Fish passage barrier inventory, assessment, and prioritization

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Inventory, assessment, and prioritization

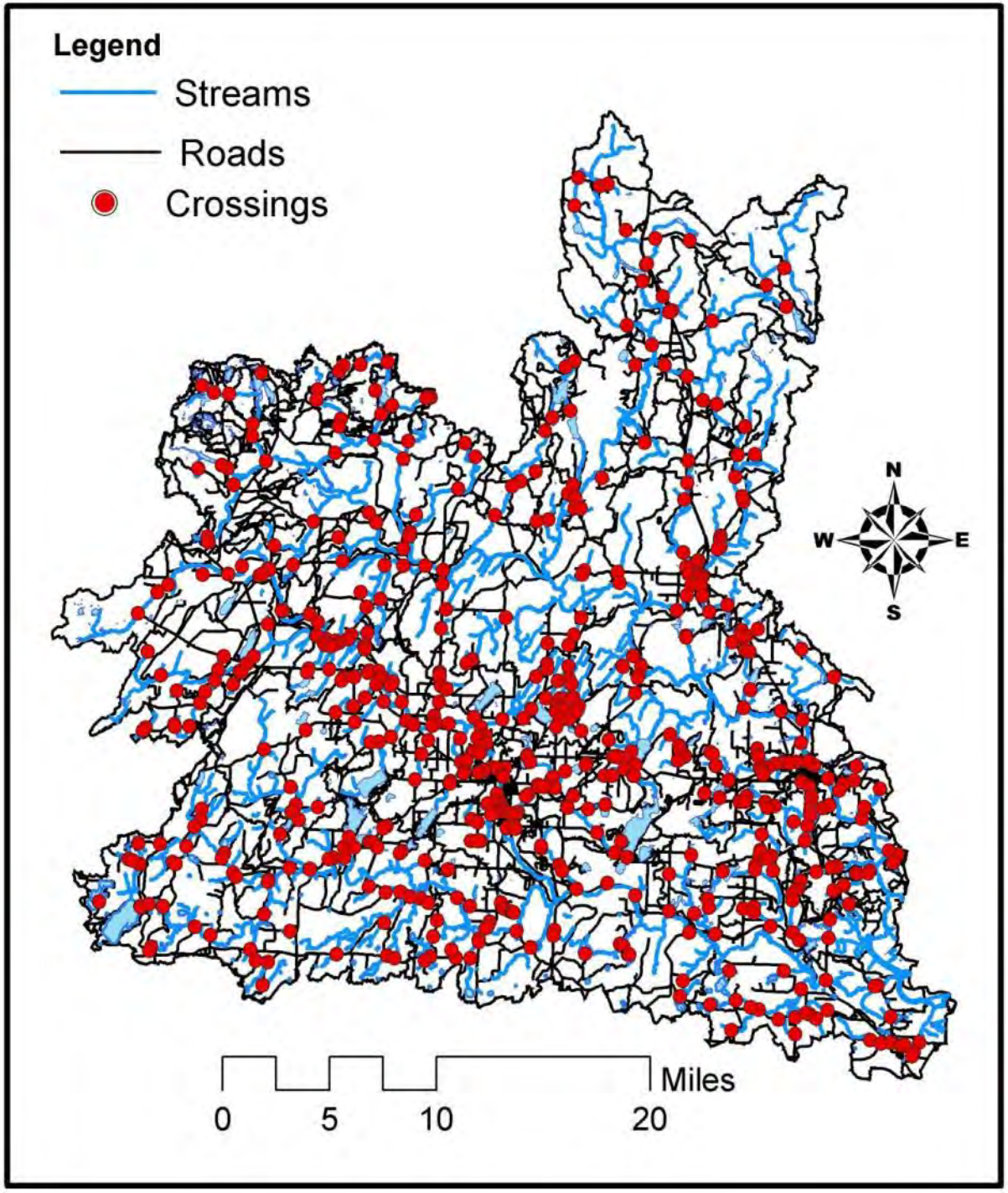
- How many crossings are out there?
- How many are bad?
- Where do we begin fixing problem sites?

How many road/stream crossings are out there?

(Velocity barrier)

Upper Menominee Watershed

649 Crossings!

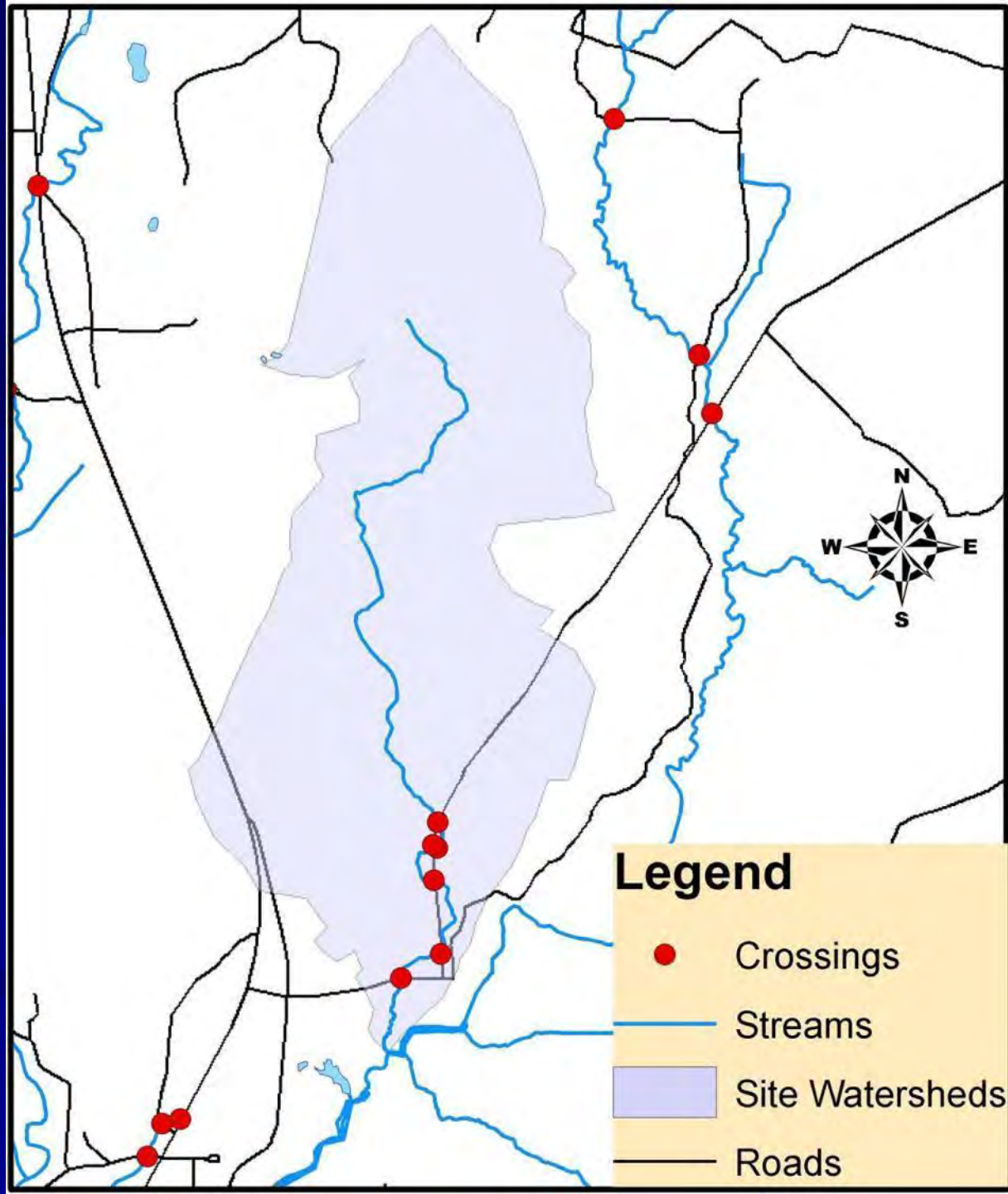


A few cautions

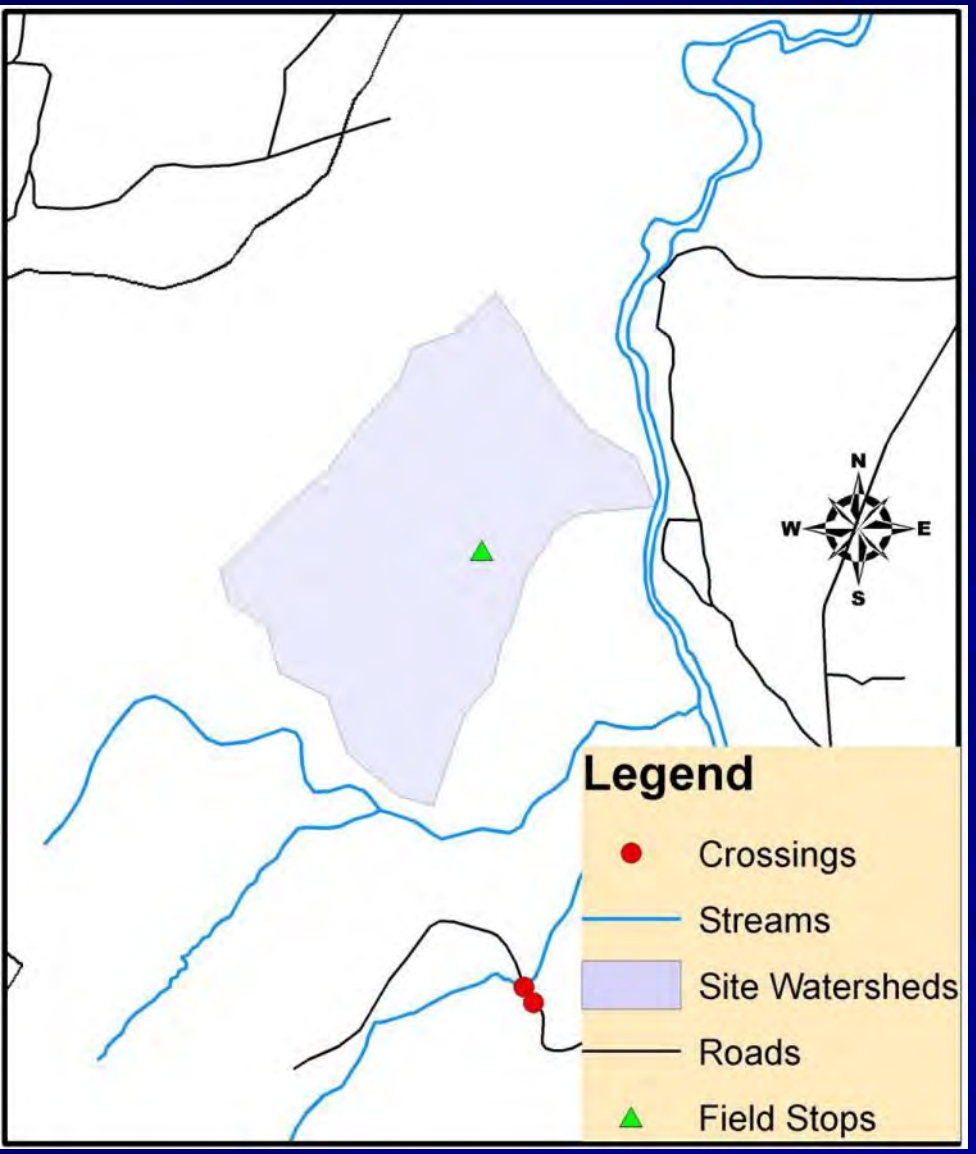
- Scale matters
- Some roads are not mapped
- Some streams are not streams
- Some roads are not roads
- Some crossings are not crossings
- Some crossings don’t show up

Zoom in to field sites

Looks good!

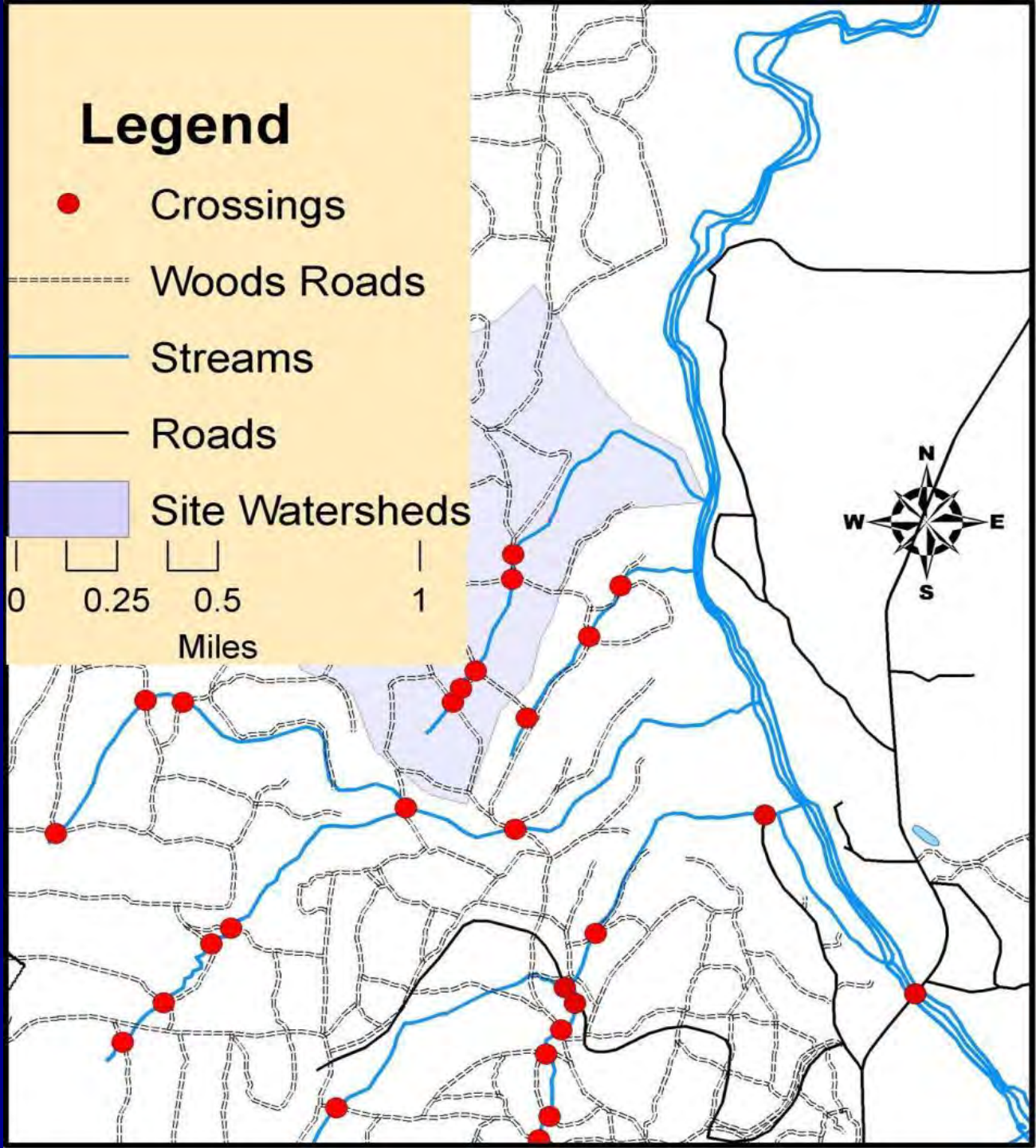


What crossing?



27 Crossings in 4 Square Miles

Scale Matters – Use the finest scale possible



Some roads are not mapped

1,462 miles mapped

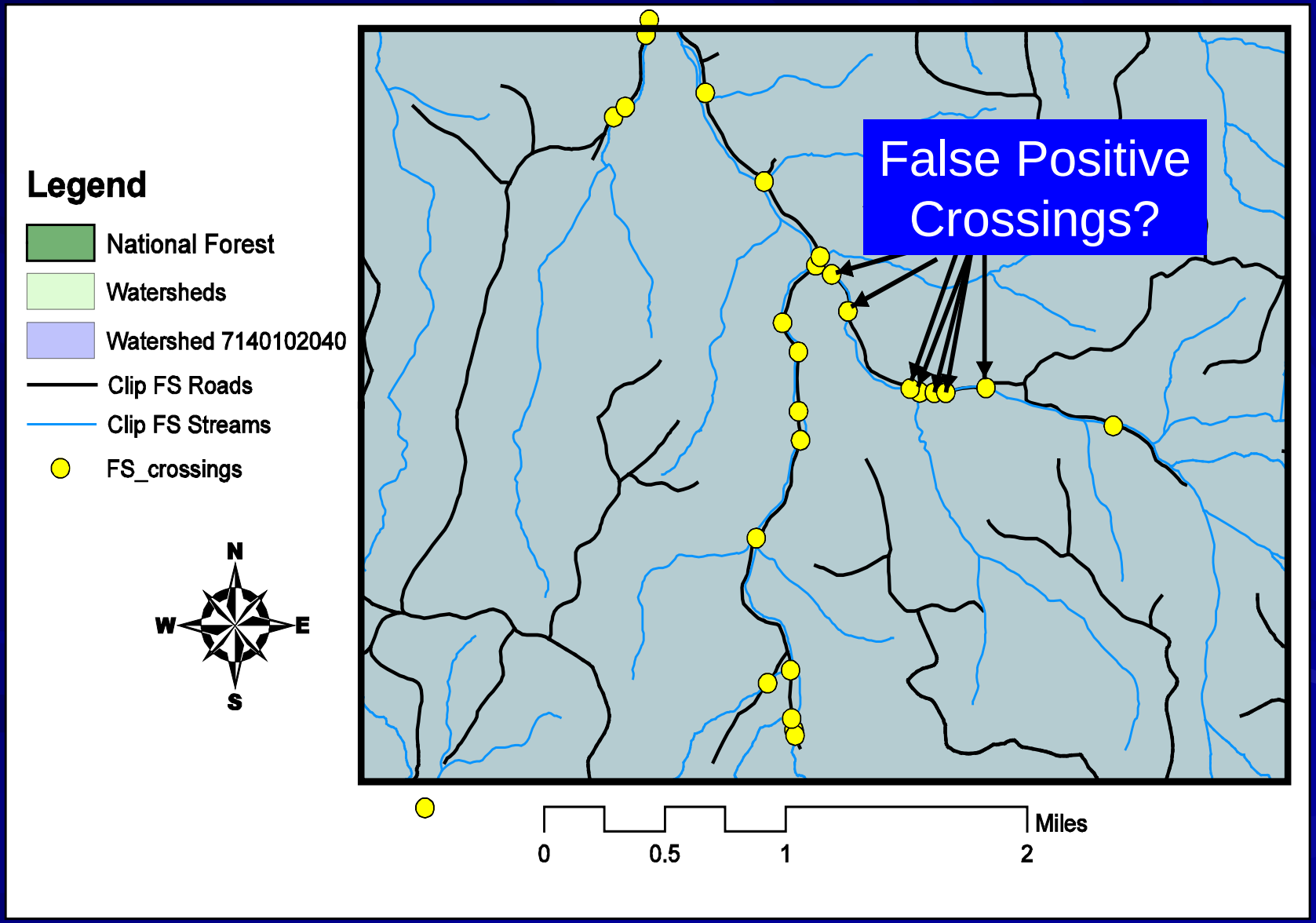
3,050 miles unmapped

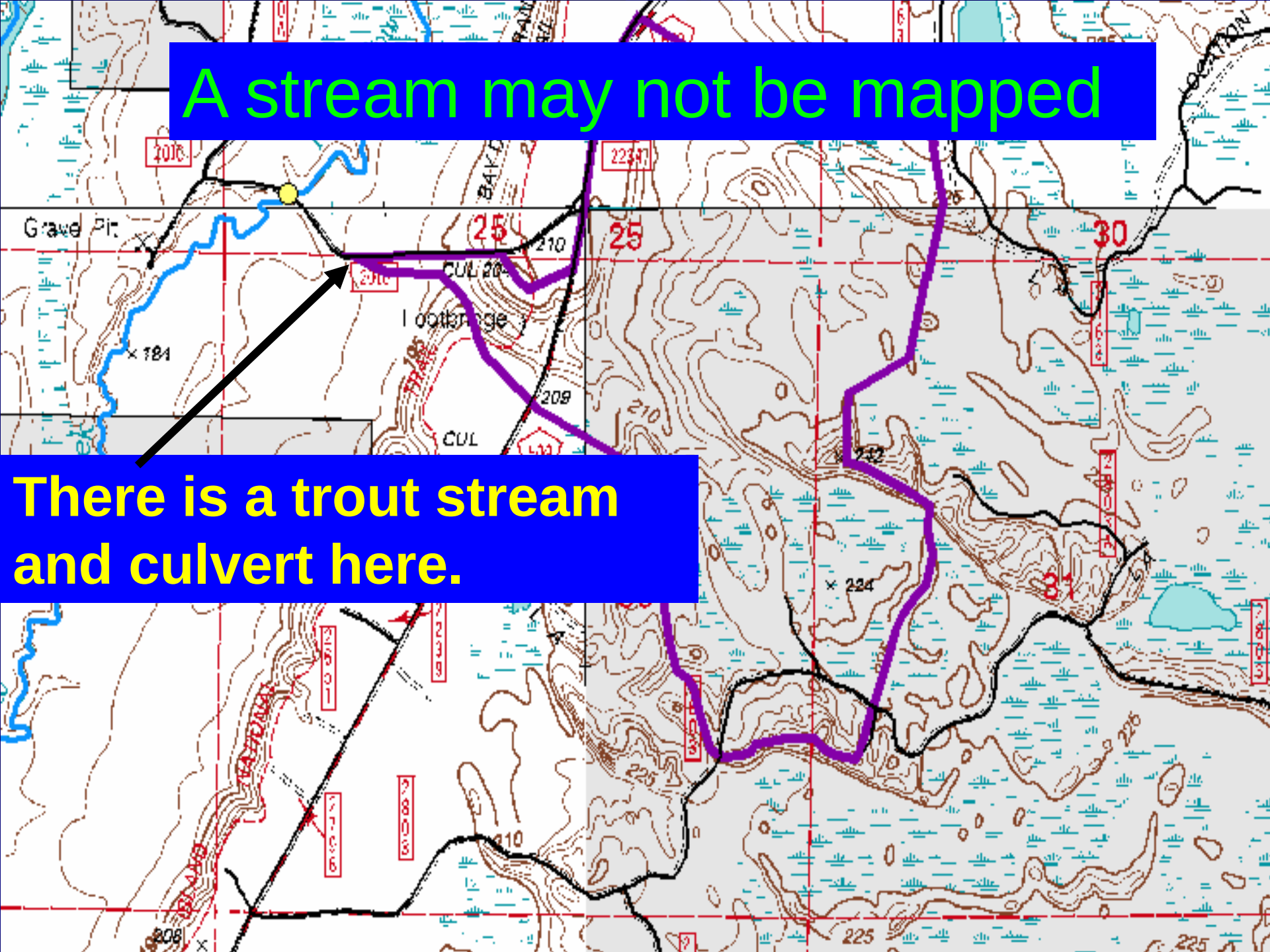
Unmapped stream crossings

789 mapped crossings

1,441 unmapped

Some crossings may not be crossings




A stream may not be mapped
There is a trout stream and culvert here.
Gravel Pit
25
30
31
CUL
Footbridge

Inventory and assessment

- Goals:
  - What kinds of problems are out there?
  - How bad are they?

Two tier approach to inventory

- Tier 1– Rapid assessment (volunteers)
- Tier 2 – More in-depth (more equipment and skills required)

Communication plan, first aid kit, sunscreen, insect repellent, water, knowledge of safety hazards.

Data Collection

Stream Crossing Data Sheet

Site ID: _____

General Information

Stream Name: _____ Road Name: _____

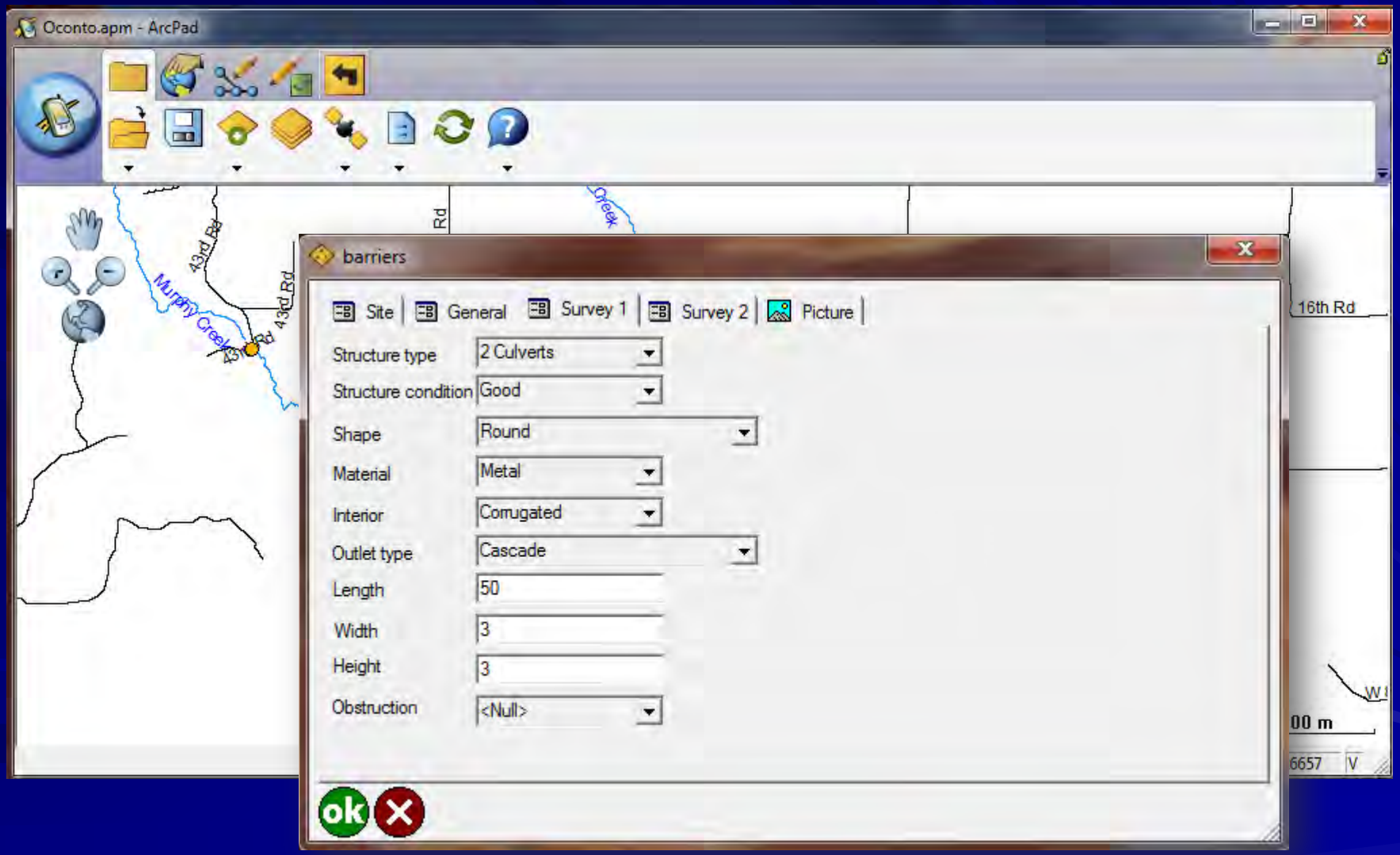
Name of Observer(s): _____ Date: _____

GPS Waypoint: _____ GPS Lat/Long: _____

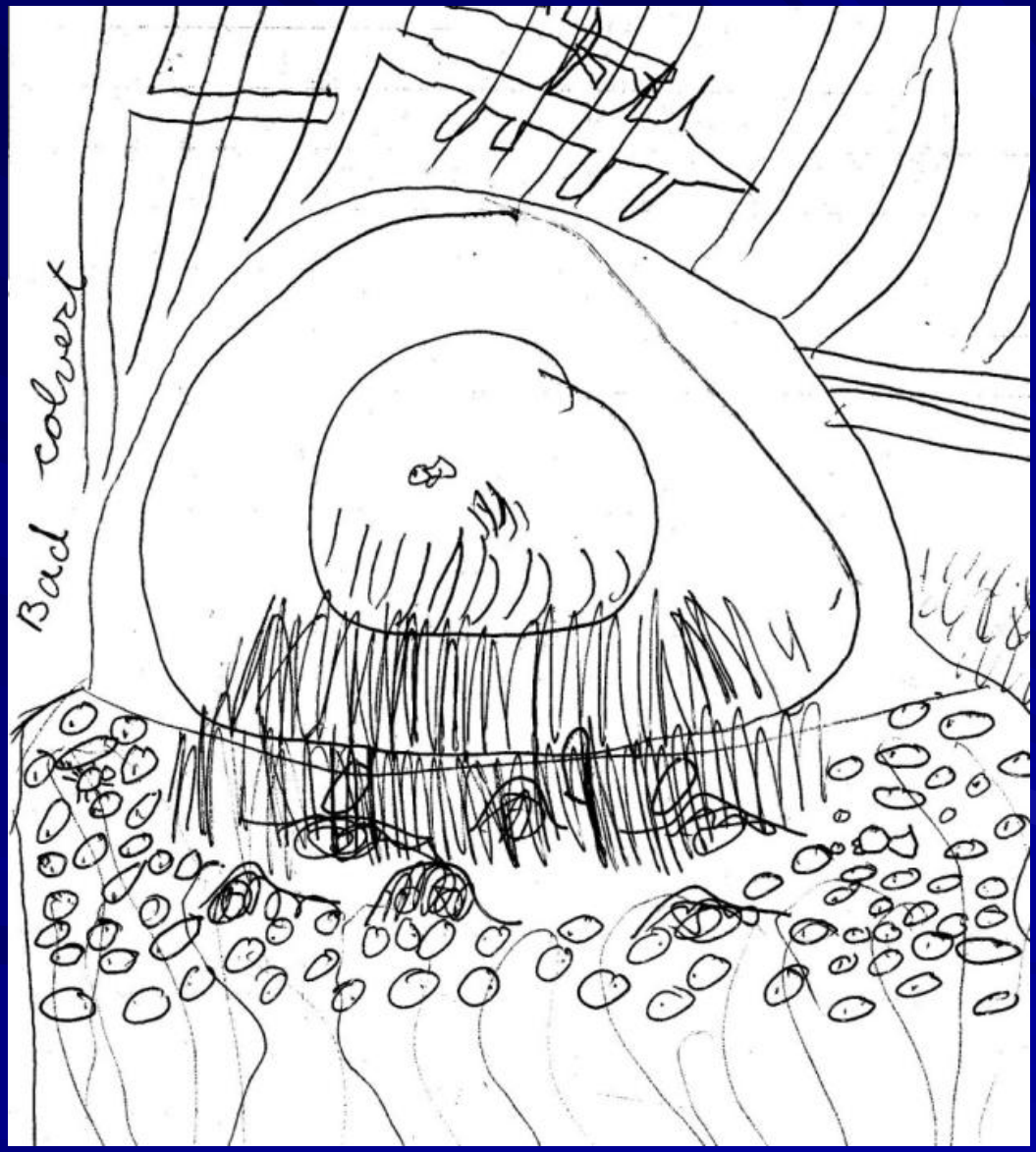
County: _____ Township: _____ Range: _____ Sec: _____

Adjacent Landowner Information: _____ Additional Comments: _____

Data Collection



Site sketch



Database

Site ID	1926-6918	Stream	Little Fishdam River	Road	Garden Grade Rd	Date	09/06/2012

Outcome	Survey 2	Structure type	1 Culvert	Surveyed by	DNR
Road type	Road	Shape	Round	Owner	Michigan town
Road surface	Gravel	Material	Metal	Passability	0
Road width	11 ft	Length	32 ft	Pass Method	Outlet drop
Scour pool	Yes	Width	3.5 ft	April flow	4.62 cfs
Upstream pond	No	Height	3.5 ft	Cost	$68,246
Obstruction		Measured velocity	1.4 ft/s	Rank	27
Condition	Fair	Modeled velocity		Habitat Gain	103.7 acres
Bankfull width	9 ft	Outlet drop	1.3 ft		
		Outlet type	Freefall		

NOTES:

second smaller rusted out culvert must carry water, see "other" photo

OUTLET

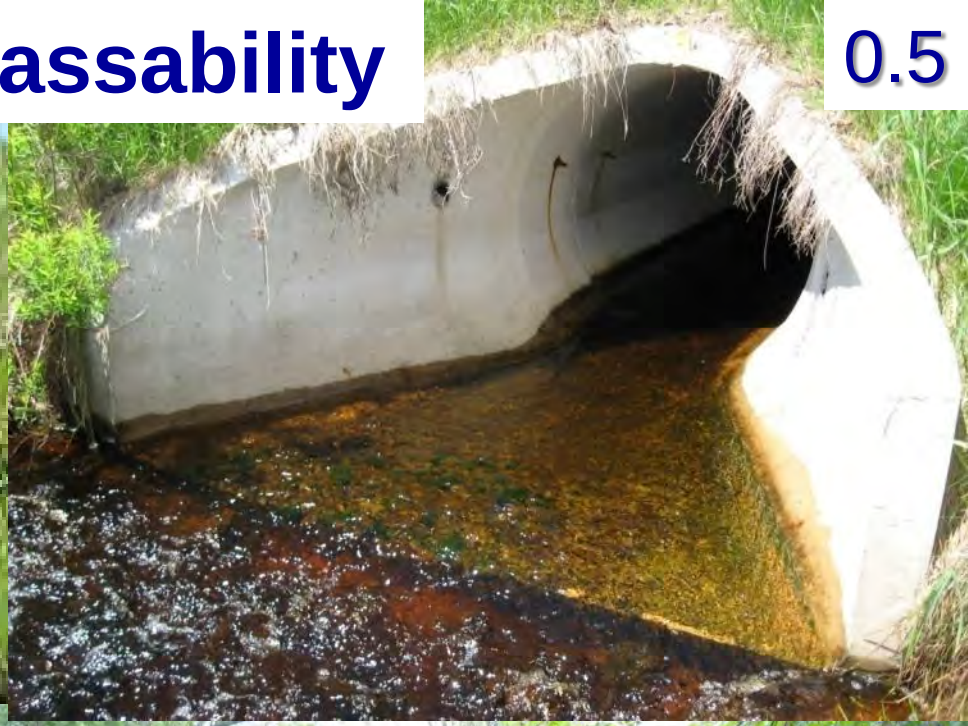
INLET

No Image Available

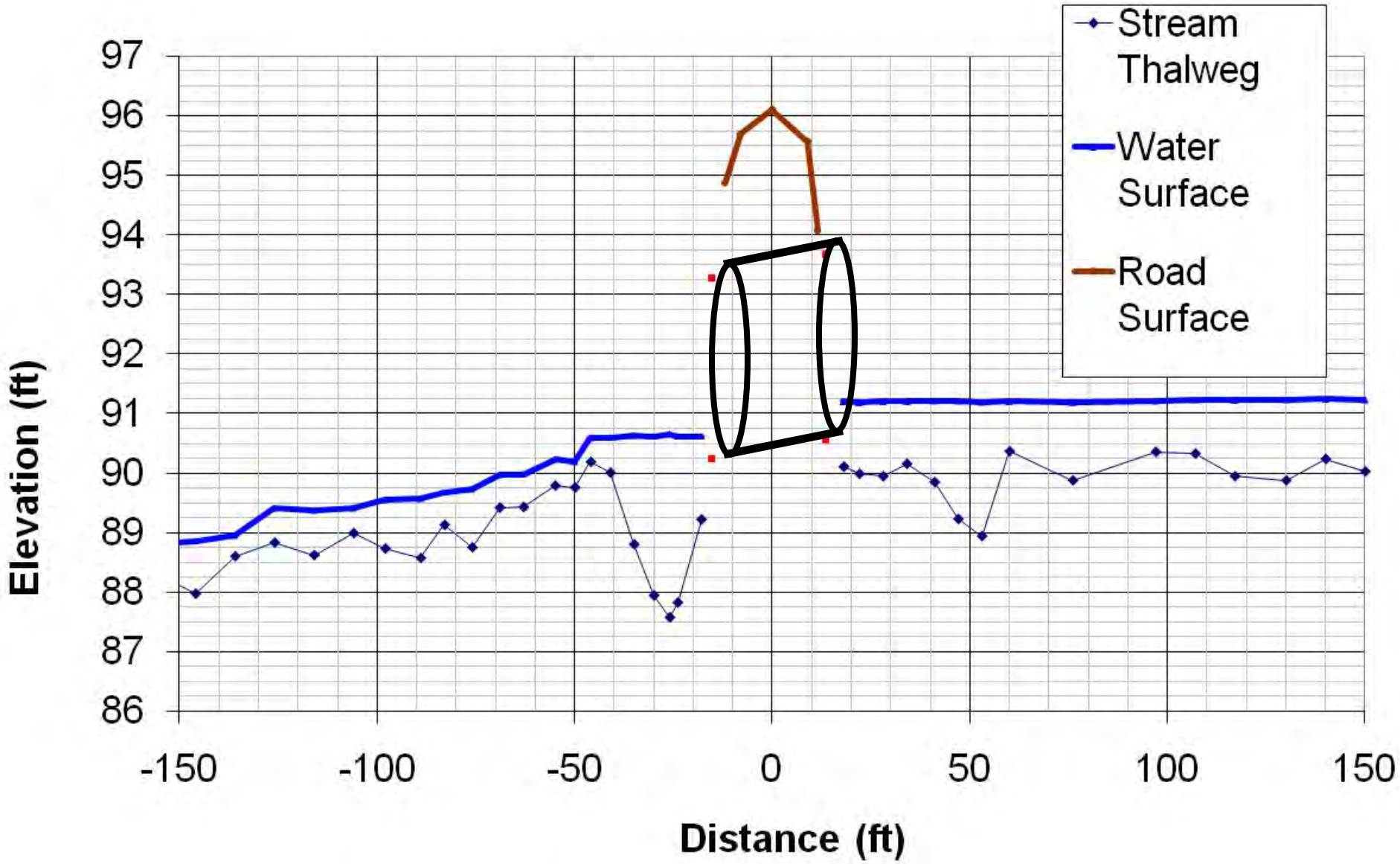
Quick assessment metrics

- Outlet drop
- Compare culvert geometry and hydraulics to natural channel
  - Water velocity
  - Water depth
  - Structure width
- Substrate?

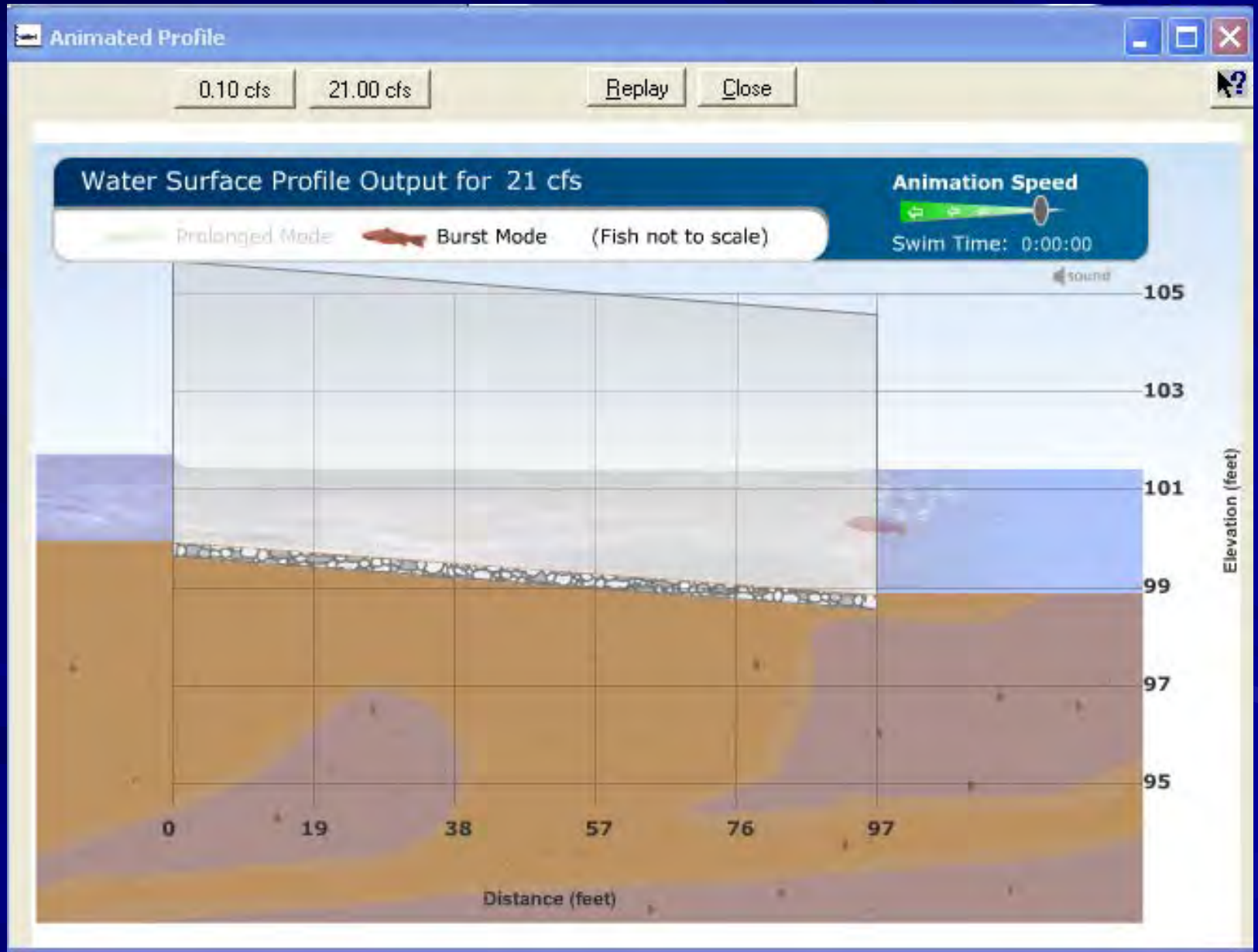
Estimating passability



Tier 2 assessment



FishXing http://stream.fs.fed.us/fishxing/

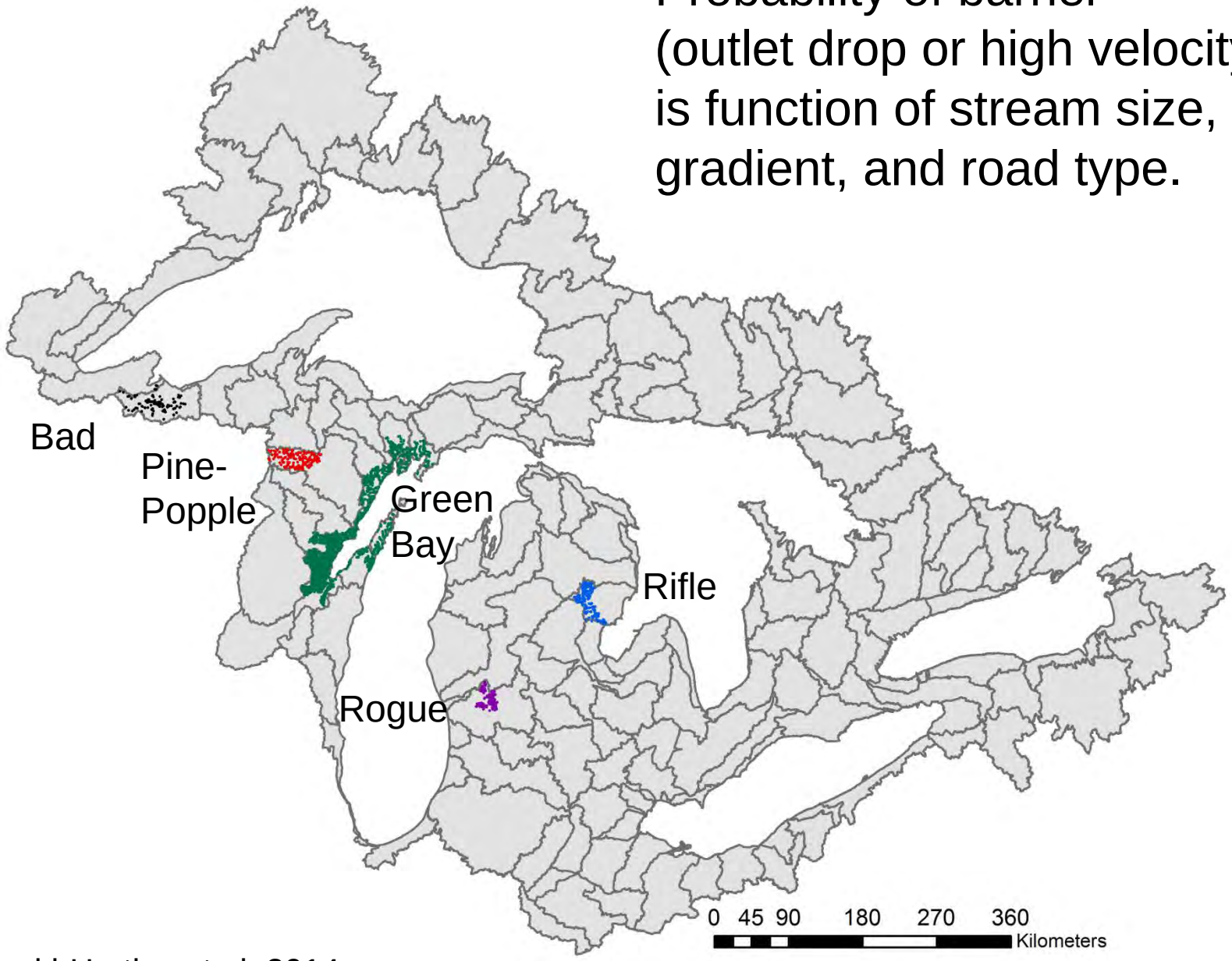


Prioritization

- Screening tools
  - Passability model
  - LiDAR assessment
- Selecting projects
  - Factors to consider
  - Tools

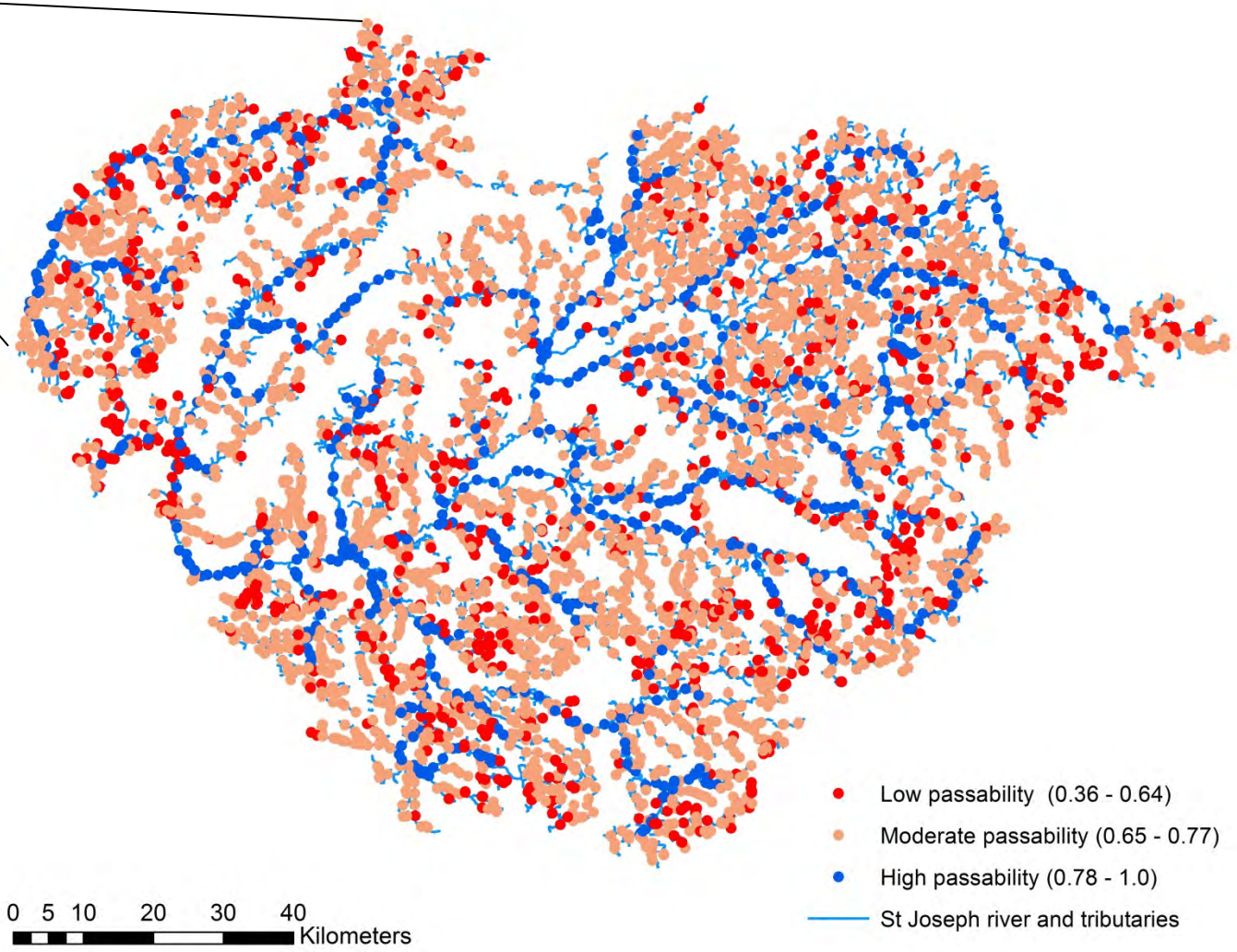
Passability Model

Probability of barrier (outlet drop or high velocity) is function of stream size, gradient, and road type.



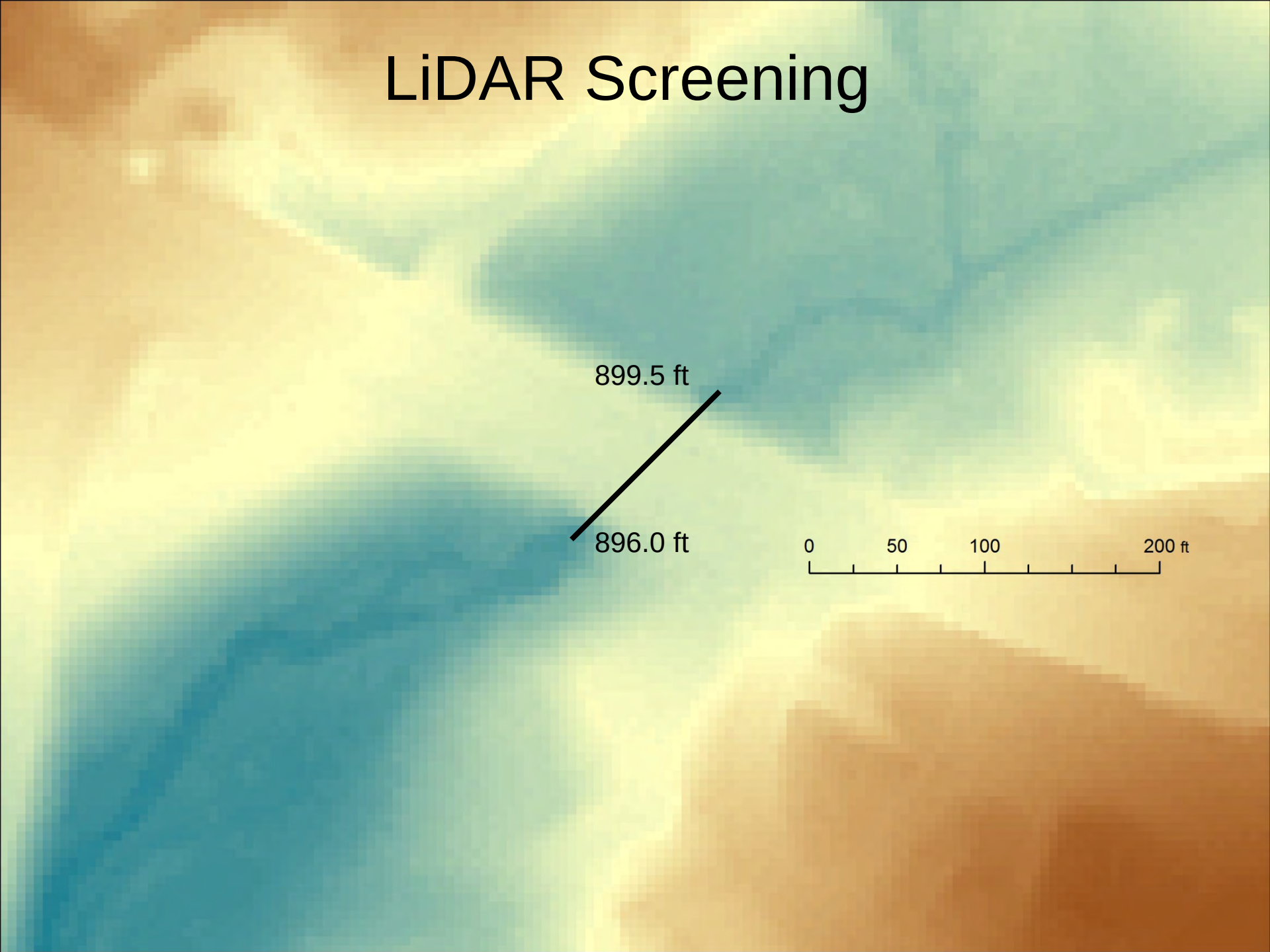
Januchowski-Hartley et al. 2014

Passability Model

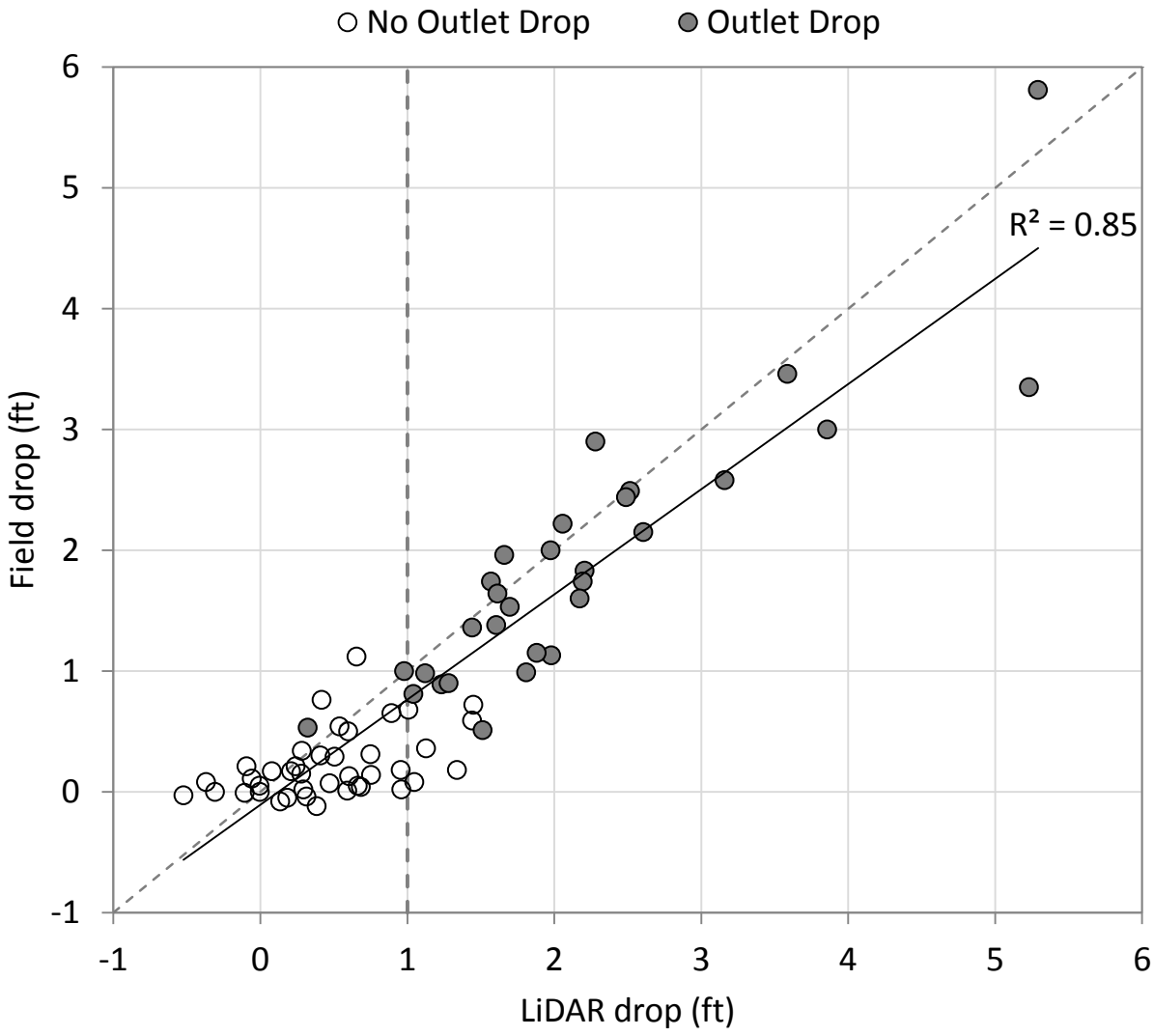


Januchowski-Hartley et al. 2014

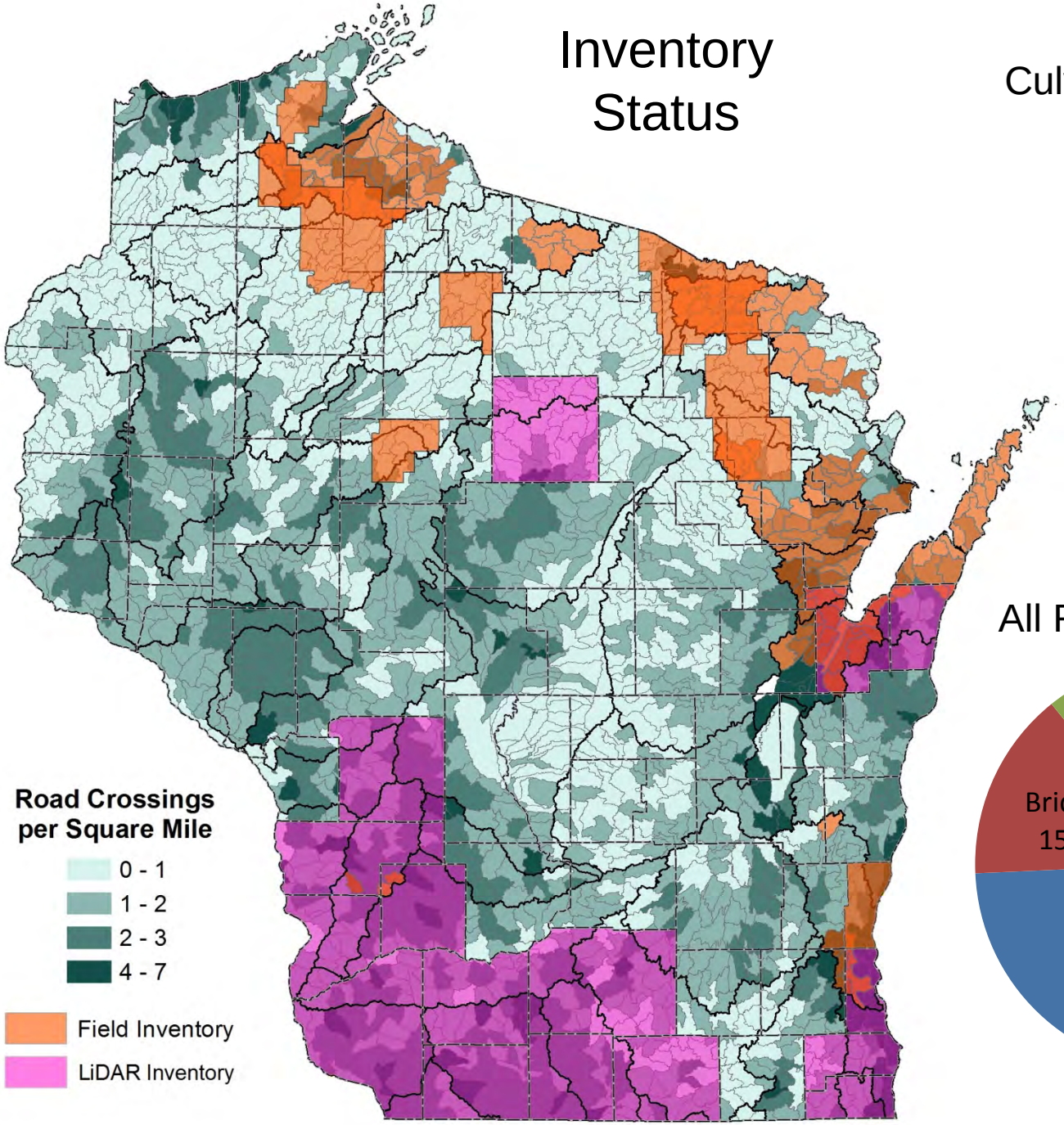
LiDAR Screening



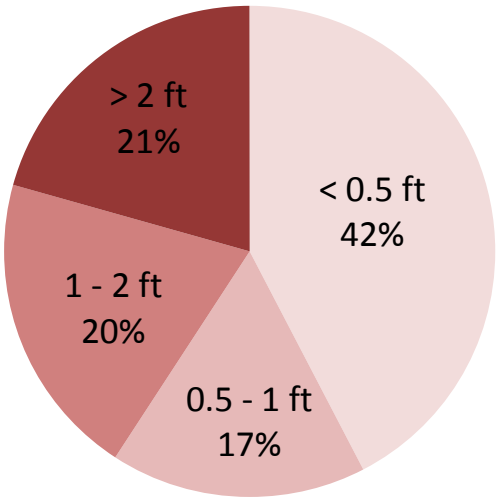
Accuracy of LiDAR Assessment



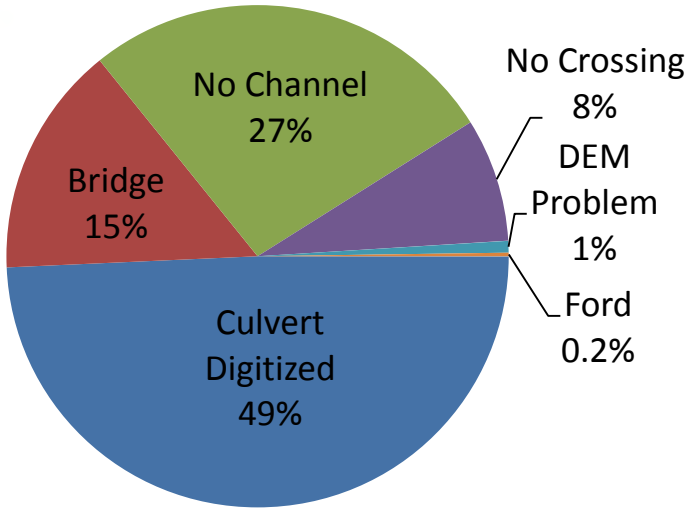
Inventory Status

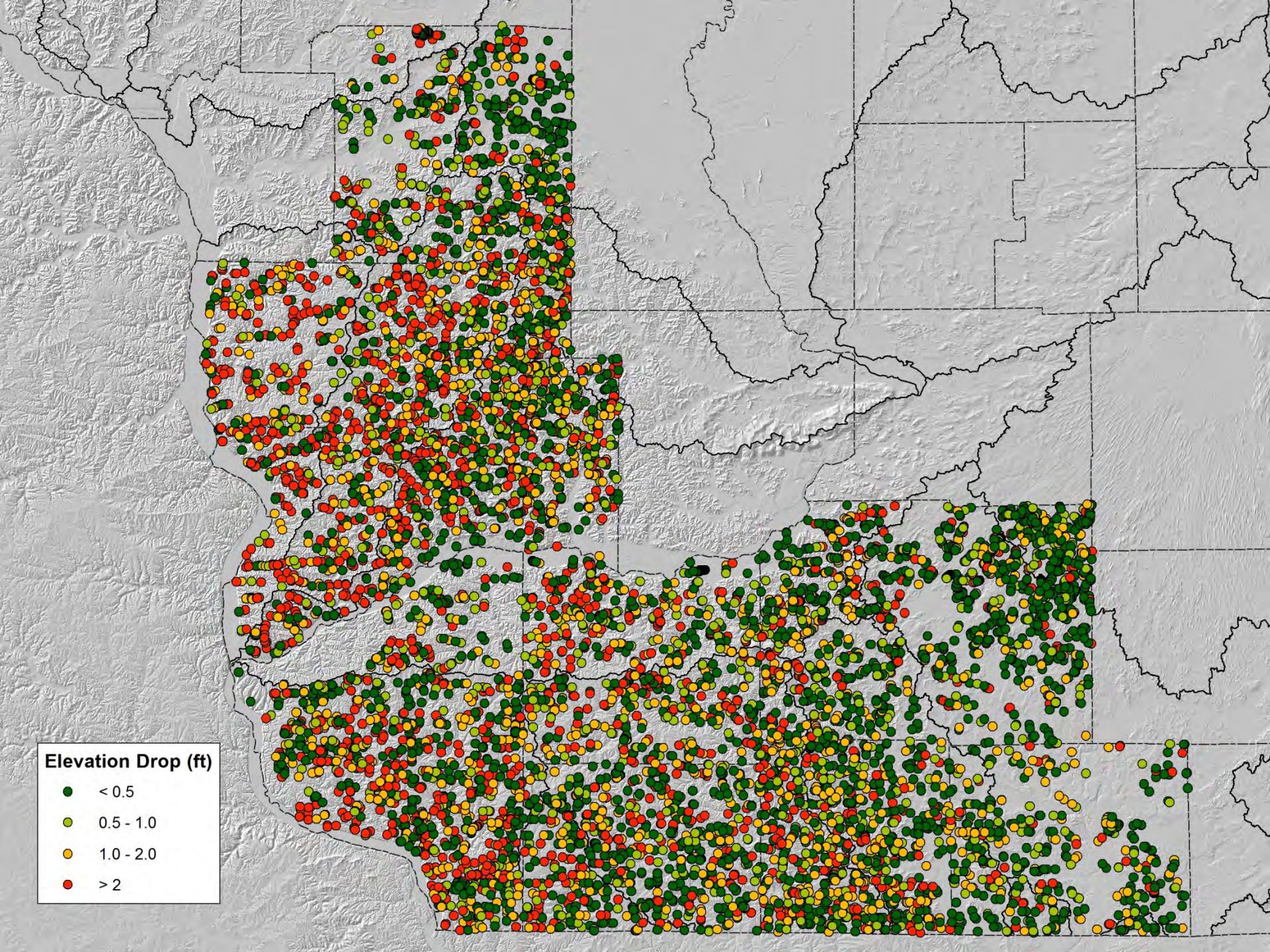


Culvert Vertical Drop (8,760)



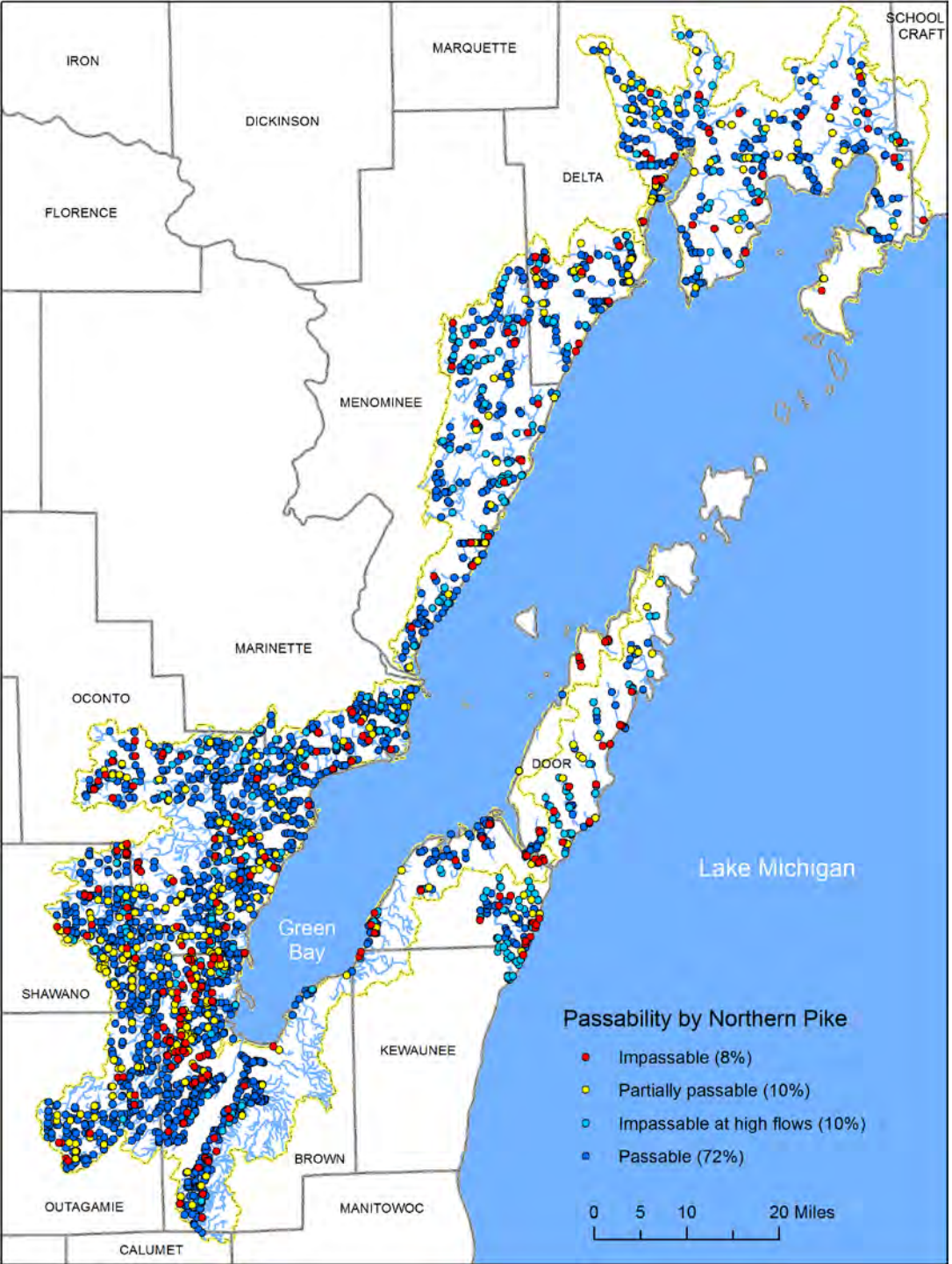
All Road Crossings (19,420)



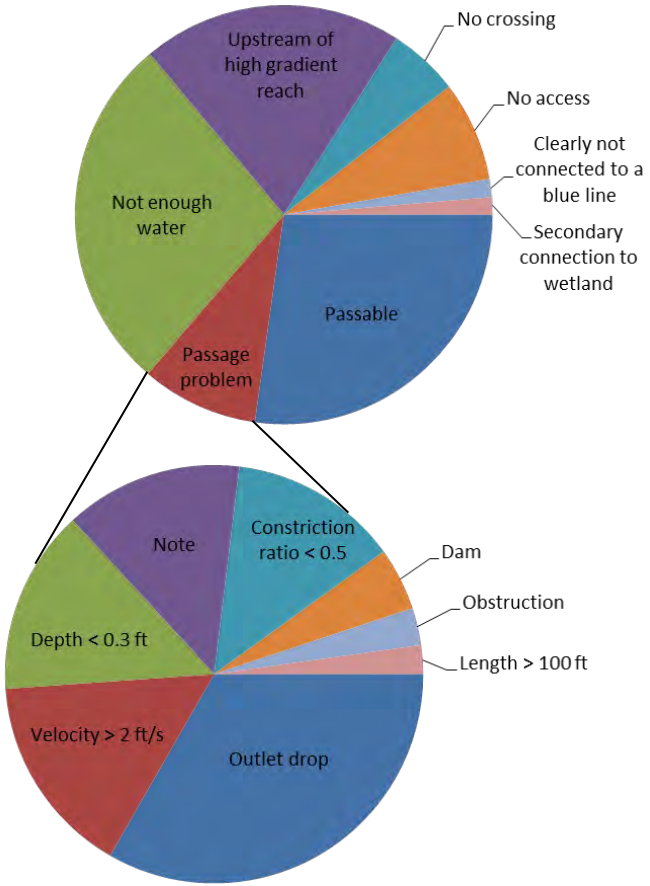

Elevation Drop (ft)
< 0.5
0.5 - 1.0
1.0 - 2.0
> 2

Comparison of Methods

Criteria		Fish Xing	Field Surveys	LiDAR	Statistical Model
Accuracy	**Passability**	Highest	High	Moderate-High	Low-Moderate
	Cost	Highest	High	Moderate-High	Low-Moderate
Speed		1 site/day	20 sites/day	200 sites/day	Completed for all RSX in GL Basin
Completeness		Depends on methods used to identify crossings for field surveys		Highest	Moderate
Other		Estimate how passability varies with flow	Identify defined channels / fish habitat		Evaluate landscape factors that influence passability
		Identify site-specific factors that influence replacement cost		Condition DEM for hydrography development	



Need for Prioritization



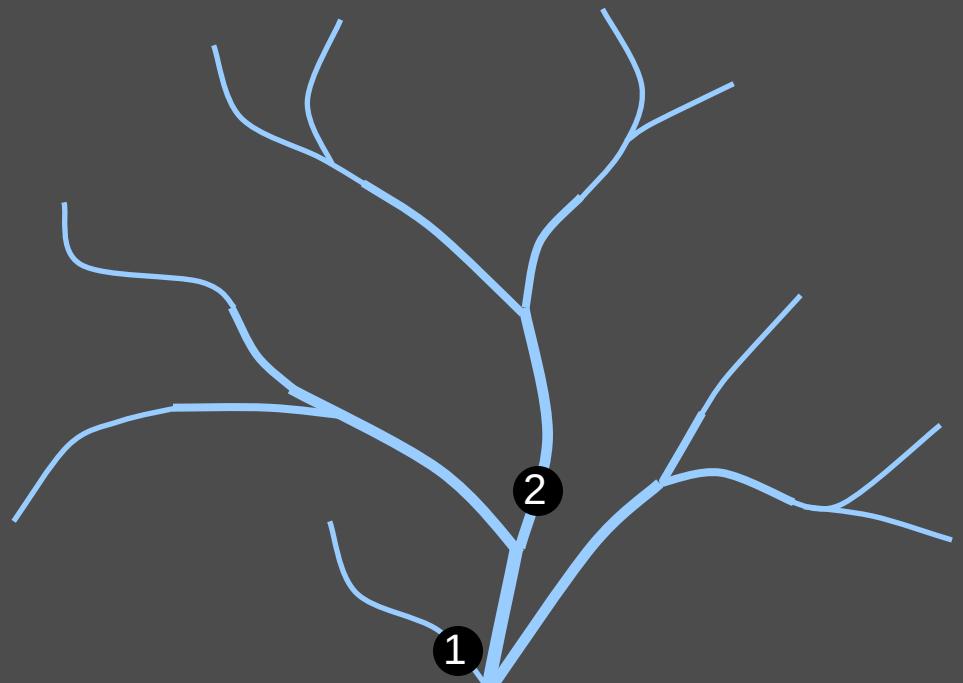
Habitat Quantity

Habitat Quality

Habitat Type

Migration Distance

Natural Barriers



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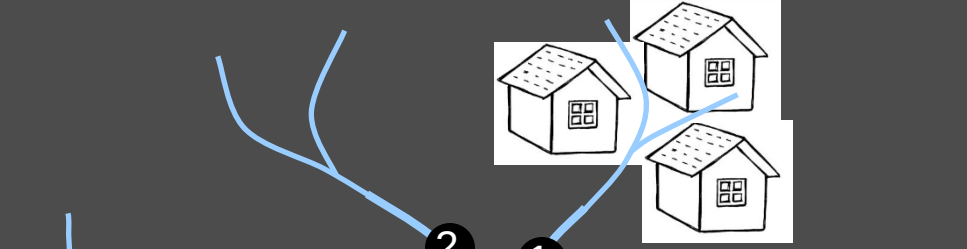

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Habitat Quantity

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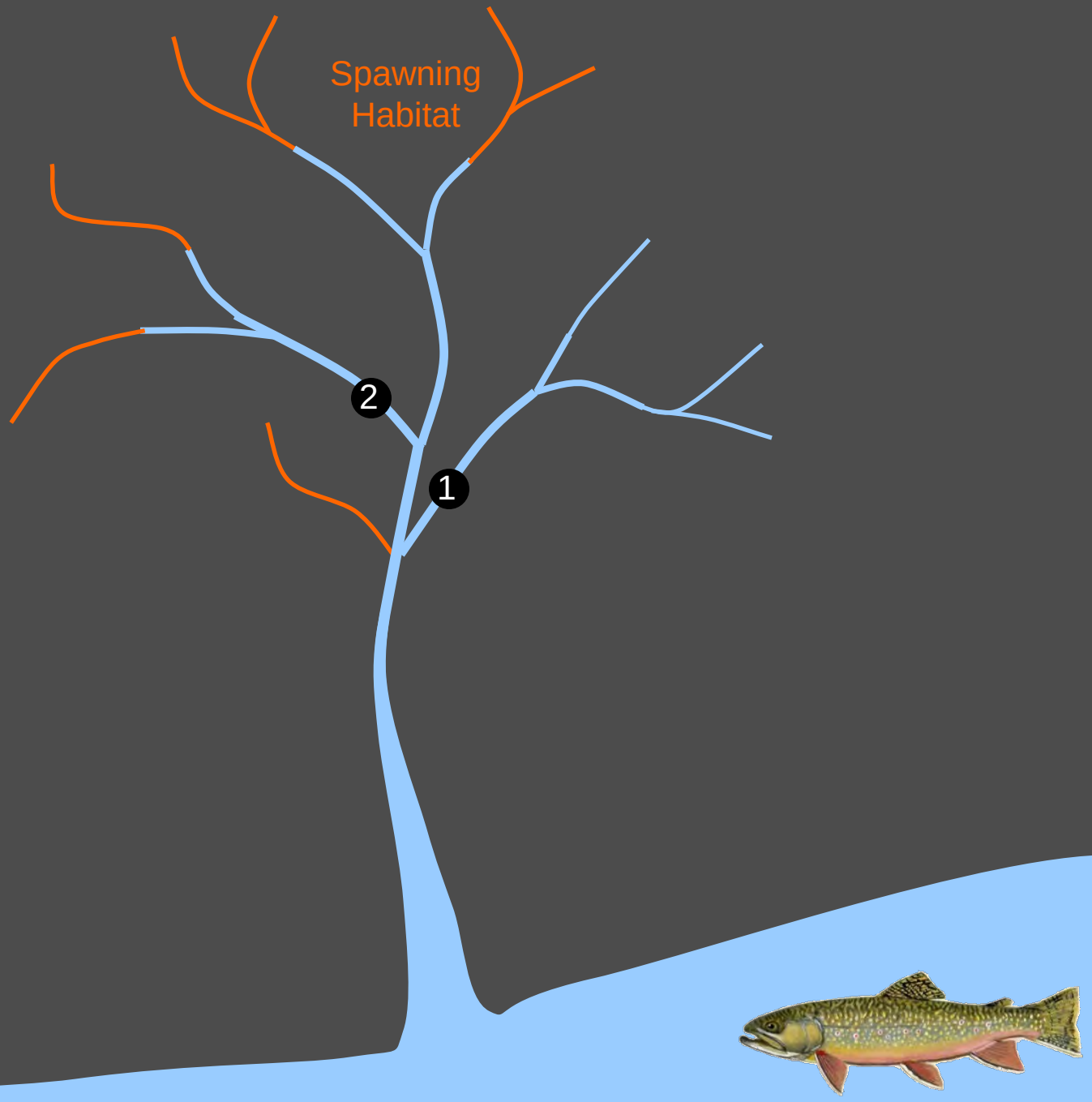

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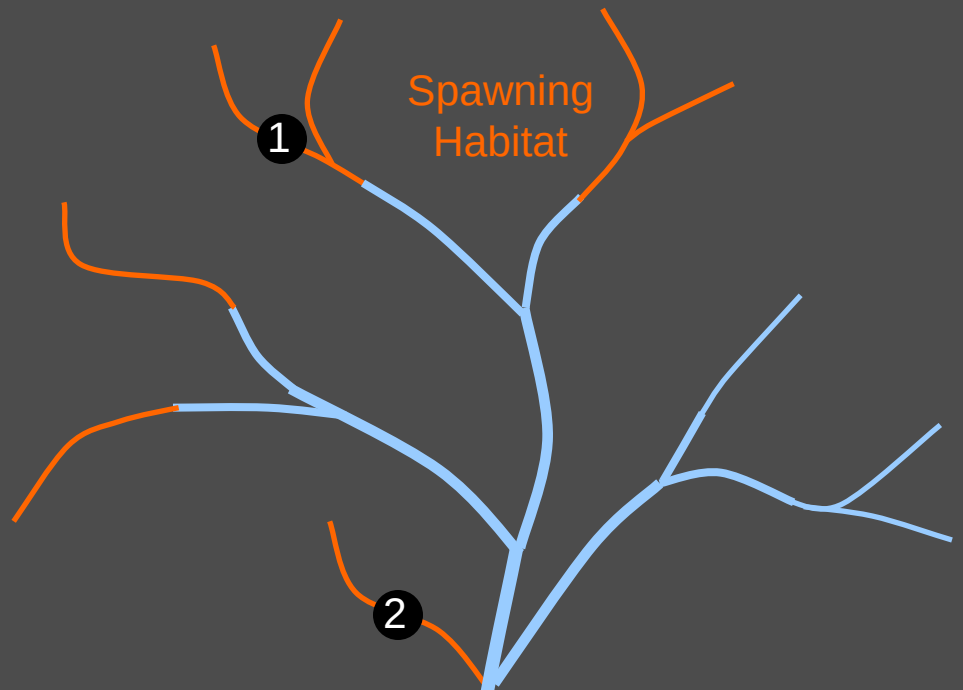

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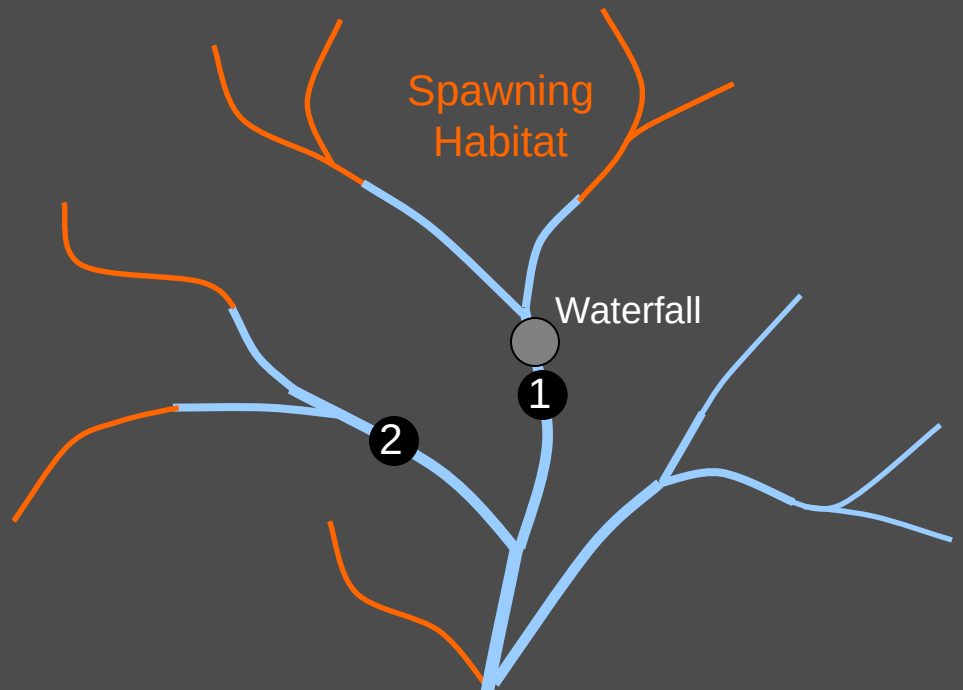
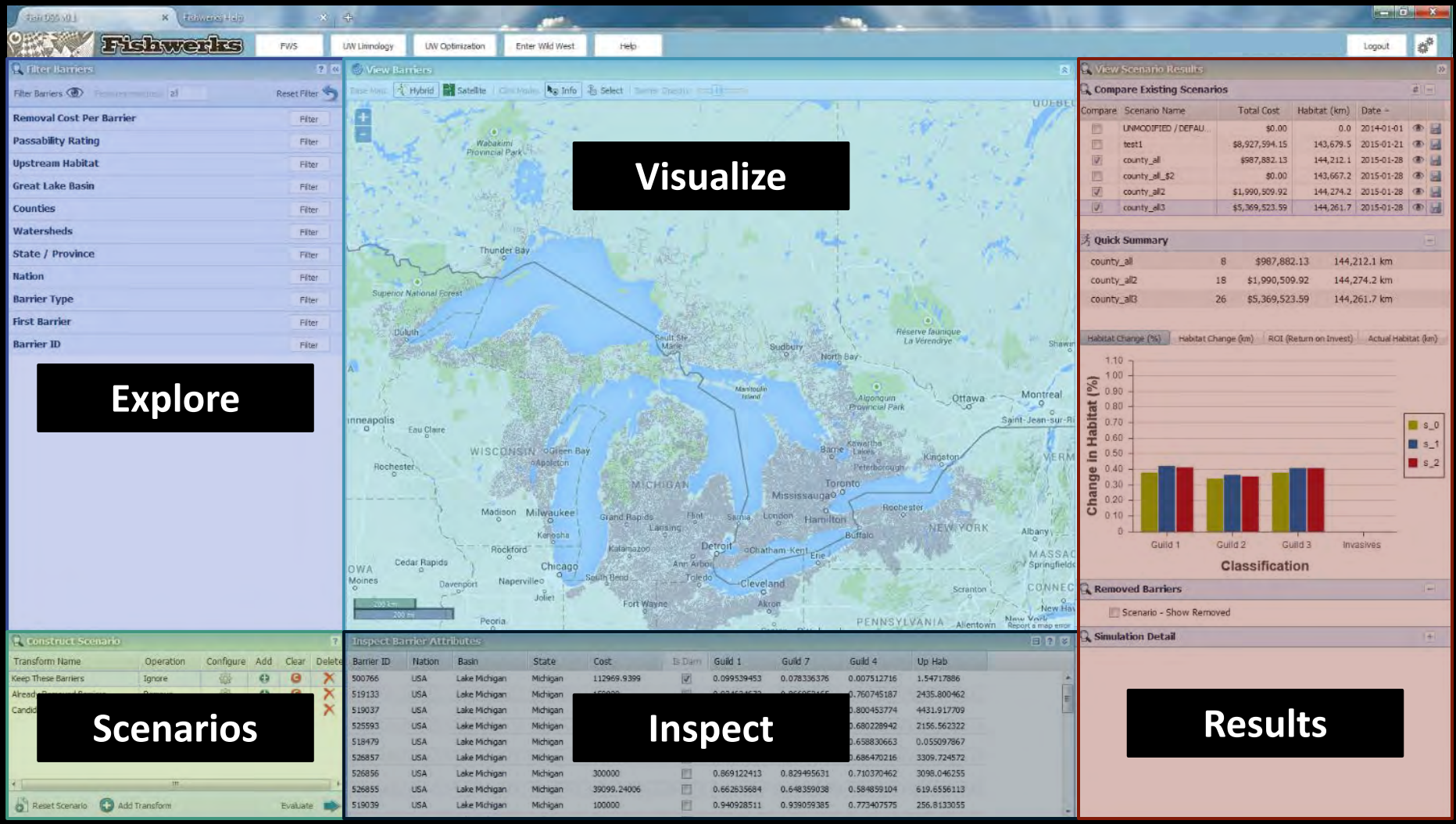


OptiPass

- ArcGIS Toolbox (10.1)
- Recommends a set of projects to maximize increase in accessible habitat for a given budget
- Developed by The Cadmus Group, Inc., and Ecotelligence, LLC for The Nature Conservancy
- Input requirements
  - Barriers
    - Passability
    - Cost to replace/remove
  - Streams
    - Quality index
    - Habitat type

Online decision support tool

www.greatlakesconnectivity.org



Summary

- How many crossings are out there?
  - Use GIS to get an estimate of road/stream crossing numbers and locations
- How many are bad?
  - Simple inventories can be conducted quickly
  - More detailed assessments require surveying skills
- Where do we begin?
  - Prioritization can identify where you can get the most bang for the buck


FISH
CROSSING
Questions?
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