



Climate Action Initiative
BC AGRICULTURE & FOOD

Cowichan Agriculture Extreme Weather Event Preparedness & Mitigation Pilot Project

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Prepared By



Sustainability
Solutions
Group



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Acronyms and Definitions

AAP – Agricultural Area Plan

CAI – British Columbia Agriculture and Food Climate Action Initiative

CVRD – Cowichan Valley Regional District

DFO – Department of Fisheries and Oceans

DNC – District of North Cowichan

GHG – Greenhouse Gas

LEPS – Langley Environmental Partners Society

MoE – Ministry of Environment

MFLNRO – Ministry of Forests, Lands and Natural Resource Operations

MoTI – Ministry of Transportation and Infrastructure

OCP – Official Community Plan

RDN – Regional District of Nanaimo

Climate Change Adaptation – Adjustment of human or natural systems in response to actual or anticipated changes in climate (to moderate harm or exploit beneficial opportunities).¹

Extreme Weather Event – An extreme weather event is an event that is rare at a particular place and time of year. Definitions of *rare* vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classified as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season).²

Climate Risks – Exposure to danger resultant from changes in the climate.

¹ International Panel on Climate Change (IPCC). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Glossary: Adaptation (*altered slightly*). http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-AnnexII_FINAL.pdf

² Ibid.

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1. Introduction

1.1 Purpose of this Report

This report details the outcomes of a pilot project to address extreme weather event preparedness and mitigation with the agriculture sector of the Cowichan Valley Regional District (CVRD). The anticipated risks and vulnerabilities of agricultural operations to extreme weather events (caused or influenced by climate change) are assessed, and action priorities for the farm and community levels are identified. As part of the pilot project, hazard maps indicating the agricultural areas of the Cowichan that may be at risk of extreme weather event impacts were developed, and are available in a separate Appendix: *Cowichan Extreme Event Risk Maps*.

The primary purpose of the report is to serve as a resource to both agricultural producers and key partners in preparing for extreme events that may impact agriculture in the CVRD. Although the pilot project is intended to result in implementation of some adaptation actions at the farm level, it is clear that full implementation requires shared responsibility, collective action and additional resources.³ Individual farm-level responsibility for next steps is shared with other project partners and a number of agencies identified in the community-level actions. Whenever possible, specific actions and potential partners are identified throughout this report.

1.2 Project Impetus

In 2012-2013, the BC Agriculture & Food Climate Action Initiative (CAI) partnered with the CVRD and the local agriculture sector to complete a plan for agricultural adaptation to climate change ([Cowichan Adaptation Strategies](#)). During the planning process, one of highest priorities for participating producers was to increase their preparedness for the range of extreme weather events that are projected to occur with more frequency as the climate changes.

The CVRD was one of the first regions in B.C. to provide resources and staff time to developing an adaptation plan for agriculture. This reflects the Regional District's commitment to adaptation and to supporting the local agriculture sector (as per the 2010 [Cowichan Valley Agricultural Area Plan](#)). With completion of the *Cowichan Adaptation Strategies*, the partnership between CAI and the CVRD continued in order to implement some of the priority actions identified in the plan (including this project).

The CVRD's Public Safety Division has partnered with CAI to deliver this pilot project. The Public Safety Division's primary goal is leading the Region's communities in preparing for, responding to, and recovering from emergency situations.⁴ This focus aligns well with the objectives of this project, which were to:

³ There are two distinct *Growing Forward 2* funded programs that may apply to extreme events preparedness and mitigation activities. 1) The [Canada-BC Agri-Innovation funding program](#), an application-based program delivered through the Investment Agriculture Foundation of BC, identifies Climate Change Adaptation as one of five areas of activity identified to advance innovation and competitiveness in BC. 2) The Regional Adaptation Enhancement Program is providing implementation funding for the [Cowichan Adaptation Strategies](#), this funding may contribute to collaborative prioritized extreme events preparedness and mitigation projects in the Cowichan Valley region.

⁴ Cowichan Valley Regional District Public Safety Division: www.cvrld.bc.ca/index.aspx?NID=86

- Increase knowledge and understanding of vulnerabilities to extreme weather events (such as flooding, storms, extreme heat, and wildfire) for agricultural operations in the Cowichan Valley Region;
- Reduce the vulnerability of agricultural operations to the negative impacts associated with extreme weather events;
- Develop and pilot a group approach to planning, preparedness and mitigation for extreme weather events in agricultural areas.

1.3 Summary of Project Methodology

The extreme weather event preparedness and mitigation pilot project involved the following steps:

Background Research

The state of agricultural practice, and the historical and current natural hazards to agricultural operations in the Cowichan region were reviewed and summarized. The projections and potential impacts associated with: drought, wildfire, inland and coastal flooding and extreme heat events were researched for the area. Maps were made depicting the region's precipitation, flood risk, projected sea level rise and fire hazard risk. Mapping data was drawn from a combination of the following sources: IPCC sea level rise data (2007),⁵ CVRD's annual precipitation data (2007),⁶ CVRD fire hazard risk data (2012),⁷ and CVRD flooding study data (2009).⁸

In-person and phone interviews were conducted with 10 producers and 8 non-producers in the Cowichan area. These provided a sense of how producers view the risks associated with extreme weather events, their level of preparedness for extreme weather, their previous experiences with extreme weather, and any gaps in information availability, communications protocols and actions on extreme weather preparedness.

Four case studies were produced for distribution and reference during the workshops. These case studies provided hazard descriptions and identified potential actions or examples of adaptation actions to address drought, wildfire, flooding and winter storms. These were presented as four two-page documents and included links to relevant resources.

Workshops

Two workshops were conducted, the first with 23 participants and the second with 18 participants. Many of the participants in the first workshop were also present for the second one. For both workshops, postcard invitations were mailed to Cowichan producers representing a range of operation types and geographic areas. Workshop 1 included discussion of extreme events impacts and provided a clearer picture of producer priorities for preparedness actions. Workshop 2 included three local speakers addressing the topics of flood, wildfire and drought hazards (for more in depth information and discussion of the associated issues). Workshop 2 also included more detailed extreme weather event planning and action identification with participants.

Workshop Findings and Results

⁵ IPCC Data Distribution Centre. Sea level rise data (2007). www.ipcc-data.org

⁶ Cowichan Basin Water Management Plan. 2007. CVRD, MoE, DFO, Catalyst Paper Corp, Cowichan Tribes, and Pacific Salmon Commission.

⁷ CVRD Community Wildfire Protection Plan. 2012. Stratcona Forestry Consulting.

⁸ Integrated Flood Management Plan for the Lower Cowichan Valley, BC. 2009. Northwest Hydraulic Consultants.

Producers who attended the workshops agreed that extreme weather events are a serious concern. Many felt that they had already performed some of the straightforward tasks for extreme weather preparedness (e.g.: purchasing a generator). There was uncertainty as to who should take primary responsibility for the more complex and collective preparedness tasks (e.g.: livestock evacuation plans, maintaining tree lines). There was general agreement that more preparedness actions are needed, both at individual farm and community levels. Discussions resulted in a number of priority actions at the individual farm and broader collaborative levels. In addition, participants identified potential partners and responsibility assignment for the actions. Participants took home workbooks, checklists and reference materials. All participants indicated an interest in follow-up on next steps from the CVRD. The workshops enabled participating CVRD, CAI and Ministry of Agriculture staff to dialogue with local producers with a strong interest in this issue, as well as to hear participant priorities and concerns about resource and information gaps. These included:

- Priority responses for agricultural areas to power outages;
- Livestock evacuation planning;
- Maintaining agricultural drainage systems and waterways to prevent flooding;
- Developing water storage;
- Communication and assistance channels for extreme weather preparedness and response;
- Enhanced emergency weather warning alert systems; and
- Contact information for neighbouring farms, government assistance and emergency response entities.

1.4 Overview of Agriculture in Cowichan

The majority of CVRD’s agricultural land is concentrated in the District of North Cowichan (DNC) and the South Cowichan area. According to the 2011 *Census of Agriculture*, 33,200 hectares of the region’s land base are capable of agricultural production, although at present only about 2,465 hectares are irrigated.⁹ The 2011 *Census of Agriculture* reported the total number of farms in CVRD to be 685. The average farm size is quite small and most are of mixed production type. According to the 2011 *Census of Agriculture*, livestock farm types were as follows:

Table 1. Livestock farms in the Cowichan region.

Livestock Type	Number of farms	Number of Farms
	1996	2011
Poultry	429	412
Beef	210	122
Dairy	74	41
Sheep and Lambs	145	129
Goats	52	51
Pigs	77	33
Bee colonies for honey	39	33
Horses and Ponies	186	155

In some cases, the reduction in the number of farms belies the intensification of farming. For example, while the number of dairy farms has decreased in the region, the number of dairy cows has decreased only slightly (from 4,242 to 3,582 cows since 1996).

⁹ BC Agriculture & Climate Change Regional Adaptation Strategies series (2013). Retrieved Jan 12, 2014 from: <http://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-Cowichan.pdf>

By far the most common crop production is forage, followed by many small farms producing a mixture of vegetables and emerging crops, such as berries and wine grapes. Grape production has grown rapidly in the region in recent years and is now the second largest crop even though it's relatively new to the area. According to the 2013 *Agriculture Water Demand Model* the main crops in the Cowichan region are:

Table 2. Crop types by hectares in the Cowichan region.

Crop Type	Number of ha
Forage	6,092
Grapes	108
Berries	39
Grains, cereals, oilseeds	34
Vegetables	25
Tree fruits	11
Other field crops	20

2. Climate Change in the CVRD

2.1 Climate Change Projections

Climate change is anticipated to increase the frequency and intensity of extreme weather events occurring in the Cowichan region. These events include: a greater number and intensity of extremely hot days, more extended dry periods in summer and increased risk of wildfire, greater frequency and intensity of extreme rainfall events (winter and shoulder seasons), and increased risk of flooding.¹⁰ The *Cowichan Regional Adaptation Strategies* document details these projections, along with their potential impacts for agriculture. Maps identifying areas of the region with greater risk of extreme weather events have been created to accompany this pilot project and may be found in a separate Appendix: *Cowichan Extreme Event Risk Maps*.

2.2 CVRD's Climate Change Actions

The CVRD has decided to take action on climate change adaptation via several projects and initiatives.^{11,12} Those relevant to extreme weather event planning for agriculture include:

- Flood mitigation planning, including assisting with establishing flood infrastructure and upgrades (e.g.: dikes), and removing excess river sediment;
- Developing a *Climate Change Adaptation Strategy* for infrastructure within the region;
- Developing up-to-date information about critical water resources in lakes, rivers and aquifers, (with the Cowichan Watershed Board) so that water can be managed more effectively;
- Collecting high-resolution mapping data for the eastern coastline—from Mill Bay to the northern boundary—to determine the potential impacts of sea level rise and increased storm events; and
- Developing a *Community Wildfire Protection Plan* that identifies numerous recommendations for mitigating the interface fire hazard.¹³

¹⁰ Retrieved Jan 12, 2014 from Plan2Adapt climate projection information: www.pacificclimate.org/analysis-tools/plan2adapt

¹¹ Cowichan Valley Regional District. Energy and Climate Change webpage. Retrieved March 23, 2015: <http://www.cvrld.bc.ca/index.aspx?NID=1358>

¹² CVRD Agricultural Area Plan (2010). Retrieved March 25, 2014: www.cvrld.bc.ca/index.aspx?nid=924

¹³ Strathcona Forestry Consulting. Cowichan Valley Regional District Community Wildfire Protection Plan 2012 Update. August 2012. <ftp://64.114.18.97/.../CVRD%20CWPP-2012.pdf>

These actions indicate commitment by the CVRD to adaptation planning and will provide stronger information and resources (particularly around flooding mitigation, water supply issues and wildfire risk) to support the actions identified through this pilot project. Conversely, this pilot project supports the CVRD with implementation of their priorities by including adaptation actions that directly involve and benefit the local agricultural community.

3. Climate Change and Extreme Weather Hazards: Effects and Risks in the CVRD

Extreme weather hazards in the Cowichan Valley include drought (or extended dry conditions), forest fires, storms and floods. These hazards can damage homes, businesses, communities, public infrastructure and the natural land/resource base. As will be the case globally, if these events become more common with climate change they will also cause taxes and insurance costs to rise and may have substantial impacts on local economies.¹⁴ The CVRD has varied topography with a large quantity of forest interface as well as coastal areas and, as such, is susceptible to a range of weather-related hazards in different geographic areas. These hazards are anticipated to be exacerbated by climate change. Each hazard, and its potential impacts to agriculture, is summarized below.

3.1 Drought/Extended Dry Conditions

What is drought?

Drought occurs when extended periods of heat and/or lack of precipitation result in soil that lacks moisture and cannot sustain plant health.

Drought Impacts to Agriculture in the Cowichan Region

Even without climate change, agricultural production in Cowichan is already vulnerable to impacts associated with extended dry periods. A significant proportion of the agricultural land base is not irrigated, and some producers have water sources (e.g. shallow wells) that are impacted by prolonged dry periods. Extended periods of dry weather in the Cowichan can impact crop production by lowering yields, affecting quality and altering harvest times. Severe drought can also be a concern for water availability for livestock watering. Drought conditions can also lead to a reduction in management options for plant wilting, sun scald and pest management (both with existing and new pests). As conditions become drier, water restrictions will likely be enforced and this will affect some farms in the Cowichan (depending on their water source).

Climate change and drought in the Cowichan Region

With climate change, extended dry periods are projected to become more frequent and intense. A higher proportion of precipitation will fall as rain rather than snow during the winter months. Due to warmer spring temperatures, snow melt and peak flows will occur earlier in the year reducing surface water availability in times of peak demand.¹⁵ A growing number of warm and extremely hot days in summer will also increase agricultural water demand. In 2014, southern Vancouver Island, including the Cowichan Valley, reached Level 3 drought conditions (on a ranking of Level 1 – least severe to Level 4 –

¹⁴ Climate change and wildland fire in Canada. M. Flannigan. Wildland Fire Canada Conference, Oct 6, 2010.

¹⁵ Westland Resource Group Inc. (2007) Cowichan Basin Water Management Plan, Cowichan, Canada. Retrieved from: www.cowichanwatershedboard.ca/sites/default/files/CowichanBasinWaterManagementPlan-March2007.pdf

most severe).¹⁶ In August 2014, the southern Vancouver Island (including the Cowichan Valley) drought level was nearly raised to Level 4. This would have called for voluntary reduction of water use by 20% in the agricultural sector, along with increasing use of water restrictions and a regulatory response.¹⁷ Current annual mean precipitation maps for the region can be found in a separate Appendix: *Cowichan Extreme Event Risk Maps*, Maps 1 through 1c.

3.2 Wildfire

What is Wildfire?

Wildfire is a fire that burns in a forested, grass or natural vegetated areas as a result of natural or human causes. Wildfire risk increases with extended periods of warm and dry weather.

Wildfire Impacts to Agriculture in the Cowichan Region

Impacts to farms from Cowichan wildfires may include damage to farm buildings and infrastructure, as well as to crops and livestock. Wildfire is particularly challenging for livestock operations with the potential for mortality and livestock health impacts, along with costs and production losses associated with relocating and temporarily housing animals away from hazards. Crop loss and damage can also be extensive, as the majority of wildfires occur during the peak growing season. Aside from the immediate losses and damage to farms in direct contact with wildfires, there are also challenges with smoke and particulate matter. This has a range of health impacts for humans and livestock alike, and may also impact plant growth due to limitations in light and ash cover.

Climate change and wildfire in the Cowichan Region

With projections for increasing temperatures and more prolonged dry summer conditions, the risk of wildfire is anticipated to continue to grow in the future. Between 1970 and 2004 (the latest period for which data was available), over 1,300 Ministry-assisted wildfires (forest fires requiring suppression support from the Ministry of Forests, Lands and Natural Resource Operations) occurred in the Cowichan region.¹⁸ The greatest incidence of annual fires in the last 40 years has occurred in the last 5 years of the reporting period (1999-2004). Fire hazard ratings indicate that 96% of the Cowichan region has a high or extreme interface fire hazard rating; the remaining 4% percent of the region has a moderate interface fire hazard, with a negligible area rated with a low hazard. Maps of *current* fire hazard in the Cowichan region can be found in a separate Appendix: *Cowichan Extreme Event Risk Maps*, Maps 2 through 2c.

3.3 Inland Flooding

What is Inland Flooding?

Inland flooding can result when moderate precipitation falls for several days, when intense precipitation falls over a short period, when snowpack melts quickly, or when a dam or levee fails. Whenever the volume of water on land overcomes the capacity of the natural and built drainage systems to carry it away, flooding can result.¹⁹ Rain-driven flows tend to be more erratic, unpredictable, and potentially more damaging than snowpack-driven flooding.

¹⁶ Islanders urged to conserve water. August 8, 2014. www.newsroom.gov.bc.ca/2014/08/islanders-urged-to-conserve-water.html

¹⁷ Government of British Columbia. (2010). British Columbia Drought Response Plan. Retrieved March 23, 2015: http://www.livingwatersmart.ca/drought/docs/2010/bc_drought_response_plan_june-2010.pdf

¹⁸ MLFRNO database.

¹⁹ US Climate Resilience Toolkit: <https://toolkit.climate.gov/topics/coastal-flood-risk/inland-flooding>

Inland Flooding Impacts to Agriculture in the Cowichan Region

Increased river flows in the Cowichan may cause strain on dikes and flood protection infrastructure, requiring increased capacity and retention ponds. In addition, some of the Cowichan region's low lying areas (often agricultural) are already vulnerable to site specific flooding with heavy precipitation. In some areas this may be exacerbated by runoff from upland areas where development and/or forestry activity has occurred.

Critical farming operations can be impacted depending on the time of the year that flooding occurs. For example, in the early spring, flooding may alter the timing for planting, whereas flooding in the fall can harm perennial crop roots, affect crop yields, and alter harvest times. In extreme cases perennial crops (such as blueberries) can be destroyed by floods and may need to be replanted. Landslides, soil erosion and leaching of nutrients are other impacts that are also associated with inland flooding.

Climate change and inland flooding in the Cowichan Region

Overall annual precipitation in the Cowichan region is projected to increase 3% by 2020 and 6% by 2050 and more of this precipitation will fall in short and intense rainfall events in the autumn, winter and spring.²⁰ These intensive precipitation events will increase runoff and create growing challenges with drainage on agricultural lands (particularly if precipitation occurs during the production season). In addition, the proportion of winter precipitation falling as snow is projected to decrease much more sharply on Vancouver Island than elsewhere in BC. Warmer and wetter winters will increase the likelihood for precipitation driven winter flood events as runoff and winter stream flow levels increase. Peak flow events could cause large-scale damage, especially in combination with a logjam or dam failure. This can transform a manageable rainfall event into an extreme rainfall event. Current flood hazard maps can be found in a separate Appendix: *Cowichan Extreme Event Risk Maps*, Maps 3 through 3b.

3.4 Winter Storms

What are Winter Storms?

Winter storms are weather events involving low temperatures, increased wind speeds and precipitation in the form of rain, snow, freezing rain, sleet, ice pellets, or a mixture of these.

Winter Storm Impacts to Agriculture in the Cowichan Region

Transportation, electricity and farming infrastructure are at risk from severe winter storms. Transportation interruptions in feedstock supply and other farm inputs are common when storms affect roads and ferries. Dairy and poultry operations may be particularly at risk due to ongoing energy requirements (for heat and milking) and road access for moving feed and farm products. Crop and soil damage may result from freezing rain and ice pellets. However, other than winter cover crops, fruit trees, or grape vines (a growing production system in the Cowichan) there are few yield impacts due to winter storms. Winter storms may require improved livestock shelter or evacuation plans, backup energy provisions, and increased feed storage capacity. Increased uncertainty (and variability) with regards to weather overall may complicate storm preparedness efforts.

Climate change and winter storms in the Cowichan Region

Projections for the south coast of BC show a decrease in storm frequency but an increase in severe winter storm intensity.²¹ Snowfall is expected to decrease considerably within the Cowichan region due

²⁰ Ibid. 10.

²¹ Walker, I. and R. Sidney, Smith, et al. 2008. Ch. 8 in *From Impacts to Adaptation*. D. S. Lemmen et al. eds: 329-386.

to climate change (-24% by 2020 and -39% by 2050).²² Damaging windstorms do already occur during the winter months in the region and with seemingly greater frequency in recent years.²³ The 2012, 2013, and 2014 windstorms that resulted in widespread power outages and trees falling on homes in the Cowichan region are recent examples.^{24,25,26}

3.5 Sea Level Rise (Coastal Flooding and Storm Surge)

What is Sea Level Rise?

Two main mechanisms are contributing to sea level rise: thermal expansion (ocean water expanding as it warms) and the melting of ice sheets and glaciers (predominantly in Antarctica and Greenland).²⁷ Coastal flooding occurs when seawater inundates coastal landforms. This can be influenced by storm surge, sea level rise, wind, waves and tides. Storm surge is a temporary increase in the height of the sea due to extreme wind conditions at a particular location.

Sea Level Rise/Coastal Flooding Impacts to Agriculture in the Cowichan Region

The amount of agricultural land at risk of coastal inundation in the CVRD is quite small. Parcels that would be directly affected by sea level rise are mainly located north of Crofton and north of Cowichan Bay (see Maps 4b and 4c in a separate Appendix: *Cowichan Extreme Event Risk Maps*). Higher tides combined with storm surges present a risk of flooding causing damage to farm infrastructure and potential for impacts to production (e.g. livestock evacuation, damage to perennial or stored crops). Water sources can become unfit for irrigation and consumption by animals. Many Cowichan aquifers are based along the coastline and could be salinated, endangering water systems.

Climate change and Sea Level Rise/Coastal Flooding in the Cowichan Region

Global sea level has risen more than 20 cm since 1899,²⁸ though this varies significantly by location due to land movement (rising or falling) and climate and weather variability. Estimates for the BC coast over the next century suggest a minimum sea level rise of 80 cm for the east coast of Vancouver Island.²⁹ The entire Cowichan region coastline is susceptible to different degrees of coastal erosion. Saanich Inlet and Satellite Channel are particularly susceptible due to their geology and ocean flows.³⁰ Currently, a combination of a severe storm event and a high tide could overwhelm coastal flood protection infrastructure in the Cowichan region, even without additional sea level rise. As winter storms are also anticipated to increase in their intensity, this further increases risk around coastal flooding, particularly when high tides and storm events occur simultaneously. Projected (year 2100) sea level rise maps can be found in a separate Appendix: *Cowichan Extreme Event Risk Maps*, Maps 4 through 4c.

²² Post Flood Assessment, 2009. Retrieved March 25, 2014: www.cvrld.bc.ca/documentcenter/view/8001.

²³ Canadian Wind Energy Atlas: www.windatlas.ca

²⁴ Powerful rain and windstorm in Cowichan. November 2014.

www.cheknews.ca/powerful-rain-windstorm-hammers-cowichan-valley-shawnigan-lake-central-vancouver-island

²⁵ Powerful windstorm rips Cowichan Valley. November 2014. www.cheknews.ca/powerful-windstorm-rips-cowichan-valley

²⁶ Windstorm knocks out power in Cowichan Valley. October 2012.

www.timescolonist.com/news/wind-storm-knocks-out-power-in-cowichan-valley-gulf-islands-1.22390

²⁷ Church, J.A. et al. (2013). Sea Level Change. In: *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. P.1139.

²⁸ Thomson, R.E., Bornhold B. D. & S. Mazzotti. 2008. An Examination of the Factors Affecting Relative and Absolute Sea Level in British Columbia, Canadian Technical Report of Hydrography and Ocean Sciences 260, Fisheries and Oceans Canada.

²⁹ Ausenco Sandwell, 2011a. Draft Policy Discussion Paper. Report prepared for BC Ministry of Environment.

³⁰ Flannigan, M in Hume, M. (2012) *Dramatic rise in forest fires projected for Canada's West due to warming*. The Globe and Mail. February 19th 2012. Retrieved February 10, 2014 from: www.theglobeandmail.com/technology/science/dramatic-rise-in-forest-fires-projected-for-canadas-west-due-to-warming/article547356

4. Climate Change Adaptation Planning Approaches

4.1 Climate Change Adaptation in the CVRD

The ability of agriculture to adapt to climate change and minimize negative impacts can be influenced by three key drivers:³¹

1. The policies adopted by government at various levels and the signals they send to farmers and others in the food production chain;
2. The development and availability of effective adaptation choices; and
3. The capacity and motivation of farmers and farming industries to implement the appropriate adaptations and obtain support for doing so.

These drivers make it clear that adaptation is a collective responsibility. The CVRD, for example, can ensure that its water management and drought policies include support for farm adaptation measures. All levels of government can work with agricultural groups and producers to assist with identifying and developing effective adaptation options and technologies so they are available when needed. Producers also require knowledge, capital, access to information and advice, and suitable incentives to make the necessary changes. Continued collaboration between the CVRD's producers, producer organizations and all levels of government is important to bringing about the implementation of adaptation strategies that will ensure the longevity of the agricultural industry in the region.

4.2 Farm-Level and Community-Level Planning Approaches

Adaptation to extreme weather focuses on being proactive in order to minimize the negative impacts associated with extreme events, and ensuring that plans and processes for response and recovery are in place ahead of time. A key objective of this project is to increase the capacity of the Cowichan agriculture sector to prepare for extreme weather by implementing adaptation actions before they are needed (i.e.: before an emergency event occurs), particularly at a community level.

Some adaptation planning can be done on a farm-by-farm basis, while other planning is best done at a broader community level. Agricultural producers are accustomed to making independent decisions regarding the operations of their farm. Coordination with neighbours is often thought to be too challenging or ineffective. The following table compares farm-level and community-level planning approaches and indicates the rationale and importance for undertaking planning at both levels.

³¹ Stokes, Chris and Howden, Mark (2011). Adapting Agriculture to Climate Change. Climate Change Science and Solutions for Australia, CSIRO, ch.7 p.85.

Table 3. Approaches to farm-level and community-level adaptation planning

Farm-level	Community-level
Focus on individual property needs.	High-level and community-based priorities are the focus.
Gaps and resource needs identified only as they pertain to the farm operation	How extreme events impact the farming community as a whole is considered.
Planning and implementation focuses on one property.	How individual farm resources and skills could benefit others in times of emergencies is considered.
Government agencies and emergency planners become aware of specific challenges (e.g. regulatory barriers on a site-specific basis).	Collective strategies and implementation steps to leverage resources and come up with potentially new solutions are explored. Government agencies and emergency planners become aware of more high-level challenges (e.g. communications gaps, livestock evacuation needs).

Benefits that can be leveraged by planning for extreme weather events as a community include:

- Resources (including tools and equipment) can be identified and pooled so that costs and labour are shared.
- Historical knowledge that benefits planning and action can be shared through community discussions.
- Sharing information with neighbours’ and other producers can help lead to knowledge transfer and success in individual planning and adaptation projects.
- Community-level adaptation planning builds on the urban neighbourhood-based planning process for local emergency planning, thereby providing models for implementation and broader government support.
- Community-level adaptation enables producers to collectively address potential risks and vulnerabilities that are experienced collectively and at a broader scale.

Ultimately, a combination of farm-level and community-level planning and approaches are needed to most effectively support the range of adaptations required for extreme weather events.

4.3 Key Community-Level Implementation Actions

Community-level adaptation planning differs from farm-level planning in that it requires partnering and pooling of resources in order to maximize efforts. One focus of this project was to determine where there are gaps in planning for extreme events that require collaborative approaches, and to develop clear steps for action and implementation. In order to implement these community-level actions, collaboration between a number of groups and agencies will be required.

The following table outlines community-level collaborative actions that were identified and discussed at the two workshops during this pilot project. These collaborative actions are an initial to advance informational resources, existing knowledge, tools, or support for the action and further action and investment will still be required by individual producers/operations. Each of these actions is explored in greater detail in Section 5.

Table 4 lists the actions in order of priority (as determined from feedback from workshop participants). Ease of implementation is defined by both the potential resource-related and administrative challenges that may affect the implementation of the action.

Timeline definitions used in the table are:

- Short: fewer than 2 years
- Medium: 2 -5 years
- Long: greater than 5 years

Table 4. Community-level actions

Action	Ranking	Steps towards implementation	Partners Required	Funding or Other Resources Required
<p>1. Livestock evacuation planning</p> <p>Addresses:</p> <ul style="list-style-type: none"> • Wildfire • Flooding • Winter storms 	<p>Importance: High</p> <p>Ease of implementation: Medium</p> <p>Timeline: Short</p>	<p>Conduct farm-level livestock evacuation plans through a pilot project. Use results to develop template documents for the rest of the agricultural community.</p> <p>Develop a dairy sector livestock evacuation plan for Cowichan. Include a contingency plan for milking operations, livestock feed, bedding, and medication. Specifically discuss arrangements for temporary milking with other dairy operators in the region.</p> <p>Develop a non-dairy livestock evacuation plan for Cowichan. Inventory equipment for livestock transportation. Identify central locations for temporary livestock holding.</p>	<p>Cowichan producers</p> <p>CVRD</p> <p>Farmers' Institutes</p> <p>CAI</p> <p>Ministry of Agriculture (Emergency Management program)</p>	<p>Securing evacuation locations through lease (see RDN example) or other means will require coordination between CVRD and landowners.</p> <p>Shared planning costs and funding may be available through various levels of government funding. Costs of communication are minimal.</p> <p>Total estimated costs for developing the evacuation plan: \$35,000 - \$50,000</p>
<p>2. Communication of drought risk</p> <p>Addresses:</p> <ul style="list-style-type: none"> • Drought • Wildfire 	<p>Importance: High</p> <p>Ease of implementation: Easy</p> <p>Timeline: Short</p>	<p>Engage the CVRD, Ministry of Agriculture and Ministry of Forests, Lands and Natural Resource operations (MFLNRO) to discuss options for communication to distribute information about water scarcity.</p> <p>Include agricultural properties as a specific group through the CVRD's Emergency Notification System.</p>	<p>CVRD</p> <p>Ministry of Agriculture</p> <p>MoE</p> <p>Cowichan producers</p> <p>CAI</p> <p>Fire halls</p> <p>Cowichan Watershed Board</p>	<p>Updating the CVRD Emergency Notification System software to include agricultural properties as a specific group will likely cost \$2,000 - \$3,000.</p> <p>Additional human resources to populate the system with contact information and test out its effectiveness will be required.</p> <p>Develop and install drought alert signage at fire halls or adjacent to existing fire risk signage.</p> <p>Total implementation costs will likely be <\$10,000.</p>

Action	Ranking	Steps towards implementation	Partners Required	Funding or Other Resources Required
<p>3. On-farm water storage knowledge transfer</p> <p>Addresses:</p> <ul style="list-style-type: none"> Drought 	<p>Importance: Medium-High</p> <p>Ease of implementation: Easy</p> <p>Timeline: Short</p>	<p>Provide support for knowledge transfer between producers who have water storage and producers who require water storage. This may include a field day, tour, or workshop.</p> <p>Develop instructional resources for producers (collecting and distributing existing resources or creating a short guide).</p>	<p>Cowichan producers</p> <p>CVRD</p> <p>CAI</p> <p>Ministry of Agriculture</p> <p>Cowichan Watershed Board</p>	<p>Depending on the level of information, developing a centralized resource (such as a short guide) would be relatively low cost. (\$15,000 - \$20,000)</p> <p>A field day or workshop will likely cost under \$5,000 to organize, execute, and report on.</p>
<p>4. Agricultural ditch maintenance knowledge transfer</p> <p>Addresses:</p> <ul style="list-style-type: none"> Inland Flooding Sea level rise 	<p>Importance: Medium-High</p> <p>Ease of implementation: Medium</p> <p>Timeline: Medium</p>	<p>Identify, update, and distribute information on navigating the regulatory components of drainage/ditch maintenance.</p> <p>Identify farming areas that are high priority for ditch maintenance.</p> <p>Communicate success stories by supporting knowledge transfer.</p>	<p>CVRD staff</p> <p>Ministry of Agriculture</p> <p>Ministry of Environment</p> <p>Cowichan producers</p>	<p>Updating and distributing resources to the farming community will require a relatively low level of resources. The Ministry of Agriculture, in partnership with MoE, may be the appropriate leaders for this step.</p> <p>A tour of successful projects and meeting to discuss ongoing challenges and potential solutions will cost under \$5,000</p>
<p>5. Tools to improve secondary road access</p> <p>Addresses:</p> <ul style="list-style-type: none"> Flooding Wildfire Winter storms 	<p>Importance: Medium</p> <p>Ease of implementation: Challenging</p> <p>Timeline: Medium</p>	<p>Assist property owners with mapping or other data interpretation.</p> <p>Determine whether there are regulatory or policy options that act as barriers or as opportunities to developing secondary road access</p> <p>Determine whether adequate levels of funding are available to landowners to help motivate the creation of secondary road access on farm properties.</p> <p>Highlight local or regional success stories.</p>	<p>CVRD</p> <p>Ministry of Transportation and Infrastructure</p> <p>Cowichan producers</p>	<p>CVRD staff may offer in-kind mapping support.</p> <p>Research may be required to determine if funding opportunities exist, if they are appropriate, and if not what can be done to help motivate landowners to create secondary access. Cost: approximately \$10,000.</p> <p>MoTI and/or CVRD staff can highlight best practices and success stories through presentations, meetings, or brochures. Cost: <\$10,000.</p>

Action	Ranking	Steps towards implementation	Partners Required	Funding or Other Resources Required
<p>6. Agricultural equipment inventory</p> <p>Addresses:</p> <ul style="list-style-type: none"> Wildfire Winter storms Flooding 	<p>Importance: Medium-Low</p> <p>Ease of implementation: Easy</p> <p>Timeline: Short</p>	<p>Conduct an inventory of equipment (e.g. water sources for fire suppression, key contacts with fire fighting training in the area, road clearing and tree removal equipment).</p> <p>Host a meeting or workshop to present the inventory results to the agricultural community.</p> <p>Explore options for purchasing any remaining required equipment co-operatively through the meeting.</p>	<p>CVRD</p> <p>Producers</p> <p>Farmers' Institutes</p> <p>Co-operative associations</p>	<p>Inventory costs will be minimal. This could be done by the CVRD or contracted out to a consultant for under \$5,000.</p> <p>Estimated costs for hosting a meeting or workshop is \$2,000 - \$3,000.</p> <p>A local association could undertake an exploration purchasing equipment co-operatively. The cost of this research would be under \$5,000.</p>
<p>7. Debris and vegetation management</p> <p>Addresses:</p> <ul style="list-style-type: none"> Wildfire 	<p>Importance: Medium-Low</p> <p>Ease of implementation: Easy to Medium</p> <p>Timeline: Medium</p>	<p>Identify and report neglected properties.</p> <p>Communicate with landowners about managing flammable debris in shared or adjacent wooded areas.</p> <p>Follow up and consider other forms of action if necessary.</p> <p>Clear downed and dead wood in yards, fields, shelterbelts, and woodlots.</p>	<p>CVRD staff</p> <p>Local fire halls</p> <p>Cowichan producers</p> <p>Ministry of Agriculture</p> <p>MFLRNO</p>	<p>A local association or external consultant could undertake identification and reporting of neglected properties. Cost: < \$5,000.</p> <p>Total estimated costs for developing and distributing a letter or other communications piece: \$2,000.</p> <p>Actual debris clearing costs, such as hiring a tree faller or weed removal contractor, would be over and above these estimates.</p>

5. Collective Adaptation Actions

During the two workshops that were held as a component of this pilot project, many producers identified a subset of adaptation actions that are particularly challenging and will require more extensive coordination and/or resources to be successfully implemented. The producers agreed that these are appropriate adaptation actions, however, either the regulatory or financial challenges (or both) represented real deterrents to implementation. This section provides a more detailed overview of the seven actions presented in Table 4:

1. Livestock evacuation;
2. Communication of drought risk;
3. On-farm water storage;
4. Agricultural ditch maintenance;
5. Secondary road access;
6. Agricultural equipment inventory; and
7. Debris and vegetation management.

The following information is provided for each of the five strategies:

- Description of the problem and the solution;
- Overview of specific challenges;
- A table outlining possible next steps and partners; and
- Resources and/or successful examples (where possible).

5.1. Livestock Evacuation Plan

Strategy Overview

Problem: There is currently no community-level livestock evacuation plan in place for the Cowichan region. Additionally, none of the producers who were approached during this pilot project had an individual farm-level plan for evacuating or temporarily moving their livestock. In the event of a wildfire, flood, or prolonged power outage, livestock evacuation will be necessary for most farms to minimize animal losses, maximize animal health, and ensure a quicker return to normal farm operations once the extreme event has passed.

Solution: Livestock evacuation plans, both at the farm level and the community level, are recommended for the Cowichan region. Livestock evacuation plans can include on-farm strategies such as identifying higher ground for animals during a flood or away from forested areas in case of wildfire, and having backup feed and milking options. Depending on the location and scale of the weather event, a coordinated community approach may be required, particularly for dairy animals. Livestock protection is an integral part of emergency planning and local government is required by legislation to assist in the preparedness, response, and recovery from emergencies.

Specific Challenges

The *Emergency Program Act*³² provides powers to local governments when a *Declaration of Local Emergency* is made. One of these powers includes managing livestock and animals. While the BC Ministry of Agriculture provides advice to farmers on the protection of crops and livestock and provides support in the coordination of the emergency relocation during an emergency, it is not responsible for developing livestock evacuation plans on a regional basis. Furthermore, the province provides a minimal amount of reimbursement to producers for costs associated with animal relocation in the event of flooding.³³ Therefore it is in the best interest of producers to have an evacuation plan in place.

A well-planned community livestock evacuation strategy requires logistical considerations such as identifying locations to move animals, inventory of regional livestock, locating haulers and trailers to move animals, and re-housing animals after the emergency is over. Challenges include identifying a lead agency, funding the planning activities and keeping the plan up-to-date as local operations change over time. It is important to note that evacuation may not be a plausible solution for some operations (e.g.: poultry). In these cases, alternative actions (in the case of extreme events) must also be determined and planned and communicated ahead of time.

Table 5. Livestock Evacuation Planning

Action	Steps	Partners
Farm level livestock evacuation pilot project	<ul style="list-style-type: none"> Identify volunteer producers (5-10). Evaluate farm risks. Develop farm-specific plans. Communicate results to the farming community. 	Producers CVRD CAI
Template documents for livestock evacuation	<ul style="list-style-type: none"> Analyze and summarize results from the pilot project. Create template documents. Distribute and communicate to the wider community. 	Producers CVRD CAI
Dairy sector evacuation plan for Cowichan	<ul style="list-style-type: none"> Inventory local dairy sector. Interview dairy producers to determine risks and needs. Identify backup feeding and milking options regionally. Identify locations or farms for evacuation. Develop evacuation plan in consultation with the local dairy sector. 	Producers CVRD CAI Ministry of Agriculture
Livestock (non-dairy) evacuation plan for Cowichan	<ul style="list-style-type: none"> Inventory non-dairy livestock sector. Interview producers to determine risks and needs. Identify locations or farms for evacuation. Develop evacuation plan in consultation with local producers. 	Producers CVRD CAI Ministry of Agriculture

³² Emergency Program Act, [RSBC 1996] CHAPTER 111

³³ Provincial support for agri-businesses.

www.agf.gov.bc.ca/emergency/Evacuation/Provincial_Support_for_Agri_Businesses.pdf

Resources and/or Successful Examples

Regional District of Nanaimo (RDN) Livestock Evacuation Plan

An example of a community livestock evacuation plan exists just north of the CVRD in the Regional District of Nanaimo (RDN). The project was initiated by the RDN after the lack of a livestock evacuation plan was identified through the RDN's *Agricultural Area Plan* in 2012. RDN directors approved the *Emergency Livestock Evacuation Plan* in 2013. The plan lays out how and by whom animals will be evacuated in the case of a major emergency and where they will be taken. It was developed with input from both the Cedar and Coombs Farmers' Institutes. Four evacuation sites were deemed to be appropriate to shelter livestock during an emergency. These include the Vancouver Island Exhibition Grounds on Bowen Road in Nanaimo, the Coombs Rodeo grounds on Alberni Highway, the Coombs fairgrounds on Ford Road and the Arbutus Meadows Equestrian Center on Island Highway.

Note: This type of approach—centralized evacuation locations—will not be suitable for all producers and livestock production systems. However, it may be a valuable contribution to preparedness for some producers.

Emergency Planning Workbook for BC Dairy Producers

www.agf.gov.bc.ca/emergency/Evacuation/Dairy_Emergency_Management_Guide.pdf

Emergency Management Guide for BC Beef Producers

www.agf.gov.bc.ca/emergency/Evacuation/Beef_Emergency_Management_Guide.pdf

BC Ministry of Agriculture Livestock Evacuation: main webpage with links to resources:

www.agf.gov.bc.ca/emergency/Evacuation/Evacuation.htm

BC Ministry of Agriculture: Planning for Livestock Evacuations Tipsheet (2012)

www.agf.gov.bc.ca/emergency/Flood/tips/AGRITipsheet_PlanningForLivestockEvacuationsFINAL.pdf

5.2. Communication of Drought Risk

Strategy Overview

Problem: When dry conditions arise many producers are acutely aware of immediate impacts on their farms but less aware of the cumulative effects regionally and most importantly, to agricultural water sources. Drought levels are determined regionally through the *BC Drought Response Plan*³⁴. Being aware of regional drought levels can help producers to prepare further in advance for seasonal impacts to water supply, as well as to consider broader trends and changes in water management decisions. Currently, drought levels are communicated to Cowichan producers through an e-newsletter distributed by the Ministry of Agriculture regional agrologist in the Cowichan and a notice is posted on the BC Government newsroom website.

Solution: Significantly improving the messaging regarding drought levels to the agricultural community so that producers are more quickly and easily made aware of the state of drought conditions.

³⁴ Government of British Columbia. (2010). British Columbia Drought Response Plan. Retrieved March 23, 2015: http://www.livingwatersmart.ca/drought/docs/2010/bc_drought_response_plan_june-2010.pdf

Specific Challenges

The Southern portion of Vancouver Island experienced Level 3 drought conditions, which were nearly raised to Level 4, in 2014. Level 4 would have required voluntarily reduction of water use, water use restrictions and regulation of water use. However, many producers involved in this pilot project were neither aware of the drought level status nor aware of the *Drought Response Plan*. There is therefore a gap between data being collected by government agencies and effective mechanisms for sharing this information directly with producers. There is a desire to organize a better communication system for this information. Local authorities are usually responsible for communicating drought levels to members of the public.

Table 6. Communicating drought risk

Action	Steps	Partners
Identify best forms of communications for producers	<ul style="list-style-type: none"> Interview key producer stakeholders to determine the best method of letting producers know about drought levels during summer months. 	CVRD Ministry of Agriculture
Partner with other stakeholders in the region and identify potential communications tools	<ul style="list-style-type: none"> Compile a list of agencies and organizations who could assist with drought communication. Develop a range of communication responsibilities. Identify the best form of communication to focus resources on. Consider adding Agricultural Properties as a subgroup within the CVRD's Emergency Notification System as an additional form of communication 	CVRD CAI Ministry of Agriculture Cowichan Watershed Board
Create a trial period with the new form of communication and test it's effectiveness.	<ul style="list-style-type: none"> Test the agricultural feature of the Emergency Notification System. Create a survey or other evaluation method at the end of the trial period to determine the effectiveness of the new communications method. 	Producers CVRD Ministry of Agriculture

Resources and/or Successful Examples

Example: Drought in the Nicola Watershed

In 2010, the Nicola Watershed Community Round Table (NWCRT) received funding to develop a communication plan for drought. The plan was developed in consultation with local government, the provincial government, water purveyors, the Nicola Stockbreeder's Association, and residents. Partners include the Province of British Columbia, the Nicola Stockbreeders' Association, Miller's Sunshine Valley Estates Society, the City of Merritt and the Nicola Watershed Community Round Table. www.thinksalmon.com/reports/FSWP_10_40_DroughtResponseBooklet.pdf

BC Drought Response Plan: www.livingwatersmart.ca/drought/docs/2010/bc_drought_response_plan_june-2010.pdf

Drought level notices – Province of BC: www.livingwatersmart.ca/drought/

BC Ministry of Agriculture Drought Management Page: www.agf.gov.bc.ca/emergency/Drought/Drought.htm

CVRD Emergency Alert System (provides opportunity to sign up for notices): www.cvrld.bc.ca/index.aspx?nid=768

5.3 On-Farm Water Storage

Strategy Overview

Problem: Periods of dry hot weather and drought are expected to increase with climate change. This will result in less water availability for irrigation and livestock in the summer. While some farms may be more at risk than others (depending on water source), the opportunity to create on-farm water storage was seen as a desirable strategy by most of the producers that were engaged in this pilot project. However, few producers have water storage on their farms.

Solution: During times when local water resources are inadequate to meet farm needs, a well-planned water storage area can help farms through emergency situations. Water storage for irrigation requires a large-scale storage, but a range of water uses – particularly in emergencies – can be served through more modest storage. Storage is intended to capture and store water that would otherwise be lost to runoff or in-stream flow.³⁵ Storage can include a range of infrastructure types including dugouts, dams and reservoirs. Likely the most common agricultural water storage on Vancouver Island is through relatively small-scale dugouts.

Specific Challenges

In addition to the main challenge of capital costs required to build the storage, producers have encountered a complicated regulatory and administrative environment surrounding their development. If the dugout is storing water that is diverted from a watercourse a licence is required. To legally impound water for later use also requires a water storage licence and a water use licence. If the structure is quite large, an engineered design, done by a consulting engineer, will likely be required. This application process and surrounding regulatory environment can be difficult to navigate for many producers. Oftentimes several levels of government must be involved and communication lines are not always open between agencies. A partial list of Provincial Acts and Regulations that apply include³⁶:

- *Water Act*; *Water Regulation*;³⁷
- *Fish Protection Act*, *Sensitive Streams and Licensing Regulation*;³⁸ and
- *Water Act*, *Dam Safety Regulation*.³⁹

Potential steps involved in water storage development on a farm include:

- An estimate of the total annual water demand for the farm;
- An inventory of existing water sources;
- A discussion of water needs (gaps in water demand vs. water access) by professional engineers and/or hydrologists;
- Professional drawings/schematics of the water storage plan;
- A discussion with the CVRD's Water Management Division regarding applicable local policies and regulations regarding the development of dams and dugouts;

³⁵ Dobb, A. BC Farm Practices & Climate Change Adaptation: Water Storage. P.1. Retrieved on March 23, 2015 from: <http://www.bcagclimateaction.ca/wp/wp-content/media/FarmPractices-WaterStorage.pdf>

³⁶ Dobb, A. BC Farm Practices & Climate Change Adaptation: Water Storage. P.12. Retrieved on March 23, 2015 from: <http://www.bcagclimateaction.ca/wp/wp-content/media/FarmPractices-WaterStorage.pdf>

³⁷ *Water Regulation*, 1988, B.C. Reg. 204/88.

³⁸ *Sensitive Streams Designation and Licensing Regulation*, B.C. Reg. 89/2000.

³⁹ *British Columbia Dam Safety Regulation*, B.C. Reg. 163/2011.

- An application for a water licence through the BC Ministry of Environment (in some regions, dugouts do not need to be licensed if the water stored is collected from on-farm runoff such as rainwater. However, if the dugout stores water coming from a watercourse, a water licence for storage and use is required); and
- There may be a referral to the Department of Fisheries and Oceans if the water storage is connected to fish habitat.

Although each water storage development is different and every application is viewed on a case-by-case basis, Cowichan producers who have successfully navigated the administrative environment for water storage have valuable knowledge and experiences to share with others.

Table 7. On-farm water storage

Action	Steps	Partners
Work with producers who already have storage to support knowledge transfer	<ul style="list-style-type: none"> • Communicate local on-farm water storage success stories with the greater Cowichan farming community. 	CAI CVRD
Short document on water storage steps for farmers	<ul style="list-style-type: none"> • Create a short document of resources listing specific steps, timing, and contacts for producers wishing to create on-farm water storage. Some resources already exist and may simply require consolidation, updating and/or promotion. • Distribute the document to the farming community. 	CAI CVRD Ministry of Agriculture
A field day and/or workshop of successful local water storage projects	<ul style="list-style-type: none"> • Determine if those with on-farm water storage would be willing to have others tour their project. • Organize a day or half-day field trip of 2 to 3 farms. • Distribute contact information to all producers in case some are unable to attend the tour but would like to talk to those involved in the case studies. 	Producers CVRD Ministry of Agriculture CAI Cowichan Watershed Board

Resources and/or Successful Examples

BC Agriculture and Food Climate Action Initiative – BC Farm Practices and Climate Change Adaptation: Water Storage (2013):

www.bcagclimateaction.ca/wp/wp-content/media/FarmPractices-WaterStorage.pdf

BC Farm Water Dugouts Guidebook (2013):

www.agf.gov.bc.ca/resmgmt/publist/500Series/510400-1_British_Columbia_Farm_Water_Dugouts.pdf

Watershed Stewardship: A Guide for Agriculture: www.dfo-mpo.gc.ca/Library/216753.pdf

Water Licence Application: www.env.gov.bc.ca/wsd/water_rights/licence_application/

5.4. Agricultural Ditch Maintenance

Strategy Overview

Problem: Maintenance of ditches is an important element of functioning agricultural drainage systems. Most private agricultural drainage also links into broader systems to move water away from the farms. The condition of both farm and off-farm ditches and waterways can obstruct drainage; excess growth of weeds and vegetation, debris, silt accumulations, and beaver dams can all interfere with farm drainage infrastructure.

Solution: Ditch and watercourse maintenance can reduce the risk of debris and vegetation clogging ditches and drains and help to ensure proper water flow while reducing the risk of flooding. Cleaning ditches can also improve water flow to irrigation intakes.

Specific Challenges

Farmers often require approvals to clear ditches exist on, or cross through their farm property (and in addition these ditches are frequently connected to broader systems that may not be functioning optimally). The administrative process required (permits and applications) to maintain vegetation within a ditch can be quite time consuming and complicated. Depending on the type of “agricultural watercourse” in question the process can be more, or less, complex. This complexity is illustrated through the Environmental Farm Plan Drainage Management Guide,⁴⁰ which includes 20 unique fact sheets outlining requirements and processes for drainage works.

The Ministry of Agriculture *Factsheet for Constructed Ditches* outlines different maintenance requirements for dry ditches or wet ditches.⁴¹ The *Factsheet for Channelized or Natural Stream Maintenance*⁴² provides best management practices that should be followed when doing work in and about a stream and notes that contact with DFO is required for most, but not all, works in and around channelized and natural streams. Restriction periods are also outlined for work within a stream or ditch. On Vancouver Island, most work must be completed within the summer months in order to minimize impacts to fish and wildlife. Unfortunately this often coincides with the busiest production times for farmers.

There may be a role at the local or provincial government level to assist farmers in navigating the regulations to ensure that the ditch clearing can be completed in a timely, regular, on-going, and environmentally sound manner. For example, a local government could apply for a water license to undertake a regular stream maintenance program. The water license would require the preparation of a notification before work could proceed.

⁴⁰ The Ministry of Agriculture. Drainage Management Guide. Available at: http://www.al.gov.bc.ca/resmgmt/EnviroFarmPlanning/EFP_Drainage_Mgmt_Guide/Drainage_Mgmt_Guide_toc.htm

⁴¹ The Ministry of Agriculture. (2005). *Factsheet for Constructed Ditches*. Retrieved on March 23, 2015 from <http://www.al.gov.bc.ca/resmgmt/publist/500Series/543100-1.pdf>

⁴² The Ministry of Agriculture. (2005). *Factsheet for Channelized or Natural Stream Maintenance*. Retrieved on March 23, 2015 from <http://www.al.gov.bc.ca/resmgmt/publist/500Series/543000-1.pdf>

Table 8. Agricultural ditch maintenance

Action	Steps	Partners
Identify, update, and distribute useful and available information to producers.	<ul style="list-style-type: none"> Identify existing resources and update them as required. Distribute the resources to the farming community. 	CAI CVRD Ministry of Agriculture MoE
Identify farming areas that are high priority for ditch maintenance.	<ul style="list-style-type: none"> Use existing mapping resources to determine which farm properties are most at risk of runoff and flooding and therefore may require regular ditch maintenance. Provide outreach to these producers by sharing resources and inviting them to participate in a knowledge-sharing event. 	CVRD Ministry of Agriculture
Tour successful ditch clearing projects for information transfer and host a meeting to discuss challenges and solutions.	<ul style="list-style-type: none"> Identify producers who have successfully navigated the approval and/or notifications process to determine if they would be willing to have others tour their farm. Organize a day or half-day tour of 2 to 3 farms. Distribute contact information to all producers in case some are unable to attend the tour but would like to talk to those involved in the case studies. 	Producers CVRD Ministry of Agriculture

Resources and/or Successful Examples

Example: Langley Environmental Partners Society (LEPS)

The Langley Environmental Partners Society (LEPS) Agricultural Stewardship program aims to work with local farmers and landowners to ensure that the integrity of agricultural practices are maintained while minimizing the impact of agriculture on Langley's streams and wetlands as well as fish and wildlife. LEPS Watershed Coordinators assist groups and landowners by providing training, technical support, obtaining permits, liaising with government agencies, and securing project funding. In 2011, LEPS worked with more than 100 agricultural property owners within the Bertrand Creek watershed as part of a larger restoration project. The work included assistance with invasive plant removal and ditch clearing. LEPS is a non-profit society that is provided with in-kind funding (office space) by the Township of Langley.

Approvals and Notifications for Changes In and About a Stream:

www.env.gov.bc.ca/wsd/water_rights/licence_application/section9/index.html

Watershed Stewardship: A Guide for Agriculture: www.dfo-mpo.gc.ca/Library/216753.pdf

BC Environmental Farm Plan Drainage Management Guide

www.al.gov.bc.ca/resmgmt/EnviroFarmPlanning/EFP_Drainage_Mgmt_Guide/Drainage_Mgmt_Guide_toc.htm

BC Agricultural Drainage Manual, published by the BC Ministry of Agriculture:

www.agf.gov.bc.ca/resmgmt/publist/500Series/525500-1.pdf

BC Ministry of Agriculture’s Agricultural Building Setbacks from Watercourses in Farming Areas – factsheet.

www.al.gov.bc.ca/resmgmt/publist/800Series/823400-1_Agriculture_Building_Setback_Factsheet.pdf

5.5 Secondary Road Access (Egress)

Strategy Overview

Problem: Secondary road access (egress) is important for agricultural properties in case evacuation or emergency vehicle access is required but the main entry point is blocked. Sometimes access can be made through a neighbouring property or laneway. However, many farms only have one main entry point for vehicles.

Solution: Constructing a second driveway or road can allow for a secondary road access to a property in case of emergency. Alternatively, connecting to a neighbouring property or laneway may be possible. If large agricultural equipment is used to access fields and barns with the driveway, then an agricultural driveway is required.

Specific Challenges

According to the BC Ministry of Transportation and Infrastructure (MoTI), a permit to construct any driveway or other highway access is required on numbered routes and controlled access highways. Agricultural driveways also require a permit for construction. Construction of a secondary access point will be an expensive endeavour for many producers.

Table 9. Secondary road access

Action	Steps	Partners
Provide property mapping support to producers	<ul style="list-style-type: none"> Print property maps for farmers who request assistance. Assist farmers in identifying potential secondary access sites. 	CVRD
Determine funding needs	<ul style="list-style-type: none"> Research the availability (if any) of funding opportunities for landowners wishing to create a secondary road. Consider creating funding opportunities if none exist. 	CVRD Ministry of Agriculture MoTI
Highlight best practices in secondary road access	<ul style="list-style-type: none"> Discuss innovative solutions to secondary road access with the farming community (use of neighbouring properties, laneways, etc.) that help to reduce costs of road construction. Communicate examples of best practices to the farming community through an event, newsletter or short document. 	Producers CVRD Ministry of Agriculture

Resources and/or Successful Examples

Residential Driveway Information Guide in BC

www.th.gov.bc.ca/Development_Approvals/driveways.htm

Newfoundland's Agriculture Access Road program (example of provincial funding)

www.nr.gov.nl.ca/nr/agrifoods/land_resources/land_use/agric_prog.html

5.6 Agricultural Equipment Inventory

Strategy Overview

Problem: During extreme weather events such as flooding, winter storms, or wildfires, heavy equipment may be required to move debris and rocks, clear downed trees, or dig trenches around buildings. This equipment may be expensive to own and/or require skills to operate. Therefore, not every producer will have ready access to this type of machinery when needed.

Solution: An inventory of existing equipment along with names of owners/operators could assist producers in accessing machinery during times of emergency. This collaborative approach can be seen in relation to other aspects of farming (such as co-operative use of harvesting equipment).

Specific Challenges

According to producers, the use of specialized equipment during and after an extreme event can significantly reduce the amount of losses to both the business and on-farm infrastructure. However, agricultural operations are not necessarily given priority by authorities or contractors who are responding to requests across the region. An inventory of equipment owned and operated by producers will help to create a priority response for agricultural operators.

Table 10. Agricultural Equipment Inventory

Action	Steps	Partners
Identify operators with specialized equipment	<ul style="list-style-type: none">Some producers have additional businesses in tree clearing, gravel extraction, or similar, requiring large equipment. These producers could be approached and asked if they would be willing to be part of a response plan for assisting other producers in the event of extreme weather.	CVRD Ministry of Agriculture
Create a list of equipment and owners within the agricultural community	<ul style="list-style-type: none">Compile a list of producers with specialized equipment along with up-to-date contact information.	CVRD Ministry of Agriculture
Distribute the information within the agricultural community	<ul style="list-style-type: none">Create a document to be distributed to the farming community outlining available equipment within the region and associated contact information.Consider hosting a meeting or workshop to present the inventory results to the agricultural community.	CVRD Ministry of Agriculture

Resources and/or Successful Examples

Farm Machinery Arrangements in Saskatchewan

www.agriculture.gov.sk.ca/Default.aspx?DN=8b44c759-0e8e-4780-b70e-40014b40d06a

Santa Barbara Heavy Equipment Pool

www.invers.com/EquipmentPooling/CaseStudy_CityOfSantaBarbara_HeavyEquipment.pdf

Forming a Community Tool Co-op

www.motherearthnews.com/nature-and-environment/forming-community-tool-co-op-zmaz04amzsel.aspx

5.7 Debris and Vegetation Management

Strategy Overview

Problem: Neglected and/or abandoned properties within agricultural areas can become a breeding ground for weeds, invasive species, and general overgrowth of vegetation. This can lead to an increased risk of fires spreading to productive farming areas during wildfires.

Solution: Proper and regular maintenance of debris and vegetation on fields and along fence lines is required to keep fire risk minimized.

Specific Challenges

It can be difficult for farmers to communicate concerns regarding overgrowth of vegetation due to a lack of access to landowners, or in some cases because the landowners themselves are not concerned with the wildfire risk. Opportunities to report landowners who are not taking responsibility for managing debris and vegetation are few and may or may not result in action being taken.

Table 11. Debris and vegetation management

Action	Steps	Partners
Identify properties with problematic amounts of debris and/or vegetation that is not being maintained.	<ul style="list-style-type: none"> Ask producers to report specific properties. Use Agricultural Land Use inventory to assist in the identification of vacant ALR properties. Partnering with agencies such as BC Hydro or CN Rail may be helpful. 	CVRD BC Hydro CN Rail Farmers
Communicate with landowners of the problematic properties	<ul style="list-style-type: none"> Write and submit a letter to all landowners of pre-identified properties with information explaining the need to reduce vegetation and associated biomass. Provide phone numbers of organizations, contractors, or businesses that can assist in clearing debris and maintaining vegetation 	CVRD Ministry of Agriculture
Follow up and consider other forms of action if necessary	<ul style="list-style-type: none"> Visit specific properties several times over the summer to see if action is being taken to minimize fire risk. Meet with stakeholders from Fire Halls, MFLRNO, or other as necessary to discuss other forms of action (based on bylaws and regulations) if necessary. 	CVRD Ministry of Agriculture MFLRNO Fire halls

Resources and/or Successful Examples

Noxious Weed Control Board, Whatcom County, Washington State

www.co.whatcom.wa.us/publicworks/weeds/board.jsp

Weed and Brush Control, Beaver County, Alberta

www.beaver.ab.ca/departments/agricultural-services/weed-and-brush-control

6. Conclusion

As we know from research⁴³ and the outreach and workshops held as part of this project, farmers are increasingly seeking guidance on how to plan and adapt for climate change impacts. The CVRD, CAI, and Cowichan producers are now in a position to collaborate and take meaningful action in this regard. Prioritized next steps from this report may be implemented with the assistance of the [Cowichan Adaptation Strategies](#) implementation funding available through the *Growing Forward 2* funded Regional Agriculture Enhancement Program. The adaptation actions outlined in this report are among those that will help to maintain a productive farming community in the Cowichan region.

Issues such as livestock evacuation, on-farm water management, the communication of drought risk, and agricultural ditch maintenance are particularly relevant for Cowichan producers. Leadership and assistance from various levels of government will help producers to successfully navigate administrative and funding challenges that are barriers to action, both at the farm and community levels. In order for the Cowichan region to be fully prepared to reduce the impacts of extreme weather events on the agricultural sector, continued government, producer and community effort and coordination is needed to implement the actions identified in this report.

⁴³ Wiles, E. (2012). Farmers' perception of climate change and climate solutions, Global Sustainability Institute, Anglia Ruskin University Briefing Note.1, Anglia Ruskin University: Cambridge UK.