Introducing: Alberta Watercourse Crossing Guidebook

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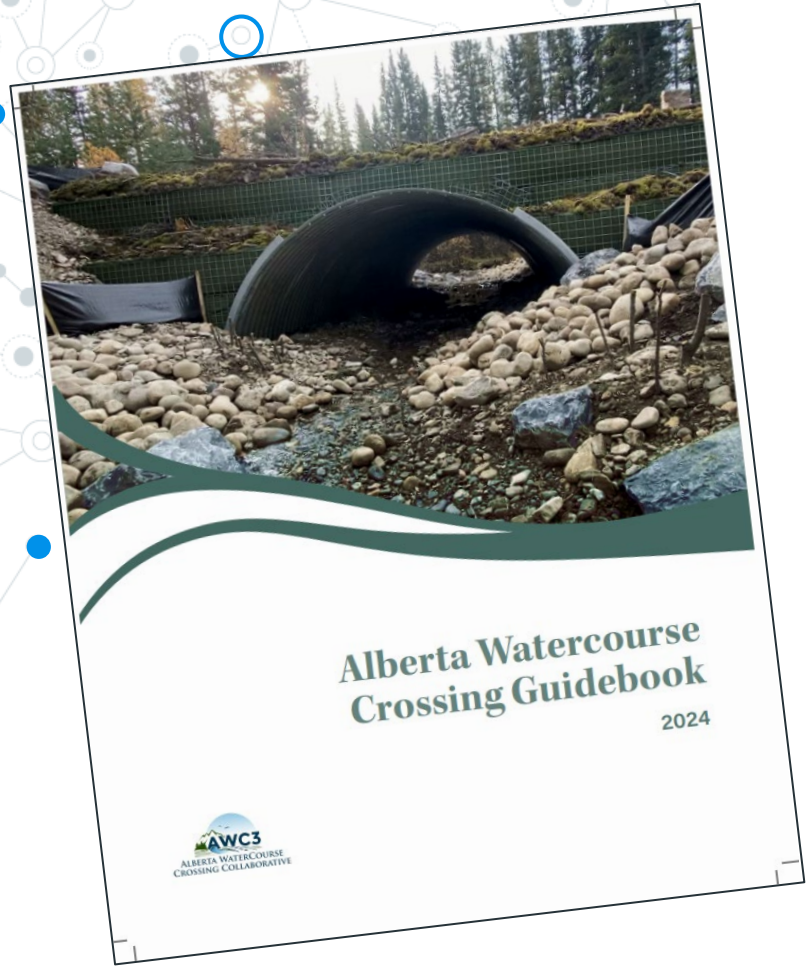
Alberta WaterCourse Crossing Collaborative

Lesser Slave Watershed Council

Athabasca Watershed Council

Water Management In Alberta's Boreal

Grande Prairie, AB. February 26, 2025



Alberta WaterCourse Crossing Collaborative

Introducing:

Alberta Watercourse Crossing Guidebook

Presentation Outline

- Introduce the AWC3 – Who, Why
- WCC and Fishery in Alberta, Background Information
- Watershed Areas in the Boreal
- Phase I - Guidebook
  - Guidebook Development Process
  - Structure and Content
- Phase II, Supporting Videos

Operational Review of WCC Restoration Examples

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AWC3 – Who, What, Why

The purpose of the Alberta Watercourse Crossing Collaborative (AWC3) is to help reverse the negative trend of the habitat loss and damage on Alberta's fishery caused by poorly installed and maintained roadway watercourse crossings.

<u>Objective:</u>

1. Information Transfer
2. Education and Training
3. Support AB Government Programs (AWCP)
4. Support evidence-based management

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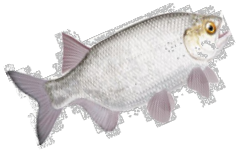
WCC and Fishery in Alberta, Background Information

Vs.



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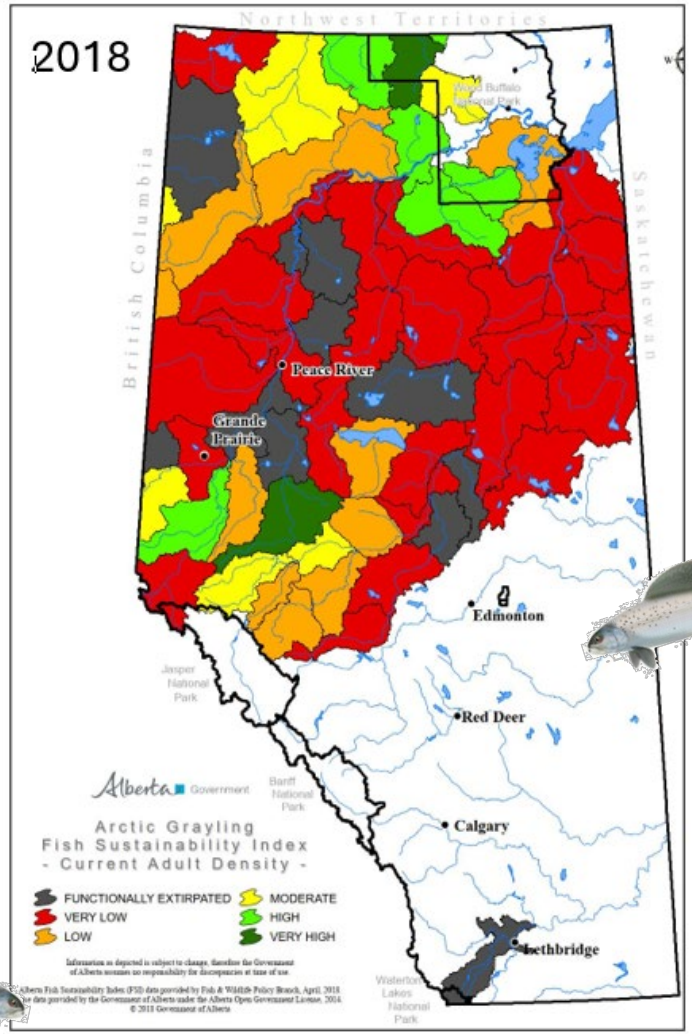
WCC and Fishery in Alberta
Background Information

- Fish species in Alberta are in trouble
- The Province maintains Fish Sustainability Index models for all species
    - FSI is AEP's method of assessing fish stocks on a provincial scale
- Because of this problem the Alberta Roadway Watercourse Crossing Mgmt. Directive was drafted in 2015 and finalized in 2020



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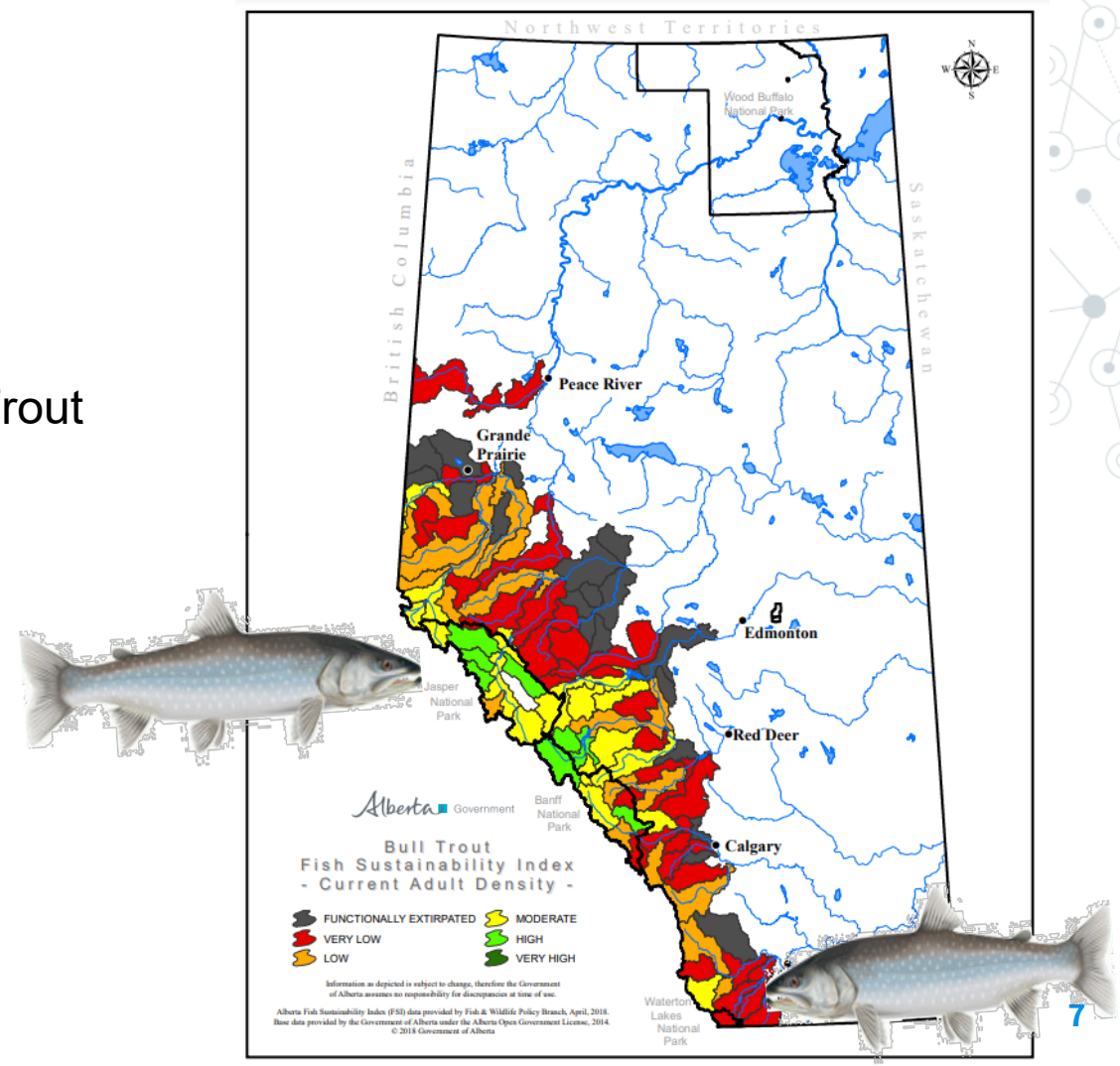
WCC and Fishery in Alberta
Background Information

- Here is the same FSI for Bull Trout
- Change from 1988 to 2018



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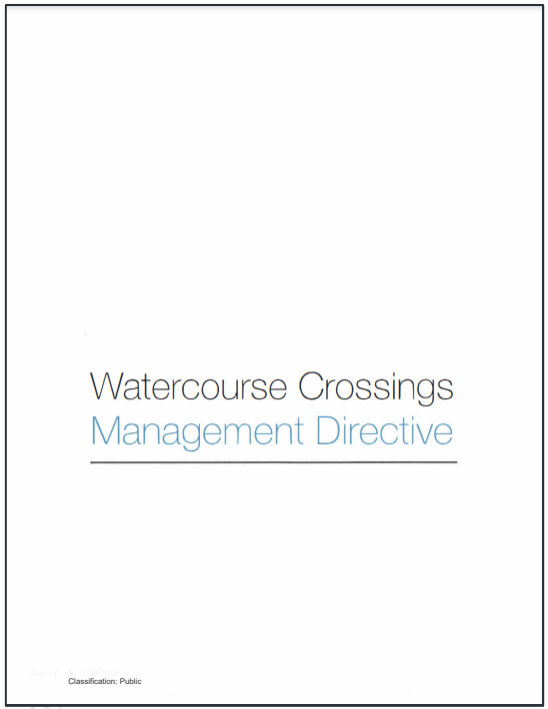
WCC and Fishery in Alberta, Background Information



- The goal of the Watercourse Crossing Program (WCP) is to address threats to fish survival stemming from poorly constructed and maintained watercourse crossings that cause habitat fragmentation, erosion and sedimentation

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WCC and Fishery in Northern Boreal Watersheds

Area of the 3 WPAC Unit = 353,350km^2

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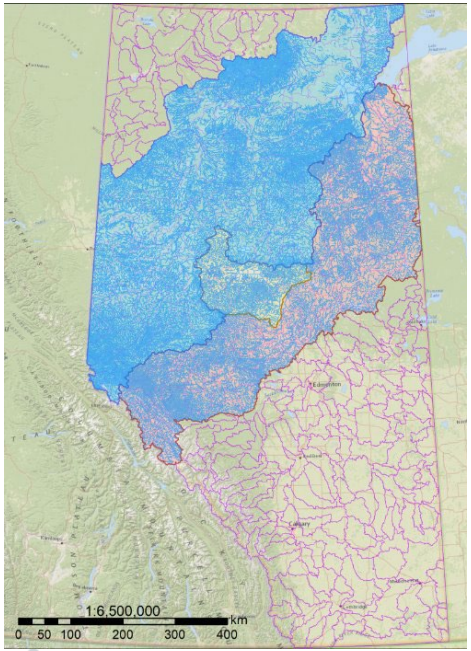
WCC and Fishery in Boreal Watersheds, Scale of the Problem

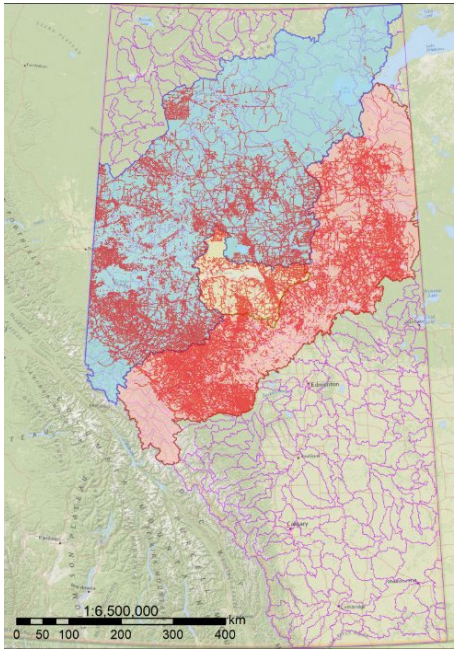
569,715 km of Fluvial Stream Network



FWMIS, SO > 2

+

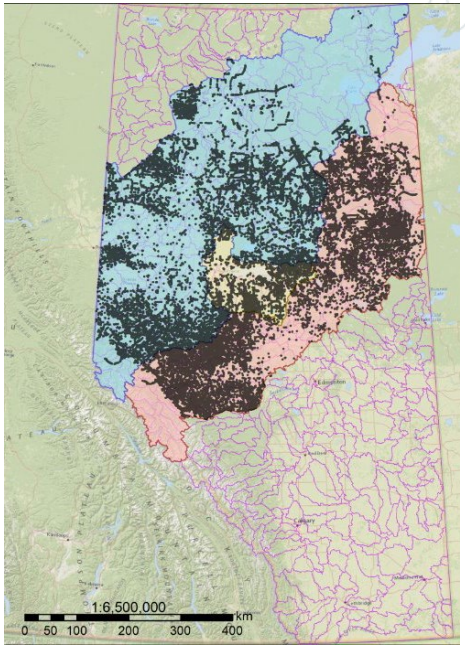
265,571 Km Road Dispositions



AltaLis DiD's Road Dispositions

=

35,378 Fluvial Roadway Crossings



Roadway WCC's

Estimate

8% high risk

2830

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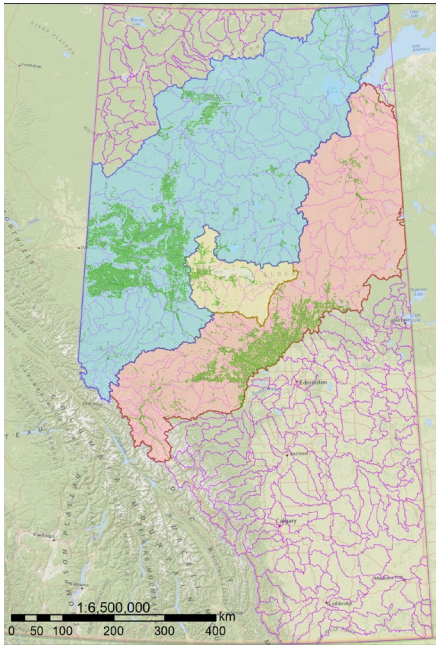
Data Source AWCP, January 2025, Map source Woodlands North

WCC and Fishery in Boreal Watersheds, Scale of the Problem

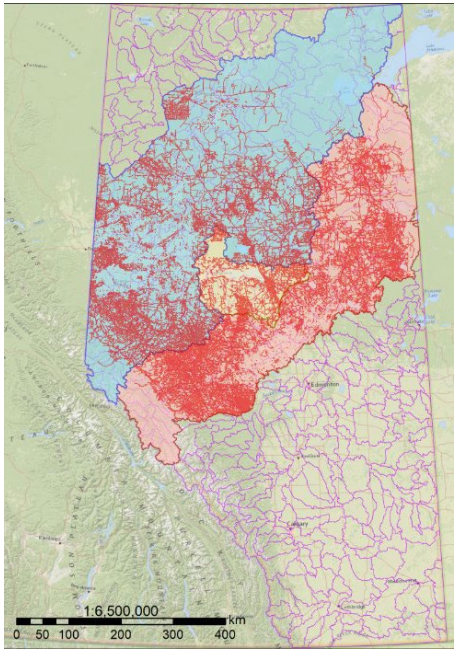
49,450 km of Non-Disposition Roadways



AltaLis DiD's

+

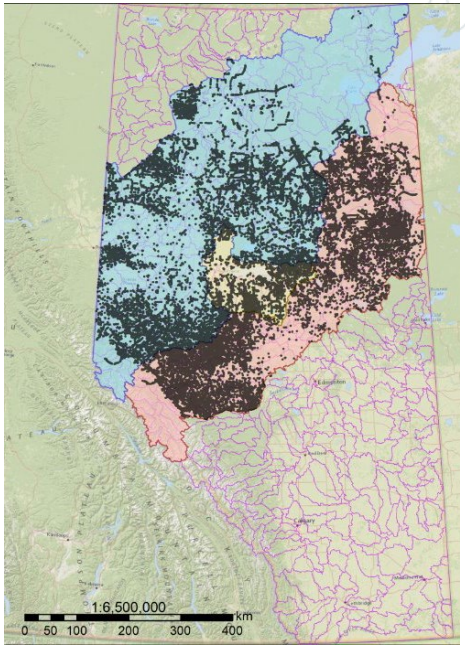
265,571 Km Dispositions



AltaLis DiD's Road Dispositions

=

47,954 Fluvial Road Crossings



Roadway WCC's

Estimate

8% high risk

3836

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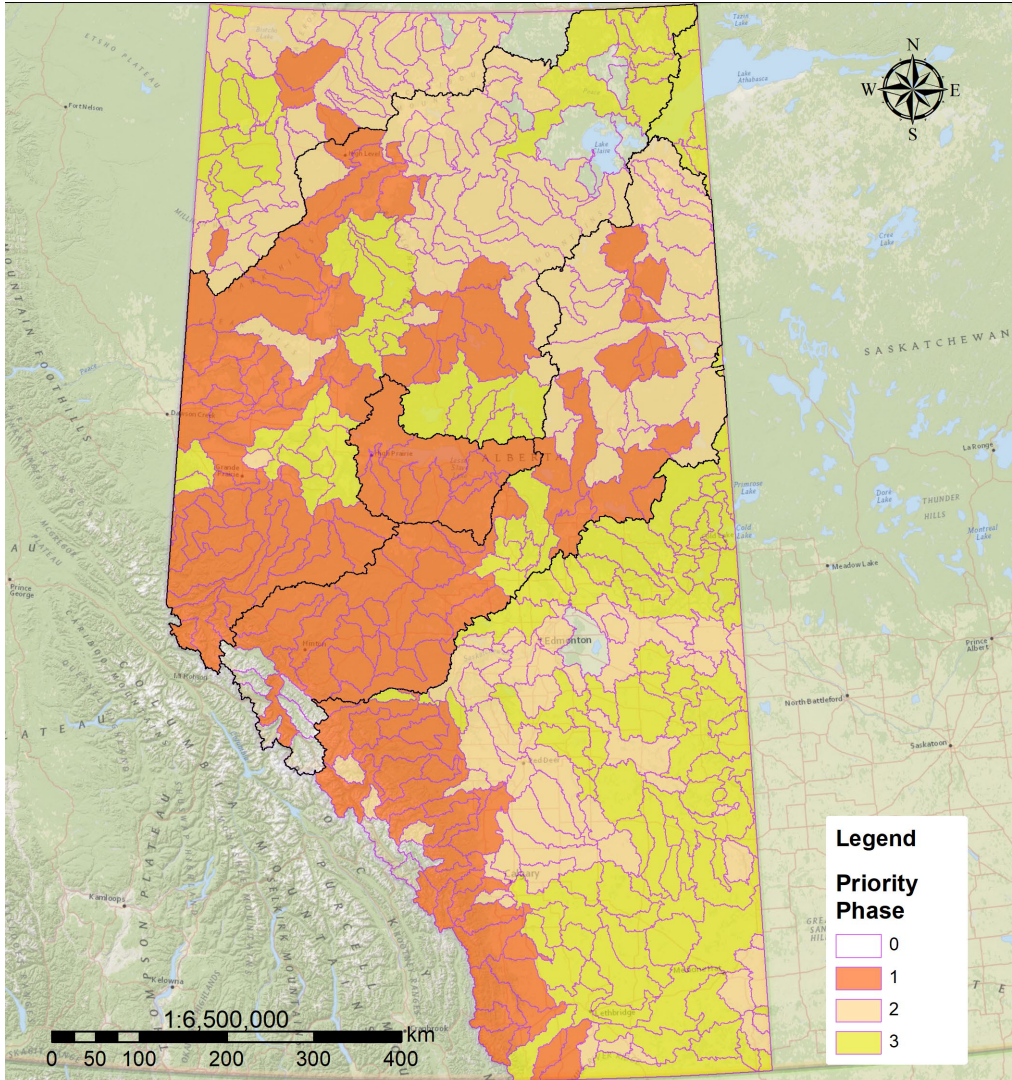
Data Source AWCP, January 2025, Map source Woodlands North

WCC and Fishery in Boreal Watersheds

- Alberta has 403 HUC 8 watersheds that are ranked based on 5 year fish management objectives
- 403 HUC 8 watersheds have been grouped into three priority levels
- Phase 1 watershed restorations are vital for fishery recovery



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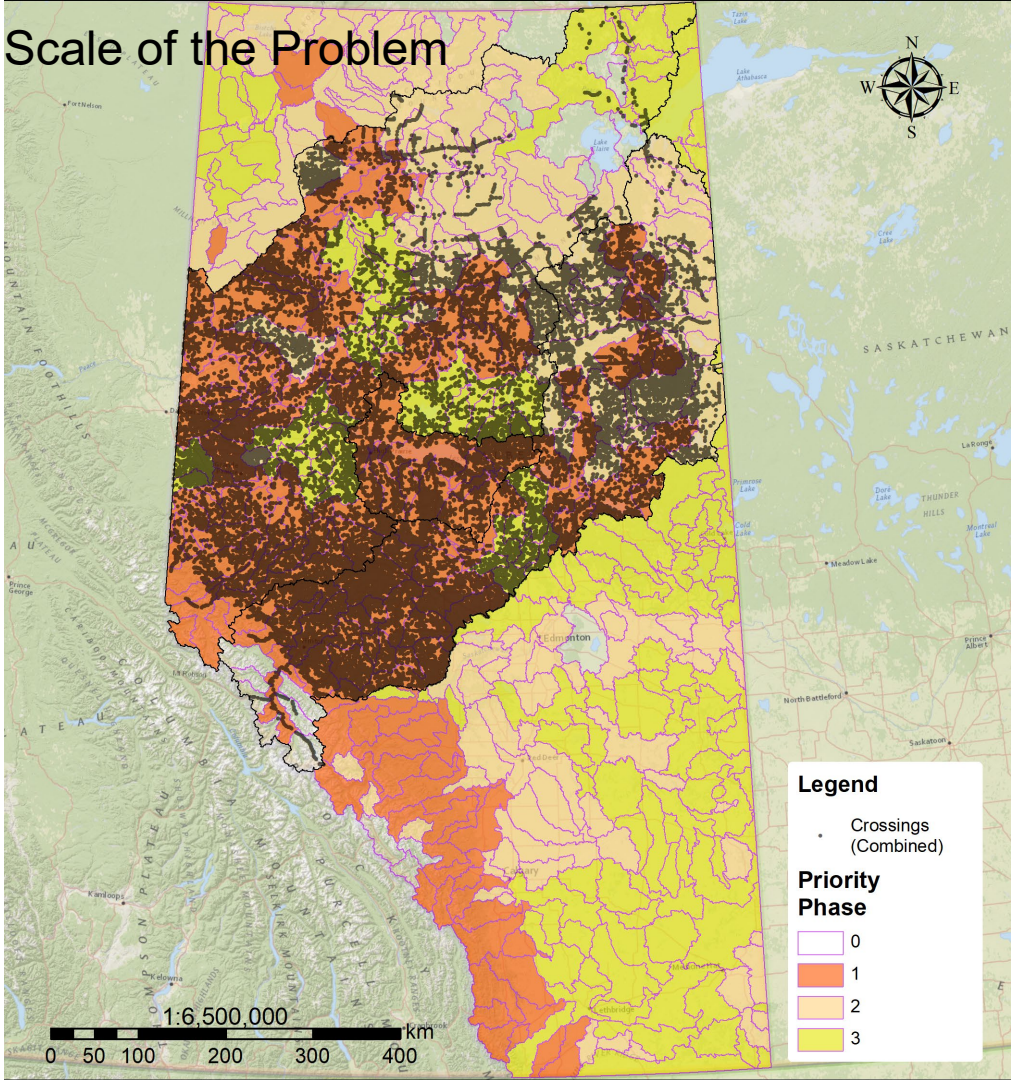
WCC and Fishery in Boreal Watersheds, Scale of the Problem

WPAC	# Crossings
Peace	21,855
Lesser Slave	4,113
Athabasca	21,986
Total	47,954

Priority Area	# Crossings
0 (Nat'l Park)	120
1	**33,646**
2	8,600
3	5,588
Total	47,954



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WCC and Fishery in Alberta, Scale of the Problem

2 years after replacement

3 years after replacement

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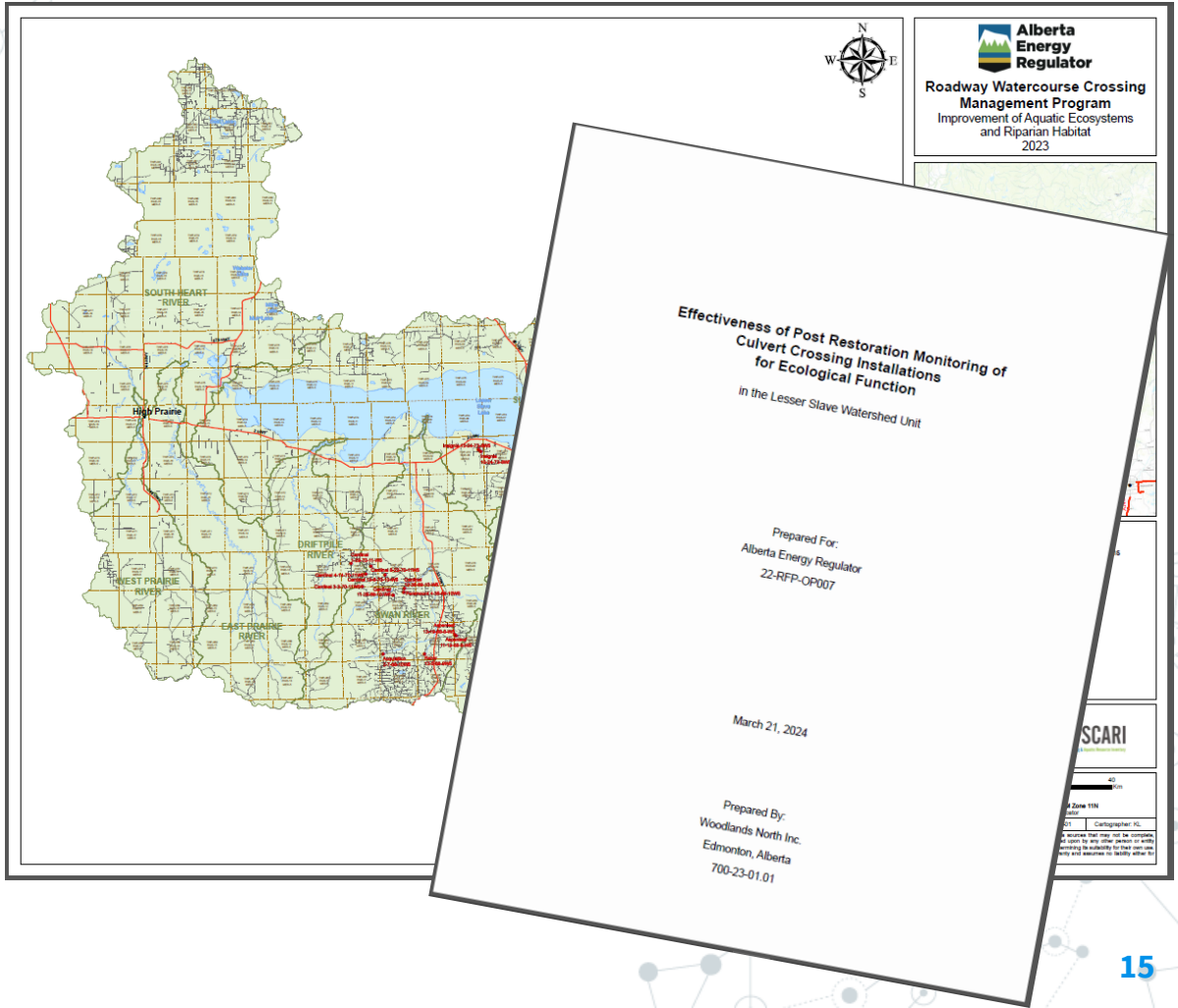
WNI – 22 RFP OP007 Project

Objective:

1. Evaluate BMP's on Recent culvert crossing installations

Results:

1. Poor sizing
2. Poor maintenance
3. Increased velocity



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WCC and Fishery in Alberta, Scale of the Problem

All crossings:
- are 8 years or newer at time of assessment
- culverts on Strahler 2 streams and fish bearing

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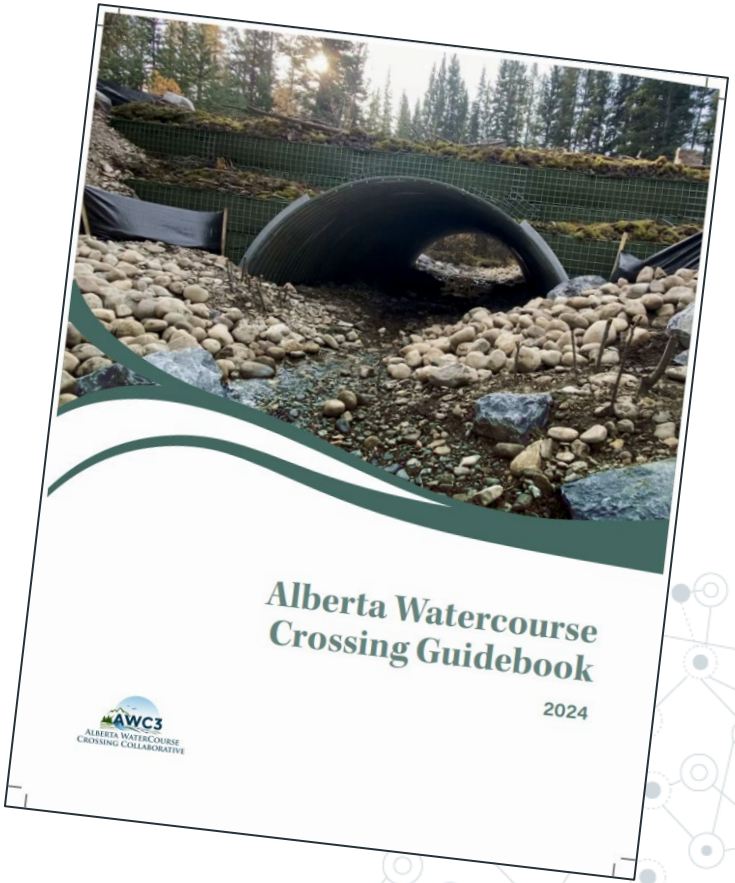
Phase I – Provincial Guidebook - Process

- The Guidebook will be available in Hard Copy print by the end of April 2024 and for Download on the Website at the end of March 2024
- Please visit www.awccc.ca in a few weeks
- AWC3 will ship the hard copy manual if you register on the website at the end of March



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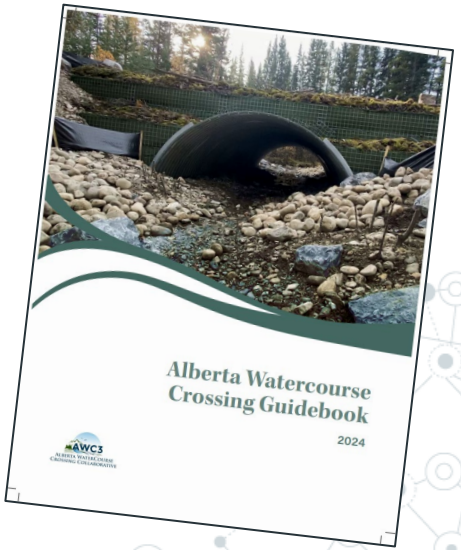
Crossing Collaborative

Phase I – Provincial Guidebook - Process

- Focused on current and correct application of Best Management Practices to support regulatory expectations
- Supported, reviewed and endorsed by the regulator(s), industry and practitioners
- Digital and print based publication with multimedia-based tools & resources to guide practitioners



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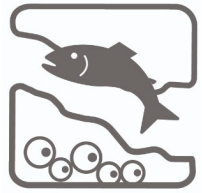
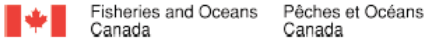
Review and Input





ALBERTA WATERCOURSE CROSSING COLLABORATIVE

Guidebook Development Process

2021 – Guidebook content scoping and grant writing

2022 – Hopes and expectations meetings (24 participants)

2023 – Technical workshop in Edmonton (27 participants)

2022/23 – Guidebook development & production of 2 videos

2023/24 – GB review by AWC3, GOA and DFO partners

2024 – Completion of seven WCC videos in spring 2024

2024- Printing production of Guidebook in summer

2025 – Phase II Production of additional videos

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Phase I – Provincial Guidebook

Fact Sheets on Key Subjects

FACTSHEET:
EMBEDDED CULVERTS

Mechanical compaction of material both around and within the culvert. Culvert has been upsized to accommodate the material inside.

Embedded culverts are superior to formerly conve
streambed. Embedded culverts are typically circu
shape can be beneficial as their increased width r
helps reduce the amount of road fill required to b
culvert installation as they greatly reduce the risk

The key objective of embedded culverts is to perm
the natural velocity of the watercourse needs to b
the structure). Maintaining a natural velocity perm
sediment flow through the culvert. The key consid
maintaining a natural velocity, sediment flow, and
include:

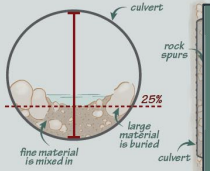
- The velocity in the culvert matches the s
watercourse through a calculation of slo
roughness.
- Sediment flow through the culvert matc
surrounding watercourse by maintainin
roughness (distribution of material with

Sizing considera

Diameter: Select a culvert that is large enough t
high flow events. Sizing must consider that the cu
15% and 30% of the culvert diameter.It is recomm
inside any culvert smaller than 1500mm can diffic
can be easier to add if shorter sections of culvert
pulling a tray of fill material through the pipe usin

* Factsheets should be use

+ Not as prone to erosion beneath the structure



Key considerati

KEYS TO SUCCE

- Accurately replicate the streambed within
culvert. If replacing an existing structure,
the natural streambed and not the artifici
conditions created by the existing structu
- Mechanically compact backfill adjacent to
within the culvert.
- Use a range of substrate sizes to ensure the
streambed is sealed. Finer substrate mates
can be washed into the larger material afte
it is placed to seal the artificial streambed.
When washing in material, be sure to set u
sedimentation protection measures to rec
sediment at the outlet of the pipe before it
the watercourse.
- A clay cap should be used to create a seal
underneath and around the structure.
- Create a V-notch in riprap materials to en
passage in low flow conditions.
- For culverts with >1% slope, ensure large r
other structures are in place to hold sedim
within the culvert over time and avoid was

* Factsheets should be use

Features:

Length: The culvert needs to be long enough that the inlet and the outlet do not become blocked over time by the encroachment of fill materials from the road. At sites where the [illegible] used along with a steel headwall. Headwalls will hold back the road fill or ditch grade material and prevent encroachment. Factors used to determine the appropriate culvert length include:

- Fill depth
- Angle of the culvert in relation to the road
- Culvert gradient
- Road width

Steep sloped channels

For culverts installed at slopes greater than 3%, larger material should be mixed into the substrate within the culvert to help anchor it in place. The large materials should be placed so they are partially buried in the streambed and interlocked. Proper placement will create areas where fish can rest, help hold s conditions. The larger natural material can also be used to control riffle/Newberry riffle/designed cross vane) approxi prevent the formation of a plunge pool.

LONG
Embe
to be
the na
the st
top of
mater

Installation best pra

- Install the culvert at the same slope as the natural result in accelerated water velocities within the cr
- Avoid letting side slope and backfill material enter
- Substrate within the culvert should match the surr
- Minimize the disturbance footprint and revegetat inlet and outlet to protect the installation and ma
- Do not store materials or equipment on the ripari
- The vertical placement of the culvert in relation to Designers should assess the natural stream profile match the crossing to this profile.
- The depth of water in the pipe above the substrate of the culvert
- Properly compact backfill material to ensure the s time without deforming. Geotextiles or other mea that can occur along the pipe length.
- Adhere to the restricted activity periods when pos periods in the fish life cycle.
- Add additional larger material to anchor the subst material size chosen will affect water velocity thro

* Factsheets should be used in combi

Site reclamation (Erosion, sediment control, and riparian)

Ensure that any side ditches and road water are not draining directly into the watercourse. Revegetate exposed soils as soon as possible after disturbance to prevent erosion. If an embedded culvert needs to be removed, all erosion and sedimentation measures required during installation are applicable to the removal.

Inspection, monitoring, & maintenance

Monitor the installation periodically to ensure it is functioning following construction. Conduct inspections before seasonal high-water flows and following any major storm event. When monitoring, ensure there is no built-up sediment upstream. Embedded culverts are resistant to scouring at the outlet but should still be monitored for any changes. Check the substrate within the culvert. If it has moved, add additional large material placed in an interlocking manner so that pieces downstream prevent the movement of pieces upstream. Check for plugging of the culvert from upstream debris and remove if necessary. Permanent marker stakes should be installed at each end of the embedded culvert to prevent damage from road maintenance equipment.

Erosion and sediment control measures are critical when installing culverts. Refer to the Environmental Protection Plan and Sediment and Erosion Control section of the guidebook.

An embedded culvert outlet that has been appropriately armored with large rocks to prevent erosion.

A culvert (not embedded) that was not adequately protected at the outlet. High flows have extensively eroded the crossing, causing severe issues.

Key References

- Allan Bradley, Francis Bober, Clayton Gillies. 2021. Small Stream Crossings: A Review and Comparison of Available Technologies.
- Fisheries and Oceans Canada. 2016. Guidelines for Watercourse Crossings in Quebec. Ottawa, ON.

* Factsheets should be used in combination with the full Alberta Watercourse Crossing Guidebook 79

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Key Considerations and Additional References

Key considerations

KEYS TO SUCCESS

- Only use clean water to construct the ice bridge. Avoid using municipal water sources for construction as these are typically chlorinated and not suitable for direct return to watercourses.
- Be mindful when trimming riparian vegetation for approaches. Only remove what is necessary and make use of existing trails whenever possible.
- Anyone working on the crossing should first complete an ice safety training program.
- Ensure bridge users know the full weight of their vehicle, understand the risks of using an ice bridge and are properly equipped to deal with emergency situations.

WHAT TO AVOID

- Do not add any gravel, rock, or loose woody materials to the crossing during construction or for additional traction during use.
- Do not allow the crossing to impede the natural flow of water at any time.
- Do not work on, or use, an ice bridge alone. If checking the thickness of ice, wear a flotation suit, stay 10 meters away from teammates, and ensure everyone has received ice rescue training.
- Never pull over to stop or drive on the edges of an ice bridge.
- Do not impede natural water flow below the ice bridge during installation and use.

Key References

- B.C. Ministry of Forests, Lands and Natural Resource Operations, B.C. Ministry of Environment, and Fisheries and Oceans Canada. 2012. Fish-stream crossing guidebook. Rev. ed. For. Prac. Invest. Br., Victoria, BC.
- FPInnovations. 2014. Temporary winter stream crossings: A practical guide for forest workers. Victoria, BC and Pointe-Claire, QC.

Pros and Cons of WCC Options

- *TEMPORARY BRIDGES*

ADVANTAGES	DISADVANTAGES
• Very low environmental impact • Some types can be salvaged and reused • Easy to restore site after use	• Can damage the watercourse bed and banks if not designed, installed, or maintained correctly

- *ICE BRIDGES*

ADVANTAGES	DISADVANTAGES
• Creates minimal disturbance when constructed according to recommendations • Can accommodate larger watercourses, lakes, and wetlands	• Can only be used in the winter • Sensitive to environmental conditions

- *TEMPORARY CULVERTS*

ADVANTAGES	DISADVANTAGES
• Some types can be salvaged and reused	• Can cause harmful alteration, disruption, or destruction (HADD) of fish habitat if not maintained • Often do not provide fish passage in both high and low flows

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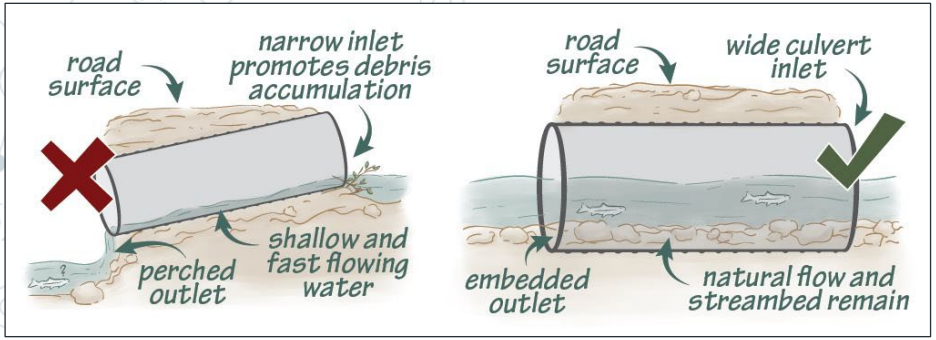
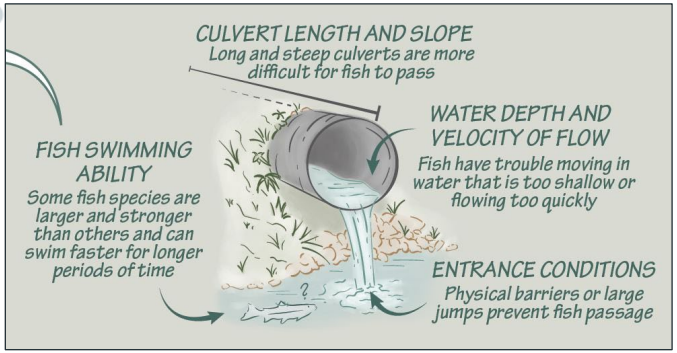
Checklists to Compare Options

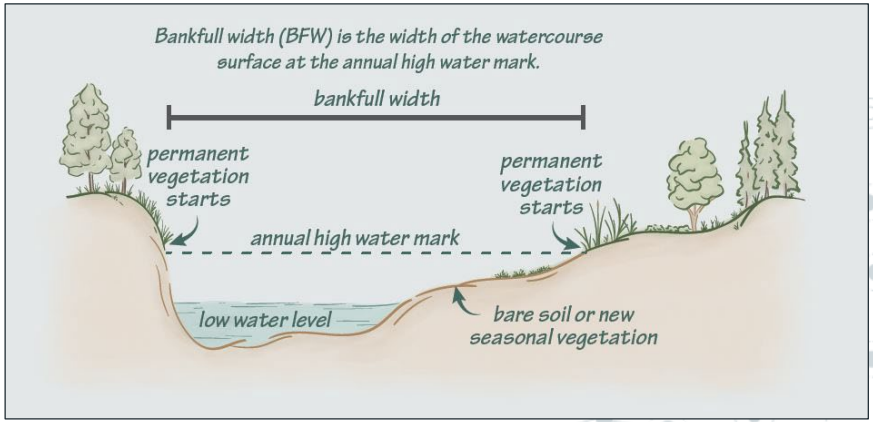
Siting Factor	Rationale
Species at risk awareness	Where possible, plan the structure location to avoid and minimize disturbance within sensitive areas that support species at risk. Be aware of species at risk recovery strategies, action plans, or critical habitat restrictions that may apply to the area.
Avoid valued fish habitat	Avoid crossing watercourses at locations where valued fish habitat (pools, spawning riffles, etc.) are present. Wherever key fish habitat features exist, it is important to move the crossing location upstream or downstream accordingly.
Drainage basin	Wherever possible, select watercourse crossing locations at the head of drainage basins because the risk of affecting fish passage is lower in these areas.
Hydrography	An efficient road network should consider the locations of watercourses that may be fish-bearing. Consult the provincial AltaLIS hydrography maps for more information.
Watercourse soils	Identify unstable and erodible streambed soils and slopes and, where possible, avoid locating a structure in these areas. Instead, choose a watercourse section where the streambed has stable, coarse granular substrate. Areas composed of erodible soil types should be avoided as they are prone to sedimentation, pose safety hazards during construction, and may lead to structural and road failures, and costly maintenance.
Watercourse banks	Ideally, watercourse banks will have slopes with stable soil, low risk of erosion, and be well covered with native vegetation.
Alignment	Locate the structure so it crosses at a right angle/perpendicular to the road to help prevent the redirection of the channel flow. Alignment is made easier when crossings are placed on a straight section of the watercourse that has no braiding.
Width and depth	Cross at the narrowest part of a straight channel and, if possible, avoid areas of very deep water (>1.5 m). This helps to avoid construction challenges that occur with larger water crossing structures.
Gradient and velocity	Select a section of the watercourse with a near-zero gradient and a uniform water velocity (i.e., water speed). This will make it easier to install a crossing with the same characteristics as the natural watercourse and minimize the crossing's impact on fish.

Phase I – Provincial Guidebook



Detailed Artwork for Visual Understanding





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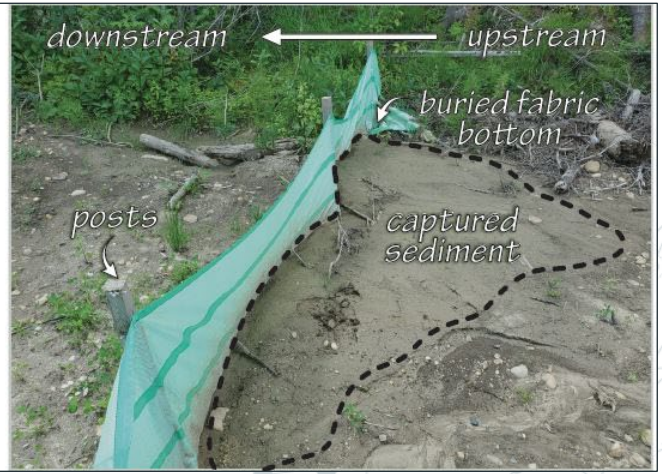
Phase I – Provincial Guidebook

The photo on the left is an example of where a culvert has not been embedded properly, and this has resulted in a perched culvert that is impeding fish passage. The photo on the right shows a properly embedded culvert allowing for the natural watercourse width to flow through the culvert, thereby allowing for fish passage. The crossing on the right is also maintaining the natural water flow.

Photographic Visuals and Explanations

SEDIMENT FENCES

- To prevent failure of the barrier and remobilization of the sediment, any sediment caught behind the barrier must be removed once it reaches half the barrier height.
- When the fences are removed, be sure to collect all the fence materials and any loose sediment they have retained.

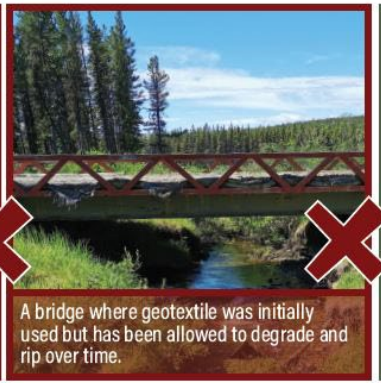


Mechanical compaction of material both around and within the culvert. Culvert has been upsized to accommodate the material inside.

An improperly embedded culvert that does represent the natural stream substrate. Only ~10% is embedded and there is an absence of larger stream bed material.

Photographic Comparisons of Good and Bad Practices

A bridge without any measures to keep gravel contained. Material is falling directly into the watercourse.



A bridge where geotextile was initially used but has been allowed to degrade and rip over time.

A bridge constructed with sides that are completely closed, preventing road material from entering the watercourse.

Completed Videos Available :

- Embedded Culvert Installation
- Clear Span Bridge Installation
- Arch Installation
- Defining Stream Habitat
- Fish Isolation and Rescue
- Stream Hydrology & Design
- Water Management during Construction

Next Videos:

- Regulatory and Permitting
- Crossing & Channel Design
- Crossing Removal
- WCC Site Restoration

Fall 2024

here

Phase I – Provincial Guidebook

Must Thank:

Appendix A: Letters of End

Alberta Forestry and Parks

January 23, 2024

Board of Directors
Alberta Watercourse Crossing Collaborative
11316 - 119 St NW
Edmonton, AB T5G 2X4

Dear Board of Directors:

I would like to extend my congratulations to the Alberta Watercours
Collaborative on the completion of the 2023 Alberta Watercourse C

Forestry Division recognizes the Guidebook as an excellent educa
focused on current best management practices for watercourse cr
construction, maintenance, restoration, and remediation in Alberta.
many hours of work and contributions by experts in this field.

While the Guidebook does not replace provincial legislative obligat
is recognized as a tool that can provide an effective mean of achie
watercourse crossing owners and a positive contribution to aquatic
connectivity, restoration of riparian habitat and ultimately a positive
habitat and fish populations.

Sincerely,

Ken Greenway, PhD, RPF
Executive Director

cc: Kevin Quintilio
Executive Director, Lands Delivery & Coordination North

Alberta Forestry and Parks

January 18, 2024

Board of Directors
Alberta Watercourse Crossing Collaborative
11316 - 119 St NW
Edmonton, AB T5G 2X4

Dear Board of Directors:

I would like to extend my congratulations to the Alberta Watercourse Crossin
Collaborative on the completion of the 2023 Alberta Watercourse Crossing G

Lands Delivery and Coordination recognizes this guidebook as an excellent
resource focused on current best management practices for watercourse cr
design, construction, maintenance, restoration, and remediation in the provin
Alberta. The guidebook content reflects many hours of work and contribution
experts in this field and is applicable to provincial watercourse crossing priori
programs, legislation, and regulations.

While the guidebook does not replace provincial legislative obligations, it is r
as a tool that can provide an effective mean of achieving outcomes for water
crossing owners and a positive contribution to aquatic ecosystem connectivit
restoration of riparian habitat and ultimately a positive outcome for fish habita
populations.

Sincerely,

Kevin Quintilio
Executive Director, Lands Delivery & Coord North

cc: Ken Greenway
Executive Director, Forest Stewardship and Trade

Alberta Watercourse Crossing Guidebook

Alberta Energy Regulator

Martin Foy
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January 19, 2024

Alberta Watercourse Crossing Collaborative (AWC3)
11316 119 St NW
Edmonton, Alberta T5G 2X4

Dear AWC3 Board of Directors:

Subject: Statement of Support by the Alberta Energy Regulator for the Alberta Watercourse Crossing Guidebook

The Alberta Energy Regulator recognizes the Alberta Watercourse Crossing Guidebook developed by the AWC3 as an excellent educational resource focused on current best management practices for watercourse crossing design, construction, maintenance, restoration, and remediation in the province of Alberta.

The content in this guidebook reflects many hours of work and contributions by experts in this field and is applicable and aligned to provincial watercourse crossing priorities, programs, legislation, and regulations. This guidebook is not intended to replace or circumvent existing provincial or federal legislation; however, it is in the AER's view that this resource will provide an effective means to achieving regulatory outcomes for watercourse crossing owners and be a positive contribution to maintaining and enhancing fish populations, restoration of habitats and improving aquatic ecosystem connectivity across the province of Alberta.

Yours truly,

Martin Foy
Chief Operations Officer, Operations

Inquiries 1-855-297-8311 24-hour emergency 1-800-222-6514 inquiries@aer.ca

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AWC3
ALBERTA WATERCOURSE CROSSING COLLABORATIVE

Must Thank:

AWC3 Board of Directors

- Michael Wagner
- Michael Hunka
- Ben Poltorak
- Michael Bender
- Jody Foster
- Jamie Rich
- Shona Derlukewich
- Bruce Nielsen

FUSE CONSULTING

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Fisheries and Oceans Canada

Pêches et Océans Canada

ALBERTA WATERCOURSE CROSSING COLLABORATIVE

Thank You

Any questions?

Guidebook
Videos
Webinars

www.awccc.ca

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You can find me at:

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780-720-2402

AWC3
Alberta WaterCourse Crossing Collaborative