



COLUMBIA BASIN TRUST  
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COMMUNITIES ADAPTING TO  
CLIMATE CHANGE INITIATIVE

CITY OF CASTLEGAR  
CASE STUDY



This adaptation project was undertaken by the City of Castlegar as part of Columbia Basin Trust's Communities Adapting to Climate Change Initiative, with federal funding support through Natural Resources Canada's Regional Adaptation Collaboratives Program



Natural Resources  
Canada

Ressources naturelles  
Canada

Canada

## CASE STUDY: CITY OF CASTLEGAR

### About the Case Study

In October 2009, the City of Castlegar embarked on a one-year climate change adaptation planning process as part of Columbia Basin Trust's (CBT) Communities Adapting to Climate Change Initiative (Phase Two)<sup>1</sup>.

The City of Castlegar led the planning process, which followed six broad steps:

1. Get Started;
2. Learn about Climate Change;
3. Identify Priorities;
4. Assess Vulnerabilities and Risk;
5. Develop Adaptation Strategies and Actions; and
6. Implement and Monitor Plan.

The project was guided by a citizen-based Steering Committee, local government elected officials, City staff, and was managed by a coordinator who was a City staff member. The City partnered with Engineers Canada to address the infrastructure portion of this project.

Concurrent with the Adapting to Climate Change project, the City of Castlegar updated their Official Community Plan (OCP) and Infrastructure Strategy to include project recommendations.

### Community Context

The City of Castlegar is centrally located in the Southern Interior of British Columbia and is 600 kilometres from both Vancouver and Calgary. The City is situated at the confluence of the Kootenay and Columbia rivers at the southern end of the Arrow Lakes. The three industries employing the most people are manufacturing (forestry), retail trade and educational services. Approximately 7,600 people reside within the City of Castlegar. More than 16,000 residents live in the Greater Castlegar area<sup>2</sup>.

*“We used to skate across  
the frozen Columbia  
River!”*

–Castlegar resident, local  
observations survey

1 [www.cbt.org/climatechange](http://www.cbt.org/climatechange)

2 [www.castlegar.ca](http://www.castlegar.ca)

### Summary of Climate-Related Changes by 2050<sup>3</sup>

**Temperatures** in Castlegar are projected to increase by an average of 1.9 degrees Celsius.

**Precipitation** is projected to increase overall by five per cent, but to decrease during the summer months.

**Stream flows** are projected to change as spring runoff (freshet) will occur earlier, resulting in reduced late-summer stream flow.

**Snowfall** is projected to decrease by 12 per cent with reductions in snowpack at lower elevations.

**Frost-Free Days** are expected to increase by 25 days.

**Extreme events** such as heavy precipitation, droughts and windstorms are likely to increase.

**Local observations** surveys and interviews were conducted with Castlegar residents to gather observations that may be related to climate change. Results indicated that residents are noticing changes in the weather and believe that climate change is playing a role.

### Community Impacts and Vulnerabilities

Castlegar identified three priority areas for further research:

1. Water Resources;
2. Local Food and Agriculture; and
3. Municipal Stormwater System.

The priority areas were further assessed for vulnerabilities, risks and opportunities as summarized below.

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<sup>3</sup> Pacific Climate Impacts Consortium (PCIC)

### Water Resources

Castlegar is fortunate to have an immense water supply from Lower Arrow Lake; however, the City has been working for the past several years to address higher than average summer maximum daily demands for water. The City's complex water system is characterized by underground pipelines, pump stations, reservoirs, pressure-reducing valves and a computer system that monitors water tank levels and flows. Declining snowpack and glaciers, compounded by shifts in precipitation, may limit water supply during peak demand periods, affecting key economic sectors including hydroelectric power generation, fisheries, agriculture and infrastructure.

Key impacts include decreased summer and fall supplies, supply-demand mismatches in reservoirs and increased demands on water and sewage treatment facilities.

### Local Food and Agriculture

The City's current reliance on distant producers and businesses to deliver affordable, healthy food leaves the community vulnerable both to price increases and interruptions in supply. This led the project to focus on food self-sufficiency at the household, community and regional scales.

Literature on agriculture and climate change suggests that length of the frost-free season is projected to increase as the climate warms, extending the growing season. This opportunity could be hindered by an increase in irrigation demand, particularly during the expected drier summer months. Other potential impacts include the risk of increased soil erosion and crop loss from increased flooding and more frequent and intense storms. The potential for warmer temperatures may encourage the appearance of new pests and exacerbation of existing ones that are normally controlled by cooler winters.

### Municipal Stormwater System

Castlegar is comprised of 12 drainage areas totalling over 2,000 hectares. Five systems are dominated by natural streams that flow through the City, and seven are comprised of urban storm drain systems within the City. Each drainage outlet is directly connected to the Columbia River. Failure of any parts of the stormwater management systems could place public safety and the community at risk. Potential climate impacts include:

- Higher peak flows and extreme precipitation events could increase the risk of floods, which may disrupt critical infrastructure;
- Increased storm events and precipitation intensity may overwhelm stormwater systems; and
- Longer fire seasons may result in more interface fires that could threaten the community and its infrastructure.

## Adaptation Actions<sup>4</sup>

### Water Resources

#### Adaptation Goal

To deliver high-quality water to residential, commercial, institutional and industrial users at an affordable cost to taxpayers, and to maintain a healthy ecosystem.

#### High Priority Actions

- Projected increase in summer temperatures and reduced summer precipitation / stream flows may increase water temperatures and cause more frequent algae blooms. Implement a Uni-Directional Flushing (UDF) program to increase velocity of the flushing regime to dispel buildup, or consider Dissolved Air Flotation (DAF) treatment.
- Promote residential water conservation through a variety of initiatives including:
  - Implement Water Smart initiative recommendations;
  - Educate homeowners and development community about xeriscaping;
  - Raise awareness by showcasing City initiatives with signage (City Hall); and
  - Through building permit process, require topsoil be added to residential development where lawns are planted.
- Implement water conservation measures for City operations. Strategies include:
  - Prioritize which parks should be irrigated;
  - Optimize irrigation program to reduce wastage;
  - Amend soils to increase water retention; and
  - Plant drought-resistant lawn seed, turf and dryscape / xeriscape public lands.

<sup>4</sup> The stormwater system was assessed by engineering consultants using the methodology outlined by Engineers Canada. The methodology for developing an action plan for water resources and food and agriculture was developed by the City Coordinator, and the process was undertaken in local community-based sessions.

## Local Food and Agriculture

### Adaptation goal for the *direct* impacts of climate change<sup>5</sup>

To enhance the capacity of the City of Castlegar and surrounding area to improve household access to food and regional growing.

### High Priority Actions

- Educate residential property owners and developers on pollinator habitats.
- Continue to experiment with pesticide-free park maintenance to reduce the risk of impacting the local food system.
- Use seasonal climate predictions for crop planning, and diversify crops for intensive cropping.

### Adaptation goal for the *indirect* impacts of climate change<sup>6</sup>

To enhance the capacity of the City of Castlegar and surrounding area to cope with climate change by growing, processing, storing and consuming more local food and ensuring that the community has adequate emergency supplies

### High Priority Actions

- Develop policies and regulations to encourage gardening, and require community gardens in multifamily developments.
- Permit beekeeping and chicken raising and the use of greenhouses in the City.
- Establish policies to protect agricultural lands by including these policies in the Official Community Plan and Zoning bylaw updates.
- Promote food production in City parks and City-owned lands.
- Develop policies to purchase locally-grown foods where possible and support the growth of farmers' markets.
- Encourage householders to store emergency food supplies and include a household preparedness policy in the Emergency Management Plan to reduce the risk of household food shortages.

5 Direct impacts: less snowpack for insulation, increased need for irrigation, extreme weather events and fewer pollinators.

6 Indirect impacts: disruptions to transportation routes for food distribution, global disruptions to food production and transportation.

## Municipal Stormwater Systems

### Adaptation Goal

The City's stormwater system was assessed for vulnerability to climate change according to Engineers Canada and their Public Infrastructure Engineering Vulnerability Committee (PIEVC). Engineering consultants conducted the vulnerability assessment with input from City staff and invited expertise. They recommended 17 adaptation actions for the City of Castlegar. Seven recommendations which could apply to most communities are listed below.

### High Priority Actions

- Update the City's drainage infrastructure data set to ensure all information required for hydraulic analysis is current and reliable.
- Consider installing at least two permanent flow-monitoring stations.
- Review the 10 high-risk infrastructure elements (included in the action plan final report) and prepare an action plan to include seeking funding opportunities with the Province to address each high-risk item as funding permits.
- Develop and implement a Daily Planning Cycle (DPC) program with respect to forecasting potentially hazardous runoff conditions within the upper catchment streams.
- Conduct a debris-load survey periodically for each upper catchment stream, as they are potentially vulnerable to increased debris blockage.
- Maintain records documenting the amount, type, and date of debris removed from culvert or storm sewer inlets.
- Develop a new trash rack design standard to ensure trash racks adequately capture and hold debris while still allowing flows to enter the downstream drainage system.



**For more information about the Communities Adapting to Climate Change Initiative:**

Website: [www.cbt.org/climatechange](http://www.cbt.org/climatechange)

Email: [adaptation@cbt.org](mailto:adaptation@cbt.org)

City of Castlegar Contact:

Corporate Administrative Officer: John Malcolm

Project website: [www.castlegar.ca/sustainable](http://www.castlegar.ca/sustainable)

Duration of project: One year

Project budget: \$59,832.35

Additional: 964 in-kind City staff hours, 141 in-kind volunteer hours