The Canadian Aquatic Barriers Database and a conservation planning framework to restore freshwater connectivity

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November 29, 2023

AFS-ON Instream Barrier Removal Workshop

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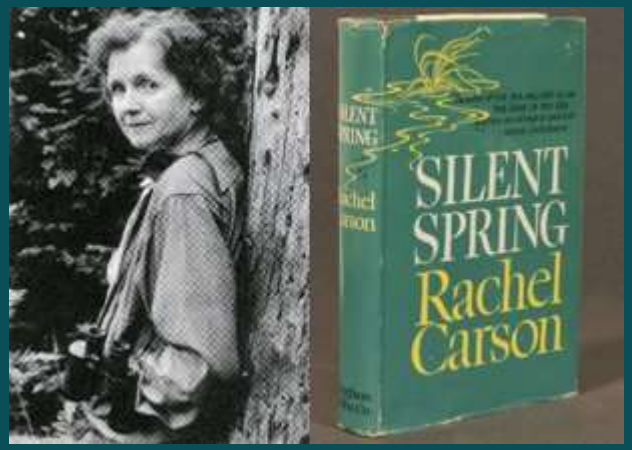
Canadian Wildlife Federation – Who We Are

- One of Canada's largest environmental NGOs
- Originated in 1962 from fish and wildlife conservation movement
- "To conserve and inspire the conservation of Canada's wildlife and habitats for the use and enjoyment for all"



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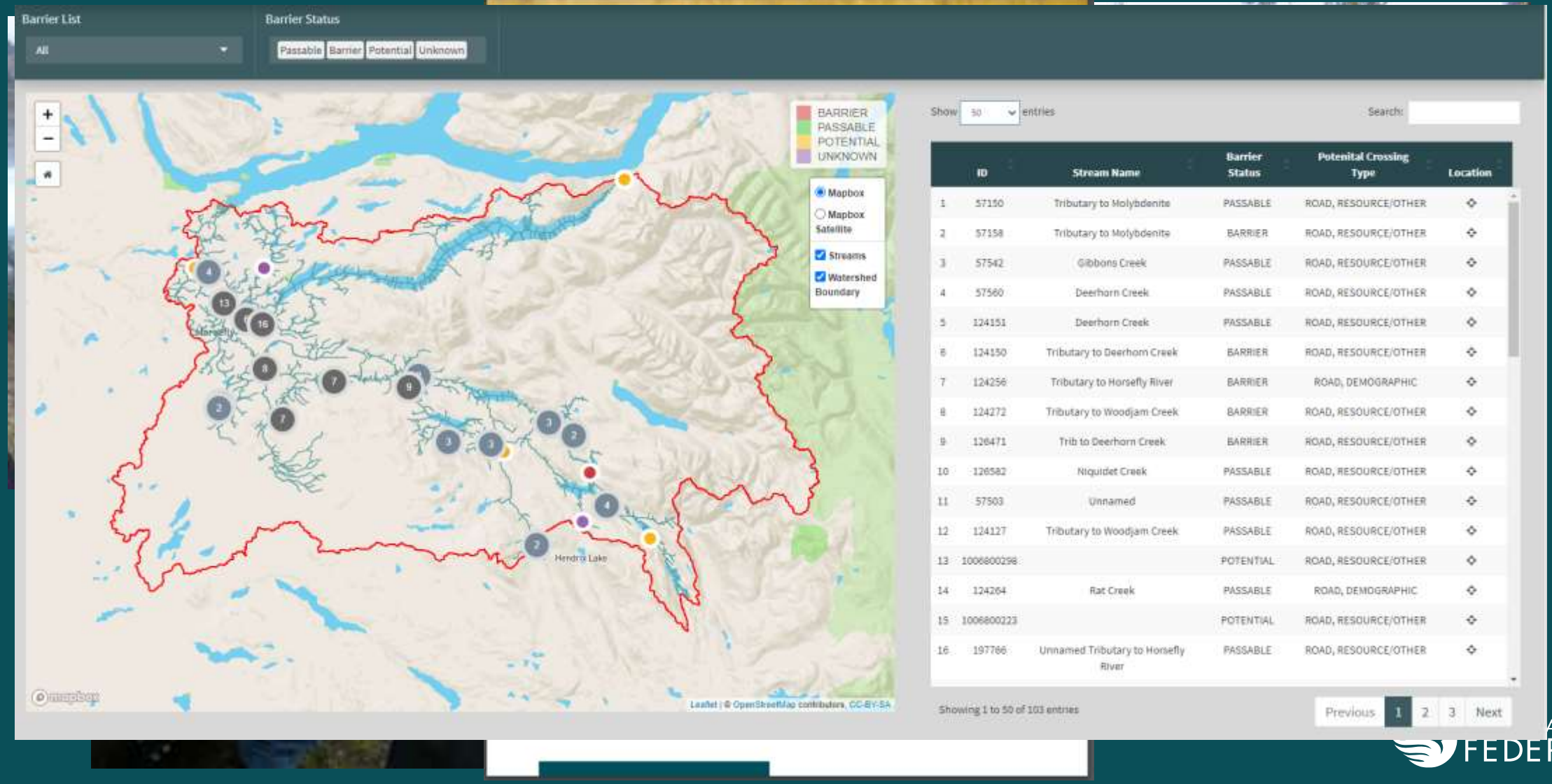
National Freshwater Connectivity Program



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Canadian Aquatic Barriers Database (CABD)

Vision:

All Canada's barrier and connectivity information in one place – easily and openly accessible!

Dams, waterfalls, fishway, stream crossings (coming soon!)

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Collaboration and Engagement

- Potential uses of CABD extend beyond CWF's needs
  - Freshwater connectivity research
  - Hydrological modelling
  - Infrastructure asset management
- CABD can improve collaboration and partnership
- Launched external engagement to get input on development

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Stakeholder Engagement

- User interviews
  - What type of work could the CABD support?
  - What information would be useful?
  - How would users like to access the data?
- Working Group and Technical Advisory Committee

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CABD Use Cases

1. Habitat status assessments and reporting
2. Informing management and regulatory decisions
3. Restoration planning and prioritization
4. Research and monitoring
5. Education and public outreach

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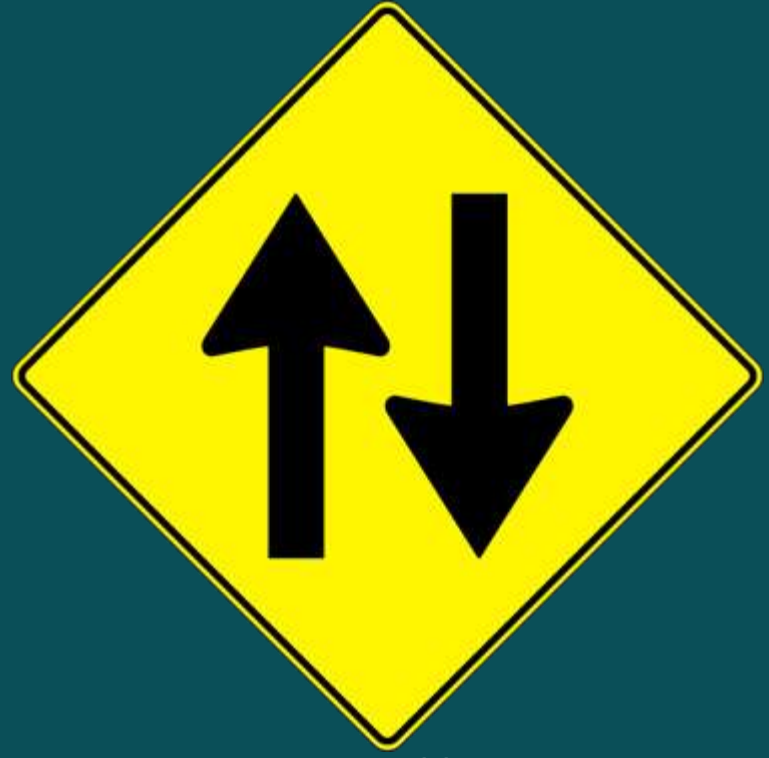
Data Gathering and Sharing



- CABD relies on existing repositories
  - Local in scale
  - Single barrier types
  - Lacking standardization
- CWF provides national coordination **without** duplicating effort
- Establish **reciprocal** relationships
  - Share data back to providers

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Barrier Data Processing

1. Data source compilation
2. De-duplication
3. Spatial attribute mapping
4. Geolocation (including snapping to hydro network)
5. Non-spatial information collection

200+ data sources

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CABD (latest release)

36,000+

v.1.2

22,000+

v.1.1

400+

v.1.1

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CABD

Are the CABD datasets perfect? **No!**

- Data gaps exist (structures and attributes)
- But, most comprehensive and standardized datasets available nationally
- Latest updates = attributes added for **3,000 features**
- CWF, partners, and practitioners across the country can help contribute data and updates

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Demo!

aquaticbarriers.ca

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Existing Users

- Fisheries and Oceans Canada
  - Integrated Planning: State of Fish and Fish Habitat reporting
  - Science (Maritime region) – climate change vulnerability and risk assessments
  - Science (Pacific region) – cumulative effect assessment for the Fraser River Basin
- Environment and Climate Change Canada
  - Lake Eerie Nearshore Assessment
- Natural Resources Canada
  - Integrating CABD data into new Canadian Hydrospatial Network
- Nature Conservancy of Canada
  - Online Aquatic Connectivity Tool for New Brunswick (pilot)
- Government of BC
  - Provincial salmon accessibility model and derived spatial layers

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Next Steps

- Add stream crossings to CABD (2024)
  - Generate modelled crossings
  - Seek and acquire assessment datasets
  - Map attributes to standardized data structure
- Continue to fill data gaps
- Develop additional tools
  - Standardized barrier assessment protocols
  - Community science mobile app
  - Remote sensing tools to fill data gaps

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A National Collaborative to Manage Aquatic Barrier Data in Canada

- Standardized datasets supported by standardized data collection
- Hosted a national assessment protocol workshop in March 2023
- Workshop outcomes
  - Utility of standardized protocols recognized and supported
  - Significant interest in more formal coordination or collaboration for (co-) development of national barrier assessment protocols

A national collaborative to manage aquatic barrier data in Canada?

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A National Collaborative to Manage Aquatic Barrier Data in Canada

- A national collaborative to:
  - Store and manage aquatic barrier data
  - Develop standardized barrier assessment protocols
  - Develop training materials certification, apps, and tools
- Learn from, coordinate, collaborate with existing programs
- Share resources and knowledge

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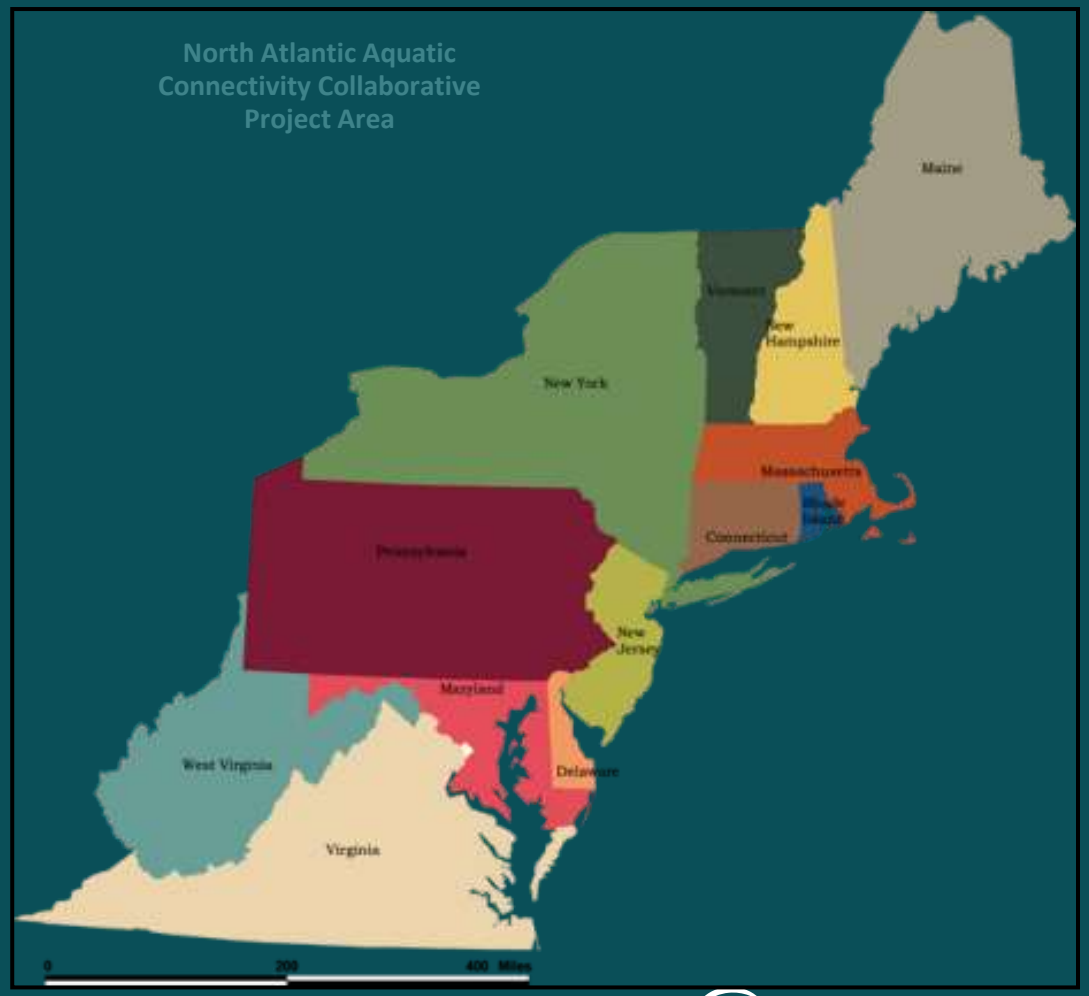
A Collaborative Success Story – North Atlantic Aquatic Connectivity Collaborative

- Network of 13 states in northeastern U.S.
- Standardize assessment protocols and database (with web tool)
- Distributed coordination framework to support data collection
- 400-500 “observers” actively collection stream crossing assessment data



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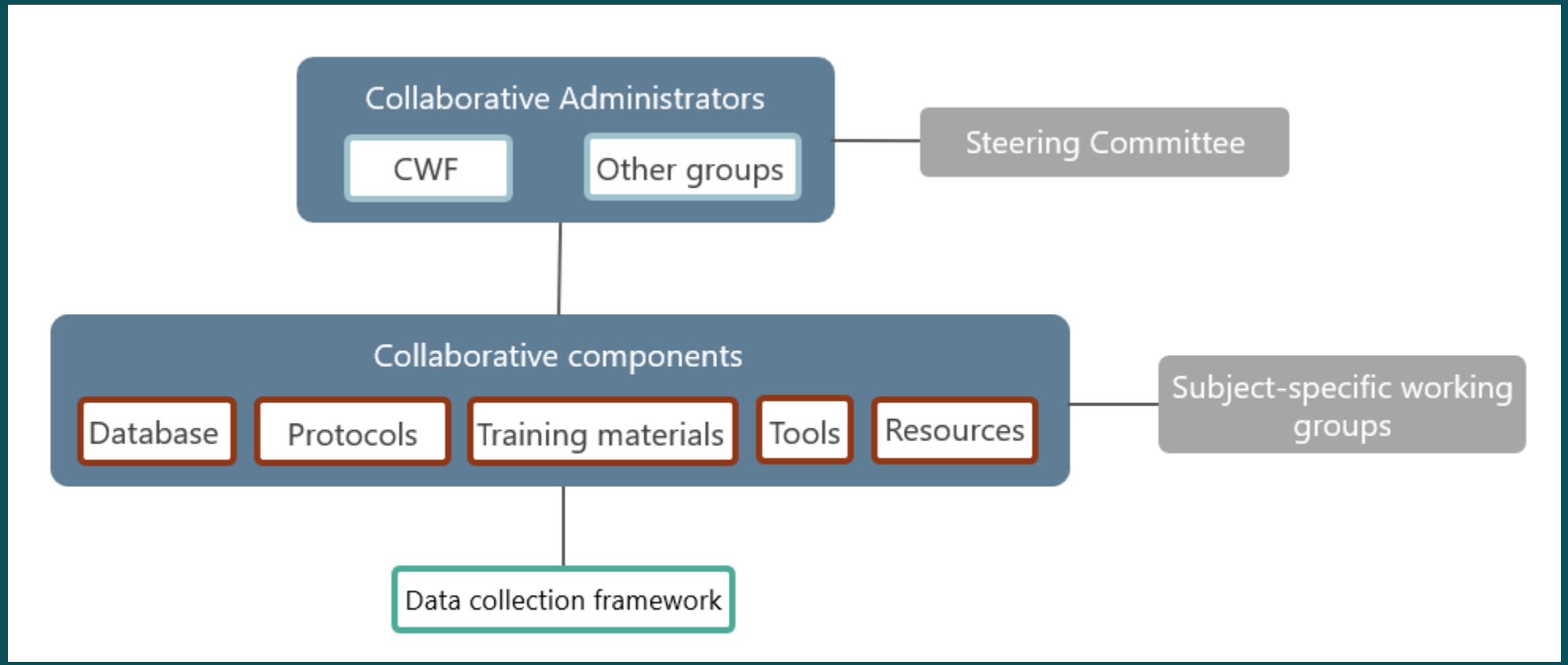
A National Collaborative to Manage Aquatic Barrier Data in Canada



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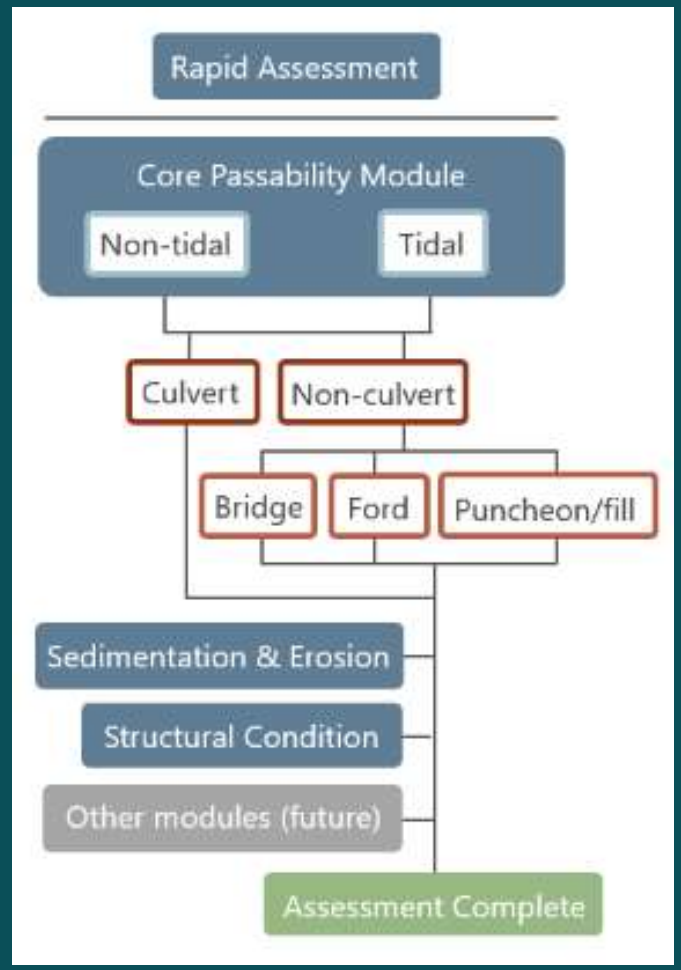
Stream Crossing Assessment Protocol Working Group

- Develop national stream crossing assessment protocols that can be applied anywhere in Canada
- Modular framework → flexibility for geography + purpose of assessment
- Convene December 2023 – March 2024



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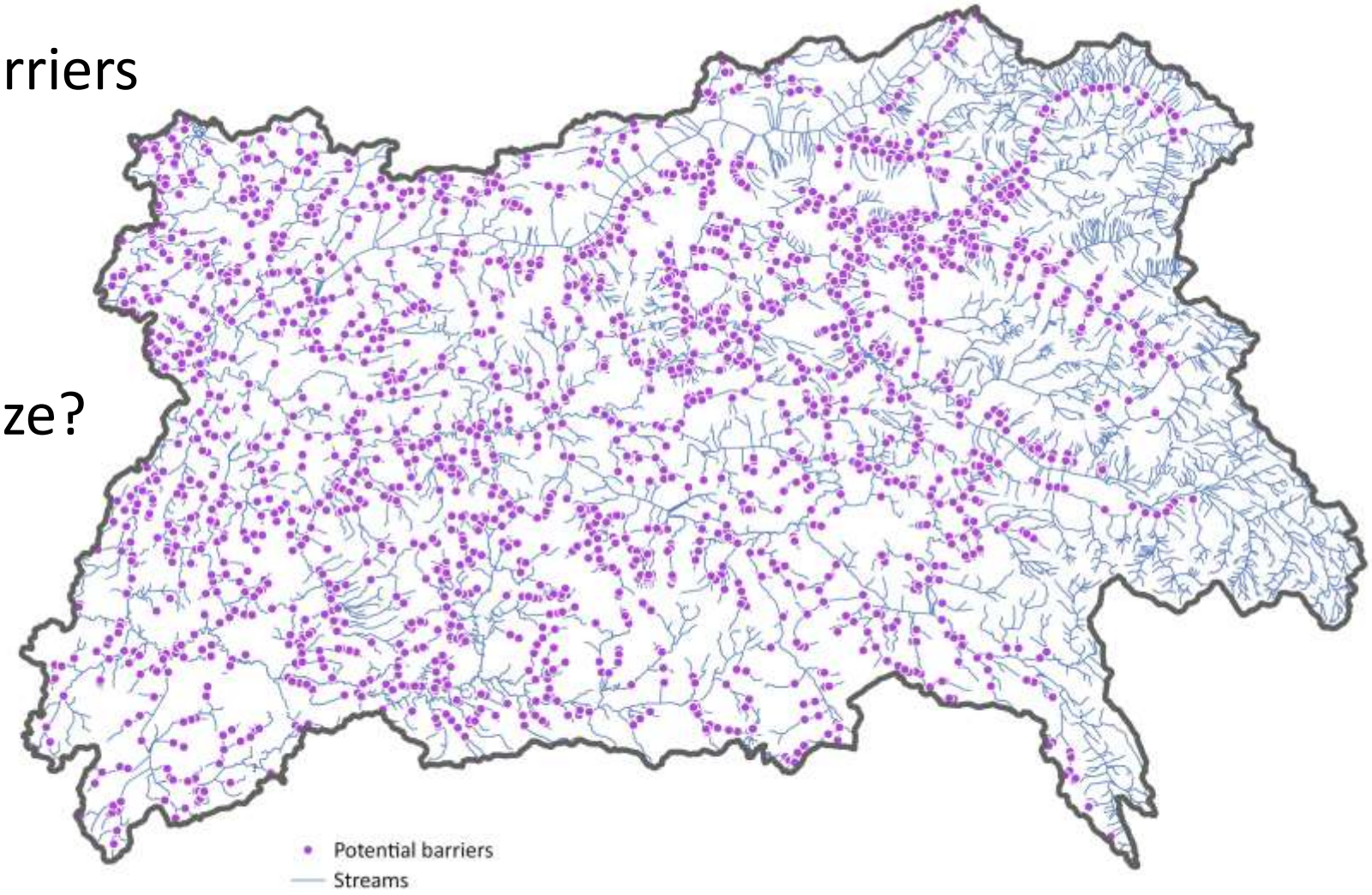
Watershed Connectivity Restoration Planning

Connectivity Planning Example: Horsefly River Watershed

Began with 2442 potential barriers

- 9 dams
- 2437 stream crossings

How do we triage and prioritize?



Watershed Connectivity Restoration Planning Process Overview

- Adapted from international Conservation Standards framework
  - "Thematic" plan addressing tractable conservation issue:

    Localized barriers to fish movement

- Not intended to be a watershed conservation plan
  - Can serve as component of a broader plan
  - Account for other threats, avoid diminishing returns

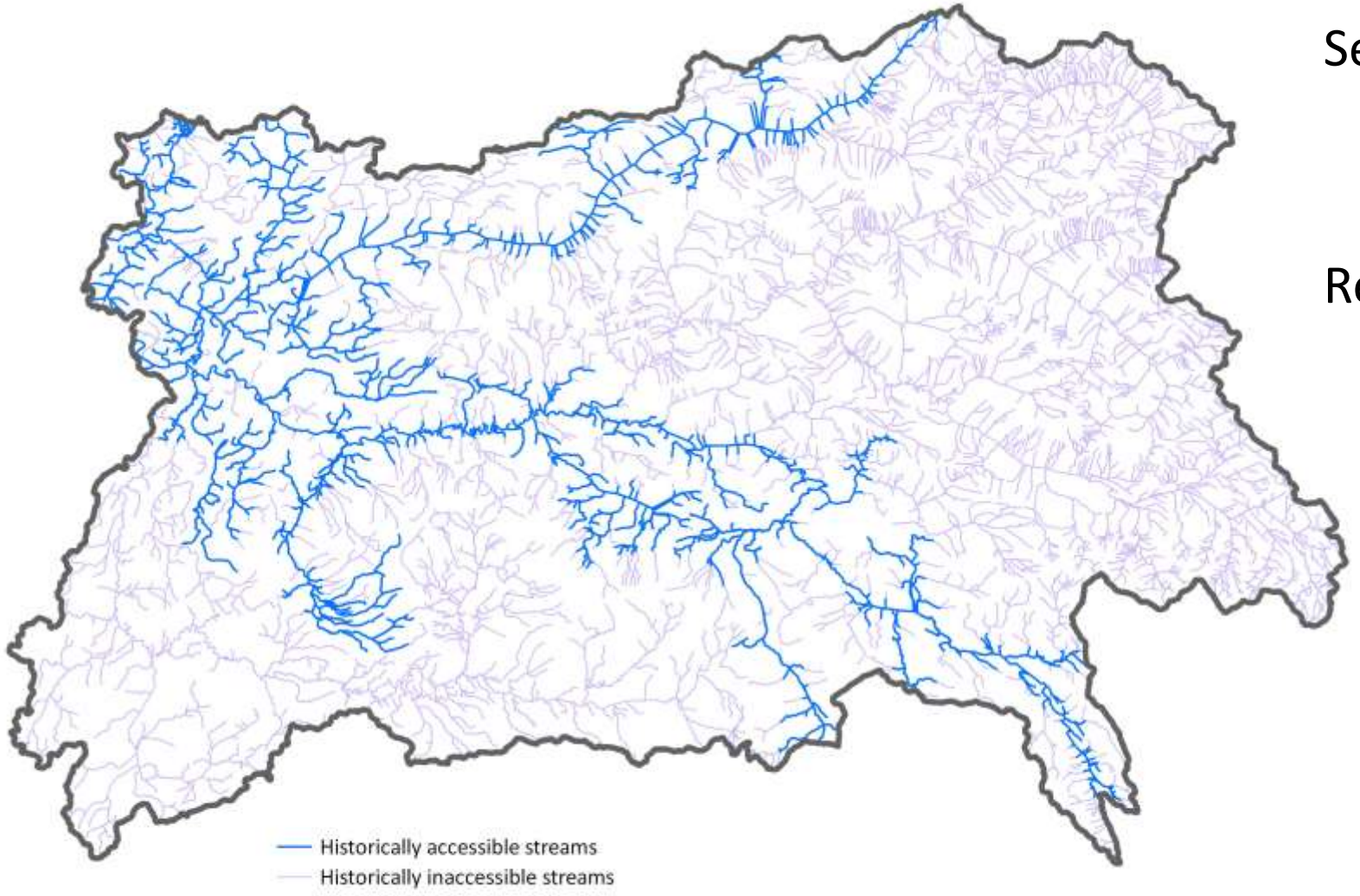
- Living conservation plans, iteratively updated over time
  - Provide a case for conservation/funding

Planning Process Overview

Key Conservation Plan Components:

- Clear geographic and thematic scope
- Focal species or guilds
- Current connectivity status estimated for each focal species
- SMART goals for gains in connectivity
  - Meant to reflect the desired future status
- Barrier prioritization to meet goals efficiently
- Action plan with responsibilities identified and costs estimated

1. Identified focal species and refined geographic scope



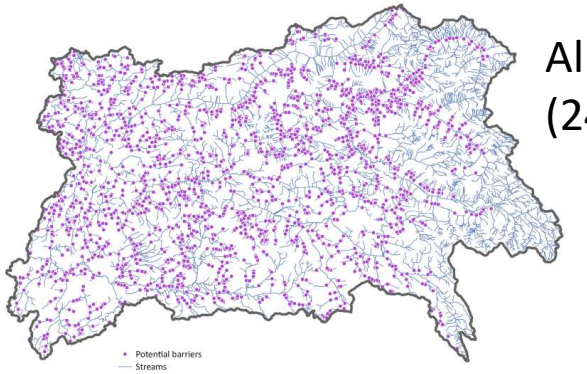
Selected focal species:

- Anadromous salmon

Reduced scope to area of interest:

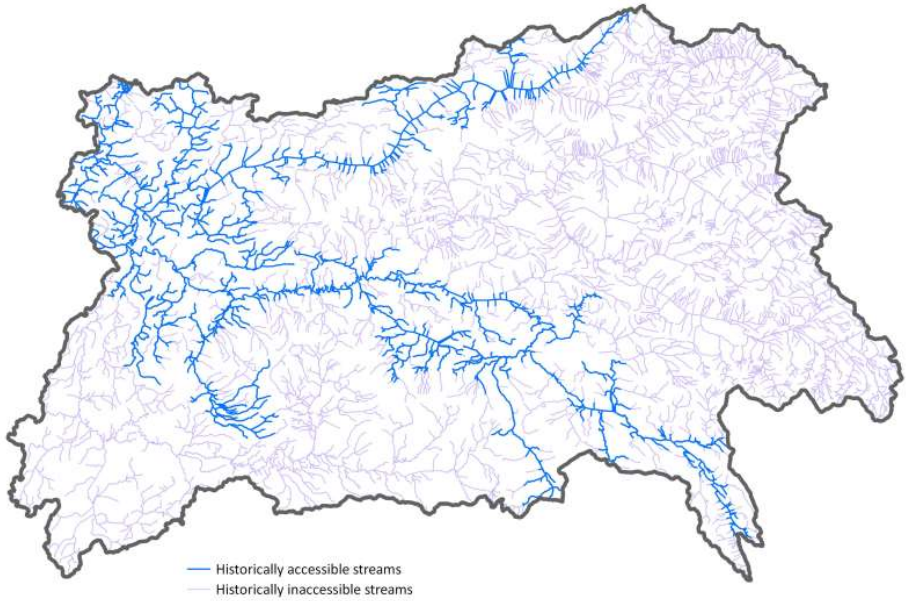
- Streams modeled as **historically accessible** to salmon based on the following natural barriers:
  - Stream gradient (>15%)
  - Falls (>5 m)
  - Subsurface flows

2. Reduced number of barriers to consider

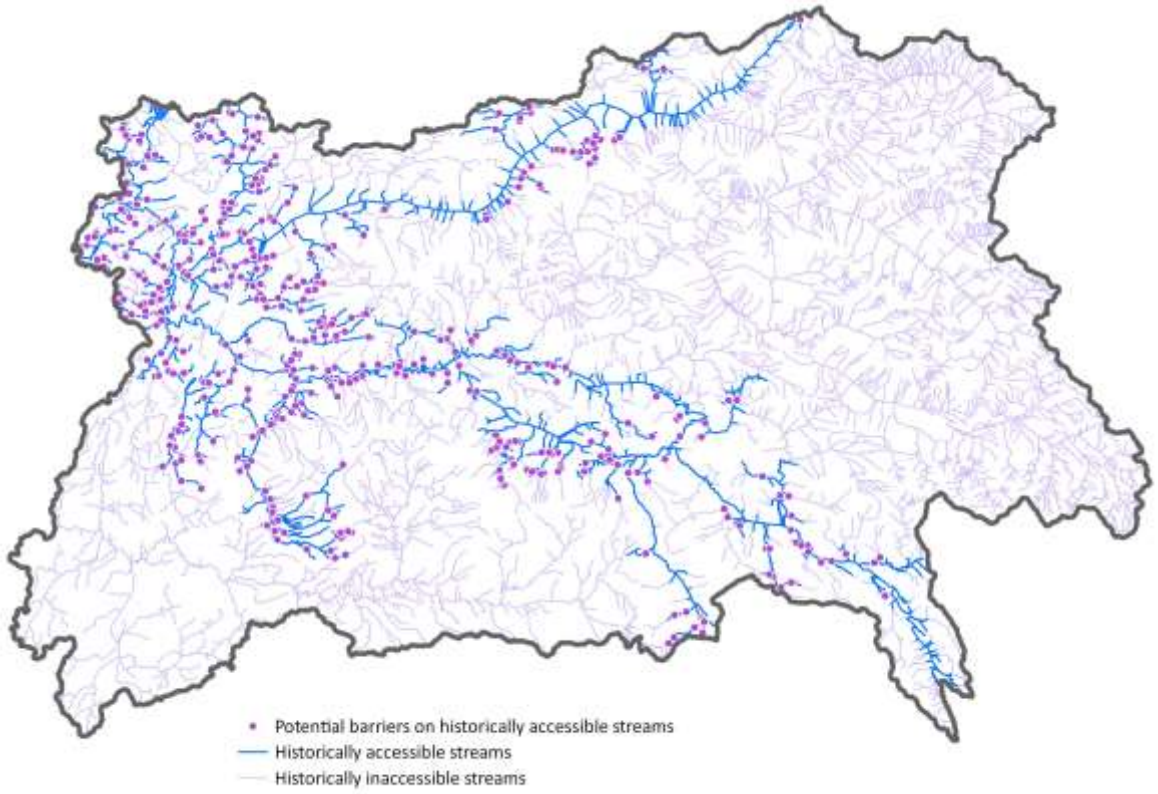


All barriers
(2442)

Historically accessible streams



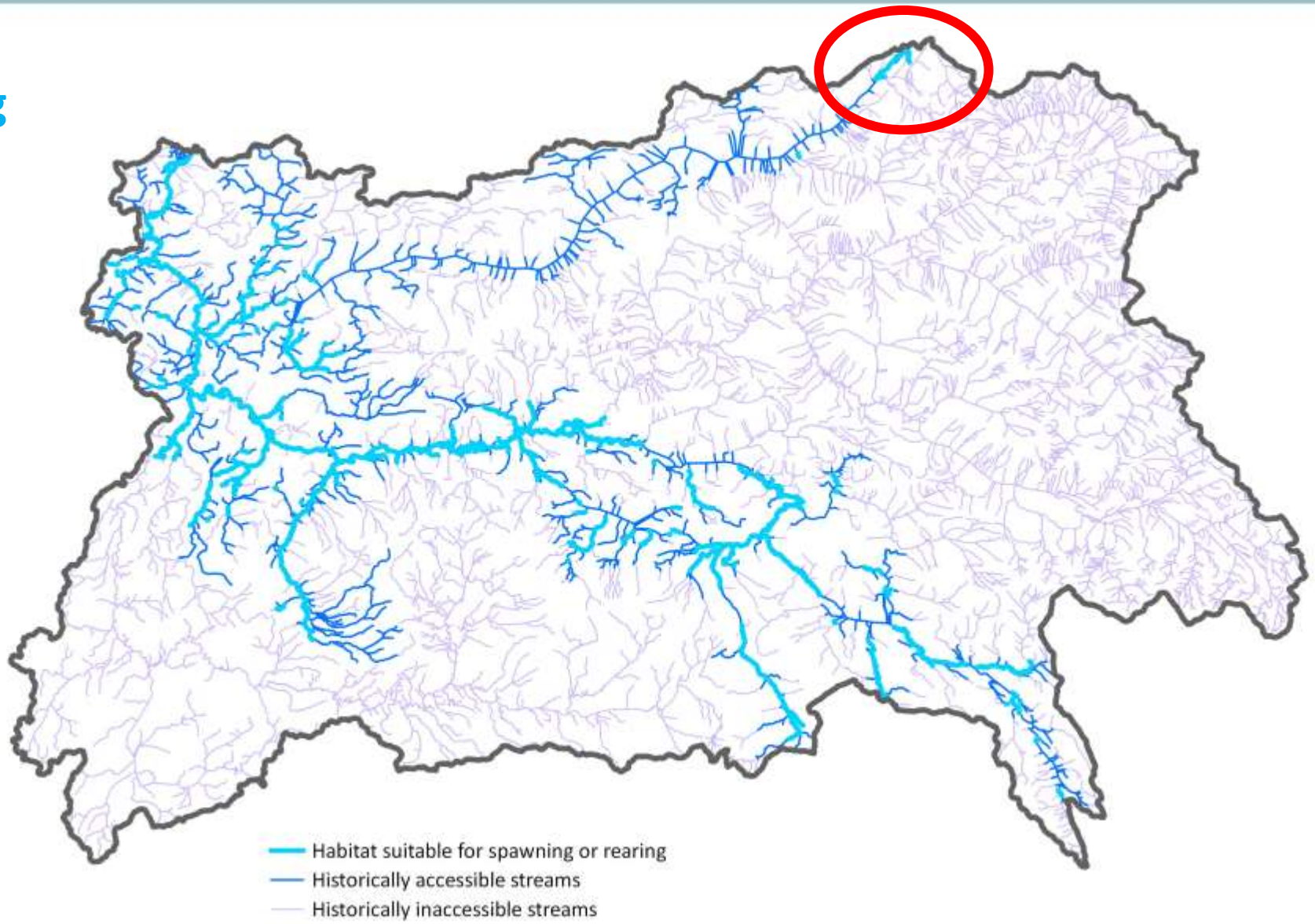
533 barriers on historically accessible streams



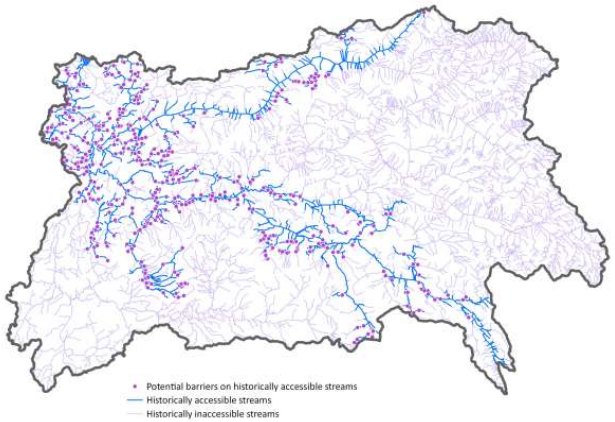
3. Identified important habitats

- **Salmon spawning and rearing habitat** located on historically accessible streams

- Combination of models, observation data, and local knowledge

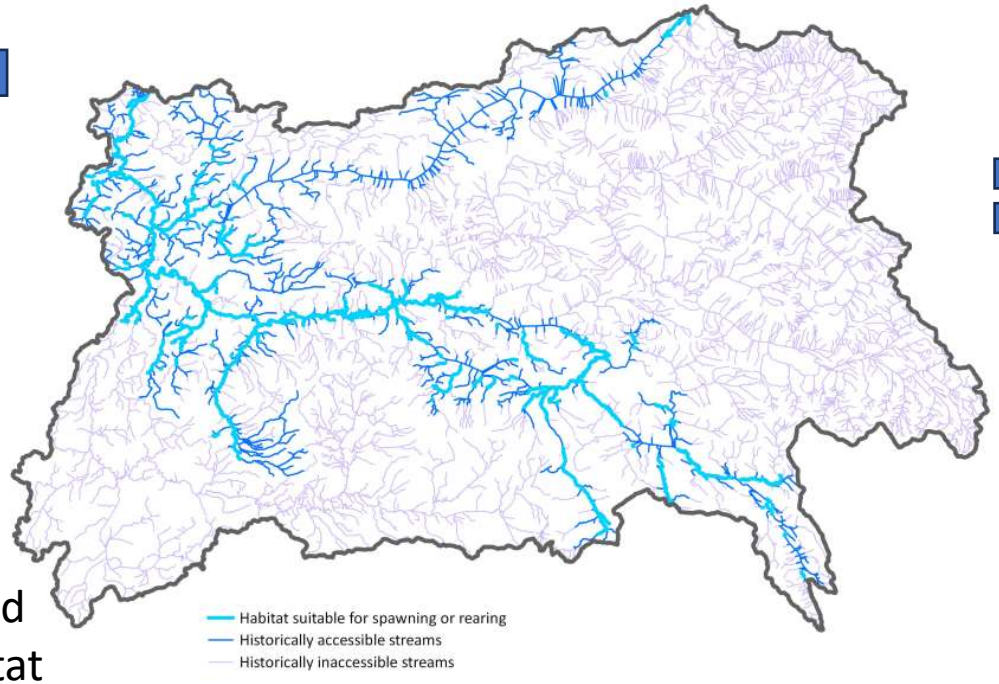


4. Further reduced number of barriers to consider

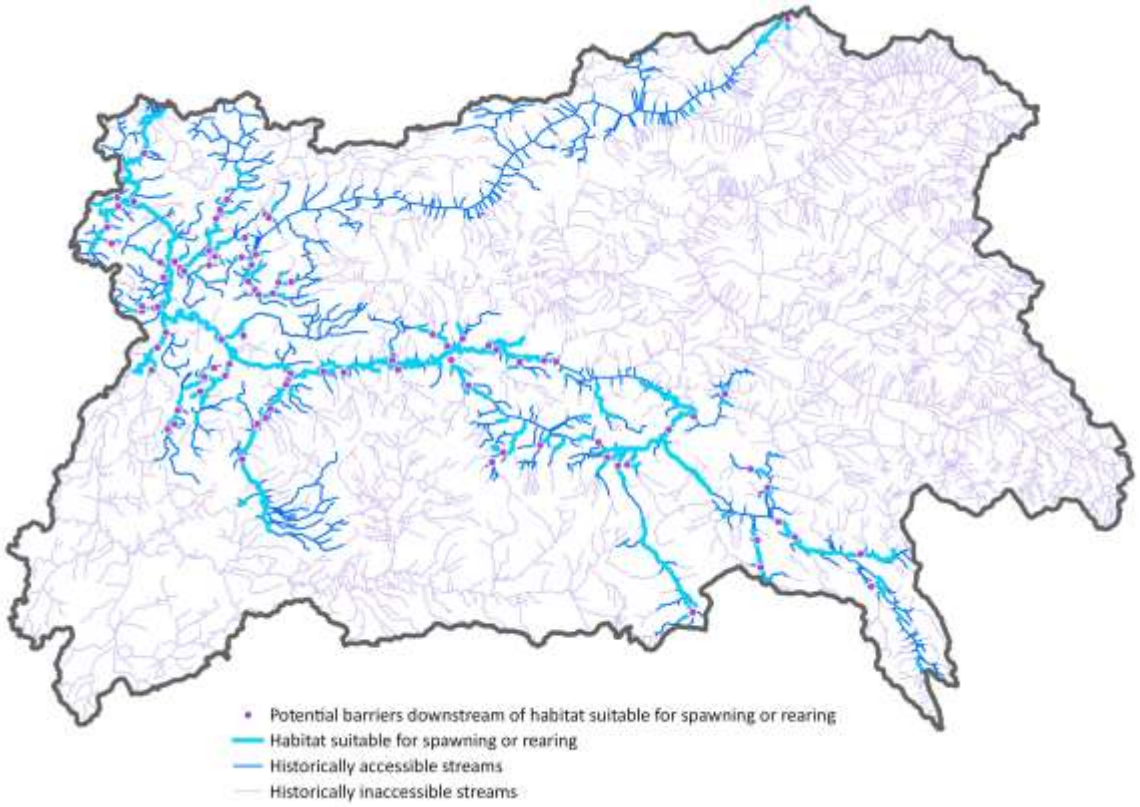


Barriers on historically accessible streams (533)

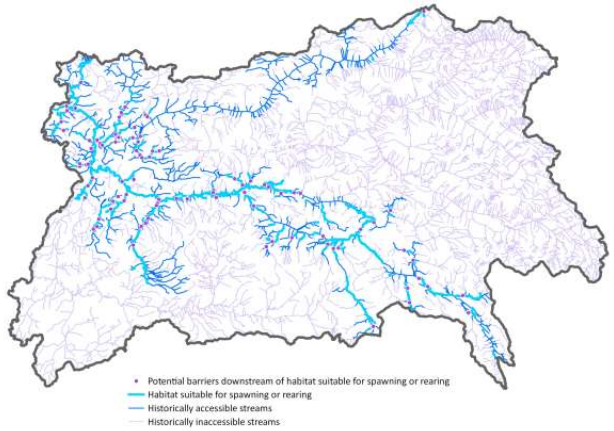
Barriers downstream of salmon spawning and rearing habitat = **109**



Salmon spawning and rearing habitat



5. Incorporated existing assessment data to exclude additional barriers

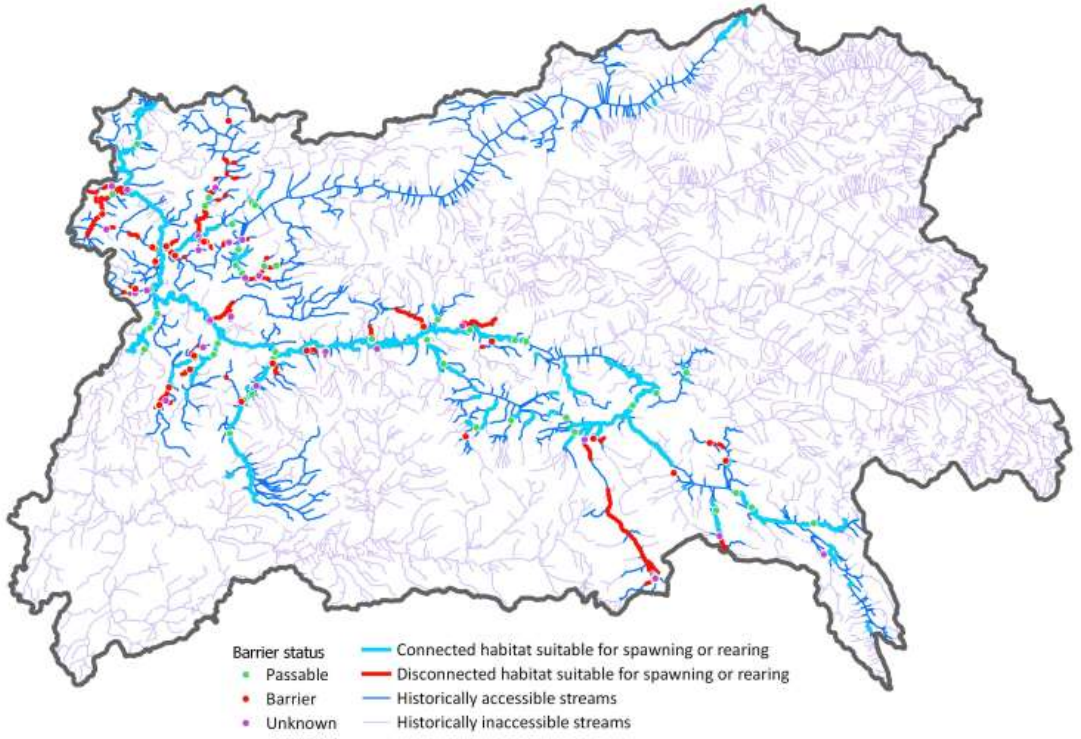


Barriers downstream of salmon spawning habitat (109)

Existing barrier assessment data

- Removed structures assessed as passable (32)
- Retained structures:
  - that were previously assessed as barriers (24)
  - where status remains unknown (not assessed; 53)

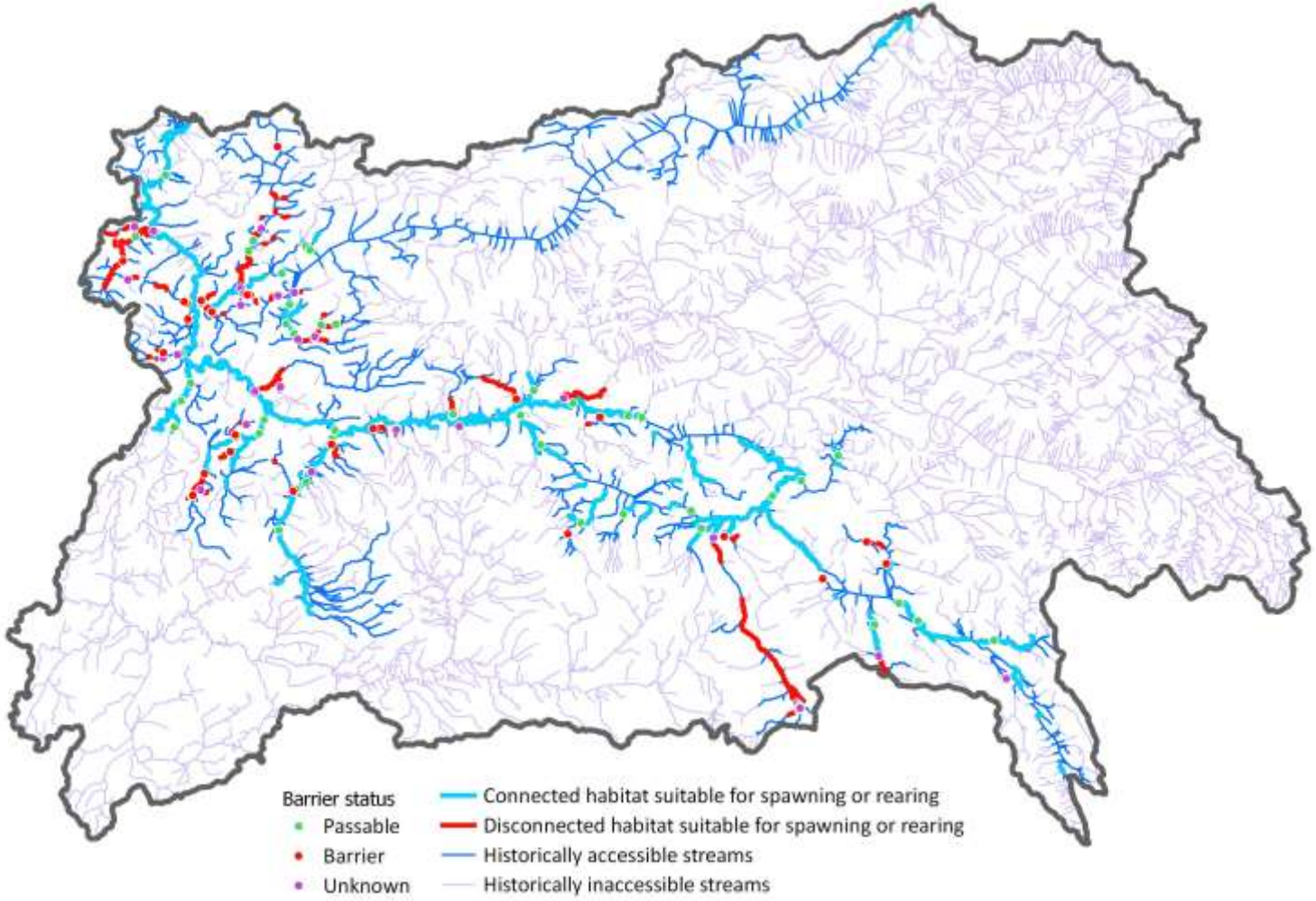
Barriers to be considered for field assessments and when estimating connectivity status = **77**



6. Estimated connectivity status

Estimated connectivity status based on how much salmon habitat was upstream of the 77 presumed barriers

Connectivity status = 81%



7. Established SMART goals

a			Indicator Ratings			
Target Species	**KEA**	**Indicator**	**Poor**	**Fair**	**Good**	**Very Good**
Anadromous Salmon	Available Habitat	% of total linear habitat connected	<80%		81 – 90%	>90%
Current Status:					**81%**	
Comments: Indicator rating definitions are based on the consensus decisions of the planning team, including the decision not to define "Fair". The current status is based on the CWF Barrier Prioritization Model output, which is current as of August 2021.						

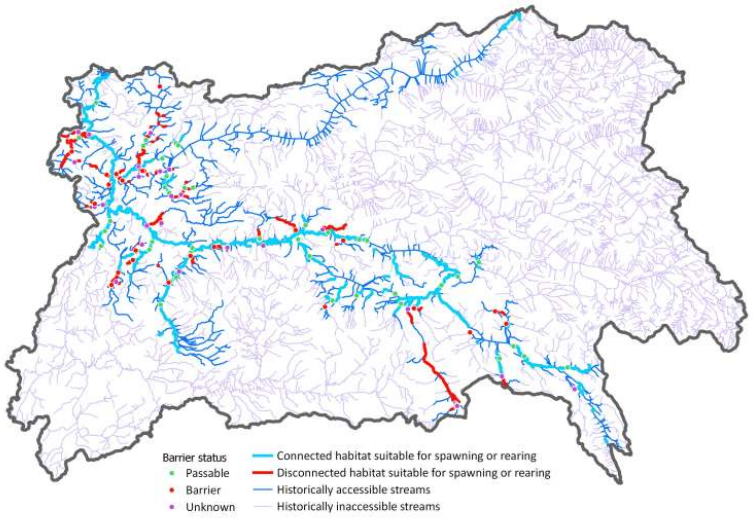
Goal #	Goal
1	By 2040, the percent (%) of total linear habitat accessible to anadromous salmon will increase from 81% to 91% within the Horsefly River watershed (i.e., reconnect at least 57.3 km of habitat).
2	By 2023, the total area of overwintering habitat accessible to Anadromous Salmon will increase by 1,500 m^2 within the Horsefly River watershed.

9. Prioritized barriers for assessment

- As part of the action plan, identified a subset of target 'barriers' (10 of 24) and 'unknowns' (20 of 53) for field assessment
- Considered pairs/sets of barriers
- Top-30 selected based on the initial goal to reconnect 57.3 km

ID	Stream name	Data source	Barrier type	Assessment status (completed to date)	Barrier status	Number of downstream barriers	Spawning and rearing habitat blocked – all species (km)
1006800520	Woodjam Creek	Modelled crossing	Road-stream crossing - Resource		P	0	22.58
57292	Bassett Creek	PSCIS	Road-stream crossing - Resource	Habitat Confirmation	B	1	11.07
57596	Tributary to McKinley Creek	PSCIS	Road-stream crossing - Resource	Assessed	B	0	9.43
1006800319	Niquidet Creek	Modelled crossing	Road-stream crossing - Resource		P	0	4.36
197701	Tributary to McKinley Creek	PSCIS	Road-stream crossing - Resource	Assessed	B	0	3.43

11. Updated estimates of current connectivity status

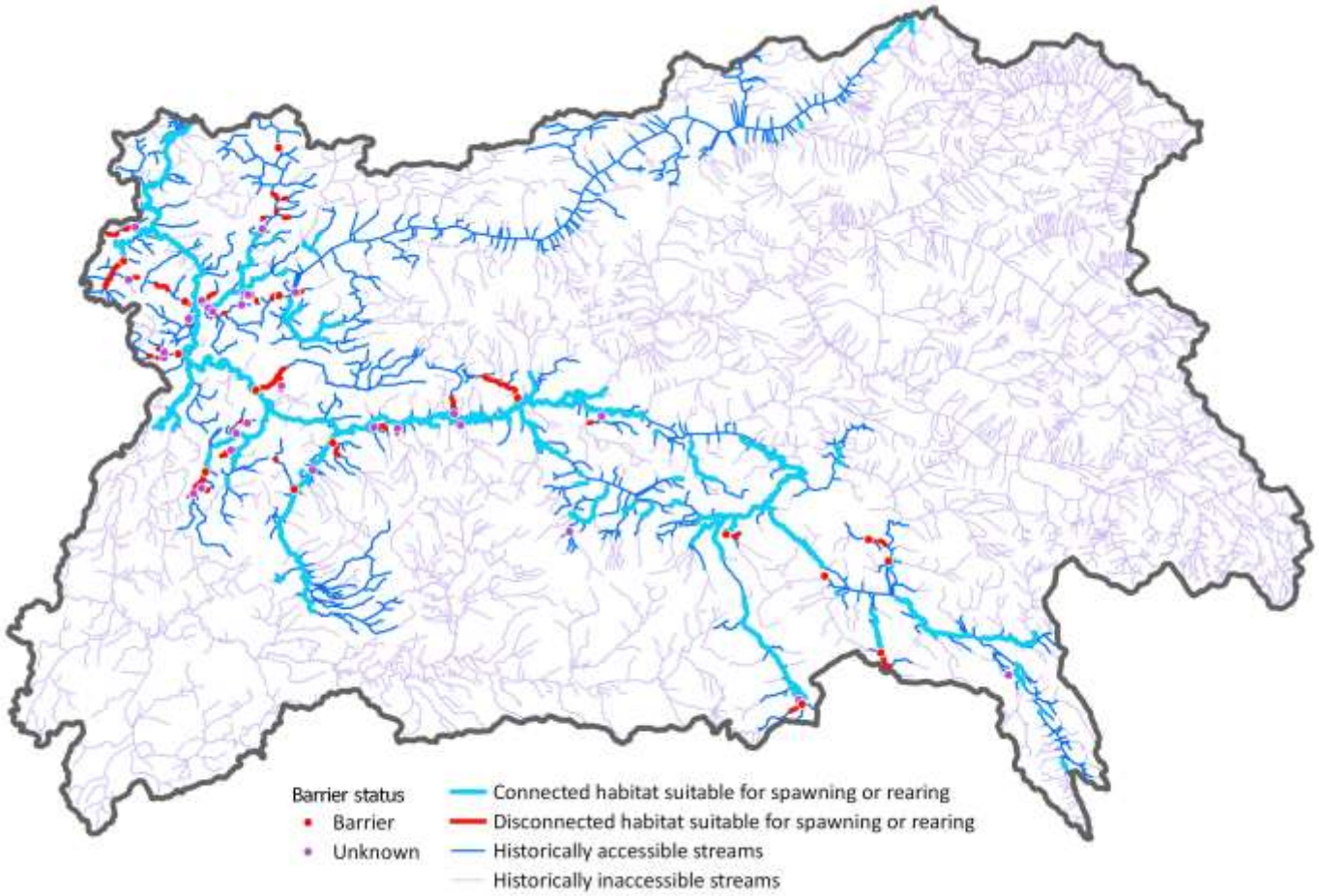


Confirmed (24)
+ unknown (53)
barriers = 77

Connectivity status = 93%;
confirmed (17) + unknown (33)
barriers= **50**

2020 + 2021 field assessment results:

- Some previously confirmed barriers excluded because habitat was unsuitable for salmon
- Additional structures assessed and confirmed or excluded



Horsefly River WCRP success stories

- Started with 2433 crossings & 9 dams = 2442 structures
- 30 structures assessed in 2020 +2021
- After field assessments: **17 priority barriers** blocked 16 km of habitat
  - Up to **33 with 'unknown' status** may block another 21 km of habitat

Habitat Type	Currently accessible (km)	Total (km)	Current Connectivity Status	Goal	Gain required (km)
Spawning and Rearing	~~450~~ 490	~~558~~ 527	~~81%~~ 93%	~~91%~~ 96%	~~57.3~~ 16

How to address priority barriers

1. CWF-led restoration projects
   - e.g., culvert on Boscar Lake Creek Road
   - Road deactivated in 2022
   - Funded by:
     - Pacific Salmon Commission Southern Endowment Fund
     - Canada Nature Fund for Aquatic Species a Risk
     - BC Salmon Restoration and Innovation Fund
2. Campaigning/Enforcement
   - Unnecessary so far

Before

After

How to address priority barriers

3. Direct action by barrier owners
   - Ministry of Transportation and Infrastructure developing designs for two barriers, aiming to address in 2024
   - Considering designs for two others
4. Partner-led restoration projects
   - Williams Lake First Nation received provincial funding for habitat restoration
   - Seeking to commission designs for two sites in 2023 to address in 2024
   - Considering assessing the remaining 33 potential barriers
5. Novel collaboration with industry
   - Tolko (Forestry company) is replacing culverts with bridges
   - Recovering costs through reductions in stumpage fees paid to the province
   - One priority barrier addressed in 2023, two or three others planned for this year

Of nearly 2500 potential barriers, 17 were identified as priorities by 2022

- Since then, 2 have been addressed and 9 others are progressing

Conclusions and lessons learned

- Consider all barrier types simultaneously
  - Cannot understand the effects of one without the other
- Combine models and local knowledge
  - Each may ‘see’ what the other does not
- Prioritize for field assessment
  - Reduces cost and effort required to understand the system
- Identify important barriers, seek out appropriate solutions for each
  - Optimization models are idealistic but impractical unless you own all the barriers and have a budget in hand to fix a subset

Thank you! Questions?

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The Canadian Aquatic Barriers Database is a multi-year project that is supported partially by financial contributions from Fisheries and Oceans Canada and the RBC Foundation.

The Watershed Connectivity Restoration Planning framework was developed, in part, with support from Fisheries and Oceans Canada and the Province of BC.

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