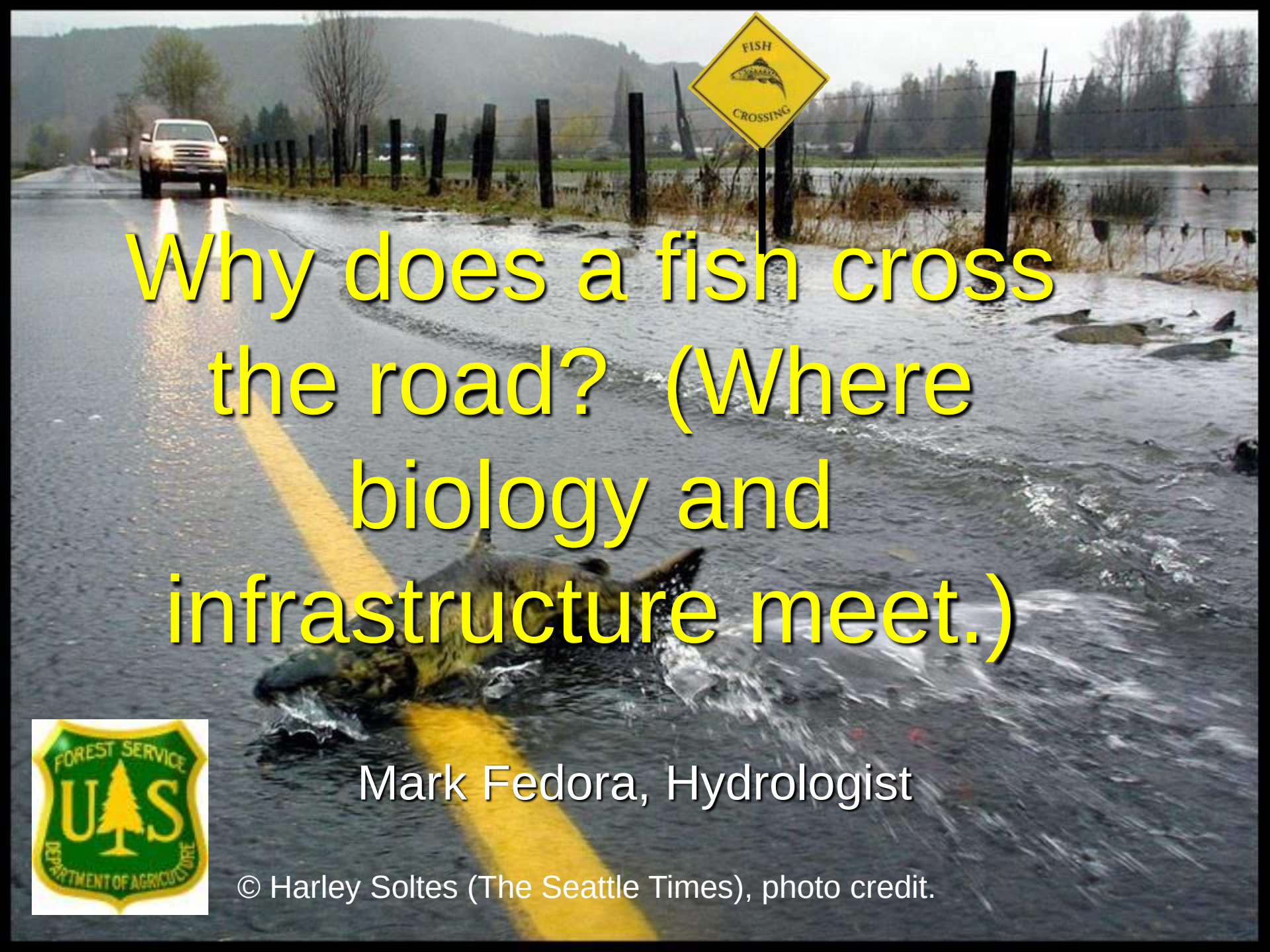
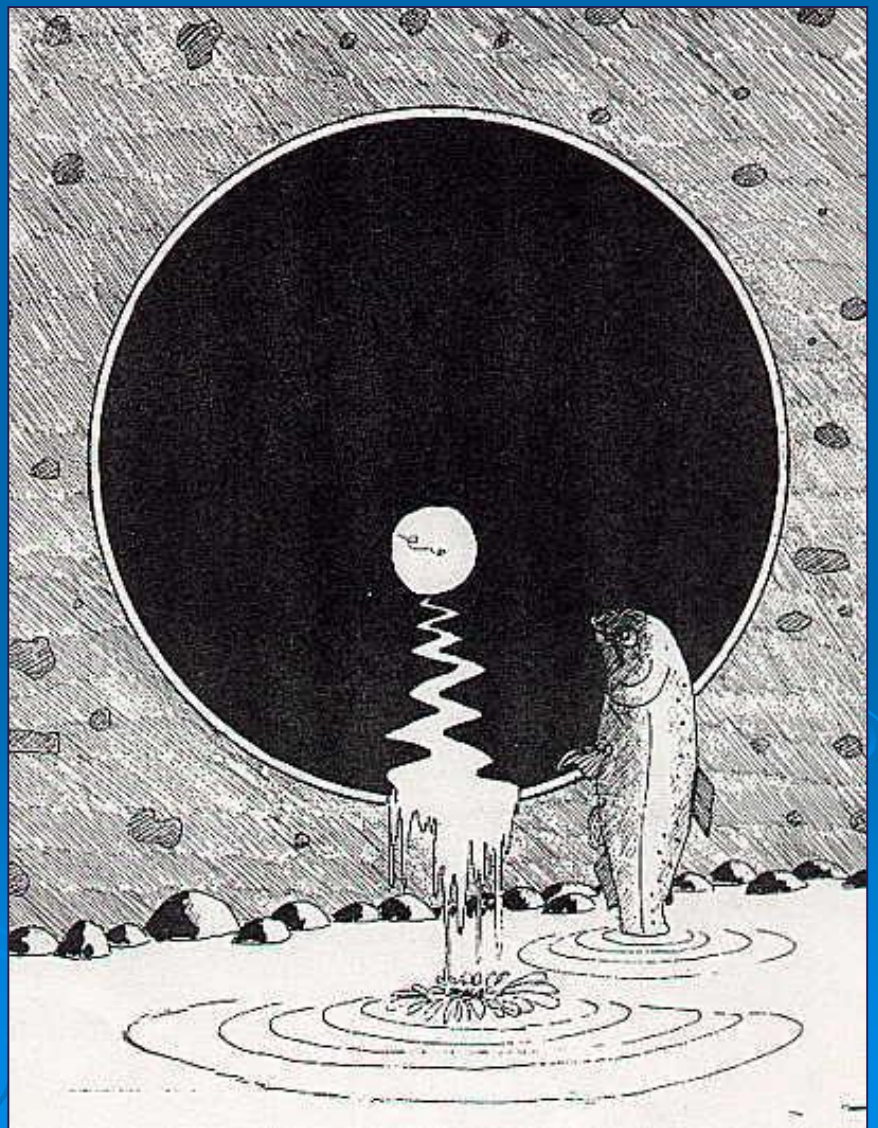


Why does a fish cross the road? (Where biology and infrastructure meet.)

Mark Fedora, Hydrologist

Why would a fish want to cross the road?

- Spawning migration
- Seek cold water
- Seek deep water
- Seek food
- Seek shelter
- Differing habitat requirements for different life stages



What could prevent a fish from moving?

- Dams
- Diversions
- Pollution
- Habitat degradation
- **Roads**

What did the fish say when it hit the wall?

DAM.

Leap barrier

Depth barrier

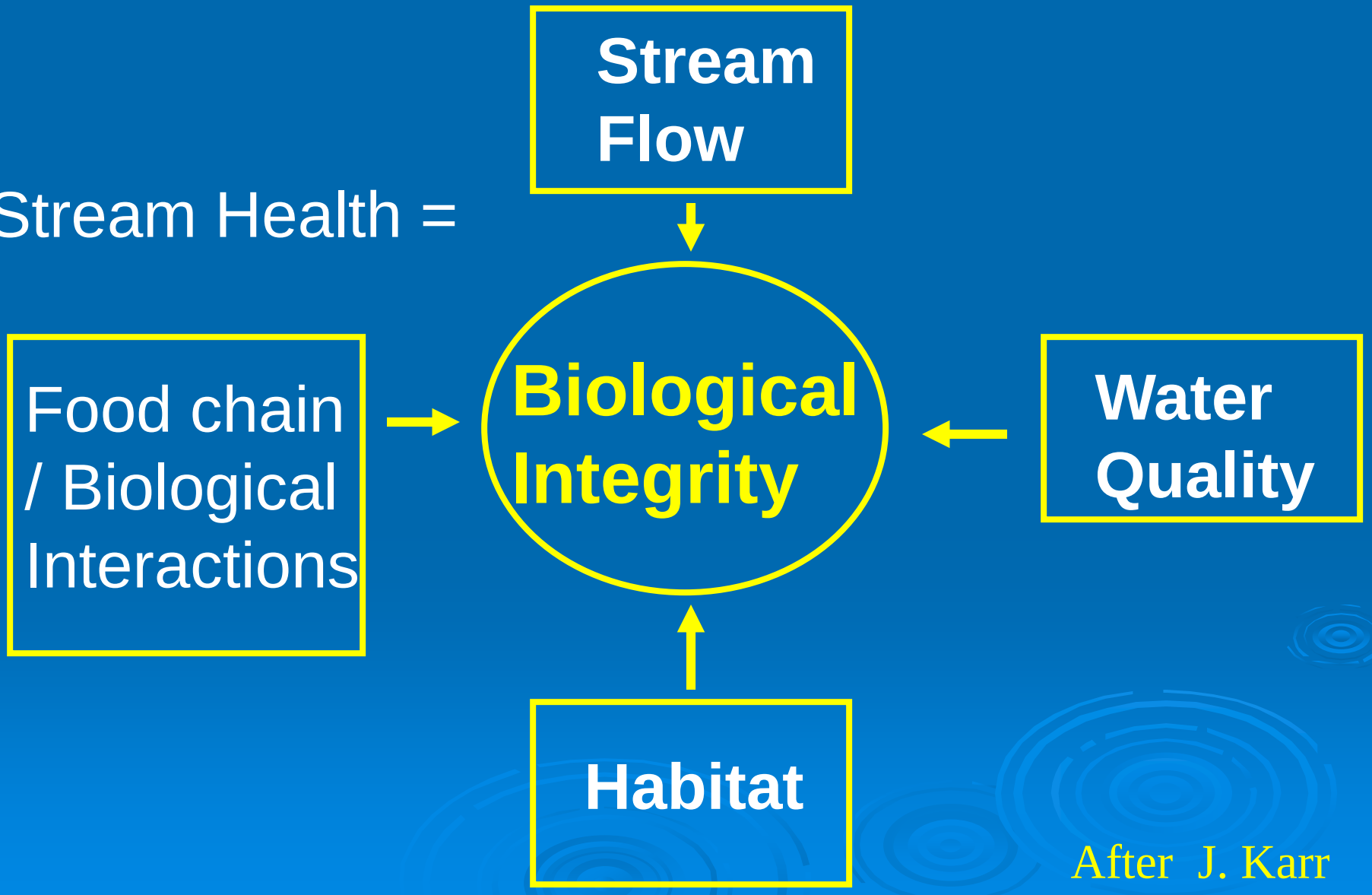
Velocity barrier

Exhaustion barrier

Behavioral barrier

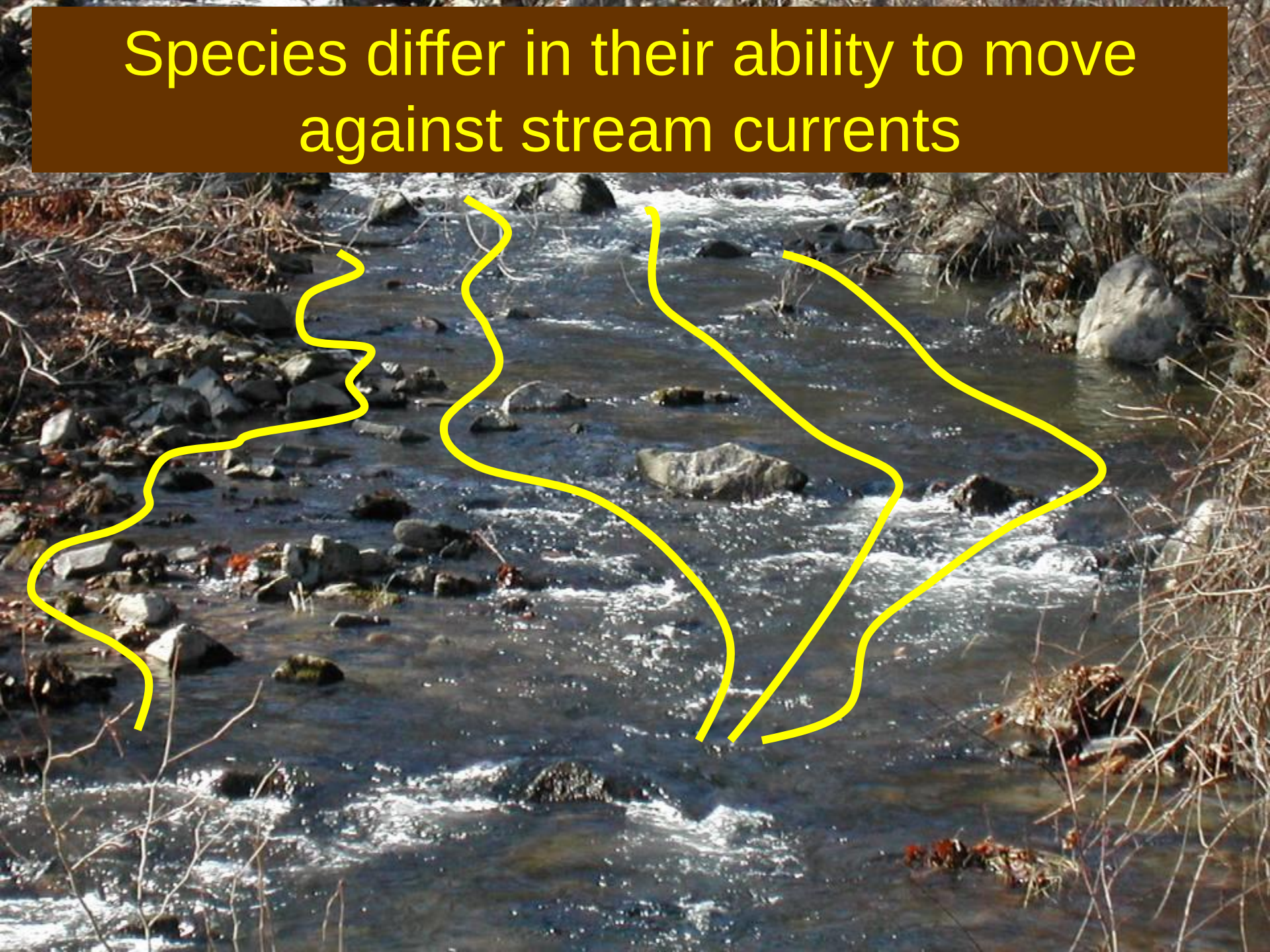
Why does it matter?

Stream Health =

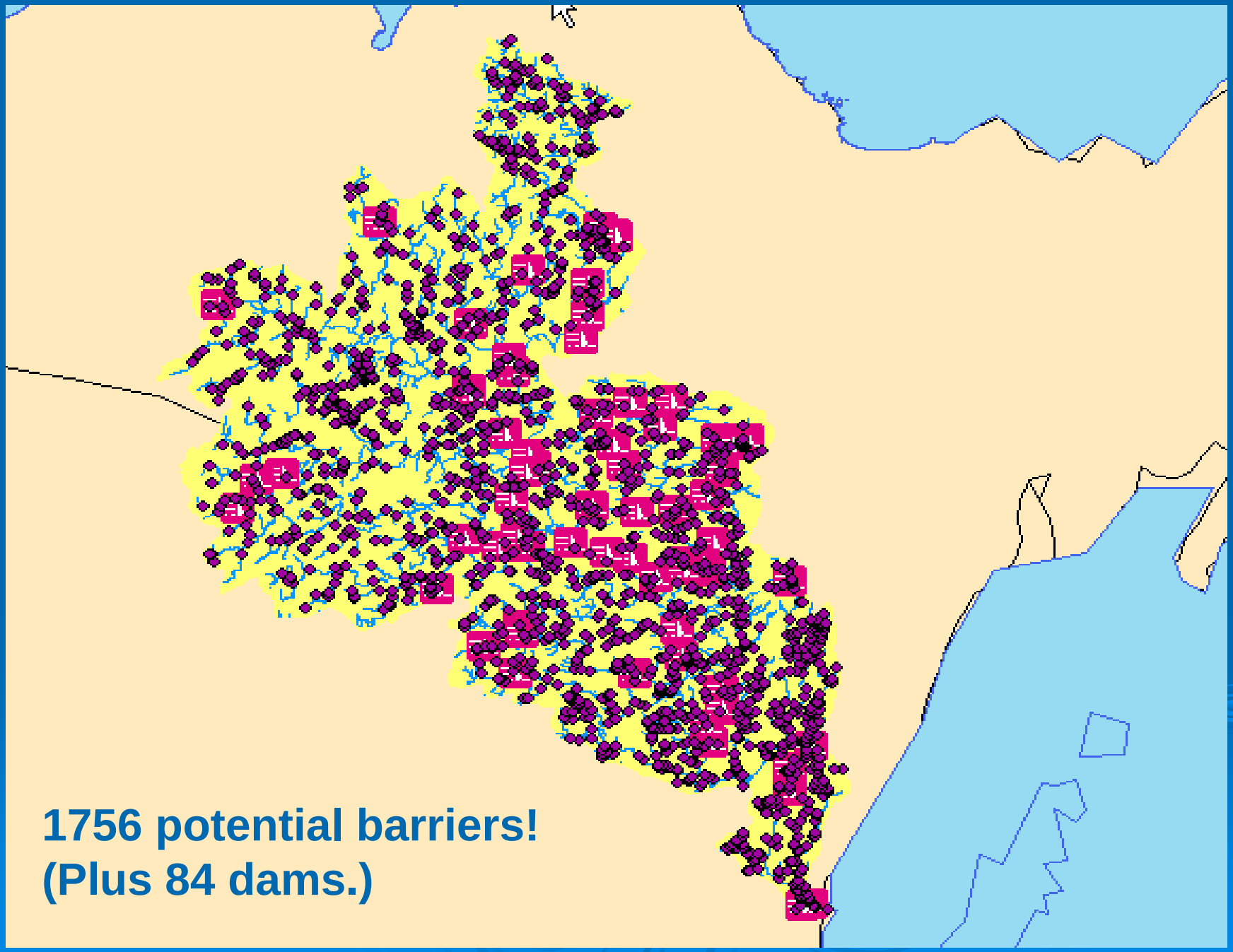


After J. Karr

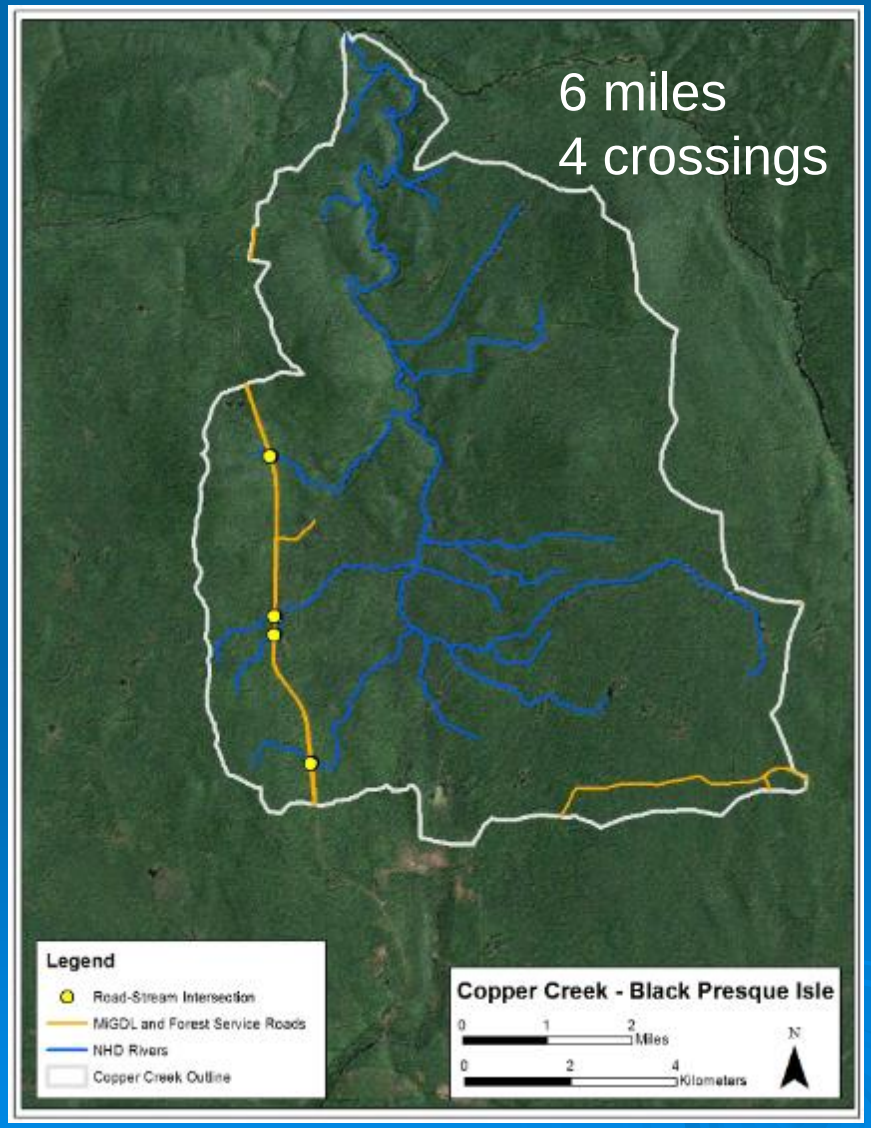
Species differ in their ability to move against stream currents

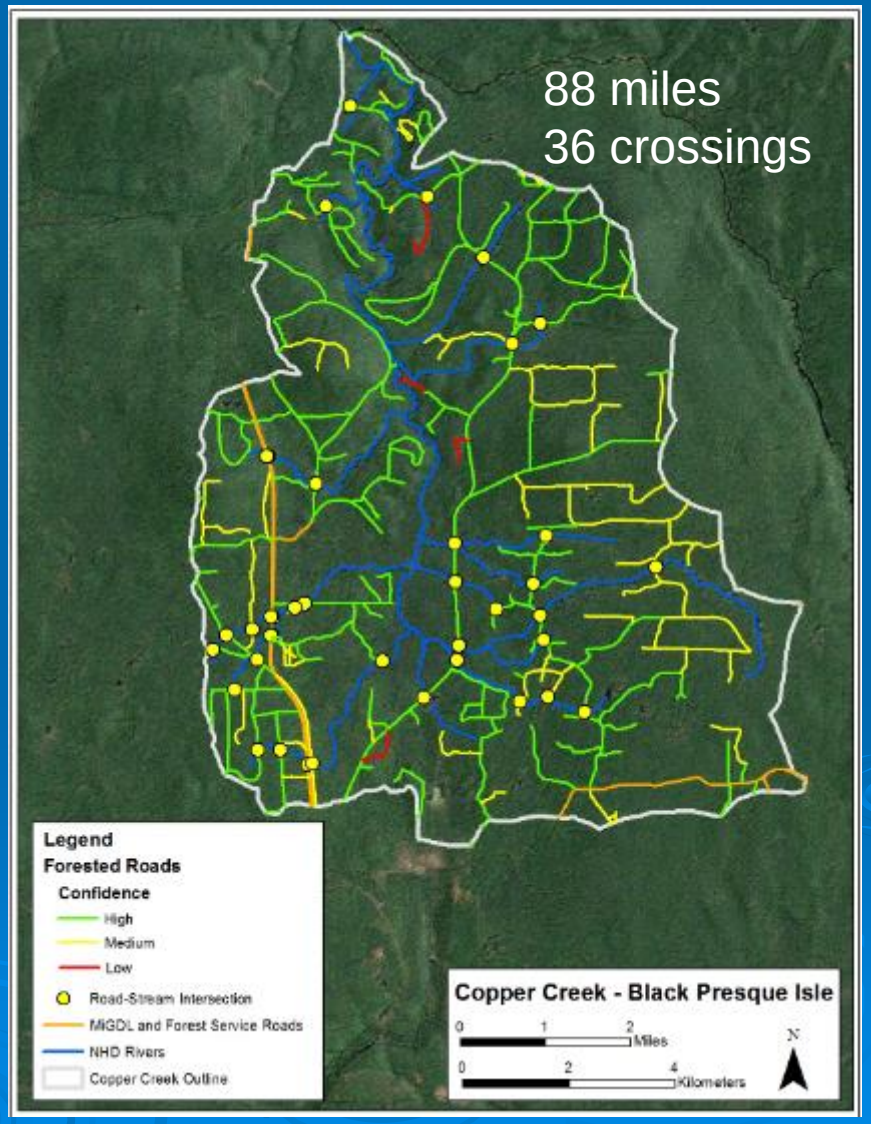


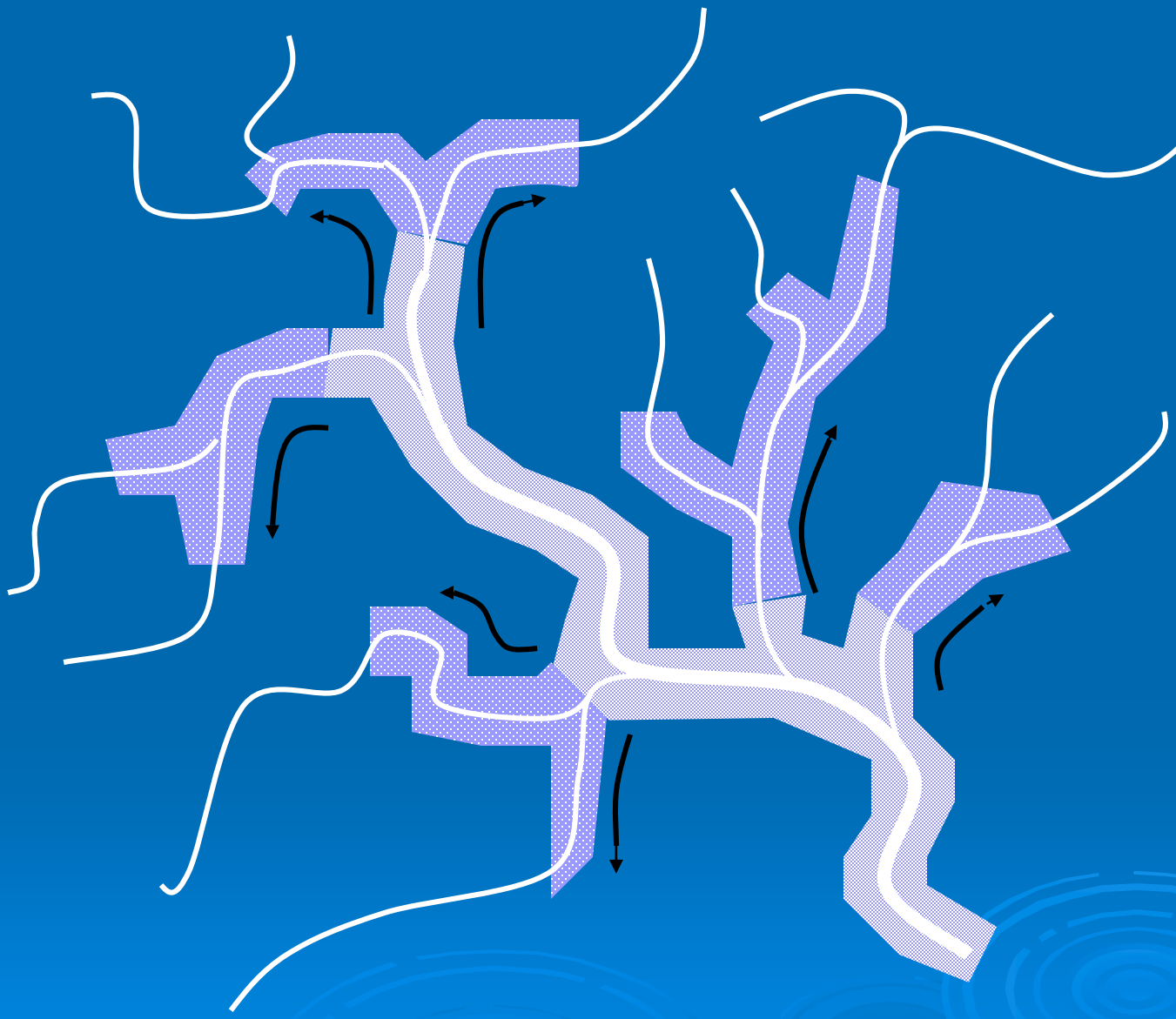
How bad is it?

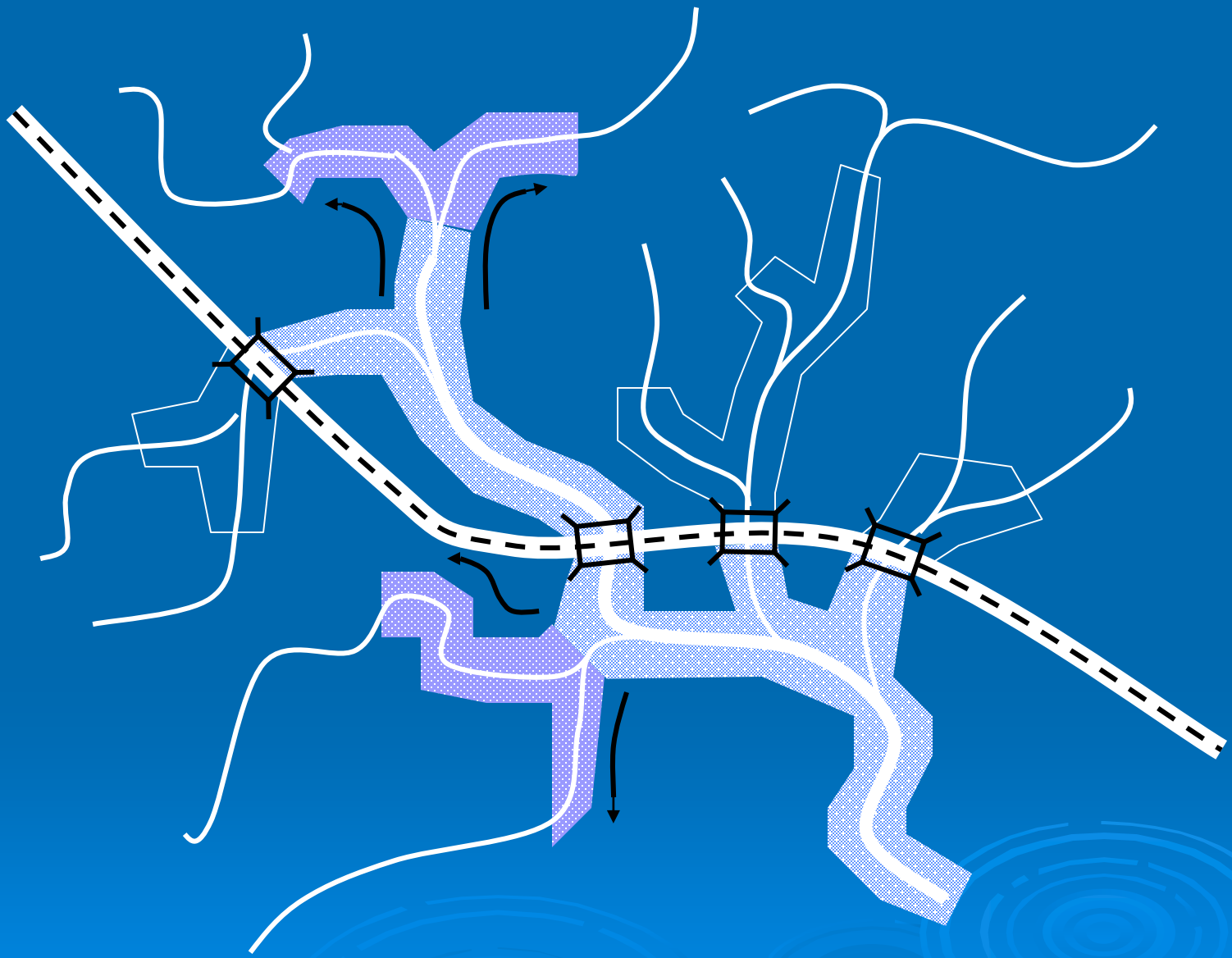

1756 potential barriers!
(Plus 84 dams.)

Mapping unmapped roads





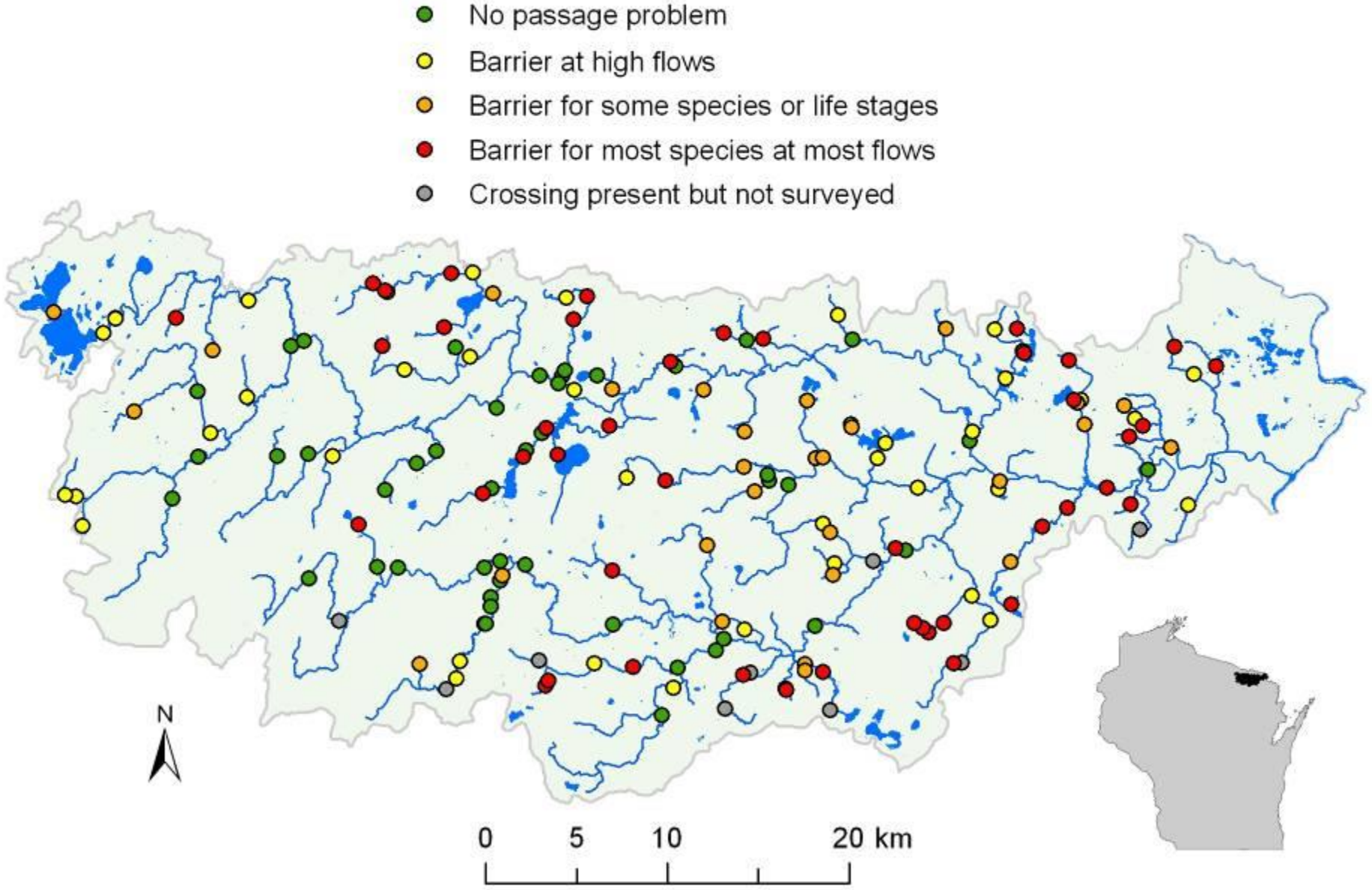




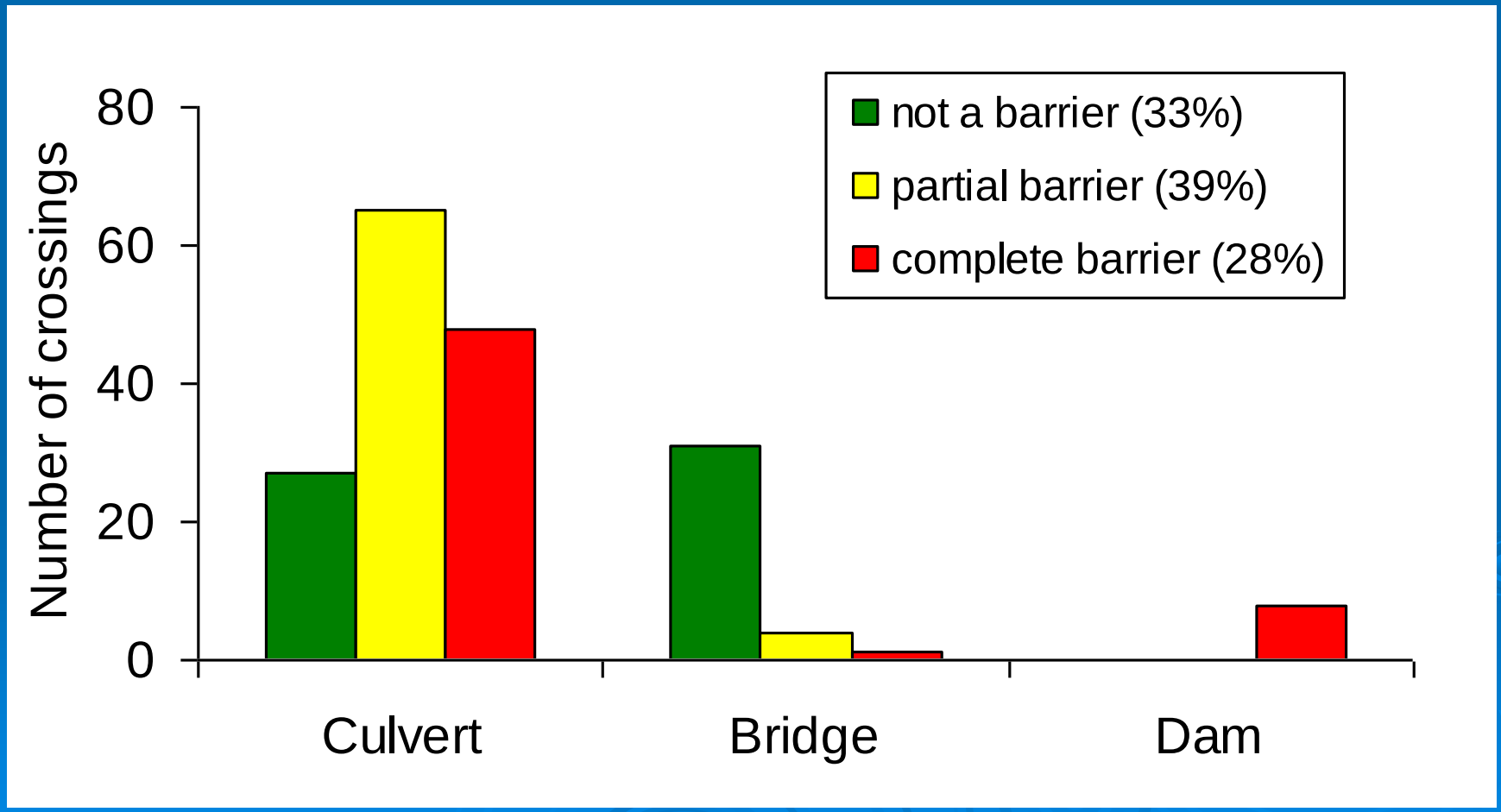
How many crossings are “bad”?

We surveyed 205 sites in the Pine and Popple watersheds, WI

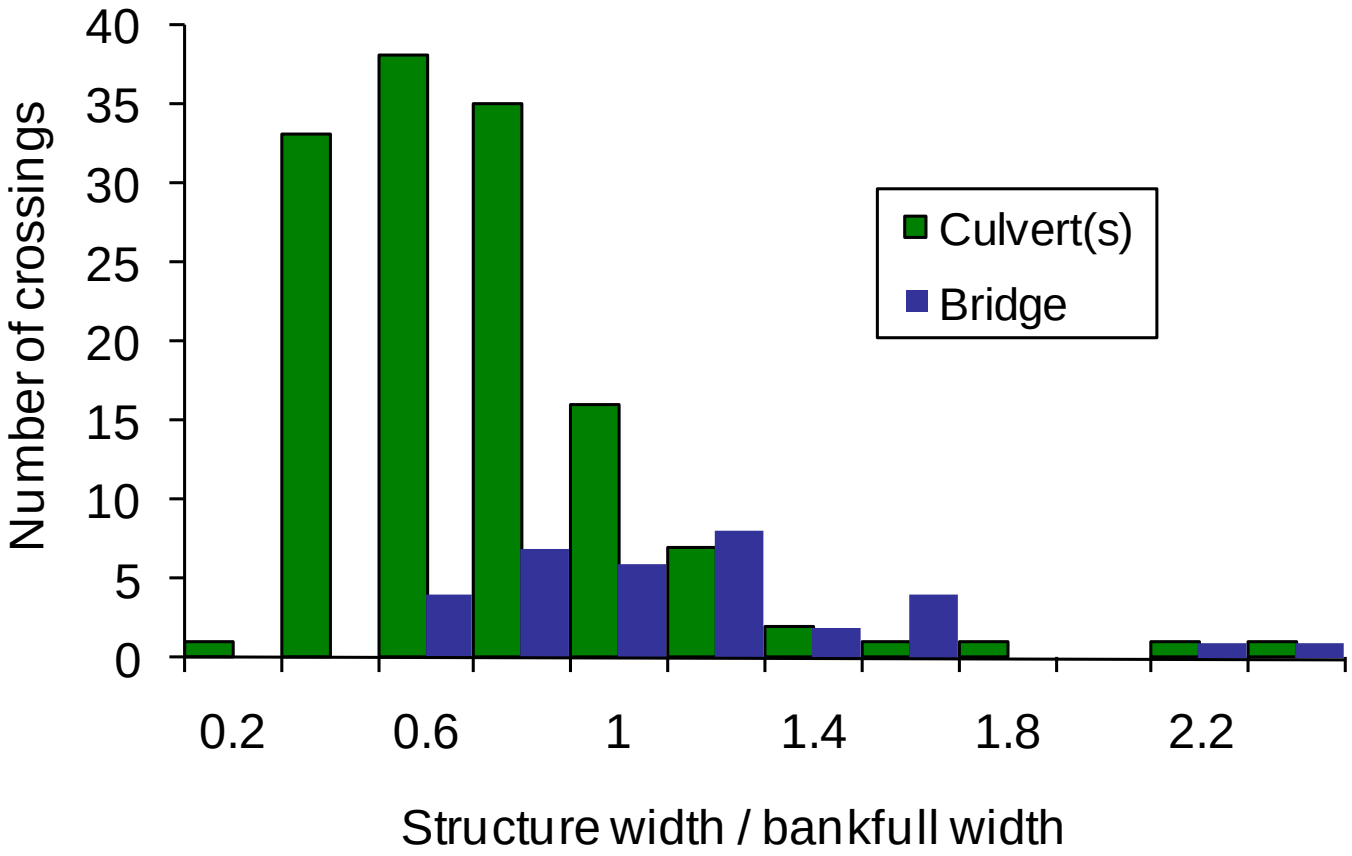
Road Crossings in the Pine-Popple Watershed



What kinds of crossings are barriers?



Why are crossings barriers?



Implications for the Menominee

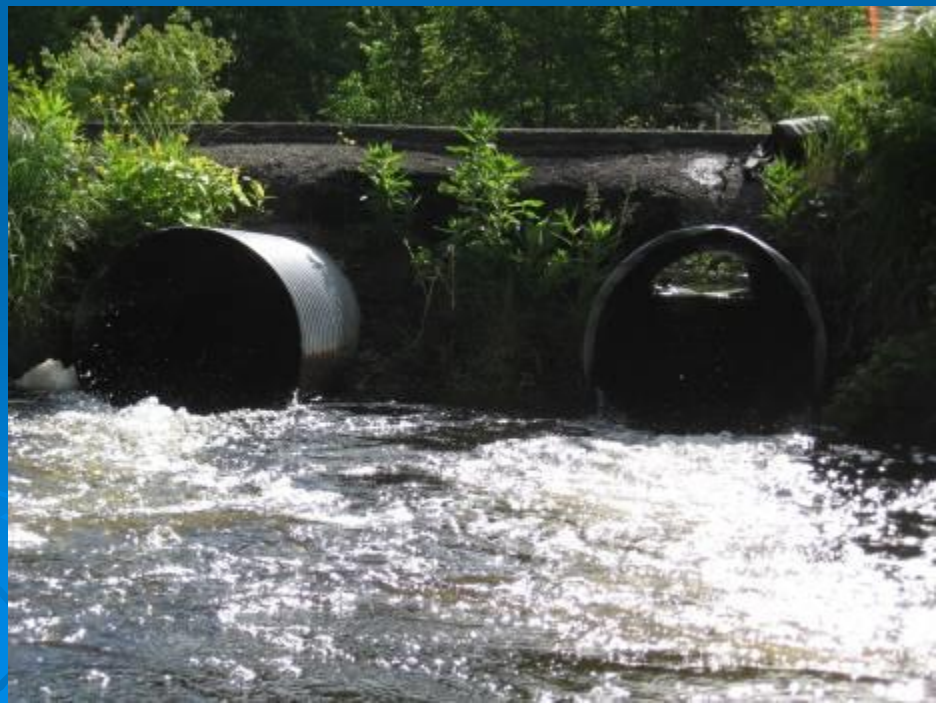
- Assume a 66% failure rate for the basin
- Add in dams
- (0.66*1756)+84 = 1243 barriers

Habitat fragmentation?

Species viability?

Conclusions

- Culverts are generally not very fish friendly
- Long term viability of our native fish is threatened by habitat fragmentation

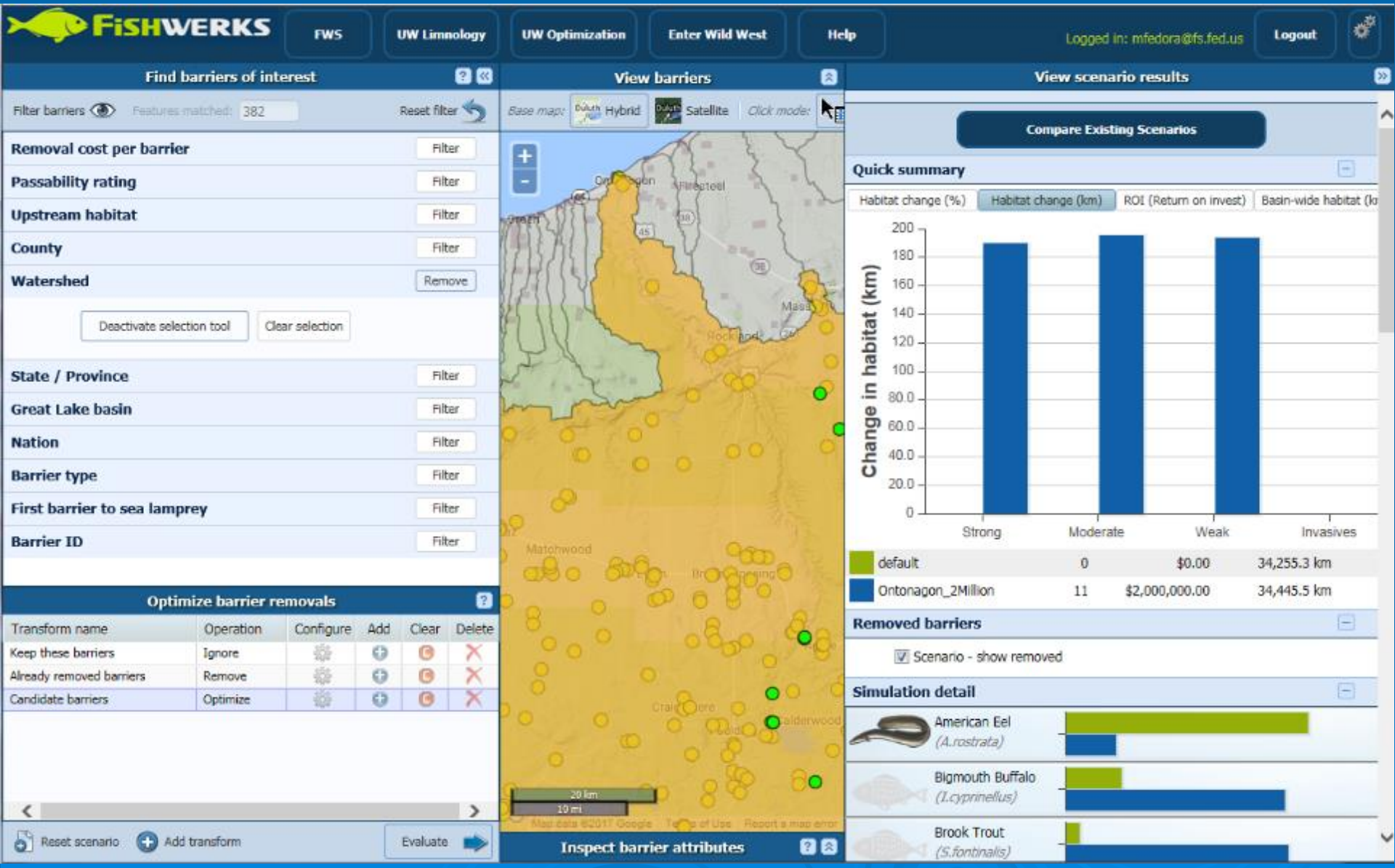


Prioritizing crossing replacement

- Quantity of habitat
- Quality of habitat
- Diversity of habitat
- Endangered/rare species
- Game species
- Invasive species
- Water quality
- Condition of structure
- Risk of failure
- Consequences of failure
- Cost
- Opportunity

Fishwerks!

https://greatlakesconnectivity.org


FISHWERKS
FWS
UW Limnology
UW Optimization
Enter Wild West
Help
Logged in: mfedora@fs.fed.us
Logout
Find barriers of interest
Filter barriers
Features matched: 382
Reset filter
Removal cost per barrier
Passability rating
Upstream habitat
County
Watershed
Filter
Remove
Deactivate selection tool
Clear selection
State / Province
Great Lake basin
Nation
Barrier type
First barrier to sea lamprey
Barrier ID
Optimize barrier removals
Transform name
Operation
Configure
Add
Clear
Delete
Keep these barriers
Ignore
Already removed barriers
Remove
Candidate barriers
Optimize
Reset scenario
Add transform
Evaluate
View barriers
Base map:
Hybrid
Satellite
Click mode:
Matchwood
20 km
10 mi
Inspect barrier attributes
View scenario results
Compare Existing Scenarios
Quick summary
Habitat change (%)
Habitat change (km)
ROI (Return on invest)
Basin-wide habitat (k
Change in habitat (km)
200
180
160
140
120
100
80.0
60.0
40.0
20.0
0
Strong
Moderate
Weak
Invasives
default
0
$0.00
34,255.3 km
Ontonagon_2Million
11
$2,000,000.00
34,445.5 km
Removed barriers
Scenario - show removed
Simulation detail
American Eel
(A.rostrata)
Bigmouth Buffalo
(I.cyprinellus)
Brook Trout
(S.fontinalis)

What does a good crossing look like?

After

Before

Upstream before

After

Upstream after

Credits: Gary Larson, the Far Side

"You'll never look at a culvert the same way again!"

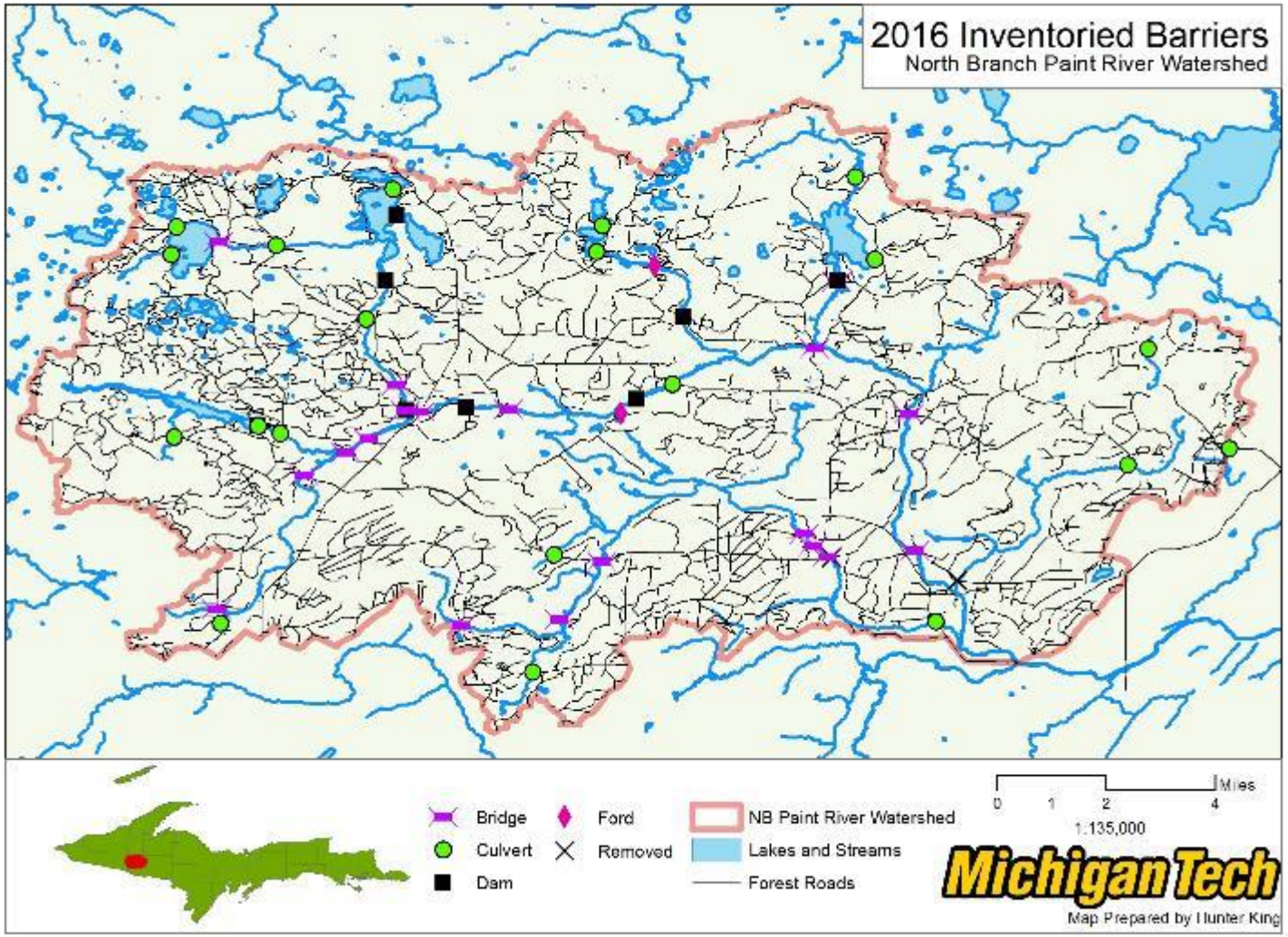
This is not just about fish!

July 2016 flood, C-N NF

July 2016 flood, C-N NF

July 2016 flood, C-N NF

Next Steps


2016 Inventoried Barriers
North Branch Paint River Watershed
Bridge
Culvert
Dam
Ford
Removed
NB Paint River Watershed
Lakes and Streams
Forest Roads
Miles
0 1 2 4
1:135,000
Michigan Tech
Map Prepared by Hunter King

High Resolution Survey Criteria

- Four Culverts
  - Two with low point adjacent to crossing (failure risk)
  - Two with increased velocities (possible impedance)
- Four Bridges
  - Two with low point adjacent to crossing (failure risk)
  - Two with increased velocities (possible impedance)

Peak Discharge Estimates

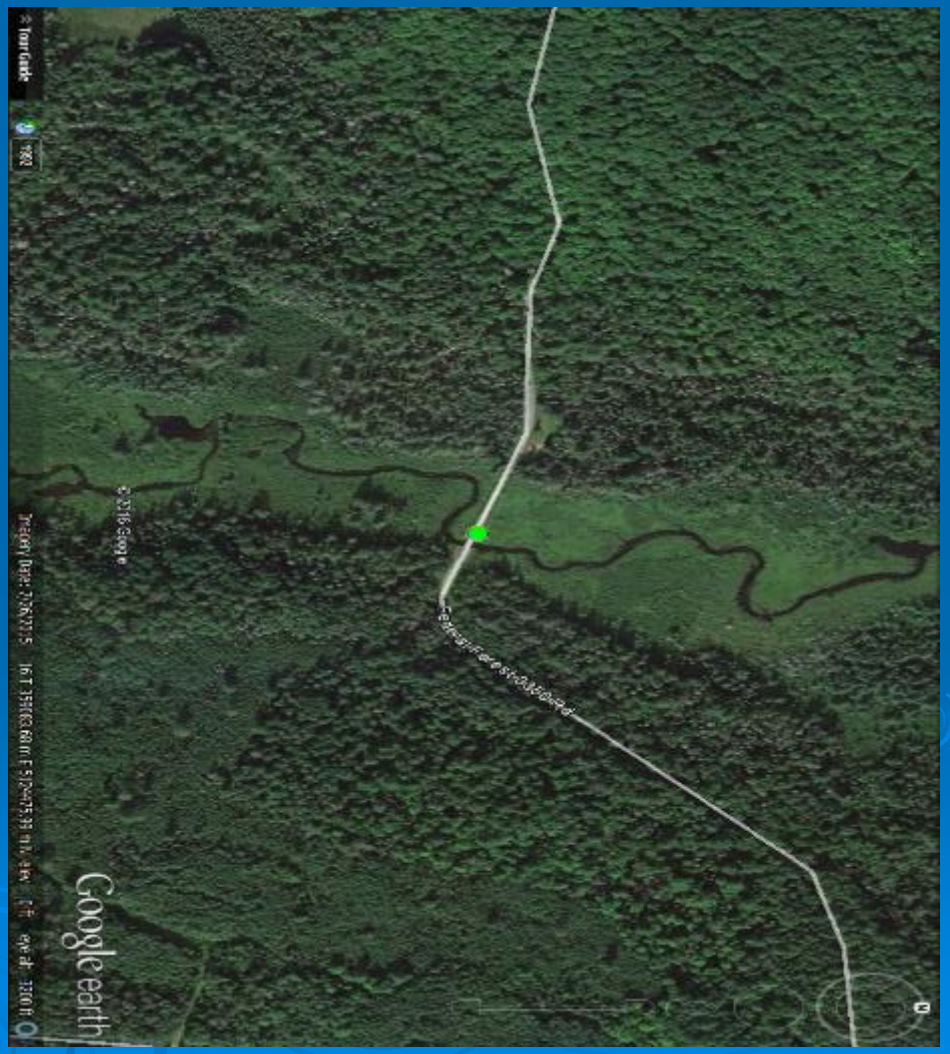
- Michigan UP regional equations (1984),
  - Consider the entire U.P. as one region
- Wisconsin area 4 equations (2003)
  - A northern Great Lakes region that includes snowmelt
- We will assess both of these options for the Paint and select best one

Model crossings in HEC-RAS

- Use peak flows to estimate recurrence interval and risk of “failure”
- Use survey data to estimate the amount of sediment released
- Use amount of sediment to estimate consequences of failure (habitat, water quality, cost of temporary/permanent fix)

Crossing Dimensions vs Sediment and Velocity

- Will compare crossing dimensions with sedimentation up and downstream
- Will compare crossing dimensions with velocity measurements up and downstream



Thank you!

Questions?