City of Fort Collins

AUGUST 26, 2014

Summary of Current Efforts & Next Steps

Climate Change Adaptation

A Changing Region

The northern Front Range of Colorado is rapidly changing. From a booming population and strong economic growth, to increased traffic and levels of development, these changes present many opportunities as well as challenges to Fort Collins and other communities across the region. Fortunately, the City of Fort Collins has long-committed to planning ahead to respond to these opportunities and challenges and to maximize community, economic and environmental benefits.

One major factor that has potential to dramatically shape the community's future is the climate. Evidence of climate change is well documented throughout the western portion of the country, and the potential impacts of a changing climate on Fort Collins are substantial. For example, average temperatures have risen 2–4 degrees Fahrenheit over the last century—these subtle increases can lead to dramatic changes in other arenas, such as precipitation patterns, storm intensity, human health effects, and stream flows.

The scientific community largely agrees that the Earth's atmosphere and oceans are warming, and that this warming is due primarily to human activities, such as deforestation and the emission of greenhouse gases (including CO_2, methane, and others). A coordinated, proactive human response to reduce emissions now may help reduce or avoid the most dramatic climate shifts in the future.

Regional Climate Trends

Long periods of warm and cool cycles (lasting about 20–30 years) are evident in the Rocky Mountain region.

On the Front Range, the warm phases are characterized by hot, dry summers, warmer than average winters, and reduced snowpack. These warm cycles are linked to increased wildfire and bark beetle outbreaks—problems that have plagued the region in recent years.

What could Climate Change mean to Fort Collins?

In order to identify potential risks of climate change to Fort Collins, climate projections were developed. As with projections for population growth, and economic trends, it is difficult to project the exact levels of climate change that will occur. However, climate forecasting does help present a range of possible future conditions and can support informed and more comprehensive decision-making.

Detailed discussion about the climate projections, and what they could mean to Fort Collins is provided in Appendix A. Provided below is a summary of the climate change projections for the region and potential impacts on Fort Collins.

- Summer temperatures are expected to rise more than winter temperatures.
- Longer and more intense drought is expected, due to drier summers and increased evaporation from higher air temperatures.
- Winters are expected to be wetter, with more precipitation falling as rain rather than snow due to rising temperatures.
- The amount of snowpack and the moisture content of spring snowpack are expected to decrease, and the runoff of snowpack is expected to occur earlier, leading to reduced stream flows and soil moisture in summer months, meaning that water may not be available when it is most needed.
- Increases in rain precipitation and heavy downpours are expected to increase flooding risk.
- Forests are expected to become less productive and healthy due to lower soil moisture during the growing season, temperature stress, insect and disease outbreaks, invasive species, and wildfire. Healthy and productive forests are important for economic and recreational reasons, and also support clean air, wildlife habitat, and water quality.
- Wildfire severity is expected to increase due to warmer and drier conditions, increased lightning strikes due to increasing CO_2 in the atmosphere, and increased fire-favorable fuel conditions.
- Changes in ecological systems, such as declines in river flows or increased water temperatures, are expected to lead to declines in water quality and fish populations.
- Human health is expected to be impacted negatively due to more severe heat waves, increased frequency and intensity of extreme weather events, changes in allergens, decreased air quality, and increased transmission of climate-sensitive diseases.

The most important step in managing the impacts from these potential scenarios is to acknowledge they may occur and to proactively plan for how we will respond to them. When we illustrate the full range of ways that climate change might influence daily life in Fort Collins, we can then begin to highlight the many different angles from which potential responses could emerge. Moreover, coordinated, proactive adaptation planning will help reduce the need for and expense of responding to climate-related catastrophic events, and can help create long term economic, environmental, and community savings.

What is the City of Fort Collins' Role?

The City of Fort Collins' vision is to provide world-class municipal services through operational excellence and a culture of innovation. The organization's values include outstanding services, innovation and creativity, respect, integrity, initiative, collaboration and teamwork, and stewardship.

As such, community members expect the City to continue to provide exceptional municipal services, even when it faces the risks and potential impacts of climate change. Many also expect the City to provide notification and communication about risks and future events, and to prepare for, mitigate, and manage future response and recovery efforts.

In addition to ensuring the City organization's ability to continue to provide services, the City of Fort Collins

also has an important role in planning for change and coordinating with other organizations and efforts. This includes long range planning for utility systems, capital projects, development patterns, investments, and many other City service areas. It also includes convening and communicating with community partners and stakeholders on adaptation planning efforts and action strategies.

Through the Climate Action Plan and other efforts, the City of Fort Collins has already demonstrated a commitment to providing leadership in climate mitigation and reducing greenhouse gas emissions community-wide. This document summarizes steps the City is taking to also adapt to a changing climate.

2014 Climate Adaptation Workshops

The City has already taken steps to increase resiliency including participation in the Presidential Task Force on Climate Preparedness and Resilience as well as the Western Adaptation Alliance, the institution of floodplain regulations, development of a sustainability assessment framework to evaluate City programs and projects, and social sustainability community outreach programs, to name a few. Recognizing the need to build on—rather than replicate—past and current City of Fort Collins efforts around climate adaptation planning, Brendle Group, in coordination with Geos Institute worked with City staff to facilitate a series of two workshops to assist City departments in exploring what a changing climate could mean for vulnerability and risk for all City departments and how each department can best prepare and respond with goals, strategies, and decision-making steps.

The first workshop involved senior-level City staff and department decision-makers. The discussion included a climate science review, general discussion of adaptation, and preliminary identification of potential vulnerabilities.

A second workshop with a larger group of City staff focused on prioritizing vulnerabilities.

Between the workshops, City departments collaborated to populate a vulnerability workbook (Appendix B), assessing the climate vulnerabilities for a variety of impacted services, populations, and resources (Appendix C). This assessment then informed the identification of potential adaptation strategies (Appendix D). The outcomes of this process are summarized in the following sections.

Involved Organizations & City Departments

A diverse mix of governmental organizations and City departments were involved in the climate adaptation workshops:

- Community Development & Neighborhood Services
- Economic Development
- Emergency Management
- Employee & Communication Services
- Environmental Services
- Forestry
- Light & Power Operations
- Natural Areas
- Operations Services
- Parks
- Planning, Development & Transportation
- Police Services
- Social Sustainability
- Water Engineering & Field Services
- Water Resources & Treatment Operations
- Larimer County
- City of Loveland

Flooding on the Poudre River, 2013

VULNERABILITY ASSESSMENT

A vulnerability assessment is an important step of climate adaptation planning because it helps identify potential levels of risk due to the impacts of climate change. A vulnerability assessment generally involves three components: exposure, sensitivity, and adaptive capacity.

An assessment typically begins with focus on a specific resource or population, and consideration of the climate change trends or impacts to which the identified focal resource/population will likely be exposed. Next, information about how each focal resource might respond to climate change related trends shapes the level of sensitivity. Finally, consideration about how flexible each focal resource is in its ability to respond to climate change determines the resources adaptive capacity.

Building on information about the potential risks facing Fort Collins due to climate change, City staff and other contributors worked to identify and evaluate the community's vulnerabilities. For a variety of identified focal resources, the climate change exposure, sensitivity, and adaptive capacity were ranked on a scale of low, medium, or high. Those rankings informed the estimated overall level of vulnerability for each focal resource or population.

Important Terms

Mitigation: Reducing the amount of greenhouse gases in the atmosphere in order to prevent rapid and irreversible climate change.

Adaptation: Planning for inevitable impacts of climate change and reducing vulnerability to those impacts.

Vulnerability: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change. The three components of vulnerability include exposure, sensitivity, and adaptive capacity.

Exposure: The changes that are expected from climate change specific to the resources or populations of interest.

Sensitivity: The level of response of the resources or population of interest to climate change trends.

Adaptive Capacity: The ability of the focal resource or population to respond or adapt to the expected changes.

Summary of Potential Vulnerabilities

The following table identifies many of the potential vulnerabilities, and perceived levels of vulnerability, to City of Fort Collins focal services, populations, and resources as climate change occurs. The intent of this list is to inform future planning and decision-making across the City organization. Note that this is a preliminary, not comprehensive, list and the perceived levels of vulnerability are based on initial review and discussion by City staff—not extensive analysis. A more detailed matrix of potential vulnerabilities, descriptions, and other factors is provided in Appendix C.

In order to estimate the level of vulnerability, groups first assessed the level of sensitivity or how the focal service/population/resource is expected to respond to the climate change impact. Then, they assessed the level of capacity each focal resource has to react to the expected impacts. A low vulnerability ranking was assigned for the climate change impacts with low sensitivity and high adaptive capacity, and a high level of vulnerability was assigned for climate change impacts with high sensitivity and low adaptive capacity. For example, potential mental health impacts from disasters were assessed as having a high level of sensitivity and exposure, and low adaptive capacity, thus an overall vulnerability ranking of high. In contrast, water costs were determined to have a high level of sensitivity, but also a high level of adaptive capacity, resulting in a low vulnerability ranking. Note that these rankings are preliminary and additional or more extensive assessment will likely yield different results.

Preliminary Vulnerability Assessment and Ranking

High Vulnerability

- Habitat conservation
- Low income housing
- Mental health
- Outdoor air quality
- Urban forestry
- Water supply (ditch delivery)

Medium Vulnerability

- Agricultural areas
- Business costs and support
- Costs of disaster response and recovery
- Disaster clean-up
- Disaster response (agency collaboration, public communications, safety and security)
- Economic well-being
- Employee retention
- Energy costs
- Energy use and greenhouse gas emissions
- Flood zones
- Homeless population
- Impacts to natural resource-based businesses
- Incidence of diseases
- Land use planning
- Long-term planning
- Outdoor workers
- Recreational opportunities
- Riparian zones
- Sensitive populations
- Streetscape standards
- Transportation issues
- Vegetation management
- Vulnerable populations
- Water contamination
- Water quality (upper watershed contamination, recreational opportunities, lower watershed regulatory standards, business issues)
- Water quantity and supply (watershed health, ecosystem services, storage, infrastructure)

Low Vulnerability

- Demonstration gardens
- Recreational opportunities (golf courses, water features)
- Urban agriculture
- Water costs

Halligan Reservoir

POTENTIAL ADAPTATION STRATEGIES

After identifying the potential vulnerabilities to the City of Fort Collins due to climate change, City staff worked to brainstorm and identify potential strategies to address some of those vulnerabilities. Reflecting on recent experiences with the 2012 High Park Fire and 2013 flooding, they considered how different City departments were affected, what worked well, and how they could better prepare for and reduce the risk of future events. The 2014 planning effort was a good first step and will require an additional focused effort around the identification and evaluation of adaptation strategies before moving forward recommendations and implementation.

Framework for Developing Adaptation Strategies

As with the exercise of identifying vulnerabilities, the effort to identify potential strategies served as a preliminary step to inform future efforts. During a facilitated workshop, City staff were divided into four topic area groups.

- Temperature Extremes and Air Quality
- Storms, Flooding, Wildfire, and Water Quality
- Drought Impacts and Water Supply
- General Climate Change and Natural Systems

A list of potential adaptation strategies was developed to address the vulnerabilities relevant to each topic area. A few examples of potential adaptation strategies identified include the following:

- Hardening/strengthening and building in redundancy to infrastructure;
- Transforming landscaping to be more drought tolerant and use less water;
- Expanding and diversifying water storage;
- Adopting cutting-edge solar policies; and
- Increasing the percentage of trails outside of flood zones.

In addition to identifying potential adaptation strategies, the groups started to populate a matrix, identifying potential affected departments, external stakeholders, funding needs, metrics to measure success, co-benefits, and barriers and tradeoffs. A timeline of next steps to implement the strategies was also outlined for several potential strategies. The following page includes an example of the populated matrix for one of the identified strategies.

While the list of potential adaptation strategies is incomplete, the preliminary ideas provide a tremendous foundation upon which to build future climate adaptation efforts and discussions. See Appendix D for the work-in-progress list of potential adaptation strategies.

EXAMPLE ADAPTATION STRATEGY DETAIL

Topic Area	General Climate Change and Natural Systems
Adaptation Strategy	Increased carbon storage in native vegetation in Natural Areas and tree canopy to increase shade and reduce greenhouse gas emissions
Focal Services, Populations, and Resources	Recreational opportunities, urban forestry, outdoor workers, riparian zones, vegetation management
Vulnerability	Medium-High
Affected Departments	Forestry; Parks & Recreation; Natural Areas; Environmental Services; Operations Services; Purchasing; Utilities; Streets; Poudre Fire Authority
External Stakeholders	Larimer County; United States Forest Service; Colorado State University; Private land owners; Development community
Financing	Need to determine City's role in planting and maintaining groves of shade trees versus private landowners and developers
Timeline/Next Steps	1. Identify stakeholders and engage/meetings, who to leverage: 6 mo. 2. Internal clarification on role: 6 mo. 3. Strategic plan/vision: 12 mo. 4. Implementation: 3–5 years
Measuring Success	• Total number new shade trees/groves established or protected • CO_2 emissions captured/sequestered
Co-Benefits	• Creation/Protection of natural habitat • Aesthetic/scenic qualities • Reduced heat island effect (building cooling load) • Reduced irrigation water demand due to increased shading from tree canopy
Barriers/Trade-Offs	• Water use to establish trees • Long-term maintenance needs and costs

NEXT STEPS

The City of Fort Collins has already undertaken several activities related to climate adaptation, including work in 2008 and 2011 to assess risk and vulnerabilities for Fort Collins Utilities, and identifying the need to develop a Climate Adaptation Plan and associated strategies in the community's 2011 update to the comprehensive plan (City Plan). Other past activities have also helped increase the community's resiliency, such as the undergrounding of the City's electrical system infrastructure, decades of stormwater management planning and improvement projects, and strong commitments to and actions around environmental and economic stewardship.

Looking to the future, the recent work of City of Fort Collins staff to identify potential climate change vulnerabilities and adaptation strategies will be used to help inform the 2014 Climate Action Plan update. This will include discussion of the ways that the City can reduce potential vulnerabilities and risks associated with a changing climate by mitigating its impact on climate change through the reduction of greenhouse gas emissions.

Beyond the Climate Action Plan update, this information can help inform the development of a community-wide plan focusing on adapting to the changes that will occur as the climate shifts. This plan may take the form of a stand-alone Community Adaptation Plan that clearly identifies strategies and implementation steps to reduce the community's vulnerabilities or it may be best integrated into the various planning efforts already taken on by the City.

Because climate adaptation and mitigation planning efforts are multi-disciplinary and relate to topics across the City organization, integrating the concepts into existing and future plans, projects, and other efforts may be the most effective approach. It is recommended that in conjunction with, or instead of a stand-alone plan, the theme and intent of community adaptation planning could also serve as one of the driving concepts in the next update to the City's overarching planning documents—City Plan and the Transportation Master Plan.

Additional resources and information about the City of Fort Collins climate action strategies and responses is available at *fcgov.com/enviro*.


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