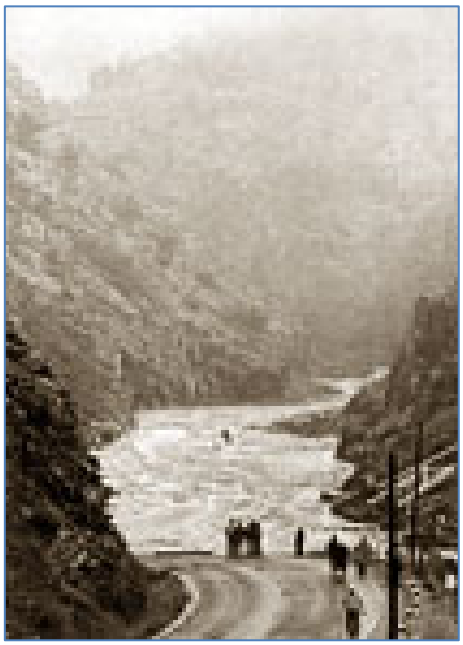
Northern Colorado Regional Hazard Mitigation Plan



Northern Colorado Regional Hazard Mitigation Plan

Larimer County
Fort Collins
Loveland
Estes Park
Wellington
Berthoud

Report and Plan for:
Larimer County
City of Fort Collins
City of Loveland
Town of Estes Park
Town of Wellington
Town of Berthoud

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- Storm Water
- Waste Water
- Law Enforcement
- Emergency Management
- GIS
- Planning
- Fire Services

Colorado Division of Emergency Management
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Funding was provided to the cities of Fort Collins and Loveland, as well as to Larimer County and the Federal Emergency Management Agency (FEMA). FEMA funding was allocated and managed through the Colorado Division of Emergency Management and its Hazard Mitigation Program.

Regional Effort:

The Northern Colorado Regional Hazard Mitigation Plan includes and addresses natural, man-made, and hazardous materials hazard mitigation efforts throughout Larimer County. Planning efforts included numerous smaller communities within Larimer County. These communities include, but are not necessarily limited to, Estes Park, Wellington, Berthoud, Red Feather, Drake, Laporte, and Masonville. The governments of Larimer County, the cities of Fort Collins and Loveland, and the towns of Estes Park, Wellington and Berthoud have agreed to work collectively on this project to produce a regional document. Natural, man-made, and hazardous materials disasters affect all of these geographic areas without regard for jurisdictional boundaries, though some hazards are more prevalent in some communities than others. These communities routinely share resources in times of disaster and emergency response and believe it is important to share resources in times of planning and mitigation activity relative to these situations.

This Plan should be considered a plan-in-progress due to the continually changing environment in which these hazards present themselves. This Plan must also be reviewed and adjusted as growth in population, industry, and overall community demographics change.

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Northern Colorado Regional Hazard Mitigation Plan

Executive Summary

Local governments must continue to improve their abilities to respond to natural, man-made, and hazardous materials hazards. It is imperative that different levels of community government be able to work together to develop approaches and responses that mitigate potential hazards. The communities of Larimer County, Fort Collins, Loveland, Estes Park, Wellington and Berthoud joined forces to develop a regional approach to hazard mitigation. As a result of this collaborative effort, the Northern Colorado Regional Hazard Mitigation Plan has been developed to help guide the mitigation efforts and activities of the various communities within Larimer County.

In order to complete the revision process, a project steering committee was convened, several group and community meetings were held, input was collected from a wide variety of stakeholders, and concurrent assessment projects were completed throughout the county. Throughout this planning process, other planning activities were reviewed for consistency. Separate mitigation plans are not required from the smaller communities within Larimer County because they were consulted throughout the plan development process and are sub-grantees to Larimer County.

This Plan includes resources and information to assist the affiliated community residents, public and private sector organizations, and others interested in participating in planning for natural, man-made, and hazardous materials hazards. The Mitigation Plan provides a list of activities that may assist the community in reducing risk and preventing loss from future hazard events. The action items address multi-hazard issues as well as activities for aircraft accident, avalanche, biological hazards/ influenza, civil disturbance, dam failure, drought, earthquake, expansive soils, fire – urban, fire – wildland, flood, hail storm, hazardous materials – fixed facility, hazardous materials – transportation, land subsidence, landslide/rockslide, lightning, terrorism/weapons of mass destruction, tornado, wind storm, winter storm, and a few miscellaneous hazards that were evaluated as a vulnerability in the community. The cumulative potential impact of miscellaneous hazards on the community is negligible.

Northern Colorado Regional Hazard Mitigation Plan

Chapter 1: Mitigation Action Plan

Section 1: Plan Development Process

Plan Organization

The Mitigation Plan contains numerous action items: background on the purpose and methodology used to develop the Mitigation Plan; profiles of Larimer County, Fort Collins, Loveland, Estes Park, Wellington and Berthoud, Colorado; resolutions authorizing Larimer County to prepare this plan for the towns of Estes park, Wellington and Berthoud; sections on the specific natural, man-made, and hazardous materials hazards that can occur in this geographic area; and appendices. All of the sections are described in detail in Section 1, the Plan introduction, and can be found in the Table of Contents.

Plan Development

The 2003 version of the Northern Colorado Regional Hazard Mitigation Plan was the result of a collaborative effort between Larimer County, Fort Collins, Loveland, and Greeley citizens; public agencies; nonprofit organizations; the private sector; and regional, state, and federal organizations. Since the 2003 Plan was developed, the City of Greeley has withdrawn from the planning process. Currently, the Plan encompasses the communities of Fort Collins, Loveland, Estes Park, Wellington, Berthoud and Larimer County. Due to their size, numerous smaller communities within Larimer County were included within the "umbrella" of Larimer County. Johnstown and Timnath were considered during the revision of this plan, but attempts to obtain information from them were unsuccessful.

Throughout the planning process, public participation has played a key role in the development of goals and action items. Community residents focused on issues that were a priority within their specific community. Interviews were conducted with stakeholders across the geographic areas, and several public workshops and meetings were conducted to include these residents in Plan development. A project Steering Committee has been appointed and is responsible for assisting with the implementation and evaluation of the Plan. The Steering Committee has guided the process of developing and updating the Plan. The current Steering Committee consists of representatives from the following agencies:

- Larimer County Office of Emergency Management
- City of Fort Collins Office of Emergency Management
- City of Loveland Office of Emergency Management
- Loveland Fire & Rescue Department
- Poudre Fire Authority
- Estes Park Office of Emergency Management
- Town of Wellington

- Berthoud Fire Protection District

Each involved community is responsible for coordinating implementation of the Plan's action items and undertaking the formal review process. This will be coordinated through the appropriate Office of Emergency Management unless otherwise directed by the local government having jurisdiction. Representatives from other government agencies within the community will participate in the implementation process.

Convener

The local area governments of the City of Fort Collins, City of Loveland, and Larimer County have adopted the 2003 version of the Northern Colorado Regional Hazard Mitigation Plan. Local area governments, in addition to the Towns of Estes Park, Wellington and Berthoud, will review and adopt the 2009 version of this Plan upon FEMA approval. The Larimer County Office of Emergency Management has taken responsibility for coordinating county-wide implementation of the Plan. The Director of the Larimer County Office of Emergency Management will serve as Convener to facilitate Steering Committee meetings, assign tasks, and facilitate the involvement of other agencies as necessary for the implementation of this plan. Plan implementation and on-going evaluation will be a shared responsibility among all of the Steering Committee Members.

Plan Methodology

Information in the Mitigation Plan is based on research from a wide variety of sources. During the 2009 update/revision process, all sections of this Plan were reviewed and analyzed. Development, update, and revision of the Plan encompassed research using historical perspectives and future projections for the vulnerability assessments. Steering Committee meetings and public workshops also played key roles in the updates and revisions to the Plan.

Partner Organizations are considered to be agencies or public-sector or private-sector organizations that may be able to assist in the implementation of various action items by providing relevant resources to the coordinating organization. Stakeholders are considered to be agencies or public-sector or private-sector organizations that may have a vested interest in the outcome(s) of implemented action items. The various agencies, departments, and organizations that participated in development of this Plan are listed in the Appendices of this Plan. Organizations listed in the Appendices of this Plan may be participatory or potential partners and were recommended by the project steering committee. Not all organizations were contacted during the development of the Mitigation Plan; some were unavailable to participate during the development of this Plan. However, Partner Organizations with direct involvement in mitigation action items will be contacted by the coordinating organization to establish level of commitment of time and resources prior to implementation.

The contributors to this Plan include but are not limited to the following agencies:

- Hazard Mitigation Plan Steering Committee
- Larimer County Building Department
- Larimer County Office of Emergency Management
- Larimer County Land Use Plan
- Fort Collins Planning Department
- Fort Collins Storm Drainage Department
- Fort Collins GIS
- Fort Collins Project Impact
- Fort Collins Office of Emergency Management
- Poudre Fire Authority
- Fort Collins City Plan
- Fort Collins City Code

- Colorado State University
- Loveland Municipal Code
- Loveland Land Use Plan
- Loveland Growth Management Plan
- Loveland Comprehensive Master Plan
- Loveland Planning Department
- Loveland Fire & Rescue Department
- Estes Park Office of Emergency Management
- Town of Wellington
- Town of Berthoud
- Local Emergency Planning Committee (Larimer County)
- Colorado Division of Emergency Management
- Colorado Dept of Transportation

Interviews were conducted with individuals and specialists from organizations interested and/or involved in natural, man-made, or hazardous materials hazards and mitigation planning. The interviews identified commonalities related to natural, man-made, and hazardous materials hazards and identified key long-term and short-term strategies and activities to help reduce risk from these hazards. A complete listing of all stakeholders is located in Appendix B. Stakeholders interviewed for the plan included but were not limited to representatives from these agencies:

- Utility Providers
- School Districts
- Police Departments
- Fire Departments
- Emergency Medical Services Agencies
- Public Works Departments
- Transportation Departments
- Local Businesses
- Hazardous Materials Specialists
- Neighborhood Groups

State and federal guidelines and requirements for mitigation plans: Mitigation plans from around the country, current State Hazard Mitigation Plans, FEMA planning standards, the FEMA Flood Mitigation Assistance Program requirements, and the National Flood Insurance Program's Community Rating System were examined, and where appropriate, were incorporated by reference into this Plan. Other materials examined and/or incorporated consisted of community and county mitigation plans, including but not limited to:

- Fort Collins Flood Mitigation Plan
- Fort Collins Water Conservation Plan
- State of Colorado Natural Hazards Mitigation Plan
- City of Fort Collins Emergency Operations Plan
- City of Loveland Emergency Operations Plan
- Town of Estes Park Emergency Operations Plan
- Larimer County Community Wildfire Protection Plan

- Poudre Fire Authority Wildfire Protection Plan
- Estes Park Community Wildfire Protection Plan
- Berthoud Community Wildfire Protection Plan
- Larimer County Emergency Operations Plan
- Federal Bureau of Investigation WMD Incident Contingency Plan
- Emergency Management Institute course curricula
- FEMA Local Multi-Hazard Mitigation Planning Guidance

Hazard Specific research: In the development of this plan, numerous hazards were examined and studied. Data were collected and compiled on the hazards determined to be important to the region: aircraft accident, avalanche, biological hazards/ influenza, civil disturbance, dam failure, drought, earthquake, expansive soils, fire – urban, fire – wildland, flood, hail storm, hazardous materials – fixed facility, hazardous materials – transportation, land subsidence, landslide/rockslide, lightning, terrorism/weapons of mass destruction, tornado, wind storm, and winter storm. The hazards that were studied and deemed to be not pertinent to the region included coastal erosion, coastal storm, hurricane, levee failure, tsunami, and volcano. During the 2009 update/revision process, hazards determined to be important to the region were reviewed and analyzed to ensure their continued applicability to this Plan. Research material came from a wide variety of local, state, and federal agencies. These specific agencies are listed in the Appendices of this Plan. Research was also conducted by referencing historical newspaper articles, texts, scientific documents, and documented resident interviews. Internet references were widely utilized in historical research applications. Current mitigation activities, resources, programs, and proposed action items from research materials and stakeholder interviews were also identified. All sources of research data are documented in the Plan's Appendices.

Public workshops: Three public workshops were facilitated during the initial development of the 2003 Northern Colorado Regional Hazard Mitigation Plan - one each in Fort Collins, Loveland, and Greeley. The purpose of these workshops was to gather information, comments, and ideas from the citizens of the local community about mitigation planning and priorities for the mitigation plan goals. The resources and information compiled in the mitigation plan provide a strong local perspective and help identify strategies and activities to make the Northern Colorado region more disaster resilient. Additional public workshops and open houses were provided to allow for public review and input during the update/revision process for the 2009 version of this Plan.

Plan Adoption

Each area government (County Commissioners/City Councils from City of Fort Collins, City of Loveland, Town of Estes Park, Town of Wellington, Town of Berthoud and Larimer County) is responsible for adopting the Northern Colorado Regional Hazard Mitigation Plan. Each governing body has the authority to promote sound public policy regarding natural, man-made, and hazardous material hazards within their respective jurisdictions. The 2003 Plan was formally adopted by Larimer County as well as the cities of Fort Collins and Loveland after the Plan received FEMA approval. Copies of adoption resolutions from the involved governments can be found in the Appendices of this Plan. It is expected that all jurisdictions will adopt the 2009 version of this Plan subsequent to its approval by FEMA.

Plan Implementation, Monitoring and Evaluation

The Plan Maintenance section of this document details the formal process that will ensure that the Northern Colorado Regional Hazard Mitigation Plan remains an active and relevant document. The maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a revision every five years. This section describes how the community will integrate public participation throughout the maintenance process. Finally, this section includes an explanation of how community government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as Land Use Plans, Capital Improvement Plans, and Building/Zoning Codes.

Continued Public Involvement

Area governments are dedicated to involving the public directly in the continual review and update of the Mitigation Plan. In order to solicit public review and input during the development of the 2003 Plan, a series of public meetings and workshops was held at various locations, dates, and times. A similar series of public meetings and workshops was conducted to present, discuss, and receive feedback on the 2009 revisions to the Plan. In addition, copies of the 2003 Plan were catalogued and kept at all of the public libraries in the region. Upon completion, FEMA approval, and local adoption, the 2009 Plan will replace the 2003 Plan in the public libraries. A copy of the Plan is also available for review through the involved offices of emergency management. The existence and location of all available copies of the Plan have been and will continue to be publicized in the media to include local newspaper, utility billing newsletter, radio station, government web sites, etc. The Plan also includes the Convener's contact information, as well as contact information for each of the local government agencies involved in the plan, to facilitate and track public comments. In addition, any proposed changes will be publicized in the media.

Northern Colorado Regional Hazard Mitigation Plan

Section 2: Introduction

Recent incidents and disasters throughout the region and nation have clearly demonstrated that natural, man-made, and hazardous materials hazards can inflict very high losses on the built environment. These losses, coupled with the economic, social, political, and psychological costs of disasters to a community can leave behind deeply rooted scars on the populace. Unfortunately these scars may linger indefinitely. One natural hazard storm event, Hurricane Katrina, inflicted the highest level of direct and indirect economic loss ever sustained in the United States[1] to date, causing massive amounts of property destruction, disruption of local/regional and international businesses, and precipitation of environmental deterioration. Similarly, much of the same can be said for the man-made disaster events of September 11, 2001.

The communities within this plan are confronted on a daily basis with the possibility of a serious emergency incident of disaster proportions. Natural, man-made, and hazardous material hazards pose a constant threat to the health, welfare, and security of our citizens. The cost of response to and recovery from disasters can be extraordinarily high as is the ultimate cost of lost lives. Consequently, significant attention must focus on mitigating the disasters' effects/impacts before they occur or recur.

Throughout history, the residents of this region have dealt with the various natural, man-made, and hazardous material hazards. Photos, journal entries, and newspapers from the mid- to late-1800s and beyond show that the residents of the area dealt with flooding, harsh winter storms, severe windstorms, fires and other hazards. For example, in 1864, Camp Collins experienced such a severe flood that it relocated from near Laporte, Colorado, to what is now known as Fort Collins. The Northern Colorado River Basin has experienced significant flooding. In 1904, more than 150 homes were destroyed and thousands of acres of farm land were ruined from flooding.

During the 1930s, the entire region experienced severe drought for approximately five years, only to end with significant flooding due to six to eight inches of rainfall in the foothills. Those residents whose survival depended on agriculture faced a multitude of disastrous events during this time period.

In 1976 the Big Thompson Canyon experienced a flash flood from heavy rainfall that occurred without warning. Within a few hours, this flash flood caused one of the greatest natural disasters in the history of the state. This disaster took 145 lives and caused nearly $40 million in property damage.

[1] Knabb, Richard D; Rhome, Jamie R.; Brown, Daniel P (December 20, 2005; updated August 10, 2006). "Tropical Cyclone Report: Hurricane Katrina: 23-30 August 2005" (PDF). National Hurricane Center. Retrieved July 21, 2008.

In 1982, Larimer County experienced the Lawn Lake Dam disaster, which claimed three lives, inundated nearby Estes Park with a wall of flood water, and caused more than $30 million in damages. The region again experienced a major flooding event in July of 1997 known as the Fort Collins Spring Creek Flood. This flash flood was the end result of a series of heavy thunderstorms over a two-day period in west Fort Collins. Torrential rains dumped nearly 15 inches of rain in the area over two consecutive nights. The flooding swelled tiny Spring Creek into a raging torrent which derailed a freight train, destroyed two fully occupied residential trailer parks, and killed five residents. The rainfall set records for the largest 1-day, 3-hour and 6-hour precipitation totals at the Colorado State University (CSU) gauge, even though the gauge was not located at the storm's center. The extensive flooding occurred citywide, resulting in more than $200 million in damage.[2]

More recently the area has experienced significant wildland fires and major hazardous materials incidents along roadways. Growth in the community, increased tourism, technological advances, and bio-medical research at the local universities and research facilities are only a few of the factors that will increase the risk of disastrous hazards in this community.

Historically, mitigation activities were the most neglected programs within emergency management. The goal of this plan is to bring those mitigation activities to the forefront. With careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from disasters.

Mitigation is defined as activities providing a critical foundation in the effort to reduce the loss of life and property from natural and/or manmade disasters by avoiding or lessening the impact of a disaster and providing value to the public by creating safer communities. Mitigation seeks to fix the cycle of disaster damage, reconstruction, and repeated damage. These activities or actions, in most cases, will have a long-term sustained effect.[3] Hazard mitigation measures, which can be used to eliminate or minimize the risk to life and property, fall into three categories: (1) those measures that keep the hazard away from life and property; (2) those measures that keep life and property away from the hazard, e.g., land use practices; and (3) those measures that do not address the hazard at all, but reduce the impact of the hazard on the victims, e.g., insurance and disaster relief. The use of all three measures of mitigation can reduce the vulnerability of our communities to the devastation of a natural, man-made, or hazardous material disaster.

One of the results of the 1997 flooding in Fort Collins was an increased awareness of the hazards that pose a risk to residents in this region. Various government departments and emergency response agencies who were involved in this event began to examine actions they could take to prepare for and reduce the impact of disasters in their own communities. Many agencies began to examine their roles and activities in disaster management and mitigation of hazards. Significant work was performed in the area of planning responses for dam failures, flood management, earthquakes, and tornadoes, including several reports outlining the risks posed by each. Mitigation activities then began to take place and emergency response agencies formed automatic aid and mutual aid policies.

[2] http://fcgov.com/oem/historical-flooding.php

[3] FEMA National Response Framework

In 1998 Fort Collins became involved in FEMA's Project Impact. More formal mitigation planning and activity would soon take place. In October of 2002, the City of Fort Collins, City of Loveland, City of Greeley, and Larimer County made a decision to collectively develop a Regional Hazard Mitigation Plan.[4] Many departments within these governments had mitigation plans and activities already in place. The goal was to bring these plans and activities into a formal and workable regional setting, thereby creating a mechanism for the sharing of resources and expertise during mitigation planning and activities.

Plan Mission Statement

The mission of the Northern Colorado Regional Hazard Mitigation Plan is to promote sound public policy that is designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural, man-made, and hazardous material hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the appropriate jurisdictions towards building a safer, more sustainable community.

[4] Since the initial development of this Plan, the City of Greeley has removed itself from the planning group and is now working with the County of Weld on further planning documents.

Section 2.1: Rationale

The rising cost of natural, man-made, and hazardous material disasters has led to renewed interest in identifying effective ways to reduce vulnerability to disasters. Hazard mitigation plans assist communities in reducing risk from hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the region. This Plan provides a set of action items to reduce risk from hazards through education and outreach programs, development of partnerships, and implementation of prevention activities such as land use or hazardous materials management programs.

The resources and information within the Mitigation Plan created three focal activities for the involved agencies: (1) establish a foundation for coordination and collaboration among agencies and the public in this community/region; (2) identify and prioritize future mitigation projects; and (3) assist in meeting the requirements of federal assistance programs. The Mitigation Plan works in conjunction with other community plans including, but not limited to, Land Use, Flood Management, and Emergency Operations Plans.

Whom Does the Mitigation Plan Affect?

The Northern Colorado Regional Hazard Mitigation Plan affects all citizens and areas in Larimer County, Fort Collins, Loveland, Estes Park, Wellington and Berthoud. It provides a framework for planning for natural, man-made, and hazardous material hazards. The resources and background information in the plan are applicable region-wide, and the goals and recommendations lay the groundwork for local mitigation plans and partnerships.

Section 2.2: Plan Goals

The Plan goals describe the overall direction that area agencies, organizations, and citizens can take to work toward mitigating risk from natural, man-made, and hazardous material hazards. The goals are the building blocks between the broad direction of the mission statement and the specific recommendations outlined in the action items.

The goals of this Plan were built to correlate to the National Science and Technology Council's (NSTC) four key characteristics of disaster-resilient communities:[5]

- Relevant hazards are recognized and understood.
- Communities at risk know when a hazard event is imminent.
- Individuals at risk are safe from hazards in their homes and places of work.
- Disaster-resilient communities experience minimum disruption to life and economy after a hazard event has passed.

Furthermore, it is the intent of the communities, agencies, and persons involved in the development, revision, and implementation of this Plan to support the six Grand Challenges established by the NSTC:

[5] Grand Challenges for Disaster Reduction, National Science and Technology Council. January 2008.

1. Provide hazard and disaster information where and when it is needed.
2. Understand the natural processes that produce hazards.
3. Develop hazard mitigation strategies and technologies.
4. Recognize and reduce vulnerability of interdependent critical infrastructure.
5. Assess disaster resilience using standard methods.
6. Promote risk-wise behavior.

Overall Plan Goals

1. Protect Life and Property

- Implement activities that assist in protecting lives by making residences, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural, man-made, and hazardous material hazards.
- Reduce the loss and repetitive damage from chronic hazard events while promoting insurance coverage, as available, for catastrophic hazards.
- Continually improve hazard assessment information to assist local governments in making recommendations for discouraging new development and encouraging preventative measures for existing development in areas vulnerable to natural, man-made, and hazardous material hazards.

2. Improve Public Awareness

- Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.
- Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

3. Strengthen Partnerships and Promote Plan Implementation

- Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation of this Plan.
- Encourage leadership within public and private sector organizations to prioritize and implement local, county, and regional hazard mitigation activities.

4. Improve Emergency Services Response Plans

- Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.
- Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.
- Where appropriate, coordinate and integrate natural, man-made, and hazardous material hazard mitigation activities with emergency operations plans and procedures.

Section 2.3: Multi-Hazard Goals and Action Items

The mission of the Northern Colorado Region Hazard Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural, man-made, and hazardous material hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the appropriate jurisdictions towards building a safer, more sustainable community.

The Plan goals describe the overall direction that area agencies, organizations, and citizens can take to work toward mitigating risk from natural, man-made, and hazardous material hazards. The goals are the building blocks between the broad direction of the mission statement and the specific recommendations outlined in the action items for each profiled hazard.

To mitigate the effects of all of the hazards identified within the Plan, Larimer County, the cities of Fort Collins and Loveland, and the Towns of Estes Park, Wellington and Berthoud will make every effort to:

- Maintain up-to-date Emergency Operations Plans in each jurisdiction.
- Locate and equip a facility to house an appropriate Emergency Operations Center.
- Exercise and update all emergency plans regularly.
- Maintain training for emergency response preparedness in each community.

Each profiled hazard includes a list of action items and of hazard mitigation activities that are completed, on-going, or proposed for the involved communities. The action items were developed as a result of data collection, research, and the public participation process.

The following list includes information for each action item:

- **Recommended Coordinating Organization(s)** – The coordinating organization(s) is/are the public agency or agencies with the regulatory responsibility to address the hazard; is /are willing and able to organize resources; will find appropriate funding,; and coordinates activity implementation, monitoring, and evaluation. Coordinating organizations may include local, county, regional agencies, or combinations there of, that are capable of, or responsible for, implementing activities and programs.

- **Partner Organizations** – The partner organizations are agencies or public/private sector organizations that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization. Partner organizations may not be listed with the individual action items but may be found in the Appendices of this Plan.

  Partners listed in the Resource Directory of the Hazard Mitigation Plan may be participatory or potential partners and were recommended by the project steering committee, but were not necessarily contacted during the development of the Mitigation

Plan or were unavailable to participate during the development of this Plan. Partner organizations should always be contacted by the coordinating organization to establish commitment of time and resources to action items.

- **Timeline** –The timeline shows projects that were completed since the original 2003 Plan was developed, on-going action items and proposed action items. For proposed action items, a proposed completion timeframe may accompany the item.

- **Ideas for Implementation** – Each action item includes a summary of what may be required to implement planned projects, including possible needs for funding, equipment, and/or human resources.

- **Priority** – Each proposed action item was prioritized by the agency of entity responsible for implementing the action.

- **Plan Goals Addressed** – The action items identified for each hazard profile are intended to provide an on-going means to monitor and evaluate how well the Mitigation Plan is achieving predetermined goals. It is the intent of the Plan to address all four of the Plan goals within the mitigation action items for each hazard profile. Plan goals are as follows:
    1. Protect life and property.
    2. Improve public awareness.
    3. Strengthen partnerships and promote plan implementation.
    4. Improve emergency services response plans.

Section 2.4: Plan Use and Implementation

Each section of the Mitigation Plan provides information and resources to assist people in understanding the local communities and the hazard-related issues facing citizens, businesses, and the environment. When viewed as a whole, the various sections of the Plan work together to create a document that helps to guide the mission of each unit of local government to meet the Plan goals to reduce risk and prevent loss from future natural, man-made, or hazardous materials hazard events.

The foundation of this Plan enables individuals and/or groups to use only the specific section(s) that is/are of interest to them. Through the annual Mitigation Plan Steering Committee meetings, local governments are given opportunities to review and update sections of the Plan when new data becomes available and significant. Because this document is reviewed annually, policy makers in local government may be able to more easily allocate funding and staff resources to selected pieces in need of review. This eliminates the need for a time consuming, costly, and complete annual update of the Plan, allowing the Plan to remain current and relevant to the local communities.

Implementation through Existing Programs

Planning for potential hazards is an integral element of community governments in the Northern Colorado region. For example, the governments of the communities within this plan all address issues of natural, man-made, and hazardous material hazards within their respective comprehensive plans and have implemented numerous ordinances and other planning documents to address these hazards. The recurring challenge faced by local officials is to keep this network of coordinated local plans effective in reflecting the changing conditions and needs of Northern Colorado communities. This is particularly true in the case of planning for natural hazards, where communities must balance development pressures with detailed information on the nature and extent of hazards. These comprehensive land use programs give the communities and citizens a unique opportunity to ensure that natural hazards are addressed in the development and implementation of local comprehensive plans. Local, state, and federal data exist to show that planning of this nature has helped reduce losses from natural hazards in the Northern Colorado region.[6]

The Hazard Mitigation Steering Committee, which meets annually, will provide a mechanism for ensuring that the Plan's action items are incorporated into existing planning documents and activities whenever possible. Area government agencies address planning goals and legislative requirements through their comprehensive land use planning, capital improvement planning, and building/zoning codes. These existing planning documents include hazard mitigation strategies.

After adoption of the Mitigation Plan, each jurisdiction will work to implement the mitigation action items recommended in the Plan through the administration of their comprehensive plans, as well as other existing programs and procedures. For example, one of the goals in the Mitigation Plan is to protect life and property. Each governing body has the authority to adopt standardized building and fire codes. The local building and fire departments will work within these adopted codes to enforce the minimum standards necessary to protect life and property in new construction projects as well as within existing construction.

Prioritization and Economic Analysis of Mitigation Projects

Mitigation projects in each community are prioritized by that community. Priorities were established based on a subjective opinion of the employees of the government division or department that is responsible for implementation of the project. The projects were evaluated based on a decision-making matrix to provide a comparison of all of the projects. The matrix included the following categories: flooding, media coverage, citizen complaints, damages, risk of life, maintenance problems, and water quality. The prioritization plan used by each community allows that community to plan and budget projects for approximately ten years.

Each mitigation project identified in this Plan was further evaluated for fiduciary efficacy by following the Federal Emergency Management Agency's approach to identifying costs and

[6] FEMA National Response Framework

benefits associated with natural, man-made, and hazardous material hazard mitigation strategies or projects. This economic analysis falls into two general categories: benefit/cost analysis and cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist participating communities in determining whether or not a project is worth undertaking now, in order to avoid disaster-related damages in the future. An analysis of cost-effectiveness helps communities to evaluate how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Prioritization and economic analysis of hazard mitigation projects should be completed annually by each community to allow for improved communication and cooperation between those involved in each project, as well as for more accurate financial/budgeting purposes.

State Support for Natural, Man-Made, and Hazardous Material Hazard Mitigation

Typically, most mitigation efforts and activities are locally managed. The primary responsibility for development and implementation of risk reduction strategies and policies generally rests with the local jurisdictions. Local jurisdictions, however, are not isolated when it comes to available resources for hazard mitigation and in some cases, as with mitigation efforts for Avalanche and Rockslide/Landslide, the state is better equipped to carry out respective efforts. There are several partners and resources available at the local, state, and federal levels. A multitude of state agencies have roles in natural, man-made, and hazardous material hazard mitigation. Some of these state agencies are listed below:

- **Colorado Division of Emergency Management (CDEM)** is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration.
- **Colorado State Forest Service (CSFS)** is responsible for wildland fire mitigation and grants administration for various mitigation projects including education, preparedness, regulation, and secondary hazards.
- **Colorado Water Conservation Board (CWCB)** provides construction loan funding for water project planning and construction.
- **Colorado Department of Public Health and Environment (CDPHE)** provides assistance in public health and emergency management issues.
- **Colorado Division of Fire Safety (CDFS)** provides assistance with fire service training and hazardous materials issues.
- **Colorado State Patrol (CSP)** provides assistance with hazardous materials transportation compliance issues.
- **Colorado Department of Transportation (CDOT)** provides assistance with transportation issues on public highways.

Mitigation Plan Resources

The appendices are designed to provide users of the Northern Colorado Regional Hazard Mitigation Plan with additional information to assist them in understanding the contents of this Plan, and potential resources to assist them with implementation.

Appendix A: Plan Adoption Information

Appendix A contains plan adoption documents from Larimer County, the City of Fort Collins, and City of Loveland.

Appendix B: References/Resources
The resource directory includes lists of maps and tables within the Plan. Appendix B also includes a comprehensive list of all city, county, regional, state, and national and internet-based partner organizations and stakeholders, resources and/or programs that were and may continue to be of technical, financial, and/or research assistance to the communities involved in this Mitigation Plan.

Appendix C: Public/Government Participation Process
Appendix C includes specific information on the various public processes used during development of the Plan.

Appendix D: Fort Collins Flood Mitigation
Appendix D focuses on Flood Mitigation for the City of Fort Collins, but many of the mitigation actions summarized in this appendix affect the region. This report provides in depth detail to include: vulnerability in terms of numbers of existing buildings, infrastructure and critical facilities located within respective basins; estimates of potential dollar losses; methodology, etc… The high level of detail is required for Community Rating System (CRS) compliance.

Appendix E: Loveland Floodplain Regulations
Appendix E contains the complete text of these City of Loveland documents: Floodplain Building Code and Floodplain Regulations. It specifically address the NFIP.

Appendix F: Larimer County 100 Year Flood Vulnerability Report
This report provides in depth detail to include: vulnerability in terms of numbers of existing buildings, infrastructure and critical facilities located within the 100 year floodplain; estimates of potential dollar losses; methodology, etc…

Appendix G: Larimer County Wildfire High Hazard Area Vulnerability Report
This report provides in depth detail to include: vulnerability in terms of numbers of existing buildings, infrastructure and critical facilities located within the High Hazard areas of Larimer County; estimates of potential dollar losses; methodology, etc…

Appendix H: Local Mitigation Plan Review Crosswalk
Appendix E contains the document provided by FEMA to assist plan developers and plan reviewers in assessing the contents of a hazard mitigation plan. The document has been completed as, and is intended to serve as, a guide for the review of the Northern Colorado Regional Hazard Mitigation Plan.

Northern Colorado Regional Hazard Mitigation Plan

Section 3: Community Profiles

Planning for Hazards in the Northern Colorado Region

Natural, man-made, and hazardous materials hazards impact citizens, property, the environment and the economy of the communities of Fort Collins, Loveland, and Larimer County. Flooding, landslides, wind storms, tornadoes, and civil disturbances, along with other hazards, have exposed residents and businesses of this region to the financial and emotional costs of disaster recovery. The risk associated with natural, man-made, and hazardous material hazards increases as more people move to the specific areas potentially affected by these hazards. The inevitability of these hazards-related disasters, coupled with the growing population and activity within this region, creates an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent losses from future hazard events. Identification of the risk posed by these hazards and development of actions to reduce the impact of the hazard event will assist the local governments in protecting the lives and property of the citizens and the community.

Section 3.1: Larimer County

Larimer County is located in north central Colorado, approximately 40 miles north of Denver, along the Interstate 25 corridor. Larimer County is the seventh largest county in Colorado, based on population. The county extends west to the Continental Divide, east to Weld County, south to Boulder County, and north to the Colorado/Wyoming border. The county includes the towns of Berthoud and Estes Park, a portion of the town of Johnstown, several smaller rural and mountain communities, the Roosevelt National Forest, and Rocky Mountain National Park. The county encompasses 2,640 square miles that include some of the finest irrigated farmland in the state. Over 50% of Larimer County is publicly owned, most of which is land within Roosevelt National Forest and Rocky Mountain National Park.[7]

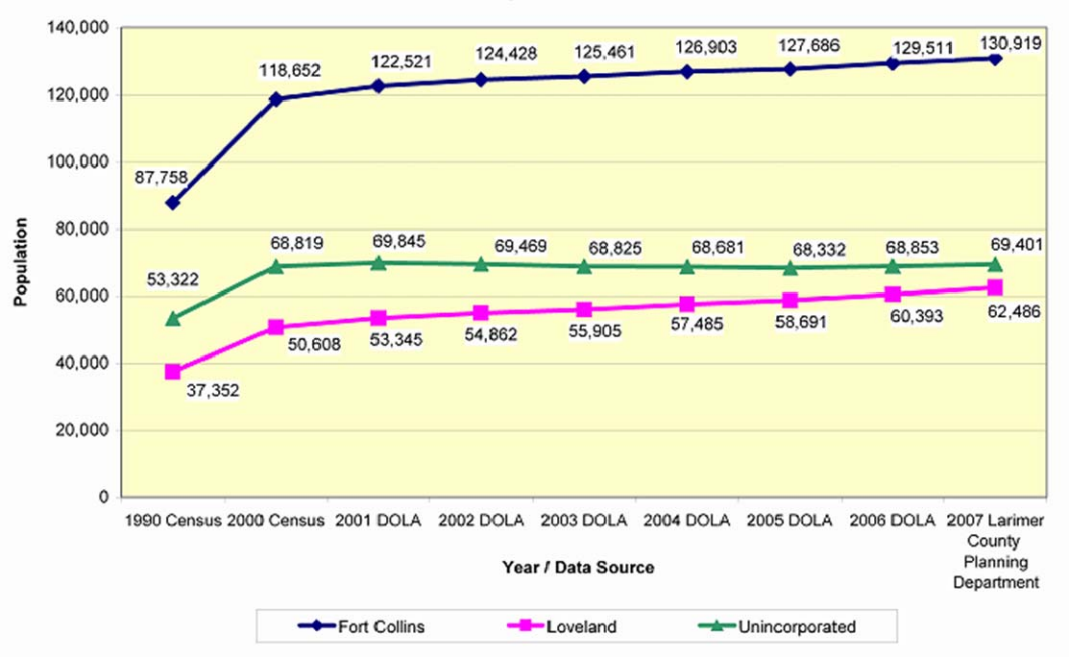
Major rivers in the county include the Cache la Poudre River and the Big Thompson River. These rivers provide benefits for fish, wildlife, and recreation. These rivers also provide a source for domestic and agricultural water for a large portion of Northern Colorado. The Cache la Poudre River is Colorado's only designated "wild and scenic" river by the National Wild and Scenic River System.[8] The region also features a wide variety of complex ecological zones, including high-altitude forests, foothills, lowlands and valleys, and riparian areas.
The County has many large employers, including Anheuser-Busch, Hewlett-Packard, Agilent Technologies, Woodward Industrial Services, General Electric, Praxair, Colorado State University, Poudre School District, Poudre Valley Health System, and Thompson School District.

[7] http://www.co.larimer.co.us/about/about.htm
[8] http://www.rivers.gov/wsr-cache-la-poudre.html

The county has several major transportation routes including Interstate 25, U.S. Highways 14, 34, 36, 287, and 392. Burlington Northern Santa Fe, Union Pacific, and Great Western Railway of Colorado have multiple lines that service the county. These rail services are providers of freight transport only.[9]

The total population of the county is estimated to be approximately 281,565 for the year 2007 and is predicted to reach approximately 292,000 in 2009.[10] Approximately 69,000 of those residents live in unincorporated areas of the county.[11] In August 2008 the city of Fort Collins was named by Money Magazine as being the second most desirable place to live in the United States, while the city of Loveland ranked 33rd in the same survey.[12]

Figure 3.1: Population in Larimer County's Largest Cities and Unincorporated Area (1990, 2000 – 2007)



Source: http://www.larimer.org/compass/popgrowth_demographics.htm#chart3

From 1990 to 2000, Larimer County's population grew at a faster rate (35.1%) than that of Colorado (30.6%). Relative to the other nine most populated Colorado counties, the increase was most similar to Adams, Arapahoe, Boulder, El Paso, and Weld counties. Denver, Jefferson, and Pueblo counties had much smaller increases than Larimer County (15% to 20%). Larimer County continued to rank as the 7th most populous county in Colorado, according to the 2000 Census. During this same timeframe, the largest cities in Larimer County, Fort Collins and Loveland, both experienced a 35% increase in population. The two other largest Colorado cities with a similar increase were Westminster and Longmont. Following the 2000 Census, Colorado Department of Local Affairs indicated that between 2000 and 2007, population growth in Estes Park (12%), Fort Collins (10%), and Larimer County (12%) was slightly lower than Colorado's

[9] Great Western Railway of Colorado
[10] http://www.factfinder.census.gov – 2006 American Community Survey information for Larimer County
[11] http://www.co.larimer.co.us/about/about.htm
[12] http://money.cnn.com/magazines/moneymag/bplive/2008/top100

14% increase. The largest population increases for the same period occurred in Loveland (23%), Timnath (24%), Wellington (102%), and the Larimer County part of Windsor (829%).[13]

Larimer County routinely ranks among the top 100 counties in the United States in the areas of market value of farmland for sheep, horses, and dry edible beans. The agricultural focus in Larimer County is primarily on livestock rather than on crop lands. The climate in this area averages 296 days of sunshine per year. The average temperature for the warmest month, July, ranges from an average low of 56 degrees Fahrenheit to an average high of 85 degrees Fahrenheit. The average temperature for the coldest month, January, ranges from an average low of 13 degrees Fahrenheit to an average high of 41 degrees Fahrenheit. Average precipitation cannot be quantified for Larimer County as a whole, but Fort Collins receives an average of 15.48 inches of precipitation annually.[14]

The increasing population of Larimer County creates more community exposure to hazards and changes how agencies prepare for and respond to hazards. As more people live on the urban fringe, the risk associated with wildland fire also increases. The impact creates multi-hazardous risks of flooding, landslides, destruction of watersheds, and other associated hazards. As the density of population is increased, risk mitigation, response, and recovery are also impacted.

Although several faults (Bellevue, Rist Canyon, and Buckhorn Creek) lay within the county, a February 2000 study completed by the U.S. Bureau of Reclamation showed no evidence exists for potential fault movement close enough to the area's water retention dams to produce ground motions of engineering interest.[15]

Hazards do not discriminate; at-risk populations are impacted in terms of vulnerability and ability to recover and can vary greatly among the population. The recovery cost of a disaster can place an unequal financial burden on the general population, especially when only a small proportion of the population may benefit from governmental funds used to rebuild private structures.[16]

During the public comment and input phase of the initial 2003 Plan development, participants and residents from Larimer County identified their perceived top five hazards as winter storms, transportation hazards, drought, wildland fires, and flash flooding. Similar results were obtained during the 2009 revision, with the exception of Utility Interruption being more prominent than transportation hazards.

[13] http://www.larimer.org/compass/popgrowth_demographics.htm#tableEstimate
[14] Colorado State University Dept. of Atmospheric Science (http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?co3005)
[15] U.S. Department of the Interior – Bureau of Reclamation: Technical Memorandum No. D8330-2000-006
[16] Hazard Workshop Session #16 Summary – Disasters, Diversity, and Equity. July 2000.

Map 3.1 – Larimer County

Source: http://www.larimer.org/images/larimer_scan_map.jpg

Section 3.2: City of Loveland

Rich in history, Loveland, Colorado, is a picturesque and progressive city located 45 miles north of Denver in Larimer County. The population of Loveland is estimated at approximately 61,000 for 2006.[17] The city is commonly referred to as the "Gateway to the Rockies" as it is nestled against the foothills on Highway 34, which leads to Rocky Mountain National Park. Several major automobile transportation routes cross through the city, including Interstate 25, which crosses through the eastern edge of the city limits; U.S. Highway 34, which bisects the community from east to west; and U.S. Highway 287, which passes north to south through the city. U.S. Highway 34 serves as a major traffic route through the city and is the main access to Rocky Mountain National Park located approximately 25 miles west of Loveland. The city also operates a daily bus service within the community.

The economy of Loveland is anchored in manufacturing, publishing, government, trade, and the arts. Computers and peripherals as well as microelectronics and biotechnology comprise a large percentage of the area's advanced technology firms. Numerous large firms, such as Agilent Technologies, Colorado Memory Systems, Hach Company, Praxair, General Electric, and Woodward Industrial Services prosper in their Loveland locations. However, retail sales and small businesses are still the backbone of the local economy. Since 2003 two new, large retail centers opened for business, and another large retail area is planned, near the area of the Interstate 25 and U.S. Highway 34 interchange. The community businesses also include two major hospitals – Banner Health System's McKee Medical Center, which is a Level III trauma center, and Poudre Valley Health System's Medical Center of the Rockies which is a Level II regional trauma center.

Burlington Northern Santa Fe, Union Pacific, and the Great Western Railway of Colorado all have rail lines and/or spurs that travel through the City of Loveland.[18] The City of Loveland and the City of Fort Collins jointly own the Fort Collins-Loveland Municipal Airport. The City of Loveland operates this FAA-certified commercial service and general aviation airport which functions as critical transportation infrastructure for the region.[19] The airport opened in 1964 with one runway and a handful of aircraft. Since then, the airport has grown to a 1,100 acre facility with an 8, 500 foot long runway; parallel taxiway; instrument landing system; 225-based aircraft; commercial air service; and a host of aviation-related and aviation-based businesses.

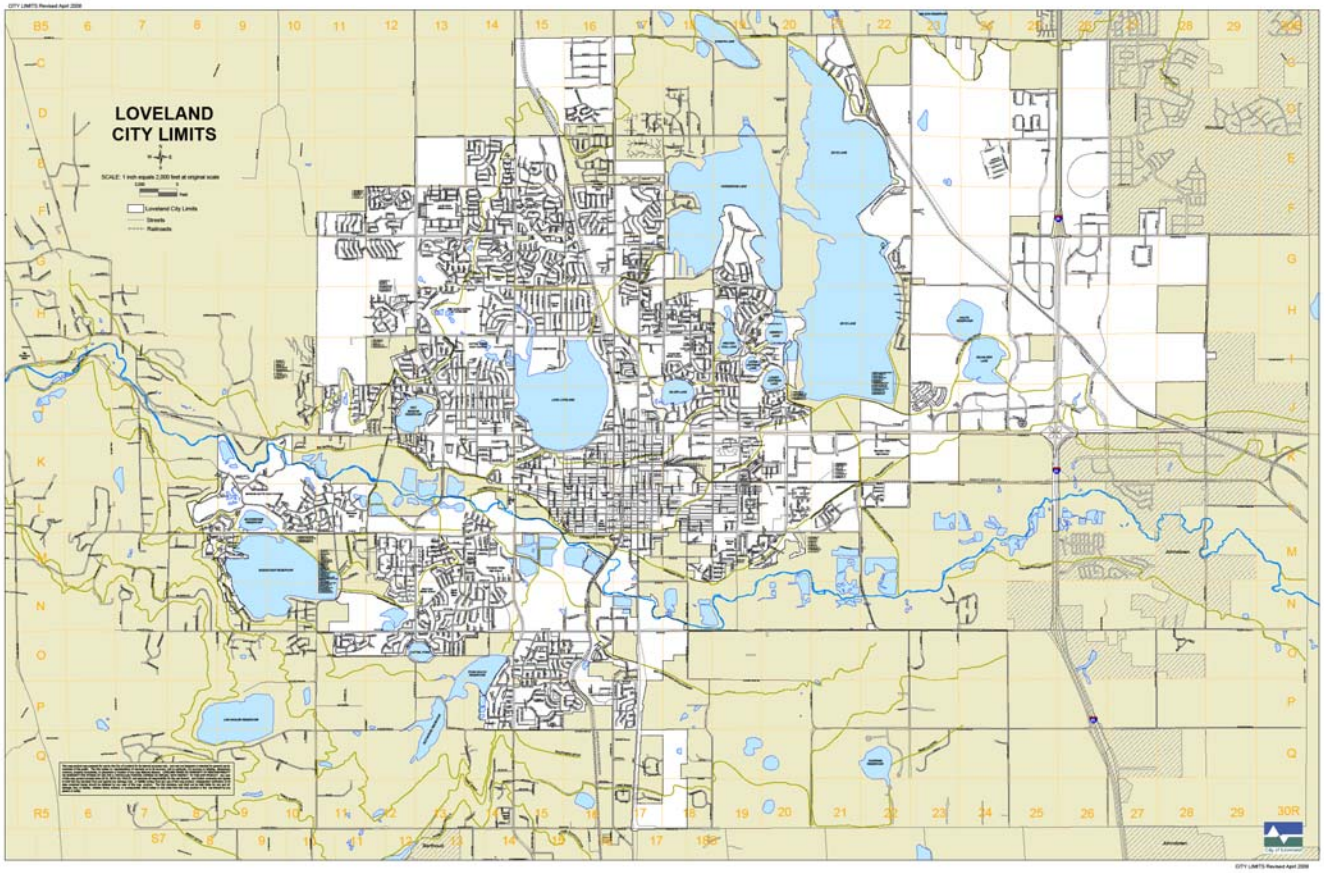
The Thompson School District (TSD) is the 16th largest school district in Colorado, encompassing 362 square miles, and is the largest employer in Loveland. The school district includes the cities of Loveland, Berthoud and the southern part of Fort Collins as well as parts of Larimer, Weld, and Boulder counties. TSD is a pre-kindergarten through 12th grade district with six early childhood centers, 19 elementary schools, five middle schools, five high schools, and one charter school. District enrollment for the 2008-2009 school year was approximately 15,000 students.[20]

[17] http://factfinder.census.gov – Population Finder search engine
[18] http://www.omnitrax.com/rail_gwr.aspx
[19] http://www.fortloveair.com/
[20] http://www.thompson.k12.co.us/about_us/about_us.html

As the community continues to experience rapid residential, commercial, and industrial growth, Loveland relies on the City's Municipal Code, Comprehensive Plan, Land Use Plan, and various Intergovernmental Agreements and model building and fire codes to manage growth. These plans are designed and intended to promote and improve the quality of life for the citizens and visitors of Loveland.

During the public comment and input phase of the initial 2003 Plan development, participants and residents from the City of Loveland identified their perceived top five hazards as transportation hazards, flooding, utility interruption, hazardous materials emergencies, and wildland fire.

Map 3.2 – City of Loveland



Source: http://www.ci.loveland.co.us/IT/GIS/ViewMaps.htm

Section 3.3: City of Fort Collins

Fort Collins was founded as a military fort in 1864 and incorporated as a town in 1873. The community is nestled against the foothills of the Rocky Mountains and alongside the banks of the Cache La Poudre River. The city lies approximately 5,000 feet above sea level. Residents enjoy a moderate, four season climate.[21]

Major transportation routes that are near or within the City of Fort Collins include Interstate 25 and U.S. Highways 14 and 287. Burlington Northern Santa Fe, Great Western Railway of Colorado, and Union Pacific have rail lines that transect the city. Fort Collins provides a community bus service to its citizens. Fort Collins shares a regional airport with the City of Loveland.

Fort Collins currently encompasses 49.43 square miles of area and has more than 680 miles of streets. There are 53,944 housing units in the city, and Fort Collins has a population of approximately 132,162 residents. The average annual population growth rate for the past six years has been 1.8 percent.[22]

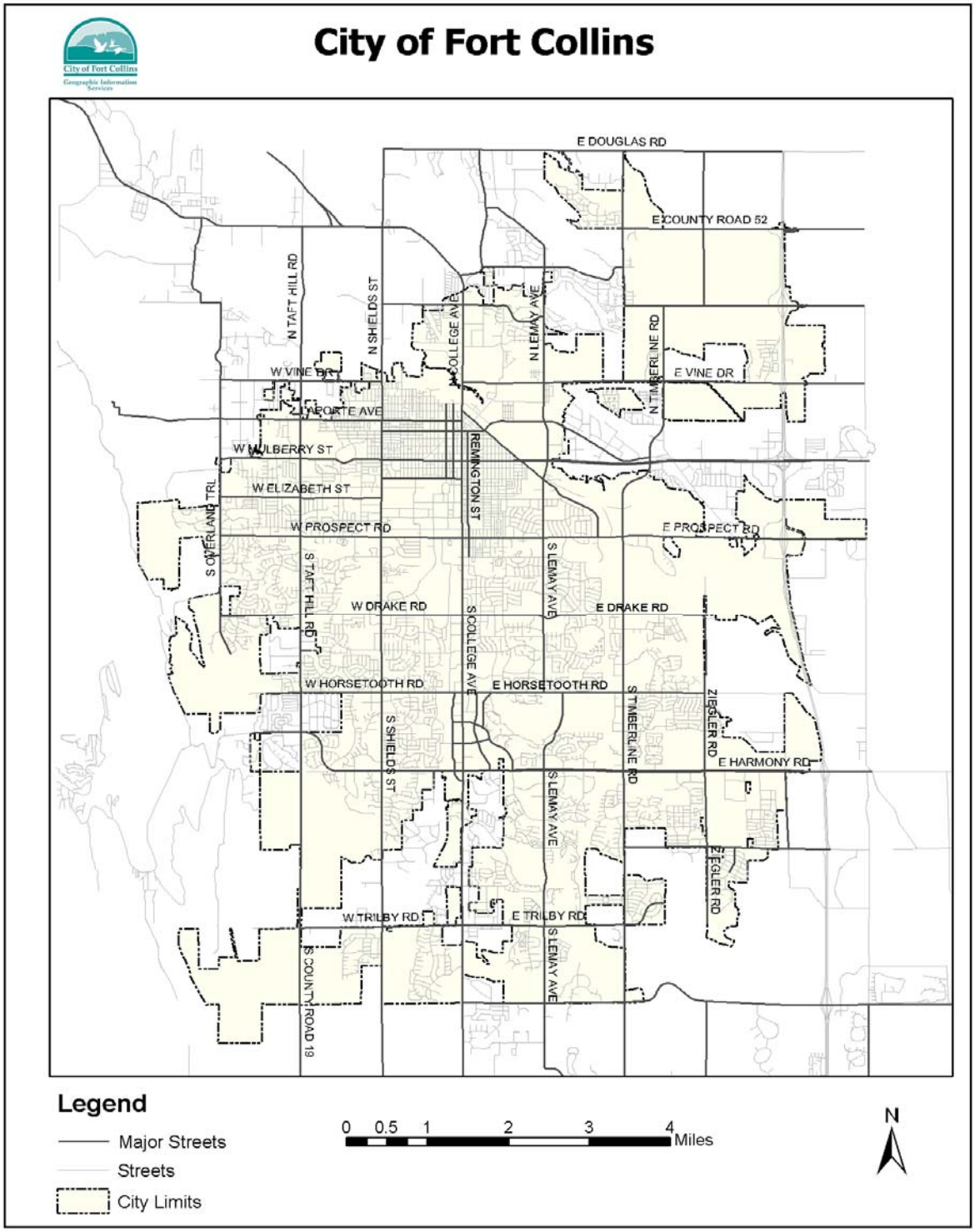
Major employers include Anheuser-Busch, Hewlett-Packard, Avago Technologies, Intel, LSI Logic, Colorado State University, Poudre School District, and Poudre Valley Health System, which includes Poudre Valley Hospital – a Level III Trauma Center serving northern Colorado. The National Wildlife Research Center and the Centers for Disease Control and Prevention have secured research facilities in the community. Colorado State University is located in Fort Collins and hosts one of the top veterinary schools in the nation.

The City of Fort Collins manages its growth through the use of a "City Plan," the City of Fort Collins Municipal Code, and the City Land Use Plan. This rapidly urbanizing, full-service community operates under a sophisticated and comprehensive development plan.

During the public comment and input phase of the initial 2003 Plan development, participants and residents from the City of Fort Collins identified their perceived top five hazards as flash floods, winter storms, utility interruption, drought, and hazardous materials transportation accidents.

[21] http://www.fcgov.com
[22] http://www.fcgov.com

Map 3.3 – City of Fort Collins



Source: http://www.fcgov.com

Section 3.4: Town of Estes Park

Estes Park is a famous tourist destination in Colorado and has been for nearly 100 years due to it's proximity to one of the crown jewels of the national park system, Rocky Mountain National Park. Even before the establishment of the Park in 1915, Estes Park was a destination for hunters, adventurers, hikers and those seeking a tranquil high altitude holiday experience, particularly in the summer months. The famous Stanley Hotel, built in 1907, was and is one of the grand hotels on the western national park system and overlooks the Estes valley to this day. The economy is overwhelmingly based upon tourism and has been for the better part of the last century.

The population of the town is currently around 6,500 full time residents but that population increases with the summer tourist and vacation season to approximately12,500. The average visitation is about 16,500 daily. Rocky Mountain National Park is nearing the three million visitors mark for annual visitation and a vast number of them travel to the town or immediate vicinity. Trail Ridge Road, the highest continuously paved road in the country (reaching 12,185 feet) connects Estes Park with it's western slope counterpart, Grand Lake, Colorado.

The response and preparedness concerns for Estes are consequently far beyond that of an ordinary town of 6,500 people. Unlike a few decades ago, Estes has become more of a bedroom community for those commuting to work in the Ft. Collins – Loveland area and even down to Boulder or Denver, 70 miles away. It is the location of the Y.M.C.A. camp and Conference Center which annually draws tens of thousands of vacationers and conference attendees to its campus to the immediate west of the town proper.

Estes Park was on the fringe of one of Colorado's greatest natural disasters, the Big Thompson Flood of July 31, 1976 and took a direct hit from a flood resulting from the collapse of the old Lawn Lake dam located in a high alpine valley on July 15, 1982. The latter event allowed the town to reinvent itself with improved buildings and an attractive river walk feature and the event itself was a catalyst for the final removal of all similar antiquated dams in the high country of Rocky Mtn. Nat'l. Park.

Section 3.5: Town of Wellington

Wellington, for a good deal of it's history, was merely a small agricultural and commercial center outside of Fort Collins area to the north and the last stop on the way to Wyoming. But, due to growth of both towns, the separation is now only a matter of 4-5 miles and Wellington has become a bedroom community for those working primarily in the Ft. Collins – Loveland area.

Wellington has experienced significant growth over the past 20 years and, whereas it's population is currently only about 5,400, that figure is at least double from what it was in the early 90's. Wellington is split by an interstate, in this case I-25 and, like it's larger neighbors to the south, contends with railroad tracks running through the middle of the town. That was once

a mark of commercial success or at least potential – and may be still but it is also a source of concern for traffic and the more serious potential of transportation accidents from derailment. Likewise, a concern for such haz mat events exists because of the interstate.

Just north of Wellington in the Rawhide Power Plant operated by the Platte River Power Authority, a coal fired plant and part of the western power grid. As a benefit, Rawhide has it's own fire and rescue response crew with up to date apparatus and vehicle inventory as well as trained fire and rescue personnel. With regard to the town itself, it has it's own volunteer fire department and relies upon Poudre Fire Authority in Fort Collins for mutual aid. Law enforcement, by agreement, is provided by the Larimer County Sheriff's Office.

Wellington's place as a small agricultural center for extreme north central Colorado has long since disappeared under the commercial influence of Fort Collins and the local economy is now service oriented for residents with the exception of business like Front Range Steel and Advanced Tank – both fabricating and small manufacturing concerns. Most residents work elsewhere, mainly as noted, in Fort Collins and Loveland.

The town can be and certainly has been, the site of significant sheltering operations for interstate travelers who find themselves detoured from the highway up to Cheyenne by infamous winter storms which often close I-25 at the Wellington exit. In such instances, the Sheriff's Office, County Emergency Management and the Wellington Volunteer Fire Department work together with the Red Cross to attend to these stranded drivers. The vicinity also a predictable site for tornado funnels during several months of the year but these overwhelmingly remain just funnels. The history of tornados in the area, however scant, is still a reminder of potential, especially considering the reminder of the EF3 tornado of May, 2008 to the south and east of Fort Collins in the Weld County town of Windsor.

Section 3.6: Town of Berthoud

Berthoud, founded in 1888, is a small community located just a few miles south of Loveland along what was Highway 287. Over the past few years, major highway and interchange work has taken the bulk of motor vehicle traffic out of the town proper, thereby reducing noise, pavement wear and the probability of hazardous materials incident from vehicle accident. The town still contends with rail road tracks skirting the eastern side of town. The last train derailment in Larimer County (other than one occurring in the middle of the historic Fort Collins Flood of 1997) took place immediately south of Berthoud in September of 1993. Luckily, only a very minor amount of low hazard powdered chemical was spilled and the clean up presented few problems. It may (or may not) be a long while into the future that another derailment takes place but town planners and emergency response authorities must anticipate the possibility.

Like other towns in Larimer County and those up and down the so-called Front Range Urban Corridor, Berthoud has experienced rapid growth. While only about 7,000 resident currently, it's population is significantly greater than 20 years ago with a good deal of residential growth, not only in Berthoud proper but also immediately outside it's city limits. Many of these people, as in Wellington, work in the Fort Collins or Loveland area with many commuting to the south, from Boulder or Denver, the northern edge of which being only around 40 miles away.

Berthoud is situated north of the Little Thompson River, a relatively minor stream course which has little history of flooding and about 8 miles east of the major Front Range reservoir of Carter Lake. Summer recreation here nearly rivals that of another Corps of Engineers structure west of Fort Collins, Horsetooth Reservoir.

Agriculture in the Berthoud area flourished at the beginning of the 20th century as water diverted from the Little and Big Thompson rivers fed a network or ponds and lakes in the vicinity and this economic resource remained as a town economic mainstay for many years. More currently, the local economy is service oriented for the town itself with many incomes, as noted, bringing money in from out of town employment. The Town of Berthoud's Enterprise Zone was created in June 1993 and the Berthoud Economic Resource Team was formed in 2008 to explore expansion possibilities of the local economy, currently including an expansion of the Aims Community College campus located on the Berthoud area.

Northern Colorado Regional Hazard Mitigation Plan

Section 4: Risk Assessment

Larimer County, Fort Collins, Loveland, Estes Park, Wellington and Berthoud identifiied several hazards that are addressed in the Northern Colorado Regional Hazard Mitigation Plan. These hazards were identified through a variety of sources. These sources included, but were not limited to, reviewing local agency regulations, codes, land use policies, and past mitigation actions. Numerous discussions were coordinated between plan developers and experts from the local community, local governments, engineering specialists, Colorado State University (CSU), Colorado Department of Transportation (CDOT), and the National Oceanic Atmospheric Administration (NOAA). Newspapers, magazines, textbooks, and the internet were searched for specific data relevant to the area. Local citizens who had resided in the community for long periods of time were interviewed for historical data. Documentation from past disasters, Presidential Declarations, and Project Impact actions were also reviewed. Local, county, and state Emergency Operations Plans were examined. Public meetings were held to gather citizen input. Templates from various agencies (CDEM, FEMA, and USDOJ) were utilized in gathering and managing this information. A Resource List is attached to this document as an Appendix to assist the reader in reviewing sources of information. This list will be frequently updated in conjunction with future Plan revisions.

In all, 20 hazards were identified and assessed. The impact of several other hazards is considered to be minimal. Several of the identified hazards will have a greater impact on one community versus the others, but most hazards are regional in nature. This information will be discussed throughout this Plan due to its specificity to one particular area. If it is specific to one of the three identified communities, it will be stated in the Hazard Identification Section of the Assessment and various other locations in this Plan.

Larimer County GIS, Fort Collins GIS, and Loveland GIS all participated in this planning process by providing current, available maps. As infrastructure, critical facilities, land uses, and other data sets becomes available, maps to assist in determining hazards and the impact on the community will be added.

This Plan also identifies the different variables within each hazard as they apply to the specific community rather than identifying variables within the community as they apply to the specific hazard. Each community in the Plan is impacted by each of these specific hazards.

Table 4.1: Hazard Identification

HAZARD	HOW IDENTIFIED	WHY IDENTIFIED
Aircraft Accidents • Larimer County • Fort Collins • Loveland	• Review of past disasters • Review of future growth • FAA input • NTSB input	• Increasing building density in proximity to airport • Increase in flying population • Increase in flight operations • Airspace includes DIA traffic
Avalanche • Larimer County	• Review of past incidents • Review of transportation plans	• Increased public visitation to remote back-country areas
Biological Hazards/Influenza • All Communites	•	•
Civil Disturbance • Larimer County • Fort Collins • Loveland	• Review of past incidents • Input from local law enforcement • Input from local residents	• Diversity of population • Colorado State University • State/Federal Buildings • Controversial Businesses • Research Facilities
Dam Failure • Larimer County • Fort Collins • Loveland • Estes Park • Berthoud	• City/County Utilities • Public Input • Review of past records • United States Army Corps of Engineers studies and data • Input from Natural Resources departments	• Potential catastrophic results to Northern Colorado • Loss of critical facilities • High loss of life • High economic impact • Significant number of dams in Larimer County • Large-scale geographic disaster area
Drought / Extreme Heat • Larimer County • Fort Collins • Loveland • Wellington • Berthoud	• Review of ordinances • Input from City/County Planning • Input from Utilities • Input from Natural Resources departments	• Development pressure • Impact on general community • Impact on agricultural-based economy • Heightened sense of urgency
Earthquake • All Communities	• Geological reports • History of faults in the area	• Impact on dams in the area • Potential loss of structures
Fire – Urban • Larimer County • Fort Collins • Loveland • Estes Park • Berthoud	• Review of past disasters • Public input • Review of past records	• Multi-hazard with HazMat • Loss of critical facilities • Impact on economy • Business failures
Fire – Wildland	• County Wildland Plan	• Potential for widespread damage

• Larimer County • Fort Collins • Loveland • Estes Park • Berthoud • Wellington	• Input from USFS • Review of past disasters	and/or destruction • Loss of watershed • Increasing population in urban interface areas
Flooding – Flash and Riverine • All Communities	• Input from city/county departments • Public input • Review of past declarations • Risk assessments • Identification of NFIP losses of properties in the region	• Repetitive losses • Region contains numerous rivers, streams, and bodies of water. • Flooding has caused loss of life and property. • All areas are undergoing development pressure along flood-prone areas.
Hail Storm • All Communities	• Public input • Review of past incidents	• Repetitive losses identified by insurance industry
Hazardous Materials – Fixed Facility • All Communities	• Public input • Risk assessments • Review of past incidents • Risk management	• Increased use in industrial setting • More than 200 businesses with registered/regulated hazardous materials
Hazardous Materials – Transportation • All Communities	• Review of railroad reports • Input from DOT, CDOT, & area Hazmat teams • Review of past incidents re: hazmat shipments	• I-25 corridor; Highways 14, 34, 85, and 287 • WIPP shipments in area • Nuclear materials transport route • Burlington Northern/Union Pacific/Great Western routes through all communities • Routes run through downtowns and heavily populated areas
Landslide/Rockslide • Larimer County • Estes Park	• CDOT records • Input from utilities • Review of past incidents	• Closes major transport routes (Highways 14 and 34) • Associated with effects of flooding, wildland fires, watershed quality
Lightning • All Communities	• National Weather Service • Review of past incidents	• Public perception of risk • Regional incident statistics
Terrorism/WMD • All Communities	• Input from public • Input from law enforcement • Input from local governments • Review of past incidents • Review of DOJ vulnerability assessment	• Centers for Disease Control Research Facility • National Wildlife Research Center • Various bio-safety labs in region • Heightened sense of security since September 2001 • Division of Wildlife facilities • Colorado Air National Guard

		Facility
Tornado • All Communities	• National Weather Service reports • Review of past disasters • Input from residents	• Frequency of occurrence • Increased growth and population in rural areas • Increased risk of property damage and/or personal injury
Utility Interruption • All Communities	• Input received during public meeting process	• Natural gas, water, and/or electric utility interruptions can be common and may lead to property damage and/or personal injury.
Wind Storm – Severe • All Communities	• National Weather Service reports • Review of past incidents • Input from OEMs	• Severe windstorms are common along the Front Range corridor • Significant property damage occurs as a result. • Associated power interruptions occur.
Winter Storm – Severe • All Communities	• Emergency response records • Business interruption reports • Traffic reports • National Weather Service reports • News articles • Public input • Utility input	• Economic negative impact • Damage to property • Risk of personal injuries • Flooding • Traffic interruption • Utility interruption • School system interruption • Emergency delays • Infrastructure interruptions

HAZARDS CONSIDERED BUT NOT ADDRESSED: Historical data did not support the inclusion of the following hazards in most cases. Natural Hazards examined but not addressed included: coastal erosion, coastal flood, tsunami, and volcano. Because the state of Colorado is located in the interior of the country, it was determined that the possibility of ocean-related hazards was non-existent. Additionally, there are no active volcanoes proximal to the region. Man-Made and Hazardous Materials Hazards examined but not addressed included: levee failure, mass casualty, and National Security Emergency. There are no levees, current or planned, within the region. It was determined that a mass casualty incident can result from any type of hazard and/or large scale incident and such incidents are addressed within each agency's Emergency Response Plans. It should also be noted that a National Security Emergency is a generic label for a wide variety of specific emergencies that may arise. These specific emergencies were addressed in the specific hazard assessment and profile.

HAZARDS CONSIDERED BUT NOT ADRESSED FOR CERTAIN COMMUNITIES WITHIN THIS PLAN:

1. Fort Collins-After examination, it was determined that the hazards of Avalanche and Landslide/Rockslide were not significant risks, or would minimally impact the City of Fort Collins.
2. Loveland- After examination, it was determined that the hazards of Avalanche and

Landslide/Rockslide were not significant risks, or would minimally impact the City of Loveland.

3. Estes Park- After examination, it was determined that the hazards of Aircraft, Avalanche, Civil Disturbance and Drought, were not significant risks, or would minimally impact the Town of Estes Park.
4. Wellington- After examination, it was determined that the hazards of Aircraft, Avalanche, Civil Disturbance, and Landslide/Rockslide were not significant risks, or would minimally impact the Town of Wellington.
5. Berthoud- After examination, it was determined that the hazards of Aircraft, Avalanche, Civil Disturbance, and Landslide/Rockslide were not significant risks, or would minimally impact the Town of Berthoud.

**All identified hazards will be re-examined in future updates of this Plan.*

Section 4.1: Profiling Hazards
Definitions:

Frequency: how often the event is likely to occur

Highly likely:	Near 100% probability in next year
Likely:	Between 10% and 100% probability in next year, or at least one chance in next 10 years.
Possible:	Between 1% and 10% probability in next year, or at least one chance in next 100 years.
Unlikely:	Less than 1% probability in next 100 years.

Magnitude: percentage of the jurisdiction that can be affected

Catastrophic:	more than 50%
Critical:	25%-50%
Limited:	10%-25%
Negligible:	less than 10%

Speed of Onset: probable amount of warning time

Minimal or no warning

6-12 hours warning

12-24 hours warning

More than 24 hours warning

Hazard: Aircraft Accidents

Frequency:	**Likely: 10% - 100% in next year, or at least one chance in next 10 years**
Potential Magnitude:	**Limited: 10% - 25%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**Any area in the cities and/or county due to air traffic patterns. All geographic areas involved in this Plan.**
Influencing Factors:	**Prevalence of wind shear and thunderstorms, proximity to mountain range**

Description

Aircraft accidents can occur at any location, with significant differences in magnitude due to the size of aircraft, altitude of the incident, and population density at the crash site and/or debris field. The cities of Fort Collins and Loveland, and Larimer County, are subject to potential aircraft accidents. The cities of Loveland and Fort Collins share a municipal airport that offers limited commercial service. The Fort Collins-Loveland Municipal Airport primarily handles small aircraft and helicopters, along with various larger private and commercial aircraft. The airspace above this region is utilized and controlled by Denver Center, which also services the Denver International Airport (DIA). The City of Fort Collins operated the Fort Collins Downtown Airport until 2005, when it was permanently closed. Larimer County experienced several aircraft accidents while controlling wildland fires during 2001. The Federal Aviation Administration and National Transportation Safety Board have reviewed reports from all included incidents. Their information will be utilized as data for action items within this plan.

Since the original development of this Plan, the Poudre Valley Health System's Medical Center of the Rockies, a five-story, Level II regional trauma center, began operation within the City of Loveland. This medical center lies in the glide path at the south end of the runway for the Fort Collins-Loveland Municipal Airport. In addition, the airport now services Allegiant Airlines, a Nevada-based commercial air carrier providing daily direct flights to Las Vegas using an MD-80 aircraft.

Table 4.2: Aircraft Accidents

Event Date	Location	Make / Model	Registration Number	Event Severity	Type of Air Carrier Operation and Carrier Name (Doing Business As)
4/6/2008	Fort Collins, CO	Cessna 170B	N2232D	Nonfatal	Part 91: General Aviation
1/2/2008	Loveland, CO	Cessna 152	N24965	Nonfatal	Part 91: General Aviation
8/13/2007	Fort Collins, CO	Cessna 172R	N249FS	Nonfatal	Part 91: General Aviation
7/3/2007	Loveland, CO	Cessna T210N	N5129C	Nonfatal	Part 91: General Aviation
7/1/2007	Loveland, CO	Cessna 180A	N180EV	Nonfatal	Part 91: General Aviation
8/19/2006	Loveland, CO	Stallings VariEze	N23HS	Fatal (2)	Part 91: General Aviation
7/7/2006	Masonville, CO	Airbus A319-131	N839UA	Nonfatal	SCHD Part 121: Air Carrier United Airlines
4/11/2006	Fort Collins, CO	Cessna TR182	N729SC	Nonfatal	Part 91: General Aviation
8/7/2005	Fort Collins, CO	Sheel Vans RV-8	N5754S	Fatal (1)	Part 91: General Aviation
8/6/2005	Fort Collins, CO	Cessna 172RG	N5136R	Nonfatal	Part 91: General Aviation
7/19/2005	Loveland, CO	Hughes 369FF	N530TJ	Nonfatal	Part 91: General Aviation
5/10/2005	Fort Collins, CO	Champion 7ECA	N11065	Nonfatal	Part 91: General Aviation
4/3/2005	Fort Collins, CO	Beech E55	N3FJ	Fatal (1)	Part 91: General Aviation
2/2/2005	Loveland, CO	Cessna 172N	N618MN	Nonfatal	Part 91: General Aviation
11/16/2004	Loveland, CO	Cessna 172P	N54165	Nonfatal	Part 91: General Aviation
11/12/2004	Fort Collins, CO	Blair-American USA	N1518	Incident	Part 91: General Aviation
11/12/2004	Fort Collins, CO	Cessna 152	N5531P	Incident	Part 91: General Aviation
7/24/2004	Fort Collins, CO	Beech 58P	N69CL	Fatal (3)	Part 91: General Aviation
6/13/2004	Fort Collins, CO	Northwing WS2	UNREG	Nonfatal	Part 91: General Aviation
3/7/2004	Berthoud, CO	Shook Rans S-12	N7138K	Nonfatal	Part 91: General Aviation

*Table 3.2 is a complete list of incidents investigated by the National Transportation Safety Board for the plan area between November 1, 2003, and July 30, 2008. All information below was obtained from the same source.[23]

[23] http://www.ntsb.gov/ntsb/

History of Recent Accidents

On August 19, 2006, at approximately 1921 hours Mountain Daylight Time, a Stallings VariEze, N23HS, a privately operated airplane, was destroyed when it struck terrain while maneuvering approximately two miles north of Loveland, CO. The pilot and pilot-rated passenger were both fatally injured in the accident.

On July 7, 2006, at approximately 0800 hours Mountain Daylight Time, an Airbus A319-131, N839UA, owned and operated by United Airlines Inc, encountered turbulence at 17,000 feet mean sea level near Masonville, CO. One passenger fractured an ankle during the turbulence. The flight continued to Denver International Airport as scheduled.

On April 11, 2006, at approximately 1330 hours Mountain Daylight Time, a Cessna TR182, N729SC, a privately operated airplane, sustained substantial damage when it impacted terrain during a forced landing following a loss of engine power in cruise flight. The owner and sole occupant was not injured.

On August 7, 2005, at approximately 0900 hours Mountain Daylight Time, a Sheel Vans RV-8, N5754S, a privately operated airplane, sustained substantial damage when it impacted terrain during a descent. There were no injuries as a result of this accident.

On July 19, 2005, at approximately 1515 hours Mountain Daylight Time, a Hughes 369FF single-engine helicopter, N530TJ, registered to the United States Department of Agriculture – Rocky Mountain Region Forest Service, was destroyed when it impacted trees and terrain following a loss of control while hovering during firefighting operations approximately 20 miles west of Loveland, CO. The commercial pilot and sole occupant of the helicopter received minor injuries in the accident.

On May 10, 2005, at approximately 1000 hours Mountain Daylight Time, a Champion 7ECA, N11065, a privately operated airplane, was destroyed when it impacted a tree and terrain during the initial climb from the airport. The pilot and passenger received minor injuries.

On April 3, 2005, at approximately 1450 hours Mountain Daylight Time, a Beech E55, N3FJ, a privately operated airplane, was destroyed when it departed controlled flight during an aborted (balked) landing or attempted go-around and impacted a parking lot and industrial building adjacent to the Fort Collins Downtown Airport. The pilot and sole occupant of the airplane was killed in the accident.

On July 24, 2004, at approximately 1207 hours Mountain Daylight Time, a Beech 58P, N69CL, a privately operated airplane, was destroyed when it impacted terrain in a residential area of Fort Collins, CO. The pilot and two passengers sustained fatal injuries as a result of the accident.

On June 13, 2004, at approximately 1230 hours Mountain Daylight Time, a Northwing WS2, an unregistered ultralight, was destroyed when it impacted a cornfield adjacent to Yankee Field, an ultralight airstrip five miles northeast of Fort Collins, CO. The non-certified pilot was seriously injured.

On March 7, 2004, at approximately 1715 hrs Mountain Standard Time, a Shook Rans S-12, N7138K, a privately operated airplane, was substantially damaged when the landing gear collapsed following collision with terrain at the Lazy W private airstrip near Berthoud, CO. There were no injuries reported as a result of the accident.

By reviewing accident reports, it can be seen that aircraft accidents typically result in most of the property damage being contained to the aircraft. However, commercial and residential property damage is not uncommon, and additional forest fires have resulted from crashes during firefighting operations. The opportunity for an aircraft accident involving a populated area increases with community growth and the increase in air traffic volume over the geographic region addressed in this Plan.

Assessing Vulnerability

Larimer County: Larimer County as a whole is at minimal risk for aircraft accidents. During the last several years, serious aircraft accidents have occurred in unincorporated areas of the county, but most have been attributed to wildland firefighting. As the hazard of drought and wildland fire increases, the risk of aircraft accidents while fighting these wildland fires will also increase. Aircraft traffic for wildland firefighting activities is at a greater risk of accidents than is normal aircraft traffic.

Fort Collins: The volume of air traffic over the City of Fort Collins is currently minimal. Fort Collins Municipal Airport is no longer in service, but there are a small number of aircraft service centers in the area. Air traffic patterns impact all areas of Fort Collins, with a higher concentration south of the city towards the Fort Collins-Loveland Municipal Airport. Air traffic will continue to increase with growing populations. Building density also increases the impact of an aircraft accident. Airspace above Fort Collins is utilized and controlled by Denver Center which also services Denver International Airport (DIA). It is also important to mention that Poudre Valley Hospital has a helipad for accommodating emergency helicopter traffic. The immediate hazard area from this landing site would include the hospital and surrounding residential areas during landing and take-off of these rotor-blade aircraft.

Loveland: The volume of air traffic over the City of Loveland is currently significant. The Fort Collins-Loveland Municipal Airport services small personal aircraft, helicopter traffic, as well as both small and large commercial jet traffic. Air traffic patterns impact all areas of Loveland with a higher concentration north and east of the city. Air traffic will continue to increase with growing populations. Building

density also would increase the impact of an aircraft accident. Much of the land use around and immediately adjacent to the airport is commercial. However, some residential subdivisions currently exist near the airport and others may be planned for the area north and west of the facility. One area of specific concern is the Medical Center of the Rockies (MCR) campus. MCR is a level II regional trauma center, with two attached medical office buildings, which lies along the glide path approximately one mile south of the primary runway for the Fort Collins-Loveland Municipal Airport. Airspace above Loveland is utilized and controlled by Denver Center, which also services the Denver International Airport.

Hazard Mitigation Action Items

Loveland, Fort Collins, Larimer County: The Fort Collins-Loveland Municipal Airport is the Recommended Coordinating Organization for this hazard. They have a Master Plan that is currently in place. This Master Plan is reviewed and updated by the airport manager on an annual basis to ensure that it remains current and accurate. Several potential mitigation-related projects were identified in the Master Plan. These projects include:

1. Work with the Transportation Safety Administration to be prepared for aircraft-related emergencies: TSA is constantly changing regulations to the ever changing security threats. As such we recently had to install fencing and access gates to secure the hangar areas. This high priority project is ongoing until the airport parameter is completely fenced (6' chain link with 1' barbed wire on top). With the hangar areas secured TSA mandated that we access badge all of the tenants, airplane owners, business owners, employees and anyone that has access to the Airport Operations Area (AOA). The airport went from having 44 badges to 590 to date. This required the airport to have its own stand alone badge access system. Fence and Gates, $480,000 to date, $400,00 to go. Badging $30,000 to date.

2. Establish and maintain runway protection zones: The airports protections zones are established by zoning and are constantly threatened by development. This is high priority. Staff attend planning meetings and keep planners and developers informed of the airports influence areas.

3. Pursue property acquisitions on lands adjacent to Airport property: No land acquisitions to date, but discussions with FAA have started in regard to the dairy NW of the airport. This is medium priority.
4. Extend the length of the primary runway: The runway extension is tentatively planned for 2012. The environmental assessment will begin this coming summer and will take a year and a half to complete. After the assessment the design will start construction late summer 2012. This is medium priority.

5. Increase the width and potential of the cross-wind runway: The FAA says no funding of crosswind runways, which means we will take money from Loveland Fire Department to fund expansion. This is low priority.
6. Install a new runway parallel to the primary runway: Install new and improved approach lighting for the main runway: This is a long range planning item and will be reviewed yearly with the 6 year CIP update. This is low priority.
7. Construct and staff an air traffic control tower: This is a long range planning item and will be reviewed yearly with the 6 year CIP update. This is low priority.
8. Construct a larger passenger terminal building: This is a long range planning item and will be reviewed yearly with the 6 year CIP update. This is low priority.

In addition to the projects identified above for the Fort Collins-Loveland Municipal Airport, the Loveland Fire & Rescue Department has a fire station on the airport property that is staffed by a crew of firefighters certified in aircraft rescue and firefighting (ARFF). This ARFF-certified staff trains on a regular basis to maintain their skills and abilities. They also conduct quarterly inspections of the airport facilities and fuel delivery vehicles. Loveland Fire and Rescue is planning to purchase a new ARFF fire truck will be ordered next fall, takes one year to build, and will be funded through the FAA 2011 grant. This is high priority.

In addition, the public safety agencies in Larimer County participate in periodic "disaster drills" involving the airport as required by Federal Aviation Administration (FAA) requirements. The purpose of these drills is to simulate potential aircraft-related disasters at and/or near the airport property in order to evaluate the preparedness of the communities for such an incident. These drills also allow the public safety agencies in these communities to re-examine their response plans and to adjust them as needed for deficiencies or issues identified during the drill process. The public and news media are invited to observe and/or participate in these drills. The purpose of this involvement is to increase public awareness of the issues surrounding this hazard, as well as to provide an opportunity to educate the public about associated emergency response needs and issues.

Public safety agencies in the Larimer County area also perform post-incident critiques of all aircraft-related disasters that do occur within their jurisdictions. These critiques, in conjunction with periodic tabletop exercises, allow emergency responders to evaluate real or potential responses to emergencies, discuss pros and cons to specific response plans, and update or modify agency plans as needed to address identified issues.

Hazard: Avalanche

Frequency:	**Highly likely: Near 100% probability in next year**
Potential Magnitude:	**Negligible: less than 10%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**Mountainous areas**
Influencing Factors:	**Wind, slope, precipitation, human activity**

Description

An avalanche is a mass of snow, ice, and other debris that flows and/or slides rapidly down a steep slope. If conditions are perfect, an avalanche can reach speeds in excess of 150 mph. An avalanche needs a steep slope, snow cover, a weak layer within the snow cover, and a triggering incident. Most avalanche accidents are caused by slab avalanches which are triggered by the victim or a member of the victim's party. However, any avalanche may cause injury or death and even small slides may be dangerous. Distinctions between geographic areas, elevations, slope aspects, and slope angles are approximate, and transition zones between dangers exist. No matter what the current avalanche danger, there are designated avalanche-safe areas in the mountains.

Avalanches can be triggered by either natural causes such as earthquake, thermal changes, or blizzards, or by human activities such as snowmobiling, skiing, or hiking. The greatest threat of avalanche is in the mountainous area of Larimer County. While avalanches are quite common in the mountains, the risk of personal injury or property damage from avalanche is minimal due to the remote location. There is minimal development in mountainous areas where avalanches occur. Furthermore, there is usually a small number of people in the area when avalanches occur.

History of Recent Accidents

On December 2, 2007, a snowboarder was caught in an avalanche in an area identified as "Hot Dog Bowl," located immediately southeast of Cameron Pass. Though the victim was dug from the debris field by two companions and transported to an area hospital, he did not recover from the burial and associated injuries and died several days later.

On March 13, 2007, a party of seven people was skiing in the backcountry north of Cameron Pass and triggered an avalanche. One person was completely buried in the avalanche and was rescued by others in the group.

On January 1, 2006, seven snowmobile riders triggered and were caught in an avalanche near Trap Lake, approximately 3-½ miles from Cameron Pass. Five of the riders were partially buried, two were completely buried and killed.

In March 2003, an avalanche occurred within Rocky Mountain National Park and completely destroyed the unoccupied Chasm Meadow Cabin. There was no known human trigger for this avalanche.

Assessing Vulnerability

Larimer County: Larimer County has in excess of 1300 square miles of mountainous terrain, where the threat of avalanche exists. Though the potential magnitude is relatively small, the almost certain probability of occurrence warrants addressing the hazard in this plan.

Hazard Mitigation Action Items

Due to the rarity of human injury or death from avalanches, mitigation efforts for this hazard focus on public education and prevention. Larimer County, Colorado State Parks, the National Park Service, and the U.S. Forest Service all provide avalanche safety and other educational materials to visitors of the avalanche-prone areas. Prevention is accomplished through educational signs as well as internet-based education and personal contacts with winter sports enthusiasts. Visual evaluation of avalanche-prone areas, followed by periodic blasting of areas that are determined to be at high risk for avalanche, is another prevention measure being employed by land managers and transportation coordinators in effected areas.

The State of Colorado Natural Hazards Mitigation Plan states, "The cheapest and safest way to prevent property damage and save lives is to stay out of avalanche paths and runout zones in winter."[24] The Colorado plan also recommends:

- Applying directional control of blowing and drifting snow by erecting snow fences to keep snow away from avalanche starting zones.
- Implementing planned releases of small snowslides with explosives before the snow accumulation increases the destructive potential to unmanageable proportions.
- Building snow sheds over particularly dangerous sections of railroad and highway.
- Constructing diversion structures to divide potential avalanches around identified critical structures and/or facilities.

Though CDOT and or private contractors would be the Recommended Coordinating Organizations for Avalanche, Larimer County Emergency Services (LCES), an operational division of the Larimer County Sheriff's Office (LCSO), is the agency with primary response authority to avalanche-related emergencies. Employees of the U.S.

[24] State of Colorado Natural Hazards Mitigation Plan, page Hazards-6.

Forest Service and Colorado State Parks also frequently provide backcountry patrol and safety enforcement of popular snowmobile and cross country ski areas in the region. In addition, the Colorado Avalanche Information Center (CAIC) maintains a website that provides up-to-date avalanche hazard information and education for the general public. The region's action items for avalanche hazard mitigation include:

1. Limit land use within avalanche-prone areas, whenever practical, to outdoor recreation. This is a high priority, on-going action item.
2. Provide avalanche and wilderness safety presentations throughout the winter season. This is a medium priority, on-going action item
3. Promote the Colorado Avalanche Information Center (CAIC) website. This is a medium priority, on-going action item.
4. Support the CAIC's mission and goals through public interaction and information sharing of backcountry safety and avalanche awareness messages. This is a medium priority, on-going action item.
5. Encourage frequent winter backcountry visitors to register as a Friend of the CAIC so they may receive twice daily email updates of current avalanche conditions. This is a medium priority, on-going action item.
6. Work with appropriate agencies to ensure that hazard warning/information signs remain posted at identified backcountry access points. This is a low priority, on-going action item.
7. Identify areas at extreme risk of avalanche and use explosives or other means to trigger an avalanche under controlled / supervised conditions. This is a medium priority, on-going action item.
8. Work with appropriate transportation departments and utility providers to assess highways and utility easements in avalanche-prone areas, and determine if snow sheds and/or diversion structures are needed. This is a medium priority, on-going action item.

Hazard: Biological Hazards / Influenza

Frequency:	**Likely : between 10% and 100% probability in next year, or at least one chance in next 10 years**
Potential Magnitude:	**Critical: up to 50%**
Speed of Onset:	**More than 24 hours warning**
Geographical Area Affected:	**All geographic areas**
Influencing Factors:	**Human susceptibility to disease and infection**

Description

Biological hazards were of somewhat limited probability and scope prior to the advent of recent modern terrorism. The exception to that was and is naturally occurring disease such as pandemic influenza, which will be the primary focus of this examination.

Recognition of a biological hazard can occur through several methods, including identification of a credible threat, discovery of bioterrorism evidence (devices, agents, clandestine lab), diagnosis (identification of a disease caused by an agent identified as a possible bioterrorism agent), and detection (gathering and interpreting public health surveillance data). When people are exposed to a pathogen such as anthrax they may not know that they have been exposed. Those who are infected, or subsequently become infected, may not feel sick for some time. This delay between exposure and onset of illness is characteristic of infectious diseases.

Until anthrax attacks of October, 2001, the use of biological agents by terrorists has been for small-scale attacks (assassination) using biotoxins rather than active biological gents. No terrorist group is currently assessed to have the technical capabilities to produce and execute a large-scale bio-attack without foreign government sponsorship. However, concern for bioterrorism (or a natural pandemic like the 1918 Influenza) remains high. A bioterrorist attack may be subtle and difficult to recognize. Medical surveillance and reporting is critical for containment.

Bioterrorism is a significant threat to agriculture and livestock and one which local, state and federal officials and responders have been working to address with response protocols since before September 11, 2001. These response plans have been written by and are under the jurisdiction of state authorities and will not be included herein.

As noted, pandemic influenza is a concern and all planning and mitigation efforts including the local development of mass immunization clinics and protocols originally grew out of the biological hazard threat posed by, e.g. small pox. The probability of our having to confront small pox versus the spontaneous introduction of highly pathogenic avian influenza (H5N1) caused all Larimer County entities to refocus our planning and mitigation efforts in this area, with the recognition that lessons learned with that effort are useable in many other response efforts.

There are a number of planning assumptions regarding this threat:

- Once efficient human-to-human transmission of a novel influenza strain becomes established, Illness will spread quickly and globally. We cannot keep pandemic flu out of Larimer County. We will have little lead time between when a pandemic is first declared by the WHO and when it spreads to our county.
- Assistance from the federal government, state, and neighboring counties will be limited or unavailable.
- The clinical disease attack rate will likely be 30% or higher in the overall population during the pandemic, which may occur in waves. Absenteeism rates in all sectors may be high due to illness, caring for sick family members, or looking after children (if schools close).
- Essential community services, such as electricity, drinking water treatment, fuel, heat (depending on the season), food distribution, and public safety services may be at risk. It will be crucial to ensure their functioning to prevent additional deaths and disease. Supply chains may be disrupted.
- Prior to the pandemic and the observation of its epidemiology, it will be difficult to predict what groups may be at highest risk.
- Although the health sector may be significantly affected even by a mild pandemic or severe seasonal flu outbreak, the county as a whole would need to plan primarily for a severe pandemic.
- In the short term, vaccine will be non-existent or very limited for 6 to 8 months, and will likely require two doses to provide protection.
- Antiviral medication will be limited and of unknown effectiveness. It will be prioritized to essential groups.
- In a severe pandemic, the health care delivery system will be overwhelmed – restructuring and prioritization of health services will be necessary.
- The Larimer County Pandemic Influenza Plan will be an evolving document, changing with community circumstances, research findings, and assessment of best practices.

Assessing Vulnerability

The recent influenza strain H1N1, originally referred to as “Swine Flu” sprang upon the world rapidly from initial reports out of Mexico in the last week of April, 2009. Initially, it seemed the mortality rate might be as bad or worse than that projected

for H5N1 in a readily transmissible form from human to human (which has yet to happen and perhaps may not).
This rapid onset and spread throughout the world was epidemiologically predictable, as was the situation where effective vaccines were at least 6 months in the making after initial virus typing. Larimer County health official organized multiple immunization clinics once vaccine was available, based on original protocols for small pox and then H5N1 and thousands were effectively protected. More would have been but for the shortage of vaccine – another valuable lesson and predictable.

Projected Estimates of Health Needs/Outcomes based on Federal Projections by Pandemic Severity (and extrapolated to Larimer County)

	Mild/Moderate	Mild/Moderate	Severe Pandemic (1918-like)	Severe Pandemic (1918-like)
	U.S	Larimer*	U.S.	Larimer*
Illnesses	90,000,000	85,757	90,000,000	85,757
Outpatients	45,000,000	42,879	45,000,000	42,879
Hospitalizations	865,000	824	9,900,000	9,433
ICU Care	128,750	123	1,485,000	1,415
Ventilators	64,875	62	745,500	710
Deaths	209,000	199	1,903,000	1,813

*Estimates based on extrapolation from past pandemics in the United States.

Estimates Based on a Range of Attack Rates and Case-Fatality Rates

Health Impact	**Number**	**Assumptions using Larimer County population of 275,000**
Total Illnesses	41,250 - 96,250	15-35% of population
Outpatient visits	16,500 - 42,350	6-15% of population
Needing hospitalization	2,062 - 9,625	5 - 10% of population
Hospitalizations needed per day at peak of outbreak	75/day to 350/day	About 25% of all cases occurring during peak week

Deaths	412 - 4,812	1%-5% of ill patients
Deaths per day at the peak of the outbreak	15/day - 172/day (Normal average of 4 deaths per day)	About 25% of all cases occurring during peak week

It is difficult to adequately project potential damages from a range of biological hazards even if know, such as small pox, let alone for those which may be novel and as yet unknown to mankind . But the charts above do represent a valid data set for extrapolation in assessing other similar hazards.

Hazard Mitigation Action Items

Based upon the Leadership and Coordination chapter of our local Influenza Response Plan, the primary focus of Larimer County, and the other communities within this plan, is on the following four areas:
1. Limit the number of illnesses and deaths
2. Preserve continuity of essential government functions
3. Minimize social disruption
4. Minimize economic losses

In order to address these four general goals, the Larimer County Health Department, in partnership with response and governmental representatives from every town or municipality in the county, among others, have worked for 5 years within the Larimer County Pandemic Steering Committee to develop realistic response plans for influenza. As noted, these protocols are readily useable as a template for biological hazards other than flu. Work by the Steering Committee continues on a regular basis.
Additionally, there have been several table top and functional exercises over the past 6-7 years examining the problem and the way we can respond. Health officials and local emergency responders have significantly improved our medical surge capacity with Homeland Security grants for supplies and responder personal protective equipment. We continue to exercise the distribution of medications from the Strategic National Stockpile and also refine aspects of the response plan. All public officials in the county are a part of this and geographical boundaries are of very little import in this, very much like the ubiquity of biological hazards knowing no political boundaries either.

Hazard: Civil Disturbance

Frequency:	**Likely: 10% - 100% in next year, or at least one chance in next 10 years**
Potential Magnitude:	**Limited: less than 10%**

Speed of Onset:	**Minimal or no warning to 6 - 12 hours**
warning	**Dependent on incident**
Geographical Area Affected:	**Incident dependent – near university, college, medical facilities, governmental buildings, or downtown areas.**
Influencing Factors:	**Political and/or social issues, local or state athletic team performance**

Description

A civil disturbance is a broad term that is typically used by law enforcement to describe one or more forms of disturbance caused by a group of people. A civil disturbance is typically a symptom and/or a form of protest against major socio-political problems, and the severity of the action may coincide with public expression(s) of displeasure. Examples of civil disorder include, but are not necessarily limited to illegal parades, sit-ins and other forms of obstructions; riots; sabotage; and other forms of crime. A civil disturbance is intended to be a demonstration to the public and the government, but can escalate into general chaos.[25] Civil disorder may be spontaneous, such as when a group suddenly erupts into violence, or it may be planned, such as a demonstration or protest intentionally interfering with another's lawful business.
Universities, industry, government officials and buildings, research laboratories, medical facilities, and downtown congested areas are all potential sites and targets for civil disturbances. All of the communities in this region have the potential to experience civil disturbances: Fort Collins is host to both the Centers for Disease Control and Colorado State University, which also has a veterinary/research school; Loveland is host to many genetic, medical, technological, and research facilities; and Larimer County hosts numerous other research facilities for genetic and other animal research.

The diverse population of the region, coupled with the presence of numerous research facilities, universities, and other avenues for active political and/or social issues, and the region's proximity to the Denver metropolitan area, contribute to the increased risk for civil disturbance.

History of Recent Incidents

The hazard of civil disturbance has a track record in the communities of Fort Collins, Loveland, and other areas of Larimer County. There were civil disturbances in these communities that caused significant damage and several injuries to the public and emergency responders. Public celebration and/or complaint has occurred after

[25] http://en.wikipedia.org/wiki/Civil_disorder

sporting events, including Colorado Avalanche hockey championship games, Denver Broncos football championship games, and Colorado State University football games. The cities of Loveland and Fort Collins have also experienced civil disturbances related to the "right to life" and choice of lifestyle movements.

Emergency service agencies involved in these type incidents included police, fire, and EMS from Fort Collins, Loveland, Larimer County, Colorado State Patrol, and Colorado State University.

Table 4.3: Sample of Documented Civil Disturbance Incidents

1987 College Daze riots for	10,000-12,000 college students involved in disturbance more than three days in Fort Collins.
1988 Baystone riots day period.	10,000 people involved in civil disturbance over three
1989 Baystone riots day period.	10,000 people involved in civil disturbance over three
1995 Football riots 3,000 people	CSU football team wins WAC Championship, nearly involved in riots over two days.
1997 Whitcomb/Howes nights of riots	More than 3,000 people involved in two consecutive on and near Colorado State University campus.
1998 Super Bowl riot Ave., the Super	3,000 to 6, 000 people involved in riots along College Mountain Ave., and Plum St. after Denver Broncos won Bowl football championship[26]
2000 Stanley Cup riot Collins championship[27]	2,000 to 3,000 people involved in riots in Old Town Fort after Colorado Avalanche won Stanley Cup hockey
2004 CSU student riots of-control campus	Fort Collins experiences two consecutive nights of out- parties, which developed into riots near the CSU

Some of the most recent civil disturbance incidents were related to the annual CSU versus University of Wyoming football game or to large parties that developed into out-of-control riots. Other such civil disturbances have occurred as protesters gathered near Pineridge Reservoir in Larimer County due to the planned removal of

[26]Fort Collins Police Services, SWAT Archives.
[27]Fort Collins Police Services, SWAT Archives.

prairie dog colonies that were reported to be infested with plague. Extremist groups such as Animal Liberation Front and the Environmental Liberation Front are known to be involved in several civil disturbance incidents in this region. Intelligence reports gathered by law enforcement indicate that several research facilities were burglarized and/or vandalized, and this included having laboratory facilities destroyed and/or research animals being released. "Right to Life" groups have made their presence known by obstructing sidewalks and entryways to certain medical facilities within the communities of Fort Collins, Loveland, and Larimer County.

Since September, 2001, several small-scale civil disturbances involving religious groups have occurred within the City of Fort Collins at local mosques.

As the population and research industry both continue to grow, the risk of civil disturbance will also continue to increase. Additionally, as professional sports teams gain greater followings from successful play, the risk of civil disturbance from "excessive celebration" also increases.

Assessing Vulnerability

Fort Collins: As past incidents have proven, all areas of Fort Collins are vulnerable to civil disturbances. Most of the area that is impacted centers around either the Colorado State University campus or the downtown (Old Town) area. Critical structure buildings that are located in this area include City Hall, county buildings, federal buildings, and Colorado State University facilities. Although the economic impact of civil disturbance has been minor in the past, the psychological impact that these incidents have on the community can be staggering.
Loveland, Larimer County: These areas have experienced vandalism activity, civil disturbances, and several arson fires. However, documented damage to buildings as a result of civil disturbance was minimal in all of these communities. Data gathered in this assessment does not support a significant risk of large scale civil disturbances. However, with the diverse populations in the communities along with growing social and political issues, and success of sports teams, the region may be at risk for increased risk of large-scale civil disturbance activity. Research facilities, industrial and/or technological operations, and certain medical facilities are the target buildings for these types of incidents. Current mitigation efforts reflect this assessment.

Hazard Mitigation Action Items

Local law enforcement agencies recently gained some extremely valuable practical experience in the arena of civil disturbance planning and operations, when officers worked in nearby Denver during the 2008 Democratic National Convention. In addition, officers routinely receive crowd control training and work large-scale public events such as Fourth of July celebrations, Colorado State University football games, and Colorado Eagles hockey games. Working this type of event provides

officers with valuable hands-on, practical experience working around large numbers of people.

Through experience, it has been determined that the best mitigation for civil disturbance is training and preparation. To that extent, each community involved in this plan has developed numerous policies, procedures, and directives to guide the employees of their various public safety departments in responding to and dealing with potential civil disturbance incidents. Action items for this hazard include:

Fort Collins:

1. In 2009, the Fort Collins Police Department (FCPD) developed plans for activation of the Police Services building Operations Room, which can serve as a EOC of sorts if necessary. A staff tabletop was conducted in June 2009 regarding the use of this room. Another tabletop is proposed for 2010 with other City emergency responders in an EOC setting. This proposed action item is medium priority.
2. Fort Collins Police, within the officer, sergeant, and lieutenant rank attend a one day training session in July of each year, with 2 hours dedicated to Mobile Field Force training, or riot control. Training is done with the department. Another one day session is proposed for 2010. This proposed action item is high priority.
3. Fort Collins Police Department sworn and non-sworn employees take NIMS and ICS100 as basic training. It has been taught annually, but will now be scaled back to being taught every two years. Almost all of the staff have received ICS at the 200 level. This on-going action item is medium priority.
4. An Operations tabletop, in part to exercise response plans, was conducted and is proposed for 2010. This is medium priority.
5. A full scale active shooter exercise is proposed for 2010. All sworn personnel will attend this training, which is done at a local school. This is active training using volunteers as victims and as suspects. Simmunition is also used to add realism to the training. Tactics, searches, room entries, suspect contact, and victim rescue are all topics taught during this training. This is high priority.
6. Fort Collins School Resource officers work with individual schools in developing and training of active shooter protocol. This on going action item is high priority.

Larimer County, Loveland (General Action Items):

1. Develop and/or maintain emergency operations plans involving all local emergency responders.
2. Encourage local law enforcement officers to attend civil disturbance-related courses at the FEMA Emergency Management Institute.
3. All communities involved in the development of this Plan have identified employees who may become involved in potential incident responses to civil disturbances. These identified employees have completed the National

Incident Management System (NIMS) training appropriate to their level of responsibility.

4. Work with local school district safety committees to plan for and be prepared for possible disturbances at school district facilities.
5. Conduct annual emergency training exercises (table-top, functional, and/or full-scale exercises) to evaluate response plans.
6. Provide inter-agency training opportunities to improve the capabilities of local horse-mounted law enforcement units.
7. Develop plans to increase the number of local law enforcement K-9 units. Each dog costs approximately $6,000 to purchase untrained. Training consists of approximately 10-weeks of off-site training, plus at least 18 hours of training per month.
8. Develop plans to increase the number of horse-mounted law enforcement units.
9. Incorporate law enforcement K-9 units into horse-mounted law enforcement training programs whenever possible.
10. Purchase additional less-lethal weapons for local law enforcement agencies. Options currently being addressed include Tasers, which cost approximately $1,000 per unit, and pepper-ball shotguns, which cost approximately $850 per unit.
11. Local law enforcement agencies maintain active and well-trained SWAT teams. Local fire and EMS agencies are incorporated into the SWAT training to improve intra-agency working relations during crisis response.

Hazard: Dam Failure

Frequency:	**Possible: 1% and 10% probability in next year, or at least one chance in next 100 years**
Potential Magnitude:	**Limited: 10% to 25% to Catastrophic: more than 50%**
Speed of Onset:	**Minimal to several hours, depending on location and size of failure**
Geographical Area Affected:	**Most geographic areas included in this plan (Fort Collins, Loveland, Estes Park, Berthoud and Larimer County)**

Influencing Factors:	**Heavy rains, inadequate maintenance practices**

Definition

Dams are considered "installations containing dangerous forces" under International Humanitarian Law due to the massive impact of a possible destruction on the civilian population and the environment. Dam failures are comparatively rare, but can cause immense damage and loss of life when they occur.[28] The hazard of a dam failure is determined by the potential loss of life and downstream property damage it may cause, and not by any characteristics of the dams themselves. There are many reasons and/or potential causes for dam failure, such as terrorism, earthquake, rapid erosion, etc. However, the most common reasons for dam failure are spillway design error, geologic instability, poor maintenance, extreme rainfall, and dam design error.[29]

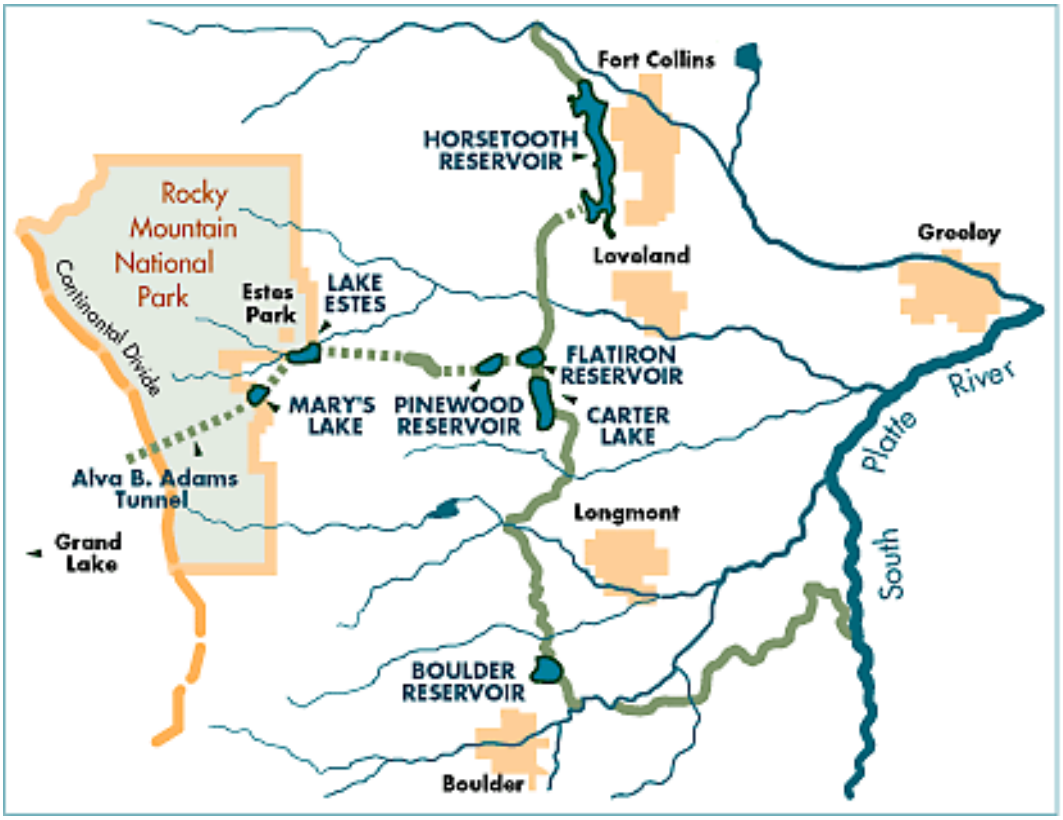
Hydraulic failures result from the uncontrolled flow of water over, around, and adjacent to the dam (i.e.: the erosion action of the water on the dam and its foundation). Earthen dams are susceptible to overtopping, foundation defects, seepage, and structural failure. **Overtopping** is often a precursor of dam failure, where water flows over the upper surface of the dam rather than through its intended or designed path of travel. Overtopping results in approximately 34% of all dam failures. **Foundation defects** cause approximately 30% of all dam failures. **Seepage** is present in almost all dams. Seepage, if not monitored and uncontrolled, can erode material from the downstream slope or foundation and work backward toward the upstream slope to create a "scour hole," which can lead to a complete failure of the structure. Seepage accounts for approximately 20% of all dam failures.[30] **Structural failure** involves the rupture or movement of monolithic components of the dam and its foundation. This is a particularly important hazard on large earthen dams and on dams built of low strength material such as silts.[31]

Description

Pinewood Reservoir, Flatiron Reservoir, Carter Lake, and Horsetooth Reservoir are all located in the foothills immediately west of the cities of Fort Collins and Loveland. These water storage facilities are all part of the U.S. Bureau of Reclamation's Colorado-Big Thompson Project (see Map # 3.1). Carter Lake, Pinewood Reservoir, and Flatiron Reservoir are located in southwestern Larimer County, west of Loveland. Horsetooth Reservoir is located in the foothills west of Fort Collins. Additional large water storage facilities in the area include Joe Wright Reservoir and Long Draw Reservoir (west of Fort Collins near Cameron Pass) and Horseshoe Lake and Boyd Lake (east Loveland).

Map 4.1: Colorado-Big Thompson Water Project and Regional Reservoirs

[28] http://en.wikipedia.org/wiki/Dam_failure
[29] http://en.wikipedia.org/wiki/Dam_failure
[30] http://www.damsafety.org/news/?p=412f29c8-3fd8-4529-b5c9-8d47364c1f3e
[31] Dams and Other Disasters: A Century of the Army Corps of Engineers in Civil Works, Morgan, Arthur E., 1971.



Source: Northern Colorado Water Conservancy District

The Colorado-Big Thompson (C-BT) Project is operated by the U.S. Bureau of Reclamation and Northern Colorado Water Conservancy District. The C-BT Project is the largest transmountain water diversion project in Colorado. Built between 1938 and 1957, the C-BT Project provides supplemental water to 30 cities and towns. The water is used to help irrigate approximately 693,000 acres of northeastern Colorado farmland. Twelve reservoirs, 35 miles of tunnels, 95 miles of canals, and 700 miles of transmission lines comprise this complex collection, distribution, and power system. The C-BT system spans 150 miles east to west and 65 from north to south.[32] The project is of vital importance to the communities of Larimer County, Fort Collins, and Loveland, as well as to most of northeastern Colorado.

Lily Lake, Sprague Lake, and Lake Estes are all located near Estes Park, CO, or in nearby Rocky Mountain National Park. Lake Estes, a feature of the C-BT Project, is formed by the Olympus Dam across the Big Thompson River. The afterbay storage in Lake Estes and the forebay storage in Mary's Lake enable the Estes Park-Foothills Power System to meet daily variations in energy demand.

History of Incidents

[32] http://www.ncwcd.org/project_features/cbt_main.asp

The Lawn Lake dam failure occurred at approximately 0530 hours Mountain Daylight Time on July 15, 1982. Lawn Lake dam, a 26-foot high earthen dam located at 11,000 ft. in Rocky Mountain National Park, CO, failed due to years of disrepair and neglect. Full breach development was estimated to have taken approximately ten (10) minutes. The dam released 674 acre-feet, or 29 million gallons, of water at an estimated peak discharge of 18,000 cubic feet per second (cfs) down the Roaring River Valley. [Note: a class 5 rapids run, which is considered very dangerous, is rated at 5,000 cfs.] At this rate, the lake emptied in about one (1) minute. In the Roaring River Valley, the flood wave was described as a wall of water 25 to 30 feet high. Three people were killed and damages totaled more than $31 million.

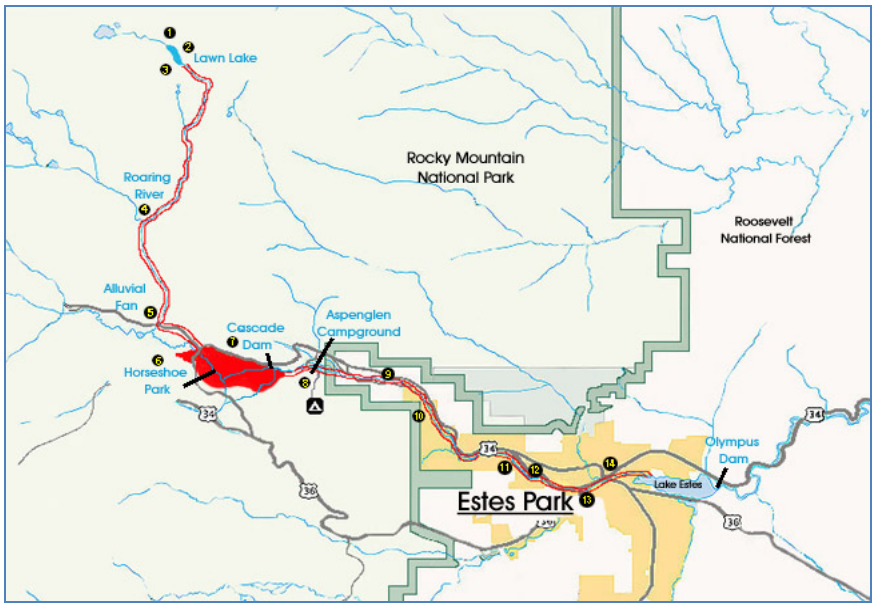
The Colorado State Engineer determined that the probable cause of failure was deterioration of lead caulking used for the connection between the outlet pipe and the gate valve. The resulting leak eroded the dam's earthen fill and led to failure of the embankment.[33] The resort community of Estes Park sits 12 miles to the east, and approximately 3,500 feet below Lawn Lake. At approximately 0830 hours, the floodwaters from Lawn Lake came through the downtown area at the rate of more than 8,500 cubic feet per second.[34]

The flood "destroyed 18 bridges, damaged road systems (particularly Fall River Road), inundated 177 businesses (75% of Estes Park's commercial activity), and damaged 108 private residences. Most businesses reported 3 to 4 ft. of water, and as much as 1 to 2 ft. of mud in their establishments."[35]

This is the only rapid dam failure know of in this area. Several dams along Horsetooth Reservoir and Carter Lake have experienced seepage, and one smaller dam at Dixon Reservoir just west of Fort Collins has experienced overflow from a severe rain storm in July of 1997.

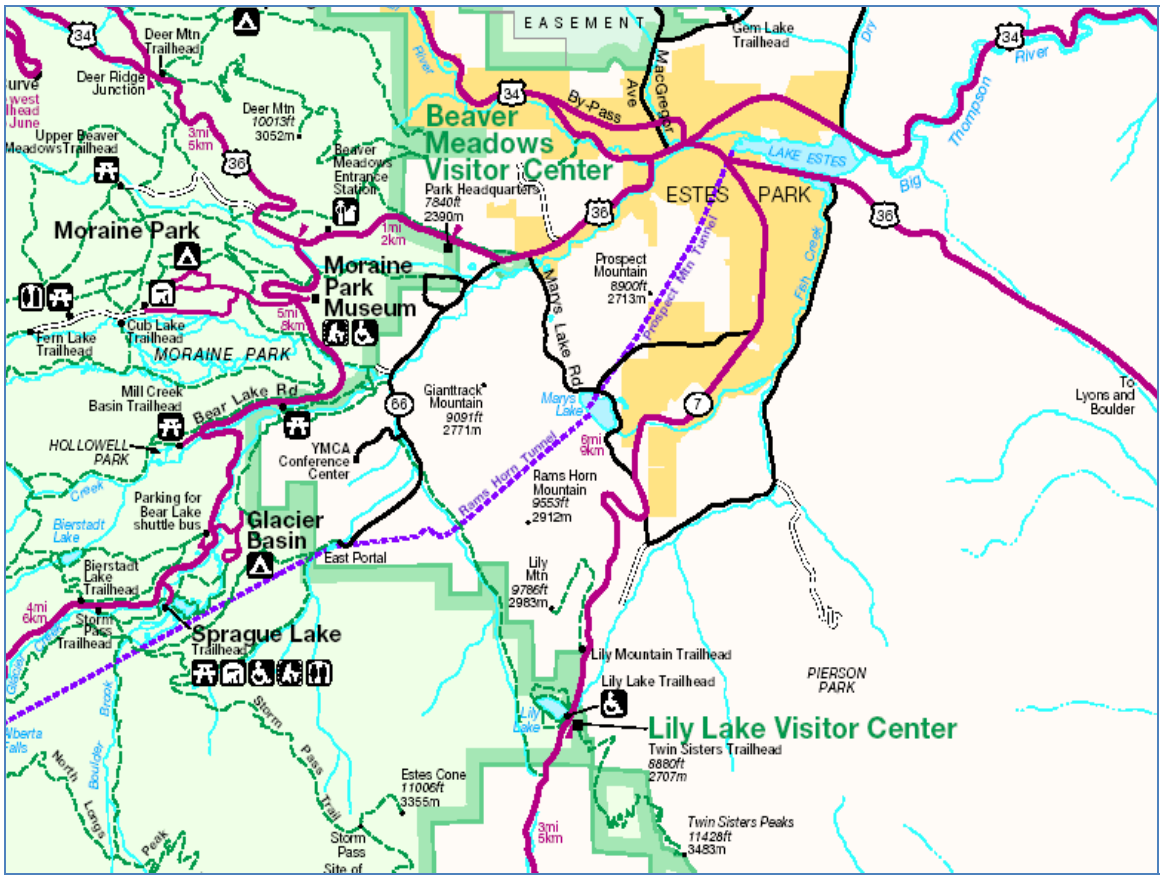
Map 4.2: The Lawn Lake Dam Failure and Flood Route

[33] http://www.estesnet.com/82flood/
[34] http://www.estesnet.com/82flood/
[35] Hydrology, Geomorphology, and Dam-Break Modeling of the July 15, 1982 Lawn Lake Dam and Cascade Dam Failures, Larimer County, Colorado. US Geological Survey Open File Report 84-612.



Source: *http://www.estesnet.com/82flood/interactive%20map1.aspx*

Map 4.3: Lily Lake, Sprague Lake, Lake Estes, and Big Thompson River



Source: Rocky Mountain National Park

Local Dam/Reservoir/Lake Information:[36]

Carter Lake - 3 dams

Located in the foothills west of Loveland, Carter Lake contains approximately 85,000 acre-feet of water that is used for recreation, domestic, and agriculture water supply.

Flatiron Reservoir

Located northwest of Carter Lake, Flatiron Reservoir contains approximately 760 acre-feet of water that is used for recreation and domestic and agriculture water supply.

Green Ridge Glade Reservoir

Located west of Loveland, adjacent to the city's water treatment plant, Green Ridge

Glade Reservoir contains approximately 6,835 acre-feet of water and is used for domestic water supply for the City of Loveland.

Horsetooth Reservoir – 4 dams

[36] U.S. Department of Interior – Bureau of Reclamation.

Located just west of Fort Collins, Horsetooth Reservoir contains approximately 151,000 acre-feet of water that is used for recreation and domestic and agriculture water for Fort Collins, Greeley, and surrounding areas.

Joe Wright Reservoir

Located in the mountains west of Fort Collins near Cameron Pass, Joe Wright Reservoir contains approximately 7,161 acre-feet of water that supplies Fort Collins via the Poudre River. It is used for recreation and domestic and agriculture water supply.

Lake Estes and Olympus Dam

Located just east of Estes Park, Lake Estes contains approximately 2,068 acre-feet of water that is used for recreation, domestic and agricultural water supply, and hydroelectricity for Estes Park and the surrounding area.

Lily Lake

Located south of Estes Park, Lily Lake contains approximately 80 acre-feet of water that is used for limited recreation. Its outflow feeds the Big Thompson River.

Long Draw Reservoir

Located in the mountains west of Fort Collins near Cameron Pass, Long Draw Reservoir contains approximately 10,800 acre-feet of water that is used for recreation and domestic and agriculture water supply.

Pinewood Reservoir and Rattlesnake Dam

Located west of Carter Lake, Pinewood Reservoir contains approximately 21,080 acre-feet of water that is used is for recreation and domestic and agriculture water supply.

Sprague Lake

Located southwest of Estes Park, Sprague Lake contains approximately 80 acre-feet of water that is used for limited recreation. Its outflow feeds the Big Thompson River.

Assessing Vulnerability

The Horsetooth Reservoir dams and the Carter Lake dams are classified by the U.S. Bureau of Reclamation as high-threat dams due to the high volume of water that they normally hold and the population density downstream. An additional 107 smaller dams are located in the vicinity of the communities covered in this Plan. Failure of any eastern dam along the length of Horsetooth Reservoir would result in

up to twenty feet of water reaching the downtown Fort Collins area in less than two (2) hours. This would result in extensive property damage to critical facilities, in personal injury, and in loss of life. Flood studies relative to all major dams in the Plan area are well documented, including flood wave activity. The results show extensive damage to all areas in this Plan. Supporting documents may be obtained from the appropriate communities. As growth continues in these areas, the impact will increase. It is worth mentioning that dams at both Horsetooth Reservoir and Carter Lake have recently undergone major renovation. All areas in this Plan are exposed to the hazard and consequences of dam failures. Most flooding will follow areas that are already within the 100 year flood plain. Developments that are near, but not currently in, the 100 year flood plain will be impacted. A rapid dam failure will cause catastrophic results in Fort Collins, Loveland, and in Larimer County. Massive amounts of water released will not be managed with systems that are currently in place.

The dams at Carter Lake also recently underwent major renovation. Carter Lake Dam #1 is classified as a high threat dam due to the high volume of water and population density downstream. The continued growth patterns in the area downstream of Dam #1 will increase the potential for property damage and life loss.

Failure of dams at Flatiron Reservoir, Pinewood Reservoir, Lake Estes, Sprague Lake, Lily Lake or Carter Lake could have a tremendous impact on the community of Loveland and the central and southern portions of Larimer County.

Failure of dams at Long Draw Reservoir, Joe Wright Reservoir, or Horsetooth Reservoir could have a great impact on the communities of Fort Collins, Loveland and portions of Larimer County.

Flood wave patterns, water depths, timelines, and other specific data related to these dams is information controlled by the U.S. Bureau of Reclamation and was provided by the U.S. Department of Interior - U.S. Bureau of Reclamation, Great Plains Region, Billings, Montana. Copies may be maintained by the Larimer County Office of Emergency Management, Fort Collins Office of Emergency Management, or the Colorado Division of Emergency Management.

Dam structures and their functions are considered critical to the survival of the communities involved in this mitigation plan. Failure of these structures could cause catastrophic results including extreme property damage and loss of life.

Hazard Mitigation Action Items

FEDERAL MITIGATION ACTIVITIES:
The U.S. Bureau of Reclamation (Reclamation) monitors the area dams as part of the Safety Evaluation of Existing Dams (SEED) Program. Monitoring includes analyses of structural performance data, regular examinations of the entire facility, periodic assessments of design and performance in comparison to state-of-the-art criterion,

and periodic assessments of the risk associated with the continued operations of the facilities. When these analyses indicate actions may be necessary to reduce risks, Reclamation initiates a corrective action study under the Safety of Dams Program to formulate corrective measures and to select a recommended course of action. Structural corrective actions necessary to reduce risk associated with new hydrologic or seismic data or due to changes in state-of-the-art facilities may be authorized for construction under the Reclamation Safety of Dams (SOD) Act. The SOD Act authorizes Reclamation to take action to reduce such risks.

Dam safety activities during the past two years have focused on the evaluation of the significance of rising foundation pressures and increasing seepage at Horsetooth Dam, and potential dam safety risks at the other dams. In 1999 two primary studies were conducted. The first was a screening of proposed corrective actions to mitigate potential seepage issues. The second was an extensive risk analysis of both the seepage and seismic risks posed at all dams, including the potential risk reduction benefits of the various corrective actions. As part of the SEED and SOD Program activities, Reclamation has retained the services of an independent consultant board to advise Reclamation on the technical studies, risk analyses, and proposed corrective actions. This independent consultant board has been, and will continue to be, involved in the project at critical steps in the process.[37]

Larimer County, Fort Collins, Loveland, Estes Park, Berthoud:
The Public Works or other appropriate departments of the above listed communities shall do the following (Specific mitigation activities for Dam Failure are addressed in the Flood-Flash and Riverine , and Appendix D of this plan):

1. Review and update existing emergency operations plans on an annual basis to address the issue of dam failures and/or flooding.

    a. On May 1, 2008, the City of Loveland published the updated Emergency Preparedness Plan for the Green Ridge Glade Reservoir. This document provides detailed information related to possible dam failure at Green Ridge Glade Reservoir.

2. Maintain current and accurate flood risk maps.

3. Maintain and improve existing stormwater engineering systems.

4. Work with the Colorado Division of Water Resources and/or Bureau of Reclamation to ensure that periodic assessments are conducted at area dams and that appropriate measures are taken to correct any deficiencies or issues noted.

[37] http://www.usbr.gov/gp/ecao/horsetooth/horsetooth_safety_dams/htchapter1.htm

5. Maintain current and accurate emergency notification contact information for agencies, departments, private companies and/or individuals that may be needed to respond in the event of a dam failure.

Hazard: Drought / Extreme Heat

Frequency:	**Likely: 10% - 100% in next year, or at least one chance in next 10 years**
Potential Magnitude:	**Catastrophic: more than 50%**
Potential Speed of Onset:	**More than 24 hours warning**
Geographical Area Affected:	**Populated areas of the communities and county (domestic needs) and widespread areas of the county (agricultural needs).**
Influencing Factors:	**Seasonal patterns, temperature patterns, precipitation patterns, growth**

Description

Drought is an ambiguous hazard that defies a universal definition. Typically, drought is a shortage of water associated with a deficiency of precipitation. However, water shortages can also be induced by humans through water mismanagement practices. Perhaps it is easier to think of drought as being a function of supply versus demand. Drought occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities.[38] For the purposes of this document, drought shall be considered as a condition of climatic dryness that is severe enough to reduce soil moisture and water below the minimum necessary for sustaining plant, animal, and human life systems.

A number of hazards are associated with drought, the greatest of which is an increased fire danger in urban natural areas, the wildland/urban interface, and in open space areas. The risk to public safety personnel is also increased as they respond to these fire incidents. The reduction in vegetative cover will expose soil to wind and erosion. The quality of rivers and lake water will change and sediment transport regimes of streams will be altered, resulting in a deterioration of water quality. This particular hazard affects the entire geographic area included in this Plan. Stagnant pools of water near rivers and streams will provide conditions

[38] http://dola.colorado.gov/dem/public_information/drought.htm

favorable for insect habitat, particularly mosquitoes, locusts, and grasshoppers. As rains return, more soil erosion and flooding is likely to occur.

Severe drought could deplete water sources in the areas where natural water sources are used for domestic and/or agricultural water supplies. Streams, ponds, and wells often dry up during a drought; thus wildlife and livestock suffer and die. Although agriculture production is the most obvious recipient of this type of loss, this hazard will also impact urban areas by attacking the domestic and industrial water supplies. This situation would affect all communities within the region. Drought situations can last for several years and take many years to recover. Northern Colorado is dependent on agricultural activity for a significant portion of its economic base. Loss of this base due to drought conditions could have a tremendous impact on the economy of all the communities, the county, and the State of Colorado. Other industries that rely on water could also be impacted and cause collateral effects in the overall economy of the region.

History

In the years between 1952 and 1956, Northern Colorado experienced a significant drought. Because there were no significant water supplies in place and the Fort Collins, Loveland, and Larimer County area was primarily an agricultural community at that time, the drought had a severe economic impact on area agriculture. Ironically, the construction of Horsetooth Reservoir had just been completed but it had not yet filled with water due to the drought. Ultimately, it took several years for the reservoir to fill completely and the area to recover.

The time period between 2000 and 2003 was identified by the Colorado Water Conservation Board (CWCB) as a "significant multi-year statewide drought, with many areas experiencing [the] most severe [drought] conditions in Colorado instrumented history."[39] Since this time period, Colorado has continued to experience moderate drought conditions. Seasonal weather patterns continue to maintain abnormally dry conditions and below average snowpack in the mountains that supply water to the northern Colorado region.

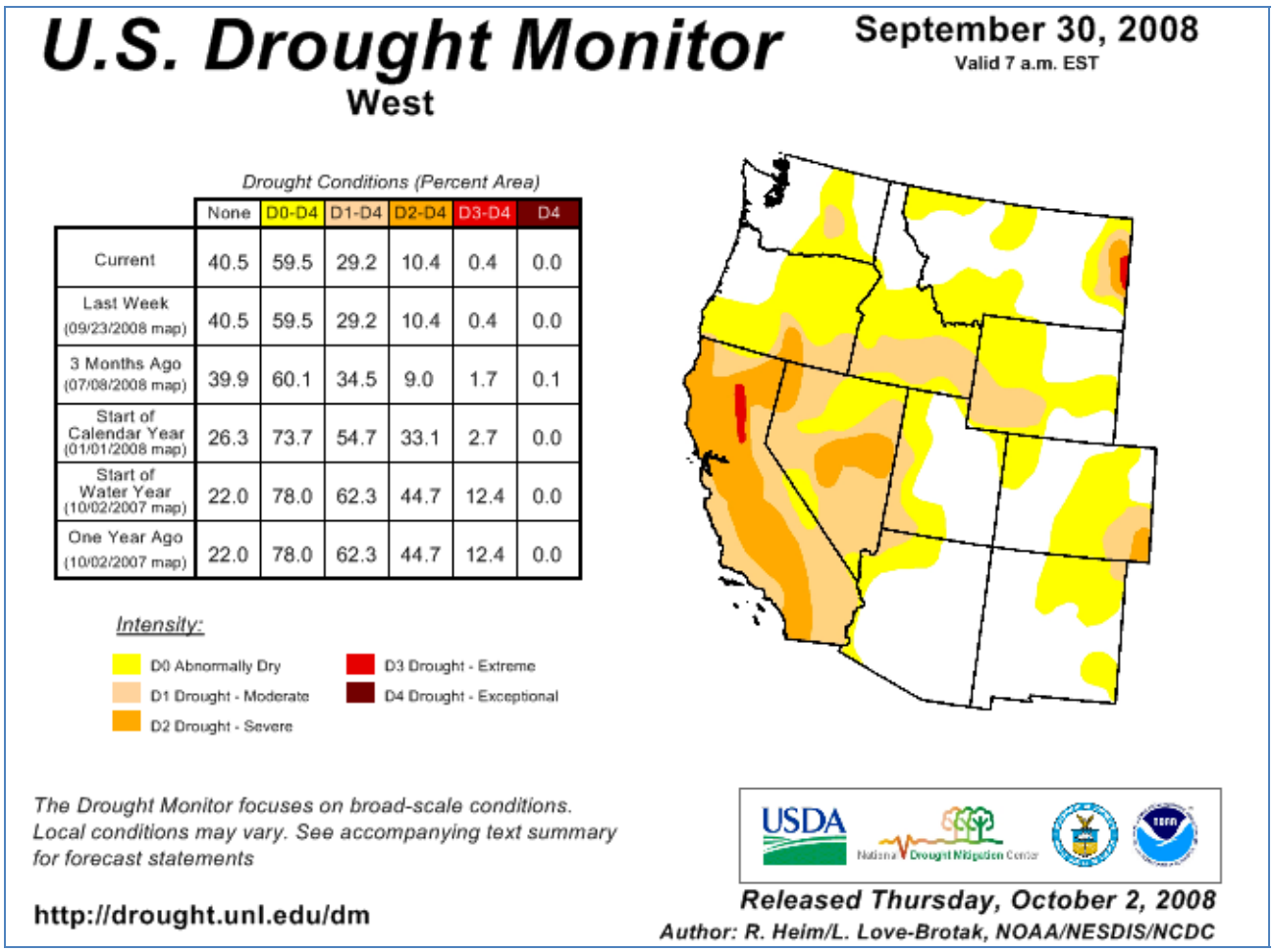
Assessing Vulnerability

Colorado, being a semi-arid state, is constantly at risk for drought. Northern Colorado began experiencing severe drought conditions in 2000. These conditions persisted until the winter of 2003/2004, when several winter storms moved through the region and provided extremely heavy snowfalls. Despite the recent history of large accumulation snowfalls, the communities in the region consider water a very precious commodity and continually work to prevent another recurrence of similar drought conditions that existed between 2000 and 2003.

All residents, commercial facilities, industry, and agricultural businesses are affected by drought conditions. Development pressure and growth demands increase the impact of this hazard. Possibly the greatest and most visible result of drought conditions is the increased risk of wildland fires in the community. Natural habitat areas are also impacted by drought. Agriculturally-based areas of the communities within this plan can be greatly affected. Specific buildings are not identified as being at risk since this hazard impacts the entire community.

[39] "Updated Information Provided in Support of the 2002 Colorado Drought Mitigation and Response Plan." Colorado Water Conservation Board, June 2007.

Figure 4.4: Western United States Drought Conditions



Hazard Mitigation Action Items

Fort Collins:

The State of Colorado Water Conservation Act of 2004 (HB 1365) requires entities that supply 2,000 acre-feet or more annually to submit a water conservation plan to the Colorado Water Conservation Board (CWCB) before receiving financial assistance from the CWCB or the Colorado Water Resources and Power Development Authority. Fort Collins uses an average of 27,500 acre feet per year. Although Fort Collins isn't seeking funds from either State agency, they developed and maintain a water conservation plan. The city believes that weather conservation is important for a number of reasons, including preparing for climate change and drought. The city hired a consultant who evaluated successful water conservation programs throughout the United States. Based on that review, the consultant recommended a number of mitigation strategies that the city then evaluated using a cost benefit analysis. The following strategies will be implemented over the next three years: (Fort Collins Utilities is the Recommended Coordinating Organization)

1. Public Information Campaign Expansion
2. On-line Access to Water History

3. Low Income Retrofit Program
4. Irrigation Technology Rebates
5. Facility Audit Program Expansion
6. Financial Incentives for Commercial Water-Saving Upgrades

These are just a few of many proposed action items that will be funded through utility billing. Additional information regarding these and other items can be located at www.fcgov.com/conservation

Larimer County, Loveland:

1. The City of Loveland hosts an annual Public Works Day. This annual event provides public education in the area of water conservation to the citizens of Loveland.
2. The City of Loveland recently completed a major project to increase available domestic water supply through the construction of Green Ridge Glade Reservoir west of Loveland. This project was completed in 2004 at a total cost of $20 million.
3. Local agencies are in the process of studying the feasibility of increasing available domestic water supply through the construction of Glade Reservoir north of Fort Collins. This project is currently in the initial public input phase.
4. Local agencies are currently studying the feasibility of increasing available domestic water supply through the construction of Windy Gap Reservoir above Carter Lake. At this time, the land purchase has been completed and the project is in the public input phase. The project is estimated to cost a total of $270 million when completed.
5. Local water providers periodically implement domestic water use restrictions during identified periods of drought. Increases in water tap and/or water use fees are also addressed during times of drought.
6. Local water providers as well as public works agencies provide education to property owners about use of drought-resistant or native vegetation requiring reduced amounts of water.
7. Local governments may consider requiring water saving plumbing features in new construction projects.

Hazard: Earthquake

Frequency:	**Possible: 1% and 10% probability in next year, or at least one chance in next 100 years.**

Potential Magnitude:	**Critical: 25% - 50%**
Geographical Area Affected:	**Larimer County, Fort Collins, and Loveland**
Influencing Factors:	**Geologic studies indicate over 100 active faults in Colorado**

Description

Earthquakes can be caused by the sudden movement along faults. Property damage and loss of life from earthquakes and their secondary effects can be devastating to communities. By studying the geologic characteristics of faults, geoscientists can often determine when the fault last moved and estimate the magnitude of the earthquake that produced the last movement. Because the occurrence of earthquakes is relatively infrequent in Colorado and the historical earthquake record is short, accurate estimations of magnitude, timing, or location of future dangerous earthquakes in Colorado is nearly impossible to estimate.[40] However, geological research indicates that there are faults capable of producing earthquakes throughout Colorado and Larimer County. According to the National Science and Technology Council's Subcommittee on Disaster Reduction, the secondary effects [from earthquakes] can be cascading or compounding, including:

- Fires can occur as a result of ruptured gas lines, and if water main breakages occur, this combination makes fire fighting very difficult.
- Landslides are a common post-earthquake event, particularly if the earthquake strikes during periods of heavy rains in already saturated soils.
- Historically, liquefaction is responsible for a tremendous amount of damage in historical earthquakes around the world. Liquefaction occurs when ground shaking reduces the strength and stiffness of the soil, which loses the ability to support the foundations of structures.[41]

History

"Geological studies in Colorado indicate that there are about 90 faults that moved during the Quaternary Period (the last 1.6 million years) and should be considered potentially active."[42] Current studies indicate up to 100 faults with over 400 tremors of a magnitude of 2.5 or higher since 1870. Colorado experienced a magnitude 6.5 earthquake on November 7, 1882. The location of this earthquake appeared to be in the Northern Front Range west of Fort Collins. Damage that was found south of Fort Collins included the power plant in Denver and buildings in Boulder.[43] Seismologists predict that Colorado will again experience a magnitude 6.5 earthquake at some unknown point in the future. Data is available from the Colorado Geological Survey, Information Series 60A, which describe numerous faults within the Larimer County area. Continued evaluation of these faults is a necessary step in our mitigation efforts.

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[40] http://www.dola.state.co.us/oem/PublicInformation/pio1.htm

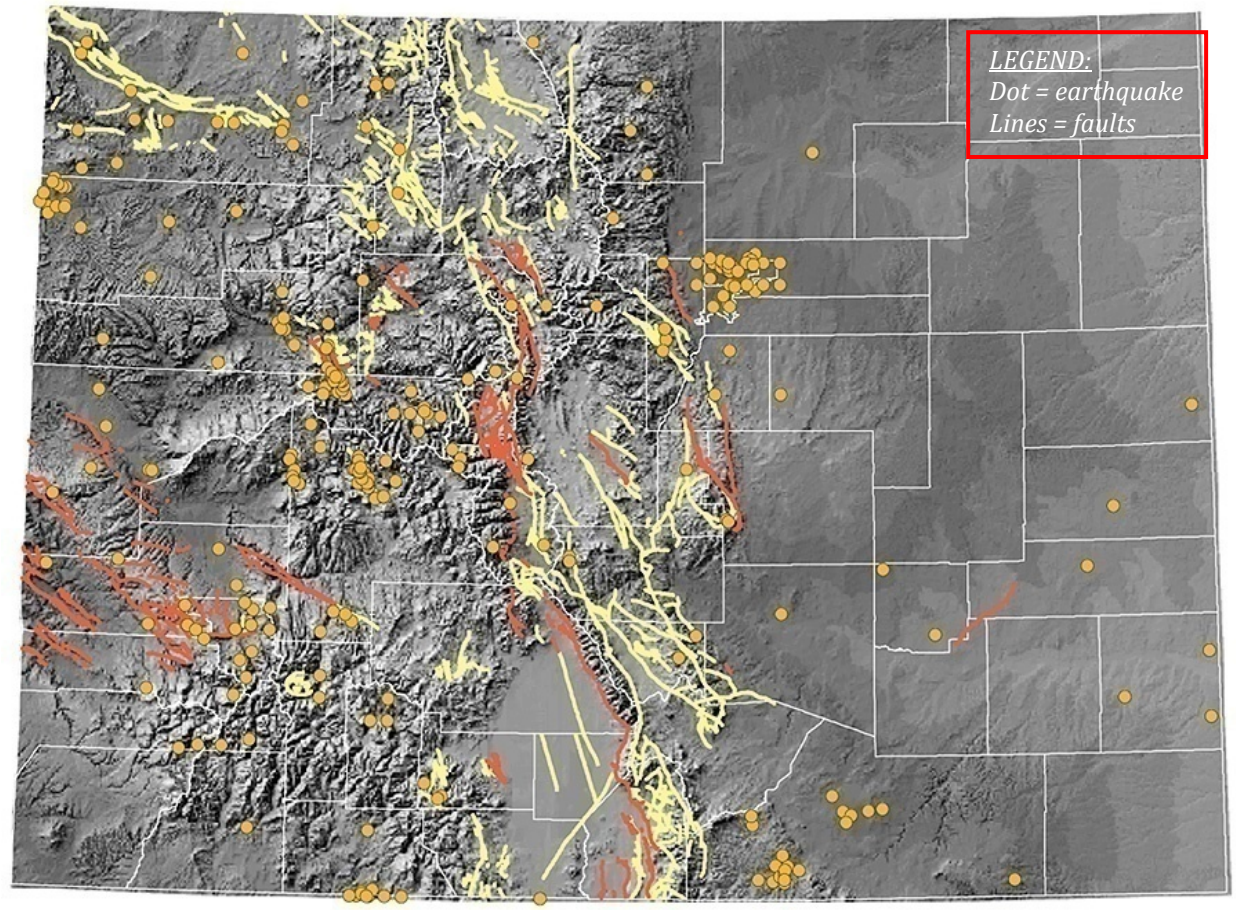
[41] "Grand Challenges for Disaster Reduction - Earthquake" National Science and Technology Council, Subcommittee on Disaster Reduction, 2nd Ed., January 2008.

[42] Colorado Earthquake Information. Prepared by the Earthquake Subcommittee. Colorado Natural Hazards Mitigation Council, November 15, 1999.

[43] http://www.dola.state.co.us/oem/PublicInformation/pio1.htm

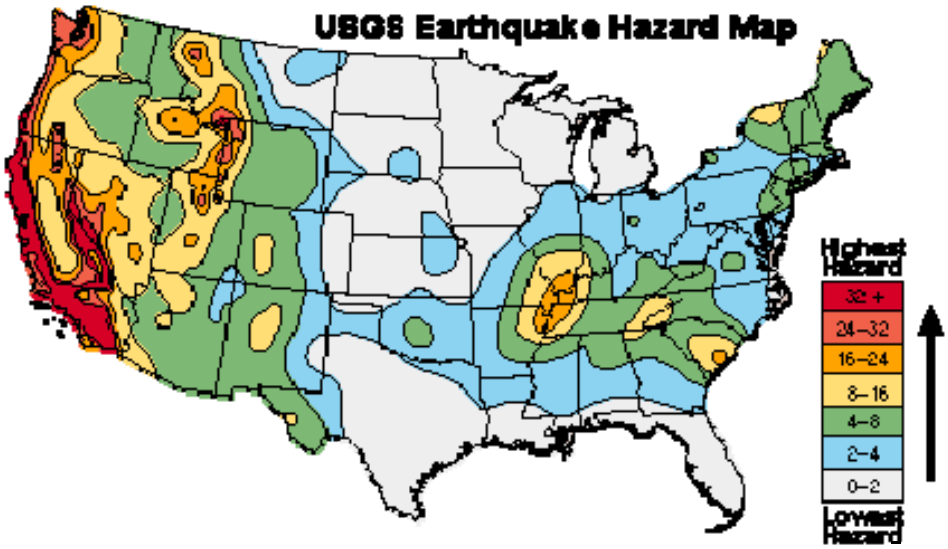
The potential property damage and loss of life from an earthquake could be tremendous. Other hazards that are associated with an earthquake include fires, hazardous material releases, delayed building collapse, flooding, and extreme risks to emergency responders.

Map 4.4: Colorado Fault Map



Source: Colorado Geologic Survey

Map 4.5: U.S. Earthquake Site Map



Source: U.S. Geologic Survey

Assessing Vulnerability

Based on the historical earthquake records and geological studies in Colorado, an event rated at 6.5 – 7.25 in magnitude could occur in the state, although scientists are unable to predict where it will occur. The potential impact on Larimer County and the cities of Fort Collins and Loveland will be determined by the location and magnitude of the incident. Because of the low risk for earthquake in this geographical region, building construction methods do not typically address earthquake stresses in most new construction projects. The hazard area is not specifically defined, although several faults are located in proximity to the dams retaining Horsetooth Reservoir, west of Fort Collins. Future growth will increase the number of buildings potentially impacted by this hazard. This region of the nation does not routinely build earthquake-resistant structures, and older structures along with high rises are at a greater risk of damage.

Hazard Mitigation Action Items

1. Maintain open communications with the Colorado Geologic Survey to remain informed on earthquake risk assessments.
2. Build hazard awareness through K-12 education programs, public information distribution, and appropriate offerings of hazard-related courses in local colleges and universities.
3. Predict collateral damage and cascading failures based on models of infrastructure interdependencies.

Hazard: Expansive Soils / Subsidence

Frequency:	**Possible: between 1% and 10% probability in the next year**
Potential Magnitude:	**Negligible: 10% to 25%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**Any area of the plan region could be affected**
Influencing Factors:	**Previously-disturbed soils, abandoned mines, excessive weight, vibration, ground water**

Description

Ground subsidence is defined by the Colorado Geologic Survey (CGS) as the sinking of the land over man-made or natural underground voids, often resulting in the development of sinkholes. Expansive soils, commonly referred to as collapsing soils, are relatively low density materials that expand in volume when they become wet, and/or are subjected to great weight such as from a building or road fill. The process of ground collapse along with the addition of water is also known as hydrocompaction.[44] Subsidence and collapsing soils are processes that may occur abruptly, seemingly without warning, or gradually over many years. These processes may occur over a wide geographical region. In Colorado, subsidence is most common in the sedimentary rocks over abandoned coal and clay mines. It may also occur where underground water has dissolved subsurface materials or has been withdrawn by wells. Collapsing soils occur within a wide variety of geographic locations.

There were no recent reports of sinkholes developing in the Larimer County region; however, collapsing soils are frequently discovered as a result of new construction projects. Typically, this is discovered when a portion of the structure is found to have shifted and/or settled some time after construction. Problems found can range from the simple cracks in concrete floors and driveways, to shifting of entire building walls, all the way to failure of paved roadways due to extensive settling and/or shifting.

Assessing Vulnerability

All areas of Larimer County are potentially at risk for collapsing soils and/or subsidence. The best way to assess for vulnerability of a structure and/or construction project is to conduct comprehensive soils analysis and testing prior to construction or immediately upon discovery of signs of possible collapsing soils.

Hazard Mitigation Action Items

Larimer County, Fort Collins, Loveland, Estes Park, Wellington, Berthoud:
Recognition of past subsurface activity can help identify potential problem areas so precautions can be taken to prevent or minimize property damage on the surface of the ground. In certain extremely hazardous, localized areas of ground subsidence, complete avoidance is the most advisable course of action. Non-conflicting uses are the safest, surest, and most economically acceptable utilization of many lands subject to ground subsidence. In general, agriculture, park land or other open space, and highly selective industrial uses are the most feasible land uses in areas subject to ground subsidence. Engineered design and construction is a third alternative for minimizing or preventing property damage. In areas where engineering and geologic studies have shown the feasibility of corrective engineering to mitigate unfavorable site conditions, areas of moderate hazard may still be effectively

[44] Colorado Geologic Survey. http://geosurvey.state.co.us

reclaimed for use.[45] Local Land Use Plans, Capital Improvement Plans, and Building/Zoning Codes address all of these issues.

[45] http://geosurvey.state.co.us/default.aspx?tabid=359

Hazard: Fires – Urban

Frequency:	**Highly likely: 100% probable in next year.**
Potential Magnitude:	**Limited: 10% - 25%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**Any residential and/or commercial area within Larimer County, Fort Collins, or Loveland**
Influencing Factors:	**Density/growth issues, electrical issues, intentional causes, smoking materials, levels of human activity in urban areas**

Description

Urban fires as well as residential structure and other building fires are hazards that have challenged the American population since our nation was born. Structure fires are among the most costly of fires in the nation. The National Fire Protection Association (NFPA) reports that residential structure fires currently account for 25 percent of fires nationwide, 83 percent of fire deaths, 77 percent of fire injuries, and 64 percent of direct dollar loss from fire.[46] Nationally, there are millions of fires, thousands of deaths, tens of thousands of injuries, and billions of dollars in property loss – which makes the U.S. fire problem one of great national importance. Between 1998 and 2007, there was an average of 1,664,500 fires resulting in nearly $11 billion in direct dollar losses each year. In the same time period, an average of 3,695 Americans lost their lives and another 19,405 were injured annually as a result of fire. These averages do not reflect the events of September 11, 2001.[47] In 2007 alone, fire killed more Americans than all natural disasters combined – There were 3,430 civilian lives lost and 17,675 civilian injuries as a result of fire, 118 firefighters were killed while on duty, and direct property losses due to fires were estimated at $14.6 billion.[48] In other words, residential fires account for a disproportionate share of fire losses. Most structure fires in the region occur in residential occupancies. The two primary reasons for the lack of significant commercial structure fires are constantly improving business safety practices and frequent fire department inspections.

[46] "Residential Structure and Building Fires." U.S. Fire Administration. October 2008. "These percentages are derived from summary data presented in the NFPA's annual survey and report, *Fire Loss in the United States During 2005.*

[47] http://www.usfa.dhs.gov/statistics/national/index.shtm

[48] http://www.usfa.dhs.gov/statistics/quickstats/index.shtm

The increasing costs of natural gas and fuel oil have caused families to rediscover alternate heating methods, which create new fire hazards when improperly utilized. At the same time, increasing construction costs continue to force contractors into utilizing less expensive construction materials and methods. This may lead to substandard fire prevention measures incorporated into structure construction. Increased construction costs have led to the modern trend of lightweight construction methods, which may contribute to structural collapse earlier within the fire activity timeline. Associated risks include building collapse, exposure risks to other structures, release of hazardous materials, and added risks for emergency responders.

History of Recent Incident

Numerous residential and commercial fires occur within Fort Collins, Loveland, and Larimer County every year. Unfortunately several of these fires resulted in personal injury and/or loss of life. The economic impact of fire on the community can be tremendous. According to the US Fire Administration, most small businesses that sustain a significant fire loss do not sufficiently recover to re-open their doors. The consequences of businesses that close as a result of fire include displaced employees who must seek work elsewhere, disappointed customers, wages lost due to injury or time off for recovery, decreased tax dollars to the community government, and possible loss of earned income that is normally spent in the immediate area. As the population increases and industry continues to grow within the Larimer County region, the risk of residential and commercial structure fire also increases.

Significant recent **commercial** fires within the history of these communities include:

AquaMedics industrial building – Loveland (2005)
Multi-tenant industrial building severely damaged in arson fire.
One million dollar loss, building renovated, business relocated and re-opened.

Western Area Power Administration – Loveland (2006)
Accidental fire started outside the building and penetrated the exterior wall.
Approximately $300,000 loss, building renovated, and business continued operation.

Cozy Kitchenettes – Loveland (2007)
Several units of abandoned motel severely damaged in arson fire.
$250,000 loss, building completely removed.

Assessing Vulnerability

Fire risk to the communities within this plan continuously exists. Any of the identified critical structures and/or infrastructure could be impacted by this hazard. As commercial and industrial growth continues to increase, urban density increases and the risk of fire will also rise. This hazard resides in no predetermined specific

area or zone. All buildings and facilities within the region have some level of risk for fire. Older structures may be at a greater risk than recently constructed buildings due to a potential lack of ongoing preventive maintenance. Certain processes that occur in industrial occupancies add to their potential level of risk. Fire is also associated with the risk of a hazardous material hazard release due to immediate or potential impingement of fire upon hazardous materials-related containers, pipelines, or process facilities.

Hazard Mitigation Action Items

The fire prevention bureaus of the communities' respective fire departments are the primary agencies charged with reducing fire risk in their respective communities. In addition, there are numerous other subdivisions of these fire departments, as well as other local, state, and federal programs that are aimed at reducing fire risk. Other agencies include the SafeKids Coalition of Colorado, Fire and Life Safety Educators of Colorado, United States Fire Administration, and the National Fire Protection Association. The majority of mitigation efforts focus on fire prevention and public education activities.

The local fire departments adopt and enforce standardized model fire codes throughout their communities. These fire codes are typically adopted into both municipal code as well as county ordinance, providing the fire departments with the legal authority to inspect structures for fire safety issues as well as to investigate fires for the determination of origin and cause. Fire investigation is an important link in the public education process. Through the determination of fire origin and cause, fire prevention activities may be "fine-tuned" by the jurisdiction to focus on specific areas of fire risk identified during the investigation.

Fort Collins
Poudre Fire Authority (PFA) provides fire protection and prevention for the City of Fort Collins, as well as in the unincorporated areas of Larimer County. PFA currently enforces the 1997 Uniform Fire Code, but is in the final stages of adopting the 2006 International Fire Code. In 2010, PFA intends to implement a Residential Safety Program. The program is being implemented because a large portion of the fires, injuries and life loss within PFA's district, and nationally, is in the residential setting. PFA will partner with willing homeowners and tenants and surveys of homes will be completed. PFA will make recommendations to make the home safer. This high priority action item will be funded through the annual budget. Additional information regarding this program and others can be found at poudre-fire.org

Loveland
The Loveland Fire & Rescue Department provides fire protection and prevention for the City of Loveland as well as in the unincorporated areas of Larimer County within the Loveland Rural Fire Protection District. The City of Loveland and Larimer County have both adopted the 2006 International Fire Code.

The local fire departments have the support of their administration to continue to promote fire prevention and education campaigns. Personnel involved in these programs include, but are not limited to:

- Fire prevention bureau personnel
- Fire suppression personnel
- Volunteer firefighters
- Public information officers
- Fire Corps volunteers
- Local EMS agency personnel

Following is a list of various federal public fire safety education efforts that are endorsed, supported, and/or used by local fire departments:

United States Fire Administration

Annual Arson Awareness Week
USFA Kids Fire Safety Website (http://www.firesafety.gov/kids/flash.shtm)
Fire Safety for Babies and Toddlers Campaign
Fire Safety for People 50-Plus Campaign
Smoking & Home Fires Campaign
Tribute to Heroes Campaign
Fireplaces and Home Safety Campaign
Smoke Alarm Promotional Campaign
Wildfire…Are You Prepared? Campaign
Home Heating Fire Safety Campaign
Cooking Fire Safety Tips Campaign
Holiday Fire Safety Campaign
Winter Storm Fire Safety Campaign
Fire Safety Public Service Announcements
Hotel/Motel Fire Safety Campaign

Home Fire Sprinkler Coalition
Home Safety Council

National Fire Protection Association

Annual Fire Prevention Week
Risk Watch – Preventing Unintentional Injuries to Kids Campaign
Remembering When – Fire Safety Prevention Campaign
Sparky the Fire Dog – Kids Fire Safety Website (www.firesafety.gov)
Fire Safety Fact Sheets – Available for purchase from www.nfpa.org website
Community Tool Kits – Available for purchase from www.nfpa.org website
NFPA Safety Source – free periodic electronic newsletter (http://ebm.cheetahmail.com/r/regf2?a=0&aid=272412627&n=200)

Following is a list of fire prevention and disaster preparedness activities administered by local fire departments:

Frequent business fire safety inspections
Administration of various hazardous materials permit programs
Feedback on development of business emergency action plans
Assistance with business evacuation drills
Fire safety trailer presentations throughout the community
Fire safety education programs at local schools (K-12)
Fire station tours for youth that include fire safety presentations
Home fire safety checklists

Holiday fire safety public service announcements and activities
Children's activity books

Hazard: Fires – Wildland

Frequency:	**Highly Likely: Near 100% probability in next year**
Potential Magnitude:	**Limited: 10%-25%**
Speed of Onset:	**Minimal or no warning**
Geographic Area Affected:	**Open space, grasslands, forests, and urban interface areas**
Influencing Factors:	**Remote terrain that is difficult to access, normally dry weather conditions, thunderstorms, low humidity, seasonal weather patterns, and vegetation growth**

Description

Each year tens of thousands of natural and manmade wildfires burn millions of acres across the United States. The height of the wildfire season occurs in the late summer months, particularly across the western states.[49] Wildland fires burn homes; damage infrastructure and natural resources; kill and injure firefighters and the public; and impact wildlife, local economies, and the global environment.[50] The number and severity of wildland fires are increasing throughout the nation, primarily due to population increases in the wildland-urban interface area. The risks of and from wildland fires will increase as population increases in the areas. Hazards commonly associated with wildland fires include risk of physical injury to emergency responders, hazardous material release into the atmosphere, hydrophobic soils, reduction in water quality in water shed and "run off" areas, and firefighting aircraft accidents. There has been an alarming increase in firefighting aircraft accidents associated with wildland fires in the last several years. As drought conditions materialize, communities are faced with similar problems as those listed

[49] http://www.economics.noaa.gov/?goal=weather&file=events/fire
[50] Grand Challenges for Disaster Reduction – Wildland Fire, National Science and Technology Council's Subcommittee on Disaster Reduction.

above, but on a lesser scale. Open space areas within structured communities become "at risk" for wildland fires and smaller-scale grass fires.

Recent studies have indicated that Larimer County is one of the 64 counties in Colorado that is most susceptible to wildfires. In the past two decades, several hundred wildfires have burned in Larimer County, with an annual average of more than 2,200 acres burned. Many disastrous wildfires have burned along Colorado's Front Range. The most significant wildland fire in the region's history was the Bobcat Gulch Fire, which occurred in the Rocky Mountain foothills of Larimer County during the summer of 2000.[51] The urban communities of Fort Collins and Loveland routinely experience wildland and/or grass fires in the open space areas within their city limits. As the urban population density increases and the city limits expand within the county, the "grass fire" occurrence will also increase.

History of Incidents

April 1, 2004 – Picnic Rock Fire was determined to be human caused. The fire destroyed 8,908 acres and one home.

July 17, 2002 – The Big Elk Fire was determined to be human caused. The origin was approximately nine miles southeast of Estes Park. Although there was only one outbuilding reported lost, there were three lives lost trying to contain this 4,400-acre fire. The cost of this fire was more than $4.0 million.[52]

June 12, 2000 – The Bobcat Fire was determined to be human caused and was started from a campfire in the Bobcat Gulch on early Monday morning, June 12, 2000. The Bobcat Fire lasted several days and was finally extinguished after intense fire suppression efforts and the onset of cooler and wetter weather conditions in the area.[53] Fire suppression costs totaled more than $3.5 million, not including the private financial losses. Insurance claims reached more than $15 million. The long-term costs to the water shed and agriculture industry by future flood damage have not been determined. The fire damaged or destroyed 22 structures and burned 10,600 acres, which included 9,295 acres of national forest. The water quality in the surrounding communities was impacted due to runoff and watershed-related issues.

July 1, 1994 – The Hour Glass Fire started Friday morning as a lightning storm without associated rainfall passed through the Pingree Park area at approximately 1:45 am. Smoke was detected in the sky over Pingree Park near daybreak. Authorities were alerted to the wildfire in the Arapaho-Roosevelt National Forest southwest of the Pingree Park campus. Before the day was over, 170 people were evacuated from the campus; the fire destroyed 13 buildings and 12 summer homes

[51] http://www.fema.gov/news/event.fema?id=2626
[52] http://fam.nwcg.gov/fam-web/hist_209/r_209_gacc_spreadsheet?v_gaid=r_209_gacc_spreadsheet%3Fv_gaid%3DRM
[53] http://www.cnr.colostate.edu/avprojects/larimer/hazard/web_docs/fire.htm

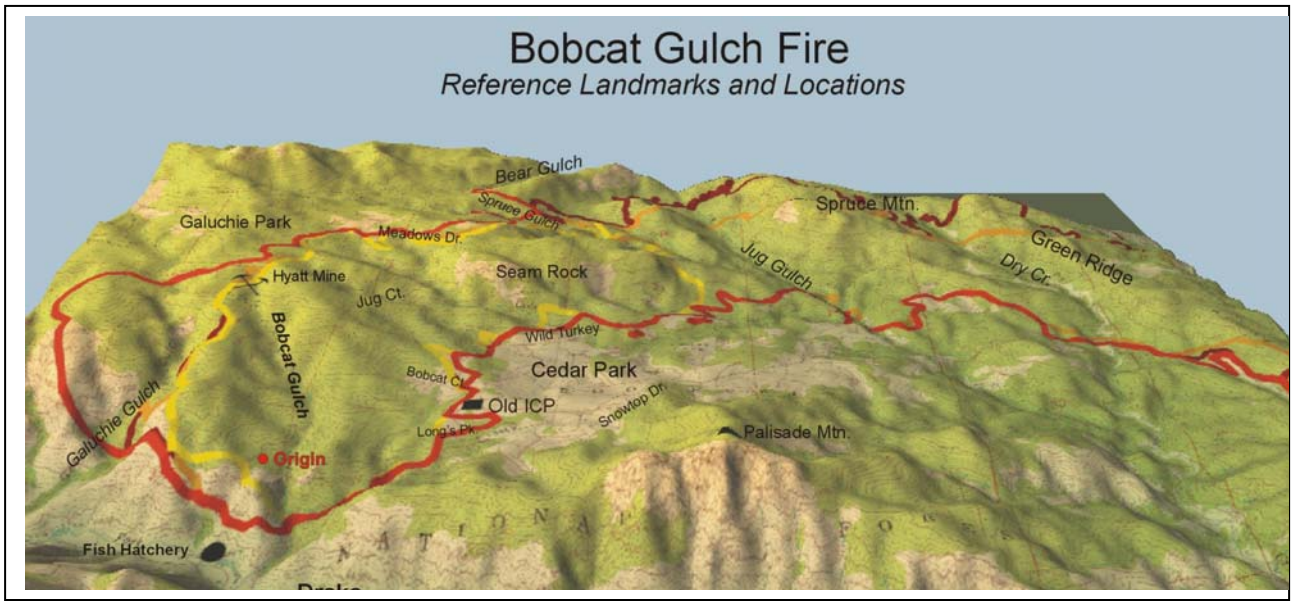
and consumed approximately 1,300 acres of lodgepole pine forest. The final costs including structural loss and suppressions cost were approximately $3.7 million.[54]

Other significant fires in Larimer County[55]

1996 Crystal Fire – 370 acres
1993 Snowtop Fire – 275 acres and 15 homes in Cedar Park area
1989 Livermore Fire – 1,967 acres
1988 Grace Creek Fire – 2,800 acres
1980 Beartrap Fire – 2,734 acres

Several other fires occur in this region every year, but are of less significance than the fires listed above. The economic impact to the local communities and the State of Colorado is increasing with each wildland fire season. The risk of wildland fires will continue to increase as economic demands surface in other areas, drought conditions continue, development in these areas continues, and recreational demands increase. Resources from all of the Plan participants support the involved emergency activity required to control and/or mitigate these hazards.

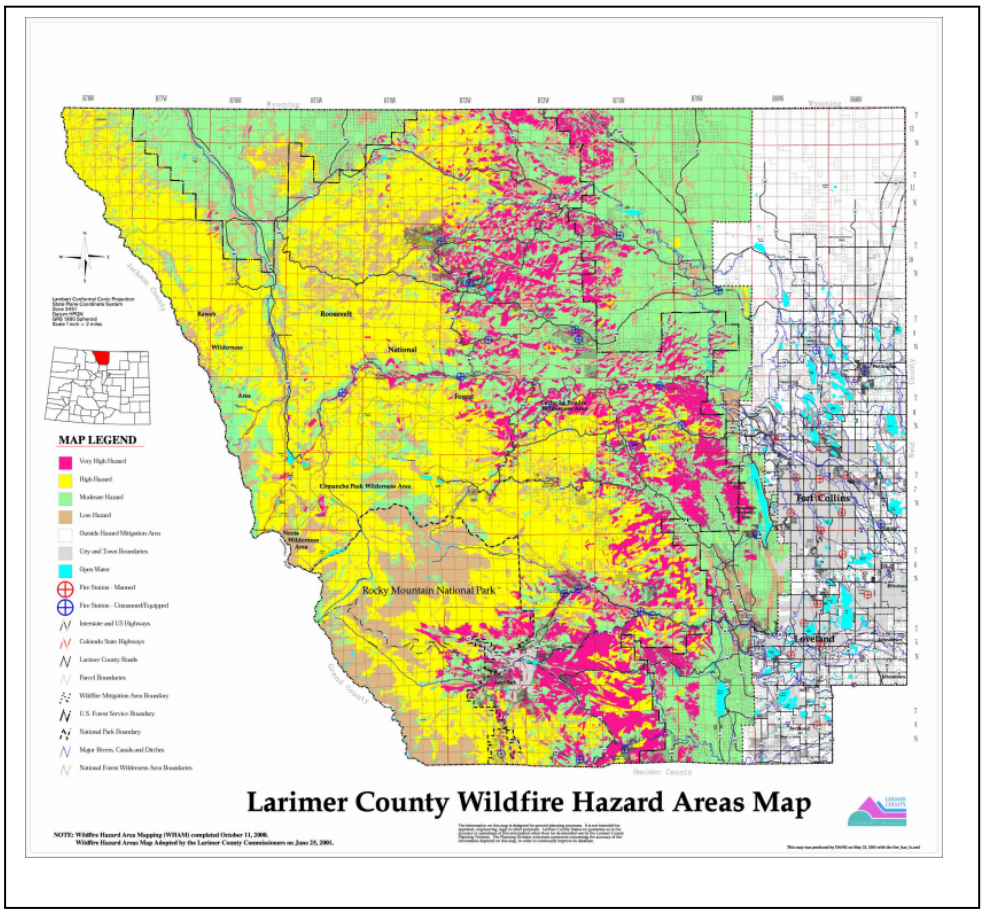
Map 4.6: Bobcat Gulch Fire



Source: http://www.co.larimer.co.us/wildfire/bobcat_gulch_fire/Maps/Location_Perspective.jpg

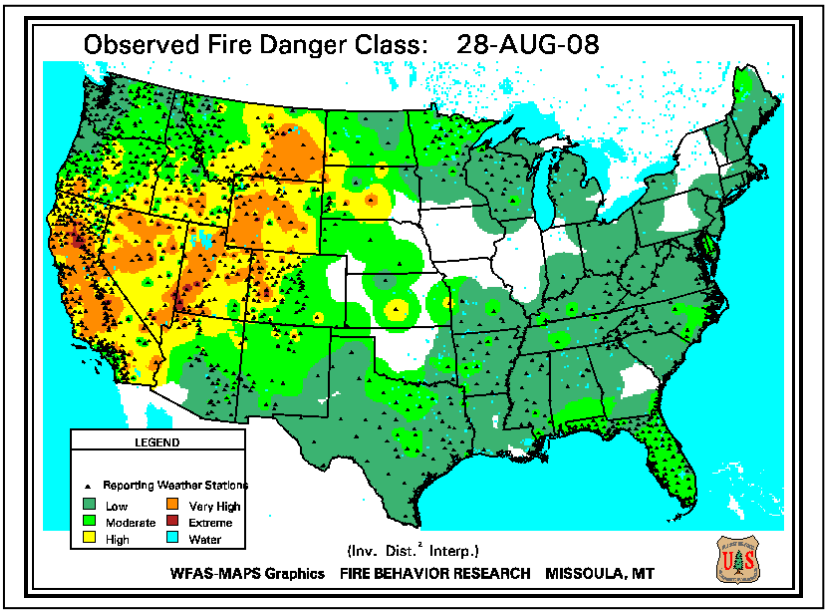
[54] Department of Housing and Food Services, CSU, Fort Collins, CO 80523
[55] Fort Collins Interagency Wildfire Dispatch Center 2000 Annual Report

Map 4.7: Area Wildland Fire Hazard Map



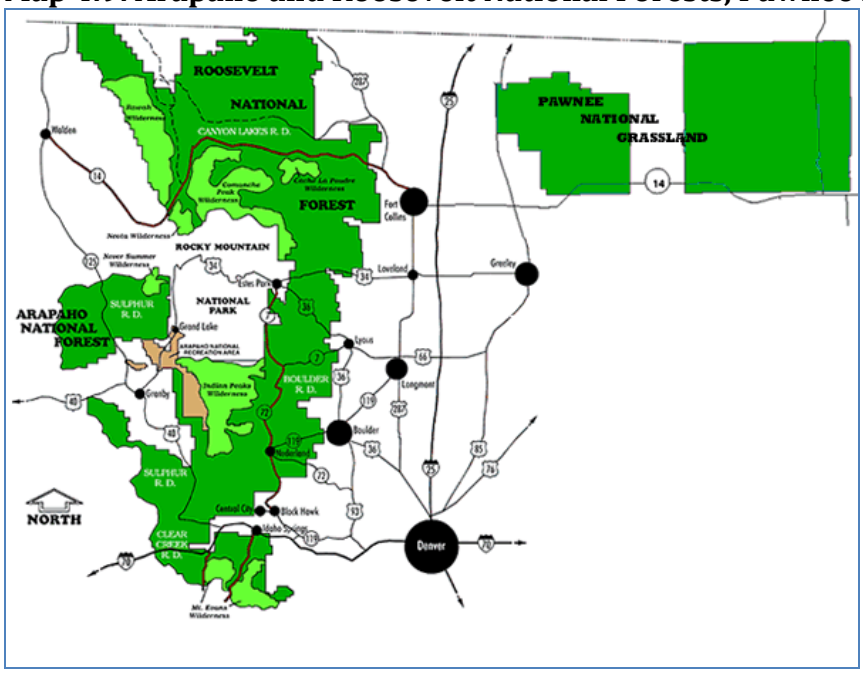
Source: http://www.co.larimer.co.us/wildfire/fire_haz_lc_small.jpg

Map 4.8: U.S. Wildland Fire Danger Class



Source: http://www.fs.fed.us/land/wfas/fd_class.gif

Map 4.9: Arapaho and Roosevelt National Forests, Pawnee National Grassland



Source: http://www.fs.fed.us/r2/arnf/

Assessing Vulnerability

A significant wildland fire in Larimer County could impact schools, fire stations, government installations, research facilities, watershed areas, and water supplies. The fire stations that could be impacted by a wildland fire include those located in the canyon areas (Poudre, Big Thompson, and Redstone) and also in the communities of Estes Park, Glacier View, Glen Haven, Allen's Park, Livermore, Red Feather Lakes, and Drake. Fires in the wildland-urban interface areas of Fort Collins, Loveland, Estes Park, Berthoud and Wellington could result in significant property loss to a variety of structures and the temporary loss of certain utilities and infrastructure. Abnormally dry seasons increase the severity of this hazard as does the current growth trend in these areas. Smaller grass and brush fires could have only a minimal impact on the critical facilities of Fort Collins, Loveland, Berthoud, Wellington and other areas within Larimer County. Although the town of Estes Park is located within forested land, the risk of wildland fire impacting its critical facilities and infrastructure is marginal. Additional associated impacts would be in emergency services and water quality (watershed).

Poudre Fire Authority, Loveland Fire & Rescue, Larimer County Emergency Services, Berthoud Fire Department, Estes Park Volunteer Fire Department, Wellington Fire Department and the various other volunteer fire protection districts within Larimer County support emergency actions against wildland fires by training and equipping their personnel to fight wildland fires. These agencies work closely with wildland fire professionals from the Colorado State Forest Service and the United States

Forest Service to maintain a state of readiness at all times. Many of these listed departments deploy their resources within the community, county, and state, as well as throughout the United States on requested deployments. Larimer County Emergency Service is the agency with the primary responsibility for responding to wildland fires within the county. The County maintains several trained fire crews with appropriate equipment for this purpose.

Hazard Mitigation Action Items

Larimer County, The City of Fort Collins (Poudre Fire Authority), the Town of Estes Park (Estes Park Fire Department) and the Town of Berthoud (Berthoud Fire Protection District) have all created Community Wildfire Protection Plans (CWPP) to mitigate against wildfire. Hazard Mitigation directly from those plans is addressed here, by community. Some of these plans are very detailed and can be located within the respective fire departments. (Loveland Fire and Rescue Department was in the process of developing a CWPP, but due to budgetary and staffing issues, that project has been delayed. Wellington has yet to develop a CWPP.)

Larimer County:

Larimer County is a part of the Larimer County Coordinating Group (LCCG), which also includes the US Forest Service, Rocky Mountain National Park and the Colorado State Forest Service. The group seeks to provide a community-based approach to hazardous fuels management through collaborative processes, using scientific expertise and local knowledge. The overall goal of the partnership is to enhance community sustainability and restore fire-adapted ecosystems through identification, prioritization, and implementation of treatment projects in the Front Range of Colorado.

The primary role of the coordinating group is to provide leadership and coordination for all fuels management activities in Larimer County. Additional responsibilities include:

1. Ensuring the completion and routine maintenance of a comprehensive landscape-level fuels assessment utilizing the best available scientific tools that will evaluate hazards, values, and risks
2. Utilizing the fuels assessment findings to prioritize, design, and locate effective fuel treatments in a cohesive strategy; invest in projects that seek to protect communities and watershed values
3. Coordinating and supporting Community Wildfire Protection Planning (CWPP), Critical Community Watershed Wildfire Protection Plans and *FireWise* efforts with local communities

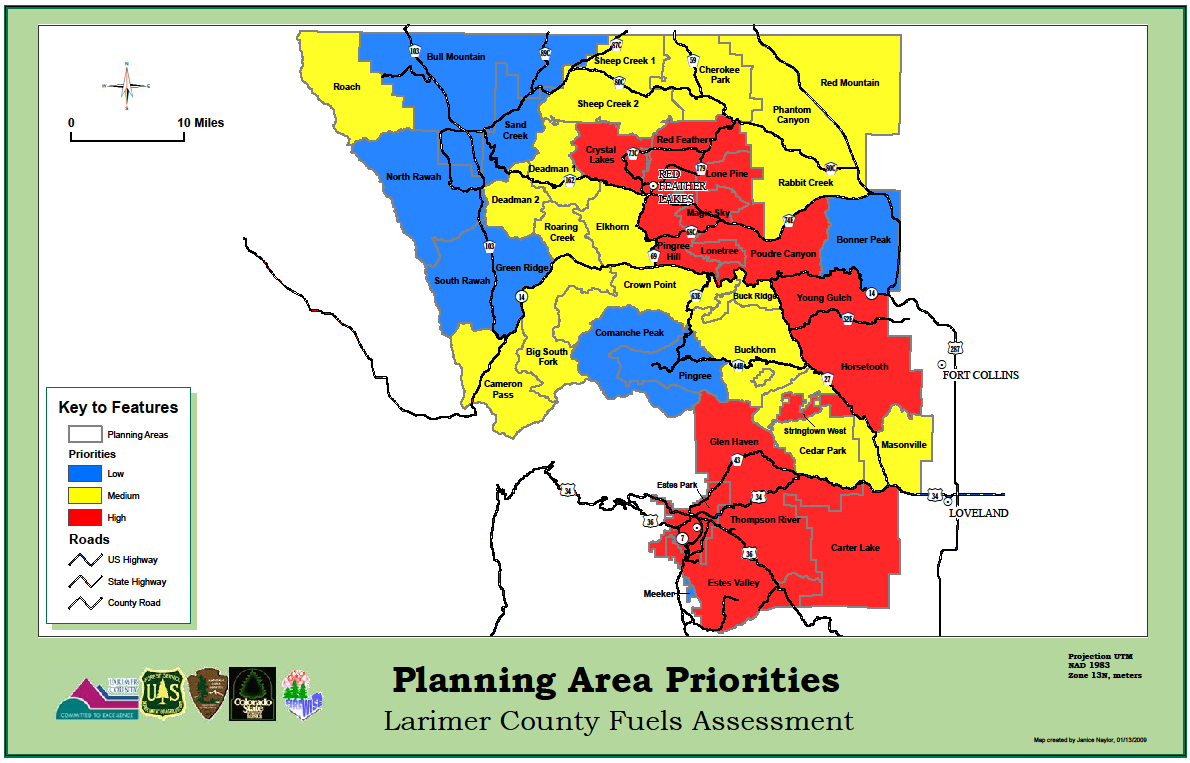
4. To the greatest extent possible, supporting on-the-ground efforts by sharing resources and expertise; overcoming financial barriers to collaborative efforts
5. Encouraging private enterprise participation in treatment implementation
6. Seeking financial and political support from federal, state, county, and municipal governments and their leadership
7. Given the proportionally high amount of congressionally designated wilderness and National Park land in the county, working to facilitate the operational feasibility for managing wildland fire for resource benefit, including such benefits as protection of watersheds
8. Providing a communication link with the Front Range Fuels Treatment Partnership Steering Committee and Leadership Team for upward reporting of accomplishments and close coordination of planning and implementation of projects

In June 2003, Larimer County adopted the Larimer County Fire Plan, a CWPP. This plan is reviewed and updated on an annual basis. This fire plan was implemented between various governmental authorities under a Memorandum of Understanding. It established mutual commitment to the mission and objectives outlined in the Fire Plan to facilitate interagency collaboration in the implementation of a wildland fire program in the Larimer County region. On Jan 1, 2009, the Fire Plan was updated and includes planning areas that are prioritized for analysis and implementation of mitigation actions. The following criteria were used to establish priority:

1. **Threat from wildland fire to values at risk** - private land acres or specific values at risk
2. **Fuel Hazard** - Acres and percent of planning area with Very High and High Fuel Hazard Ratings
3. **Community willingness** - Community Wildfire Protection Plan or community active in forest management or defensible space
4. **Fire Regime / Condition Class** - Acres and percent of planning area in Fire Regime II and III and Condition Class 2 and 3
5. **Feasibility (Treatable Acres)** – Acres and percent of planning area that are considered treatable (<40% slope that are not excluded from treatment due to Forest Plan Standards and Guidelines)
6. **Feasibility (Access)** - Access (Easements) / accessibility from existing or planned roads
7. **Feasibility (Limitations)** - Treatable acres (see above definition) with limitations (i.e. Roadless Areas, Wild and Scenic River, Wilderness) - % of planning are that has these limitations County Fire Plan 2009 13

8. **Cumulative Effects / Effectiveness** – Amount of previous treatment and the effectiveness of treatment to protect values at risk

Map 4.10: Larimer County Planning Area Priorities



The LCCG, as mentioned previously, is working with local communities to create and implement Community Wildfire Protection plans. The plans identify the following goals and objectives in providing wildland fire hazard mitigation activities.[56]

1. Identification of Values at Risk – Using technology and local expertise, each identified community will develop a base map and narrative of the community and adjacent landscapes of interest. The base map will act as a visual aid from which community members can assess and make recommendations and will include, at a minimum:
    a. Inhabited areas and values at potential risk to wildland fire.
    b. Areas containing critical infrastructure such as evacuation routes, municipal water supply structures, and major power or communication lines.
    c. A preliminary designation of the community's wildland-urban interface zone.

[56] Larimer County Fire Plan, June 16, 2006.

2. Community Risk Assessment – The purpose of this assessment is to help prioritize areas for treatment and to identify the highest priority uses for available financial and human resources. This section is divided into five areas of concern:
    a. Fuel Hazards – An evaluation of vegetation conditions within the community and on adjacent lands, including the Larimer County Wildfire Safety Program and the Larimer County Fuel Hazard Map.
    b. Risk of Wildfire Occurrence – An evaluation of the probability of fire ignition within the community and surrounding lands.
    c. Risk to homes, businesses, and critical facilities and infrastructure – An evaluation of the vulnerability of structures within the community to ignition from firebrands, radiation, and/or convection. Also includes an evaluation of risks to critical facilities and infrastructure such as evacuation routes, water supply structures, and power and communication lines.
    d. Risk to Other Community Values – An evaluation of risk to other community values such as wildlife habitat; recreation and scenic areas; water supplies; and landscapes of historical, economic, or cultural value.
    e. Local Preparedness and Firefighting Capability – Initial response to all fire, medical, and associated emergencies is the responsibility of the local fire department. Wildland fire responsibilities of Larimer County, Colorado State Forest Service, U.S. Forest Service, Bureau of Land Management, and the National Park Service are described in the current version of the Larimer County Annual Operating Plan. All mutual aid agreements, training, equipment, and emergency responses are the responsibility of the local fire department and the agencies listed above.
3. Hazard Reduction Priorities – Each community should develop a prioritized list of community needs regarding fuels reduction treatments and fire response needs within the wildland-urban interface zone.
4. Action Plan – Each community plan should include information that identifies roles and responsibilities, funding needs, and timetables listed in the Hazard Reduction Priorities section of the plan. The core team for the Larimer County Fire Plan meets annually to evaluate progress and mutually agree on treatment priorities.

In addition, Larimer County also performs the following mitigation actions:

1. Larimer County provides public wildland fire education and information to homeowners. Topics include wildland fire safety and awareness, defensible spaces, and urban interface issues.

2. Larimer County has established and enforces building and planning codes specific to construction in the wildland urban interface. These codes require defensible space on new construction in the wildland-urban interface.
3. Larimer County Emergency Services administers open burning permit programs designed to regulate the safe use of fire for fuels reduction projects completed by area property owners.
4. Larimer County has historically provided tree slash disposal options to homeowners in the wildland-urban interface in order to promote the establishment of defensible space around residential dwellings. A proposed, high priority action item for 2010 is to continue to provide this service. Procurement of grant funding is necessary to implement this action item.
5. Larimer County Emergency Services maintains web-based wildland fire information, including links to the FireWise wildland fire safety education program (http://www.co.larimer.co.us/wildfire/). LCES would like to expand this high priority project in 2010. Funding to implement this action item is from existing program funds and grants.
6. Additional Mitigation information can be obtained by contacting Tony Simons with LCES.

Fort Collins:
The 2006 Poudre Fire Authority (PFA) Community Wildfire Protection Plan outlines mitigation items through 2009. They are currently due for an update of these initiatives, but funding issues and several grant processes have somewhat slowed the planning process.

PFA's mitigation efforts will continue to focus on community outreach and education, hazard identification, and response planning. They've also been directly involved with the City of Fort Collins Natural Areas Program's prescribed fire and fire management planning programs. Budgetary and weather issues have somewhat slowed these efforts in the last eighteen months as well. State and county mitigation actions within our jurisdiction are also listed in the CWPP action items, but fall outside of PFA's operational purview.

To date, PFA has performed over 500 WUI safety assessments of individual homes. There are an estimated 150 home awaiting assessments. This is a priority for 2010. The outreach process is integral to motivating homeowners to take action. An interactive website where homeowners can view their assessment information has been delayed by budget constraints.

Top Priorities for 2010 include:

- Completing home assessments

- Website for homeowners accompanied by informational mailings to homeowners
- Wildland Urban Interface fire preplans
- Return Fort Collins Natural Areas back on a schedule of two prescribed fires per annum
- Develop a Poudre River Corridor Fire Management Plan

Poudre Fire Authority Mitigation Action Items

Year	Action	Lead	Status
2007	Detailed community and home assessments of Whale Rock	PFA	Completed, due for updates in 2011
	Detailed community and home assessments of Redstone	PFA	Completed, due for updates in 2012
	Firewise education and outreach in Redstone and Whale Rock	Core Teams / CSFS	Completed, requires continued effort
	Clarify escape routes and procedures for Whale Rock	Core Team / RCVFD	Need to follow up with RCVFD
	Develop incident public information plan	Ft. Collins OEM / PFA	Requires further assessment
	Complete review of the IFC WUI code	PFA	Completed, WUI not evaluated/not adopted
	Develop foothills fire restoration plan	Ft. Collins Natural Areas	Partially complete
2008	Tactical maps and preplans for Whale Rock and Redstone	PFA	Not completed, PRIORITY FOR 2010
	Detailed community and home assessments of North Horsetooth	PFA	Not completed, PRIORITY FOR 2010
	Detailed community and home assessments of South Horsetooth	PFA	90% complete
	Implement incident public information plan	Ft. Collins OEM / PFA	Requires further assessment
	Develop Poudre River corridor fire restoration plan	Ft. Collins Natural Areas	Not completed, PRIORITY FOR 2010
2009	Tactical maps and preplans for North and South Horsetooth Areas	PFA	Not completed, PRIORITY FOR 2010
	Develop Soapstone Prairie fire management plan	Ft. Collins Natural Areas	
	Lory State Park		Ongoing, action underway
	Horsetooth Mountain Park		Ongoing, action underway
	Implement at least two Rx fires per annum	Ft. Collins Natural Areas	Ongoing, PRIORITY FOR 2010
	Bobcat Ridge fuels reduction project	Ft. Collins Natural Areas	Ongoing, action underway
	Lory State Park fuels management projects	Lory State Park / CSFS	Ongoing, action underway
	Horsetooth Mountain Park fuels management projects	Larimer County	Ongoing, action underway

	Enhanced staffing on high fire danger days	PFA	Not funded
	Creation of dedicated wildland fire coordinator position	PFA	Not funded
	Thin along roads in Whale Rock and Redstone Canyon	Core Teams	Not funded
	Development of fire service water supply in Redstone Canyon	Core Team / PFA	Not funded

7. Local fire departments and Larimer County provide public wildland fire education and information to homeowners. Topics include wildland fire safety and awareness, defensible spaces, and urban interface issues.
8. Larimer County and local fire departments provide tree slash disposal options to homeowners in the wildland-urban interface in order to promote the establishment of defensible space around residential dwellings.
9. Local fire departments provide specialized wildland fire training for emergency responders.
10. Local fire departments provide specialized wildland firefighting equipment for an adequate response to a moderate-sized fire incident.
11. Many local fire departments, along with Larimer County Emergency Services, administer open burning permit programs designed to regulate the safe use of fire for fuels reduction projects completed by area property owners.

The following action items are considered long-term and may need outside funding sources such as grants, fees, or private-public partnerships. These actions would also be coordinated by the local fire department or forestry service.

1. Loveland Fire & Rescue, Poudre Fire Authority, and the Red Feather Lakes communities are currently in the process of conducting "Red Zone" wildfire risk assessments of the various residential neighborhoods within their identified wildland-urban interface zones. There are currently approximately 296 neighborhoods identified throughout Larimer County. This high priority project is on going and is funded by grants.
2. The U.S. Forest Service is working with residents in the Glen Haven area on a fuels reduction project. This project is currently in the public input phase and has not yet been implemented. The scope of the project is generally located between the communities of Drake and Estes Park, north of Highway 34. The proposed project area boundary encompasses approximately 37,460 acres, of which approximately 29,000 acres are National Forest Service lands. This is a high priority project that will be funded through grants.

Table 4.5: Loveland Fire & Rescue Department Red Zone Assignments

PRIORITY	AREA	COUNTY RATING	DATE STARTED	DATE COMPLETED	# OF SURVEYS

1	Namaqua Hills	High	11/1/07	12/1/07	135
2	Sedona Hills	Moderate	11/18/07	12/4/07	59
3	Hidden Valley	Moderate	1/30/08	1/30/08	6
4	Indian Valley	Moderate	12/5/07	12/5/07	7
5	Springer Valley	Low - Mod	1/20/08	2/2/08	25
6	Bonnell West	Low - Mod	2/2/08	8/26/08	118
7	County Road 23H area	Low - Mod	1/26/08		28
8	West 1st Street between CR 23H & CR 29	Low - Mod	3/14/08	8/28/08	104
9	Glade Road	Low - Mod	9/29/08		
10	Arkins Park	Low to Very High			
11	Eden Valley / Sunrise Ranch	Low to Very High			
12	Masonville	Low - Mod			
13	Sylvan Dale Ranch	Moderate			
14	Carter Lake	High			
15	Buckhorn Canyon	Low to Very High			
16	Flatiron / Pinewood Reservoir	Mod to Very High			
17	Storm Mountain	Low to High			
18	Waltonia / Drake / Big Thompson Canyon	Low to High			
TOTAL RED ZONE ASSESSMENTS COMPLETED TO DATE					**482**

Information current as of 09/30/2008

Berthoud:

The Berthoud Fire Protection District used internal budgets in combination with a CSFS grant to complete a district-wide hazard and risk assessment and the resultant CWPP. Numerous proposed mitigation action items were generated during the completion of the CWPP. For example in the community of Sprague, near Carter Lake and in Berthoud's Fire District, the following specific action items were proposed: (BFPD is the recommended coordinating organization)

- A parcel-level analysis is recommended.
- Sprague and Gunn roads' surfaces should be graded smooth and an all weather surface applied to allow fire equipment better access into the subdivision.
- Adequate defensible space is recommended for all homes. For details, please refer to the **Home Mitigation FMU** in the main report.
- Extended defensible space (beyond zone 3) recommended for homes located in dangerous topography (in saddles, above natural chimneys, mid-slope on steep slopes, or on summits) that have heavy fuel loads near or below the home. For details, please refer to the **Home Mitigation FMU** in the main report.

- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments. For details, please refer to the "Access Route Fuels Modification Recommendations," located in the **Fuels Modification Projects FMU** section of the main report.

- Wherever possible, add pullouts for emergency apparatus on driveways and private roads longer than 300 feet. Turnarounds should be constructed at the end of all driveways and dead-end roads.

- Discourage the use of combustible materials for decks and siding, especially where homes are upslope from heavy fuels.

- Flammable yard clutter (pallets, tires, disabled vehicles) should be removed. If unable to remove, the items can be grouped together and "defensible" space surrounding them created.

- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.

These are high priority action items that will be funded through the procurement of grants. The timeline is variable based on funding and the cooperation of local homeowners. Additional information can be located at berthoudfire.org

Hazard: Flood – Flash and Riverine

Frequency:	**Likely: Between 10% and 100% probability in next year, or at least one chance in next 10 years.**
Potential Magnitude:	**Limited: 10% to 25%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**Areas within Larimer County that are in low elevations, near creeks, streams, rivers, water storage facilities, drainage areas, or flood plains**
Influencing Factors:	**Meteorological conditions such as severe thunderstorms, up-slopes, and intense localized rain storms**

Description

Floods are an overflow or inundation from a river or other body of water [that] causes or threatens damage. Floods occur in all regions of the United States, at all times of the year. One in three federal disaster declarations is a result of flooding. An increase in population, more development in flood-prone areas, an increase in the frequency of heavy-rain events over the last fifty years, and impacts of wildland fire and land use changes have resulted in an increase in flood-related losses.[57] In the Larimer County region, flooding is usually the result of severe weather events. Severe summer storms are generated by temperature imbalances in the atmosphere, when thunderstorms develop as warm, moist air rises. These conditions can produce winds greater than 100 mph. Updrafts and downdrafts are the reason for gust fronts, heavy rain, lightning, hail, and high winds, which are weather elements that contribute to local flooding. Flash floods are generally limited in area and occur due to a high volume of runoff over a relatively short amount of time, and usually develop in Larimer County from severe summer storms producing heavy rainfall. Riverine flooding in Larimer County is generally associated with a large volume of snowpack melt that is contained within the floodplain of a large stream, such as the Poudre or Big Thompson Rivers. Occasionally, both types can coincide, such as when relatively warm rain falls onto snowpack. Both flash and riverine flooding are natural hazards that have been a part of the area's conflict with nature throughout history.

Flood hazards arise from the complex effects of water on land surfaces and by water pressure. Flooding and its impacts result from the overflow of rivers, creeks, drainage channels, streams, lakes, and other bodies of water. The inundation of low lands, the temporary backup of sewer and storm water systems, the rise of ground water, and the failure of flood control facilities also contribute to flash flooding. Floods can also occur when the ground is frozen and/or saturated with moisture and cannot absorb any further moisture. The source of saturation in this area is usually attributed to heavy rainfall over extended periods of time. Gradual flooding can also occur and is a slow developing event with a natural, predictable source of water or moisture, such as snow melt, slow rain, or a controlled dam release. This can often contribute to flash

[57] Grand Challenges for Disaster Reduction: Flood. National Science and Technology Council's Subcommittee on Disaster Reduction

flooding, but its time of occurrence can sometimes be anticipated. The high runoff produced by excessive rainfall may cause man-made and natural drainage systems to fail, causing flash flooding. The loss of life and severe damages may result when floodwaters strike cities, industries, and/or farms located in or near waterways or floodplains. Most of the property damage usually occurs in the floodplain area.

History of Incidents

During the summer months, all of Colorado is subject to convective thunderstorms. Humidity is present in the atmosphere, and some storms become capable of producing large amounts of rainfall in very short periods of time. The source of this moisture (humidity) is from the Gulf of Mexico and the central plains states. In mid- to late summer, monsoon-type wind circulation brings moisture, coming from the Baja California area and/or the Gulf of Mexico into Larimer County. The moisture is the source responsible for many of the summer thunderstorms observed over Colorado.

Fort Collins, Loveland, and Larimer County have all been affected by flash flooding. This hazard is considered the greatest risk in the area of natural disasters in this particular region. Numerous floods in the history of this region have resulted in loss of life and substantial property-related dollar loss.

Table 4.6: History of Flood Events for Northern Colorado

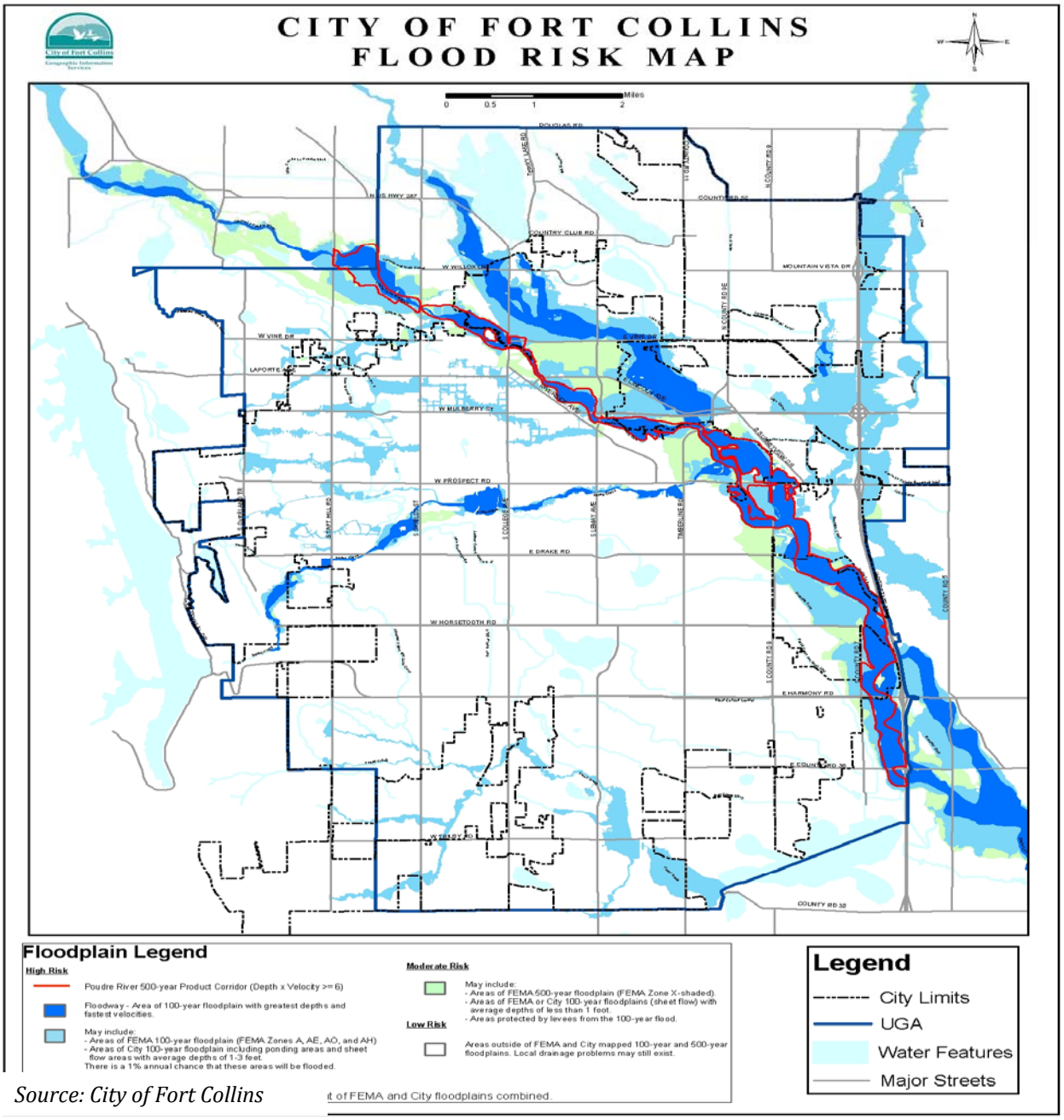
LOCATION	DATE	DAMAGE	DESCRIPTION
Larimer County (Berthoud)	07-12-2001	$ unknown	Heavy rain caused flooding and flash flooding problems in the Berthoud area. Some parts of town were under two to three feet of standing water. Highway 287 was closed as high water covered the roadway. Some basements in the Berthoud Lake subdivision were inundated with up to five feet of water. Major crop damage was reported on the west side of town as 320 acres of corn, wheat, and beets were flooded. The storm also caused the Burlington Northern/Santa Fe railroad to shut down tracks for four hours while repair crews fixed 100-foot and 75-foot stretches of washed-out track.[58]
Front Range Foothills	05-01-1999	$200,000 +	A very warm and moist Pacific storm system allowed for a deep east to southeasterly upslope flow to develop along portions of the Front Range Foothills. Heavy snow occurred in the foothills above 7,000 feet with a steady period of moderate rainfall below this elevation. As a result, the normal runoff was accelerated, causing the Cache La Poudre, the Big Thompson, and the South Platte Rivers to jump their banks. Several rural roads were either closed due the floodwaters or washed out completely. In Windsor, the Cache la Poudre River flooded the basements of several homes along the river. Substantial lowland and agricultural flooding was also reported.
Fort Collins	07-28-1997	5 deaths $190 million	More than eight inches of rainfall were measured in southwest Fort Collins during the evening hours as a series of storms developed, dumping heavy rain. Debris blocked a culvert which flowed into Spring Creek adjacent to a mobile home park. A 10-15 foot wall of water surged through two mobile home parks, destroying 108 homes, damaging 481 others, and severely damaging 86 homes. The high water also derailed four railroad cars. The Colorado State University campus was also flooded, with the library hardest hit. High waters from the surrounding area filled the library basement with 10 feet of water, destroying the medical archives.
Fort Collins, Larimer County	06-02-1997	$500,000	Heavy rain and large hail from thunderstorms moving across eastern Larimer County caused extensive flooding and flash flooding problems throughout the afternoon and evening hours. Rainfall totals ranged from 2 to 5 inches. Flash Floods washed out several roads and highways. Highway 14, the main highway between Fort Collins and Sterling was extensively damaged and remained closed for a week to facilitate repairs. Five bridges were damaged by floodwaters, and several sections of the highway were washed out. Lone Tree Creek, near Lucerne, jumped its banks and flooded several homes. Highway 14 was closed for at least a week to repair the damage.
Larimer County (Livermore)	08-24-1994	$ unknown	The road extending between Livermore and Red Feather Lakes was washed out or badly damaged at several locations.
Fort Collins	07-23-1994	$50,000	Heavy rain caused flash flooding in Fort Collins. Rain amounts of up to 2.00 inches caused flooding of the main streets through downtown Fort Collins. Several basements of residences and businesses were flooded, causing damage. A roof of a radio station collapsed due to the weight of the rainfall.
Drake/Loveland	07-31-1976	145 deaths $40 million	Heavy overnight rainfall came without warning to this area of Colorado. Within a few hours, a severe flash flood swept down the

[58] National Climatic Data Center

		(in 1976 dollars)	Big Thompson Canyon, causing one of the greatest natural disasters in the history of the state.[59]

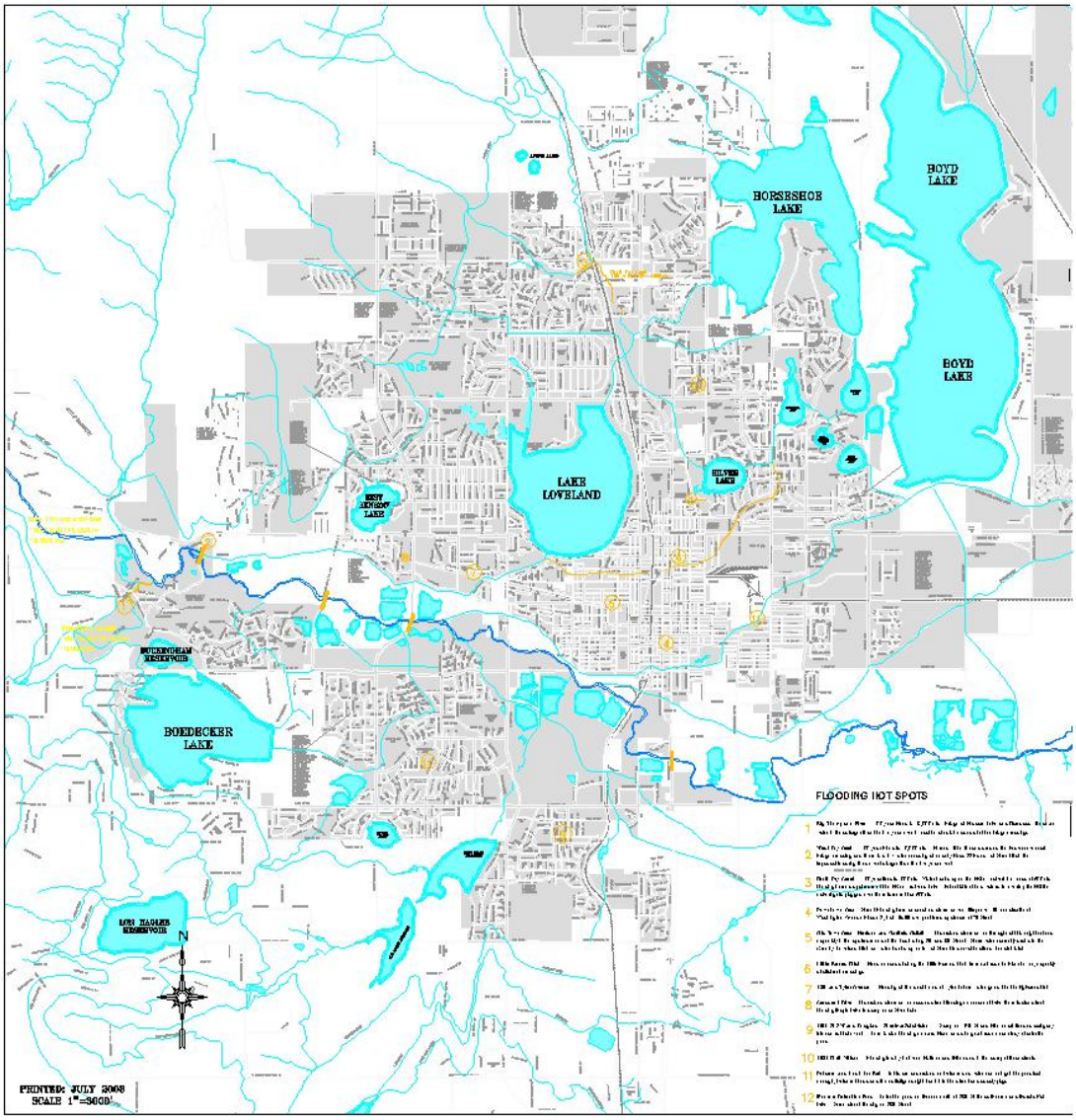
[59] Disaster Response to a Flash Flood, Berling, Robert L., U.S. Bureau of Reclamation.

Map 4.11: City of Fort Collins Floodplains & Flood Risk Map



Source: City of Fort Collins

Map 4.12: City of Loveland Flooding Hotspots Map



Source: http://www.ci.loveland.co.us/PublicWorks/StormWater/FloodplainManagement.htm

Assessing Vulnerability

Larimer County, Estes Park, Wellington, Berthoud: The principal cause for flooding in Larimer County is intense rainfall, which normally occurs in the period of May through September. A historical analysis of rainfall patterns along the Front Range has shown that probable maximum amounts of 20 inches of rainfall can occur in a given 24 hour period.

The likelihood of flooding on the Big Thompson and Cache La Poudre Rivers is also increased in May and June as a result spring runoff from winter snowpack. Both of these principal rivers of the County have well documented histories of notable flooding. According to a 1978 study, the largest flood on the Cache la Poudre produced approximately 21,000 cubic feet per second. The carrying capacity of that river is approximately 5,000 cfs. The Big Thompson is reported to have crested at nearly 32,000 cfs on the night of July 31, 1976.

Several floods have occurred on Spring Creek but these were prior to the construction of Horsetooth Reservoir. However, flooding still took place in this drainage in 1975 and 1977 which caused some flooded basements. Additionally, the city of Fort Collins and county land in the vicinity of the city experienced flash flooding in 1992 when a short but intense thunderstorm caused nearly a half million dollars damage. The 1997 Spring Creek flooding on July 28-29th killed 5 people and became perhaps the worst disaster to hit Ft. Collins in modern times. The county is vulnerable to such flash floods each summer although most rural areas escape the kind of dollar damage which results when cities such as Loveland or Fort Collins are involved.

One of the more notable floods in the county in addition to those mentioned above was the Dry Creek flood of 1924 when water several feet deep eventually worked its way through Fort Collins. It would appear that this drainage basin is prone to producing two consecutive floods when intense rainfall may cause the upper basin water to overtop Douglass Reservoir thus adding to flood waters which would develop in the lower basin.

The County has access to information from the Division of Water Resources which will aid in determining if flooding is imminent. Additionally, the National Weather Service, NOAA, professional meteorologists on contract to the County and river spotters provide as much warning as practicable to initiate warnings to county residents. The Big Thompson Canyon residents have been given free NOAA weather radios with special crystals to warn them in the event of flash flood.

Fort Collins: Depending on its location and extent, a 100-year flood would have an impact on certain Colorado State University facilities, various city facilities, a fire station, a private school, an old industrial hazardous materials site (a federally identified "brownfield" site), a wastewater treatment facility, several roadways within the community, and virtually the entire residential part of the downtown area. A vast portion of Fort Collins electric, phone, and cable networks are underground. Significant flooding within and outside the 100-year flood map may cause temporary outages of these services. The risk of these outages is minimal compared to past historic problems when most utilities were located above ground.

Significant mitigation activities have taken place since the Spring Creek flood in 1997. Mitigation efforts were primarily aimed at decreasing the risk to identified critical facilities and infrastructure from flooding. Historically, flash flooding is one of the most common natural

hazards that impacts the City of Fort Collins and presents the greatest risk. Loss of life and substantial property damage have been recorded in numerous instances over the past 100 years. All areas along waterways and within identified flood plains are facing increasing development pressure. Land use in the Fort Collins area is under pressure due to current density and infill issues within the city. Structures within the floodplains were identified after the 1997 disaster and during Project Impact program activity.

Loveland: A 100-year flood would have an impact on various city facilities, both private and public educational facilities, parks and open space areas, and some residential areas of the community. As with Fort Collins, most utilities in Loveland are buried underground. However, flooding will inevitably cause temporary utility failures. The City of Loveland and areas of the Big Thompson Canyon suffered a catastrophic flash flood during the summer of 1976, resulting in hundreds of deaths and more than $45 million in property damage. This flood impacted all communities in Northern Colorado. Demands for growth and the encroachment of development on flood plains put certain areas of the community at a higher risk of flooding.

Hazard Mitigation Action Items

General flood hazard mitigation goals addressed throughout the county include, but are not limited to:

- Review and adjust floodplain areas as necessary.
- Maintain approved, up-to-date floodplain maps.
- Increase the ability to safely divert storm water.
- Increase ability to retain storm water.
- Acquire high risk property in the floodway and convert it into open spaces.
- Increase the ability to contain the flow of rivers and streams within their banks.
- Provide measures to protect critical facilities from the effects of flash flooding.
- Limit new development within areas prone to flooding.

Hazard Mitigation – Larimer County, Fort Collins, Wellington

Storm drainage problems have long plagued the Boxelder Creek watershed, particularly the developing area from just north of the Town of Wellington, to just south of Timnath. Recently completed studies have suggested that damages from an infrequent flooding event would be severe and threaten both life and property. For that reason, the Boxelder Creek Regional Alliance was formed. The Alliance consists of representatives from Larimer County, Fort Collins, Wellington, Timnath, Windsor, the Boxelder Sanitation District, the New Cache La Poudre Irrigation Company, the North Poudre Irrigation Company, a private property owner's group and the Colorado Water Conservation Board. The Alliance developed a Master Plan and through that plan identified several stormwater mitigation alternatives that would reduce the threat of flood damage to existing homes and businesses and allow for the thoughtful and safe development of other vacant or agricultural properties have been identified. The alternative recommended was selected based on a cost/benefit analysis and overall effectiveness of being implemented. The Stormwater Authority, formed by the Alliance is responsible for implementing the following action items:

1. Diversion of Coal Creek to Clark Reservoir
2. Construction of Edson Reservoir
3. Middle Boxelder Creek Stream Improvements
4. Construction of a siphon/waste way along the Larimer Weld Canal at Boxelder Creek

5. Construction of I-25 Split Flow Diversion Channel

The above, high priority action items are phase one of three and are projected to cost about 13.7 million. A FEMA PDM Grant has been awarded (match cash and in kind funds provided by local communities). The grant expires September 29, 2012. More information regarding phase two and three, timelines, potential funding, implementation strategies, prioritization information, vulnerability information, (etc…) can be found at www.larimer.org/engineering/stormwater/boxelder/History_Master_Plan.htm

Hazard Mitigation – City of Fort Collins

(See Appendix D for additional information, including: NFIP information, additional action items, implementation strategies, prioritization information, vulnerability in terms of types and numbers of buildings and infrastructure and critical facilities in the floodplain.)

The City of Fort Collins adopted its Flood Mitigation Plan in 2004. This plan is incorporated by reference into the Northern Colorado Regional Hazard Mitigation Plan. Many capital projects are included in the following list of activities, undertaken since 2003, to mitigate the potential effects of flooding within the City of Fort Collins:

1. The City continues to sponsor its annual Flood Awareness Week each July. Mailers are sent to all floodplain residents and property owners, as well as to realtors, lenders, and insurance agents. Displays containing flood information are available at the Customer Service Division, two libraries, and Fort Collins Utilities. Videos regarding flooding and preparedness are shown on cable TV Channel 14 in July and August. Signs on bus benches, warning of the dangers of driving through flood water, are placed at numerous locations around town. Banners also are hung on various light poles advertising Flood Awareness Week.
2. The City continues to offer free technical assistance for property protection as well as information on flood insurance, emergency preparedness, etc.
3. The City provides free floodplain determinations and maintains a web site offering the floodplain maps in an interactive format. The City's web site continues to be updated regularly.
4. Open space continues to be preserved by the City's Natural Resources Department.
5. Council initiated a contract with Colorado State University to review Water Quality Best Management Practices.
6. The City's Flood Warning System continues to be operated and maintained. Streamflow and rain gauges located throughout Fort Collins are maintained quarterly and tested annually. The annual on-call meeting between the Office of Emergency Management and the OnCall Stormwater staff was held April 10, 2008. A comprehensive tabletop exercise between the Office of Emergency Management, on-call Stormwater staff, field crews, and City Public Information Officers was held May 28, 2008.
7. A new public outreach video on the flooding threat in Fort Collins and the City's response, including capital projects, floodplain regulation, continuing public education and an expanded flood warning system, was produced in 2008 and will be ready for the 2009 flood season.

8. The $10 million Dry Creek Flood Control Project was completed in 2006, significantly reducing flooding in the Dry Creek basin. A physical map revision was submitted to FEMA in January 2007, and the new maps became effective on June 17, 2008. Construction was completed on four projects in the Spring Creek Basin. These projects are funded in part by a $2.7 million FEMA Pre-Disaster Mitigation Grant. They included construction of three detention ponds and stabilization of the Burlington Northern Railroad Embankment. A Physical Map Revision is expected to be submitted to FEMA in 2009.
9. A bank stabilization and a series of controlled spills from the Poudre River near Riverbend Ponds was completed in 2008. This was a joint project between the Stormwater, Natural Resources, and Engineering Departments. A Letter of Map Revision reflecting the changes to the floodplain mapping for this project and the improvements made by Engineering to Prospect Road has been submitted to FEMA for approval.
10. The Canal Importation Ponds and Outfall (CIPO) project is under construction in west Fort Collins. This stormwater mitigation project incorporates a detention pond and storm sewers.
11. Construction on the Union Pacific Railroad culvert improvement project on Fossil Creek is complete. The map revision was approved in early 2009. A project in the Dry Creek Basin to reduce local drainage problems in the North College Avenue area started design in 2006 and continues to date.
12. The Upper Cooper Slough Drainage Master Plan and Boxelder Regional Drainage Master Plan and Intergovernmental Agreement were approved by City Council in 2008. These master plans provide:
    - Proposed projects to reduce flood damages;
    - Guidance for new development;
    - Guidance for enhancements to the riparian habitat along stream corridors;
    - Proposed improvements to water quality; and
    - Guidance for stabilizing streams when necessary. [60]

Hazard Mitigation – City of Loveland

In 1987, the City of Loveland adopted the Floodplain Building Code and Floodplain Regulations. These two documents (refer to Appendix D) encompass the contents and requirements of the National Flood Insurance Program and are updated and revised annually. In addition, the following activities were undertaken since 2003 to mitigate the potential effects of flooding within the City of Loveland:

1. Developed a new Flood Management Plan in 2005. Plan is reviewed and updated annually.
2. Designated a Stormwater Division maintenance truck as a flood response vehicle. This vehicle is stocked with tools and supplies to respond to basic localized flooding, spills, or emergency storm sewer location requests.
3. On May 1, 2008, the City of Loveland published the updated Emergency Preparedness Plan for the Green Ridge Glade Reservoir. This document provides detailed information related to possible dam failure at Green Ridge Glade Reservoir.

[60] http://fcgov.com/stormwater/ann-fld_mit_plan.php

4. The Stormwater Division maintains an on-call program to provide around-the-clock emergency response from April through September.
5. The Public Works Department conducts regular cleaning and/or servicing of stormwater vaults, siphons, catch basins, and connector sewers.
6. During 2009, the Public Works Department plans to purchase and equip a "quick-hitch" trailer to be stocked with emergency traffic control devices. The trailer will be available to respond quickly to re-route traffic in areas affected by flooding.
7. Installed numerous real-time, early-warning flood monitoring stations along the Big Thompson River floodplain.
8. Completed numerous stormwater improvement and/or repair projects such as the City's Early Flood Warning System (see Appendix D, Map 4.16).
9. The City continues to offer free technical assistance to the community for property protection as well as information on flood insurance, emergency preparedness, etc.
10. The City provides free floodplain determinations and maintains a web site (http://www.ci.loveland.co.us/PublicWorks/Stormwater/FloodManagement.htm) offering the floodplain maps in an interactive format. The City's web site continues to be updated regularly.
11. Open space continues to be preserved by the City's Natural Resources Department.

Hazard: Hail Storm

Frequency:	**Highly Likely: Near 100% probability in next year**
Potential Magnitude:	**Limited: 10-25 %**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**All geographic areas**
Influencing Factors:	**Climate and topography**

Description

Hail is made up of spherical balls of ice that fall from thunderstorms. Hail stones form as the result of small frozen raindrops being continuously recycled through multiple updrafts and downdrafts. Once the accumulated layers of ice become so heavy, they can no longer be suspended by wind or drafts. Hail is not to be confused with sleet, which is simply frozen raindrops that fall to the ground. Other pertinent facts about hail and hailstones include:

1. Large hail stones can fall at speeds faster than 100 mph.
2. Hail stones sometimes contain foreign matter such as pebbles, leaves, twigs, nuts, and insects.
3. The largest hail stone observed in the United States fell in Aurora, Nebraska, on June 22, 2003.[61] The hailstone measured more than seven inches in diameter and more than 18-¾ inches in circumference.
4. Hail causes nearly $1 billion in damage to property and crops annually throughout the United States.
5. The costliest hail storm in United States history was the Tri-State Hailstorm of April 10, 2001. This storm struck eastern Kansas through southern Illinois and created $1.9 billion in insured losses in a 2-day period.[62] The previous record for costliest hail storm in the U.S. was for a July 11, 1990, storm that struck the Denver, Colorado, area causing total damage of $625 million.

    - The most deadly international hail storm on record occurred in India on April 30, 1888. This hailstorm killed 230 people and thousands of animals in and around Moradabad, about 100 miles east of Delhi.[63]

History

The primary resource for historical records of notable hail events in the Larimer County area is the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS), a non-profit network of volunteers, coordinated through the Colorado Climate Center at Colorado State University.

[61] http://en.wikipedia.org/wiki/Weather_records#Hail
[62] American Meteorological Society Monthly Weather Review, Vol 131, Issue 8, pp. 1734-1739. http://ams.allenpress.com/perlserv/?request=get-abstract&doi=10.1175%2F%2F2549.1&ct=1
[63] http://www.history.com/this-day-in-history.do?action=Article&id=419

The CoCoRaHS network was developed in 1998 and monitors, records, and reports on extreme weather events.

Table 4.7: History of Severe Hail Events in Larimer County

DATE	LOCATION	DESCRIPTION
05/22/2008	Loveland	Accumulation of ½ to 1-¾ inch diameter hail stones
08/22/2007	Wellington	Accumulation of hail stones up to one inch in diameter
08/15/2007	Southwest Larimer County	Accumulation of hail stones up to 2 inches in diameter
07/12/2007	Buckeye Canyon	Accumulation of ½ to 1-¾ inch diameter hail stones
07/03/2007	Western Larimer County	Accumulation of hail stones up to 2 inches in diameter
05/14/2007	Loveland/Drake	Accumulation of one inch diameter hail stones
07/11/2005	Fort Collins	Accumulation of hail stones up to 1-½ inch diameter
05/07/2005	Fort Collins	Accumulation of hail stones up to 1-½ inch diameter
08/10/2004	Timnath	Accumulation of one to two inch diameter hail stones
06/10/2004	Fort Collins	Accumulation of one to 1-½ inch diameter hail stones

Sources: http://www.cocorahs.org/ViewData/ListHailReports.aspx and http://www.nws.noaa.gov/om/hazstats.shtml

Assessing Vulnerability

Larimer County, located approximately one mile above sea-level, experiences numerous hail storms due to the wide temperature ranges within temperature zones. In contrast to hail storms at sea-level, hail stones that are formed at higher elevations have less time to melt before they reach the ground.

Forecasting hail is not a simple process, even with the use of Doppler radar. The primary reason for the difficulty is due to the complexities of hail formation. Verification of hail events is also a cumbersome, albeit important, process. Hail can be smaller than a pea or larger than a softball and can be very destructive to crops, vehicles, and buildings. Hail storms are generally localized and have limited impact since most injuries require first aid only. Hail storms can potentially shut down critical facilities and services for long periods of time, and may severely damage or destroy property. Hail events have no defined geographic boundary. Because it cannot be predicted where hail will fall, all people, buildings, critical facilities, and infrastructure should be considered at risk from hail storms.

Hazard Mitigation Action Items

Typically, hail storms cause property damage. Therefore, mitigation efforts throughout the region focus on public education efforts. However, little can be done to prevent property damage from hail storms. Local governments, in cooperation with local media outlets and weather forecasters, support the sharing of information regarding risk reduction and protection of property from damage related to hail storms.

Hazard: Hazardous Material – Fixed Facility

Frequency:	**Likely: Between 10%-100% probability in next year, or at least one chance in next 10 years.**
Potential Magnitude:	**Negligible: less than 10%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**Specific impact determined by size, type, and location of incident**
Influencing Factors:	**Dependent upon chemical properties**

Description

Hazardous materials are any substance in any quantity or form that may pose an unreasonable risk to the safety, health, environment, and property of citizens. The potential severity of hazards of these materials is varied but the primary reason for their designation is their risk to public safety. Local industries, such as natural gas and oil pipelines, present the opportunity for a fixed site hazardous materials incident anywhere within the region.

A stationary hazardous materials incident is any occurrence resulting in the uncontrolled release of materials from a fixed site capable of posing risk to health, safety, and property as determined in EPA's regulations. Areas at risk include the locations of hazardous materials manufacturing, processing or storage facilities, as well as all hazardous waste treatment, storage, and disposal sites.

The hazardous materials incident that is of local concern is methamphetamine laboratories. The presence of clandestine methamphetamine labs (meth labs) in northern Colorado presents serious risks to public health and safety. According the U.S. Drug Enforcement Administration, there were 450 meth labs reported in Colorado in 2002. That number has steadily declined, with only 46 meth lab incidents reported in 2007.[64] This decline has eased the strain on local resources to a small extent; however, local agencies continue to be strained by meth lab responses due to the extended time and large amount of resources that are required when a meth lab is discovered. However, the decline in reported incidents can also be used to show the potential increase in mobile meth labs, or meth labs contained in vehicles. This type of meth lab

[64] www.usdoj.gov/dea/concern/map_lab_seizures.html

is extremely difficult to identify and poses extreme risks to the public in proximity to the vehicle.

History of Incidents

Larimer County, Fort Collins, and Loveland are exposed to and are at risk from accidents and/or incidents involving hazardous materials. A large portion of the local economy is based upon agriculture, manufacturing, and industry. All of these businesses rely on the production, use, and/or storage of hazardous materials. Several educational and research facilities in the community also utilize hazardous materials in their facilities. Explosives, flammable liquids, flammable solids, gases, poisons, pesticides, oxidizing substances, and radioactive materials are either used in or stored throughout the region.

Over the years, the region has experienced numerous hazardous materials incidents at fixed sites. Reports from local fire department records management systems indicate that the local fire departments have responded to more than 1000 hazardous materials fixed-site incidents per year since 2003. Gasoline and carbon monoxide incidents were not included in these responses. Suspicious substance responses were also not included due to the lack of credible evidence after investigation. However, unsubstantiated call/incidents do put a burden on local emergency response agencies and public health. Following is more detailed information on some of the more serious responses since 2003:

History of Regional Incidents

- August 2008 – An unlabeled tank inside an abandoned garage was found to be leaking. West Highway 34 was closed for more than 7-½ hours as crews worked to determine that the tank contained ammonia, and then worked to contain the leak.
- June 2008 – Fire crews responded to a fire alarm at a cold-storage facility and found that a 150-pound ammonia cylinder had ruptured and several other adjacent tanks were bulging. East Highway 34 was closed overnight while crews worked to mitigate the problem.
- January 2008 – Several large above-ground storage tanks at an oil pumping facility were found to be leaking. Crews spent approximately three hours reinforcing the secondary containment berms.
- December 2007 – A local high-tech company reported a toluene spill inside its building. The plant was evacuated for more than 2-½ hours and five employees were transported to local hospitals for evaluation.
- August 2007 – A railroad locomotive spilled more than 300 gallons of oil along more than three miles of tracks through Loveland.
- July 2007 – A water treatment plant outside of Berthoud exploded after an adverse chemical reaction occurred during a product delivery. Four workers were injured and a large area around the plant was evacuated for several hours. The water supply provided by the facility was disrupted for several months while repairs were made.
- April 2007 – A mercury spill at a middle school resulted in the school being closed for more than three hours and more than 12 students being decontaminated.
- April 2006 – A 500-pound liquefied propane gas tank rolled out of a parking garage that was under construction, fell two stories to the adjacent roadway, and began leaking. The

roadway and nearby businesses were evacuated for more than four hours as crews worked to mitigate the situation.

- October 2004 – A Freon line burst at a refrigeration facility. One person was transported to the hospital for evaluation.
- Local fire departments respond to numerous calls for large amounts of fuel leaking onto the roadway following traffic accidents. A September 2008 accident resulted in more than 70 gallons of diesel fuel leaking onto East Highway 34.
- In 2000, over 30 individuals were transported to medical facilities from a fabrication facility due to chemical exposure when a scrubber appeared to malfunction.

Assessing Vulnerability

The United States Environmental Protection Agency (EPA) has selected the City of Fort Collins for a Brownfields Pilot Program. Fort Collins was also selected to receive additional funding for assessments at Brownfields properties to be used for greenspace purposes. The City plans to use the Pilot Program to help recover and preserve the Downtown River Corridor as a community asset. The Pilot Program will facilitate the environmental cleanup and redevelopment of the area that is needed to stimulate the economy of the Corridor. Redevelopment of the Corridor will protect and restore the quality of the natural environment, improve the quality of life for the community, and preserve the history and culture of the area for future generations. For example, the City will reuse historical buildings wherever possible to preserve cultural elements and conserve the use of building materials. The Pilot Program will use the greenspace funding to assess and address environmental conditions along the riverbanks and riparian environments of the Poudre River. The funding will be used to conduct assessment activities necessary to restore riverbank habitats, preserve riparian land and greenways along the riverbanks, and to reestablish the riverside trail through downtown to create a positive, natural experience for the community.[65]

There are numerous facilities in Fort Collins, Loveland, and Larimer County that use, store, transport through fixed systems, and/or produce hazardous materials. These range from large dry cleaning facilities to agricultural co-ops to industrial manufacturing plants. Fixed sites also include oil and gas pipelines, most of which are located in every area of the communities that are identified within this Plan. It is not uncommon for the fire department to frequently respond to cut natural gas lines. Over 500 businesses are required to report to local authorities due to the use of hazardous materials. As growth continues in all areas of the community, these types of incidents will also continue. These facilities are located throughout the City although primarily in the industrial growth quadrants of the City. The larger facilities are located in areas zoned, or land use-permitted, for commercial/industrial use. An accident in one of the smaller sites would have a minimal impact on the community. However an incident at one of the larger facilities could produce an incident area of several miles in diameter, impact the community physically and economically, and cause the loss of life. Although the number of large incidents at hazardous material fixed site facilities were few in number and negligible in magnitude,

[65] *http://cfpub.epa.gov/bf_factsheets/gfs/index.cfm?xpg_id=5929&display_type=HTML*

these incidents had the potential to become catastrophic based upon the available amount and type of product.

Hazard Mitigation Action Items

The primary means for mitigating potential hazardous materials incidents at commercial occupancies throughout the region is through fire code inspection programs administered by local fire departments. Through these inspection programs, facilities containing hazardous materials are identified and inspected for code compliance on a routine basis. Inspectors assess for safe storage, handling, and use of hazardous materials. Additionally, numerous commercial facilities throughout the region participate in the OSHA Voluntary Partnership Program, which encourages high levels of safety in the workplace. Furthermore, local public safety agencies routinely participate in drills and planning exercises concerning local hazardous materials facilities, such as those facilities that produce cryogenic liquids. Employees in local public safety agencies are trained in hazardous materials awareness programs, providing for more rapid recognition of hazardous materials issues.

Hazard: Hazardous Materials – Transportation

Frequency:	**Likely: Between 10% and 100% probability in next year, or at least one chance in next 10 years.**
Potential Magnitude:	**Negligible: Less than 10%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**On or near major interstates, highways, roadways, and streets including commercial and residential areas.**
Influencing factors:	**Product, amount involved in incident, geographical and environmental elements.**

Description

A hazardous material transportation incident is defined as any occurrence resulting in the uncontrolled release of materials during transport that are capable of posing a risk to health, safety, environment, and property as determined in the US Department of Transportation (DOT) Regulations. Over 18,000 materials are covered under the DOT regulations. The population groups likely to be seriously affected are within the most densely populated five-mile circle around a major transportation route (i.e., highway, rail lines, or pipeline) along which hazardous materials move.

History

The area encompassed within this Plan is exposed to and is at risk from accidents and or incidents involving transportation of hazardous materials. The local economy is based upon agriculture, manufacturing, research, and industry. All of these rely on the production, use, storage, transportation, etc. of hazardous materials. The projected growth in the use of nuclear fuels and radioactive isotopes for nuclear power generation, medicine, agriculture, research, and industry use indicates that increasing quantities of many types of radioactive materials

with varying degrees of hazard potential are and will be transported intrastate and interstate across Colorado for the foreseeable future. Interstate 25 is designated as the Hazardous and Nuclear Materials Transportation Route by the Colorado Department of Highways. Transuranic waste shipments pass through the area on the way to the Waste Isolation Pilot Plant in New Mexico.

Fort Collins is located next to Interstate 25. U.S. Highway 287 runs through the middle of Fort Collins in a north-south direction, and U.S. Highway 14 cuts through the north side of town connecting with 287 and traveling up the Poudre Canyon. Loveland is located next to Interstate 25. U.S. Highway 34 bisects Loveland north-to-south, and U.S. Highway 287 bisects Loveland east-to-west. Heavy commercial truck traffic containing varying amounts of hazardous materials travels on these major roadways daily. Even though Highways 287 and 34 are listed as the primary corridors for commercial truck traffic, many trucks by-pass these routes for a variety of reasons, which may include illegal loads and/or cargo. This can put the hazard in residential areas. Traffic containing various hazardous materials (some of them being incompatible with each other) travel through and are delivered to businesses throughout residential and industrial areas.

Along with road transportation, Fort Collins and Loveland have railways that pass through their communities. Great Western, Burlington Northern Santa Fe, and Union Pacific all provide service to these areas. Up to eight trains a day travel on these railways with some trains as long as eight miles. Significant quantities of hazardous materials are transported on these routes. Derailments and collisions with auto/truck traffic have occurred in the past. Rail spurs can also serve as a risk to the community as materials are delivered to facilities within the community.

Although many of the accidents and incidents (spills and releases) are small, a single hazardous materials accident can result in the loss of many lives and cause millions of dollars in property damage.

Besides the numerous hazardous materials incidents involving spilled fuels, the following is a list of several hazardous materials transportation incidents that resulted in closing major roadways.

Table 4.8: Hazardous Materials Transportation Incidents

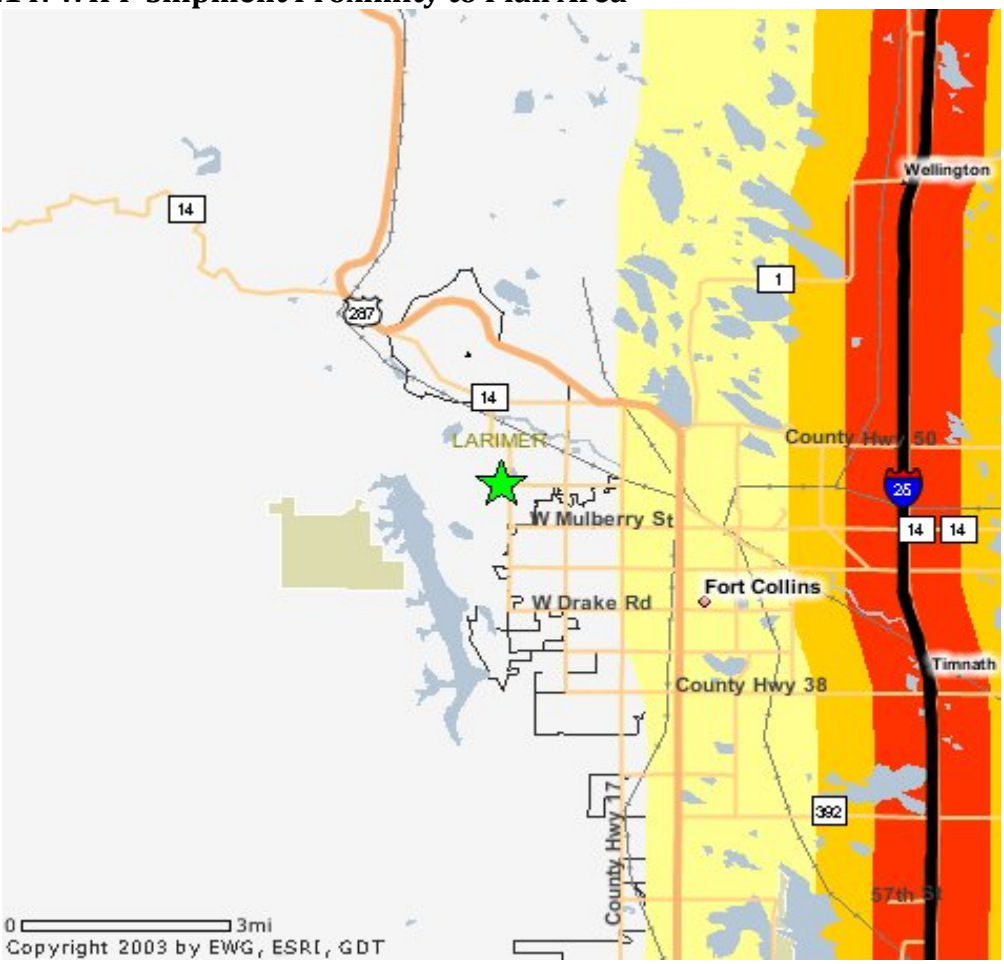
DATE	CITY	COMMODITY	QUANTITY RELEASED	INJURIES	FATALITIES	DAMAGES
08/17/07	Estes Park	Liquefied Petroleum Gas	36.7 cubic feet	1	0	$757
01/11/07	Ft Collins	Paint-Related Materials	4 gal	0	0	$0
06/05/06	Ft Collins	Caustic Alkali Liquids	15 gal	0	0	$1,800
04/04/06	Ft Collins	Calcium Hypochlorite	8 gal	0	0	$0
02/02/06	Loveland	Cryogenic Helium	6.6 gal	0	0	$0
09/06/05	Loveland	Liquid Flavoring Extracts	15 gal	0	0	$0
04/18/05	Ft Collins	Toxic Corrosive Liquids	5 gal	0	0	$3,500
08/30/04	Loveland	Sodium Hypochlorite (solid)	20 gal	0	0	$500
06/22/04	Loveland	Bulk Diesel Fuel	1,008 gal	0	0	$181,334
05/13/03	Loveland	Chlorobutane	5 gal	0	0	$100
05/12/03	Ft Collins	Bulk Petroleum Distillate	90 gal	0	0	$46,200
02/07/02	Loveland	Liquid Cleaning Compound	15 gal	1	0	$335
01/08/02	Loveland	Bulk Gasoline	2,700 gal	0	0	$427,700

Source: U.S. Department of Transportation – Pipeline and Hazardous Materials Safety Administration (https://hazmatonline.phmsa.dot.gov/IncidentReportsSearch/Search.aspx)

Map 4.13: Nuclear Waste Shipment Routes

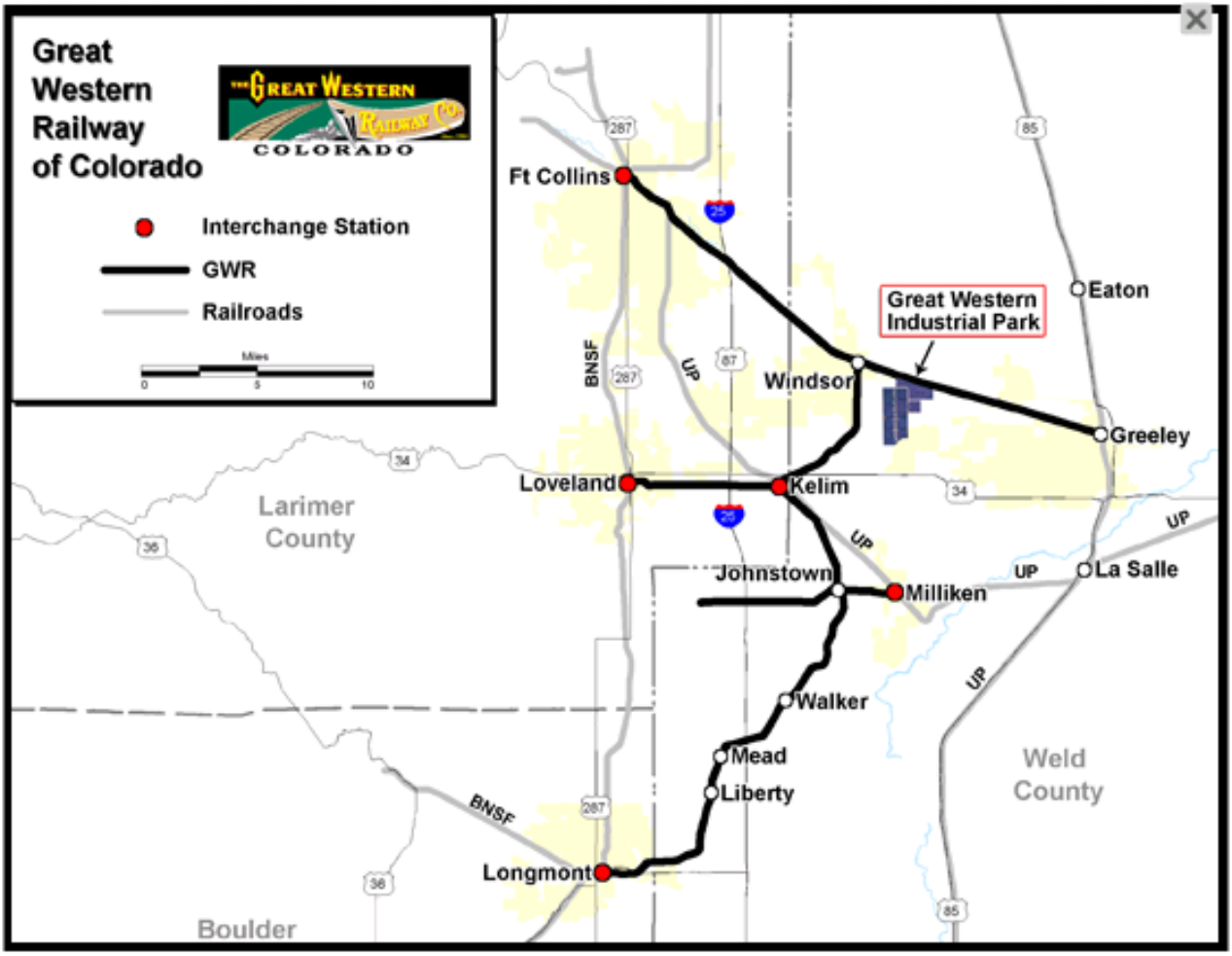
Source: U.S. Department of Energy – Waste Isolation Pilot Program: WIPP Transuranic Waste Transportation Routes

Map 4.14: WIPP Shipment Proximity to Plan Area



Color bands indicate damage effect distances from the transportation corridor.
Source: United States Department of Energy – Waste Isolation Pilot Plant Program

Map 4.15: Railway Lines



Source: Great Western Railway of Colorado

Assessing Vulnerability

Substantial amounts of hazardous materials pass through Fort Collins, Loveland, and Larimer County on a daily basis via the roadway and rail system. The potential for a catastrophic disaster does exist. Several localized transportation events have occurred in the past on major roadways including U.S. Highways 14, 34, 287, and Interstate 25. Heavy truck traffic containing hazardous materials proceeds through the north section of Fort Collins and generally throughout Loveland and Larimer County. A large factor in the location of hazardous material transportation incidents is dependence on the location of major roadways. Numerous hazardous materials are delivered daily to businesses within the local cities, and I-25 is designated as the Hazardous and Nuclear Materials Transportation Route (WIPP and nuclear materials transport route). CDOT has documentation showing several closures of major transportation routes due to hazardous material incidents on these infrastructures. The local rail systems that pass through Fort Collins, Loveland, and parts of Larimer County also carry significant quantities of hazardous materials. These transporters were also involved in minor accidents/incidents including several derailments over the last 10-20 years. The rail system passes through all downtown commercial/business districts that house police stations and city hall facilities. Other tracks carry materials through residential areas traveling north and south through the entire City of Fort Collins and Loveland. These communities have businesses within them that use, store, or manufacture hazardous materials within their facilities. The magnitude of an incident in this area could be catastrophic to the community. Although building damage may be minimal with a hazardous material release, the cost of containment, decontamination, and clean-up, along with injury and loss of life, could be tremendous.

Hazard Mitigation Action Items

In order to be prepared to respond to potential transportation-related hazardous materials incidents, local emergency response agencies will do the following:

- Maintain trained and equipped hazardous materials response team, consisting of technicians and specialists.
- Provide emergency preparedness education to their citizens.
- Provide areas of safe refuge for their citizens.
- Maintain adequate supplies of emergency equipment to appropriately respond to a moderate sized event.
- Provide hazardous materials recognition training to all first responders.

In addition to the efforts listed above, local governments are working to:

- Improve early warning and emergency notification capabilities.
- Improve hazardous materials recognition and inspection programs within the local fire departments.
- Develop response plans for transportation-related hazardous materials incidents in proximity to heavily populated areas and identified critical facilities. Examples of areas of concern include, but are not limited to, shopping mall areas along major transportation routes, hospitals, and large-scale public assembly areas.

Hazard: Landslide/Rockslide

Frequency:	**Likely: 10% - 100% in next year, or at least one chance in next 10 years**
Potential Magnitude:	**Limited: 10% - 25%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**Steep grades, unstable geological formations within the Big Thompson Canyon and the Poudre Canyon**
Influencing Factors:	**Prevalence of wind shear and thunderstorms, proximity to mountain range**

Description

Landslides/rockslides are a serious geological hazard found in almost every state in the nation. While not all landslides and/or rockslides result in private property damage, many impact transportation corridors, communication systems, and energy and fuel conduits. Landslides and rockslides also pose a threat to human life. Weathering and decomposition of geological materials produce conditions to support landslides and rockslides. Studies indicate that changes to a slope through cutting and filling can increase the risk of a landslide and/or rockslide by over 75% in many cases.[66] Landslide and erosion losses are greatly affected by flooding. Excessive rain and flooding increase the risk of these hazards.

Sediment produced by landslides can also affect the regional water quality. Smaller slides along the rivers introduce sediment and silt into the waterways and affect the quality of the region's water. As growth continues into the areas prone to landslides and rockslides, terrain will be modified and natural processes altered. Without proper planning, this hazard will continue to threaten life safety and property.

History

While a quantitative vulnerability assessment (describes the number of lives and amount of property that is exposed to the hazard) has not been done for all communities of this plan, there are many factors that point to potential vulnerability. Landslides can block major transportation routes and block residents and businesses from essential services. These blockages may last from hours to days depending on the severity of the slide. While past landslide/rockslide events have not caused major property damage, they have blocked several major transportation routes. This affects residential, commercial and emergency traffic.

[66] Burns, Scott. Dr., Portland State University

Major Landslide/Rockslide incidents:[67]

07/25/2004	Highway 14	closed – 24 hours	rockslide
07/14/2004	Highway 14	closed – 24 hours	rockslide
04/05/2002	Highway 34	closed – 24 hours	rockslide
06/19/1999	Highway 14	closed – 21 days	large rock/landslide
02/23/1993	Highway 14	closed – 72 hours	avalanche/rockslide
08/01/1989	Highway 34	closed – 8 hours	rockslide

Several additional landslide/rockslides have occurred within these areas, but were negligible and had minimal impact on transportation. The areas prone to slides that have affected transportation routes are Highway 34 within the Big Thompson Canyon west of Loveland and Highway 14 within the Poudre Canyon northwest of Fort Collins. These roads are important in that they serve as the primary transportation routes for several rural communities. Highway 34 serves the communities within the Big Thompson Canyon, Estes Park, Rocky Mountain National Park, and the towns of Granby and Grand Lake. Highway 14 serves the communities within the Poudre Canyon, including Red Feather, Cameron Pass, Gould, and the town of Walden. Several water-related critical facilities are located within these canyon areas.

While past landslide/rockslide incidents have not caused loss of life or major property damage, or significantly impacted county residents, continuing to map landslide/rockslide and debris flow areas will assist in preventing future loss.

Assessing Vulnerability

Landslides and rockslides have had a negligible impact on the Fort Collins community. Citizens have reported minor impacts of falling rocks striking their vehicles as they travel outside the city. The impact to the water quality has also been negligible in nature. The community of Loveland and areas within Larimer County has experienced landslide/rockslide incidents. CDOT has provided data that indicates several large scale slides have occurred near Loveland, Estes Park, and areas of Larimer County. These slides are more prevalent in the Big Thompson and Poudre Canyon areas of the county. As growth continues in these areas, the potential for slide damage will increase.

Hazard Mitigation Action Items

The Colorado Department of Transportation (CDOT) is the lead agency for the geologic assessment of rock slide and landslide or other such geomorphological phenomena in Larimer County. CDOT works in conjunction with the county Road and Bridge department and the office of Emergency Management as necessary when road work or mitigation/stabilization work needs to be undertaken. In suspect areas where rock fall impacts highways, CDOT is responsible for signs warning the public of such dangers.

Hazard: Lightning

Frequency:	**Highly Likely: Near 100% probability in next year**
Potential Magnitude:	**Limited**

[67] Miller, Don E., Colorado Department of Transportation

Speed of Onset:	**Minimal or no warning**
Geographic Area Affected:	**All geographic areas (no boundaries)**
Influencing Factors:	**Topography and Climate**

Description

Lightning is the discharge of atmospheric electricity that is a component of all thunderstorms. In an instant, the lightning flash superheats the surrounding air to a temperature of nearly 50,000 degrees Fahrenheit. Nearby air expands and vibrates, forming sound that is heard as thunder. There are more than 40 million cloud-to-ground lightning flashes annually in the continental United States. Lightning is a component of all thunderstorms, kills an average of 89 people annually, and injures an average of 300 people annually, making it nature's #2 killer, second only to flash floods. [68] The National Lightning Safety Institute currently ranks Colorado as the third most dangerous state for lightning-related injury and/or death. Larimer County is one of only two counties in the state that are rated as high risk for lightning injury and/or death. Secondary effects from lightning strikes include fires, utility interruption, and property damage. Other effects often result from people's reactions to lightning, leading to chain-reaction type events.

Some additional lightning facts:

- In an average year, over 22 million cloud to ground flashes hit the contiguous United States and surrounding coastal waters.
- In an average year, approximately 494,000 flashes occur in Colorado.
- In an average year, more than 11,500 flashes occur in Larimer County.
- Colorado ranks 3rd in the nation for number of fatalities-per-year caused by lightning.
- Larimer County ranks 12th in Colorado in the number of cloud-to-ground flashes per year, but 1st in the number of fatalities per year.
- Since 1982, there were more than 50 lighting-related injuries and seven lightning-related fatalities in Colorado.
- The most recently documented death caused by a lightning strike occurred in 2008 in Fort Collins.
- The electrical energy in a cloud-to-ground lightning strike can range from 100 million volts to one billion volts.[69]

History

July 2008 – Lightning struck the CSU campus, injuring one person and killing another. The injured person later died as a result of his injuries.

[68] State of Colorado Natural Hazards Mitigation Plan – Lightning, page 76.
[69] http://www.strikealert.com/LightningFacts.htm

July 2008 – A lightning strike in Rocky Mountain National Park injured three hikers. Lightning strikes also caused numerous small-scale wildland fires.

July 2007 – A jogger was struck by lightning and killed in the Devil's Backbone area of Larimer County. A lightning strike also started a wildland fire in the Storm Mountain area west of Loveland. This fire burned for three days before being declared "100% contained."

August 2006 – Lightning strikes caused two separate fires in the Storm Mountain area west of Loveland.

September 2005 – A lightning strike caused a small wildland fire southeast of Estes Park.

July 2005 – Lightning struck the public swimming beach at Boyd Lake State Park in Larimer County. Twelve people were transported to local hospitals for treatment of injuries.

March 2004 – Lightning struck a tree in Lory State Park, causing a small wildland fire.

July 2003 – Lightning struck a tree adjacent to a camper's tent, injuring one person.

May 2003 – Lightning struck at Boyd Lake State Park, killing one person and injuring another.

Table 4.9: Lightning-Related Injuries/Fatalities (1982-2003)[70]

Year	Month	Total Killed	Total Injured	Year	Month	Total Killed	Total Injured
2003	August	0	1	1994	August	0	1
2003	July	0	1	1994	August	0	2
2003	May	1	1	1994	May	0	1
2001	August	1	0	1992	June	0	1
2000	October	0	2	1992	June	1	1
1999	August	1	2	1991	August	0	1
1999	July	1	2	1991	June	0	2
1999	June	0	1	1989	August	0	1
1998	August	0	6	1989	September	0	1
1996	July	0	2	1988	July	0	1
1996	June	0	1	1988	June	0	1
1996	October	0	3	1988	June	0	2
1994	August	0	3	1982	August	0	1

Assessing Vulnerability

As previously mentioned, the National Lightning Safety Institute currently ranks Colorado as the third most dangerous state for lightning-related injury and/or death, and Larimer County is one of only two counties in the state that are rated as high risk for lightning injury and/or death. As a result of this, it can be inferred that the citizens and visitors of Larimer County are at high risk for being injured or killed by a lightning strike. The Eastern Slope of the mountainous region of western Larimer County as well as the high plains region of eastern Larimer County are areas that are identified by the National Lightning Safety Institute as being at high risk for lightning strikes.

[70] http://www.crh.noaa.gov/pub/ltg/county_by_county_table.php

Hazard Mitigation Action Items

The State of Colorado Natural Hazards Mitigation Plan recommends that mitigation activities focus around increasing education and improving communication and life safety activities. The Colorado Natural Hazards Mitigation Plan states that public information should be developed, improved, and disseminated on a continual basis, and this information should lead property owners and renters to property improvements designed to prevent physical damage to their properties. The Colorado Natural Hazards Mitigation Plan states that improved communications should include obtaining and/or replacing warning systems that are designed to alert persons to severe weather activity in the vicinity. Section 4.2 of this Plan documents the numerous hazard mitigation activities that were undertaken in the region to address a wide variety of hazards. In addition to the activities listed in Section 4.2, the following lightning-specific activities were initiated within the region to improve lightning safety:

1. Five departments at Colorado State University (Athletics, Campus Recreation, Conference Services, Facilities Management, and Health and Exercise Science) joined with the University Safety Committee and Environmental Health services to purchase and install the Thor Guard Lightning Prediction and Warning System, which covers a majority of the main campus as well as Hughes Stadium. The system's sensor constantly monitors atmospheric conditions that can cause lightning within a two-mile radius of the sensor. When those conditions are detected, the sensor sends a signal to the horn assemblies that broadcast a "red alert" alarm to warn people in those areas to seek appropriate shelter.[71]

2. The Larimer Emergency Telephone Authority (LETA), an entity created through an intergovernmental agreement with Larimer County, has signed a contract with the vendor 3N Global, Inc. for emergency notification systems. The 3N mass notification system enables one person to communicate with tens, hundreds, or thousands of people anywhere and anytime via telephone, email, instant messaging, text messaging, fax, BlackBerry, personal digital assistant, voice-over-internet, and pager devices. This new notification system has dramatically increased the effectiveness and timeliness of community emergency notifications.

3. Several new large and/or technological facilities in the region have installed lightning grounding systems. Two examples of buildings with built-in grounding systems are the Budweiser Events Center, which can accommodate public gatherings in excess of 7,500 people, and the Medical Center of the Rockies, which is a level II regional trauma center serving northern Colorado and the surrounding region.

4. Larimer County Emergency Services maintains a website that provides outdoor-related safety recommendations. This website can be found at: (www.larimercountysar.org) Other websites that are publicized include:

   National Weather Service Lightning Safety **www.lightningsafety.noaa.gov/**
   Colorado Lightning Resource Center **www.crh.noaa.gov/pub/ltg.php**
   National Lightning Safety Institute **www.lightningsafety.com/**

Hazard: Terrorism/WMD

[71] http://www.ehs.colostate.edu/WLightning/Home.aspx

Frequency:	**Likely: Between 10% and 100% probability in next year, or at least one chance in next 10 years**
Potential Magnitude:	**Limited: 10% - 25%**
Speed of Onset:	**Minimal or no warning**
Geographic Areas Affected:	**All geographic areas (no boundaries)**
Influencing Factors:	**University setting, federal facilities, research facilities, technology-based industry**

Description

Terrorism is defined in the USA Patriot Act as *"activities that (A) involve acts dangerous to human life that are a violation of the criminal laws of the U.S. or of any state; that (B) appear to be intended (i) to intimidate or coerce a civilian population, (ii) to influence the policy of a government by intimidation or coercion, or (iii) to affect the conduct of a government by mass destruction, assassination, or kidnapping; and (C) occur primarily within the territorial jurisdiction of the U.S."*[72] Terrorism may be either domestic or international depending on its origin, base, and the objectives of the terrorist. It usually involves a criminal act, often symbolic in nature and intended to influence an audience beyond the immediate victims. Although political violence has existed in the country since the American Revolution, new forms of politically motivated terrorism are emerging.

The legal definition of a ''Weapon of Mass Destruction'' is from Title 18 of the United States Code, Part I, Chapter 113B, Section 2332 (A) any destructive device as defined in section 921 of this title; "…(B) any weapon that is designed or intended to cause death or serious bodily injury through the release, dissemination, or impact of toxic or poisonous chemicals, or their precursors; (C) any weapon involving a disease organism; or (D) any weapon that is designed to release radiation or radioactivity at a level dangerous to human life."[73]

Our global environment is changing rapidly, and many of these changes increase our risk and exposure to those hazards, as evidenced by the terrorist acts committed on September 11, 2001. These trends place greater demands on local authorities to be prepared and capable of managing emergencies resulting from terrorist activities. Recent events in the U.S. and abroad indicate that a terrorist strike is an ever-increasing possibility.

[72] www.wikipedia.org – definition of terrorism
[73] Federal Bureau of Investigation

History

Whereas other hazards have a track record within the communities of this Plan, terrorism has had no such significant record of occurrences. But that by no means indicates that such a tragedy could not happen. Such events can cause deaths, injuries, and significant property damage. Previous terrorist incidents in the country have overwhelmed the local communities due to the magnitude of the incidents. A United States Department of Justice (DOJ) vulnerability assessment that was performed several years ago indicated that at least two known domestic groups were active in the Northern Colorado region. Several animal research labs were victim to actions claimed by these organizations. Some of the associated risks with terrorism include explosions, building collapse, hazardous materials release, fire, loss of power, blocked roadways, and delayed emergency response. As terrorist groups advance in technological areas, biological and radiological hazards increase.

In the mid-1980s, a state research laboratory north of Fort Collins was a victim of arson. It was believed to be the work of an animal rights group. In the early 2000s, there were several burglary incidents with the release of research animals at local laboratories. Animal rights groups are believed to be responsible for these activities. Local events involving vandalism, arson, and burglary have occurred, and terrorist groups have taken credit. With the diversity of the population, universities, state and federal government facilities, and technology-based industry in the Larimer County area, the likelihood of a terrorist incident is increased.

Assessing Vulnerability

Past history indicates that there has been limited financial loss compared to other hazards that have occurred. Buildings that were identified as being potential targets for terrorism/WMD actions previous to and since September 2001 include the Federal Building, Centers for Disease Control and Prevention, National Wildlife Research Center, and several private and state laboratories in the region. Future costs of continued incidents have not been determined due to the lack of data and relatively low terrorist activity levels.

Hazard Mitigation Action Items

Efforts to maintain local emergency responders in a state of readiness include cross-training between law enforcement, fire, emergency medical services, and emergency management agencies of the region. Activities include, but are not limited to:

- Provide terrorism/WMD awareness training and equipment to all first responders.
- Develop and/or maintain emergency operations plans involving all local emergency responders, including annual emergency training exercises.
- Encourage local law enforcement officers to attend terrorism/WMD-related courses at the FEMA Emergency Management Institute.
- Provide National Incident Management System (NIMS) training to personnel who may be involved in responding to a terrorism/WMD incident.
- Work with local school district safety committees to plan for and be prepared for possible incidents involving school district facilities.
- Maintain active and well-trained SWAT teams, incorporating fire and EMS agencies into the SWAT training to improve intra-agency working relations.
- Ensure that local law enforcement agencies have sufficient weapons to respond to a moderate incident.

Hazard: Tornado

Frequency:	**Likely: Between 10% and 100% probability in next year, or at least one chance in next 10 years.**
Potential Magnitude:	**10% to 25%**
Speed of Onset:	**Minimal to no warning**
Geographical Area Affected:	**All areas of Northern Colorado, increased risk in eastern areas of Larimer County**
Influencing Factors:	**Severe thunderstorms, geographical flat areas**

Description

A tornado is a violently rotating column of air extending from within a thundercloud down to ground level. The strongest tornadoes may sweep houses from their foundations, destroy brick buildings, toss cars and buses through the air, and even lift railroad cars from their tracks. Tornadoes vary in diameter from tens of meters to nearly 2 km (1 mi), with an average diameter of about 50 m (160 ft). Most tornadoes in the northern hemisphere create winds that spin counter-clockwise around a center of extremely low atmospheric pressure. Peak wind speeds can range from near 120 km/h (75 mph) to almost 500 km/h (300 mph) while the forward motion of a tornado can range from a near standstill to almost 110 km/h (70 mph).[74]

Tornadoes are classified by the speed of their winds according to the Enhanced Fujita scale.

EF0 = 40-72 mph	EF3 = 158-206 mph
EF0 = 40-72 mph	EF3 = 158-206 mph
EF2 = 113-157 mph	EF5 = 260-300 mph

Many tornados, including the strongest ones, develop from a specific type of thunderstorm known as a supercell. A supercell is a long-lived, rotating thunderstorm 10 to 16 km (6 to 10 mi) in diameter that may persist for several hours, travel hundreds of miles, and produce numerous tornados.

Risks associated with tornados include hazardous material release, fire, building collapse, loss of utilities, loss of communication systems, and flying debris.

[74] "Tornado," Microsoft® Encarta® Online Encyclopedia 2002

History

Severe thunderstorms consisting of heavy rains, hail, high winds, and tornados frequent this area of the state. Until recently, the region had not incurred any major damage from tornados; however, in May of 2008, a tornado that originated south of Greeley ravaged its way north and west, skirting Greeley and devastating Windsor. It continued on that track, crossing Interstate 25 just north of Fort Collins, where it knocked down a number of utility poles and damaged a number of homes. One fatality and numerous injuries were reported in Weld County, which is directly east of Larimer County. The National Weather Service rates Colorado's eastern plains as one of the areas in the nation that is at highest risk for tornados. As the rural population increases, the potential risk of tornados will increase. It is also important to note that the number of funnel cloud sightings over the last several years has increased. The National Weather Service believes this may be due to an increase in population, creating a better tracking of what actually occurs. As growth of the communities continues to expand to the east into these rural areas, the potential for damage and risk to life will increase correspondingly.

Table 4.10: Tornado Data Chart[75]

DATE	AREA	CLASSIFICATION	DAMAGE
05-22-2008	Windsor	EF3	Over $200 million damage reported, numerous homes and vehicles destroyed, one fatality and more than 100 injuries
07-25-2008	Larimer County	EF0	A tornado reportedly touched down northeast of Buckeye, in rural Larimer County. No damage reported.
05-09-2002	Fort Collins	EF0	None
05-28-1993	Loveland	EF0	None
06-09-1990	Larimer County	EF2	Swath of damage three miles long by 200 yards wide. $25,000 in damage reported.
06-15-1988	Larimer County	EF1	$2,500 in damage reported
06-18-1987	Larimer County	EF1	$25,000 in damage reported

Assessing Vulnerability

Tornados continue to be a reasonable threat to Fort Collins, Loveland, and Larimer County. The potential is higher on the eastern border of Larimer County. Land use in this area includes residential, small business, and several large manufacturing facilities. Any structure is at risk, but the data gathered in the assessment does not support any trends that could identify specific structures that would be at risk. Historical records and scientific studies based on geographical areas were utilized to identify the areas at risk. The impact will be determined by the path of the hazard and classification level of the tornado.

[75] National Climatic Data Center, http://www.ncdc.noaa.gov/oa/ncdc.html

Hazard Mitigation Action Items

The efforts to maintain local communities as well as emergency responders in a state of readiness include a public education program and hazard-specific training for law enforcement, fire, emergency medical services, public works, and emergency management agencies of the region. These activities include, but are not limited to:

- Providing emergency preparedness education to the community.
- Providing areas of safe refuge for affected people.
- Installing emergency generators in many public buildings and critical facilities.
- Providing specialized rescue training to first responders, including developing and maintaining Urban Search and Rescue (USAR) teams.
- Incorporating building collapse training into the Special Operations Team training requirements.
- Improving the early warning capabilities within the local communities.
- Promoting the inclusion of tornado shelters in new construction.

Wellington:

Emergency notification is vital in the case of tornadoes and the Town of Wellington is currently exploring the possibility of adding tornado sirens. This proposed action item is medium priority. Funding would have to be obtained through grants and a tentative timeline is within the next five years.

Hazard: Utility Interruption

Frequency:	**Highly likely: Near 100% probability in next year**
Potential Magnitude:	**Possible: 1-10%**
Speed of Onset:	**Minimal or no warning**
Geographical Area Affected:	**Varies, typically negligible: less than 10%**
Influencing Factors:	**High wind, earthquake, flooding/heavy rains, tornado, severe winter storm**

Description

Larimer County and its communities rely on the delivery of utilities to residents and businesses. Utility interruption or disruption can occur as a result of a natural hazard, but it can also occur from manmade causes such as fires or transportation incidents. While receiving public input during development of the original Mitigation Plan in 2003, utility interruption was identified as a priority hazard, with attention given to the following utility sources:

- Electricity
- Natural Gas
- Communications

Assessing Vulnerability

The impacts of electric utility disruptions are most significantly felt by the general population during the winter and the summer for heating and cooling purposes. However, any electric disruption creates business losses when computers, lighting, refrigeration, gas pumps, and other equipment are without power. Severe summer and winter storms, and tornados and floods can bring trees and tree limbs down onto power lines. These events also cause serious safety hazards to the general public and emergency responders.

Manmade causes of utility interruption may be due to construction accidents or an over-use of particular power grids. Disruptions of communication systems happen frequently, especially since society is now more dependent upon multiple means of communication. When telephone lines are out of service, credit card and many internet transactions cannot be made. The potential loss of cellular phone communication has occurred in localized events but it has not yet been regionally experienced. Severe storm or atmospheric/solar activity could impact radio communications. Local and regional communications plans address the need for redundancy within the local, regional, and state-wide communication systems. Each jurisdiction produces independent communications plans and maintains them as needed.

The majority of homes in Larimer County are heated with natural gas; however, propane is a common heating fuel in the rural areas. A large diameter natural gas pipeline travels through Larimer County along the Interstate 25 corridor. The distribution of natural gas through this pipeline could be disrupted by an earthquake, construction accident, transportation accident, or serious fire along this corridor.

Hazard Mitigation Action Items

While the local communities constantly strive to maintain a state of readiness for addressing potential utility interruptions, the utility providers work to improve the reliability of their systems as well as to reduce the frequency and/or severity of utility interruptions. Efforts to maintain local communities in a state of readiness include public education programs and hazard-specific training for law enforcement, fire, emergency medical services, public works, and emergency management agencies of the region. These activities include, but are not limited to:

- Provide emergency preparedness education to the community.
- Provide specialized training to local emergency responders.
- Take measures to protect above-ground utilities from falling or flying debris.
- Install emergency generators in many public buildings and critical facilities.
- Require all utilities for new construction projects to be installed underground.
- Establish and/or continue the process of placing all existing utilities underground.
- Maintain an adequate supply of emergency equipment to appropriately respond to a moderate sized event.

Wellington:

One way to improve the reliability of systems as well as to reduce the frequency and/or severity of utility interruptions is to bury existing power and communications lines. Wellington is currently working on burying all lines within town boundaries. They are also

working on requiring al new lines to be buried. This proposed action item is a medium priority item that will be addressed through codes and regulations. The Town of Wellington hopes to implement this change within the next year.

Hazard: Wind Storm – Severe

Frequency:	**Highly likely: Near 100% probability in next year**
Potential Magnitude:	**Limited: 10% - 25%**
Speed of Onset:	**Minimum to no warning**
Geographic Area Affected:	**Entire plan region, greater risk near foothills**
Influencing Factors:	**Foothills, mountains, canyons, and weather systems**

Description:

Wind storms frequently impact all communities in the region, with little or no advanced warning. The duration and maximum wind speeds experienced during wind storms have repeatedly resulted in serious property damage and personal injury. Wind storms are common along the Northern Colorado Front Range corridor. Several significant wind events have been responsible for severe damage to property, including buildings, vehicles, and large trees. As a direct result of these extreme winds, the northern Colorado region has experienced widespread utility outages, downed and/or arcing power lines, debris blocking streets, personal injuries, and structure fires.

Table 4.11: History of Severe Wind Storm Incidents (5 knots = 5.8 miles per hour)[76]

DATE	LOCATION	WIND SPEED	DESCRIPTION / DETAILS
June 2008	Larimer County	74 knots	Strong winds damaged several boats at the Carter Lake Marina and knocked down branches and trees in Loveland, resulting in downed power lines and damaged vehicles and homes.
Jan 2007	Larimer County	77 knots	High winds and recent snow resulted in whiteout conditions and several highway closures.
Nov 2006	Larimer County	80 knots	Strong winds were experienced in the foothills of Larimer County.
Nov 2005	Fort Collins	61 knots	Strong winds downed a tree near a home daycare facility, destroyed a large tent on the CSU campus, and left approximately 500 homes and businesses without power for one to two hours. One semi-trailer was knocked over on Highway 287 north of Fort Collins.
July 2005	Loveland	50 knots	Strong winds occurred near Boyd Lake, capsizing a boat and killing two occupants and injuring four others.
Apr 2005	Masonville	56 knots	Strong winds downed power lines.
Dec 2004	Larimer County	88 knots	Damaging downslope winds had gusts approaching 100 mph along the Front Range.
Nov 2003	Larimer County	89 knots	Strong downslope winds developed along the Front Range. Damaging winds downed power lines and caused two fires.

[76] National Weather Service statistics – http://www.nws.noaa.gov/om/hazstats

Assessing Vulnerability

Severe wind storms are common along the Front Range corridor. Significant property damage frequently occurs as a result of these storms. Damage includes disruption of electrical service as well as destruction of landscaping, roofing materials, and other building components (siding, windows, etc.). Associated hazards include fires from arcing power lines, debris in the streets disrupting transportation routes, and power loss. Several occurrences of large commercial vehicles being overturned due to high winds have also occurred in the region. Although they are transportation vehicles, the impact and resources necessary to alleviate the emergency may take the same amount or more resources than typical wind damage to structures. All of the communities in Larimer County are at risk. Speed of the winds, location, and duration of the storm are the main factors in determining the amount of damage that results from this natural phenomenon.

Hazard Mitigation Action Items

Emergency preparedness is the primary mitigation action item for the region's communities.

- Public works departments and utility providers maintain on-call personnel with the equipment necessary for responding to a moderate sized severe wind emergency.
- Transportation departments maintain traffic control devices for detouring/re-routing traffic through the hazardous areas.
- Police, fire and emergency medical service professionals train frequently to be prepared to respond to a wide variety of emergency situations, including severe wind storms

Hazard: Winter Storm – Severe

Frequency:	**Likely: Between 10% and 100% probability in next year, or at least one chance in next 10 years.**
Potential Magnitude:	**Catastrophic: more than 50%**
Speed of Onset:	**More than 24 hours warning**
Geographical Area Affected:	**All areas of the plan**
Influencing Factors:	**Weather system, seasonal, prevalent to this part of state**

Description

Winter storms occur in many forms and vary significantly in size, strength, intensity, duration, and impact. The elements to consider in the definition of a winter storm include temperature, temperature extremes, wind and wind chill temperatures, and snow and blowing snow. Three significant incidents that occur in the winter are the Winter Storms, Blizzards, and Ice Storms.

> **Winter Storms** include a combination of snow and strong wind that is insufficient to be classified as a blizzard.
>
> **Blizzards** occur when considerable snowfall is accompanied by winds of 35 mph or more. Visibility is reduced to ¼ mile or less. Blizzards also include fine, powdery particles of snow that are whipped from the surface in such great density that the visibility is often reduced to only a few yards.
>
> **Ice Storms** are a condition that will produce significant and damaging accumulations of ice when heavy rains are combined with below freezing surface temperatures.

While the previous definitions may not sound critical, the combinations of temperatures, wind, snow, wind chill temperatures, and reduced visibility can make these storms deadly and costly in terms of loss of human and/or animal life, property damage, and extended recovery operations.

History

Winter storms can severely impact the region in a short period of time. Disruption of local and state transportations systems, utility outages, daily business activities, school cancellations, and delayed emergency responses are all potential results of a winter storm. Other results include communication disruptions, vehicle accidents, and cold exposure/hypothermia. Typically, storms of this nature are short-lived. Some of the significant winter storms that have impacted the area can be found on the following table.

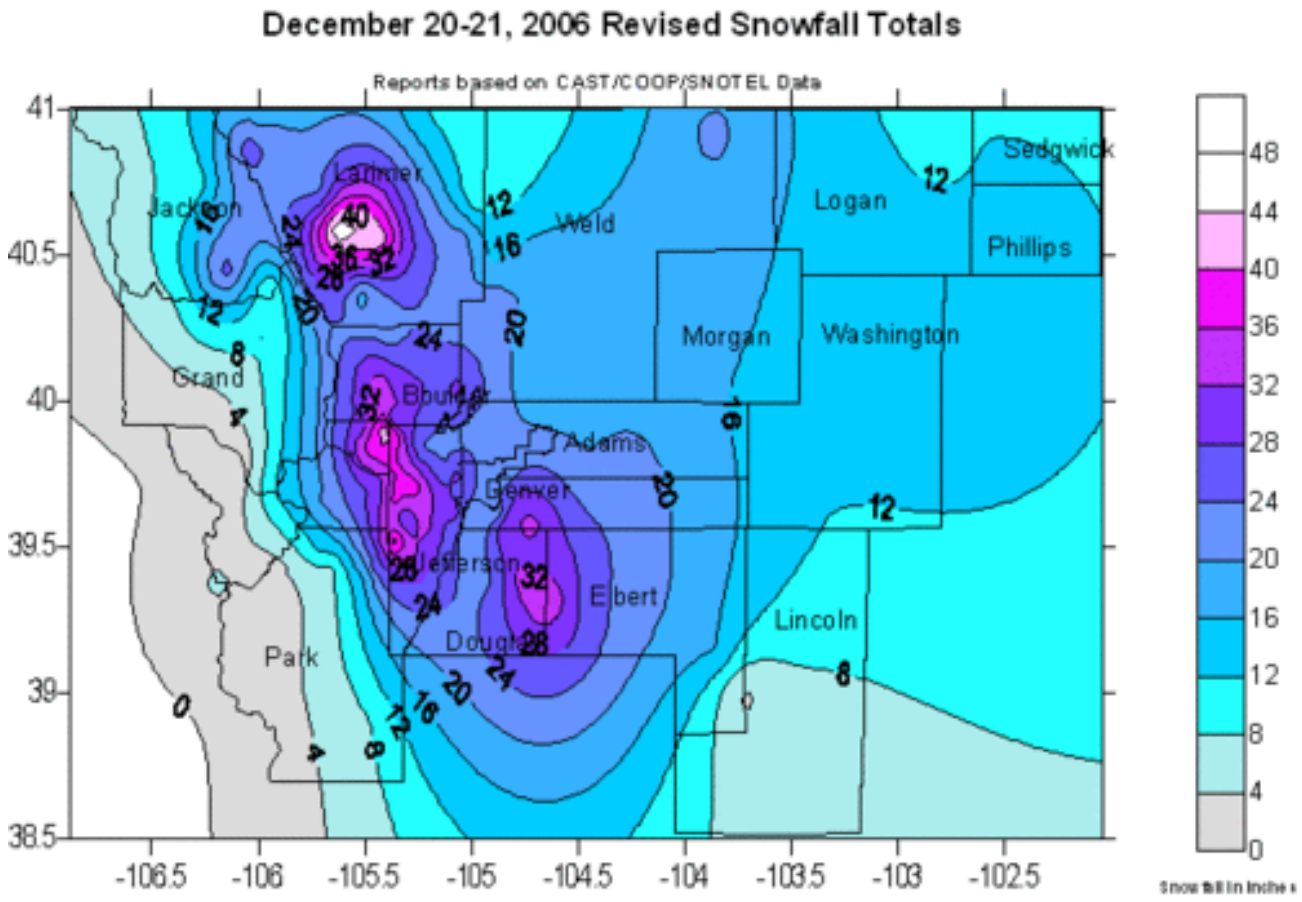
Table 4.12: Severe Winter Storm History

DATE	INFORMATION
01-07-2007	Strong winds and 14 to 23 inches of freshly fallen snow resulted in whiteout conditions, leading to the closure of several highways.
12-28-2006	An intense snow storm struck Colorado on December 28 and 29, on the heels of the week's previous blizzard. Due to the previous heavy snowfalls and lack of sufficient snow removal, many of the residential streets became impassable and unmanageable. Estes Park received 17 inches of snow, while Fort Collins received 21 inches of snow. More than 15,000 cattle died due to starvation, dehydration, and shock following the cumulative effects of both blizzards, resulting in losses of millions of dollars in the local the cattle industry.
12-20-2006	A powerful blizzard crippled the region, forcing the closures of Interstate 25 and other public highways in the region. The cities of Loveland and Fort Collins were shut down, the US Mail was undeliverable, and a statewide disaster was declared. Many grocery stores, department retailers, and other service providing institutions were shut down or severely limited in the diversity of their supplies.
11-28-2004	Heavy snowfall of up to 17 inches was recorded in the region
03-18-2003	Larimer County snowfall for 3-18-2003 was 65 inches at Bear Lake in Rocky Mountain National Park and 25 inches near Loveland[77].
03-01-2002	13 inches of snow were reported at Horsetooth Inlet Bay; 12 inches were reported at Loveland and Red Feather Lakes.[78]
09-28-1999	Snowfall totals included 12 inches at Allenspark; ten inches near Buckhorn Mountain; eight inches at Estes Park, Hourglass Lake and Red Feather Lakes; and six inches near Livermore and Rustic. The heavy, wet snow snapped branches from fully leafed trees, downing power lines and causing scattered utility outages.
12-16-1996	A strong Arctic cold front moved across the Northeast Plains, Urban Corridor, and Front Range Foothills. Heavy snow and strong winds accompanied the storm front as near whiteout conditions suddenly developed. Northerly winds gusting from 40 to 60 mph followed behind the front. Dozens of accidents occurred as roads and highways quickly turned to sheets of ice. In addition, strong winds and cold temperatures combined for extremely cold wind chill readings from -30^{0}F to -40^{0}F by late afternoon**.**

[77] http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~ShowEvent~488218

[78] http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

Map 4.16: 2006 Blizzard Snowfall Totals



Source: http://en.wikipedia.org/wiki/December_20-21%2C_2006_Colorado_Blizzard

Table 4.13: CDOT Winter Storm Highway Closures

DATE	HIGHWAY	LENGTH OF CLOSURE	CAUSE FOR CLOSURE
05-02-2008	Highway 287	4.5 hours	Snow and blowing snow
04-10-2008	Highway 287	9.5 hours	Snow and blowing snow
04-09-2008	Highway 287	3.5 hours	Snow and blowing snow
02-20-2008	Interstate 25	12 hours	Snow and blowing snow
01-29-2008	Highway 287	6 hours	Snow and blowing snow
01-28-2008	Highway 287	4 hours	Snow and blowing snow
01-09-2008	Highway 287	4 hours	Snow and blowing snow
01-05-2008	Interstate 25	2 hours	Snow and blowing snow
12-30-2007	Highway 287	8 hours	Snow and blowing snow
12-30-2007	Interstate 25	5.75 hours	Snow and blowing snow
12-07-2007	Interstate 25	4 hours	Snow and blowing snow
02-22-2007	Highway 287	5.5 hours	Snow and blowing snow
02-20-2007	Interstate 25	8.5 hours	Snow and blowing snow
02-17-2007	Highway 287	4 hours	Snow and blowing snow
01-07-2007	Highway 287	15 hours	Snow and blowing snow
12-29-2006	Highway 287	5 hours	Snow and blowing snow
12-28-2006	Highway 287	4 hours	Snow and blowing snow
12-14-2006	Highway 287	12.5 hours	Snow and blowing snow
12-13-2006	Highway 287	10 hours	Snow and blowing snow
06-04-2005	Highway 287	8 hours	Snow and blowing snow
03-01-2004	Interstate 25	4 hours	Snow and blowing snow
02-29-2004	Highway 287	6 hours	Snow and blowing snow
02-29-2004	Interstate 25	10 hours	Snow and blowing snow
12-15-2003	Highway 287	2 hours	Snow and blowing snow
11-23-2003	Highway 287	4.75 hours	Snow and blowing snow
03-19-2003	Interstate 25	22 hours	Snow and blowing snow
03-18-2003	Interstate 25	6 hours	Snow and blowing snow

Source: Colorado Department of Transportation and Colorado State Patrol

In addition to the highway closures listed in the above table, numerous road closures occurred on the local roads system due to winter storms.

Assessing Vulnerability

Winter storms in Northern Colorado can severely impact the region in a relatively short period of time. Disruption of transportation services, utility outages, daily business activities, school cancellations, and delayed emergency responses are historically results of a winter storm. Typically these storms are "short lived." One of the greatest associated risks with severe winter snow and ice storms is the disruption of utilities. Local outages occur during weather related events. Large scale utility (power) disruptions have occurred although most were rapidly repaired. Areas that are impacted are primarily those locations with above ground electrical supply. Wind, ice, and snow storms have disrupted services for short periods of time. Longer outages have occurred in larger storms. Treacherous road conditions impact public safety responses due to vehicle accidents and other hazards. Building damage is usually minimal, but

infrastructure damage can be tremendous. Winter storms are the primary driver of utility outages. Occasional population relocation is possible in an extended event, especially to the "at risk" population. The "at risk" population includes those using medical equipment; elderly and individuals needing daily medical or physical care; the home-bound; the homeless; and individuals who live in areas that are designated at the highest risk for potential impact. Structural damage during winter storms is typically isolated and usually results from other debris (trees) striking the structure. Falling or fallen debris is a major cause of transportation problems. The Larimer County region is at risk for winter storms.

Hazard Mitigation Action Items

The public works and transportation departments of the local communities are the primary agencies involved in planning and preparing for severe winter storms. In 2003, representatives from several public works and public safety agencies within Larimer County participated with representatives from FEMA's Emergency Management Institute (EMI) in a simulated winter storm emergency of disaster proportions. This simulation involved all of the participating agencies to prepare detailed response plans. In addition, the involved agencies sent representatives to the EMI campus in Emmitsburg, Maryland, for participation in the drill simulation. At the time of the drill, the region experienced a severe winter storm that mimicked the drill scenario. As a result of the exercise and subsequent heavy snow storms, local public works and public safety agencies have established schedules to refine, revise, and adapt their preparedness and response plans at least once annually.

Public Safety agencies engage in public education campaigns to share information on winter emergency preparedness with the members of the community. Plans and activities include, but are not limited to the following on-going action items:

- Maintain and update Winter Storm, Ice Storm, and Snow Removal Plans.
- Exercise the snow emergency response plans annually.
- Provide emergency preparedness education to the community.
- Provide areas of safe refuge for affected people.
- Maintain adequate fleets of snow moving equipment, as determined by Public Works department directors and national standards.
- Require all utilities for new construction projects to be installed underground.
- Install emergency generators in many public buildings.
- Install emergency generators or emergency power sources at critical facilities.
- Acquire temporary snow storage sites that provide proper drainage.

Section 4.2: All-Hazards Mitigation Activities

The governments of Fort Collins, Loveland and Larimer County understand the importance of hazard mitigation, as evidenced by the creation and adoption of the 2003 Mitigation Plan by all three communities. Estes Park, Wellington and Berthoud all express similar sentiments by their participation in the revision of the 2009 plan. Throughout this document, numerous hazard-specific mitigation activities were addressed and discussed. However, several activities remain that do not easily fit into only one specific hazard profile, but rather can be applied to many or even all of the hazards discussed within this Plan. These activities are addressed in this section and include projects within all participating communities. These activities include, but are not limited to:

- Providing areas of safe refuge for affected people.
- Providing emergency preparedness education to the communities.
- Providing specialized training to the emergency responders.
- Improving the early warning capabilities within the communities.
- Maintaining an adequate supply or access to an adequate supply of emergency equipment to appropriately respond to an event.
- Improving upon the emergency services communication systems with redundancy, training and local exercises.

Front Range Fire Consortium[79]

Poudre Fire Authority and Loveland Fire and Rescue both participate in the Front Range Fire Consortium (FRFC), along with Boulder Fire Department, Cheyenne (WY) Fire and Rescue, Longmont Fire Department, Mountain View Fire Protection District, and Union Colony Fire/Rescue Authority. The mission of the Consortium is to promote cooperation between the fire agencies of northern Colorado in the areas of training and customer service, both internal and external. This cooperation is promoted through the sharing of resources between agencies for mutual gains.

The Front Range Fire Consortium was created in 1996 as an association between the six largest fire departments in northern Colorado. The six original member departments were the Boulder Fire Department, the Longmont Fire Department, the Loveland Fire and Rescue Department, Poudre Fire Authority, the Mountain View Fire District and Union Colony Fire/Rescue Authority. In 2001, FRFC expanded to seven member departments by including Cheyenne Fire and Rescue in southern Wyoming. Together these seven fire service agencies serve a population of approximately 592,000 with 635 career and 190 volunteer personnel. FRFC also includes two affiliate member departments – the Laramie Fire Department in Laramie, Wyoming, and the Windsor-Severance Fire Protection District in Windsor, Colorado.

The two primary services of FRFC are the Professional Development for Fire Officers Program (PDFO) and the Recruit Fire Academy. PDFO is an intensive, two-week long leadership development program modeled after the NFA Executive Fire Officer Program for aspiring and current officers. In the seven years that this program has been offered, 200 firefighters have participated from 12 departments. PDFO is offered as a service to the seven NCFC members and

[79] http://northerncoloradofire.com/

is also open to affiliate and non-member departments. The Recruit Fire Academy has been provided by FRFC for the seven member departments since 1998. This academy provides entry-level training for new career firefighters. The standard curriculum is 14 weeks. It includes Firefighter I and II, Hazardous Materials Awareness and Operations, and National Wildfire Coordinating Group (NWCG) Basic Wildland Firefighter (Red Card) certifications. This academy is offered at least once and often twice a year, depending on the hiring needs of the member departments. The academy staff is comprised of member department training personnel.

In addition to PDFO and the Recruit Fire Academy, FRFC provides a number of other services to member departments. These include joint purchasing of some personal protective equipment, hazardous materials technician training, and ownership of Candidate Physical Ability Test (CPAT) testing equipment. FRFC also sponsors periodic training opportunities on a regional level that are open to all fire service agencies in the northern Colorado area.

Larimer County, Estes Park, Wellington, Berthoud All-Hazards Mitigation Activities

1. The communities within this plan maintain inter-agency mutual aid agreements to facilitate expedited sharing of resources during emergency situations. These mutual aid agreements are reviewed and updated annually.
2. The Cities of Loveland, Fort Collins, Estes Park, along with Colorado State University, Larimer County, and local hospitals and volunteer organizations are currently working with FEMA's Emergency Management Institute to participate in a disaster simulation. This simulation, which will be focused on a flooding emergency, is scheduled to take place during April 2009 and will present an opportunity to the involved groups/agencies to exercise emergency operations plans, as well as to build and maintain professional relationships. This is high priority and will involve over seventy personnel.
3. The groups/agencies listed above participated in another Emergency Management Institute disaster simulation in 2003. This simulation tested the region's response capabilities for a severe winter snow storm.
4. The governments of the various communities within Larimer County have developed and maintain inter-governmental mutual aid agreements to address resource needs and facilitate emergency response to potential emergency and/or disaster situations.
5. Larimer County continues to work towards county-wide implementation of an 800 MHz radio system to improve inter-agency communications throughout the county. The Larimer County Sheriff's Office recently phased out their VHF radio system and began using the 800 MHz radio system. An additional part of the county's effort involves working to provide 800 MHz communication capabilities to local volunteer fire departments in smaller communities throughout the county.
6. The Larimer County Sheriff's Office has incorporated laptop computers into their vehicles. This dramatically improves communications capabilities for the agency, while simultaneously reducing radio traffic.
7. The Larimer Emergency Telephone Authority (LETA), an entity created through an intergovernmental agreement with Larimer County, has signed a contract with the vendor 3N Global, Inc. for emergency notifications systems. The 3N mass notification system enables one person to communicate with thousands of people anywhere,

anytime via phone, email, instant messaging, text messaging, fax, BlackBerry, personal digital assistant, voice-over-internet, and pager. This new notification system has dramatically increased the effectiveness and timeliness of community emergency notifications.

8. The Larimer County website has initiated a Special Needs Registration service and an associated password-protected mapping function to improve emergency services response to at-risk individuals during disasters and evacuations.
9. In 2005 the region spent $350,000 to purchase a mobile police/fire command vehicle. This vehicle is essentially a highly-customized recreational vehicle that serves as a mobile incident command center. It is housed at Loveland Fire Station #1 and is available for response to any large-scale incident in the northeastern portion of Colorado.
10. Poudre Valley Hospital in Fort Collins is working with the Colorado Department of Public Health and Environment (CDPHE) to administer the Chempack Program for northeastern Colorado. The Chempack Program is the forward placement of nerve agent antidotes in order to treat patients and responders with nerve agent or organophosphate exposure in both the pre-hospital and hospital environment. The Chempack container is housed under secure conditions at Poudre Valley Hospital (PVH). It contains sufficient supplies for 1,000 hospital patients and 454 pre-hospital patients. As part of the Chempack Program, PVH has developed and maintains a mobilization/deployment protocol and has worked with the Colorado State Patrol (CSP) to ensure that the CSP will provide a security escort for transport of the Chempack.
11. The Northern Colorado Bomb Squad (NCBS) has been formed through inter-governmental agreements between the involved agencies. The NCBS is a multi-agency organization with members from Fort Collins Police Services, Larimer County Sheriff's Office, and Loveland Police Department. The NCBS is organized to provide a front-line response to incidents involving or suspected of involving bombs, explosives, and/or other shock-sensitive materials. The NCBS will render safe and/or remove suspected improvised explosive devices, incendiary devices, explosives, explosive chemicals, pyrotechnics, and ammunition.

City of Loveland All-Hazards Mitigation Activities

1. The City of Loveland Office of Emergency Management has trained 98% of the entire City staff in the National Incident Management System (NIMS) and the City is now "NIMS Compliant." The Loveland Office of Emergency Management also works with a number of stakeholders to maintain a Hazard Mitigation Plan and Continuity of Operations Plan for the City of Loveland.
2. The City of Loveland maintains an interactive website, a public television channel, and an AM radio station. The City maintains a library of standardized messages for each media outlet to allow for proactive communication of emergency information to the community.
3. The City of Loveland has a dedicated and published emergency telephone number (970-962-2302) that provides up-to-date information in the event of an emergency. In addition, during emergency situations, the City staffs an emergency Call Center with up to ten staffed telephones.

4. The City of Loveland utilizes an 800-MHz radio communication system. This radio system is utilized by all City departments as well as the local emergency medical service agency, the local school district and adjacent jurisdictions. Utilization of a standardized radio communication system has improved communication capabilities throughout the region. This radio system is approximately ten years old and is currently being evaluated for replacement/upgrade. In addition, the Loveland Communication Center is in the process of adding two additional dispatcher consoles.
5. The City of Loveland Office of Emergency Management has partnered with surrounding communities and a number of stakeholders to create and maintain this Hazard Mitigation Plan as well as an Emergency Operations Plan (EOP) and a Continuity of Operations Plan. Copies of the EOP have been distributed among various city departments to ensure improved interoperability.
    a. In conjunction with the EOP, the city has helped to facilitate the creation of local Emergency Support Functions (ESFs).
    b. Through the EOP, the city has helped to ensure the creation of standard operating procedures and checklists for the various contingencies in which ESFs will be utilized. Procedures for alerting key personnel are included.
    c. The city has contacted a number of private companies to establish contracts ensuring that the company will provide equipment, supplies, and services to support the community in the event of a disaster.
6. Loveland Fire & Rescue (LFR) is NIMS compliant. LFR works with the City of Loveland in the following manner:
    a. Provides a Battalion Chief to the Loveland Office of Emergency Management to be the city's Emergency Manager.
    b. Ensures all staff level employees receive ICS-300 and ICS-400 level courses.
    c. Improved fire station security procedures.
    d. Ensures three days of food and water are kept at all fire stations.
    e. Installed auxiliary generators in a number of fire stations.
    f. Purchased a trailer that carries collapse and trench rescue equipment in sufficient supply to respond to a moderate sized event.
    g. Added a medical advisor to help ensure adequate training and to improve communication with local health care organizations and transport services.
    h. Formed a special operations team to address a wide range of hazards.
7. The Loveland Police Department and Thompson Valley EMS have incorporated laptop computers into their vehicles. This dramatically improves communications capabilities for local agencies, while simultaneously reducing radio traffic. Loveland Fire & Rescue is currently in the planning process for purchasing laptops in the future.
8. The Loveland Emergency Communications Center (LECC) works very closely with the various emergency response agencies, including Loveland Police, Loveland Fire, Thompson Valley EMS, Berthoud Police, and Berthoud Fire.
    a. In 2007, the Communications Center formed a group of dispatch personnel who provide 911 public education classes on the proper use of 911 and Emergency Medical Dispatch (EMD) education. These classes are taught to citizens, students, and teachers at Loveland schools, nursing homes and assisted living centers, area

industries, and large businesses operating in our jurisdictions, as well as all involved user agencies.

b. Personnel from the Communications Center attend several area health fairs in order to give customers a better understanding of the procedures for EMD. They report having already seen a better understanding of the EMD process.

c. The Communications Center is currently working on future plans as far out as 2018 for replacement of the city's 800 MHz radio system to an IP system, officially called MCC7500. Along with the future need to replace and upgrade the dispatch at a proposed cost of $1,350,000, the Communications Center also needs to upgrade all portable and mobile radios used in the field as well as at the various Larimer County radio sites to new technology. This project is currently being developed and the funding stream identified.

d. The Communications Center is currently working to expand the number of dispatch consoles from the current six to eight. This project will hopefully be completed no later than 2010, with special emphasis on the increased call load and need to maintain effective emergency communications networks.

e. The LECC operates and maintains a status and resource tracking program called HAvBED (a product of the EMSystems, LLC), which is an internet-based information sharing system managed by the Colorado Department of Health and Environment. It allows for resource queries of all hospitals in the state and immediate advisories to hospitals for given emergency events in progress as a measure of pre-alert and preparedness. The LECC rolled out the EMSystem in 2008. It is currently in limited service, with additional dispatcher training pending.

f. The LECC is currently in the process of installing an automated weather station. This equipment will allow for real-time monitoring of current local weather conditions and specific alerts to the dispatch center for sudden changes in weather conditions.

g. Dispatchers completed training during the third quarter of 2008 on the use of Weather Underground[80], an internet weather site. This internet–based weather forecast and information access service further improves the dispatcher's ability to provide real-time weather information and forecasts to emergency operations personnel.

h. The LECC is currently in the process of implementing Tabletop High-Profile incident drills. The drills will involve regularly-scheduled drills being conducted in the live dispatch environment to enhance dispatchers' skills in handling critical call situations and the related workload.

[80] http://www.wunderground.com/

i. The LECC worked with Loveland Fire & Rescue to implement the Fire Resource Officer (FRO) project in early 2007. The FRO project involves training select fire service personnel on basic dispatching skills so that they can act as an in-dispatch liaison with incident command during critical, high-profile incidents. This position/project is currently on hiatus due to staffing and training time deficiencies. It may be reorganized later in 2009.

9. The City of Loveland Public Works Department has improved, developed, and implemented the following new planning documents and programs since the 2003 Mitigation Plan was adopted:

   a. Developed and maintained a Continuity of Operations Plan.
   b. Developed an Emergency Operations Plan for potential emergency situations.
   c. Compiled an updated list of commercial contractors available for emergency call-out to a wide variety of situations.
   d. Created a Public Works Master Equipment List based on FEMA resource types for faster analysis of available Public Works equipment and resources and for improving the documentation and reimbursement process.
   e. Increased and expanded the City's contract for mosquito control services to reduce health threats posted by West Nile Virus.
   f. Developed an expanded public education campaign to educate the public about West Nile Virus.
   g. Created a multi-year plan to purchase additional 800 MHz radios for all Public Works employees. In 2008 the Department purchased an additional six radios for improved employee communications.
   h. Equipped a quick-hitch trailer with an emergency generator that could be rapidly deployed to provide emergency power to any facility.
   i. Approved for purchase in 2009 a quick-hitch trailer stocked with traffic control devices for rapid deployment during emergency situations. Trailer will be stored at the City's Maintenance Operations Center.
   j. Developed an annual tabletop and field training exercise program.
   k. Worked to formalize mutual aid agreements with neighboring communities while pursuing the possibility of a state-wide "sign-on" mutual aid system.
   l. Formed an agreement between managers from City of Loveland Water & Power and Parks & Recreation departments to proactively assist Public Works during future emergency situations.
   m. Improved inter-departmental communications with Loveland Police and Fire Departments.

City of Fort Collins All-Hazards Mitigation Activities

1. The City of Fort Collins utilizes an 800-MHz radio communication system. This radio system is utilized by all City departments as well as the local emergency medical service agency, the local school district, and adjacent jurisdictions. Utilization of a standardized radio communication system has improved communication capabilities throughout the region.

2. The City of Fort Collins is NIMS Compliant and maintains a website that educates citizens on the following:
    a. Safety and Emergencies – This includes links to the Office of Emergency Management, the Fort Collins Police Department, and Poudre Fire Authority.
    b. Transportation
    c. Building and Zoning
    d. Code Compliance
    e. Utilities – This includes links to additional Emergency and Safety information.
3. The City of Fort Collins Office of Emergency Management has partnered with surrounding communities and a number of stakeholders to create and maintain this Hazard Mitigation Plan as well as an Emergency Operations Plan (EOP) and a Continuity of Operations Plan. More than 90 copies of the EOP have been distributed among various city departments to ensure improved interoperability.
    a. In conjunction with the EOP, the city has helped to facilitate the creation of local Emergency Support Functions (ESFs).
    b. Through the EOP, the city has helped to ensure the creation of standard operating procedures and checklists for the various contingencies in which ESFs will be utilized. Procedures for alerting key personnel are included.
    c. The city has contacted a number of private companies to establish contracts ensuring that the companies will provide equipment, supplies, and services to support the community in the event of a disaster.
    d. Obtained the assistance of Amateur Radio Emergency Services (ARES) personnel in establishing a logistics and resources communications network.
    e. Distributed NOAA weather radios to all Poudre Fire Authority fire stations.
    f. Purchased 150 additional NOAA weather radios to be distributed throughout the community to ensure enhanced warning capabilities.
4. The City of Fort Collins Office of Emergency Management has created relationships with a number of Voluntary Organizations Active in Disaster (VOADs) that will:
    a. Coordinate sheltering of emergency/disaster victims.
    b. Provide food and clothing to emergency/disaster victims.
    c. Provide meals at established shelters and vouchers to purchase food on a case by case basis.
    d. Assist with emergency/disaster welfare inquiries.
    e. Assist with shelter for victims and families.
    f. Assist in mass feeding of citizens.
    g. Maintain a resource list for needs in emergency/disaster situations.
    h. Serve as point of contact for citizen requests / needs.
    i. Serve as point of contact for volunteer registration.
    j. Serve as point of contact regarding information on donations from public.
    k. Coordinate donations - receiving, warehousing, and distribution.

l. Provide counseling services.

m. Provide canteen trucks for emergency workers and displaced citizens.

n. Provide suitable comfort, counseling, and religious activities during emergency and disaster situations.

o. Coordinate with Disaster Mortuary Operational Response Team (DMORT).

p. Coordinate with the Veterinary Medical Assistance Team (VMAT).

5. The City of Fort Collins has formed a Disaster Council to plan for and address emergency response to disasters.
6. The City of Fort Collins has an Emergency Operations Center (EOC) and can implement a secondary Emergency Operations Center in the event of an emergency situation, thereby disabling the primary EOC. In addition, land has been acquired to build a new Emergency Operations Center.
7. The City of Fort Collins facilitates specialized training for first responders and citizens.
8. The Fort Collins Office of Emergency Management maintains a website that educates citizens on:
    a. Disaster Planning and Mitigation.
    b. Various Hazards as described in this document.
    c. Emergency Preparedness.
    d. Disaster Related Utility Problems.
    e. Family Disaster Preparedness.

9. The Poudre Emergency Communication Center (PECC) has evolved substantially over the past five years. Changes and improvements include:

    <u>New Upgrades & Building</u>

    a. Significant upgrades have occurred over the past five years including the new Tiburon CAD (Computer-Aided-Dispatch) system that is shared by PECC (Fort Collins Police Services, Poudre Fire Authority, and PVHS Ambulance Service); Larimer County Sheriff; Colorado State University Police; and Estes Park Police. This enables each agency's Center to monitor the partner agencies' activities and create related law enforcement calls to assist Fire & EMS when initially dispatched regardless of jurisdiction and vice versa. It also creates the situation where any emergency call center can be configured to be a 'back-up' for another center that needs to evacuate.
    b. There are two CAD servers: one is located at the Larimer County Sheriff's Office administration building and the other at Fort Collins Police Services.
    c. The inter-agency CAD system features the Maverick® mapping system that integrates with the 911 VESTA Meridian phone allowing immediate transfer of caller location and callback number to be moved to the incident mask and is Wireless Phase 2 compliant for cell phone callers with Phase 2 cell phones.
    d. The new state-of-the-art Fort Collins Police Services building was completed in 2007, and the Communications Center was activated in August of that year. The

building has a digital VoIP telephone system that networks with the new 911 VESTA Meridian phone.

e. There are numerous redundant systems that include: a redundant fiber loop that ensures connectivity if one area of the loop is damaged; two separate electrical power sources to the building; a new generator and a new UPS (uninterrupted power source) system. The Center can continue to operate on back-up power should there be a power failure to the building. These systems are tested on a regular basis.
f. The ability to transfer our 911 calls to Loveland was also part of the new construction, should there be a need to evacuate the Center.
g. The new Center increased the number of fully-functional consoles (CAD, 800MHz radio, and VESTA phones) from seven to nine. The number of call-taking consoles (CAD and VESTA phones) was increased to three.
h. The 800MHz digitally trunked radio system is part of the Statewide radio system. It allows interagency communications to be facilitated during multi-agency events, including fire, police, and medical in any combination.

Back-up Centers: Evacuation planning is in progress for the LCSO Communications Center and the Loveland Communications Center. The main objective of the evacuation planning process is to determine the technical requirements for creating a redundant emergency communication system in the event that either Communications Center must be evacuated.

Staffing: Staffing levels have remained at 23 dispatcher positions for the past 5-6 years. We have recently received approval to add two 'over-hires' to that total. It is our goal to achieve full staffing by the end of the year.

Training: In the past two years, Center personnel have attended a variety of trainings, including National Incident Management System (NIMS) training to meet federal requirements. They have also attended training provided by Poudre Fire Authority and have met ongoing continuing education training required by the National Academy of Emergency Dispatchers. Annually, members of PECC have provided training to area residents enrolled in the FCPS Citizens' Academy. One of the supervisors attended HSEEP training in October 2007, with plans to send the other supervisors to the same training within the next year.

10. Poudre Fire Authority (PFA) is NIMS compliant. PFA works with the City of Fort Collins in the following manner:

a. Provides a Battalion Chief to the Fort Collins Office of Emergency Management to be the Manager.
b. Ensures all staff level employees receive ICS-300 and ICS-400 level courses.
c. Improved fire station security procedures.
d. Ensures three days of food and water are kept at all stations.
e. Installed auxiliary generators in a number of stations.
f. Has a surge trailer that carries medical equipment in sufficient supply to respond to a moderate sized event.
g. Added a medical advisor to help ensure adequate training and to improve communication with local health care organizations and transport services.

h. Formed a technical rescue committee to address a wide range of hazards.
i. Supplies Colorado Task Force 1, a federally supported Urban Search and Rescue (USAR) team, with 20 firefighters and a battalion chief. They make up three specially trained rescue squads and have a canine handler and his canine. They are part of a larger team of 80 personnel that handle tasks such as large area search, wide area search, technical search, heavy rescue, water rescue, hazardous materials response, and weapons of mass destruction. They can be activated at the local, state, and national levels and can be responding to an incident within four hours of activation.

Town of Wellington All-Hazards Mitigation Activities:

The Town of Wellington has historically relied upon Larimer County for planning. Consequently, they have no Emergency Operations Plan or Community Wildfire Protection Plan, Flood Plans, etc… Development of these and other plans is a proposed action items. Funding for this medium priority action item is undetermined at this time. A tentative timeline for development and adoption is within the next five years.

Section 4.3: Identification of Critical Facilities and Infrastructure

The Northern Colorado Regional Hazard Mitigation Plan addresses the geographic areas of Larimer County and the communities therein. It also identifies critical facilities and infrastructures located within the boundaries of each identified community. For the purposes of this document, a critical facility is defined as a building or structure in either the public or private sector that provides essential products and services to the general public; is otherwise necessary to preserve the welfare and quality of life in the appropriate jurisdictions; or fulfills important public safety, emergency response, and/or disaster recovery functions. Examples of critical facilities include:

- Public health facilities
- Emergency medical service providers
- Water and wastewater treatment facilities
- Public safety service providers, including military, police, fire, and public works
- Public and private schools
- Institutions of higher education
- Research laboratories
- Financial institutions
- Chemical production and/or distribution facilities
- Public broadcasting facilities
- Hazardous waste storage and/or distribution facilities

A **critical infrastructure** as defined in Presidential Directive PDD-63 of May 1988 is any asset that is essential for the functioning of a society and economy.[81] Examples of critical infrastructure in the region include installations for:

- Electricity generation, transmission, and distribution
- Gas production, transportation, and distribution
- Oil and oil production, transportation, and distribution
- Telecommunication systems
- Water supply, including storage and distribution systems
- Agriculture, food production, and distribution
- Heating
- Transportation systems, including roads, railways, and airports

[81] http://en.wikipedia.org/wiki/Critical_infrastructure

The current scope of this Plan is to address hazard mitigation efforts involving and/or related to the critical facilities and infrastructure identified in this section within the communities of Larimer County. It is the desire of the Plan partners to work not only within the communities of Fort Collins, Loveland, Estes Park, Wellington and Berthoud but also to identify the critical facilities and infrastructure within the smaller communities and in the unincorporated portions of Larimer County.

Data from local planning departments and GIS departments were used to assist in the analysis of the areas affected by various hazards. These departments demonstrated their commitment to providing planning data into the future as data changes and as time and funding are available. Historical documents of hazard events were also used for this analysis. The following community partners provided data critical to the analysis phase:

*Additional information regarding Critical Facilities and Infrastructure can be located in Appendices D, F and G of this document

Critical Facilities/Infrastructure – Fort Collins

Poudre School District buildings	City Hall
Poudre Fire Authority fire stations	Columbine Care System Facilities
Fort Collins Police Department	Poudre Valley Ambulance buildings
TransFort Transportation Center	Excel Energy (natural gas)
911 Communications Center	Qwest Communications Center
Comcast cable television	Railroad systems
Sanitation service providers	Poudre Valley Rural Electrical Association
Fort Collins Light & Power	Fort Collins Utilities (water & sewer)
Larimer County combined courts	AmeriGas (propane)

Poudre Valley Hospital and associated medical office buildings
Poudre Valley Hospital Harmony Campus and associated medical office buildings
Centers for Disease Control and Prevention
Colorado Division of Wildlife and United States Forest Service facilities
Major transportation routes (Highway 287, Highway 14, Interstate 25)
Colorado State University Student Health Care Facility
Colorado State University educational facilities and laboratories

Critical Facilities/Infrastructure – Loveland:

Thompson School District buildings	Loveland Municipal Building
Nursing and extended care facilities	Aims Community College
City Maintenance Operations Center	911 Communications Center
Excel Energy (natural gas)	Clear Channel Communications
Loveland Police & Courts Building	Comcast cable television
City Transportation Services	Qwest Communications Center

Transportation routes (Highway 34, Highway 287, Interstate 25)

Railroad systems	Poudre Valley Rural Electrical Association
Sanitation service providers	Loveland Light & Power
Loveland utilities (water & sewer)	AmeriGas (propane)

Loveland Fire & Rescue Department stations

Thompson Valley EMS ambulance stations
McKee Medical Center and associated medical office buildings
Medical Center of the Rockies and associated medical office buildings

Critical Facilities/Infrastructure – Estes Park:

Mary's Lake Water Plant
Public Water Dispenser
Glacier Water Plant
Kiowa Ridge Water Pump House
Thunder Mountain Water Pump House
Fall River Water Pump House
SCADA Radio Repeater & Fiber Optic Equipment, located at the top of Prospect Mountain
Municipal Water Dispenser
Estes Park Sanitation
Upper Thompson Sanitation
Upper Thompson Sanitation Lift Station
Power Transmission lines (WAPA), from Pole Hill to the Lake Estes Power Plant
Lake Estes Power Plant & Substation
Fiber Optic Node, @ Senior Center
Transmission lines from Mary's Lake Substation to Lake Estes Power Plant
Mary's Lake Power Plant & Substation
Estes Park Fire Department & alternate Comm-Center
Estes Park Municipal Building & primary Comm-Center
Estes Park Fleet Maintenance Shops
Estes Park Water Shops
Estes Park Light & Power Shops

Critical Facilities/Infrastructure – Wellington:

Town Hall
Public Works
Leeper Center
Boys and Girls Club
Poudre RE-1 Schools
Wellington Fire Station
Wellington Transfer Station
Water Plant
Major Transportation Routes (I-25, HWY 1/CR9)

Critical Facilities/Infrastructure – Berthoud:

Thompson R2-J Schools
Berthoud Fire Station
Berthoud Police Department
City Hall
Public Works
Berthoud Area Transportation Service
Municipal Courts
Public Works
Major Transportation Routes (I-25, HWY 287)

Critical Facilities/Infrastructure – Larimer County:
(Those not previously listed)

Larimer County Sheriff's Office
Larimer County Detention Center
Larimer County Health Department
Platte River Power Authority – Rawhide Energy Station
Northern Colorado Rehabilitation Hospital
Estes Park and Berthoud utilities providers
911 Communications Center – Larimer County
Transportation routes (Highway 287, Highway 14, Highway 34, Highway 60, Highway 66, Interstate 25)

Section 4.4: Estimating Potential Losses

The locations of some disasters are somewhat predictable. Such is the case with Flood and Wildland hazards. In general, the most common geographical locations for significant floods to occur are in the 100 year floodplains. Similarly, the most common geographical locations for wildland fires to occur are in high hazard areas. In both of these cases, more detailed reports have been generated and are included as appendices to this document.

Conversely, while it is vital to identify critical facilities and infrastructure in order to help prioritize hazard mitigation activities, it is impossible to predict the exact timing, location, and/or degree of impact of many of the other hazards identified within this Plan. For example:

- Wind, hail, and snow storms occur randomly across wide-spread geographic areas without regard for political boundaries. The Building Department and Fire Departments should work cooperatively to identify structures within their jurisdictions that have common construction characteristics that increase the risk of loss of life and/or property damage. Through this analysis, trends can be identified to help guide community planning, as well as hazard mitigation activities and efforts.
- Potential terrorist events will impact different targets based on the terrorist group. Therefore, it is impossible to include an estimate for each structure and/or facility with the potential to be affected by terrorism. Of the potential terrorist threats that are identified in the region, the potential targets should be evaluated for potential vulnerabilities by emergency planners and reflected within Mitigation, Response, and Recovery plans.

So, rather than dwelling on potential estimates for specific buildings and/or facilities for each hazard, the Plan participants instead have chosen to provide detailed data to indicate specific dollar losses from previous incidents relative to the profiled hazards. Some of the documented damages occurred to critical facilities and/or infrastructure, including fire stations, roadways, utilities, and other buildings in the communities. This historical data, coupled with incident history as detailed in the individual hazard profiles, should be used to determine desirable and cost-effective mitigation actions, thereby providing area governments with the ability to determine trends and averages, allowing for improved fiscal and emergency planning.

The governments of Loveland, Fort Collins and Larimer County use GIS to assist with the planning and mitigation activities. GIS data sets should be matched with tax assessor's office

records within the community to clearly identify critical facilities within identified hazard zones. Historical data, as discussed above, should be used to estimate the potential dollar losses and/or casualties if the identified critical facilities and/or infrastructure were to experience those hazards again. Currently, historical records indicate that the most likely hazards to occur in the Plan region are drought, wildland fires, high winds, and severe winter storms. Facilities and/or infrastructure that are or may become vulnerable to these hazards were identified; however, the degree of damage caused by most hazards is difficult to predict. The following table reflects average dollar losses as indicated in historical records from previous incidents. It is important to realize that some hazards, such as flash floods, may cause damage that is dramatically higher than the local statistical averages.

Table 4.14: Estimating Potential Losses

HAZARD	HISTORICAL LOSS	DISCUSSION
Aircraft Accidents	Minimal	Most aircraft accidents tend to cause damage only to the aircraft. Rarely do they cause damage to buildings or infrastructure.
Avalanche	Minimal	Avalanches, by their very nature, cause damage to natural areas where there is very little development.
Civil Disturbance	$250,000	Past civil disturbances in Fort Collins have affected the downtown business areas and areas near the University. Most of the damage was to commercial buildings in the area. Cost estimates also need to include personnel and equipment for responding agencies. This dollar amount does not include the cost of lost business revenue to the affected local businesses.
Dam Failure	$31 million	There has been only one historical dam failure, involving Lawn Lake and the town of Estes Park. Any dam failure has the potential for catastrophic damage.
Drought / Extreme Heat	Unable to determine	Droughts impact not only agriculture, but also utilities such as power and water.
Earthquake	Unable to determine	There were no reports of major earthquake-related damage in the region.
Expansive Soils / Subsidence	$250,000	Expansive soils/subsidence in the region typically affects individual locations. It is possible for incidents to occur that may have serious impacts on critical facilities and/or infrastructure.
Fire – Urban	$1 million	The majority of structure fires in the region occur in single family dwellings. However, several large fires have occurred in commercial occupancies.
Fire – Wildland	$15 million	As population continues to expand into the wildland/urban interface areas, the risk of wildland fire increases as well as the risk of damage to structures within these areas. Past wildland fires have affected residential structures, agricultural structures, rangeland, utilities, watersheds, and roadways.
Flood – Flash or	$45 million	Previous flash floods have damaged roads, businesses,

Riverine		residences, communication center, fire stations, utilities, roadways, libraries, educational facilities, and emergency vehicles. They have also delayed emergency responses and resulted in injuries and loss of lives.
Hail Storm	$500,000	Hail storms can cause widespread damage to homes, businesses, automobiles, and the agricultural industry.
Hazardous Materials – Fixed Facility	$100,000	Most incidents involving hazardous materials at fixed facilities are very labor-intensive response operations for responding agencies.
Hazardous Materials – Transportation	$100,000	Historically, most transportation-related hazardous materials incidents were small-scale, traffic-related emergencies. However, the potential exists for catastrophic damage resulting from railway disasters in proximity to congested commercial areas.
Landslide / Rockslide	$75,000	Landslides and/or rockslides in the canyons of the region have the potential to cause limited damage to transportation routes.
Lightning	Unable to determine	The region has a high incidence of lightning strikes. As a result, many critical structures were constructed and/or retro-fitted with sophisticated grounding systems.
Terrorism / WMD	Unable to determine	The possibility exists for terrorist-related incidents in the region; however, there is very little historical record of the damages resulting from terrorism.
Tornado	$25 million	Tornado activity results in structural and utility damage, as well as disruptions to communication and transportation systems.
Utility Interruption	$50,000	Critical structures and infrastructure typically are constructed and/or retro-fitted with redundant power back-up systems to mitigate utility interruption.
Wind Storm – Severe	$200,000	Wind storms typically affect utilities (communication & electricity) and private and public buildings and may cause disruptions to transportation corridors. They also result in increased calls for service from the various emergency service agencies.
Winter Storm – Severe	$250,000	Winter storms typically affect utilities (communication & electricity), roadways, and private and public buildings, and they cause an increase in calls for service from the various emergency services agencies.

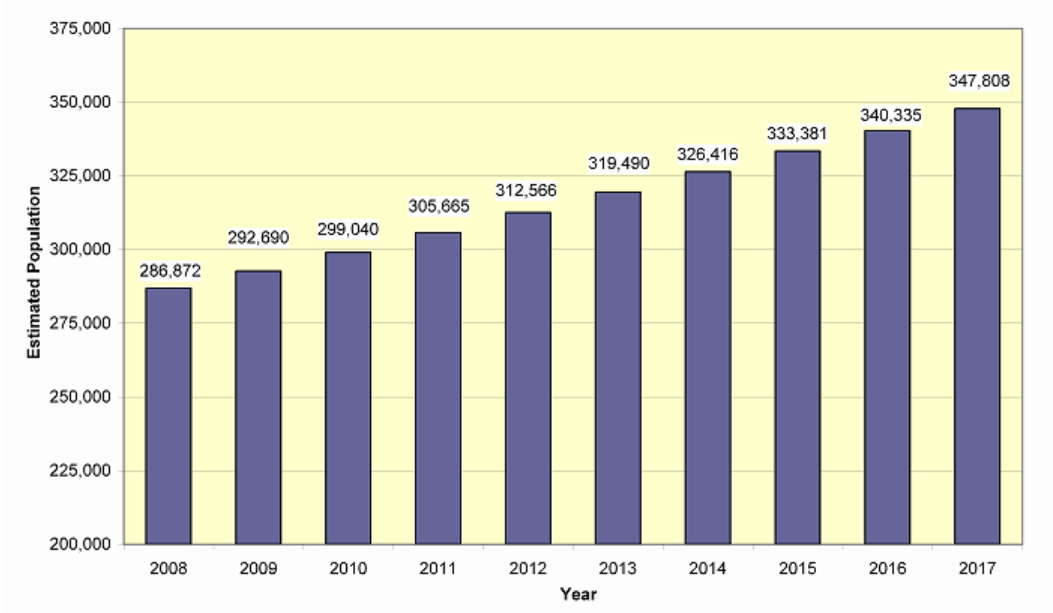
All types of hazards can impact critical facility and/or infrastructure and cause significant damage. Other potential impacts that are also costly collateral impacts resulting from the major hazards include: large amounts of debris; business interruption; increased emergency response times and costs; loss of income for business and residents; increased demands on hospital services; the need to replace roads, bridges and public buildings; and the loss of life. Appendices D, F and G address these potential impacts more specifically.

Section 4.5: Analyzing Development Trends

The cities of Fort Collins and Loveland and the various communities within Larimer County have a lot of similarities in their geographic, economic, cultural, and demographic make-up. All of these communities are proactive when it comes to providing a safe living environment for the citizens and visitors alike. Public safety and quality of life can often be attributed to advanced planning and public-private partnerships during community development. Community and technological growth issues will always be of concern when dealing with hazard mitigation.

Larimer County and the communities within are experiencing the pressures of commercial and residential growth within their boundaries. However, the economic situation of 2009 is causing the local communities to re-examine their processes for accommodating development and the impact of development on their land use master plans. The 2009 economic downturn in many communities is also causing local governments to re-examine the tax base and review growth patterns to develop the financial support for future needs.

Figure 4.15: Estimated Population Growth in Larimer County (2008 – 2017)



Source: Compass of Larimer County (http://www.larimer.org/compass)

All of the communities participating in this Plan utilize growth management and/or land use plans of some type to assist with growth management in their communities. These plans are frequently reviewed and updated. Most identified hazards that are located within these communities are addressed and/or impacted by the growth management plans. The flood plain maps impact growth plans, as do zoning regulations which assist in the regulation of hazardous material fixed site facilities. It is the goal of this assessment, and this Plan, to assist the local citizens and government agencies in making educated decisions regarding the safety and growth of their communities.

Larimer County is largely rural, with farming and recreation as main land uses. Larimer County also supports a wide variety of commercial and industrial uses. Fort Collins and Loveland are a mix between residential, industrial, and commercial. All areas of this Plan also have open space, park land, and specialized land use categories for institutional, educational, and mixed use. The Interstate-25 corridor is currently undergoing a transportation feasibility study that has the potential to have a tremendous impact on this entire region. The industrial and commercial land use near this corridor will be driven by the final transportation plan. The Northern Colorado Regional Hazard Mitigation Plan will also be impacted by changes to transportation corridors.

Fort Collins is currently revisiting its "City Plan," which impacts growth and land use. One important focus of this plan will deal with the "infilling" of vacant areas in the city. Open space will also be addressed as will buffer zones between Fort Collins and Loveland.

Loveland is experiencing growth in all areas of its community. Residential growth is occurring in the north and east along with significant commercial and industrial growth in the eastern areas of the city. Major commercial development is currently underway near the Interstate 25/Highway 34 interchange as well as the Interstate 25/Crossroads Boulevard interchange. Development in these areas includes medical facilities, residential housing, shopping centers, conference and events centers, and several other commercial occupancies.

Larimer County will continue to evaluate growth and use its Master Growth Plan to help direct, control, and evaluate growth in the county. A large portion of the land along Interstate 25 currently is in county jurisdiction and is subject to significant commercial and industrial development. The areas of Laporte and Timnath are also within county jurisdiction and are experiencing rapid growth and expanded land use. Since the adoption of the 2003 Plan, Larimer County completed construction of a new fairgrounds facility located near the Interstate 25/Crossroads Boulevard interchange. This facility includes numerous public buildings, including a large events center.

Local governments have worked together in the past to plan, control, and regulate the growth that occurs in this northern region of the state. This cooperation will continue into the future as the communities strive to improve the quality of life for all residents in northern Colorado. The preservation of open space, while also accommodating growth, is a challenge we will continue to face into the foreseeable future. The governments of Larimer County, Loveland, and Fort Collins will continue to work together to see that hazards are mitigated whenever possible. The leaders of these communities have realized that proper planning of community growth can assist in accomplishing that goal.

Risk Assessment Summary

The geographic area of Larimer County, including the cities of Fort Collins, Loveland, Estes Park, Wellington and Berthoud, is quite vast. All of these jurisdictions have contributed to the risk assessment analysis presented in the Northern Colorado Region Hazard Mitigation Plan. This assessment could not have been performed without their input and assistance. As previously mentioned, most of these hazards have the ability to occur in any or all of the jurisdictions. This assessment has identified several that may have a greater impact in one jurisdiction over another. Some of these increased risks include but are not limited to the following:

- Tornadoes have occurred in the Plan region, but damage has been relatively minor compared to tornado-related damage in the Weld County area.
- Larimer County and western portions of Loveland and Fort Collins are at greater risk for wildland fires due to vegetation and increased population in the wildland-urban interface.
- All jurisdictions are susceptible to the risk of flash flooding due to the presence of rivers and waterways within their boundaries.
- All communities are at risk to the same natural weather hazards, such as high winds, hail, snow, and ice.

Each community has developed Emergency Operation Plans to respond to the hazards identified in this Plan. Each community also uses data such as floodplain maps to assist them in growth and development planning. Due to the geographic location of this Plan area, there is not a clear-cut difference in the hazards that each individual community may face. As each community may face a different degree of risk within a specific hazard area, each community will have a varying degree of action within the associated mitigation strategies.

Section 5: Plan Maintenance

The Plan Maintenance Section of this document describes the formal processes that will ensure that the Northern Colorado Regional Hazard Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing an updated revision every five years. This section also describes how the public participation process will be incorporated throughout the plan maintenance and revision process. Finally, this section includes an explanation of how community government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as Land Use Plans, Capital Improvement Plans, and Building/Zoning Codes.

Each community will be responsible for coordinating implementation of Plan action items and undertaking the formal review and adoption process upon FEMA approval of the final document. This will be coordinated through the appropriate Office of Emergency Management unless otherwise directed by the local government in authority. Representatives from other government agencies within the community will also participate in the implementation process. A Hazard Mitigation Steering Committee was appointed and is responsible for assisting with the implementation and evaluation of the Plan.

The Director of the Larimer County Office of Emergency Management serves as the **Convener** to facilitate Hazard Mitigation Steering Committee meetings, assign tasks, and facilitate the involvement of other agencies as necessary for the implementation of this Plan. Plan implementation and evaluation is a shared responsibility among all of the Hazard Mitigation Steering Committee Members.

Area governments are dedicated to involving the public directly in the continual review and update of the Mitigation Plan. In order to solicit public review and input, a series of public meetings and workshops was held at various locations, dates, and times during the development of the 2003 Plan. A similar series of public meetings and workshops was held for the 2009 revisions to the Plan. In addition, copies of the Plan will be catalogued and kept at all of the public libraries in the region. The existence and location of these copies will be publicized in the media (newspaper, utility billing newsletter, radio, web sites, etc.). The Plan will also include the Convener's contact information to facilitate and track public comments. In addition, any proposed changes will be publicized in the media.

Formal Review and Update Timeline

The Northern Colorado Regional Hazard Mitigation Plan will be evaluated annually to determine the effectiveness of programs and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a schedule and timeline and identifies the local agencies and organizations participating in plan evaluation. Hazard Mitigation Steering Committee members will be responsible for monitoring and evaluating the progress of the Plan's mitigation strategies in their respective communities. The

Convener will be responsible for contacting the Hazard Mitigation Steering Committee members and organizing the annual meeting. At the annual meeting, the Steering Committee will review the Plan and any mitigation activities that have taken place or are planned within their communities. The Committee will also examine and discuss the goals and action plans for the specific hazards to assess their continued accuracy and importance. Once each five years the Convener will begin the process of evaluating and updating the Plan, which will include gathering stakeholders to review the plan, gathering updated research, and scheduling public meetings. This revision process should start at the beginning of the fifth Plan year, to ensure that a revision is ready by the end of that year. The timeline below is a tentative plan and may be adjusted to reflect changes in the Plan approval and adoption processes.

January through May 2009 – Public meetings held throughout the region to discuss plan revisions

June 2009 – Plan submission for FEMA approval

July 2009 – Plan returned from FEMA and sent to local government agencies for adoption

January 2010 – Hazard Mitigation Steering Committee annual meeting

January 2011 – Hazard Mitigation Steering Committee annual meeting

January 2012 – Hazard Mitigation Steering Committee annual meeting. Five-year Plan revision process initiated.

January 2013 – Public meetings held throughout the region to discuss plan revisions

Northern Colorado Regional Hazard Mitigation Plan

Chapter 2: Appendices

Appendix A: Plan Adoption Information

The 2003 Northern Colorado Regional Hazard Mitigation Plan was adopted by Larimer County, as well as by the Cities of Fort Collins and Loveland. It is expected that the 2009 Plan will be adopted by these governments, as well as the governments of Estes Par, Wellington and Berthoud as soon as the Plan is approved by FEMA

Larimer County Resolution #03022004R005 A-1

Multi-Hazard Mitigation Plan Adoption Resolution

Resolution # 03022004R005

Adopting the Larimer, and City of Greeley Multi-Hazard Mitigation Plan

Whereas, Larimer County recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, an adopted Multi-Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, Larimer County fully participated in the mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Colorado Office of Emergency Management and Federal Emergency Management Agency, Region VIII officials have reviewed the Multi-Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governments and entities;

Now, therefore, be it resolved, that the Larimer County Board of County Commissioners , hereby adopts the Larimer County and City of Greeley Multi-Hazard Mitigation Plan as an official plan; and

Be it further resolved, that in coordination with the City of Greeley, Larimer County will submit this Adoption Resolution to the Colorado Office of Emergency Management and Federal Emergency Management Agency, Region VIII officials to enable the Larimer County and City of Greeley Multi-Hazard Mitigation Plan's final approval.

For the Board of County Commissioners

Kathay Rennels
Chair

ATTEST:

Clerk to the Board

City of Fort Collins Resolution #2004-049 A-2

RESOLUTION 2004-049
OF THE COUNCIL OF THE CITY OF FORT COLLINS
ADOPTING THE NORTHERN COLORADO REGIONAL
MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Fort Collins recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, an adopted Multi-Hazard Mitigation Plan (the "Plan") is required as a condition of future funding for mitigation projects under multiple Federal Emergency Management Agency ("FEMA") pre- and post-disaster mitigation programs; and

WHEREAS, the City of Fort Collins is within Larimer County, and fully participated in the mitigation planning process to prepare this Plan; and

WHEREAS, the Colorado Office of Emergency Management and FEMA, Region VIII officials have reviewed the Plan and approved it contingent upon official adoption by the participating governments and entities.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF FORT COLLINS as follows:

Section 1. The Multi-Hazard Mitigation Plan, dated July 2003, developed by the City of Fort Collins, Larimer County, the City of Loveland and the City of Greeley, a copy of which is on file in the office of the City Clerk, is hereby adopted as the City of Fort Collins' official plan.

Section 2. That Larimer County, the City of Greeley, and the City of Loveland are authorized to submit this Resolution to the Colorado Office of Emergency Management and Federal Emergency Management Agency, Region VIII officials in furtherance of their effort to secure final approval of the Multi-Hazard Mitigation Plan.

Passed and adopted at a regular meeting of the City Council held this 6th day of April, A.D. 2004.

Mayor

ATTEST:

City Clerk

City of Loveland Resolution #R-16-2004 A-3

RESOLUTION # R-16-2004

A RESOLUTION ADOPTING THE NORTHERN COLORADO REGIONAL MULTI-HAZARD MITIGATION PLAN

WHEREAS, the City of Loveland recognizes the threat that natural hazards pose to people and property within our community; and

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

WHEREAS, an adopted Multi-Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

WHEREAS, the City of Loveland resides within Larimer County and the City of Greeley Planning Area, and fully participated in the mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

WHEREAS, the Colorado Office of Emergency Management and Federal Emergency Management Agency, Region VIII officials have reviewed the Multi-Hazard Mitigation Plan and approved it contingent upon official adoption by the participating governments and entities.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LOVELAND, COLORADO THAT:

Section 1. The Multi-Hazard Mitigation Plan developed by Larimer County and City of Greeley is adopted as the City of Loveland's official plan.

Section 2. Larimer County and the City of Greeley are authorized to submit this Adoption Resolution to the Colorado Office of Emergency Management and Federal Emergency Management Agency, Region VIII officials in furtherance of their effort to secure final approval of the Multi-Hazard Mitigation Plan.

Section 3. That this Resolution shall go into effect as of the date and time of its adoption.

City of Loveland Resolution #R-16-2004 A-3

Adopted this 17th day of February, 2004.

CITY OF LOVELAND SEAL COLORADO

Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:

Assistant City Attorney

Town of Estes Park Resolution

(Signed copy to be included after Jan 13 meeting)

RESOLUTION NO. 03-10

RESOLUTION FOR AUTHORIZED REPRESENTATION
TO AUTHORIZED THE HAZARD MITIGATION PLAN AUTHOR TO
ACT ON BEHALF OF THE TOWN OF ESTES PARK

WHEREAS, the Town of Estes Park has limited capability to undertake extensive participation in the preparation of a hazard mitigation plan; and.

WHEREAS, the Office of the Emergency Management for Larimer County is able to act on behalf of the Town of Estes Park in the analysis and development of a hazard mitigation plan; and

WHEREAS, the Office of the Emergency Management for Larimer County shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 C.F.R. 201.6; and

WHEREAS, the Office of the Emergency Management for Larimer County shall deliver a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

NOW THEREFORE, the Estes Park Town Board of Trustees authorizes the Office of the Emergency Management for Larimer County on behalf of the Town of Estes Park to prepare the Larimer County Multi-Hazard Mitigation Plan, which shall be reviewed and considered for adoption by the Estes Park Town Board of Trustees upon completion.

ADOPTED this _____ day of _____, 2010.

TOWN OF ESTES PARK

_____
Mayor

ATTEST:

_____
Town Clerk

Town of Wellington Resolution

RESOLUTION 12 - 2009

A RESOLUTION OF THE TOWN OF WELLINGTON, COLORADO AUTHORIZING LARIMER COUNTY TO PREPARE THE NORTHERN COLORADO REGIONAL HAZARD MITIGATIONPLAN ON BEHALF OF THE TOWN OF WELLINGTON

WHEREAS, the Town of Wellington has limited capability to undertake extensive participation in the preparation of a hazard mitigation plan; and

WHEREAS, Larimer County is able to act on behalf of the Town of Wellington in the analysis and development of a hazard mitigation plan; and

WHEREAS, Larimer County shall prepare a hazard mitigation plan in accordance with 44 FEMA requirements at 44 C.F.R. 201.6; and

WHEREAS, Larimer County shall deliver a draft copy of the Plan for public comment as well as the governing body's comment during the planning process and prior to adoption.

NOW THEREFORE, BE IT RESOLVED by the Board of Trustees of the Town of Wellington, Colorado, that:

The Board of Trustees of the Town of Wellington authorizes Larimer County on behalf of the Town of Wellington to prepare the Northern Colorado Regional Hazard Mitigation Plan, which shall be reviewed and considered for adoption by the Town Board of Trustees upon completion.

PASSED AND ADOPTED THIS 8TH DAY OF DECEMBER, 2009 BY THE BOARD OF TRUSTEES OF THE TOWN OF WELLINGTON, COLORADO.

Larry Noel, Mayor

Attest:

Larry Lorentzen, Administrator/Clerk

Resolution 12-2009
Town of Wellington
3735 Cleveland Avenue
Wellington, CO 80549

Town of Berthoud Resolution

Appendix B: Resources/References

Partner Organizations or Stakeholders B-1

FEDERAL ORGANIZATIONS AND STAKEHOLDERS

Federal Emergency Management Agency (FEMA)
U.S. Department of Homeland Security (DHS)
U.S. Bureau of Reclamation (USBOR)
U.S. Department of Justice (DOJ)
U.S. Fire Administration (USFA)
Emergency Management Institute (EMI)
National Science and Technology Council (NSTC)
Federal Bureau of Investigation (FBI)
U.S. Department of Transportation (USDOT)
U.S. Forest Service (USFS)
Burlington Northern Santa Fe (BNSF)
National Oceanic and Atmospheric Agency (NOAA)
National Weather Service (NWS)
Federal Motor Carrier Safety Administration
Federal Aviation Administration (FAA)
Centers for Disease Control and Prevention (CDC)
Texas A & M Engineering Extension Service (TEEX)

COLORADO/LOCAL ORGANIZATIONS AND STAKEHOLDERS

Colorado Division of Emergency Management (CDEM)
City of Fort Collins (numerous departments)
City of Loveland (numerous departments)
Larimer County (numerous departments)
Colorado Department of Public Safety (CDPS)
Colorado Bureau of Investigation (CBI)
Colorado State Forest Service (CSFS)
Colorado Water Conservation Board (CWCB)
Colorado Department of Public Health and Environment (CDPHE)
Colorado Division of Fire Safety (CDFS)
Colorado State Patrol (CSP)
Colorado Department of Transportation (CDOT)
Colorado Collaborative Rain and Hail Study (CoCoRaHS)
Colorado Geologic Survey (CGS)
Northern Colorado Water Conservancy District (NCWCD)
Colorado State University (CSU)
University of Colorado at Boulder Natural Hazard Center

Referenced Documents B-2

Ake, Jon & Ute Vetter. February 2000. "Probabilistic Ground Motion Evaluation for Horestooth, Spring Canyon, Soldier Canyon, and Dixon Dams, Colorado-Big Thompson Project, North-

Central Colorado." Technical Memorandum No. D8330-2000-006. U.S. Department of the Interior – Bureau of Reclamation.

Community Wildfire Protection Plans. Colorado State Forest Service.

Grand Challenges for Disaster Reduction, National Science and Technology Council, Committee on Environment and Natural Resources, Subcommittee on Disaster Reduction. 2nd printing. January 2008.

Guidance for Water Utility Response, Recovery & Remediation Actions for Man-Made and/or Technological Emergencies., U.S. Environmental Protection Agency, Office of Water. April 2002.

I-35W Bridge Collapse and Response, Minneapolis, MN, FEMA/United States Fire Administration, USFA-TR-166. August 2007.

Knabb, Richard D; Rhome, Jamie R.; Brown, Daniel P (December 20, 2005; updated August 10, 2006). "Tropical Cyclone Report: Hurricane Katrina: 23-30 August 2005" (PDF). National Hurricane Center. Retrieved July 21, 2008.

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Protecting the Nation's Infrastructure, Volume 8, Number 2. June 2000.

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Reducing Disaster Vulnerability Through Science and Technology, National Science and Technology Council, Committee on the Environment and Natural Resources. July 2003.

Risk Management: An Essential Guide to Protecting Critical Assets, National Infrastructure Protection Center. November 2002.

School Fires, FEMA/United States Fire Administration National Fire Data Center, Volume 4, Issue 6. December 2004.

Special Report: Fire Department Preparedness for Extreme Weather Emergencies and Natural Disasters, FEMA/United States Fire Administration, USFA-TR-162. April 2008.

The Critical Infrastructure Protection Process Job Aid, Emergency Management and Response Information Sharing and Analysis Center, FA-313, 2nd Ed. August 2007.

Transportation Security Guidelines for the U.S. Chemical Industry, American Chemistry Council, National Association of Chemical Distributors, The National Chlorine Institute Inc. 2001.

Twelve-Fatality Hotel Arson, Reno, NV, FEMA/United States Fire Administration, USFA-TR-164. May 2008.

Windstorm Impact Reduction Implementation Program, National Science and Technology Council. April 2006.

You Can Go Home Again, Institute for Business & Home Safety, 2002.

Various plans from the affiliated communities that are currently in place were also utilized in the revision of this Plan. It is our intent to have the various plans work together for mitigation strategies within our communities.

Internet References B-3

Appendix C: Public/Government Agency Participation Process

This is where you insert Public Government Agency Participation Process

Appendix D: Fort Collins Flood Mitigation

This is where you insert City of Fort Collins Flood Mitigation

Appendix E: Loveland Floodplain Regulations

Appendix F: 100 Year Flood Vulnerability Information

Appendix G: Wildland Fire-High Hazard Vulnerability Information

Appendix H: Local Mitigation Plan Review Crosswalk

This is where you insert Local Mitigation Plan Review Crosswalk.