CANADIAN WILDLIFE FEDERATION

Watershed Connectivity Planning and Restoration Outcomes

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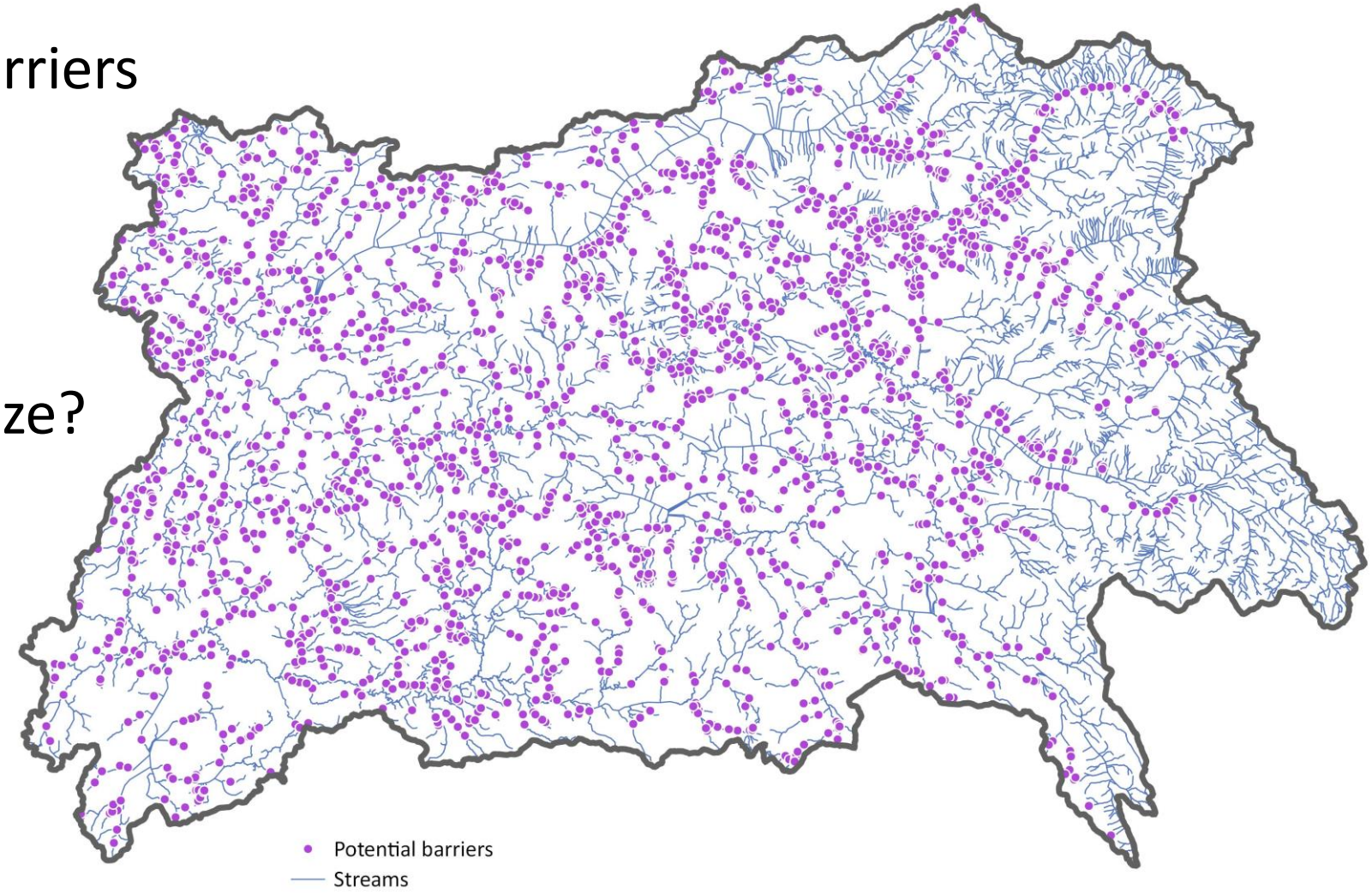
Connectivity Planning Example: Horsefly River Watershed

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

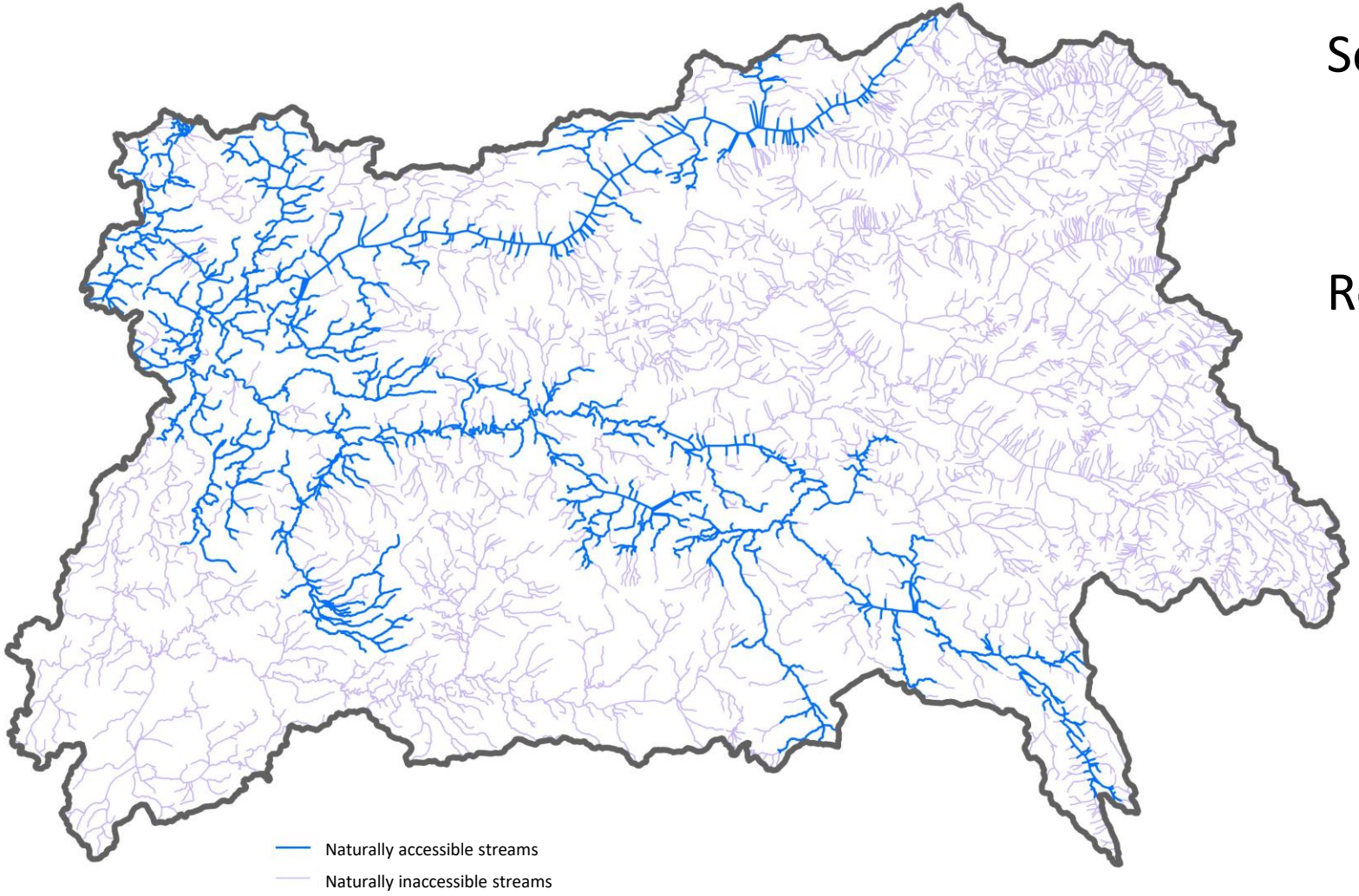
- Living conservation plans, iteratively updated over time
  - Provide a case for conservation/funding

Planning Process Overview

Key Conservation Plan Components:

- Defined geographic area
- 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



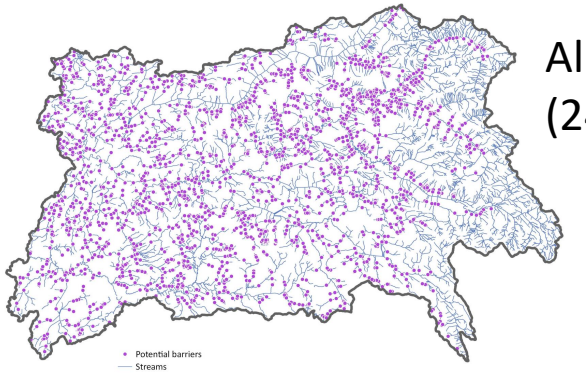
Selected focal species:

- Anadromous salmon

Reduced scope to area of interest:

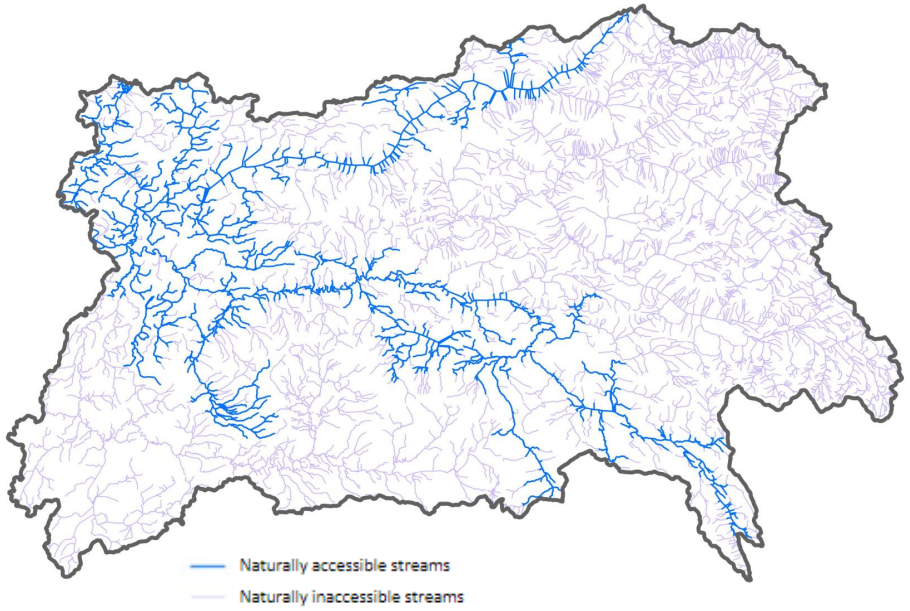
- Streams modeled as **naturally accessible** to salmon based on the following natural barriers:
  - Stream gradient (>15%)
  - Falls (>5 m)
  - Subsurface flows

2. Reduced number of barriers to consider

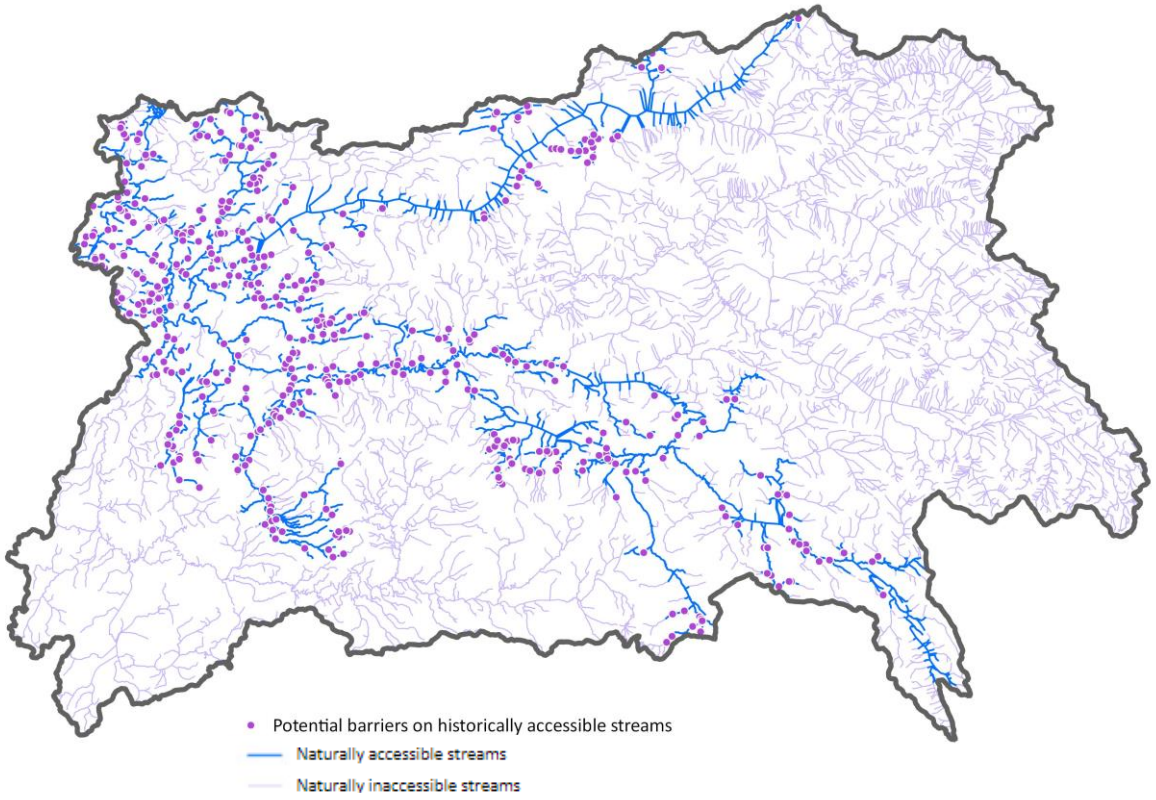


All barriers
(2442)

Naturally accessible streams



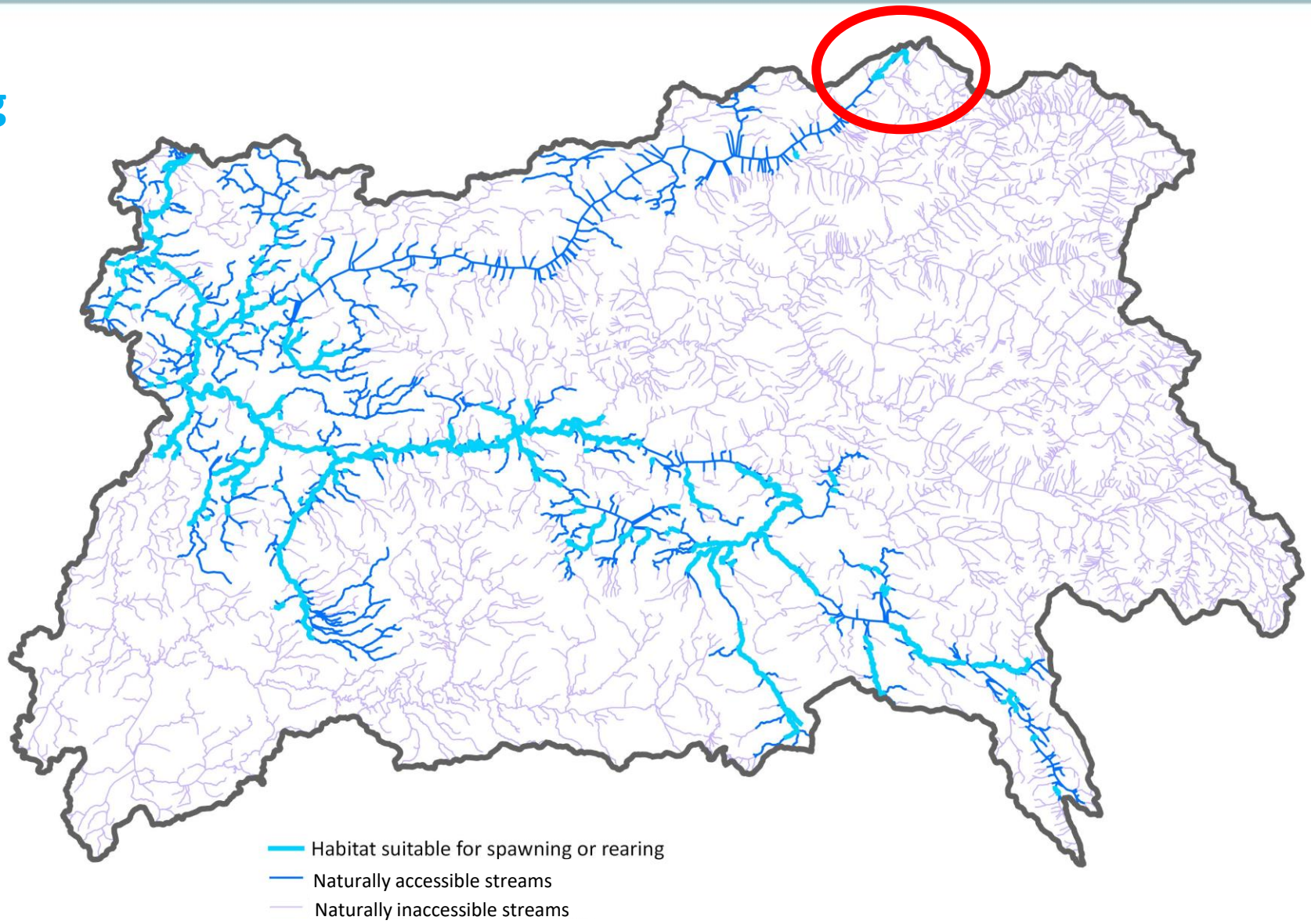
533 barriers on naturally accessible streams



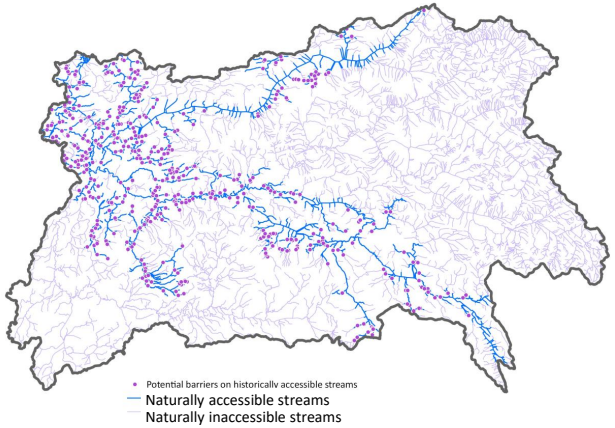
3. Identified important habitats

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

- Habitat identified by:
  - Intrinsic potential models
  - Observation data
  - Local knowledge

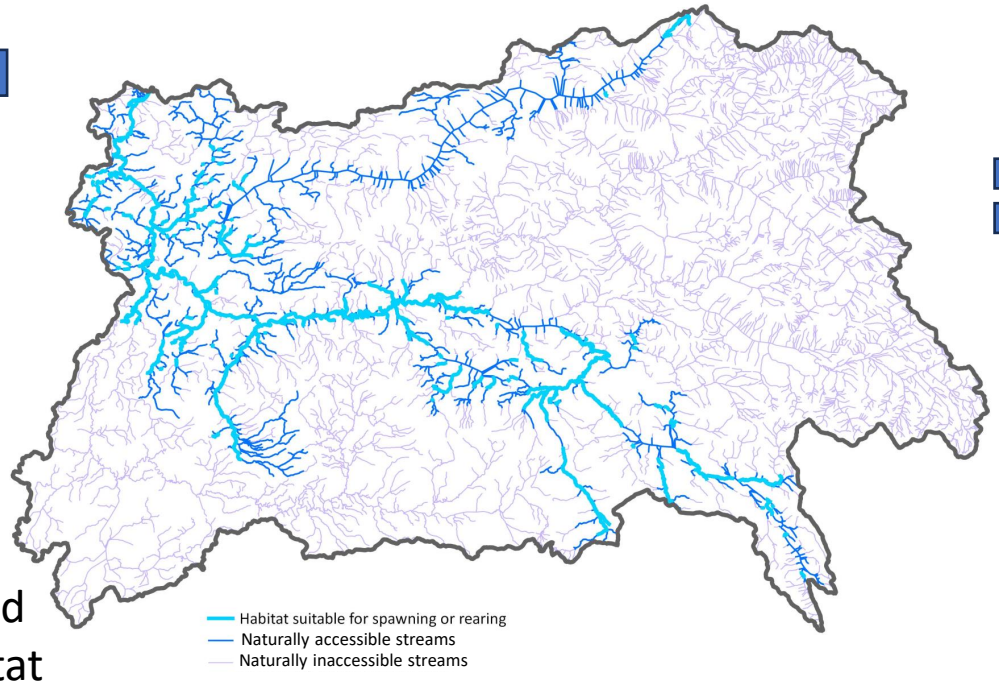


4. Further reduced number of barriers to consider

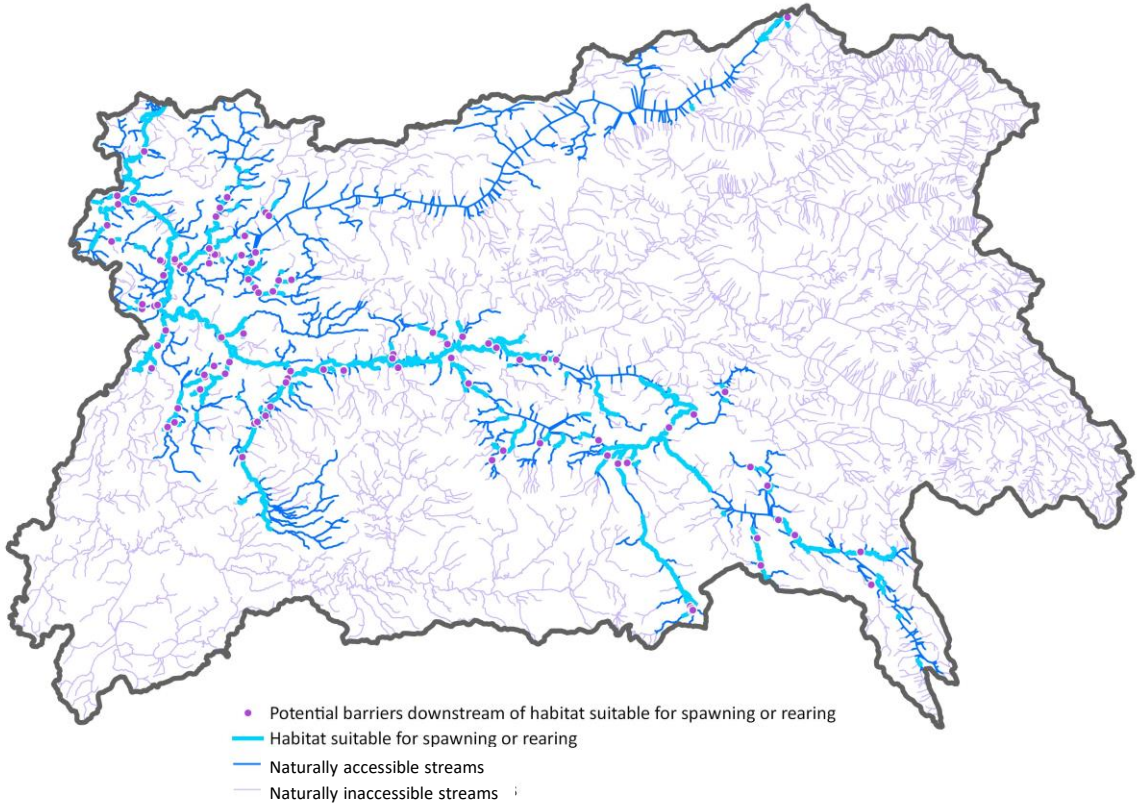


Barriers on naturally accessible streams (533)

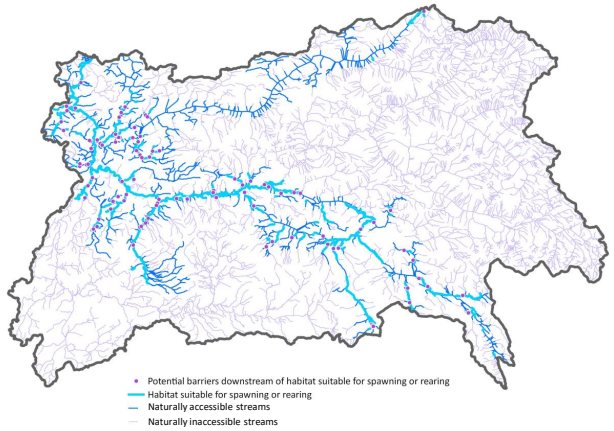
Barriers downstream of salmon spawning and rearing habitat = **109**



Salmon spawning and rearing habitat



5. Incorporated existing assessment data to exclude additional barriers



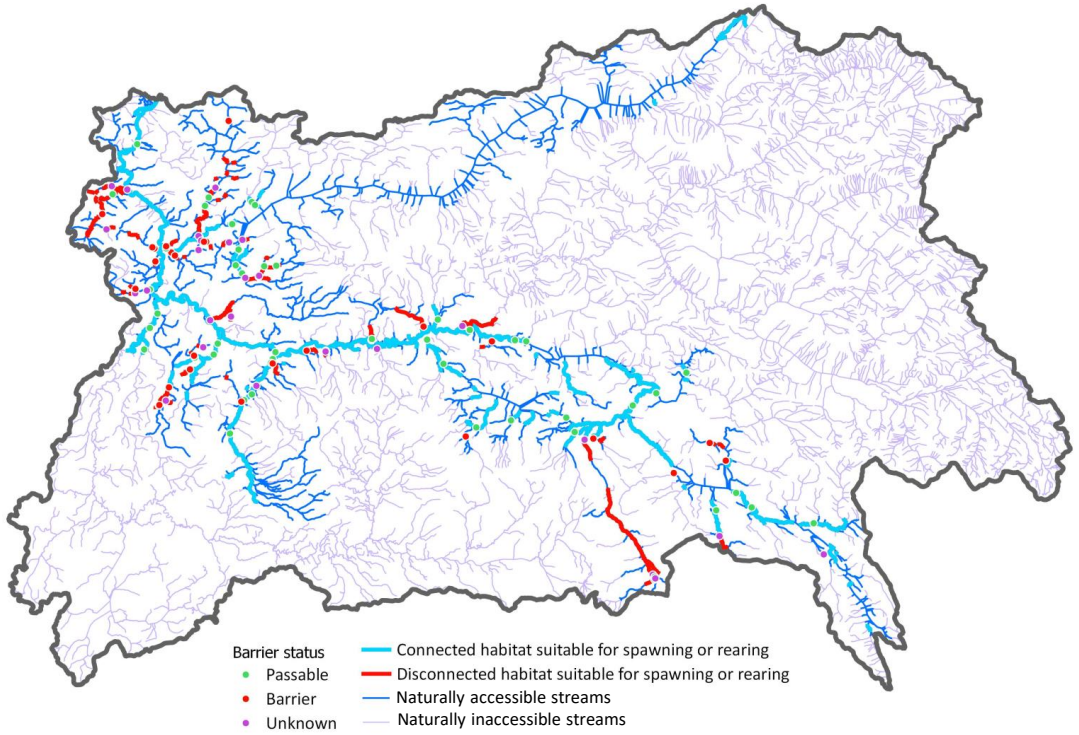
Barriers downstream of salmon spawning habitat (109)

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

Existing barrier-assessment data

+ local knowledge

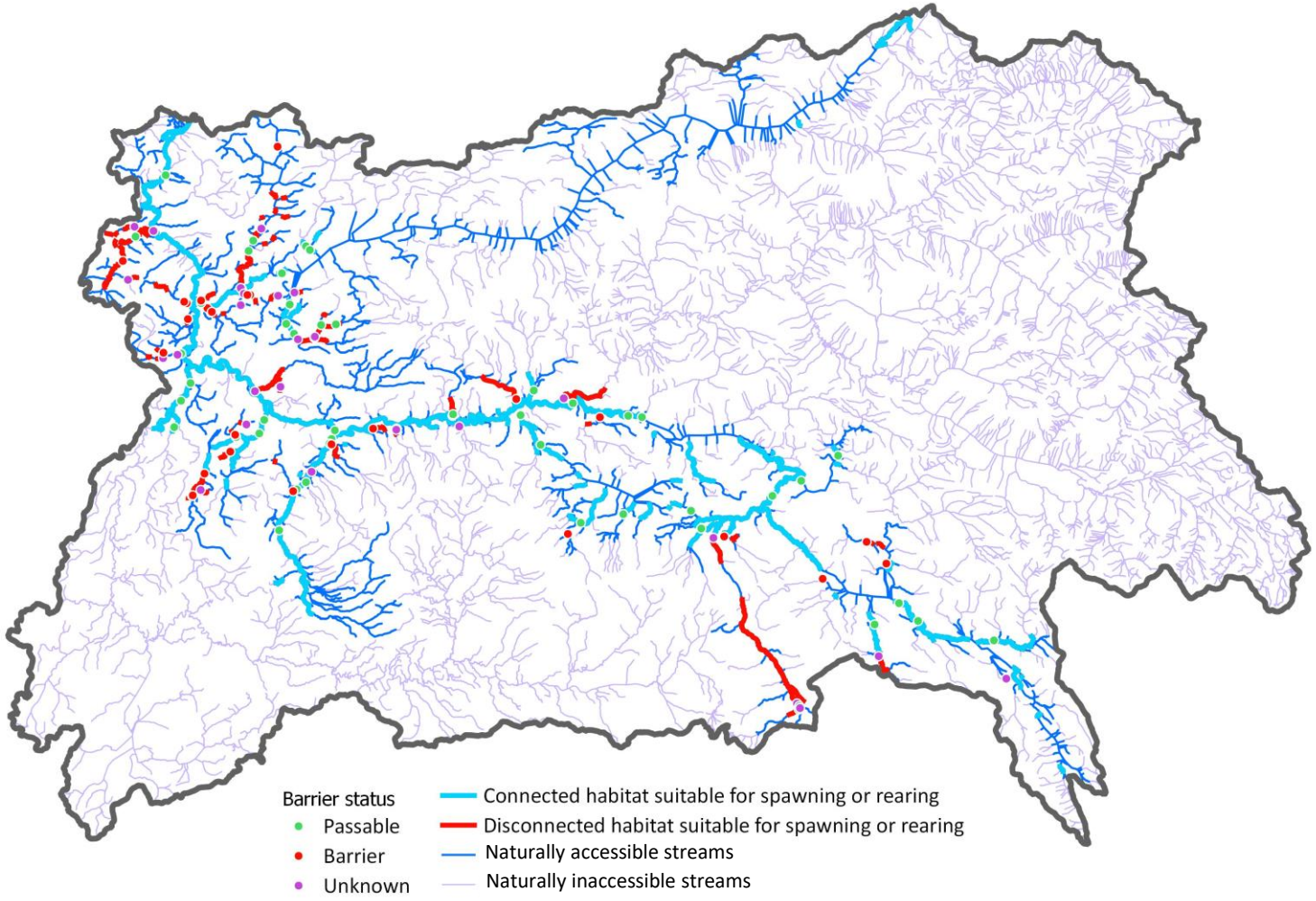
- Removed structures assessed as passable (32)
- Retained structures:
  - that were previously assessed as barriers (24)
  - where status remains unknown (not assessed; 53)



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.

8. Prioritized barriers for assessment

- Considered pairs/sets of barriers
- Top-30 selected for assessment 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

9. Developed Action Plan

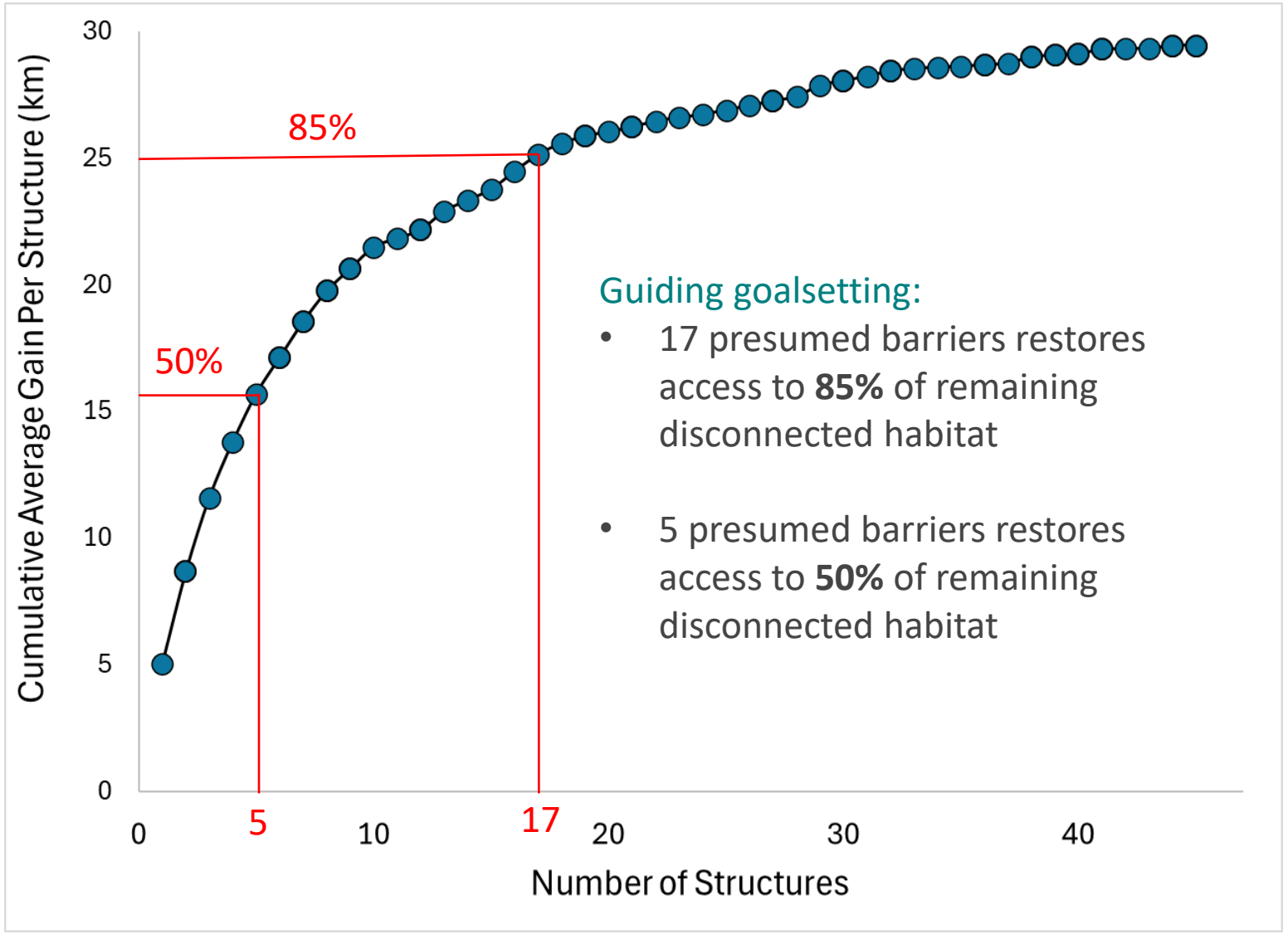
Identified key action items + knowledge gaps = develop action plan

Strategy 2: Lateral Barrier Remediation			**$80,000.00**
2.1 – Remediate dikes / berms / other structures that are acting as barriers	CWF	DFO, Horsefly River Roundtable	*TBD*
2.2 – Initiate a barrier owner outreach program	*TBD*	CWF, DFO	*TBD*
2.3 – Knowledge Gap: Identify and map year-round lateral habitat, as well as overwintering habitat	*TBD*	CWF, DFO, Horsefly River Roundtable Northern Shuswap Tribal Council (NSTC), WLFN	$65,000.00
2.4 – Knowledge Gap: Map lateral barriers and barrier ownership	CWF	DFO, Horsefly River Roundtable	$5,000.00
2.5 – Knowledge Gap: Develop a framework to assess and prioritize between different lateral barrier remediation projects	CWF	DFO	$10,000.00
Strategy 3: Dam Remediation			**$1,305,000.00**

Horsefly River field assessment outcomes

Field assessment results:

- 77 presumed barriers reduced to 51
  - 16 confirmed
  - 35 still need assessment



Horsefly River WCRP outcomes

Updating goalsetting:

- Current connectivity status improved after assessments
  - Some habitat found to be naturally inaccessible = less habitat
  - Some presumed barriers were passable or did not exist = more connected

- Goal reconsidered based on updated knowledge
  - 13 barriers need fish-passage restoration
  - 3 other confirmed barriers had limited habitat upstream

Habitat type	Currently connected (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

Before

After

How to address priority barriers

2. Direct action by barrier owners
   - Ministry of Transportation and Infrastructure developing designs for two barriers
   - Considering designs for two others
3. Novel collaboration with industry
   - Tolko (Forestry company) is replacing culverts with bridges
   - Recovering costs through reductions in stumpage fees paid to the province
   - Two priority crossings addressed in 2023, two others in progress
4. Campaigning/enforcement
   - Unnecessary so far, but to be considered

Of nearly 2500 potential barriers, 13 were identified as priorities by 2023

- 3 have been removed
- 6 are progressing

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
  - Prioritizing for restoration is impractical unless you own all the barriers and have a budget in hand to fix a subset

Broader applications

- Connectivity models are open-source, and available for all salmon watersheds in BC

- Can be run now; however, outputs are greatly improved by incorporating local knowledge
  - Detailed imagery review
  - Incorporate local reports/datasets
  - Review and edit outputs with local knowledge holders

- Quickly produces:
  - Connectivity status estimate
  - Priorities for assessment
  - Context for known barriers