

Landscape Level Approaches to Mitigate Flood Impacts for Farms & Ranches

Supplement to the Farm Flood Readiness Toolkit

This snapshot provides an overview of flood risk and resources specific to **Landscape Level Approaches to Mitigate Flood Impacts for Farms & Ranches**. Visit the [Climate Change Adaptation Program](#) website to download the complete [Farm Flood Readiness Toolkit](#).

Landscape level practices are an important part of a whole-farm approach to reducing flood risk. This handout provides an introductory overview of 5 landscape-level practices and provides links to more detailed information on each of these practices. This handout complements the [Farm Flood Readiness Toolkit](#), which is primarily focused on protecting physical farm assets and infrastructure. The Toolkit also covers broader emergency preparedness, emergency communications and insurance options. The Toolkit does not discuss landscape level approaches to mitigate flood damage to extensive areas in crops or pasture.

The approaches below can reduce the severity of flooding impacts, but farmers are also frequently subject to risk created from land management decisions and land uses upstream and around

them. Land uses, development patterns and industrial activity beyond the farm gate, in the same watershed, impact infiltration of flood waters ultimately affecting runoff, flood depth, speed of water and the duration of time flood waters will remain on the land base. If the practices in this handout were collectively applied on large properties or applied across the agricultural landscape on numerous smaller properties, flood impacts within the wider watershed could be reduced.

Five practices/approaches are discussed at a general level in this handout and links and resources are included for further information. The 5 practices are Protective Berms, Modifying Topography, Soil Cover, Agricultural Drainage and Removing Land from Production.

1.0 Protective Berms

Definition

A berm is a flat or raised strip of land, and in the flooding context, is created to separate or protect an area. For the purposes of this handout, the type of berm discussed is on private property and is set back from watercourses and riparian zones (other types of berms are regulated, see below under Regulatory Considerations).

Application:

Berms can be useful for protecting certain farm assets from types of floods on individual properties. Since this type of berm would most often be constructed using earth, or natural materials, and likely without the help of an engineer, they may not stand up to high velocity flooding, flood depths above a certain height, or floods remaining on the landscape for a long time period.

These types of simple, earthen berms can protect assets for floods below the height of the berm that are not moving quickly enough, or on the landscape long enough, to erode the berm. There is good evidence and examples of earthen berms protecting farm assets during flooding.

Implementation Considerations:

- Berms must be constructed in advance of a flood.
- Berms require a moderate financial investment and time commitment to create.
- Usually, heavy machinery would be needed for construction.
- There are implications with respect to any water held back by the berm. Measures should be taken to deal with any floodwaters held back by the berm.¹

- Altering land topography can create issues for your land where waters are held back and/or for surrounding properties. The flood water that is pushed away from the asset at risk or individual property may worsen the flood conditions in neighbouring properties that do not have berms. On-farm strategies should align with regional management as a whole system approach.

Regulatory Considerations:

Depending on the length, height, and exact location of the berm, it may or may not be regulated by the Water Sustainability Act (WSA), and the Dam Safety Regulation (DSR). For the purposes of this handout, berms discussed are set back far enough from watercourses to not fall under the WSA, are not being used to store any water, and under the height where they would be regulated by the DSR (under 7.5 metres).² If you are interested in constructing a berm and are not sure if your work would trigger

either of these regulations you need to check with the Ministry of Forests. The Ministry of Forests is the regulatory body responsible for oversight of works within a stream as well as dam safety. If you are working within these contexts, FrontCounter BC staff can assist with the application process and using online systems and tools necessary.

There are also regulations with respect to bringing fill on agricultural land and with respect to agricultural land use. Use of fill on the Agricultural Land Reserve (ALR) land must be in accordance with the ALC Act and ALR Regulations.³

- (see Section 2: Soil Cover, or involve a registered professional to help answer questions about sinking or re-directing water held back).
- https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/water/water-supply-conservation/510100-1_farm_water_storage.pdf

Resources

Resource Description & Title	Link	Type
<p>How to Build a Homemade Levee</p> <p>This is a high level easy to use article on 6 steps how to build an earthen levee.</p>	https://www.popularmechanics.com/home/how-to/a6715/how-to-build-a-homemade-levee/	How to Article
<p>Selecting Appropriate Mitigation Measures for Floodprone Structures Chapter 5 Barriers:</p> <p>This is a manual for US officials developed by the Federal Emergency Management Agency (FEMA). It is a comprehensive guide to flood barriers, which is largely transferable to a Canadian context.</p>	https://www.fema.gov/sites/default/files/2020-08/fema_551.pdf	US Government Guide
<p>B.C. Ministry of Agriculture and Food: Water Supply FactSheet -Guidance on Farm Water Storage</p> <p>This sheet describes the types of farm water storage that do and do not require licenses. Useful for context if building a berm that would also store water .</p>	https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/water/water-supply-conservation/510100-1_farm_water_storage.pdf	BC Government Guidelines
<p>Government of B.C. Dam Safety Webpage</p> <p>This is the BC Government landing page containing guidelines on rules and regulations for dam safety.</p>	https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/dam-safety	BC Government Guidelines
<p>Activities designated as a permitted non-farm use: Dikes for flood control and irrigation in the ALR</p> <p>This policy is intended to assist in the interpretation of the Agricultural Land Commission Act.</p>	https://www.alc.gov.bc.ca/assets/alc/assets/legislation-and-regulation/policies/alc_policy_1-13_-_dikes_for_flood_control_and_irrigation.pdf	Policy Document

3. The Agricultural Land Commission (ALC) Act defines “fill” as any material brought on land in the ALR. Except where exempted by regulation, the placement of fill in the ALR is a non-farm use activity and is illegal without approval or authorization of the ALC. The exemptions provided in the ALC Regulations, however, allow filling where necessary for farm uses, and other permitted uses, provided that the filling activity does not (a) cause danger on or to adjacent land, structures or rights of way, or (b) foul, obstruct or impede the flow of any waterway. For ‘specified’ farm uses a notification process is additionally set out in the Regulations. Fill to raise the soil surface elevation to address on-farm soil drainage issues typically requires an application to the ALC.

2.0 Modifying Topography

Definition:

Modifications to farm topography can help to temporarily spread, sink or store excess water during periods of excessive moisture or flooding. In some contexts, these types of topographical modifications, including **swales, runoff ponds and keyline design practices**, are also subject to regulations.

Runoff ponds, swales, and keyline design are fairly simple to implement and are some of the oldest and most common stormwater control measures. A swale is a hollow, depression, or low area of land that carries water mainly during rainstorms or snow melts. Unlike a typical drainage ditch, a swale is perfectly level, meaning that the swale fills up like a bathtub and then afterward, the water slowly seeps into the soil.

Keyline design is a specific pattern of topographical sub-soiling used to better distribute water across a farm from wetter to drier areas. Keyline land management includes two components: the applied subsoiling design combined with a specialized type of plough.

Application:

Swales and run-off ponds can be applied to any type of farming system (as long as the farm topography permits), and would benefit from this design. The amount of water these elements can store or slow is dependent on their size, number, and location.

Keyline design can apply to crop or pasture lands and is focused on water distribution during rain events and emerged in a dry or semi-arid Australian context. Its applicability to flooding situations is limited. This design technique is appropriate for

excess moisture and small amounts of flooding. The primary goal and outcome of keyline design is better soil structure and increased soil fertility. Keyline design maximizes the use of water over the landscape; slowing the shedding of water from higher elevations which are typically drier and re-directing the amount of water which would gather in low lying lands.

Implementation considerations:

- Swales and run-off ponds both take small tracts of land out of production.
- In-depth knowledge of farm soils, topographical data, and expertise with these design techniques is needed to maximize effectiveness.
- These strategies would work better with some farm designs or production types than others.
- For keyline land management, most farmers using the technique also use other land improvement strategies such as organic soil amendments, liming, rotational grazing, perennial cropping, and no-till systems. It is difficult to quantify the impact of keyline management when used in isolation.

Regulatory Considerations:

Run-off ponds would be treated as water storage if they are of a certain size, or would hold above a certain volume of water, or are surrounded by a berm or dam of a certain height. See the Dam Safety Regulation and the Water Sustainability Act to clarify.

4. <https://bcclimatechangeadaptation.ca/wp-content/uploads/2022/Resources/FIO9-Keyline-Water-Management-CRD-2018-report.pdf>



Swale

Resources

Resource Description & Title	Link	Type
<p>Capital Regional District page on bioswales</p> <p>This page provides an overview, description and definitions of types of bioswales and their design as a part of green infrastructure for stormwater, wastewater and septic.</p>	https://www.crd.bc.ca/education/stormwater-wastewater-septic/green-stormwater-infrastructure/bioswales	Regional government information page
<p>How to Build a Bio-Swale (and Why You Should Want To!)</p> <p>This is a straightforward article outlining simple steps for building a bio-swale.</p>	https://modernfarmer.com/2015/11/how-to-build-bio-swale/	How to guide
<p>Before Permaculture: Keyline Planning and Cultivation</p> <p>This resource is an online article which provides an introduction of keyline planning and cultivation, its components, and how to implement it. The article includes useful diagrams.</p>	https://www.permaculturenews.org/2013/02/22/before-permaculture-keyline-planning-and-cultivation/	Description and how to
<p>Keyline Water Management: Field Research & Education in the Capital Region</p> <p>This report documents findings from a Soil Monitoring Program that measured the changes in water storage and soil quality after keyline plowing on pastures in multiple sites across the Capital Regional District.</p>	https://bcclimatechangeadaptation.ca/wp-content/uploads/2022/Resources/FI09-Keyline-Water-Management-CRD-2018-report.pdf	Research project findings
<p>Environmental Farm Plan Program ⁵:</p> <p>-Best Management Practice 1101 - Erosion Control and Riparian Habitat Structures from BMP Policy and Descriptions for CAP (2022-2023 Program).</p> <p>- Best Management Practice Section 05 Farmyard Runoff Control / Storm water Management: from Policy and Descriptions for CAP (2022-2023 Program). Practice 0501 - Upstream diversion around outdoor confined livestock areas or downstream protection of stewardship areas.</p>	https://iafbc.ca/wp-content/uploads/2022/04/BMP-List-with-BCAF-March-23-2022.pdf	<p>Link to EFP program page.</p> <p>Link to best management practice description</p>

5. A completed Environmental Farm Plan is required to apply for Best Management Practice funding and funding is not guaranteed.

3.0 Soil Cover, Soil Health & Species Selection

Definition:

Practices to reduce soil loss and erosion and to increase soil water holding capacity could also mitigate flooding impacts to farms and ranches. An exhaustive list of soil cover, soil management and species selection options are beyond the scope of this handout. To reduce soil loss and erosion, farmers and ranchers could consider: maintaining crop residues or managing to a certain stubble height in grazing areas, using cover crops, maintaining areas with perennial plant cover, selecting deep rooted species, and selecting species more tolerant of flooding (including the lack of oxygen and/or salinity in the soil). All of these

practices can reduce ponding and excess moisture in extreme rain events and may minimally reduce the impacts of flooding.

Overall soil health is an important aspect of the landscape's or farm's ability to store water. Healthy soil structure and more soil carbon allow soils to hold more water (keyline design described in section 2.0 is one practice of farm design and tilling style to optimize soil structure for this end goal). Hardpan soil is much more prone to ponding and flooding. A discussion of soil health is beyond the scope of this handout, but soil health is certainly an important component of overall farm water management.

Application:

The strategies and principles of soil cover, maintenance of soil health and considerations around species selection apply to all types of farms and ranches. These practices are unlikely to prevent flooding (other than minor site-specific flooding) but could mitigate flooding impacts. These practices are tied closely to overall water distribution around the landscape and to Strategy 2.0 “modifying topography”.

Implementation considerations:

- Not all crop types include any species or varieties that have increased tolerance to salinity or flooding.
- Even if species or variety may have some enhanced tolerance, this will still be quite time limited and can reach a threshold under extended flooding conditions.

- The tolerance and recovery of species will also be extremely dependant on conditions post-flooding. (For example, for coastal flooding with saltwater inundation, a certain amount of freshwater flushing will be needed after rain events. For non-coastal flooding, the time required for soils to dry out afterwards is directly related to the amount of rain following the first event, and this is an important influence on overall crop resilience).
- Practices such as utilizing cover crops or incorporating perennial crops in a typically annual system all have financial implications and may not be appropriate for all farms. The costs and benefits will need to be weighed with consideration.

Regulatory Considerations:

None

Resources

Resource Description & Title	Link	Type
<p>BC Organic Grower: Soil Health and Cover crops</p> <p>Discusses soils, soil health, overview of best management practices for soil health and cover crops.</p>	<p>https://bcorganicgrower.ca/2019/04/soil-health-cover-crops/</p>	Article
<p>Environmental Farm Plan Reference Guide -Chapter 8 Soils</p> <p>This chapter discusses soil management practices for protection of the environment. It contains introductory information on soil quality. It also contains information on environmental concerns, legislation and beneficial management practices related to soil management.</p>	<p>https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/environmental-farm-planning/efp-reference-guide/chapters/rg-chp8.pdf</p>	Program Guide
<p>Rangeland Seeding Manual: Precipitation and Objectives Filter</p> <p>Table 5.1 on page 112 is a species summary rating table including ability to withstand flood and control erosion.</p>	<p>https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/rangelands/bc_rl_seeding_manual_web_single_150dpi0904.pdf</p>	Table within a larger report
<p>Runoff, Drainage and Erosion Webinar</p> <p>A webinar focused on the BC Peace region.</p>	<p>https://bcclimatechangeadaptation.ca/resource-items/runoff-drainage-and-erosion-webinar/</p>	Webinar
<p>Fact Sheet – Soil, Water and Residue Management Tools</p> <p>A fact sheet focused on the BC Peace region. This fact sheet discusses equipment and tools for effectively managing or conserving soil water and residue.</p>	<p>https://bcclimatechangeadaptation.ca/wp-content/uploads/2022/Resources/PC08-RunoffDrainageErosion-2020-FactSheet4-ManagementTools.pdf</p>	Fact Sheet
<p>Environmental Farm Plan Program⁶:</p> <p>Best Management Practice Soils at Risk (cover Cropping) (BMP section #13 from BMP Policy and Descriptions for CAP (2022-2023 Program)</p>	<p>https://iafbc.ca/wp-content/uploads/2022/03/BMP-List-with-BCAF-March-23-2022.pdf</p> <p>https://iafbc.ca/environmental-farm-plan/#aboutBMP</p>	Best Management Practice Description

6 A completed Environmental Farm Plan is required to apply for Best Management Practice funding and funding is not guaranteed.

4.0 Removing portions of land from production

Definition:

Re-purposing land

Farmers and ranchers could consider the topography of their property and evaluate whether having a small area, larger area, or multiple areas, in agroforestry, tree cover or perennial set-aside might aid in slowing water. This acknowledges that certain areas are vulnerable to frequent flooding and may need to be removed from active food production and put into another function within the farm system.

Floodplain Farming

The concept of “floodplain farming” attempts to combine floodplains with farming. This approach allows tracts of farmland to be flooded to regenerate groundwater and even redistribute nutrients through silt. This is an ancient technique that is no longer practiced in the west. However, in some drought prone major agricultural areas like California, this technique is being demonstrated and tested.

Application:

While probably the most costly and complex to implement, the strategies in this section would have the biggest impact on preventing flooding and mitigating flood damage.

Re-purposing land

Land could be re-purposed as pollinator habitat, for wildfire mitigation, riparian restoration/health, and/or flood mitigation. Often an area dedicated to agroforestry or perennial plantings will serve more than one of these aforementioned functions simultaneously. This concept connects to the concept of Ecological Goods and Services (known as EG&S). EG&S attempts to quantify the economic benefits (goods and services) that come from ecosystems for performing one or more of the aforementioned functions (and others). There is a growing recognition of the role that EG&S provide and there is increasing interest and opportunities globally for farmers or ranchers to be remunerated for providing these services on their land.

Floodplain Farming

The applicability is limited because floodwaters often contain deleterious substances and toxins, and not just useful, nutrient rich, silt. It is also limited to certain types of crops.

Implementation considerations:

- Taking land out of production and/or establishing new functions for areas of the farm/ranch is costly and time consuming (i.e. costs of design, cost of perennials).
- Farmer and rancher interest in taking land out of production, or switching the function of portions of land may be low, as this is a major change to a farm.
- EG&S is still an emerging strategy with limited opportunities for B.C. farmers to be involved and financially compensated.



Restoration Work on Riparian Area

- In some parts of B.C. with high land costs (and other parts with ever increasing land values) removing any land for production at all is not cost effective for farmers and ranchers.
- Research and demonstration on re-vitalizing floodplain farming is preliminary and findings are not yet applicable to the B.C. context.

Regulatory Considerations:

Implementation of riparian restoration must follow the Water Sustainability Act regulations and will require assistance from a Qualified Professional (e.g. proper riparian restoration requires a Registered Professional Biologist or Professional Agrologist).

Resources

Resource Description & Title	Link	Type
<p>Farmland Riparian Interface Stewardship Program (FRISP) FRISP was designed to assist agricultural producers in their efforts to protect and enhance water quality, riparian vegetation, and fish habitat.</p>	<p>https://www.cattlemen.bc.ca/frisp.htm</p>	Program
<p>Improvement of Riparian areas This Government of B.C. landing page outlines practices for improvement of riparian areas, provides a series of links for riparian habitat restoration specifically, and a series of links for livestock watering in riparian areas.</p>	<p>https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/water/riparian-areas/improvement</p>	Government of B.C. landing page. Including redirects to more resources.
<p>Riparian Pasture Design Ministry of Agriculture and Food 4 page fact sheet on riparian pasture design covering information on size, ratio of riparian to upland, vegetation and practicality (fencing, access, time of use).</p>	<p>https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/water/riparian/649000-7_riparian_pasture_design.pdf</p>	Fact Sheet
<p>Environmental Farm Plan (EFP) The Environmental Farm Plan Program’s objective is to provide farm and ranch operators with the means to identify agri-environmental risks and opportunities. The EFP program and the associated Beneficial Management Practices (BMP) program provide eligible agri-food sector producers with access to consultants to assist in the completion of EFPs and support the application process to BMP funding..</p>	<p>https://iafbc.ca/environmental-farm-plan/</p>	Program
<p>Bank re-vegetation Ministry of Agriculture and Food 4 page fact sheet on bank revegetation for agricultural land. Includes: Objectives; Advantages; Disadvantages; Technical Considerations; Information on Plants, Staking, Seeding; and Fencing.</p>	<p>https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/water/drainage-management-guide/533440-1_bank_re-vegetation-drainage_guide_factsheet_no11.pdf</p>	Fact Sheet
<p>Riparian Management Field Workbook for Streams and Small Rivers This is a detailed 75 page workbook published in 2019. The main purpose of the Riparian Management Field Workbook is to assess the condition of riparian areas associated with watercourses on an agricultural property.</p>	<p>https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/environmental-farm-planning/riparian_management_field_workbook.pdf</p>	Workbook
<p>Riparian resources Government of B.C. landing page containing links to selected useful riparian-related organization and riparian resources grouped under headings for B.C., Canada, and international.</p>	<p>https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/water/riparian-areas/resources</p>	Government of B.C. landing page. Including redirects to more resources.

Resource Description & Title	Link	Type
<p>Selecting plants for agricultural riparian plantings</p> <p>Ministry of Agriculture and Food 12-page fact sheet on selecting plants for agricultural riparian plantings. Includes recommended riparian plant lists, descriptions, photos and tables organized by plant type.</p>	<p>https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/water/riparian/810210-4-selecting_plants_for_agric_riparian_plantings.pdf</p>	Fact Sheet
<p>Lands Near Water Riparian Restoration & Enhancement</p> <p>A 2013 guide to successfully implementing riparian stewardship projects.</p>	<p>http://stewardshipcentrebc.ca/PDF_docs/sar/LandsNearWater.pdf</p>	Guide
<p>Agricultural Waterways Drainage Maintenance and Stewardship</p> <p>This 42 -page guide published in 2018 was designed to provide landowners and managers with information they can use to conserve wildlife and species at risk while maintaining land drainage.</p>	<p>http://stewardshipcentrebc.ca/PDF_docs/sar/Agricultural%20Waterways%202018%20(Web).pdf</p>	Guide

5.0 Agricultural Drainage

Definition:

Agricultural drainage includes using surface ditches, subsurface permeable pipes, or both, to remove standing or excess water from agricultural lands. Waterlogged soils reduce workable days, this often occurs on certain soils during seeding and harvest season. Waterlogged soils can also lead to compacted soils if worked too soon after excess rain and can also cause stress to crops, because saturated soils don't provide sufficient aeration for crop root development. The roots of many crop species cannot tolerate excessively wet conditions for more than a couple of days.

Application:

Many soils have poor natural drainage. Even with baseline precipitation conditions, without artificial drainage, many areas would not be possible to farm as soils would remain waterlogged for several days after excess rain. This issue is exacerbated with increased frequency of extreme rain events and site-specific flooding. Agricultural drainage is only one component of a broader system to manage excess water at specific locations on the farm and needs to be implemented in combination with the other practices outlined. There is strong potential to combine a farm's drainage system with modifying topography, for example linking drainage systems into on-farm run-off ponds, or swales as part of a broader farm-based system. In many cases, agricultural drainage systems drain into public or

shared infrastructure, such as drainage ditches. In this case, the on-farm drainage is limited by the water conveyance capacity of the ditch system.



Poorly Draining Field

Implementation considerations:

- Farmers must make a significant financial investment when installing an agricultural drainage system.
- Higher value crops need to be grown to offset the drainage infrastructure costs.
- Effectiveness of agricultural drainage is constrained by the effectiveness and state of broader ditch infrastructure, including maintenance and flow, across a municipality or region.
- Subsurface drainage systems should be built to proper design standards. The drain tile spacings and depth must match with crop spacings and rooting depth, soil texture, and other field design considerations.
- Subsurface drainage systems require periodic and on-going maintenance in order to function properly.

Regulatory Considerations

Draining wetlands should be avoided. Wetlands are defined as a stream in the WSA and cannot be drained without a change approval for changes in and about a stream.

Resources

Resource Description & Title	Link	Type
<p>B.C. Agricultural Drainage Manual:</p> <p>This publication contains information on guidelines for agricultural drainage in British Columbia. The manual is intended as a general reference although specific drainage design criteria are included.</p>	https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/water/drainage/agricultural-drainage-manual	Manual
<p>B.C. Ministry of Agriculture and Food: Drainage Fact Sheet -Agricultural Drainage Criteria</p> <p>These criteria were developed to describe the level of drainage required to allow for good on-farm drainage. The criteria were used in projects under the Agricultural and Rural Development Subsidiary Agreement (ARDSA) that were intended to improve regional drainage and are commonly referred to as ARDSA criteria.</p>	https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/water/drainage/535100-2_agric_drainage_criteria.pdf	Fact Sheet
<p>Government of B.C. Drainage Management Guide:</p> <p>This guidebook provides information on how to develop and implement an Agricultural Drainage Management Plan. It includes 20 accompanying fact sheets.</p>	https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/water/drainage-management-guide/drainage_management_guide.pdf	Guidebook
<p>Webpage Evaluating On-Farm Drainage Management Practices in Delta</p> <p>These resources summarize the results of two years of applied research into the effectiveness of various drainage management practices in Delta, including modelling for increasing precipitation challenges into the future. The page links to a separate project report and 4 fact sheets.</p>	https://bcclimatechangeadaptation.ca/resource-items/evaluating-on-farm-drainage-management-practices-in-delta/	Program Landing page and 5 links to resources

Pasture Recovery Resources from Other Jurisdictions:

Information on pasture recovery was noted as a gap in the Farm Flood Readiness Toolkit and information on this was noted as a need for B.C. producers. The following table includes resources from other jurisdictions that are strong livestock producing regions and have experienced extensive flooding. The following content is not entirely transferable in terms of the specifics around species selection, topography, soils and geography, but many of the concepts and ideas would apply to pasture recovery in B.C.

Resource Description & Title	Link	Type
Reclaiming Flood-damaged Pastures and Forage Production University of Nebraska-Lincoln, Institute of Agriculture and Natural Resources	https://beef.unl.edu/beefwatch/reclaiming-flood-damaged-pastures-and-forage-production#:~:text=The%20major%20flooding%20impact%20on%20grass%20pastures%20may,likely%20have%20sediment%20deposits%20greater%20than%202%20inches.	Article with tables and checklist
Flood Recovery for Pastures Iowa State University Extension and Outreach, Small Farm Sustainability	https://www.extension.iastate.edu/smallfarms/flood-recovery-pastures	Newsletter Article
Pasture Recovery from Flooding Queensland Government, Australia	https://www.publications.qld.gov.au/ckan-publications-attachments-prod/resources/694a0b72-28e4-4723-9abe-38ecda57f13c/pasture-recovery-flooding.pdf?ETag=%2283814f694e71c8029888a08f1f458135%22	Fact Sheet
Pasture Recovery After a Coastal Flood New South Wales, Local Land Services	https://www.lls.nsw.gov.au/_data/assets/pdf_file/0009/1299168/Pasture-Recovery-after-a-Coast-Flood-2021-HUNTER.pdf	Fact Sheet
Five considerations before striking back against silt (New Zealand)	https://www.ravensdown.co.nz/expertise/five-considerations-before-striking-back-against-silt	Article
Recovering Flooded Forages University of Wisconsin-Madison, Team Forage Division of Extension	https://fyi.extension.wisc.edu/forage/recovering-flooded-forages/	Fact Sheet

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This is a supplement to the [Farm Flood Readiness Toolkit](#). It is current as of May 2022.