

RIPARIAN MANAGEMENT

COURSE WORKBOOK

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17507 Fort Road
Edmonton, Alberta, T5Y 6H3

Authors: Luke Wonneck and Noel St. Jean: Agroforestry and Woodlot Extension Society

Graphic Designer: Avenir Creative

Contributors: Norine Ambrose, Kelsey Spicer-Rowe, and Kerri O'Shaughnessy: Alberta Riparian Habitat Management Society (Cows and Fish)

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For more information, please contact the Agroforestry and Woodlot Extension Society:

Email: info@awes-ab.ca

Phone: (780) 643-6732

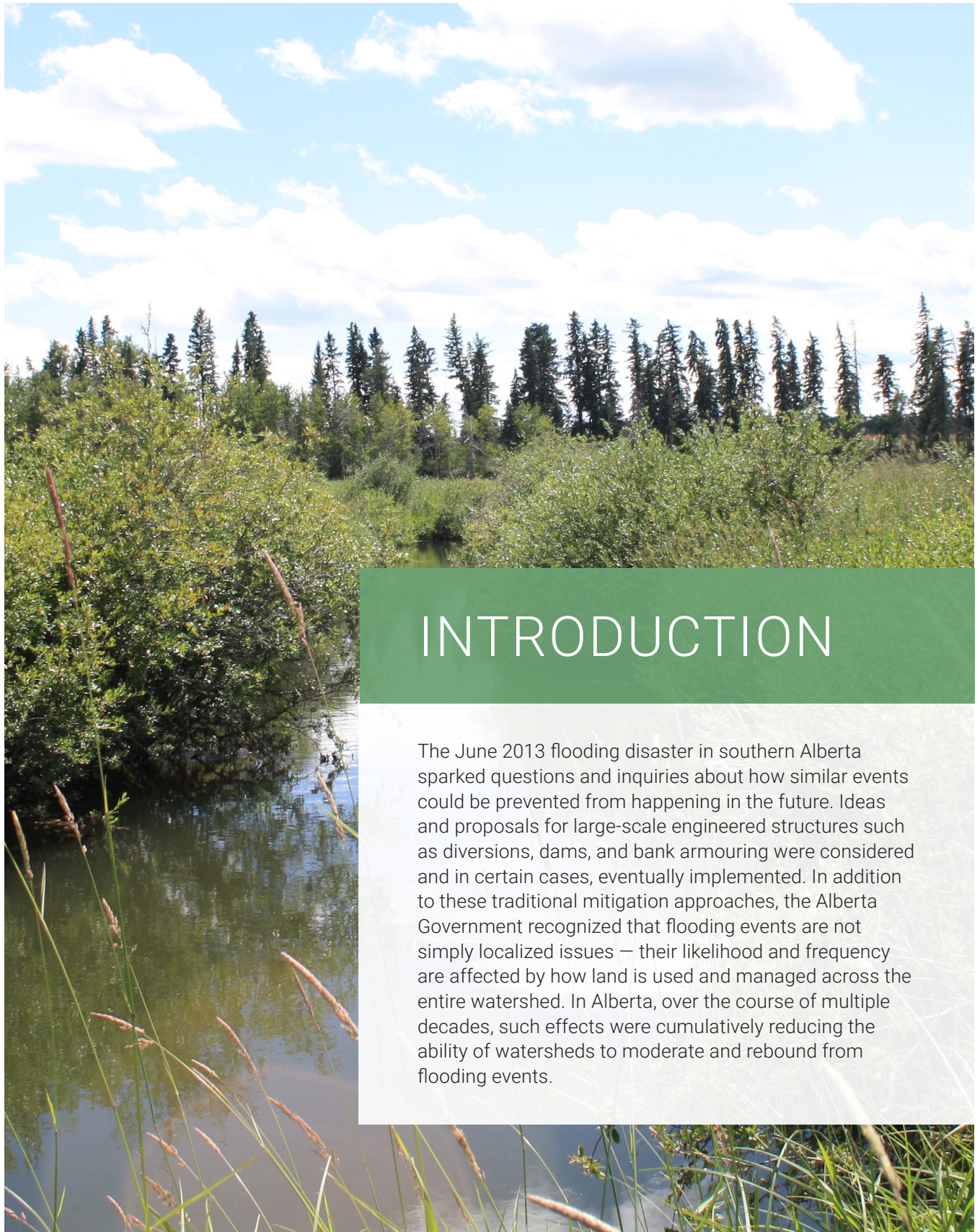
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INTRODUCTION

The June 2013 flooding disaster in southern Alberta sparked questions and inquiries about how similar events could be prevented from happening in the future. Ideas and proposals for large-scale engineered structures such as diversions, dams, and bank armoring were considered and in certain cases, eventually implemented. In addition to these traditional mitigation approaches, the Alberta Government recognized that flooding events are not simply localized issues — their likelihood and frequency are affected by how land is used and managed across the entire watershed. In Alberta, over the course of multiple decades, such effects were cumulatively reducing the ability of watersheds to moderate and rebound from flooding events.

In response, the Alberta Government introduced the Watershed Resiliency and Restoration Program (WRRP). The primary goal of WRRP is to improve natural watershed functions to build greater long-term resiliency to droughts and floods. This goal is achieved through a range of watershed mitigation approaches that are more upstream (both metaphorically and literally) from traditional measures, and include restoration, conservation, education and stewardship, and research and data.

By providing funding for this course, WRRP recognizes that riparian areas play a crucial role in watershed resiliency to flooding and droughts. Although they take up only 2-5% of the landscape, **healthy** riparian areas have a unique ability to act as a sponge – absorbing large amounts of water during flooding events, and gradually releasing it during lower water periods. Importantly, the health of a given riparian area comes down to how it is managed – how the various land-use activities within both riparian and upland areas are coordinated, arranged, and carried out; and what is done to these areas to ensure these activities can sustainably continue.

However, healthy riparian areas are not **only** of benefit to the greater watershed. These lush, productive lands are bursting with the potential to provide a range of values directly to landowners and their communities. This two-day course is designed to give you the reasons, skills, tools, and resources to start to realize this potential. **Its overarching goal is to help landowners manage their riparian areas in ways that maximize the environmental, social, and economic benefits to themselves, their community, and the greater watershed.** By the end of the two days, you can expect to leave with:

- A basic understanding of what riparian areas are, what they can do, and different strategies for managing them
- The beginnings of a management plan for your riparian area(s)
- Tools, skills, and resources to continue to develop and implement your management plan

This workbook is meant to support and complement course activities over the two days. It is divided into two parts.

Part 1 provides a brief outline of the key topics being covered, highlighting relevant references and resources where applicable.

Part 2 is organized as a series of steps and questions that guide participants through the management planning process. Additional resources – including supplemental materials and funding opportunities – are listed in the Appendices.

PART 1: COURSE OUTLINE

The following sections provide a brief overview of the key components being covered in this course, along with reference material to use if you wish to dig deeper. Note that these components may be taught in a different order than they are presented here.

1. Introduction to Riparian Areas and Riparian Health

In this component, you will learn about:

- What defines “riparian”
- Why riparian areas are important
- The core functions of “healthy” riparian areas
- Why riparian health is important to measure

SUPPLEMENTARY MATERIAL

Fitch, L., B. Adams, and K. O’Shaughnessy. 2003. *Caring for the Green Zone: Riparian Areas and Grazing Management*. Third Edition. Lethbridge, Alberta. Cows and Fish Program.

Fitch, L., and N. Ambrose. 2003. *Riparian Areas: A User’s Guide to Health*. Lethbridge, Alberta: Cows and Fish Program.

2. Goods and Services of Riparian Areas

In this component, you will learn about:

- What riparian goods and services are
- How to choose the right goods and services for your context and vision
- Design requirements for select goods and services

SUPPLEMENTARY MATERIAL

Table 1 on page 15 of AWES’ (2018) Manual for Riparian Forest Buffer Establishment in Alberta provides design recommendations for select goods and services.

Fitch, L., B. Adams, and K. O’Shaughnessy. 2003. *Caring for the Green Zone: Riparian Areas and Grazing Management*. Third Edition. Lethbridge, Alberta. Cows and Fish Program

Fitch, L., and N. Ambrose. 2003. *Riparian Areas: A User’s Guide to Health*. Lethbridge, Alberta: Cows and Fish Program.

3. Conducting a Riparian Health Assessment

In this component, you will be guided through the process of conducting a Riparian Health Assessment, as developed by Cows and Fish. Through this, you will learn:

- Basic skills in recognizing and evaluating key indicators of riparian health
- How to identify strengths and weaknesses of your riparian area

SUPPLEMENTARY MATERIAL

Ambrose, N., G. Ehlert, K. Spicer-Rowe. 2009. *Riparian Health Assessment for Lakes, Sloughs, and Wetlands - Field Workbook Second Edition*. Modified from Fitch, L., B. W. Adams, and G. Hale, 2001. *Riparian Health Assessment for Streams and Small Rivers - Field Workbook*. Lethbridge, Alberta: Cows and Fish program.

Fitch, L., B.W. Adams and G. Hale, 2009. *Riparian Health Assessment for Streams and Small Rivers - Field Workbook. Second Edition*. Lethbridge, Alberta: Cows and Fish Program.

Hale, G., N. Ambrose, A. Bogen, K. Spicer-Rowe, M. Uchikura, and E. Saunders. 2005. *A Field Guide to Common Riparian Plants of Alberta*. Lethbridge, AB: Cows and Fish Program.

4. Riparian Management Strategies

In this component, you will learn about:

- Different strategies for supporting and fostering riparian health and functions, which then provide a diversity of goods and services. These strategies include management of existing land-use activities (e.g. grazing, recreation, cropping, etc.), stimulating natural restoration, and planting.
- How to choose the right strategy or strategies for your context and vision

Note that engineering of bank, channel, or floodplain may sometimes be a necessary strategy to address severely eroding or slumping sites that pose significant environmental, social, or economic risk. However, engineering is beyond the scope of this course.

SUPPLEMENTARY MATERIAL PROVIDED IN APPENDIX A.

5. Developing a Management Plan

In this component, you will create a management plan using a five-step process known as “backcasting”. This management plan will include:

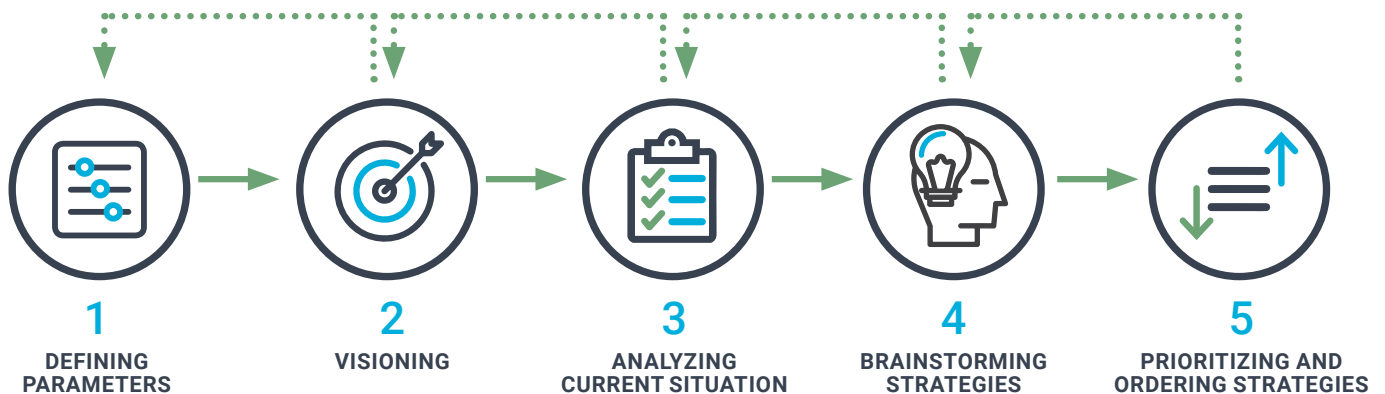
- A vision of your riparian area in the future
- Priority strategies for achieving this vision
- Action items for meeting each strategy

THIS PROCESS IS OUTLINED IN DETAIL IN THE FOLLOWING PAGES OF THIS WORKBOOK.

PART 2: DEVELOPING A MANAGEMENT PLAN

Part 2 takes you through the process of developing a management plan for your riparian area using a technique known as “backcasting”. Backcasting involves envisioning a future state and then working backwards to the present to determine what needs to be done to achieve the vision. This process allows for more creative solutions than forecasting, which involves predicting the future by extrapolating from the present.

Backcasting can be done in five steps:



The following sections include questions intended to guide you through each of these steps in turn.

STEP 1: Defining Parameters

Before anything else, it is first important to have a clear idea of where and when your management plan is for. Start by defining the boundary of your riparian area by outlining it on your map. You then have the option of adjusting this boundary to incorporate an area that is either smaller or larger than your ecological riparian boundary – whichever land-base you are most interested in influencing.

Include a descriptive title for your area of interest (e.g. “Southern bank of creek on home quarter” or the legal land location):

Next, choose a future date that you’d like to make your vision for. It could be 5, 10, or 20 years into the future – whatever is most appropriate to your context and needs. This is a tricky step, because it involves balancing how long you are willing to wait to achieve your vision with how long your site can physically get there. For this reason, you may need to adjust this date as your plan develops.

Visioning date (year): _____

STEP 2: Visioning

After parameters have been defined, the next step is to develop a vision. In the space provided below, write down what you'd like your riparian area to be and do by that date. You can also use the space given to draw a picture of your vision, if you are so inclined.

If it's helpful, consider answering one or more of the following sub-questions:

- What do you want your riparian area to provide you with?
- What do you want your riparian area to provide your land with?
- What do you want your riparian area to provide fish and wildlife with?
- What do you want your riparian area to provide your community with?
- What do you want your riparian area to provide your watershed with?

Vision

E.g. By the year _____, my riparian area will....

The table on the following page can help you plan out which activities you'd like to see happening in your riparian area in the year you've envisioned. Fill in different activities in the far left column, and then highlight the months that they will be occurring through the season. Activities might be ecological (e.g. bird nesting, queen bumblebees emerging, high water level, etc.), social (e.g. hunting, bird watching, birch sap harvesting, etc.), or economic (e.g. grazing, timber harvesting, saskatoon harvesting, etc.). You can total up the number of months each activity takes in the far right column, and the number of activities happening each month in the bottom row.

[illegible]

STEP 3: Analyzing Current Situation

Current situation analysis involves evaluating the current state that your riparian area is in to determine which aspects are bringing you closer to or further away from your vision. This helps you to identify priority areas for action, and resources to assist with reaching your vision.

A good place to start is to conduct a Riparian Health Assessment (or work with Cows and Fish to do one). Riparian Health Assessment is a tool to evaluate riparian health using a standardized set of questions. It can help to “tune your eyes” to how well your riparian area is functioning, and provide insight into its strengths and weaknesses.

To conduct a Riparian Health Assessment, make a field visit to your riparian area and work through the questions provided in Cows and Fish’s *Riparian Health Assessment Field Workbook*. Keep in mind that there are two different workbook versions – one for lotic systems (systems that involve moving water, such as creeks or rivers) and another for lentic systems (systems that involve still water, such as lakes or sloughs).

When you are finished, continue with the following questions:

1. How healthy is your riparian area currently?

- i. Healthy
- ii. Healthy but with problems
- iii. Unhealthy

2. What are some weaknesses of your riparian area that are preventing it from achieving your vision?

List all that you can think of in the box below. Include weaknesses you identified in the Riparian Health Assessment (e.g. lack of vegetation cover, high proportion of dead wood, invasive plants, etc.), and other weaknesses that are preventing it from providing specific goods and services in your vision (e.g. lack of fruit bearing species, lack of taller trees and shrubs, few deep rooted grass like plants to trap sediment, etc.). Remember to try and tie the weakness to the function or good/service in your vision.

3. In the box below, describe any human activity that has contributed to or is contributing to the weaknesses you indicated in the last question. Activities could include:

- Land-use activities at the site
- Dams, diversions, culverts, or artificial water inputs upstream of the site
- Land-use activities upland of the site

Try to be as specific as possible when describing activities. For example, rather than just stating a land-use activity, include information on the timing and duration of it and how you think it's contributing to the weakness. Keep in mind that the activity may be interacting with natural events such as drought or flooding to contribute to the weakness.

4. What are some strengths of your riparian area that are helping it to achieve your vision?

List all that you can think of in the box below. Include strengths you identified in the Riparian Health Assessment (e.g. extensive vegetation cover, few dead and dying woody plants, etc.), and other strengths that are helping it to provide specific goods and services in your vision (e.g. presence of fruit bearing species, taller trees and shrubs, deep rooted sedges to trap sediment, etc.). Remember to try and tie the strength to the function or good/service in your vision.

5. In the box below, describe any human activity that has contributed to or is contributing to the strengths you indicated in the last question. These could include:

- Good management practices at the site
- Good management practices upland of the site
- Previous restoration efforts

Try to be as specific as possible when describing activities, explaining how they are contributing to the strengths.

6. The strengths listed in Question 4 can be thought of as ecological assets that could help you to achieve your vision. In this final box, list any other assets you can think of that could be of assistance.

These may include available equipment, labour, or livestock, existing skills, or potential funding opportunities.

STEP 4:

Brainstorming Strategies

So far, you have identified where you want to get to and where you are at now. The next step is to connect the dots by brainstorming a range of possible strategies that could help you to achieve your vision. The goal here is to be as creative as possible and write down whatever comes to mind – later on we'll be more selective and prioritize certain strategies.

Fill out the tables on the following pages in a similar manner to the example table shown below. Start by writing down a strategy in the "strategy" row (second from bottom). Then, fill in the action items required to complete this strategy in chronological order, including expected costs, labour requirements, and completion dates. You can total each of these up in the strategy row to get estimates for the strategy as a whole.

Finally, fill out the bottom "Indicators of Failure" row with observable characteristics or signs that show that your strategy is not leading to a desired outcome that brings your riparian area closer to your vision. Although it sounds pessimistic, establishing such indicators may help you to consciously look out for things that contradict or expose limitations within your assumptions, which is often far more challenging to do than finding things that reaffirm them. Include your planned date(s) of measuring or monitoring the indicators.

As you complete your actions items, you will be able to fill in the actual costs, labour requirements, and completion dates (right-hand columns) and compare them to your expectations. This will help you to adjust your expectations when developing future strategies.

1 FILL IN FIRST

2 FILL IN SECOND

	DESCRIPTION	EXPECTATIONS			REALITY			NOTES
		COST (\$)	LABOUR	DATE COMPLETE	COST (\$)	LABOUR	DATE COMPLETE	
TIME ↓ ACTION ITEMS	Order 50 willow and 50 balsam poplar seedlings from nursery in Edmonton	\$200 (stock)	1 hour	Feb. 2018				
	Use farm backhoe to create 100 mounds to alleviate soil compaction in planting sites	\$20 (gas)	3 hours	May 2018				
	Pick up and transport seedlings from nursery in Edmonton	\$30 (gas)	3 hours	June 2018				
	Plant 100 seedlings	\$60 (spade)	2 hours	June 2018				
	Mulch seedlings with wood chips obtained for free from local arborist	\$10 (gas)	4 hours	June 2018				
STRATEGY ↓	Establish 2 rows of balsam poplar and willow seedlings at 2m spacing along the 100m stretch of the southern bank (first row at high water level, second row 2m above).	\$320	13 hours	June 2018				3 FILL IN THIRD
INDICATION OF FAILURE	50% of seedlings die in the first two years following planting	MONITORING DATE (S): May 2019 and 2020			RESULT:			

4 FILL IN FOURTH

	DESCRIPTION		EXPECTATIONS			REALITY			NOTES
			COST (\$)	LABOUR	DATE COMPLETE	COST (\$)	LABOUR	DATE COMPLETE	
TIME ↓	ACTION ITEMS								
	STRATEGY								
INDICATION OF FAILURE			MONITORING DATE (S):			RESULT:			

	DESCRIPTION		EXPECTATIONS			REALITY			NOTES
			COST (\$)	LABOUR	DATE COMPLETE	COST (\$)	LABOUR	DATE COMPLETE	
<div> <div>TIME</div> <div> <div>←</div> <div>↓</div> </div> </div>	ACTION ITEMS								
	STRATEGY								
INDICATION OF FAILURE			MONITORING DATE (S):			RESULT:			

	DESCRIPTION	EXPECTATIONS			REALITY			NOTES
		COST (\$)	LABOUR	DATE COMPLETE	COST (\$)	LABOUR	DATE COMPLETE	
<div> <div>TIME</div> <div> <div>←</div> <div>ACTION ITEMS</div> <div>STRATEGY</div> </div> </div>								
INDICATION OF FAILURE		MONITORING DATE (S):			RESULT:			

	DESCRIPTION		EXPECTATIONS			REALITY			NOTES
			COST (\$)	LABOUR	DATE COMPLETE	COST (\$)	LABOUR	DATE COMPLETE	
<div> <div>TIME</div> <div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> </div>	ACTION ITEMS								
	STRATEGY								
INDICATION OF FAILURE			MONITORING DATE (S):			RESULT:			

	DESCRIPTION		EXPECTATIONS			REALITY			NOTES
			COST (\$)	LABOUR	DATE COMPLETE	COST (\$)	LABOUR	DATE COMPLETE	
<div> <div>TIME</div> <div> <div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> <div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> </div> </div>	ACTION ITEMS								
	STRATEGY								
INDICATION OF FAILURE			MONITORING DATE (S):			RESULT:			

STEP 5: Prioritizing and Ordering Strategies

The final step is to decide which strategies are of highest priority, and then order your strategies into a coherent plan. Prioritize the “low-hanging fruit” strategies – those that move you the furthest towards your vision with these least effort and cost. Keep in mind that certain strategies may complement each other or fulfill multiple aspects of your vision. Others may be more mutually exclusive.

Complete the following table with your priority strategies described in chronological order and their expected costs, labour requirements, and completion dates; and then your vision description and associated cost and labour requirements (taken as the sum of the costs and labour requirements of the strategies) and its completion date. As you work through your plan in the coming months and years, you can fill in the other columns that indicate actual costs, labour requirements, and completion dates.

	DESCRIPTION	EXPECTATIONS			REALITY			NOTES
		COST (\$)	LABOUR	DATE COMPLETE	COST (\$)	LABOUR	DATE COMPLETE	
TIME ↓	STRATEGIES							
	VISION							



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CONCLUSION

Developing a management plan for an entire land-base – using similar techniques to the ones introduced in this course – is an excellent way to ensure that the various land-use activities occurring on it complement rather than conflict with each other.

Our goal with this course is to help you manage your riparian areas in ways that maximize the environmental, social, and economic benefits to yourself, your community, and the greater watershed. In completing the two days, we hope you have gained increased appreciation of riparian areas and land management planning; a draft management plan for your riparian area(s); and tools, skills and resources to help you continue to develop and implement it.

The latter of these three takeaways is the most important, since we recognize that management planning is an ongoing, iterative process that cannot be finalized in two days. In the coming months and years, you may find that implementation of some of its strategies opens up possibilities for other strategies, or even influences your vision.

The process may even inspire you to **expand the scope of your plan to include more upland areas**. After all, although riparian areas contain unique characteristics, they are ecologically, economically, and socially connected to the surrounding lands. Developing a management plan for an entire land-base – using similar techniques to the ones introduced in this course – is an excellent way to ensure that the various land-use activities occurring on it complement rather than conflict with each other. We encourage you to think broadly about the connected landscape, to most effectively manage upland and riparian areas.

Keeping your plan open and responsive to the needs of your land and yourself will help you through this process. The resources listed on the following pages might also be of assistance. If at any time you have further questions or are looking for technical advice or the latest information on funding opportunities, please do not hesitate to contact the Agroforestry and Woodlot Extension Society or Cows and Fish via the contact details given on the next page.

APPENDIX A: POSSIBLE MANAGEMENT STRATEGIES

Table 1. Possible strategies for managing riparian areas to achieve health and the provision of goods and services.

CATEGORY	STRATEGY EXAMPLES	SUPPLEMENTARY MATERIALS
Land-use activity management	Grazing management	Fitch, L., B.W. Adams, and K. O'Shaughnessy. 2003. <i>Caring for the Green Zone. Riparian Areas and Grazing Management – Third Edition</i> . Lethbridge, AB: Cows and Fish Program.
	Recreation management	The Alberta Environment and Parks webpage aep.alberta.ca/recreation-public-use/recreation-on-public-land/default.aspx provides information, recommendations, and regulations about recreation on public lands, including riparian areas
	Cropping management	<i>Crops, Creeks, and Sloughs: Managing Riparian Areas in and Around Cropland</i> . Lethbridge, AB: Cows and Fish Program
	Management of residential, commercial, and road development	Government of Alberta. <i>Stepping Back from the Water: A Beneficial Management Practices Guide for New Development Near Water Bodies in Alberta's Settled Region</i>
Stimulating natural regeneration	Control of undesired species	Refer to common riparian weeds and disturbance-caused species in: Hale, G., N. Ambrose, A. Bogen, K. Spicer-Rowe, M. Uchikura, and E. Saunders. 2005. <i>A Field Guide to Common Riparian Plants of Alberta</i> . Lethbridge, AB: Cows and Fish Program.
	Root pruning	<i>Root Pruning: A method to stimulate suckering for riparian forest regeneration</i> . Edmonton, AB: Agroforestry and Woodlot Extension Society.
	Coppicing	<i>Woodlot Management in the Aspen Parkland</i> . Edmonton, AB: Agroforestry and Woodlot Extension Society.
	Scarification	<i>Woodlot Management in the Aspen Parkland</i> . Edmonton, AB: Agroforestry and Woodlot Extension Society.
	Beaver management	Fitch, L. 2016. <i>Beaver: Our Watershed Partner</i> . Lethbridge, AB: Cows and Fish Program.

CATEGORY	STRATEGY EXAMPLES	SUPPLEMENTARY MATERIALS
Planting	Planting seedlings, stem cuttings, or seed	<ul style="list-style-type: none"> • Wonneck, L.A., S. Zeran, J. Renton, and K. Peterson. 2017. <i>Manual for Riparian Forest Buffer Establishment in Alberta</i>. Edmonton, AB: Agroforestry and Woodlot Extension Society. • <i>AWES Planting Assessment Worksheet</i>. Edmonton, AB: Agroforestry and Woodlot Extension Society. • The Alberta Native Plant Council provides an up-to-date list of native plant nurseries across the prairies. The list can be downloaded from their website, anpc.ab.ca/
Engineering	Bioengineering	<ul style="list-style-type: none"> • Polster, D.F. 2013. <i>Soil Bioengineering for Site Restoration</i>. Peace River, AB: Boreal Research Institute, NAIT. • <i>Fascines for Riparian Erosion Control</i>. Edmonton, AB: Agroforestry and Woodlot Extension Society.
	Physical engineering	If you have a riparian area that might require physical engineering, contact AWES or Cows and Fish staff as soon as possible and we will direct you to an appropriate consultant.

APPENDIX B: APPROXIMATE COSTS RELEVANT TO RIPARIAN MANAGEMENT

The following table outlines some approximate costs for materials and labour/equipment time that may be relevant for select riparian management strategies. These costs were estimated based on professional experience, personal communication, and review of resources such as Alberta Agriculture and Forestry's *Custom Rates Survey 2017*. **Please note that these estimates are not actual costs nor the costs associated with AWES or Cows and Fish specifically.** Instead, the costs are general approximations only – actual costs may vary significantly due to location, site conditions, and a number of other factors (some of which are listed in the righthand column below). We recommend that careful research is done on actual costs before project budgeting occurs.

Table 2. Approximate costs of materials and labour/equipment time relevant to riparian management.

TYPE	ITEM	RATE	MAJOR REASON(S) FOR COST RANGE*
Materials	4-wire barbed wire fence	\$1550/km (\$2500/mile)	
	4-wire electric fence (not including energizer)	\$1100/km (\$1800/mile)	
	1-wire temporary electric fence (not including energizer)	\$750/km (\$1200/mile)	
	Pond leveler (for beaver management)	\$500-1000 per leveler	Discharge of stream/river
	Culver exclusion fencing (for beaver management)	\$500-1000 for each culvert end fenced off	Size of culvert, depth of water
	Small-scale gravity fed offsite watering system	\$2,000-3,000 per system	Number of livestock, lift and distance required
	Portable solar-powered offsite watering system	\$4,000-8,000 per system	Number of livestock, lift and distance required
	Large-scale offsite watering system with extensive pumping and pipeline	\$15,000-30,000+ per system	Number of livestock, lift and distance required
	1-year old seedlings	\$1.00-2.50 per seedling	Species, quantity ordered
	2-year old seedlings	\$2.00-4.00 per seedling	Species, quantity ordered
	Native grass seed	\$45-65 per kg (\$20-65 per lb)	Species
	Pulp mats (40cm x 40cm) with field staples	\$0.80 per mat + 3 staples	
	Hemp mats (40cm x 40cm) with field staples	\$1.00 per mat + 3 staples	
	Plastic mulch (2.7 mil)	\$170 per 450m (1500ft) roll	
	Biodegradable plastic mulch (2.0 mil)	\$395 per 450m (1500ft) roll	

TYPE	ITEM	RATE	MAJOR REASON(S) FOR COST RANGE*
Labour/equipment time	4-string barbed wire fence construction	\$1500-1900 per km (\$2500-3000 per mile)	Soil conditions
	4-wire electric fence construction	\$870-1100 per km (\$1400-1800 per mile)	Soil conditions
	Drilling a well	\$10,000-35,000 per well	Well depth and diameter, medium being drilled through
	Plowing furrows for planting	\$0.10-0.30 per m (\$0.03-0.09 per ft)	Topography, soil conditions
	Mounding with inline moulder (5,000+ seedlings)	\$0.40-0.60 per mound	Topography, soil conditions
	Mounding with mini-excavator (<5,000 mounds)	\$1.00-1.50 per mound	Topography, soil conditions, operator efficiency
	Discing	\$220/hour	
	Rototilling	\$115/hour	
	210hp tractor rental	\$55/hour	
	Chainsaw rental	\$40/day	
	Planting 1-year old seedlings	\$0.90-1.25/seedling	Complexity of planting design, soil conditions
	Planting 2-year old seedlings	\$1.25-1.75/seedling	Complexity of planting design, soil conditions
	Harvesting stem cuttings	\$0.40-0.60 per m of cutting (\$0.12-0.18 per ft)	Ease of access to cutting material
	Planting stem cuttings	\$1.50-2.50 per cutting	Size of cuttings, complexity of planting design, soil conditions
	Seeding native grasses (with modified airdrill)	\$100/ha (\$40/ac)	
	Applying mulch mats	\$1.50/mat	
	Applying plastic mulch	\$0.30/m (\$0.09/ft)	

****This column only lists major reasons for cost variance that are specific to the particular item. However, costs may vary for other reasons (such as location, project scale, and vendor/contractor), regardless of whether a cost range is provided.***

APPENDIX C: FUNDING OPPORTUNITIES

Organizations and programs that may financially support riparian management or restoration projects are listed below:

- The Environmental Stewardship and Climate Change program of the Canadian Agricultural Partnership provides funding for a range of riparian management and restoration projects, including riparian fencing, watering systems, watercourse crossings, innovative grazing management strategies, manure management, livestock facility relocation, pesticide and nutrient management, shelterbelt/riparian buffer establishment, and wetland assessments. More information is available at: https://cap.alberta.ca/CAP/program/STEW_PROD
- Watershed Planning and Advisory Councils (WPACs) sometimes have access to or information about funding sources. Smaller stewardship groups within the WPACs may also be of assistance. Alberta's WPACs include:
 - » Athabasca Watershed Council: <http://www.awc-wpac.ca/>
 - » Battle River Watershed Alliance: <http://www.battleriverwatershed.ca/>
 - » Beaver River Watershed Alliance: <https://beaverriverwatershed.ca/>
 - » Bow River Basin Council: <http://www.brbc.ab.ca/>
 - » Lesser Slave Watershed Council: <http://www.lswc.ca/>
 - » Mighty Peace Watershed Alliance: <https://www.mightypeacewatershedalliance.org/>
 - » Milk River Watershed Council Canada: <http://www.mrwcc.ca/>
 - » North Saskatchewan Watershed Alliance: <http://www.nswa.ab.ca/>
 - » Oldman Watershed Council: <http://oldmanwatershed.ca/>
 - » Red Deer River Watershed Alliance: <http://www.rdrwa.ca/>
 - » South East Alberta Watershed Alliance: <http://seawa.ca/>
- Alternative Land-Use Services (ALUS) Programs, available in select counties. ALUS Programs may assist with project establishment costs, and provide ongoing financial support for land taken out of production for environmental goods and services. Contact your county for more information.
- Other county environmental stewardship programs may also assist with project establishment costs. Contact your county to inquire about what is offered.

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