/Martin Cabins	Kladstrup Family Cabins	305 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10472	Hornback Cabin	Hornback Cabin	315 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10473	Charles S. Parsons Cabin/"Texanois" Cabin	"Texanois" Cabin/William Dale Pierson Jr. Cabin	371 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10474	Romiette Howard Cabin	Michael A. and Patricia McCoy Cabin	375 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10475	Edith Simpson Cabin/"Nebraska" Cabin	"Butter 'n' Eggs" Cabin	385 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10476	Lilly Cabin	Michael J. and Patricia Anne Audet Cabin	475 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10477	W.R. Guinn Cabin	Graves Cabin	545 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10478	Paul Woodward Cabin (Northwest)	Moodie-Gordon Cabin	574 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10479	Martin-Frazier Cabin	Frazier-Bruce Cabin	702 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10480	Harry Z. and Leva C. Neal Cabin	"Honeywicke" Cabin/R. Edgar and Julia Carson Cabin	745 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10481	William James and Nellie M. Bailey Cabin	Robert E. Anderson Cabin	798 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10482	Ralph W. and Gladys O. Harlow Cabin	Calvin C. and Lee S.S. Miller Cabin	824 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10483	Clifford and Vivian Grace Cabin	Grace Cabin	825 Eldorado Avenue	Not eligible	Not eligible	Not eligible

Site Number	Historic Property Name	Current Property Name	Address	Nat. Reg. Eligibility	State Reg. Eligibility	Local Ldmk Eligibility
5BL.10484	William H. Gardner Cabin	John E.C. and Margaret A. Warren Trust	855 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10485	Shaw-Connell Cabin/"Inn-Dianola" Cabin	"Inn-Dianola" Cabin	920 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10486	Gilbert Cabin/Woodland Park Lodge/Penrose Lodge	Penrose Lodge	1001 Eldorado Avenue	A,C	A, C	1, 4
5BL.10487	H. Reginald Platts Cabin	John R. Cohagen Cabin	1010 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10488	"Overflowin'" Cabin	"Overflowin'" Cabin	1025 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10489	Penrose Lodge Guest Cabin	"Tenderfoot" Cabin/Jeffrey B. and Claire R. Haggin	1045 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10490	Horace and Elizabeth Macintire Cabin	"Hoteldorado" Cabin/Richard and Marilyn Hartsell Cabin	1104 Eldorado Avenue	Not eligible	Not eligible	1, 4
5BL.10491	James J. and Margaret M. Yeager Cabin	John B. and Wilma Brocklehurst Cabin	1120 Eldorado Avenue	Not eligible	Not eligible	Not eligible
5BL.10492	Harry L. King Garage and Shop	Anne Rogers David Cabin	436 Huron Avenue	Not eligible	Not eligible	Not eligible
5BL.10493	Hinshaw Cabin	Hinshaw Cabin	812 Klondyke Avenue	Not eligible	Not eligible	Not eligible
5BL.10494	Marshall and Armorel Reddick Cabin	Spruce Tree Cabin	856 Klondyke Avenue	Not eligible	Not eligible	Not eligible
5BL.10495	Rumley Cabin/Marron Cabin/"Bonita Casa" Cabin	Tasaday Cabin	902 Klondyke Avenue	Not eligible	Not eligible	Not eligible
5BL.10496	Ada Lou Edge Cabin	Robert Roundtree Cabin	1060 Klondyke Street	Not eligible	Not eligible	Not eligible

Map 4.1. Eldora, depicting all surveyed properties and the boundaries of the existing National Register Historic District.

National Register eligible

Local Landmark eligible

Not Eligible

Eldora Historic District Boundary

Scale: 1 inch = 500 feet


SBL.10474
SBL.10472
SBL.10476
SBL.10449
SBL.10478
SBL.10475
SBL.10473
SBL.10448
SBL.10471
SBL.10458
SBL.10470
SBL.10469
SBL.10468
SBL.10467
.10454
BRYAN AV

SECTION 5

Recommendations

RECOMMENDATION 1: NOMINATE ELIGIBLE PROPERTIES

Many of the properties determined field eligible for listing in the National Register or as Boulder County Landmarks have been fastidiously maintained and preserved by the families who own then. They have managed to preserve their beloved cabins against brutal winters, the lure of modern materials, and the drive to expand and improve. National Register and Boulder County Landmark designations would not only appropriately recognize these property owners for their efforts, but also would provide incentives, financial and otherwise, to continue their preservation efforts.

RECOMMENDATION 2: COMPLETE THE SURVEY

This project surveyed 50 of 58 possible properties that had not been previously surveyed and were over 50 years old. Historitecture recommends completing the survey of the remaining eight properties. They are…

- 385 Eldorado Avenue
- 701 Eldorado Avenue
- 834 Eldorado Avenue
- 860 Eldorado Avenue
- 898 Eldorado Avenue
- 930 Eldorado Avenue
- 960 Eldorado Avenue
- 990 Eldorado Avenue

Many of these properties were not selected for this survey because they were particularly inaccesible, especially during the winter. Thus, they should be surveyed in the late spring, summer, or early fall. As well, one property, the Lazy Dale Cabins, at 960 Eldorado Avenue, warrants particular attention for the number of buildings it contains and its rich history. However, surveying the property would require additional time and effort due to the number of resources erected on the property.

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APPENDIX A

Photograph Log

The following tables contain information for each of the digital images recorded on the CD-ROM accompanying this report. They are stored as 300 dots-per-inch, four-by-six-inch images in Tagged Image File Format (TIFF). The disc itself is formatted in a generic Unix-based file hierarchy compatible with any Windows- or Macintosh-based operating system. The photographer was Jeffrey DeHerrera, Historitecture, L.L.C.

Address	Site No.	File Name	View To	Object	Elevations	Notes	Date
150 South 6th Street	5BL.10457	06thst0150 - 1.tif	west		east	southern half of east elevation	12/18/07
150 South 6th Street	5BL.10457	06thst0150 - 2.tif	west		east	northern half of east elevation	12/18/07
150 South 6th Street	5BL.10457	06thst0150 - 3.tif	northeast		south and west		12/18/07
150 South 6th Street	5BL.10457	06thst0150 - 4.tif	northeast		south and west	detail of southern end of south wing	12/18/07
125 South 7th Street	5BL.10452	07thst0125 - 1.tif	northwest		south and east		12/18/07
125 South 7th Street	5BL.10452	07thst0125 - 2.tif	north		south		12/18/07
125 South 7th Street	5BL.10452	07thst0125 - 3.tif	west	shed	east		12/18/07
150 South 7th Street	5BL.10453	07thst0150 - 1.tif	northeast		south and west		12/18/07
150 South 7th Street	5BL.10453	07thst0150 - 2.tif	east		west	detail of northern end of west elevation	12/18/07
150 South 7th Street	5BL.10453	07thst0150 - 3.tif	southeast		north and west	detail of addition under construction	12/18/07
150 South 7th Street	5BL.10453	07thst0150 - 4.tif	southeast	shed	north and west		12/18/07
125 South 10th Street	5BL.10456	10thsts0125 - 1.tif	southwest		north and east		2/28/08
125 South 10th Street	5BL.10456	10thsts0125 - 2.tif	west		east		2/28/08
125 South 10th Street	5BL.10456	10thsts0125 - 3.tif	northwest		south and east		2/28/08
125 South 10th Street	5BL.10456	10thsts0125 - 4.tif	southwest		north and east	guest house/studio in background, right	2/28/08
125 South 10th Street	5BL.10456	10thsts0125 - 5.tif	southeast		north and west	cabin (left) guest house/studio (right)	2/28/08
355 Bryan Avenue	5BL.10458	bryanave0355 - 1.tif	northeast		south and west		2/28/08
355 Bryan Avenue	5BL.10458	bryanave0355 - 2.tif	southeast		north and west		2/28/08
355 Bryan Avenue	5BL.10458	bryanave0355 - 3.tif	southeast		north and west	detail of north wing	2/28/08
355 Bryan Avenue	5BL.10458	bryanave0355 - 4.tif	southeast	privies/sheds	north and west	house at left, cistern at center, privies/sheds at right	2/28/08
355 Bryan Avenue	5BL.10458	bryanave0355 - 5.tif	northeast	foot bridge	south and west		2/28/08
635 Bryan Avenue	5BL.10459	bryanave0635 - 1.tif	southeast		north and west		2/28/08
635 Bryan Avenue	5BL.10459	bryanave0635 - 2.tif	southwest		north and east		2/28/08
635 Bryan Avenue	5BL.10459	bryanave0635 - 3.tif	west		east		2/28/08
635 Bryan Avenue	5BL.10459	bryanave0635 - 4.tif	north		south	guesthouse/studio at far left	2/28/08
635 Bryan Avenue	5BL.10459	bryanave0635 - 5.tif	southwest	guesthouse/studio	north and east		2/28/08
640 Bryan Avenue	5BL.10454	bryanave0640 - 1.tif	east		west		12/18/07
640 Bryan Avenue	5BL.10454	bryanave0640 - 2.tif	southeast		north and west		12/18/07
640 Bryan Avenue	5BL.10454	bryanave0640 - 3.tif	southwest		north and east	detail of east elevation	12/18/07
640 Bryan Avenue	5BL.10454	bryanave0640 - 4.tif	southeast	shed	north and west		12/18/07
640 Bryan Avenue	5BL.10454	bryanave0640 - 5.tif	southeast	privy	north and west		12/18/07
640 Bryan Avenue	5BL.10454	bryanave0640 - 6.tif	southeast	guesthouse	north and west	privy in foreground	12/18/07
640 Bryan Avenue	5BL.10454	bryanave0640 - 7.tif	southwest	guesthouse	north and east		12/18/07
645 Bryan Avenue	5BL.10455	bryanave0645 - 1.tif	northwest		south and east		12/18/07
645 Bryan Avenue	5BL.10455	bryanave0645 - 2.tif	north		south	shed in background, left	12/18/07
645 Bryan Avenue	5BL.10455	bryanave0645 - 3.tif	southwest		north and east	detail of north elevation	12/18/07
645 Bryan Avenue	5BL.10455	bryanave0645 - 4.tif	north	shed	south		12/18/07
655 Bryan Avenue	5BL.10460	bryanave0655 - 1.tif	northwest		south and east		12/18/07
655 Bryan Avenue	5BL.10460	bryanave0655 - 2.tif	northeast		south and west		12/18/07
655 Bryan Avenue	5BL.10460	bryanave0655 - 3.tif	northeast		south and west	detail of west elevation	12/18/07
655 Bryan Avenue	5BL.10460	bryanave0655 - 4.tif	northwest		south and east		12/18/07

Address	Site No.	File Name	View To	Object	Elevations	Notes	Date
655 Bryan Avenue	5BL.10460	bryanave0655 - 5.tif	northwest	shed	south and east		12/18/07
660 Bryan Avenue	5BL.10461	bryanave0660 - 1.tif	southeast		north and west		12/18/07
660 Bryan Avenue	5BL.10461	bryanave0660 - 2.tif	southwest		north and east		12/18/07
660 Bryan Avenue	5BL.10461	bryanave0660 - 3.tif	southwest		north and east	detail of east elevation	12/18/07
660 Bryan Avenue	5BL.10461	bryanave0660 - 4.tif	southeast		north and west	detail of west elevation	12/18/07
675 Bryan Avenue	5BL.10462	bryanave0675 - 1.tif	northwest		south and east		12/18/07
675 Bryan Avenue	5BL.10462	bryanave0675 - 2.tif	northeast		south and west		12/18/07
675 Bryan Avenue	5BL.10462	bryanave0675 - 4.tif	northwest	shed	south and east		12/18/07
695 Bryan Avenue	5BL.10463	bryanave0695 - 1.tif	northwest		south and east		12/18/07
695 Bryan Avenue	5BL.10463	bryanave0695 - 2.tif	northeast		south and west		12/18/07
695 Bryan Avenue	5BL.10463	bryanave0695 - 3.tif	southeast		north and west	detail of chimney	12/18/07
695 Bryan Avenue	5BL.10463	bryanave0695 - 4.tif	southeast		north and west	detail of north elevation	12/18/07
725 Bryan Avenue	5BL.10464	bryanave0725 - 1.tif	northeast		south and west		12/18/07
725 Bryan Avenue	5BL.10464	bryanave0725 - 2.tif	north		south	detail of south elevation	12/18/07
725 Bryan Avenue	5BL.10464	bryanave0725 - 3.tif	west	shed	east		12/18/07
775 Bryan Avenue	5BL.10465	bryanave0775 - 1.tif	north		south		12/18/07
775 Bryan Avenue	5BL.10465	bryanave0775 - 2.tif	north		south	detail of south elevation	12/18/07
775 Bryan Avenue	5BL.10465	bryanave0775 - 3.tif	east		west		12/18/07
775 Bryan Avenue	5BL.10465	bryanave0775 - 4.tif	northwest	shed	south and east		12/18/07
755 Eaton Place	5BL.10466	eatonpl0755 - 1.tif	northwest		south and east		12/18/07
755 Eaton Place	5BL.10466	eatonpl0755 - 2.tif	north		south	detail of south elevation of east wing	12/18/07
755 Eaton Place	5BL.10466	eatonpl0755 - 3.tif	northeast		south and west		12/18/07
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 1.tif	northwest	1934 cabin	south and east		2/28/08
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 2.tif	west	1934 cabin	east		2/28/08
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 3.tif	southwest	1934 cabin	north and east		2/28/08
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 4.tif	northeast	1934 cabin	south and west		2/28/08
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 5.tif	west	1965 cabin	east	1991 cabin in background, left	2/28/08
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 6.tif	east	1965 cabin	west	north elevation of 1991 cabin at right	2/28/08
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 7.tif	north	1991 cabin	south		2/28/08
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 8.tif	west	1991 cabin	east	1965 cabin at right	2/28/08
125 Eldorado Avenue	5BL.10467	eldoradoave0125 - 9.tif	southeast	1991 cabin	north and west	detail of west elevation	2/28/08
145 Eldorado Avenue	5BL.10468	eldoradoave0145 - 1.tif	northwest		south and east		2/28/08
145 Eldorado Avenue	5BL.10468	eldoradoave0145 - 2.tif	northeast		south and west		2/28/08
145 Eldorado Avenue	5BL.10468	eldoradoave0145 - 3.tif	north	gate	south		2/28/08
185 Eldorado Avenue	5BL.10447	eldoradoave0185 - 1.tif	north		south		9/5/07
185 Eldorado Avenue	5BL.10447	eldoradoave0185 - 2.tif	northwest		south and east		9/5/07
185 Eldorado Avenue	5BL.10447	eldoradoave0185 - 3.tif	southwest		north and east	detail of north elevation	9/5/07
185 Eldorado Avenue	5BL.10447	eldoradoave0185 - 4.tif	southwest		north and east		9/5/07
185 Eldorado Avenue	5BL.10447	eldoradoave0185 - 5.tif	north	shed	south		9/5/07
199 Eldorado Avenue	5BL.10469	eldoradoave0199 - 1.tif	northeast		south and west		9/5/07
199 Eldorado Avenue	5BL.10469	eldoradoave0199 - 2.tif	northwest		south and east		9/5/07

Address	Site No.	File Name	View To	Object	Elevations	Notes	Date
199 Eldorado Avenue	5BL.10469	eldoradoave0199 - 3.tif	north	garage and guest house	south		9/5/07
225 Eldorado Avenue	5BL.10470	eldoradoave0225 - 1.tif	northeast		south and west		9/5/07
225 Eldorado Avenue	5BL.10470	eldoradoave0225 - 2.tif	northwest		south and east		9/5/07
225 Eldorado Avenue	5BL.10470	eldoradoave0225 - 3.tif	south		north	shed at right	9/5/07
225 Eldorado Avenue	5BL.10470	eldoradoave0225 - 4.tif	northeast	shed	south and west		9/5/07
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 01.tif	north	overview of complex	south	l to r: cabin 2, cabin 3, and cabin 4	2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 02.tif	north	cabin 3	south		2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 03.tif	north	cabin 4	south		2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 04.tif	northwest	cabin 4	south and east		2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 05.tif	north	cabin 4	south	detail of west end of south elevation	2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 06.tif	northwest	cabin 4	south and east	cabin 3 in background	2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 07.tif	north	cabin 2	south		2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 08.tif	northeast	cabin 1 (garage and shop)	south and west		2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 09.tif	southeast	cabin 1 (garage and shop)	north and west		2/28/08
305 Eldorado Avenue	5BL.10471	eldoradoave0305 - 10.tif	southeast	shed complex	north and west		2/28/08
315 Eldorado Avenue	5BL.10472	eldoradoave0315 - 1.tif	northeast		south and west		2/28/08
315 Eldorado Avenue	5BL.10472	eldoradoave0315 - 2.tif	southeast		north and west		2/28/08
315 Eldorado Avenue	5BL.10472	eldoradoave0315 - 3.tif	northwest		south and east		2/28/08
315 Eldorado Avenue	5BL.10472	eldoradoave0315 - 4.tif	northeast		south and west	garage (left) and shed (right)	2/28/08
315 Eldorado Avenue	5BL.10472	eldoradoave0315 - 5.tif	northeast	privy ruins	south and west		2/28/08
315 Eldorado Avenue	5BL.10472	eldoradoave0315 - 6.tif	north	cabin ruins	south		2/28/08
335 Eldorado Avenue	5BL.10448	eldoradoave0335 - 1.tif	northwest		south and east		9/5/07
335 Eldorado Avenue	5BL.10448	eldoradoave0335 - 2.tif	northeast		south and west		9/5/07
335 Eldorado Avenue	5BL.10448	eldoradoave0335 - 3.tif	southeast		north and west		9/5/07
335 Eldorado Avenue	5BL.10448	eldoradoave0335 - 4.tif	north	privy	south	east elevation of cabin at right	9/5/07
335 Eldorado Avenue	5BL.10448	eldoradoave0335 - 5.tif	southwest	privy	north and east	cabin in background	9/5/07
371 Eldorado Avenue	5BL.10473	eldoradoave0371 - 1.tif	northeast		south and west		9/5/07
371 Eldorado Avenue	5BL.10473	eldoradoave0371 - 2.tif	north		south		9/5/07
371 Eldorado Avenue	5BL.10473	eldoradoave0371 - 3.tif	northwest		south and east	sheds 1 and 2 in background	9/5/07
371 Eldorado Avenue	5BL.10473	eldoradoave0371 - 4.tif	northwest	shed 1 (left); shed 2 (right)	south and east		9/5/07
371 Eldorado Avenue	5BL.10473	eldoradoave0371 - 5.tif	northeast	shed 2 (left); shed 1 (right)	south and west		9/5/07
371 Eldorado Avenue	5BL.10473	eldoradoave0371 - 6.tif	north	barn	south		9/5/07
375 Eldorado Avenue	5BL.10474	eldoradoave0375 - 1.tif	northwest		south and east		9/5/07
375 Eldorado Avenue	5BL.10474	eldoradoave0375 - 2.tif	northeast		south and west		9/5/07
375 Eldorado Avenue	5BL.10474	eldoradoave0375 - 3.tif	southwest		north and east		9/5/07
375 Eldorado Avenue	5BL.10474	eldoradoave0375 - 4.tif	southeast		north and west		9/5/07
385 Eldorado Avenue	5BL.10475	eldoradoave0385 - 1.tif	northeast		south and west		9/5/07
385 Eldorado Avenue	5BL.10475	eldoradoave0385 - 2.tif	southeast		north and west		9/5/07
385 Eldorado Avenue	5BL.10475	eldoradoave0385 - 3.tif	south		north		9/5/07
385 Eldorado Avenue	5BL.10475	eldoradoave0385 - 4.tif	northwest	privy	south and east		9/5/07
475 Eldorado Avenue	5BL.10476	eldoradoave0475 - 1.tif	northeast		south and west		9/5/07

Address	Site No.	File Name	View To	Object	Elevations	Notes	Date
475 Eldorado Avenue	5BL.10476	eldoradoave0475 - 2.tif	northwest		south and east		9/5/07
475 Eldorado Avenue	5BL.10476	eldoradoave0475 - 3.tif	southeast		north and west		9/5/07
475 Eldorado Avenue	5BL.10476	eldoradoave0475 - 4.tif	northeast	shed	south and west	shed behind fence north end of the cabin's west elevation in foreground, right	9/5/07
498 Eldorado Avenue	5BL.10449	eldoradoave0498 - 1.tif	southwest		north and east		9/6/07
498 Eldorado Avenue	5BL.10449	eldoradoave0498 - 2.tif	northeast		south and west		9/6/07
498 Eldorado Avenue	5BL.10449	eldoradoave0498 - 3.tif	southeast	shed (left), privy (right)	north and west		9/6/07
545 Eldorado Avenue	5BL.10477	eldoradoave0545 - 1.tif	northwest		south and east		9/5/07
545 Eldorado Avenue	5BL.10477	eldoradoave0545 - 2.tif	southwest		north and east		9/5/07
545 Eldorado Avenue	5BL.10477	eldoradoave0545 - 3.tif	northeast	garage ("Sunny Nook")	south and west		9/5/07
545 Eldorado Avenue	5BL.10477	eldoradoave0545 - 4.tif	southwest	garage ("Sunny Nook")	north and east		9/5/07
545 Eldorado Avenue	5BL.10477	eldoradoave0545 - 5.tif	north	privy	south		9/5/07
545 Eldorado Avenue	5BL.10477	eldoradoave0545 - 6.tif	north	shed	south		9/5/07
574 Eldorado Avenue	5BL.10478	eldoradoave0574 - 1.tif	south		north		12/18/07
574 Eldorado Avenue	5BL.10478	eldoradoave0574 - 2.tif	west		east		12/18/07
574 Eldorado Avenue	5BL.10478	eldoradoave0574 - 3.tif	southeast		north and west	detail of west elevation	12/18/07
574 Eldorado Avenue	5BL.10478	eldoradoave0574 - 4.tif	north		south		12/18/07
702 Eldorado Avenue	5BL.10479	eldoradoave0702 - 1.tif	east	privy (frgrnd), cabin (bckgrnd)	west		9/5/07
702 Eldorado Avenue	5BL.10479	eldoradoave0702 - 2.tif	southwest		north and east		9/5/07
745 Eldorado Avenue	5BL.10480	eldoradoave0745 - 1.tif	north	gate	south	detail of "HONEYWICKE" plaque above gate	12/18/07
745 Eldorado Avenue	5BL.10480	eldoradoave0745 - 2.tif	northeast		south and west		12/18/07
745 Eldorado Avenue	5BL.10480	eldoradoave0745 - 3.tif	north		south		12/18/07
745 Eldorado Avenue	5BL.10480	eldoradoave0745 - 4.tif	north		south	detail of east wing	12/18/07
745 Eldorado Avenue	5BL.10480	eldoradoave0745 - 5.tif	northeast	guest cabin	south and west		12/18/07
745 Eldorado Avenue	5BL.10480	eldoradoave0745 - 6.tif	northeast	shed	south and west		12/18/07
798 Eldorado Avenue	5BL.10481	eldoradoave0798 - 1.tif	northeast		south and west		2/28/08
798 Eldorado Avenue	5BL.10481	eldoradoave0798 - 2.tif	northeast		south and west		2/28/08
798 Eldorado Avenue	5BL.10481	eldoradoave0798 - 3.tif	northeast		south and west	detail of west elevation	2/28/08
798 Eldorado Avenue	5BL.10481	eldoradoave0798 - 4.tif	south		north		2/28/08
798 Eldorado Avenue	5BL.10481	eldoradoave0798 - 5.tif	southwest		north and east		2/28/08
798 Eldorado Avenue	5BL.10481	eldoradoave0798 - 6.tif	south	garage	north		2/28/08
824 Eldorado Avenue	5BL.10482	eldoradoave0824 - 1.tif	south		north		
824 Eldorado Avenue	5BL.10482	eldoradoave0824 - 2.tif	south		north	detail of south elevation	
825 Eldorado Avenue	5BL.10483	eldoradoave0825 - 1.tif	northeast		south and west		9/6/07
825 Eldorado Avenue	5BL.10483	eldoradoave0825 - 2.tif	northwest		south and east		9/6/07
825 Eldorado Avenue	5BL.10483	eldoradoave0825 - 3.tif	west		east		9/6/07
825 Eldorado Avenue	5BL.10483	eldoradoave0825 - 4.tif	northwest		south and east	cabin in its open setting	9/6/07
855 Eldorado Avenue	5BL.10484	eldoradoave0855 - 1.tif	northwest		south and east		9/6/07
855 Eldorado Avenue	5BL.10484	eldoradoave0855 - 2.tif	north		south	detail of east end of south elvtn west & south elvtn of guesthouse/studio at far right	9/6/07
855 Eldorado Avenue	5BL.10484	eldoradoave0855 - 3.tif	north	guesthouse/studio	south	southeast corner of house at left	9/6/07
855 Eldorado Avenue	5BL.10484	eldoradoave0855 - 4.tif	northeast	guesthouse/studio	south and west	southeast corner of house at left	9/6/07
895 Eldorado Avenue	5BL.10451	eldoradoave0895 - 1.tif	northeast		south and west		9/6/07

Address	Site No.	File Name	View To	Object	Elevations	Notes	Date
895 Eldorado Avenue	5BL.10451	eldoradoave0895 - 2.tif	northwest		south and east		9/6/07
895 Eldorado Avenue	5BL.10451	eldoradoave0895 - 3.tif	northeast		south and west		9/6/07
895 Eldorado Avenue	5BL.10451	eldoradoave0895 - 4.tif	southeast		north and west		9/6/07
895 Eldorado Avenue	5BL.10451	eldoradoave0895 - 5.tif	west	shed	east		9/6/07
895 Eldorado Avenue	5BL.10451	eldoradoave0895 - 6.tif	southeast	shed	north and west		9/6/07
920 Eldorado Avenue	5BL.10485	eldoradoave0920 - 1.tif	southeast		north and west		12/18/07
920 Eldorado Avenue	5BL.10485	eldoradoave0920 - 2.tif	southwest		north and east		12/18/07
920 Eldorado Avenue	5BL.10485	eldoradoave0920 - 3.tif	south	second cabin	north		12/18/07
980 Eldorado Avenue	5BL.10450	eldoradoave0980 - 1.tif	south		north		9/6/07
980 Eldorado Avenue	5BL.10450	eldoradoave0980 - 2.tif	south		north	east wing at right	9/6/07
1001 Eldorado Avenue	5BL.10486	eldoradoave1001 - 1.tif	north		south		9/6/07
1001 Eldorado Avenue	5BL.10486	eldoradoave1001 - 2.tif	northwest		south and east		9/6/07
1001 Eldorado Avenue	5BL.10486	eldoradoave1001 - 3.tif	northwest		south and east	detail of north end of east elevation	9/6/07
1001 Eldorado Avenue	5BL.10486	eldoradoave1001 - 4.tif	northeast		south and west		9/6/07
1001 Eldorado Avenue	5BL.10486	eldoradoave1001 - 5.tif	northwest	shower building	south and east		9/6/07
1001 Eldorado Avenue	5BL.10486	eldoradoave1001 - 6.tif	northwest	shower building	south and east		9/6/07
1001 Eldorado Avenue	5BL.10486	eldoradoave1001 - 7.tif	northwest	privy or pump house	south and east		9/6/07
1001 Eldorado Avenue	5BL.10486	eldoradoave1001 - 8.tif	northwest	barn	south and east		9/6/07
1010 Eldorado Avenue	5BL.10487	eldoradoave1010 - 1.tif	southwest		north and east		9/6/07
1010 Eldorado Avenue	5BL.10487	eldoradoave1010 - 2.tif	southeast		north and west		9/6/07
1010 Eldorado Avenue	5BL.10487	eldoradoave1010 - 3.tif	west		east		9/6/07
1010 Eldorado Avenue	5BL.10487	eldoradoave1010 - 4.tif	south	garage	north		9/6/07
1010 Eldorado Avenue	5BL.10487	eldoradoave1010 - 5.tif	southwest	garage	north and east		9/6/07
1010 Eldorado Avenue	5BL.10487	eldoradoave1010 - 6.tif	south	pump house	north		9/6/07
1025 Eldorado Avenue	5BL.10488	eldoradoave1025 - 1.tif	northeast		south and west		9/6/07
1025 Eldorado Avenue	5BL.10488	eldoradoave1025 - 2.tif	northwest		south and east		9/6/07
1025 Eldorado Avenue	5BL.10488	eldoradoave1025 - 3.tif	west		east		9/6/07
1025 Eldorado Avenue	5BL.10488	eldoradoave1025 - 4.tif	southwest		north and east		9/6/07
1025 Eldorado Avenue	5BL.10488	eldoradoave1025 - 5.tif	southeast		north and west	southwest corner of shed in foreground, left	9/6/07
1025 Eldorado Avenue	5BL.10488	eldoradoave1025 - 6.tif	northwest	shed	south and east		9/6/07
1045 Eldorado Avenue	5BL.10489	eldoradoave1045 - 1.tif	north		south		9/6/07
1045 Eldorado Avenue	5BL.10489	eldoradoave1045 - 2.tif	northwest		south and east		9/6/07
1045 Eldorado Avenue	5BL.10489	eldoradoave1045 - 3.tif	southwest		north and east		9/6/07
1104 Eldorado Avenue	5BL.10490	eldoradoave1104 - 1.tif	west		east		9/6/07
1104 Eldorado Avenue	5BL.10490	eldoradoave1104 - 2.tif	south		north		9/6/07
1104 Eldorado Avenue	5BL.10490	eldoradoave1104 - 3.tif	east		west	detail of south half of west elevation	9/6/07
1104 Eldorado Avenue	5BL.10490	eldoradoave1104 - 4.tif	southeast		north and west		9/6/07
1104 Eldorado Avenue	5BL.10490	eldoradoave1104 - 5.tif	northwest		south and east		9/6/07
1104 Eldorado Avenue	5BL.10490	eldoradoave1104 - 6.tif	southeast	privy	north and west		9/6/07
1120 Eldorado Avenue	5BL.10491	eldoradoave1120 - 1.tif	southwest		north and east		
1120 Eldorado Avenue	5BL.10491	eldoradoave1120 - 2.tif	south		north		

Address	Site No.	File Name	View To	Object	Elevations	Notes	Date
1120 Eldorado Avenue	5BL.10491	eldoradoave1120 - 3.tif	northwest		south and east		
1120 Eldorado Avenue	5BL.10491	eldoradoave1120 - 4.tif	northwest	shed	south and east		
436 Huron Avenue	5BL.10492	huronave0436 - 1.tif	south		north		12/18/07
436 Huron Avenue	5BL.10492	huronave0436 - 2.tif	northwest		south and east		12/18/07
436 Huron Avenue	5BL.10492	huronave0436 - 3.tif	southeast		north and west		12/18/07
436 Huron Avenue	5BL.10492	huronave0436 - 4.tif	northwest	llama shelters	south and east		12/18/07
812 Klondyke Avenue	5BL.10493	klondykeave0812 - 1.tif	northwest		south and east		9/6/07
812 Klondyke Avenue	5BL.10493	klondykeave0812 - 2.tif	southeast		north and west		9/6/07
812 Klondyke Avenue	5BL.10493	klondykeave0812 - 3.tif	southwest	shed	north and east		9/6/07
812 Klondyke Avenue	5BL.10493	klondykeave0812 - 4.tif	northeast	shed	south and west		9/6/07
856 Klondyke Avenue	5BL.10494	klondykeave0856 - 1.tif	southwest		north and east		
856 Klondyke Avenue	5BL.10494	klondykeave0856 - 2.tif	west		east	garage in foreground	
856 Klondyke Avenue	5BL.10494	klondykeave0856 - 3.tif	south		north	detail of west end of north elevation	
856 Klondyke Avenue	5BL.10494	klondykeave0856 - 4.tif	northeast		south and west		
856 Klondyke Avenue	5BL.10494	klondykeave0856 - 5.tif	southwest	garage	north and east	cabin in background	
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 01.tif	northwest	cabin 1	south and east	detail of northern half of east elevation	
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 02.tif	southwest	cabin 1	north and east		
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 03.tif	northwest	cabin 1	south and east		
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 04.tif	southeast	cabin 1	north and west	western portion of north elevation	
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 05.tif	southeast	cabin 1	north and west		
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 06.tif	southeast	cabin 1 (l), cabin 3 (m), prviy (r)	north and west		
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 07.tif	southeast	cabin 3	north and west	privy in background, right	
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 08.tif	northwest	cabin 3 (left), cabin 1 (right)	south and east		
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 09.tif	southwest	cabin 2	north and east		
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 10.tif	northwest	cabin 2	south and east		
902 Klondyke Avenue	5BL.10495	klondykeave0902 - 11.tif	northwest	privy	south and east		
1060 Klondyke Street	5BL.10496	klondykeave1060 - 1.tif	southwest		north and east	central portion of north elevation	12/18/07
1060 Klondyke Street	5BL.10496	klondykeave1060 - 2.tif	southwest		north and east	eastern portion of north elevation	12/18/07
1060 Klondyke Street	5BL.10496	klondykeave1060 - 3.tif	southeast		north and west	western portion of north elevation	12/18/07
1060 Klondyke Street	5BL.10496	klondykeave1060 - 4.tif	southwest	guest cabin	north and east		12/18/07
1060 Klondyke Street	5BL.10496	klondykeave1060 - 5.tif	southwest	shed	north and east		12/18/07

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APPENDIX 6.4

Oral Histories

The following oral history tapes about Eldora and Eldora people are found at Carnegie Branch for Local History, Boulder Valley Library System.

Bolton, Allen and Ena Jenner. Interview with Anne Dyni. 1990. OH0529 and OH0249

Bolton, Earl and Barbara. Video recorded interview with Anne Dyni. March 8, 2003. OH0502

Goolsby, Mrs George (Margaret). Interview by Anne Klenk, Jean Kindig and Ann Goolsby. September 4, 1994. OH0688

Goolsby, Margaret Brown, Jack Madden and Katherine Williams Olsen. 1983. OH0745

Gross, William. 1983 and 2008. OH1536A-D.

Hallock, Dave and Jean Kindig. Program on Eldora history. August 6, 1993. OH0639

Hornback, Charles and Barbara Lilly Bolton. Video recorded interview with Anne Dyni. June 25, 2005. OH1363V

Langley, Helen. Interview by Rachel Homer. July 8, 1977. OH19

Northrup, Rose Rugg. Interview with Victoria Gits. April 8, 1976. OH0069

Reddick, Armorell, Elsa Hornback and Margaret Frazier. Interview with Virginia Kent. 1983. OH0746

Rugg, Charles “Binx.” Interview with Joan Plyley. June 26, 1989. OH0456

Rugg, Charles “Binx.” Interview with Anne Dyni. March 8, 2002. OH0456

Rugg, Clara J. Harpel. Interview by Victorie Gits. April 22, 1976. OH0068

APPENDIX 6.5

List of Contacts

Name, Affiliation, Address	Field of Expertise
Carol Beam Boulder County Parks & Open Space Dept. 5201 St. Vrain Road Longmont, CO 80503 303-678-6272 cbeam@bouldercounty.org	Historic Preservation Specialist
Susan Becker, Program Manager The Marie Rogers Oral History Program The Carnegie Branch Library for Local History 1125 Pine Street Boulder, CO 80302 303-441-3110 beckers@boulderlibrary.org	Historic Preservation Oral History
Colorado Council of Professional Archaeologists http://www.coloradoarchaeologists.org	Cultural History Literature
Colorado Office of Archaeology and Historic Preservation (OAHP) 1300 Broadway, Denver, CO 80203-2137 303-866-3395, historic preservation http://www.coloradohistory-oahp.org/	Historic Preservation and Grants
Denise Grimm Senior Planner, Long Range Planning Boulder County Land Use Dept. 2040 14th St., Boulder, CO 80302 303-441-3930 dgrimm@bouldercounty.org	Historic Preservation
Rich Koopmann Boulder County Parks and Open Space 5201 St. Vrain Road Longmont, CO 80503 303-441-3950 rkoopmann@bouldercounty.org	Natural Resource Planning Historic Preservation

Nederland Area Historical Society PO Box 1252 Nederland, CO 80466 303-258-0567 http://www.nederlandmuseums.org	Historic Preservation
Payson Sheets 520 Marine Street Boulder, CO 80220 303-444-3037 Payson.sheets@colorado.edu	Archaeology

APPENDIX 7

RECREATION

Appendix 7.1
Hessie – A Look Back

1850 to 1960 – Active mining, homesteading and cattle grazing with increasing recreational use as roads are improved and population increases.

1960 to 1978 – Local communities actively engage in protection of remaining public lands, resulting in Congressional designation of the Indian Peaks Wilderness.

1978 – The first Boulder County Comprehensive Plan is adopted with environmental protection and limitations on urban growth included.

1979 – Arapaho and Roosevelt National Forest (ARNF) forest planning begins inviting participation of Boulder County residents and groups.

1978 to 1982 – Forest Service (FS), Boulder County and local constituents organize resources and shift emphasis to actively manage access and recreation use at Hessie and 4th of July Wilderness portals.

1983 – Indian Peaks Access Group provides a list of recommendations to mitigate issues that affect the Eldora/Hessie area. Actions focus on summer and winter parking congestion and related pedestrian safety and emergency access issues.

1983 to 1984 – FS responds to the Indian Peaks Access Group recommendations, describing a list of actions and constraints for managing the area; incorporates many recommendations into the 1984 ARNF Forest Plan revision.

1984 to 1990 – FS and Boulder County ramp up collaborative management activities for the area. Primary actions included developing strategic management for the area, increasing law enforcement patrols and implementing travel management activities including signage and surveying visitor use. Parking and access issues escalate.

1989 – Peak to Peak State Scenic Byway designated, Boulder County forms the Tourism and Recreation Partnership Group, and portions of Eldora Townsite listed by National Park Service as a National Historic District on the National Register of Historic Places.

1990 – Eldora Civic Association (ECA) sends letter to ARNF Forest Supervisor requesting participation in any planning efforts expressing concerns about ecological, aesthetic and safety impacts of ever increasing public use.

1991 – Mountain Ear news article dated July 3, 1991 states:

- 150 cars are parked on both sides of the road in the vicinity of the intersection of Hessie and the 4th of July roads

- Fire department expresses concerns about safety and fire access with the existing parking situation
- County considers installing a gate at Hessie/4th of July roads intersection
- The FS negotiates with Henry Toll to consider a trailhead on his property if the County blocks Hessie Road.

1992 – ECA and Boulder County Nature Association initiated the Eldora Environmental Preservation Plan (EEPP), which is aimed at preserving natural, historical and social environments. Recommends buffers between residential and high use recreational areas, such as Eldora Ski Area, Indian Peaks Wilderness and developed areas within town. Primarily emphasizes acquisition of available property, resulting in environmental preservation and resolution of access issues.

1993 – Boulder County Open Space tax is approved to initiate acquisition of available properties within the area and continues today.

1995 – Boulder County recognizes the Eldora Environmental Preservation Plan and incorporates it into the Boulder County Comprehensive Plan.

1996 – FS initiates acquisition of the Toll property and prepares a strategy to use portions of property for resolving current issues. Key focus: restoration of damaged resources and provide parking for 80 vehicles that allows summer and winter access opportunities.

1997 – The Peak to Peak Scenic Byway Interest Group and Tourism and Recreation Partnership Group finalize the scenic byway master plan with emphasis on preserving the existing character of the corridor outside of already developed areas.

1997 – The updated 1997 ARNF Land and Resources Management Plan incorporates management area prescriptions to reduce impacts to historic sites and riparian resources, considers actions to limit use at established wilderness trailheads (Hessie and 4th of July) and works with Boulder County to resolve roadside parking congestion issues in the area.

1997 to 2001 – FS receives various comment letters requesting implementation of direction in the Forest Plan, Boulder County and FS continue on-site travel management implementation and law enforcement patrols. Parking and access issues continue to escalate.

2001 – FS initiates formal planning process to implement actions as recommended by Boulder County and local stakeholders. Design and location maps for three alternatives created that considered parking for up to 160 vehicles.

2002 – The Upper Middle Boulder Creek Alliance (UMBCA) shared additional concerns and recommendations in response to FS conceptual planning. Due to planning complexities, funding constraints and other priorities, the project was put on hold.

2003 – Increasing use and trespass on the 80-acre David property (just north of Hessie Trailhead) resulted in much dialog with the private landowner. The landowner became interested in selling property shortly after.

2004 – FS initiates Hessie Winter Trailhead Project with intent to construct winter trailhead parking, restrooms and trash receptacles. Project was put on hold due to funding constraints and other priorities.

2005 – The David property is purchased by Boulder County with intent to transfer ownership to the FS in a future land exchange.

2006 to 2007 – FS, Boulder County Transportation Department and Boulder County Parks and Open Space Department began conceptualizing possibilities of using a portion of the old David property as a potential alternative to failed efforts in the past intended to resolve inadequate access on County Road 130, vehicle congestion and pedestrian safety issues.

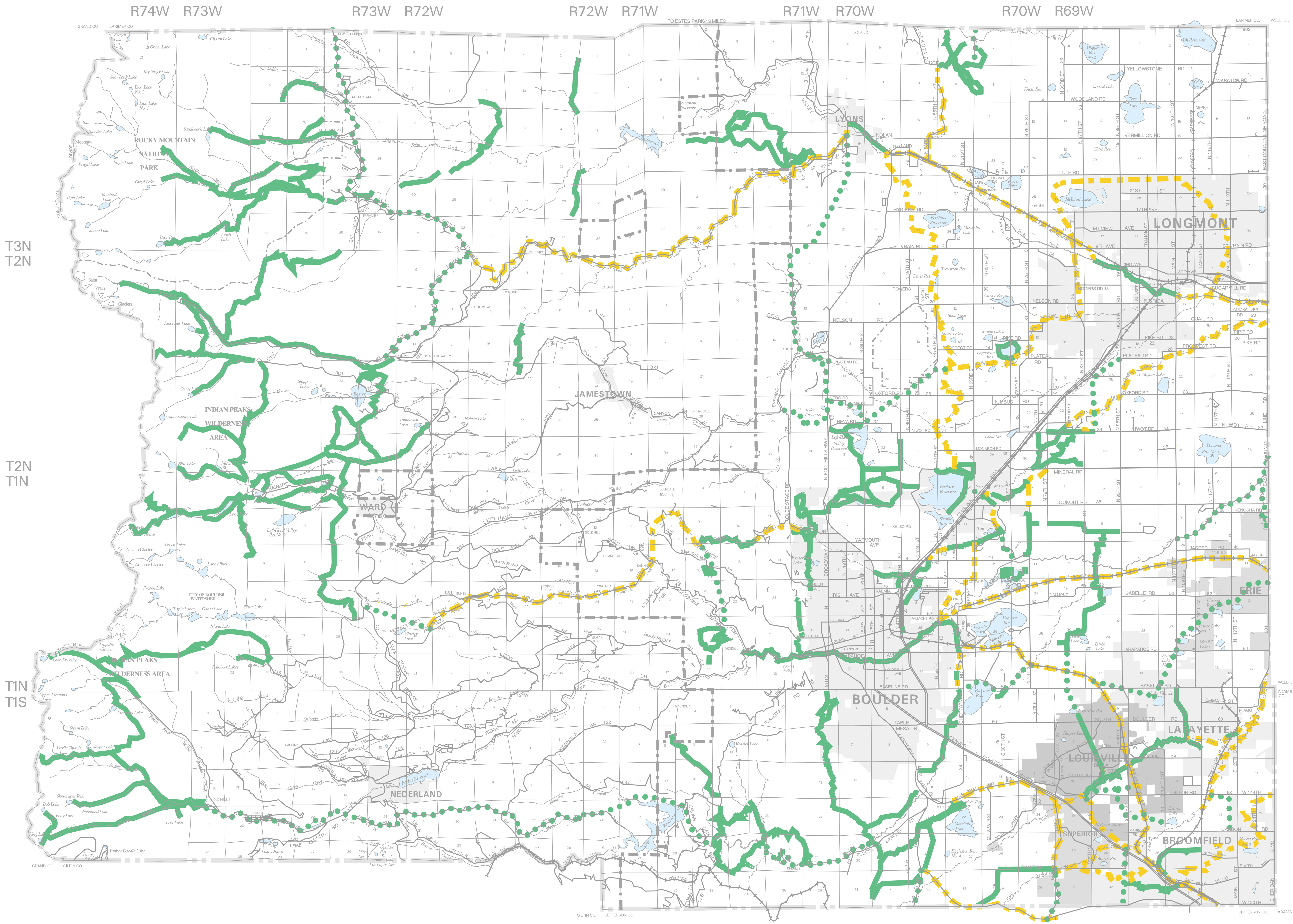
2007 – Boulder Ranger District prompted dialog with local agencies, local groups and individuals to determine if the concept was feasible. Overwhelming support for the concept initiated the July 24, 2007 Hessie Summer Trailhead meeting.

For more information:

USDA Forest Service, Boulder Ranger District
Ed Perault, Recreation Staff Supervisor
303-541-2510

Boulder County Parks and Open Space
Summer Adamietz, Nature Reserve Planner (no longer at BCPOS)
303-678-6271

County Trails Map



Legend

- Existing
- Alignment
- Corridor

Incorporated Areas
(As of April 20, 1999)

Notes

A Conceptual Trail Alignment is a route where the general location has already been identified, usually alongside a landscape feature such as a stream or road. A Conceptual Trail Corridor is a general course that usually links specific specific destinations, but no landscape feature or specific location has been determined for the trail itself. Corridors are depicted on the map with a dotted symbol in order to portray their inexact location. While a few Conceptual Trail Alignments and Corridors are shown across land that is currently owned by a public land agency, many of these Conceptual courses are on private land. Conceptual trail designations are merely proposed, no trail has been constructed and the area is not open to public access.

For detailed trail and trailhead information, contact the Boulder County Parks and Open Space Department at 303-441-3950.

Map scale and reproduction method limit precision in physical features and boundary locations.
PRINTED - APRIL 22, 1999

Revisions

Adopted - Planning Commission - January 20, 1999

Approved - County Commissioners - December 3, 1998

0 MILES 1 2 3 4 5

Boulder County

COMPREHENSIVE PLAN MAP

North

County Trails Map

APPENDIX 7.3

List of Contact People

Name, Affiliation, Address, Phone	Field of Expertise
Dale Case Boulder County Land Use Courthouse Annex Building 2045 13th St. Boulder, CO 80302 303-441-3930	Land Use Director
Randy Lee Parks, Recreation & Open Space Advisory Board Town of Nederland 45 West First St. PO Box 396 Nederland, CO 80466 303-258-3266 randyl@nederlandco.org	Chair of PROSAB
Roz McClellan Rocky Mountain Recreation Initiative 1567 Twin Sisters Road Nederland, CO 80466 303-447-9409	Citizen Activist
Ed Perault US Forest Service, Boulder District 2140 Yarmouth Ave. Boulder, CO 80301 303-541-2500 eperault@fs.fed.us	Recreation Planner
Jim Spenst Eldora Mountain Resort 303-440-8700 x226	General Manager
Ron Stewart Boulder County Parks and Open Space Dept. 5201 St. Vrain Road Longmont, CO 80503 303-678-6200	Director, Boulder County Parks and Open Space

APPENDIX 8

LAND USE PLANNING

APPENDIX 8.1

List of Contact People

Name, Affiliation, Address, Phone	Field of Expertise
Dale Case Boulder County Land Use Courthouse Annex Building 2045 13th St. Boulder, CO 80302 303-441-3930	Land Use Director
Pete Fogg Boulder County Land Use Courthouse Annex Building 2045 13th St. Boulder, CO 80302 303-441-3930	Long Range Planning
Sylvia Clark Boulder Ranger District 2140 Yarmouth Ave. Boulder, CO 80301 303-541-2500	District Ranger

APPENDIX 9

LAND CONSERVATION

APPENDIX 9.1

AGREEMENT ESTABLISHING THE ELDORA LAND PRESERVATION FUND_ A DONOR ADVISED FUND WITHIN THE BOULDER COUNTY PARKS AND OPEN SPACE FOUNDATION

THIS AGREEMENT is entered into by the Eldora Civic Association _("the Donor") and the Boulder County Parks and Open Space Foundation ("The Foundation"), on this _____day of August, 2007. The Agreement establishes a donor advised fund, to be known as the Eldora Land Preservation Fund ("the Fund"), with the Foundation and is viewed as an opportunity to build a philanthropic partnership between the Foundation and the Donor. While the Foundation must and does retain sole and absolute discretion over grants and distributions from the Fund, it is understood that the Donor stipulates that grants from the Fund be made from time to time for charitable purposes (as defined in the Foundation's Articles of Incorporation and Bylaws) to preserve those natural areas that contribute to and enhance the natural heritage of the Townsite of Eldora, Colorado, and its surroundings, generally defined as the Middle Boulder Creek drainage from the Continental Divide to the Town of Nederland, Colorado. Of highest priority for preservation are those lands identified by the Eldora Environmental Preservation Plan, the Boulder County Comprehensive Plan and the Forest Plan for Roosevelt National Forest, which encourage protection of riparian areas, wetlands, rare and significant plants, plant communities and animals, old-growth forests, and scenic areas. The charitable purposes of all grants must also be in support of the mission of the Boulder County Parks and Open Space Department.

An irrevocable minimum donation of $100.00 in cash or other assets shall be required to establish the Fund. No minimum balance shall be required to maintain the Fund, and the balance may be fully depleted through authorized grants.

The Donor may designate a representative to maintain its ongoing relationship with the Foundation and may appoint an Advisory Committee. The Donor or the Advisory Committee may recommend grants for charitable purposes from the Fund; all grant recommendations shall be for $500 or more. The Foundation shall continuously monitor the needs of the Parks and Open Space Department and gifting opportunities and provide the Donor and the Advisory Committee with suggestions, information, and specific projects for which grants from the Fund might be appropriate. The Foundation shall inform the Donor through his or her designated representative with respect to each grant made from the Fund.

Distributions from the Fund shall be made exclusively for charitable purposes as defined in the Foundation's Articles of Incorporation and Bylaws and Section 501(c) of the Internal Revenue Code.

Grants from the Fund may not be awarded to individuals. Scholarship funds may not benefit anyone in the family of any contributors to the Fund. Donors to the Fund also may not receive tangible benefits from a grant. These might include, but are not limited to: meals and tables at charity events, concert tickets or museum membership benefits, for example. Additionally, no contributor to the Fund may use grants from the Fund to satisfy a previously committed personal pledge made to a charity.

The Fund shall include the property described in the attached Schedule A together with any property which may later be added to the Fund and accepted by the Foundation, all of which shall be irrevocable gifts to the Foundation. The governing board of the Foundation shall have complete discretion to accept or refuse any non-cash gifts and shall have complete authority and discretion as to the investment and reinvestment of the assets of the Fund as part of the Foundation's investment portfolio.

The Donor may designate, in writing, a representative to maintain its ongoing relationship with the Foundation or may appoint an Advisory Committee. If a designated representative is appointed, the designated representative shall be the exclusive contact with the Foundation with respect to advice regarding dispersals from the Fund. However, the Donor may change the designated representative of the Fund at any time by communicating that change to the Foundation in writing. If an Advisory Committee is appointed by the Donor, the Foundation must be kept informed in writing as to the Advisory Committee's representative who has been designated to act as the Committee's exclusive contact with the Foundation on behalf of the Committee. The Foundation shall be entitled to rely on the advice and recommendations communicated by a representative who has been designated in writing by the Donor and shall have no obligation to confirm such advice or recommendation with the Donor or other members of an Advisory Committee. If neither the Donor nor a designated representative contact the Foundation for a period of five consecutive years, and the Foundation, after taking reasonable measures to do so, is unable to locate the Donor or designated representative, the Fund will be terminated and the Foundation shall thereafter continue to hold the assets of the Fund in its general unrestricted funds and shall distribute the net income and principal therefrom to such organizations as the governing board of the Foundation, in its discretion, shall consider appropriate.

The Foundation shall hold, manage, invest, and reinvest the assets of the Fund which may be commingled with the assets of other component funds within the Foundation, provided, however, that the separate identity of the Fund shall be maintained in the accounting records, and grants from the Fund shall be clearly identified as such to the recipients. The Foundation shall report annually to the Colorado Department of Revenue and the Internal Revenue Service regarding the Fund as a component fund within the Foundation.

If, for any reason, the Foundation dissolves, or ceases to hold or administer the Fund or otherwise to function under this Agreement, then the net assets of the Fund shall be distributed to such charitable organizations as the governing board of the Foundation may select, with primary consideration being given to any advice offered by the Donor and the Advisory Committee.

The Fund's assets shall be the property of the Foundation to be held by it in its corporate capacity and shall not be deemed a trust fund held by it in a trustee capacity. It is intended that the Fund shall be a component fund within the Foundation as an organization described in Sections 509(a)(3) and 170(b)(1)(A)(viii) of the Internal Revenue Code. This Agreement shall be interpreted in a manner consistent with the foregoing intention so as to conform with any applicable requirement of the Internal Revenue Code and its regulations. The Foundation may amend this Agreement without the consent of the Donor to the extent necessary to comply with any amendments to applicable law.

It is understood and agreed that all assets held in the Fund shall be subject to the Articles of Incorporation and Bylaws of the Foundation, including the variance power contained therein which permits the governing board of the Foundation to modify or remove any restriction or condition regarding the distribution of funds if, in its sole judgment, such restriction or condition becomes unnecessary, incapable of fulfillment or inconsistent with the charitable purposes and needs served by the Foundation.

All earnings from the Fund shall be allocated to the Foundation operating fund and shall not be available for grant requests.

The Donor	The Foundation
By ____________________________	By __________________________
President, Eldora Civic Association	Rich Koopmann, President
Date _________________________	Date _______________________

APPENDIX 9.2

ELDORA LAND PRESERVATION: A CHRONOLOGY

<u>September 1986</u>: Grace Lazzarino donates a lot containing riparian habitat along Middle Boulder Creek to the Boulder County Nature Association. Two years later this land is deeded over to ECA.

<u>December 1992</u>: Mike McCoy, Deb Evans and John Brocklehurst discuss land preservation in the Eldora area.

<u>July 19, 1995</u>: Eldora Environmental Preservation Plan (EEPP) is adopted as part of the Boulder County Comprehensive Plan. This project was under the leadership of Deb Evans.

<u>June 1996</u>: Harriett Hansen makes the first donation to the Eldora Land Preservation Fund (ELPF). Diane J. Brown opens a savings account at Peak National Back called the Eldora Land Preservation Fund.

<u>July 1996</u>: Jean Kindig and Dave Hallock give separate slide shows as fundraisers for the ELPF.

<u>December 1996</u>: ECA conducts a survey regarding Eldora open space.
Results: 62 in favor of having ECA actively pursue natural landmark status for the north slopes of Spencer and Ute Mountains, 6 opposed and 4 have no opinion.

<u>June 1997</u>: Sales of Historic Eldora coverlets begin.

<u>August 1997</u>: Fundraisers: Mushroom ID Walk, Wildflower ID walk, Bird ID Walk.

<u>August 1998</u>: Fundraisers: Geology slide show; Astronomy slide show.

<u>June 1999</u>: Sales of Silvia Pettem's book "Inn and around Nederland" and Cabin Sketch note cards by Herman Gross.

<u>December 1999</u>: Memorial Donations in memory of Russell and Ethel Rouse.

<u>July 2000</u>: First Eldora Community Yard Sale; Sales of Eldora T-shirts, Ted Warren's watercolor note cards and Jean Kindig's book. Memorial donations in memory of Ruthanna McCoy Evans.

<u>August 2000</u>: Brocklehursts host a tour of their garden to benefit the ELPF.

<u>October 2000</u>: Sale of Pets of Eldora Calendar, under the leadership of Betsy Burton.

May 2002: ECA surveys membership regarding open space acquisition around Eldora. Results: 70 in favor, 3 opposed, 1 with no opinion.

July 2002: Sale of Happy Valley Cookbooks under the leadership of Sallie Ruhnka and Virginia Menke. Second Eldora Community Yard Sale.

October 2002: Sale of Lee Evans' book "From Happy Valley to the Mountain Top" and Eldora Wildflower note cards.

2003: Memorial Donations for Nick Hoffman, Dolly Madden, Al and June Marron. Paul Woodward and Ruth Huntington Williams.

July 2004: Eldora Garden Tour Benefit. Third Eldora Community Yard Sale.

August 2004: Diane Brown and Scott Bruntjen meet with Boulder County regarding the acquisition of the Rugg Pasture.

September 2004: Diane Brown and Dave Hallock meet with the Boulder County Nature Association to see if we could use their 501 (c)(3) status to receive donations.

September 2005: Realtor contacts Diane Brown regarding a land parcel on Spencer Mountain that is for sale. She contacts Boulder County Parks and Open Space to see if they would partner with the ELPF on the purchase. County agrees to deal. Purchase finalized in October 2005.

June 2006: Sale of Eldora Calendar: Watercolors by Ted Warren.

July 2006: Fourth Eldora Community Yard Sale

October 2006: ELPF partners with Boulder County Parks and Open Space for a second time to purchase three mining claims on the top of Spencer Mountain, preserving 6.6 acres from development.

July 2007: Sale of Happy Valley, Eldora, Colorado fleece vests with cabin logo.

July 2007: Meeting with Boulder County Parks and Open Space Foundation to see if the Eldora Land Preservation Fund could "piggy back" their 501 (c)(3) status so that donations to ELPF can be considered charitable donations.

August 2007: ECA Board unanimously approves agreement between Boulder County Parks and Open Space Foundation and Eldora Land Preservation Fund which establishes a donor advised fund, giving donors IRS tax benefits.

August 2007: Anonymous donor offers a $25,000 matching grant challenge to the community of Eldora towards the BCPOS Foundation/ELPF account. A total of $5660 is raised, including the match.

August 2007: Jan Tafoya and Audrey Windolph host “A Taste of Eldora” at their cabin with speakers, music and refreshments.

October 2009: Goldminer Hotel takes over sales of ELPF merchandise.

APPENDIX 9.3

List of Contact People

Name, Affiliation, Address, Phone	Field of Expertise
Diane J. Brown 2478 Eldora Road Nederland, CO 80466 303-258-3672 eldoradh1@rmi.net	Eldora Land Preservation Fund
Dale Case Boulder County Land Use Courthouse Annex Building 2045 13th St. Boulder, CO 80302 303-441-3930	Land Use Director
Great Outdoors Colorado (GOCO) 1600 Broadway, Suite 1650 Denver, CO 80202 303-226-4500 info@goco.org	Grants for Land Conservation
Dave Hallock 2478 Eldora Road Nederland, CO 80466 303-258-3672 eldoradh@rmi.net	Conservation Planning
Mike Johnson US Forest Service, Boulder District 2140 Yarmouth Ave. Boulder, CO 80301 303-541-2500 Mjohnson10@fs.fed.us	Real Estate Specialist
Aerial Steele Tax Credit Connection, Inc. 2919 W. 17th Ave., Suite 201 Longmont, CO 80503 303-774-8195 www.taxcreditconnection.com/colorado	Colorado Tax Credits

Ron Stewart Boulder County Parks and Open Space Dept. 5201 St. Vrain Road Longmont, CO 80503 303-678-6200	Director, Boulder County Parks and Open Space
Janis Whisman Boulder County Parks and Open Space Dept. 5201 St. Vrain Road Longmont, CO 80503 303-678-6200	Real Estate Manager

APPENDIX 10

CLIMATE CHANGE

APPENDIX 10.1 CLIMATE CHANGE

THE IMPACT OF CLIMATE CHANGE LOCALLY AND GLOBALLY WITH EMPHASIS ON THE SOUTHEN ROCKIES ECOSYSTEM: WHAT HAPPENS IN ELDORA HAPPENS GLOBALLY AND WHAT HAPPENS GLOBALLY HAPPENS IN ELDORA

By Michael A. McCoy, DVM

10.1 Introduction

Climatology is the science enabling us to understand long term trends and the inter-relationships between abiotic and biotic systems and the changes within and between them over time.

Climate is dependent upon the inextricable linkage between the Biosphere (all life on the planet), Atmosphere (gases and strata), Hydrosphere (oceans, ground water, surface water, snow, ice, evaporation and transpiration), Lithosphere (the earth's crust and upper mantle), Geosphere (plate tectonics and volcanism), Cosmosphere (solar and planetary influence), Altitude, Latitude, the Earth's axis of inclination and orbit and the Anthroposphere (human use and impact on planetary systems.)

The integration of these linkages is defined by biomes or the Earth's major plant and animal communities. Biome classification includes aquatic and terrestrial ecosystems. Terrestrial ecosystems encompass tropical rainforests, tropical savannas, deserts, chaparral, grasslands, temperate deciduous forests, temperate boreal forests and arctic and alpine tundra. Aquatic biomes are divided into two groups. The marine biome which includes coral reefs, oceans and estuaries and the fresh water biome which encompasses ponds, lakes, streams, rivers and wetlands (Blue Planet 2010, Encyclopedia of Earth 2010, University of California Museum of Paleontology 2010).

Mountainous areas are subject to rapid altitudinal shifts in biota which define patterns of transition or ecotones separating biomes (Strayer *et al*. 2003, Peet 1978). These ecological zones or bands are exemplified in the Front Range of the Southern Rockies by the montane, subalpine and alpine zones. The ecological zonation from Boulder to the alpine tundra is remarkable. Biotic differences are noted between south and north exposed slopes at the same altitude due to microclimatic variation (Odum 1962).

These three ecosystems have been influenced by anthropogenic change including fire, fire suppression, mining, logging, grazing, water diversion, and now climate change.

The Montane Zone: The ecological community from 5,600 to 9,500 feet exhibits ponderosa pine and Rocky Mountain juniper located on the warmer southern exposed slopes while Douglas-fir inhabit the cooler northern slopes. Blue spruce, willow and cottonwood and the occasional grove of aspen are associated with the riparian corridor. Shrubs in this zone include: chokecherry, common juniper and kinnikinnik. Wildflowers found here include larkspur, fairy slippers, western wallflowers, snowberries, and several types of daisies (Frommer's 2010, Benedict 1991).

The montane ecosystem has a great variety of wildlife depending on the season of the year. Mountain lions are at the top of the food chain. Elk and mule deer, coyotes, pine squirrels, golden-mantled ground squirrel and deer mice, with beaver along riparian corridors, wetlands, ponds and lakes. Other residents include red-tailed hawks, hairy woodpeckers, Steller's jays, and mountain chickadees (Frommer's 2010, Benedict 1991).

Subalpine Zone – This ecological community lies between 9,000 feet and 11,500 feet. It is comprised of Engelmann spruce, subalpine fir, aspen, lodgepole pine and limber pine along with subalpine meadows and wildflowers like lupine, fireweed, monkshood, Parry primrose and Colorado columbine. Shrubs in this zone include: blueberry, wild rose, currant, willow, red elderberry and common juniper (Frommer's 2010, Benedict 1991).

Fire and human disturbance are noted in the ecological succession process demonstrated on Spencer Mountain, Caribou Flats and Woodland Flats.

The wildlife found in this zone includes mountain lions, coyotes, along with deer and elk. The latter two species graze on open meadows in the summer and winter in the montane ecosystem. They are found in the meadows between Jasper and Diamond Lake on Chittenden Mountain. Beavers live along aspen and willow dominated riparian corridors and wetlands. Long-tailed weasel, least and Uinta chipmunks, golden-mantled ground squirrels, pine squirrels, deer mice and the snowshoe hare also inhabit this zone. Commonly seen birds in the subalpine include blue grouse, Clark's nutcrackers, mountain chickadees, and both gray and Steller's jays (Frommer's 2010, Benedict 1991).

The obvious transition ecotone between the subalpine and alpine zones is demonstrated around Devils Thumb Lake, along the Arapaho Pass trail, above Diamond Lake, the Triple Lakes in the Boulder Watershed and on the climb up Mount Audubon. The tremendous winds transform the Engelmann spruce, limber pine and subalpine fir in this zone so they are stunted and often grow horizontally along the ground. Krummholz is the term used to denote this growth pattern and transition zone

The Alpine Zone is the ecological community above 11,500 feet comprised of a highly diverse composition of species with a very short growing season. The Alpine tundra habitats make up about 3 percent of the earth's surface but are composed of about 10,000 plant species many of which are identical to those found in the Arctic Tundra (Flannery 2005).

The tundra is composed of low growing assemblages of grasses and sedges adapted to extreme climatic conditions including winds over 100 miles per hour.

Many of the plants and animals that are adapted to the alpine tundra habitat are highly specialized and cannot survive anywhere else. The pika, a member of the Lagomorph family, and the white-tailed ptarmigan exemplify this adaptability and specialization. Other species of animals and birds found in this ecosystem include the heather vole, deer mouse, yellow-bellied marmot, and the northern pocket gopher. The generalized omnivorous coyote and the carnivorous long-tailed weasel are at the top of the food chain. Rocky Mountain bighorn sheep and elk are also found in this zone. In the summer months golden eagles, red-tailed hawks, American kestrels, water pipits, brown-capped rosy finches, and mountain bluebirds define the area (Frommer's 2010, Benedict 1991).

Many of the same species found in the non-mountainous biomes are also found in the mountainous ecological zones. Because mountain ranges are isolated, unique species often occur. Topographic variability and isolation can lead to speciation.

10.2 Recognizing and Understanding the Planet as a Self Regulating System

The concept of planetary self regulation has only recently become acceptable in the scientific community. Understanding abiotic and biotic interrelationships and the influence they have on each other is a critical part of understanding climate change. The scientific community has been reluctant to accept the concept of planetary self regulation and integration (WordIQ 2010). It is helpful to appreciate the historical evolution of reductionist approaches to pure and applied science. Today, scientists have the technological capability to use both reductionist and integrated approaches where appropriate.

Rene Descartes, the founder of modern philosophy, laid the ground work for the way science and technology would proceed. His influence is still well entrenched today. This concept was initiated in the 17th century.

Descartes instituted the analytical method of deductive reasoning. This allowed some of the greatest technological advances man has ever known but at the same time stifled a more holistic inductive reasoning process. Cartesian thought led to reductionism, fragmentation and mechanization of complex living systems. Descartes did not see nature as a living system, nor did he see plants and animals as any more than machines. Human beings were seen to have a soul, the seat of rationality, but the body was no more than a machine. From his point of view animals had no real awareness and felt no pain. This attitude fostered exploitation and manipulation of nature and living systems (Capra 1982). The so called Cartesian philosophy not only fragmented the relationship between man, other species, and the earth, but it removed any chance of compassion or empathy to be woven into the relationship. The impact of this is still felt today. The earth is seen as no more than a commodity to be utilized, bought and sold to satisfy the needs of humanity. There is no idea of an interdependent relationship sustaining the whole.

When dealing with living systems, reductionism is unable to lead to comprehension or explanation of the complexity and interdependence of physical, biological, and chemical entities. It is not possible to determine the behavior of living systems by understanding component parts alone. Instead, the system as a whole determines in an important way how the parts behave. There are many intrinsic factors in living systems that are not definable or understandable using a reductionist format.

Ernst Haeckel was the first biologist to propose the concept of ecology in 1869 but it was not well recognized until the 20th century (Oracle ThinkQuest 2010).

Aldo Leopold is the father of wildlife ecology. Leopold like others before him, including Henry David Thoreau and John Muir, believed that natural systems were interconnected and that human beings were a part of these systems not apart from them. Leopold was unique. He was able to bring history, science and philosophy together in a way that could be communicated to the public (Frese 2010). This led to a transformation in thinking about the interdependent interrelationship between living and nonliving systems. As a professor at the University of Wisconsin his reasoning and understanding made a great stride forward from the Cartesian philosophy of the 17th century. This new understanding of connectivity was passed on to new generations. The philosophical construct is encapsulated in the following quote.

> *"All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts.... The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or*

> *collectively: the land.... A land ethic changes the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it."* (Frese 2010, Leopold 1966)

The concept of interconnectivity was expanded by James Lovelock when he first put forward the Gaia Hypothesis which has since been revised and accepted by the scientific community as the Gaia Theory. This concept of a self regulating earth was first introduced in 1965 when Lovelock was working at the Jet Propulsion Laboratory in Pasadena, California. Lovelock described a relationship between non living and living systems and the atmosphere. His concept explained the dynamic equilibrium between biology, physics, chemistry and atmospheric science. Biological evolution does not occur in a vacuum. The developmental evolution of organisms is dependent upon their relationship with the environment (Lovelock 2009).

Evolution, adaptation and selection are not independent. Structure and function cannot be separated to make complex processes more understandable but must be recognized as a part of one another. This brings reductionism and holism together in understanding complex living systems.

In 2001 during a meeting of the European Geophysical Union more than one thousand scientists signed the Amsterdam Declaration stating that "The Earth behaves as a single self regulating system comprised of physical, chemical, biological and human components" (Lovelock 2010). This culminated in giving Gaia scientific legitimacy.

Lovelock discovered the planet to be a "self regulating system composed of a totality of organisms (biodiversity), surface rocks (the lithosphere), the ocean and atmosphere tightly coupled into an evolving system favorable for maintaining contemporary life."*Lovelock

If the equilibrium of a system is exceeded then it will shift and adapt to new conditions and demands or be eliminated. This is described in Shelford's Law of Tolerance (Cornell University 2010). <u>Any change in climatic conditions are relevant to Shelford's Law of Tolerance.</u>

Feedback loops are an inherent part of climate change. These loops make physiology and geophysiology complicated and unpredictable (Gaia 2010). The destabilization of interrelationships between the component parts of ecosystems and individual organisms are often caused by imbalances in feedback loops. This is exemplified by the relationship between increasing greenhouse gas (GHG) emissions, higher temperatures, decreasing snowpack and wildfires which produce more atmospheric carbon dioxide leading to higher temperatures. A direct reaction to increased heat leads to greater use of air conditioning. In turn, energy demand escalates to produce even more greenhouse gas emissions. These feedback loops make modeling and prediction of climate change very difficult.

It has taken over 3.5 billion years of evolution, adaptation and selection to reach the point where we can even ask about such complexities as climate change or the intricacies of a self regulating planet. According to Harvard biologist E.O. Wilson, between 1.5 and 1.8 million species have been discovered. It is estimated that the number of known and unknown living species is around 10 million or more (Wilson 2002).

The planet has seen five iterations of mass extinction altering the complexity of the global ecosystem. All were caused by natural catastrophic events. Yet today the planet may be rapidly approaching the sixth major mass extinction (Eldredge 2010). We, ourselves, are the root cause of this evolving event. The current rate of species extinction is far more rapid than previous events which occurred over millennia. Presently the rate of extinction is between one thousand and ten thousand times the prior rate bringing significant impact on planetary biodiversity (Tree of Life Guardianship 2010).

Climate change poses the greatest risk to the disruption of life and living systems as we know them. It is difficult for anyone to comprehend the scope of these changes. Homo sapiens have been part of this process for only 200,000 years (O'Neal 2010). Most of that time was spent as hunter-gatherers. About 14,000 years ago we started to domesticate animals and roughly 10,000 years ago we settled into agrarian societies. The pastoral and agrarian societies have probably transformed the planet more than anything else in our entire history.

It has enabled our species to far exceed the natural carrying capacity of the land allowing our numbers to grow to unsustainable levels putting the planet at risk. It has taken the entire 200,000 years for human population to reach 1 billion by 1804 and only 206 more years to reach almost 7 billion today (Johansen and Sornette 2010).

It is estimated that the global carrying capacity of the planet was exceeded between 1978 and 1986. At this time the population was around 4.5 billion (Flannery 2005, Wilson 2002).

It was just after this that we began using resources unsustainably. Since then we have been "mining the planet" creating an ecosystem service deficit. We have seen the fisheries plummet, overgrazing, deforestation, desertification of land, pollution, destruction of the marine ecosystem, increased energy demands, climate change and the disappearance of species (Diamond 2005). Ecological degradation can be equated to population size and affluence. Technology used to fuel our consumption rate is at the expense of complex ecosystems. An ecological system can support a much larger population living lower on the consumption chain. The problem lies in the fact that most people want a higher standard of living through wealth and possessions whether needed for survival or not.

Ecosystem services are taken for granted and until recently have not been calculated as part of the economic equation (Ecological Society of America 2010). We have separated ourselves from the natural process rather than understanding we are part of it. Our global civilization rests on the foundation of natural capital. This includes climate regulation, filtration of fresh water through wetlands, soil production, natural freshwater reservoirs retained by snowpack and glaciers, plant pollination, production of the forest ecosystems and the world's oceans.

This becomes clear when we understand that our gross domestic product (GDP) worldwide is about $18 trillion annually. This rests upon the services provided by ecological systems amounting to $33 trillion annually (Costanza *et al.* 1997). It must also be recognized that as we diminish our ecological foundation we diminish our own GDP productivity. We must move from a growth oriented economy to an economy that is sustainable and balanced.

Urban civilization began about 5000 years ago. Two-hundred fifty years ago we embarked on the Industrial Revolution and transformed the atmosphere (Anthoni 2010).

Today we are in the age of cyber-communication and globalization. We can communicate with anyone anywhere on the planet at nearly the speed of light. It is the message we send and the way it is received and interpreted that counts. We have become a force of nature. We are capable of protecting, restoring and enhancing life and living systems or destroying them. It is our choice to make.

Over the past 8,000 years, during the Holocene epoch, climatic conditions have been relatively stable allowing the development of civilization (Riversedge 2008). During this period the global temperature and sea level remained stable as did the smaller continental glaciers, Arctic sea ice, the Greenland ice sheets and the Antarctic ice shelves and ice sheets.

The mean global temperature is about 15°C or (59° F) (Tang 2005). This temperature is variable depending on the concentration of atmospheric carbon dioxide. Other atmospheric gases include: nitrogen 78%, oxygen 21%, argon 0.9%, trace amounts of other gases and CO2. Carbon dioxide has remained relatively stable for the past 1,000 years. During this period the atmospheric concentration has remained between 260 and 280 parts per million (ppm) or 0.0285%. After the Industrial Revolution this number began a steady climb reaching 388 ppm or 0.0388% in October of 2010. The earth's surface temperature has risen by 0.8 degrees C (1.4 degrees F) since the late 1800s due to rising CO2 levels (National Academies 2010). This is referred to as the Anthropocene period or the age of humanity (Stewart 2010). The CO2 levels during the glacial period were around 160 ppm. If atmospheric CO2 levels were 1% the surface temperature of the earth would reach the boiling point. The planet Venus is 98% CO2 with a surface temperature of 891 degrees (Flannery 2005). It is warmer today than in the last 1300 years. The year 2010 was one of the two warmest years since climate record keeping with instrumentation started in 1850. The National Oceanic and Atmospheric Administration figures indicate that in 2010 the global land and ocean temperature was 1.12 ° F greater than the 20th century average (Earth Watch, San Diego Union January 17, 2011)

10.3 Climate Force Gasses

Climate forcing agents include:

Carbon dioxide is the major climate forcing agent. It has a life time of over 100 years and is now at a concentration of 388 ppm.

Methane is the second most common green house gas (GHG) at 1.5ppm. It is 23 times more powerful than CO2 and has a life time of about 12 years (EEOCW 2010). It is created by anaerobic decomposition of organic material produced in garbage dumps, the livestock industry and permafrost. Methane is stored in the Arctic in natural gas deposits, permafrost, and as submarine clathrates (Thomas 2010). Permafrost and clathrates degrade on warming. The release of submarine clathrates due to global warming would be catastrophic raising the CO2 concentrations in the atmosphere to levels that are not consistent with life as we know it. If methane is burned it produces CO2 and water (Flannery 2005).

Nitrous oxide is much rarer than methane but is 270 times more efficient than CO2 at trapping heat. It lasts 114 years in the atmosphere and is created by oceans, soil, burning biomass and nitrogen based fertilizers (EEOCW 2010). There is 20% more now than at the beginning of the Industrial Revolution. The main source of nitrous oxide is human caused (Flannery 2005).

Hydroflorocarbons are 20,000 times more powerful than CO2 and last 260 years (EEOCW 2010). They are used as refrigerants and are highly regulated.

Sulphur Hexafloride is the most potent of the climate forcing gases. It is 23,900 times more efficient than CO_2 at trapping heat and lasts 3200 years (EEOCW 2010). This gas is found in car tires and electrical insulation. But it is a small contributor and must be phased out.
Water vapor is a powerful GHG. With an increase in fossil fuel emissions, the atmospheric temperature increases leading to greater evaporation and higher levels of water vapor in the atmosphere. More water vapor traps more heat resulting in an amplifying positive feedback loop exemplified by cataclysmic storm patterns (Greenpeace 2010).

These climate forcing gases, primarily CO_2, lead to climate change but the feedback loops produced by increasing temperatures play a major role forcing climate shifts (Hansen 2009). About 56% of all CO_2 that has been released by burning fossil fuels is still in the atmosphere. CO_2 is responsible for about 80% of all global warming (Flannery 2005, Kump 2002). The cumulative impact of fossil fuel emissions is dependent upon the past and present rate of accumulation as well as dissipation over time.

Human generated climate forcing gases released from fossil fuels over the last twenty to thirty years have a much greater impact than natural processes including solar forcing and volcanism. What normally takes place over thousands of years under natural conditions is happening now in decades. The anthropogenic CO_2 forcing in conjunction with positive feedback loops is unprecedented.

Table 10.1. Fossil Fuel Emission Levels

Fossil Fuel Emission Levels
- Pounds per Billion Btu of Energy Input

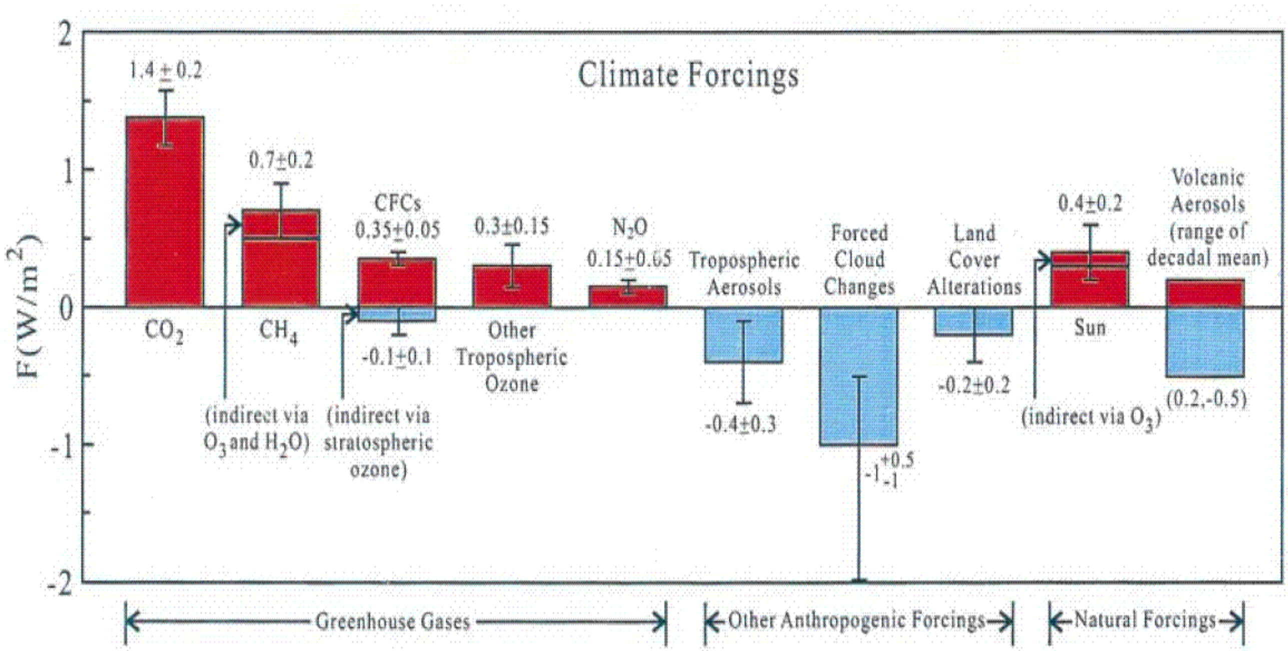
Pollutant	Natural Gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Carbon Monoxide	40	33	208
Nitrogen Oxides	92	448	457
Sulfur Dioxide	1	1,122	2,591
Particulates	7	84	2,744
Mercury	0.000	0.007	0.016

Source: EIA - Natural Gas Issues and Trends 1998

There is concern that if we continue business as usual during this century the temperature will rise as the CO_2 levels increase leading to a higher mean global temperature over time. Moderating this process is dependent upon the fate of emissions and the stability and strengthening of the carbon sinks (Smith 2010). If the ocean and land sinks weaken then emissions will go to the atmosphere creating a positive feedback leading to higher temperatures. Carbon is stored in the atmosphere, oceans and land. Most of the CO_2 is found in the oceans. The atmosphere has the smallest amount of carbon. Coal, oil and gas are also a part of the carbon cycle sink. These carbon sinks create thermal inertia and maintain homeostasis.

Paleontological evaluation of the Pliocene fossil record indicates that the CO2 atmospheric concentration levels during this epoch, over two million years ago, were 360 to 400 ppm or 0.036% translating into a global mean temperature about 2 to 3° C higher than they are today. During this period the sea level was 25 meters (75 feet) higher than present. The CO2 concentration is the same today as during the mid Pliocene epoch but the thermal inertia of the ocean has protected us from increasing temperatures until now (Lynas 2008). As emissions continue to rise and positive feedbacks increase we may choose a path inconsistent with our civilization or the biodiversity we know today.

Figure 10.1. Trends of Major Climate Forcing Agents



James E. Hansen and Makiko Sato Trends of major climate forcing agents, -NASA Godard Institute for Space Studies N.Y. New York 10025.

10.4 What Causes Climate Change?

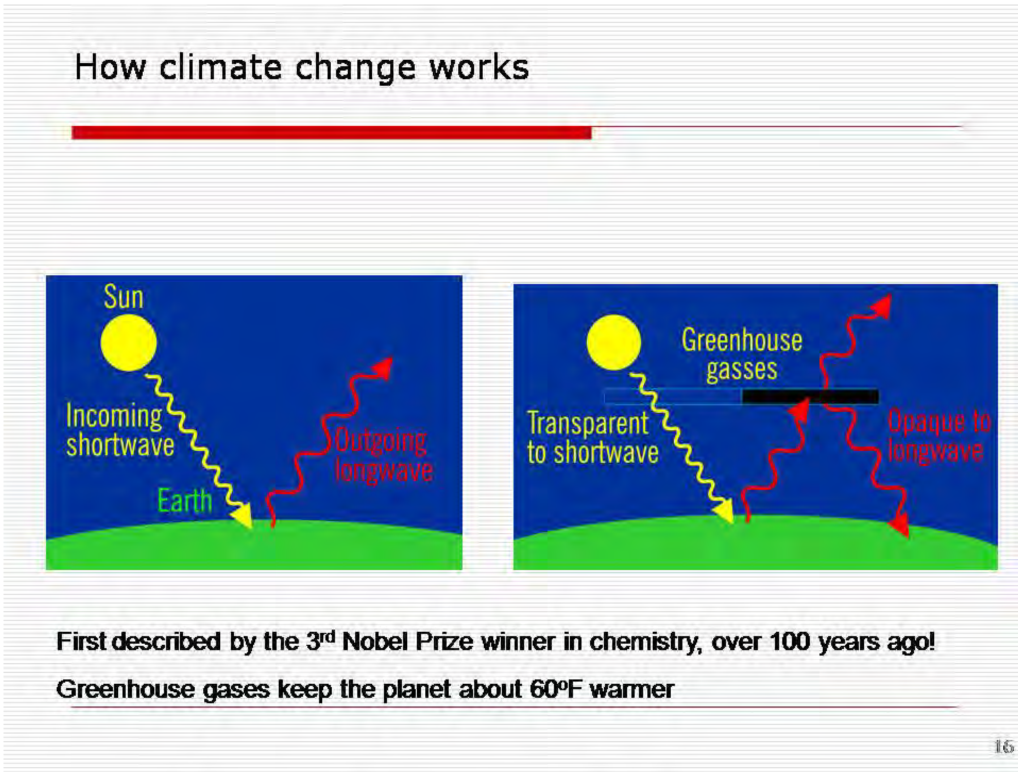
The sun and earth both emit electromagnetic radiation. The sun is much hotter than the earth and emits short high energy electromagnetic waves which are visible to the eye. Ultraviolet radiation from the sun is not visible.

The earth being a much cooler body emits low energy, longer wave electromagnetic radiation. This radiation is not visible to the eye but can be detected as heat.

The earth's atmosphere allows short wave electromagnetic radiation to pass through it.

Greenhouse gases emitted by fossil fuels like carbon dioxide are opaque to the longer wave electromagnetic radiation. These gases absorb the longer wave infrared radiation adding heat to the atmosphere. This in turn causes the atmosphere to emit more radiation. Some of this radiation is directed back towards the Earth, increasing the average temperature of the Earth's surface (Figure 10.2) (HyperPhysics 2010).

Figure 10.2. How Climate Change Works



Courtesy- David W. Pierce Division of Climate, Atmospheric Science, and Physical Oceanography
Scripps Institution of Oceanography dpierce@ucsd.edu

10.4.1 The Keeling Curve

In the 1950s Dr Roger Revelle, a scientist at Scripps Institution of Oceanography (SIO), started to take an interest in the concentration of atmospheric CO2 and the implications this might have on climate change and increased global temperature. In the mid 1950s Dr. David Keeling came to SIO and worked with Dr. Revelle to set up an atmospheric CO2 monitoring system at the Mauna Loa observatory near the summit of the Mauna Loa volcano in Hawaii where air quality is relatively pristine (Scripps Institute of Oceanography 2010, 2005).

Dr. Keeling analyzed daily atmospheric samples for CO2 concentration. When he started his research in 1958 the concentration of CO2 was 315 ppm. Further analysis showed a steady upward trend that had peaks and valleys. The peaks were demonstrated during the winter months when plants in the northern hemisphere were physiologically inactive releasing CO2 back to the atmosphere and valleys in the spring and summer when plants were utilizing CO2 during the growing season.

Over the years there was a steady annual increase of about 1.5 ppm. atmospheric CO2. The validity of the curve and the precision and replication of data left no doubt in the scientific community that fossil fuel emissions were creating a steady accumulation of climate altering green house gasses in the atmosphere. After the year 2000 there were several times this number rose above 2 ppm. The NOAA figures show CO2 increased by 2.14 ppm in 2007 which was faster than expected (Planet for Life 2010). The rise in CO2 after 2000 may be accounted for by a weakening of carbon sinks including forests, soils and oceans.

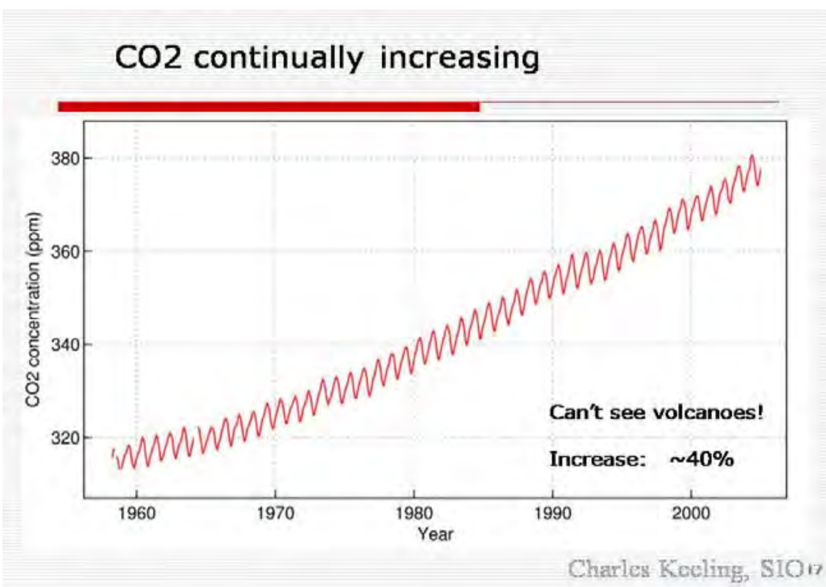
He also found that the point source of CO2 emission becomes part of the global atmosphere regardless of where it is released. If you burn a lump of coal or start your car in Eldora it becomes a part of the circulating atmosphere in the northern hemisphere.

Now there are a number of sites around the world collecting data using flux towers modeled off Dr. Keeling's original analyzation technology. These towers are connected in "flux networks" and constantly monitor data collected through advanced ground and satellite linkages on the interrelationship between carbon, energy and water. The exchange of carbon dioxide (CO2) between the land and the atmosphere is one of the most important indicators of ecosystem productivity. This data can be used to model and analyze climate and anthropogenic impacts on terrestrial ecosystems. It also provides a good indication about the source of CO2 and the strength of the sink to absorb it at different times of the day, month or season in different terrestrial environments around the world including Europe, North America, Asia and Latin America (NOAA 2010, Running *et al.* 1999)

The Keeling curve and analysis gave climate scientists a 20 year head start on understanding the earth's systems and the impact that we are having on them.

The Keeling Curve is the DNA Helix for Earth Science (Figure 10.3).

Figure 10.3. The Keeling Curve



Courtesy- David W. Pierce Division of Climate, Atmospheric Science, and Physical Oceanography
Scripps Institution of Oceanography dpierce@ucsd.edu

10.4.2 The Distinct Difference between Weather and Climate

Meteorology focuses on short and medium term weather events while climatology evaluates long term regional and global climatic trends. The difference between weather and climate are significant but often confusing.

Unfortunately, well funded groups in opposition to the validity of climate change as something to be addressed as quickly as possible, capitalize on emphasizing short term seasonal events to cloud scientific proof. Some policy makers and corporate leaders with a vested interest in maintaining business as usual, use mass media to communicate this misinformation to the public casting doubt and slowing positive solutions (Kolbert 2010, Piltz 2010).

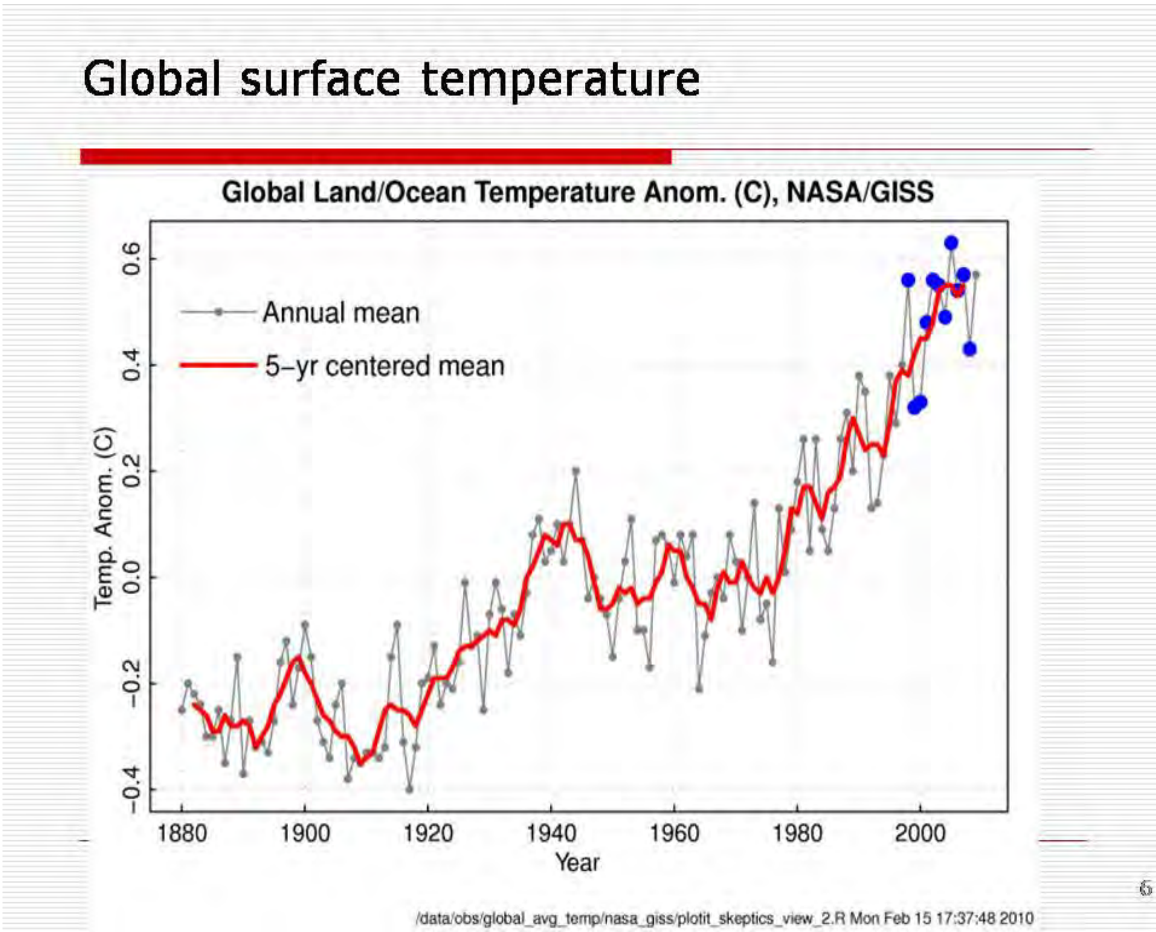
Two prominent climatologists, Steve Schneider and James Hansen, brought the dangers of climate change to legislators and the public in the late 1980s (Lovelock 2009). They were unable to move forward with a program to address and resolve the problem. Scientists who speak out publicly on professional issues like climate science are often criticized by their peers. However, 700 climate scientists belonging to the American Geophysical Union have agreed to communicate as experts on questions about anthropogenic causes of climate change. They see that science and politics cannot be separated. The two disciplines must work together engaging vested interests, denialists and politicians who attack and disregard climate science and scientists doing the research (Piltz 2010).

In the 1980s a prominent Swedish climatologist, Bert Bolin, worked with the United Nations to establish the Intergovernmental Panel on Climate Change (IPCC) (Lovelock 2009). This body enables peer reviewed climate scientists to meet with world leaders and policy makers. The IPCC does not do research but enables scientists to guide content while government approves the form. This tedious process enables pure science and politics to merge and guide climate policy worldwide. There are concerns in the scientific community that the policy making summary does not represent science correctly but many scientists and policy makers think the IPCC enables an opportunity to approach consensus on the issue (IPCC 2010).

Figures 10.4 and 10.5 illustrate the distinction between weather and climate. Figure 10.1 illustrates the long term warming trend from the late 1800s through 2008. It also emphasizes the weather event shown in dark blue from 1998 – 2008. Figure 10.2 emphasizes the weather pattern shown on Figure 10.1.

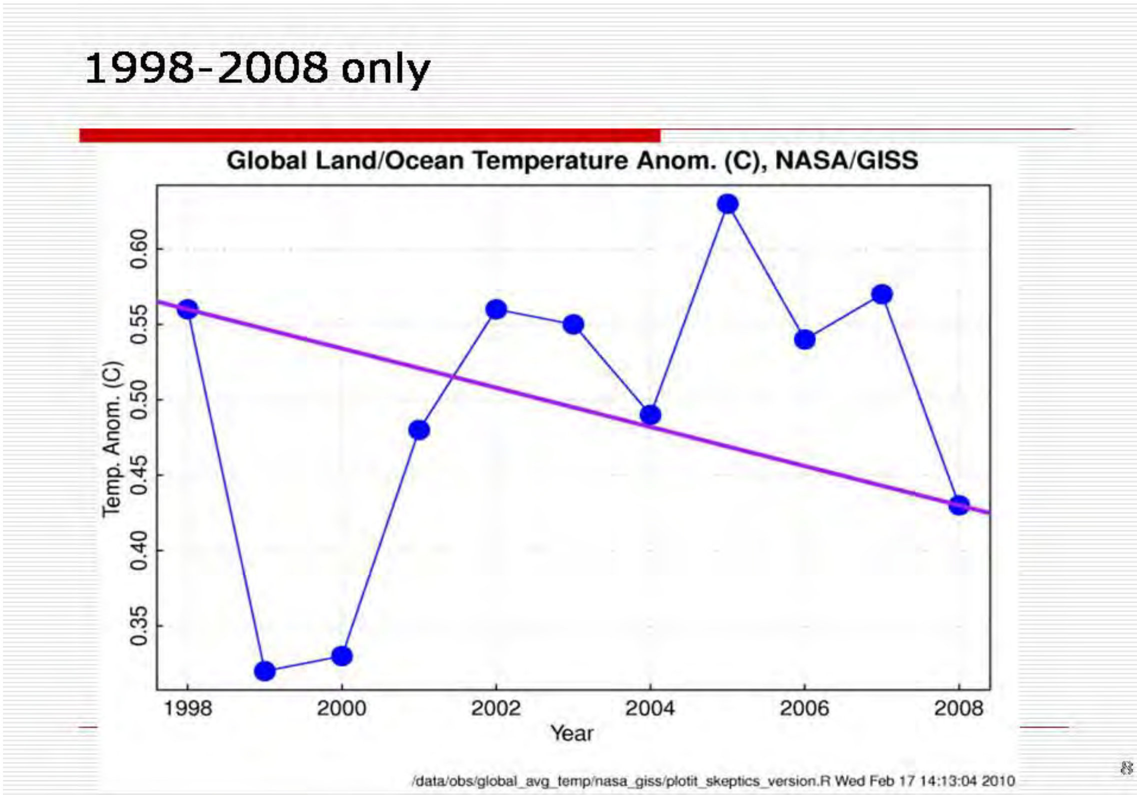
These two figures in conjunction with the Keeling Curve make it clear that burning fossil fuels increases atmospheric CO2 concentrations which are directly allied with a steady rise in the global mean temperature.

Figure 10.4. Global Surface Temperature, 1880-2000



Courtesy- David W. Pierce Division of Climate, Atmospheric Science, and Physical Oceanography
Scripps Institution of Oceanography dpierce@ucsd.edu

Figure 10.5. Global Surface Temperature, 1998-2008



Courtesy- David W. Pierce Division of Climate, Atmospheric Science, and Physical Oceanography
Scripps Institution of Oceanography dpierce@ucsd.edu

10.4.3 Climate Change on Global Ecosystems Varies Geographically

Climate change impacts on global ecosystems are different and dependent on geographic location. Understanding the location and nature of change will enable both resolution and adaptation to a new set of conditions economically and ecologically.

The land mass in the northern hemisphere is much greater than the southern hemisphere. Each hemisphere has its own atmosphere. The atmosphere in the north does not mix with the south. They do not cross the equatorial boundary hence the carbon sinks are greater in the northern hemisphere because of a 75% greater landmass (Running 2010).

Temperature changes are greater in Polar Regions than equatorial zones and this contrast influences weather patterns in the mid latitudes (World Wildlife Fund 2010a). The Antarctic is experiencing unprecedented warming over the last 50 years which is destabilizing ice shelves triggering the acceleration of glaciers toward the ocean at five times the normal rate (Scambos 2010). The temperatures are still low hence sea level rise (SLR) is not a problem yet in Antarctica. This system has been stable for thousands of years but has been changing rapidly in the last two or three decades.

The Arctic is a different matter. The rapid melting of arctic sea ice due to increasing temperatures resulting from fossil fuel emissions is creating a reverberating impact on climate change. The ratio of incident and reflected light is defined as the albedo. Snow and ice have a high albedo reflecting about 80% of their incident light. High albedo results in lower temperatures. As the arctic sea ice melts exposing the ocean the albedo or reflected light decreases and the ocean temperature increases. The albedo of water is 5 to 10% (Science Encyclopedia 2010). By September of 2007 Arctic sea ice had decreased by 60% since the 1970s which was much more rapid than the projected models had predicted (Figure 10.6) (Lovelock 2009). A colder ocean dissolves more CO2 but as it warms it takes up less and diminishes the efficacy of the ocean CO2 sink.

The increasing disappearance of sea ice produces a chain of positive feedbacks due to a rise in temperature which can lead to a tipping point or changing a system from one stable state to another over time.

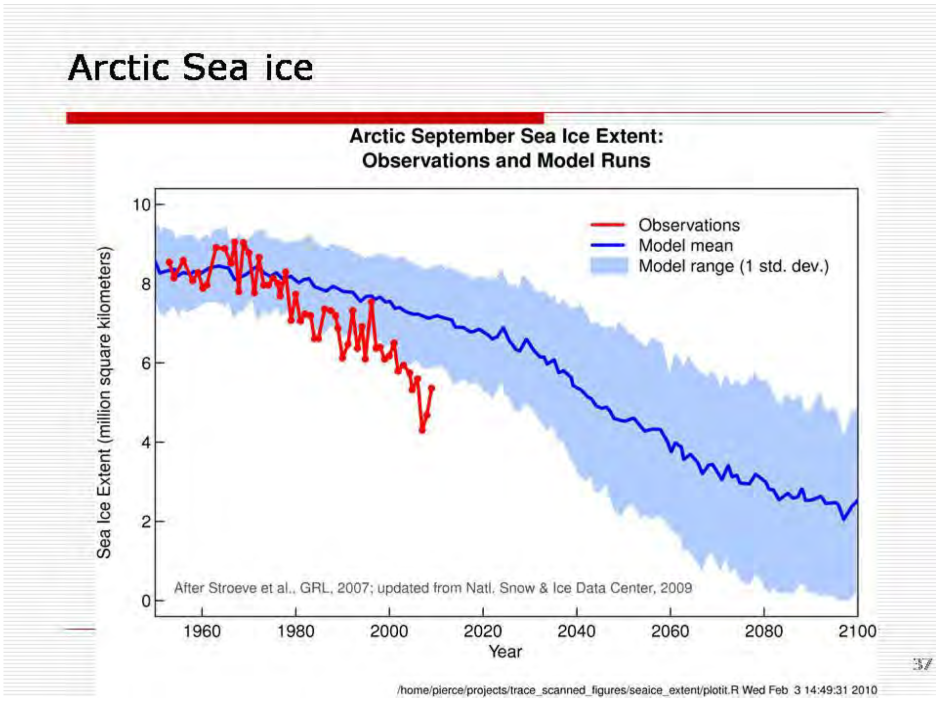
The system changes when the limits of tolerance are exceeded. In the summer of 2002 the arctic sea ice and the Greenland ice sheets shrank by 400 thousand square miles and in the summer of 2004 it was discovered that Greenland's ice sheets were melting 10 times faster than had been predicted (Flannery 2005). The destabilizing of the Greenland glacial ice sheets have a direct effect on SLR, but the melting of the arctic sea ice does not. Any land based glacial melt will lead to SLR. The level of SLR now is about 3 cm /decade (Hansen 2009). The melting of arctic sea ice has caused an ambient temperature rise leading to a chain of events:

1. Loss of biodiversity and interruption of food chains are due to the impact on the polar bear, walrus and ribbon seal (Climate Law Institute 2010).
2. Melting tundra permafrost releases methane into the atmosphere which is a powerful GHG emitter.
3. This in turn increases the temperature allowing the invasion of shrubs to replace tundra which is an indication of the beginning of a boreal forest migration northward.
4. This has led to tundra fires releasing more CO2 back into the atmosphere.
5. Tundra lakes underlain previously by permafrost are draining and disrupting food chains from single celled organisms to birds and mammals (Lynas 2008).
6. The impact on migratory birds and mammals like caribou is significant. The loss of feeding, breeding, and nesting habitat and disruption of complex food chains throughout the migratory flyways in the western and eastern hemispheres may also be significant. Flyways originating in the tundra ecosystems of Alaska, Canada and Siberia may affect bird populations in the Americas, Europe, Asia, the Middle East and Africa. Some birds may benefit while others will not (CMS 2010, NPRC 2010, World Wildlife Fund 2010b).

If the temperature of the Arctic Ocean increases enough to allow the melting of methane clathrates found under sediments in the ocean floor, the climate shift would lead to a new system quite different than anything we are familiar with today. This has happened in the past but conditions then were not supportive of the life we know now (Hansen 2009). Models indicate that a tipping point for Arctic Sea ice could be reached by 2030 or 2040 due to a collapse in its production (Holland *et al*. 2006).

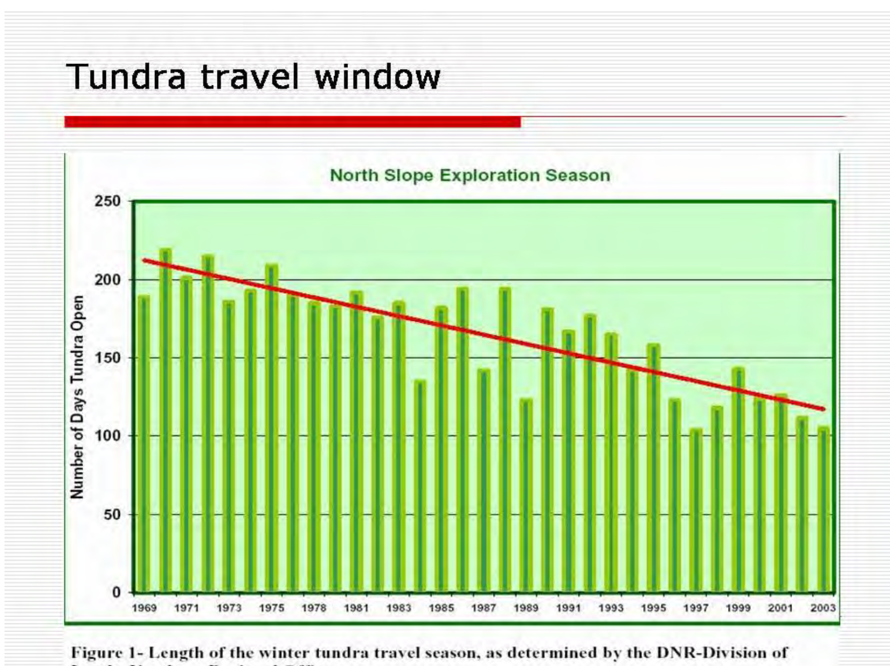
It is ironic that the loss of arctic sea ice is leading to an interest in oil and gas exploration. It is estimated that this area holds one quarter of the world's oil and gas reserves. It would be better for all of us to leave this resource in place over the long run (Krauss 2005).

Figure 10.6. Arctic Sea Ice



Courtesy- David W. Pierce Division of Climate, Atmospheric Science, and Physical Oceanography
Scripps Institution of Oceanography dpierce@ucsd.edu

Figure 10.7. Tundra Travel Window



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10.5 Climate Change Impact on the Rocky Mountains and Southwestern U.S.

Temperatures in the tropical Pacific have changed significantly from 1945 to the present. From 1945 to 1955 the surface waters in the equatorial zone of the Pacific were about 66.5° F or lower. As atmospheric CO2 levels have increased so has the temperature. In 1976 there was a rapid change in temperature to 77° F which did not return to previous levels (Nash 2002).

Since 1976 the La Nina and El Nino cycle ratios have lengthened. This has resulted in a semi permanent El Nino/Southern Oscillation. The oscillation coordinated with rising temperatures and atmospheric CO2 levels only seen once in several millennia (Flannery 2005, Trenberth and Hoar 1996). One of the strongest El Nino events ever known occurred in 1997-1998. There was sufficient energy released to impact global temperatures which had a ramifying effect on turbulent weather around the globe. In cooler periods El Nino conditions were weaker or even absent. During the Pliocene epoch temperatures were 3° C higher than today and there are indications of a permanent El Nino (Lynas 2008).

The 1998 El Nino event was triggered accompanied by ocean surface temperatures reaching 86° F in the western Pacific. It shifted the jet stream toward the North Pole from 35° to 40° north latitude. These conditions tend to be permanent and temperatures continued to reach 86°F. This situation is worsened by loss of arctic sea ice which warms the polar region also shifting the jet stream northward (Lynas 2008). Eldora and Boulder, Colorado are located on the transition zone between potential increasing moisture to the north and dryer weather to the south (National Park Service 2007). The moisture will likely come with increased turbulence. Evidence of changing snowpack in Montana makes these predictions confusing. In June of 1806 during the Lewis and Clark expedition there were 12 foot snow drifts at the 7,000 foot elevation. At the same point and elevation in March of this year the ground was free of any snow (Running 2009).

The pole-ward migration of the jet stream is influencing shifts in climatic zones, biomes and ecosystems. The structure, function and ecodynamics are changing, testing the adaptability of many species.

Looking back to 1945 and 1950 there was little or no evidence of a shift in climatic zones. But as temperatures increased evidence began to accumulate supporting a pole-ward shift of climatic and ecological zones both latitudinally and altitudinally (Parmesan and Yohe 2003, Parmesan 1999). Seasonal variability was also associated with these shifts. Spring comes earlier each decade and fall comes later extending summer and decreasing winter (Flannery 2005).

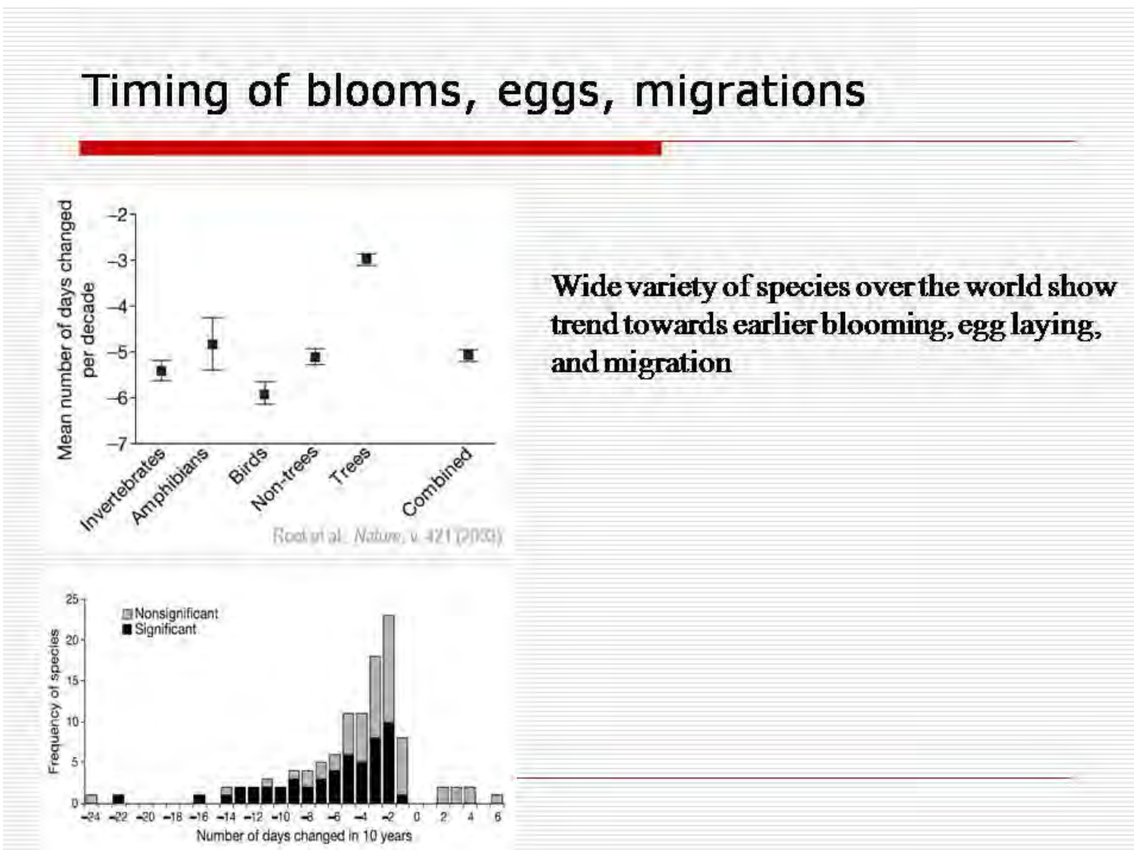
Parmesan and Yohe did much of the original research on these trends at the University of Texas (Parmesan and Yohe 2003, Parmesan 1999). The big question: Were these shifts impacting ecosystems and biodiversity caused by climate change? The rate of change is occurring many times more rapidly than it would under natural conditions. It has taken millions of years for the re-establishment of biodiversity present today after the last mass extinction.

Species depend on gradual change to adapt to new sets of conditions and the species that are generalists have a much greater chance of adapting than specialists. Migration is thwarted by human disturbance of migration corridors including habitat fragmentation, roads, urbanization, agriculture, deforestation and invasive species along with natural topographical barriers. This makes protection of migration corridors even more important.

Species in alpine and polar habitats are reaching the limits of their ecological and physiological tolerance. Rapid change translates into extirpation or extinction unless they can adapt to a new set of conditions rapidly.

Seasonal changes present many challenges especially with migratory species dependent upon regularity and timing effecting breeding cycles, food chains, pollinators and interrelationships between plants and animals (Figure 10.8). There is a problem synchronizing complex behavioral and biological demands with rapidly shifting ecosystems.

Figure 10.8. Timing of Blooms, Eggs and Migrations



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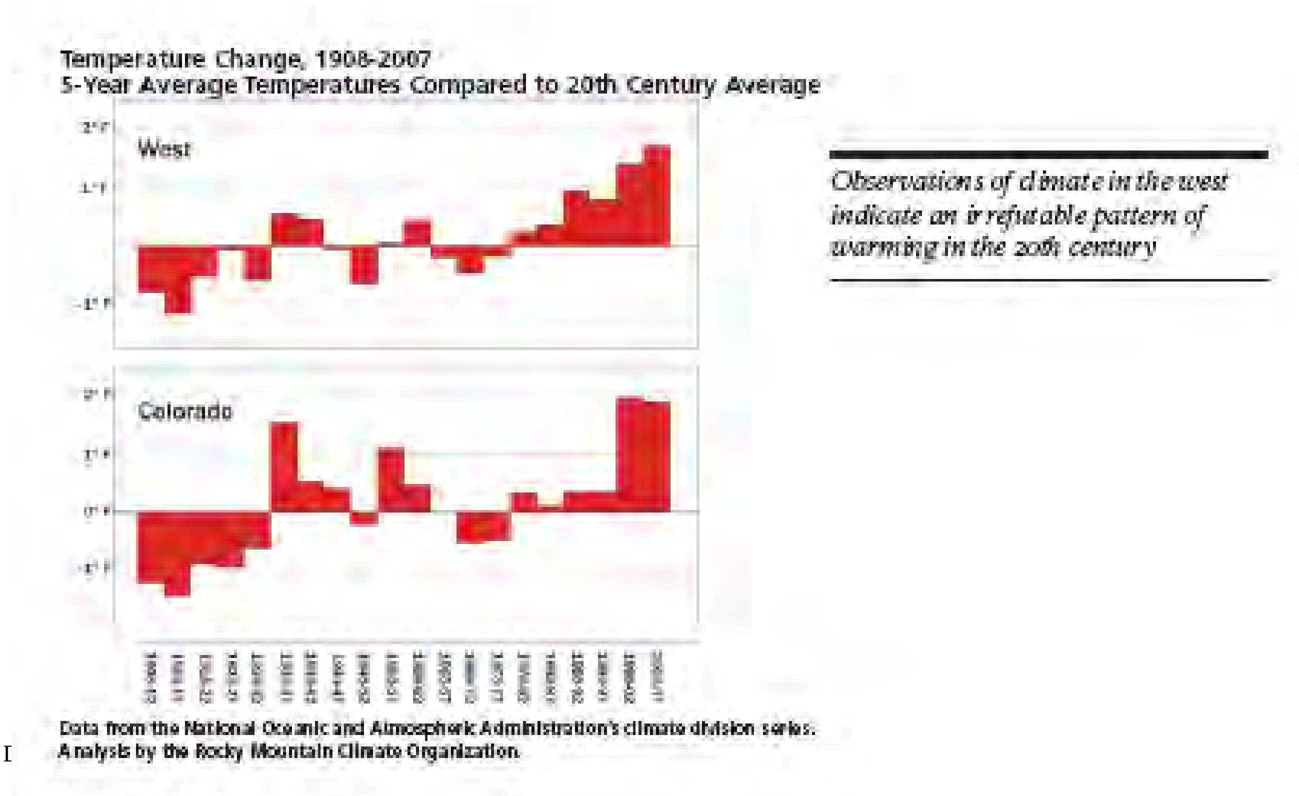
The return of birds to Eldora for the summer mirrors the trend of earlier arrivals, when looking at average return dates from 1982-1994 against 1995-2007 (Dave Hallock and Diane Brown, personal information). Seventeen of the twenty-four species returning in late April through early June have earlier arrival dates, six are later, and one is unchanged. Six of the species are arriving between a week to two weeks earlier: rock wren, yellow warbler, MacGillivray's warbler, western tanager, and black-headed grosbeak. Broad-tailed hummingbirds had an average date of May 3 for 1982-1994 and April 30 for 1995-2007. These are averages over two 13-year periods; the trend is accelerating for many bird species when looking at just the past 5 years.

Parasitic, viral and bacterial conditions that were more tropical and subtropical are shifting northward. There is an increased risk from a host of vector-borne diseases including West Nile virus, eastern equine encephalitis, ehrlichiosis, heartworm infection, Lyme disease, plague and dengue fever that are already on the rise (Karapetian 2010, Opar 2010). Climate change is a powerful disrupting force decoupling complex biological and ecological inter-relationships between and among species and their habitats. This destabilization is illustrated by the rise in the Hantavirus pulmonary syndrome carried by the deer mouse. As predatory species are eliminated and food chain linkages are broken the rodent population increases. In this case the Hantavirus carried by the deer mouse becomes more prevalent resulting in a public health problem (Washington State Dept. of Health 2010, Aguirre *et al*. 2002). These diseases, along with numerous and ever increasing invasive species, are seriously impacting ecosystems and ecosystem services in the United States, the Southwest, Colorado and around the world.

The complexity of interactions within biological and ecological systems combined with positive and negative climate feed–back loops makes it difficult to accurately predict climate trends. This is especially true in the mountains of Colorado. The use of models in conjunction with observation, measurement, monitoring and empirical evidence can enhance the accuracy of climate prediction.

The warming trend noted globally is more accentuated in the southwestern United States and Colorado than it is in other areas (Figure 10.9). As mentioned above, climate change impacts different regions of the globe in different ways as was discussed with reference to the Arctic.

Figure 10.9. Temperature Changes in the West and Colorado



10.5.1 Climate Impact on High Altitude Avian Species

The impact of climate change on certain high altitude avian species is illustrated by both the brown-capped rosy-finch and gray-crowned rosy-finch due to the transformation of habitat as temperatures rise. The more mobile a species is, the more likely it will succeed. In the case of the rosy-finches the sources of food and altitudinal demands play an important role in survival. As the climate changes they will be forced to higher elevations to breed and find a food source. This species is dependent on insects that are carried on air currents to the alpine areas of the Rockies and then die on snowfields where they are made available to the finches. If the snowfields disintegrate the food source will be threatened, impacting the species. The birds will not migrate to a lower altitude because they are dependent upon the cool alpine habitat, insects and snow fields. They can migrate to other areas but if the physiological, ecological and climate demands cannot be met this would lead to extinction. As habitat is transformed so is the probable survival of this species (Cosier 2010a).

It has been noted that habitat loss due to climate change may result in the extinction of 550 bird species in less than a century if there is a 5° F increase in temperature which is within expected ranges. Statistics are drawn from the Intergovernmental Panel on Climate Change (Sekercioglu *et al*. 2008).

The ptarmigan, a resident species, is well adapted to the alpine environment but it cannot deal with higher temperatures that come with climate change. The major impacts of increasing temperatures on this species include loss of snow cover, change in plant community composition and encroachment of subalpine into alpine tundra. As tree line moves upward into alpine areas connectivity and migration corridors will be cut off isolating this species. The combined impact of increasing temperature, change in snow cover and impacts of subalpine encroachment is putting this species at risk (Hoffman 2009).

These species illustrate the challenges birds must meet as climate changes in the montane, subalpine and alpine ecosystems in the Southern Rockies. Not all avian species will be affected to the same degree.

Some will have to move to a higher latitude, and/or altitude to meet their physiological, social and biological needs to survive and pass on their genes. The more generalized a species is the more likely it will be able to adapt to new sets of conditions. With seasonal variability there will be both subtle and sweeping changes in matching food sources with migration.

10.5.2 Climate Impact on Mammals

The effect of climate change on mammals will be similar to its effects on birds in many ways. There are examples of highly specialized species pushed toward the edge of their physiological tolerance. It is questionable whether they will be able to meet their basic biological and ecological needs.

Pika are a species that fit this highly specialized category. They are in the same order as rabbits and hares, Logomorpha, and do not hibernate. They maintain a high body temperature hence a high metabolic rate and do well in winter and summer in their alpine environment. With increasing temperatures and an elevation limit this species is put in jeopardy. To survive they gather and store food for oncoming winter. This requires many trips across the talus and higher ambient temperatures force them to a metabolic thermal maximum (Ray 2010). If they exceed their physiological limit they will not survive. This species is put in a position of meeting both its physiological and ecological boundary as temperatures rise. The pika gets water from vegetation as do voles, mice and shrews. As vegetation dries out, water sources are restricted putting small mammals at risk (Cosier 2010b, World Wildlife Fund 2010c). It is noted that a pika colony existed in a boulder field on Forest Road 505 (Caribou Jeep Road) just east of Eldora during the 1980s; it is no longer present (Diane Brown and Dave Hallock, personal information).

Rising temperatures also lead to a decrease in snow accumulation. Many species, hibernators and non-hibernators, depend on the accumulation of snow for insulation. With a decrease in snow there is an increased possibility that many alpine and subalpine species could experience hypothermia and death. These small mammals are at the base of the food web. If there is a change in vegetation due to decreased moisture the impact is felt throughout the food chain.

Like birds, less specialized mammals are more generally adapted and will do better if their environment changes. Some species may even thrive. Elk, deer, coyote, raccoons and mustelids will fare better than moose, Rocky Mountain big horn sheep and lynx (National Park Service 2007). As temperatures rise mammals adapted to ecological conditions at lower latitudes will be forced northward and upward to meet similar conditions. Migration corridors may be blocked by development including roads like Interstate 70, communities like Eldora, recreation areas like Eldora Mountain Resort. Habitat fragmentation has become more of a problem genetically for many species. Small, non-migratory species, like pika, will either adapt to new conditions or be extirpated from certain areas or become extinct.

10.5.3 Changes Species Composition with a Changing Climate

The conditions existing today within montane, subalpine and alpine ecosystems may be much different with a warming climate. The inter-relationships between abiotic and biotic components will change over time. The no-analog communities or communities replacing those existing today are changing in structure and function as the ecosystems and species shift. The patterns of precipitation are already becoming drier and are impacting forests, streams, lakes and wetland ecosystems putting dependent species at risk. There are noted changes occurring as southern latitude species shift north. There are also shifts in altitude from montane to subalpine and alpine through the transition zones at the same time. Nitrogen has become more of a problem in the alpine ecosystem due to agriculture and industry (Bowman *et al*. 2006).

New ecosystems will probably be different than predicted and there is certainly a possibility that many ecosystem services will be lost (Williams and Jackson 2007). Research indicates that as communities shift in composition due to climate change, species will adapt to new sets of conditions independently. There will be new species assemblages and shifts in trophic levels, competition, behavior and adaptation. There may be high levels of extirpation as change occurs (Stralberg *et al*. 2009).

10.5.4 Climate Change, Snow Accumulation, Fire, and Beetle Outbreaks

Bark beetles are native to North America and have been for thousands of years. Outbreaks we have seen in Canada, and the Northern and Southern Rockies have been unprecedented beginning in the mid to late 1990s through the present. Nothing like this has been seen for the past 80 years. These outbreaks are associated with a drier, hotter climate. In the subalpine zone lodgepole pine, limber pine and Engelmann spruce are subjected to parasitic infestation from pine and spruce bark beetle which are not necessarily associated with fire suppression (Veblen *et al*. 2000, Amman *et al*. 1990). The driving force is due to anthropogenic climate changing GHG emissions raising ambient temperatures by 2½° C over the past 50 years allowing the beetles to complete one life cycle (and sometimes two) per season (Veblen 2010). It does not get cold enough to freeze the larvae. The trees suffer from a combination of longer, drier summers, decrease in pitch production, decreasing vigor, aging forest stands and completion of the larval life cycle resulting in the demise of lodgepole pine, Engelmann spruce and limber pine forests (Adams *et al*. 2009, Running 2007).

When the trees die the needles on the lodgepole pine turn red and the spruce needles turn grey producing a fire hazard until the needles fall to the ground (Veblen 2010). Over time the forest ecosystem will regenerate in most cases. In rare instances the species composition may be completely changed with a new assemblage of species replacing the old forest.

Fire behavior is not influenced by parasitic bark beetle infestation. These outbreaks do not increase the frequency, extent or the severity of fire. There is no significant difference between healthy forest ecosystems and bark beetle infested forests with reference to fire behavior.

The occurrence of fire in the upper montane and subalpine forests is dependent on increasing temperatures and drought. It is weather conditions that are conducive to fire regardless of whether the forest ecosystem has live or dead trees (Trouet *et al*. 2010, Veblen 2010)

Fire danger is a human generated problem (Veblen 2010). However, fire is an important part of forest ecology. Rising temperatures will lead to a drier hotter climate with a continual elevated fire risk (Trouet *et al*. 2010). Spending money to thin forests or fight wildfires in remote areas is questionable. Many homes have been built in fire hazard zones. The siting of structures in the wildland urban interface leads to a desire for forest thinning to potentially decrease fire danger. In the long term, land use policies should be geared towards minimizing the construction of new homes in fire prone wildlands and increasing the potential of homes to withstand fire.

Over the past 50 years temperatures in the southwestern United States have risen 1.4°F (USDA Forest Service 2010). Melting snowpack and retreating glaciers in combination with spring arriving about three weeks earlier than it did in 1948 is leading toward less water flow in streams in the late summer.

Glacial retreat is obvious evidence of global warming. Glaciers, including Arapaho Glacier, have diminished over the past 100 years and this has accelerated over the last several decades (Figure 10.10). Our glaciers are small but vital for maintaining stream flows during the summer.

Further evidence of glacial, and ice patch retreat in the Front Range of the Colorado Rocky Mountains due to climate change is substantiated by the discovery of previously entombed paleontological remains of bison, bighorn sheep, deer and elk. Low temperatures have prevented normal microbial decay from occurring enabling preservation of a number of specimens. It would be assumed that as retreat continues more evidence will be discovered (Lee *et al*. 2010).

The Continental Divide acts like a snow fence. In combination with the winter winds, snowpack accumulates in the high elevations along the Divide (Armstrong 2010). If there was no wind and the snow just fell, it is highly likely we would live in an entirely different environment in Eldora. We may complain about the winter winds but because of them Middle Boulder Creek flows year round. In the Northern Rockies, Blue Ribbon trout streams are drying up in the late summer (Running 2007). As streams and lakes are impacted by higher temperatures, trophic relationships will change allowing the introduction of invasive species and diseases caused by parasites, bacteria and viruses.

Glacial maintenance depends on low summer temperatures and winter precipitation. Because temperatures are rising, glaciers are losing mass (Armstrong 2010). Stream flow is 80 to 90% dependent on the accumulation of snowfall while rain plays an insignificant role. This translates into ecosystem maintenance, water for agriculture, drinking and commerce. Snowpack and glaciers provide ecosystem services that cannot be duplicated by reservoirs.

Figure 10.10. Retreating Glaciers

the images above, white arrows show points of reference on the surrounding topography.

> *"The retreat of mountain glaciers is directly tied to increasing temperatures and melting. The Arapaho Glacier in the Rocky Mountains in Boulder County, Colorado, has shrunk dramatically since it was photographed in 1898. Measurements collected since 1960 suggest the glacier has thinned by at least 40 meters since then; thinning between 1898 and 1960 is unknown but is probably considerably greater than 40 meters."* (NASA 2010)

Images courtesy of Tad Pfeffer, Institute of Arctic and Alpine Research, University of Colorado. Detailed image credits: 1) Columbia Glacier c. 1980 by Austin Post, U.S. Geological Survey, 2) Columbia Glacier 2005 by Tad Pfeffer, Institute of Arctic and Alpine Research, University of Colorado, 3) Arapaho Glacier 1898 by R.S. Brackett, published in Waldrop, R.S. (1964) Arapaho Glacier: A Sixty Year Record. University of Colorado Studies, Series in Geology, No 3, and 4) Arapaho Glacier 2003 by Tad Pfeffer. Webmaster: Paul Przyborski NASA official: Lorranine Remer last updated: Monday, 16 February 2009 NASA EARTH OBSERVATORY- GLACIERS CLIMATE CHANGE SEA LEVEL RISE.

Water use has always been an issue in the West. Today, as demand increases supply decreases. Many states depend on the Colorado River for their survival. Water transfers made from the western slope to the east, provide for a growing population along the Front Range. It complicates water distribution to Utah, Nevada, Arizona, California and Baja Mexico, which will lead to legal battles in the near future. Colorado is expecting an increase in population from the current five million to eight million by 2040 (DeGrown 2010). This means water will have to be allocated much differently than it is today. Lawns, golf courses and swimming pools will be competing with food production and drinking water. It is estimated that people use 150 gallons/person/day (Trib.com 2008). Consumption will have to be reduced through conservation.

As glaciers recede water availability will become more of a social issue. The impact will destabilize local, interstate and global economies and lifestyles exemplified by the rapid recession of the Andean glaciers which could create "glacial refugees."

The Southern Rockies in Colorado are less susceptible to early snow melt and will maintain glaciers and snowpack longer than the Northern Rockies, Cascades or the Sierra Nevada due to higher elevation, a cold continental climate, lower temperatures and a colder snowpack (Clow 2009).

In some areas of the Rockies fire season is two months earlier now than it was 30 years ago when there was still snowpack until July in the subalpine forests (Clow 2010, Running 2007). Snowpack is the best fire retardant there is and is an ecosystem service that is often overlooked. With earlier spring snowmelt and a drier hotter environment we are seeing fires that would never have occurred before. The combination of bark beetle infestation, fire and decreasing snowpack are creating a disturbance dynamic that is converting some forest ecosystems from a carbon sink to a net source of carbon going back to the atmosphere (Running 2007).

The alpine ecosystem not only supports glaciers and snowpack but in addition have permafrost and talus slopes both of which provide important sources of ground water. Permafrost, frozen ground, is the second largest ground water reservoir in the tundra. Temperatures above 11,300 feet will support permafrost. With increasing GHG emissions and a rise in the surface temperature of 1.1 to 1.4° C since the 1990s permafrost has been melting. This will produce a short lived increase in stream flow which will diminish as this resource disappears. Talus slopes provide primary ground water retention in alpine ecosystems for both storm and seasonal groundwater seepage and flow into streams (Clow *et al*. 2008).

Middle Boulder Creek watershed is emblematic of a complex positive climate feedback system. As GHG emissions increase the ambient surface temperature of the ecosystem increases. With rising temperatures spring comes earlier and fall later with a longer summer and shorter winter. Longer summers and shorter winters result in less snow pack, receding glaciers, decreasing permafrost and lower stream flows. Decreasing snowpack and receding glaciers lead to less albedo or a decrease in reflected light with increasing ground temperatures. Increasing temperatures lead to augmented fire risk due to a hotter drier environment and an increase in bark beetle outbreak. Rising fire risk may lead to fires which will increase the atmospheric CO_2 levels accelerating climate change.

When viewed globally this translates into trouble unless we are smart and disciplined enough to take action now and halt the process. Humans are in the driver's seat for now unless we hit a tipping point. The tipping point would be an uncontrollable shift in climate that we will either adapt to or follow the way to extinction as have 99% of all organisms over the past 3.5 billion years. We humans are promoting changing climatic conditions in decades that ordinarily take thousands or even several million years to occur. Living systems cannot adapt to these rapid changes hence the biosphere is put at risk along with generations of all life to come.

10.6 How We Can Control Human Generated Climate Change?

Climate adaptation and mitigation must be considered as important motivating factors enabling a solution to climate change. The current levels of atmospheric CO_2 concentration are increasing by the minute. We can adapt to these changes to a degree but that does not address the all important issue of mitigation or decreasing fossil fuel emissions. Our civilization will have a problem adapting to a sea level rise of 3 feet with storm surges let alone 80 to 200 feet if we continue with business as usual. It will be difficult to survive large impacts on forest and ocean ecosystems or loss of arable land. It is necessary to evaluate solutions locally, globally and technologically. Our success is dependent upon public education, leadership, a shift in life style and a new way of thinking. Our behavior must change. The solution to climate change depends on each of us and our interaction with the land, other species and the planet.

Understanding sustainability pertaining to resource use is critical for our survival. Energy, water, food, fiber, housing and transportation must be balanced with resource availability, maintenance of biodiversity and protection of ecosystems and their services. Two critical items must be taken into consideration when making decisions to resolve climate changing impacts on the natural environment and civilization. The transition requires minimal ecological damage and maximum removal of emissions. We may be able to remove emissions by using alternative technologies but the impact to the environment may not be acceptable.

Major goals and considerations to help resolve climate change include:

1) Decarbonization of the power grid and transportation systems.

2) Enhancing sequestration of carbon by changing land use practices.

    a) The instillation of biodynamic approaches to agriculture and silviculture. The vibrancy of an ecosystem, including the substrate as well as the overstory, is directly related to carbon sequestration. This is well illustrated by difference between biodynamic and monocultural fossil fuel sustained agricultural practices.
    b) Stop the practice of clear cutting tropical, temperate and boreal forests.
    c) Implement the new field of restoration ecology to mitigate the damage done to carbon sinks, for example: restoring wetland, agricultural and forest ecosystems to increase their ecological, social, economic and biological value and productivity (Zedler 2010).

3) Install an incentive driven carbon tax-fee at the well head or the mine. The benefits of this approach are distributed back to society rewarding change related to cost, savings, rebates and carbon reduction. “In November 2006, voters in Boulder, Colorado passed what is proclaimed to be the first municipal 'carbon tax'. It is a tax on electricity consumption (utility bills) with deductions for using electricity from renewable sources (primarily Xcel's Wind Source program). Their goal is to reduce

carbon emissions to those outlined in the Kyoto Protocol; specifically to reduce their emissions by 7% below 1990 levels by 2012 (CEC 2008). Tax revenues get collected by Xcel Energy and are directed to the city's Office of Environmental Affairs to fund programs to reduce community-wide greenhouse gas emissions (Kelley 2006).

4) Encouraging open discussion regarding human population dynamics, carrying capacity and optimal resource use protecting economic, social and ecological systems. This will enhance the opportunity to break down barriers and encourage education to be carried out in a professional manner. Politics and emotion are no longer an acceptable solution.

5) The wellbeing of society and ecological systems must be balanced with corporate profit incentive. We have all seen too many examples in the immediate past where greed and profit prevailed at the expense of everyone else and the environment. Extraction and use of resources must be coordinated for a positive outcome. For example, natural gas and nuclear power may act as a bridge to alternative energy. Natural gas extraction employs the use of a destructive technique called fracking. This approach should be modified supporting ecological and social benefit (US EPA 2010, Lustgarten 2008).

The effectiveness of an alternative energy source is dependent on many variables (Table 10.2). Wind, solar insolation, access to sites, latitude, climate variability, wildlife and land use considerations. Where feasible use the existing urban footprint to produce energy. Do not create a second footprint in rural or pristine environments. This will eliminate the need for transmission lines, roads, habitat destruction, and impacts on agriculture and biodiversity. Produce energy where it will be used.

Table 10.2. Alternative Energy Source Variables

	Environmental Impact	Footprint	Emissions	Transmission Lines and Corridors	TOTAL
Coal, Tar Sands, Shale	10	2	10	10	32
Oil	10	2	8	10	30
Natural Gas	9	1	5	10	25
Nuclear	10+	2	1	10	23
Wind (Centralized)*[1]	10	10+	0	10+	30+
Wind (Decentralized)*[2]	2	0	0	0	2
Solar PV (Centralized)	5	5	0	10	20
Solar PV (Decentralized	2	0	0	0	2
Solar Thermal (Centralized)	5	5	0	10	20
Solar Thermal (Decentralized)	2	0	0	0	2
Biofuels	10	10++	3	Transportation 5	28+
Efficiency	0	0	0	0	0
Geothermal	5	2	0	10	17
Hydro-power	10	8	0	10	28

M. Lynas, Six Degrees: Our Future on a Hotter Planet (Washington, DC: National Geographic, 2008):pp. 295-296 J. Lovelock, The Vanishing Face of Gaia (New York: Basic Books, 2009: pp. 107 and 129

Centralized energy production is beneficial to corporations like Xcel Energy. Tax incentives and subsidies are often weighted to benefit corporate production and transmission. Decentralized energy is community oriented. Energy is produced where it is consumed. Shifting the power producer to an energy service company investing in the community will encourage the community to become the power producer using decentralized approaches to energy production. This will decrease environmental impacts, carbon emissions, increase job opportunities and keep dollars circulating locally.

Why is centralized wind power questionable? It is generated in remote areas requiring access roads, heavy equipment, a cement pad, clearing the site for construction, habitat fragmentation, wildlife impact and transmission lines. If wind machines could be located in low impact degraded sites and/or along existing roads and transmission lines then they become a much better option. Seventy-four million acres are needed to make centralized wind power a positive modality.

Decentralized wind power is preferable if it can be located within the urban footprint. There are existing access roads and no need for elaborate transmission lines. The infrastructure is already there.

Centralized solar photovoltaic cells (PV) or solar thermal presents a similar problem seen with centralized wind but require a much smaller footprint. On an equivalent scale centralized solar requires about 5 million acres.

Decentralized solar panels placed on roof tops and over parking lots are preferable to centralized solar installations if climatic conditions are optimal. Newer technologies are coming on line all the time. Solar energy and wind power attract investment and fuel the economic cycle of society.

Biofuels require more energy input than fuel produced. For example, corn requires 29% more fossil fuel energy input than the ethanol produced. Switch grass requires 45% more. The same is true for wood, soy bean and sunflower seed conversion (Lang 2005). The impact on food production, marginal lands and forest ecosystems is significant (Oxfam 2008).

Transportation and building efficiency should be a priority for reduction of carbon emissions. Residential, public, commercial and industrial buildings can be designed to be highly energy efficient. The use of triple pane windows, doors, insulation in walls ceilings and floors and energy efficient appliances can cut stationary power production significantly.

By cutting driving distance from 10,000 to 5,000 miles per year is equal to getting 60 rather than 30 miles /gallon. The carbon emission is equivalent (Lynas 2008).

10.6.1 Boulder County, Emission Reduction and Energy Sustainability

Boulder County is fortunate to have an abundance of the best climate scientists and institutions in the world and is a well educated progressive community receptive to new ideas.

One scenario that could be used to implement a sustainable energy plan for the county includes the following:

1) An open minded public educated about climate change, fossil fuel emissions, and a willingness to find solutions through a soft energy path.

2) Install a Joint Powers Agreement, JPA, between the county, cooperating municipalities within the county, nongovernmental organizations, NGOs, and the private sector to implement a soft energy program.

3) Install a community choice aggregation plan with the Colorado Public Utility Commission (PUC) enabling the JPA to become an energy supplier and distributor as well as an energy consumer. This allows cities, or counties to operate as public utilities. The public entity can choose to stay with their current utility or they can solicit bids for better pricing from other power producers and/or they can choose to become renewable electricity self sufficient locally (Burke *et al*. 2005).

4) Establish a public private partnership with the JPA, Colorado PUC and a solar energy service company like Honeywell, Siemens or Xcel Energy enabling a bond, grant

and/or loan program to be paid back by the participating municipality/rate payer. The payback rate including interest will be approximately equivalent to the current utility rate on implementation over an agreed upon time period. When the loan is paid off the JPA can work with constituents to continue a fee for insurance and maintenance. From the time of implementation the JPA will be investing within the community rather than sending rate payer dollars to a corporate energy provider. This is essentially like paying off a mortgage. When the loan is paid off the community owns its own destiny rather than being tethered to a never ending escalating rate paid to a utility company. This is a non subsidized program which makes it very attractive in comparison to many new energy proposals. This will give the community discretionary income to be used as needed.

5) Transmission infrastructure will continue to be maintained and paid for in the rate base to guarantee a continuity of energy until and if the JPA becomes totally energy self- sufficient.

6) In accordance with Table 10.2 the initial thrust of the program will be invested in passively designed energy efficiency reducing the need for active photovoltaic or solar thermal instillation. This will require energy retrofit of existing buildings. New buildings will fall under strengthened existing codes. Energy efficiency includes triple pain argon windows, doors, insulation, air and heat exchangers along with appliances in concordance with optimal installation of active energy systems. Excess energy goes back to the grid providing an incentive for energy rebate to the ratepayer. Energy efficiency or passive design can provide 80 to 90% of the total stationary power production required by conventional housing (Eaton 2010).

7) Studies have shown that a clean energy program will produce 10 times more jobs than the existing fossil fuel industry (Fried 2007).

8) Sequestration of carbon is an important part of the total resolution of climate change. The JPA can continue to encourage small family owned farms that utilize biodynamic, organic production. This enhances microbial activity, protects soil against erosion, acts as a carbon sink, saves water, improves the health of the population and encourages local business in food co-ops and farmers markets.

9) Carbon sequestration is enhanced by encouraging people to put in native plant and vegetable gardens in their yards or community gardens. Grow it don't mow it. The biodynamic approach will cut down on the use of non organic fossil fuel fertilizers, pesticides and herbicides hence decreasing carbon emissions. By turning grass into native vegetation will not only help sink carbon but will also save water.

10) Boulder County has a long time policy of growth management which should be strengthened and adhered to.

11) The JPA can work on ground transportation by continuing to encourage a more walkable community, mass transportation, fuel efficient cars and electric cars which can be recharged using the solar electric system (Walkable Communities 2010).

12) Encourage existing energy producing facilities with the smallest foot print to utilize technology lowering CO_2 emissions.

13) Silviculture practices should be carried out to enhance optimal biodiversity, ecological maintenance and an enhanced edaphic relationship between soil and living

systems. This will lead to a more productive forest management program with a higher level of carbon sequestration.

14) The importance of maintaining and protecting the integrity of forest ecosystems is critical for carbon sequestration and maintenance of the land based carbon sink. Tropical deforestation is responsible for 20% of human generated GHG emissions. This is exemplified by Brazil and Indonesia which are two of the largest carbon emitters in the world due to destruction of their forests (Lynas 2008).

15) Reforestation is critical to help resolve climate change by maintaining complex biodiversity, and protection of the land based carbon sink.

10.7 Summary

James Hansen, head of the NASA Goddard Institute for Space Studies and well known climate scientist, suggests that CO2 emissions should be targeted for initial stabilization at 350 ppm and a global temperature not exceeding 1°C increase if we are to avoid moving toward a tipping point. If we can reach this stabilization point continued reduction in CO2 is a goal to be aspired to. His research indicates that this is possible if we can eliminate black soot from diesel engines along with reduction of methane, ozone and CO2. He strongly recommends keeping coal in the ground now and move in the same direction with oil and gas in the future (Rockstrom 2009, Hansen *et al*. 2008)

Table 10.3 illustrates the point that politically motivated emission standards and planetary requirements are very different. Continuing business as usual is not possible if ecological and cultural stability are to be maintained as we know them (Lynas 2008).

Climate change is one of the most difficult problems humanity has ever faced. We must move forward swiftly and decisively to reduce fossil fuel emissions preventing catastrophic positive feedback loops that are uncontrollable. There is plenty of evidence presented in this overview that climate change is occurring rapidly. This discussion did not include the increase in tumultuous weather patterns, ocean acidification, destruction of coral reefs, climate refugees (e.g. the Inuits), legal ramifications or sea level rise. If we trigger tipping points that allow the collapse of the Gulf Stream, the demise of the Amazon rain forest or the release of methane clathrates from the sea floor and arctic tundra, life on the planet will be different from anything we can imagine. As citizens it is our responsibility to remove political and vested interest inertia that makes this situation so dangerous. We have the technology to move in a new direction. The question is do we have the political will to make the change?

Table 10.3. Impacts of Degree Changes

DEGREE CHANGE	TEMPERATURE CHANGE IN CELSIUS	ACTION NEEDED	CO2 TARGET
ONE DEGREE	.1 – 1.0°C	Avoidance probably not possible	350 PPM (TODAYS LEVEL IS ALREADY 388 PPM)
TWO DEGREES	1.1 – 2.0°C	Peak global emissions by 2015	400 PPM
Threshold for Carbon –Cycle feedback	Threshold for Carbon –Cycle feedback	Threshold for Carbon –Cycle feedback	Threshold for Carbon –Cycle feedback
THREE DEGREES	2.1 – 3.0°C	Peak global emissions by 2030	450 PPM
Threshold for Siberian Methane feedback	Threshold for Siberian Methane feedback	Threshold for Siberian Methane feedback	Threshold for Siberian Methane feedback
FOUR DEGREES	3.1 – 4.0°C	Peak global emissions by 2050	550 PPM
FIVE DEGREES	4.1 – 5.0°C	Allow constantly rising emissions	650 PPM
SIX DEGREES	5.1 – 5.8°C	Allow very high emissions	800 PPM

M. Lynas, Six Degrees: Our Future on a Hotter Planet (Washington, DC: National Geographic, 2008): 279

10.8 Recommendations

Resolving climate change will require the decarbonization of stationary power production and transportation. This can be done at all levels of government and individual families.

1) Regardless of whether your primary residence is in Eldora or not, efficiency or passive energy design is the most effective way to decrease carbon production in the home. In existing housing this will require retrofitting with insulation, putting in double or triple pane argon windows, installing new doors, energy efficient appliances and possibly using air and heat exchange systems. With new housing, this process will be much easier but the same approach will be used. One advantage with new housing is roof and lot orientation for solar panels.

2) After completion of the retrofit, or new construction, the determination for active energy systems can be calculated. High level passive design will obviate the necessity for a large solar photovoltaic bank or a wind energy system.

3) The community choice aggregation is one of the best ways to make this plan affordable. The concept is based on four basic steps: a) Getting a loan from an energy service company through an official government entity (Boulder County). b) Setting up the retrofit and solar and or wind energy program. C) Use of the carbon rebate tax incentive program and d) Paying off the loan like a mortgage which is set up not to exceed the current electric bill. This program requires no government subsidy. The transmission lines are left in place to augment needs exceeding the capacity of the dwelling or the house may exceed capacity and allow selling excess energy back to the grid. The concept is called zero-net energy or the household production of as much energy as consumed on an annual basis.

4) This approach reduces the need for stationary power plant production reducing the use of fossil fuels.

5) This system can be set up as a decentralized power grid within the community. If one house produces more energy than another this energy can be shifted for use in another home. Incentives can be built into a remuneration system for the producer.

Decarbonization of the transportation system.

1) Work with Boulder County, Nederland, Eldora Mountain Resort and the US Forest Service to encourage a people moving system or a mass transportation system that meets with the approval of the community.

2) This should address residential and recreational needs.

3) Electric cars are already on the market. These cars can be charged by using the solar grid. Some housing is already being designed with an outlet for charging a solar electric vehicle. The price on this transportation will come down as the demand goes up.

4) Do not build more parking lots and cut more forested areas to park cars. This decreases the carbon sink and encourages destruction of forest ecosystems. Clearing a forested area for parking is significant when evaluated as a global issue. This is an old mindset that must be replaced by new thinking. We are sending the wrong message by doing this. The people moving system for the Hessie and Fourth of July road is preferable to what we have now. The carbon tax rebate incentive can be implemented to help encourage and pay for the transportation system. Electric cars would create an environmental impact like any other car in this situation. They decarbonize but create habitat impact like any conventional car.

5) It is a nice walk from Eldora to Hessie or Buckingham Campground, especially when there are fewer cars. Installation of multi use pathway projects have become popular in many places without increasing the existing foot print of the road. It makes a more people and animal friendly route.

6) The speed limit must be enforced within and between Eldora and Nederland. This is a habitual problem. Safer speeds decrease GHG emissions, increase safety and save wildlife.

Climate change and recreation.

1) Recreational facilities, such as parking lots, roads and ski runs, should be restricted to their existing footprints. Clearing trees will affect the forest ecosystem carbon sink. In light of the present bark beetle epidemic, retention of the remaining living trees, particularly those species not currently being impacted, has an elevated importance.

2) Climate change impacts of new or expanding recreational facilities should be evaluated in the environmental review process.

Work with the Colorado University Geography Department, the Institute of Arctic and Alpine Research, the National Snow and Ice Data Center, the USFS and Rocky Mountain National Park to set up a monitoring program for the Middle Boulder Creek Watershed.

1) This includes monitoring snowpack and glaciers, stream flow, recreational use, fire risk and fire hazard areas, biodiversity and human impact. This data can be used for better management and understanding of climate change and climate changing impacts to ecosystems.

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APPENDIX 10.2

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