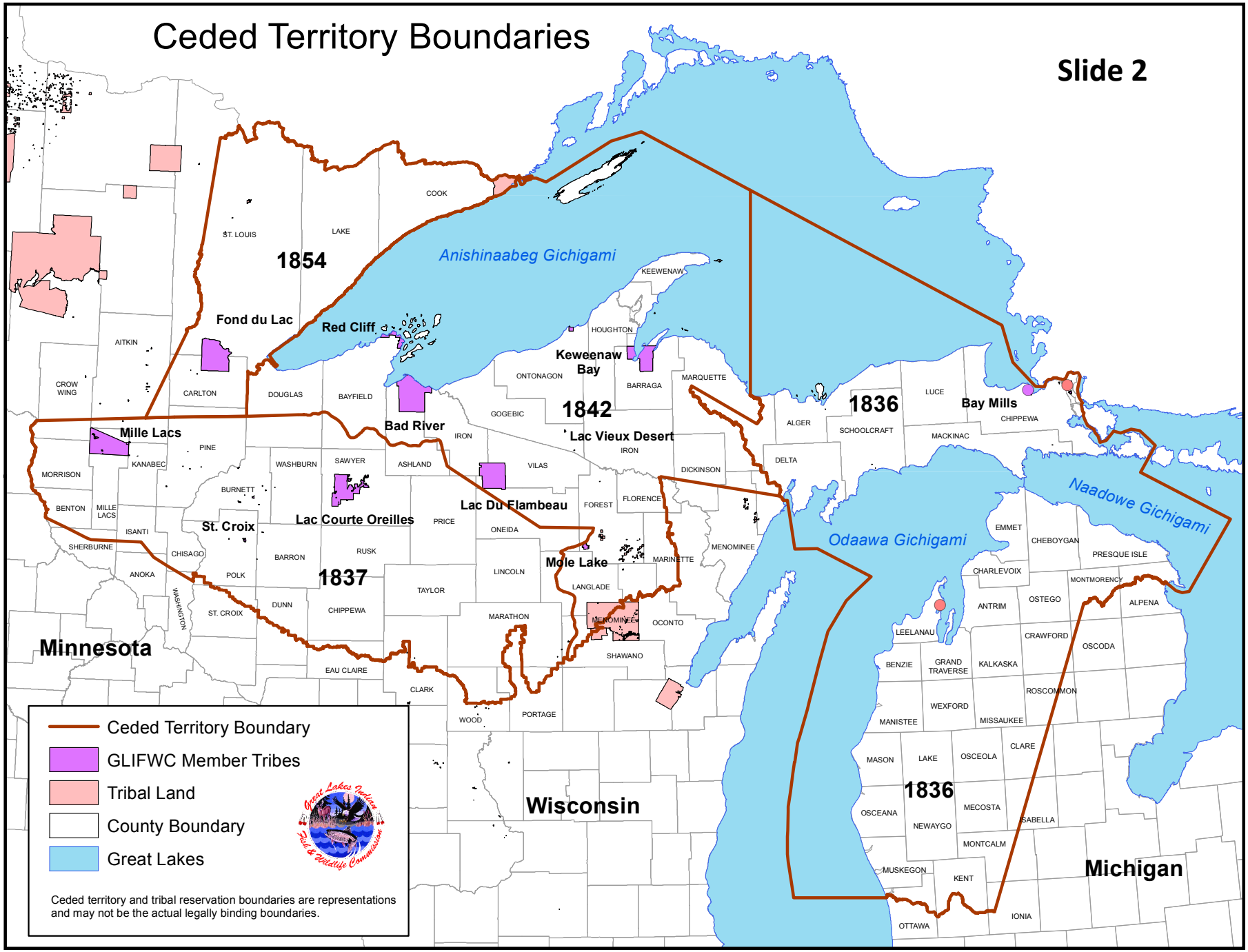
Mapping Hydrologic Connectivity in the Bad River Watershed

Great Lakes Indian Fish & Wildlife Commission

February 27, 2024

Esteban Chiriboga

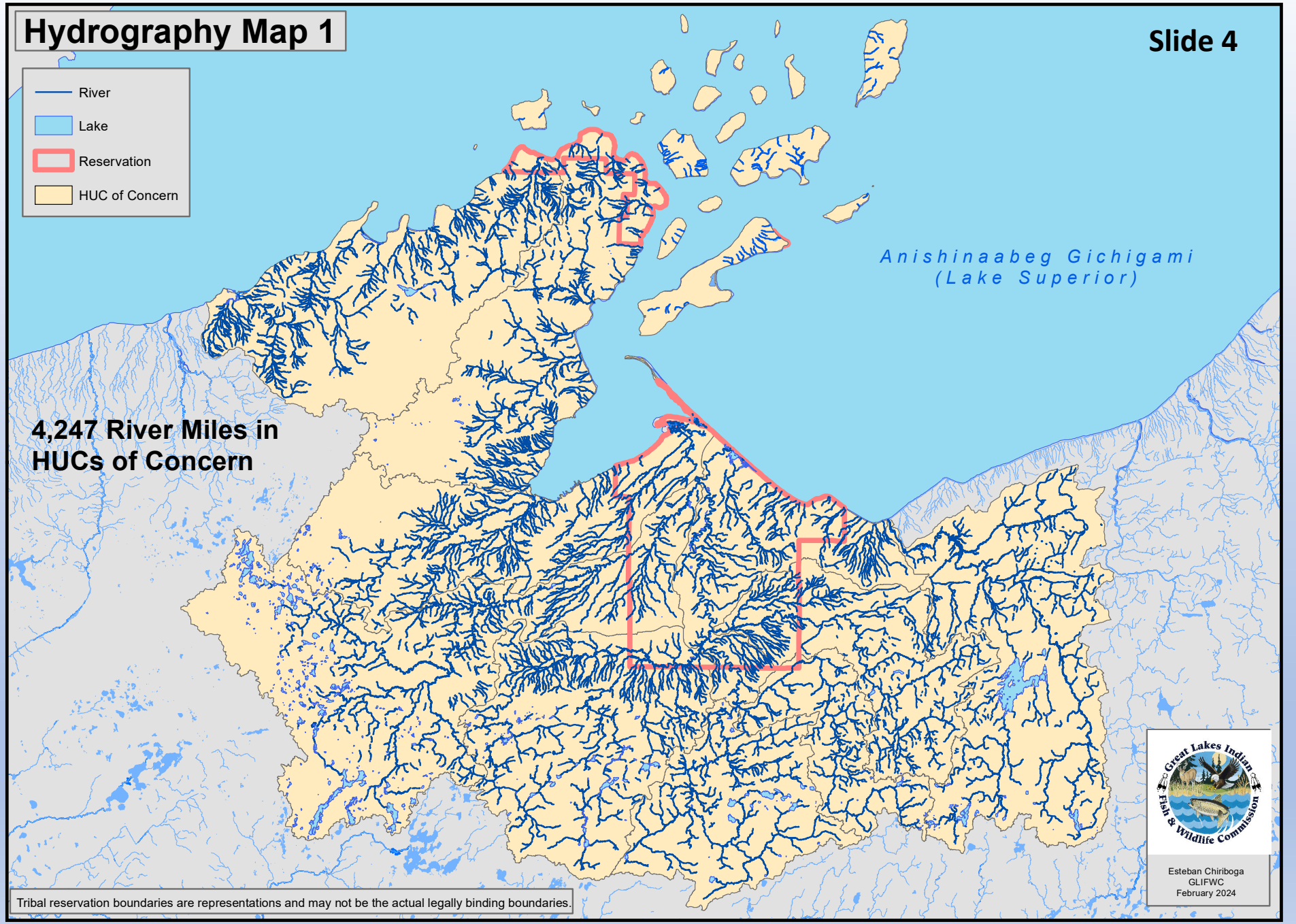

Ceded Territory Boundaries
Slide 2
1854
1842
1837
1836
1836
Fond du Lac
Red Cliff
Bad River
Keweenaw Bay
Lac Vieux Desert
Mille Lacs
St. Croix
Lac Courte Oreilles
Lac Du Flambeau
Mole Lake
Bay Mills
Anishinaabeg Gichigami
Odaawa Gichigami
Naadowe Gichigami
Minnesota
Wisconsin
Michigan
Ceded Territory Boundary
GLIFWC Member Tribes
Tribal Land
County Boundary
Great Lakes
Ceded territory and tribal reservation boundaries are representations and may not be the actual legally binding boundaries.

Purpose of Mapping:

1. Illustrate the hydrologic connections between the Bad River Reservation and the Bad River watershed.
2. Characterize the adequacy of existing hydrologic data.
3. Support the watersheds identified by Bad River as the most appropriate analysis area for water quality standard compliance.

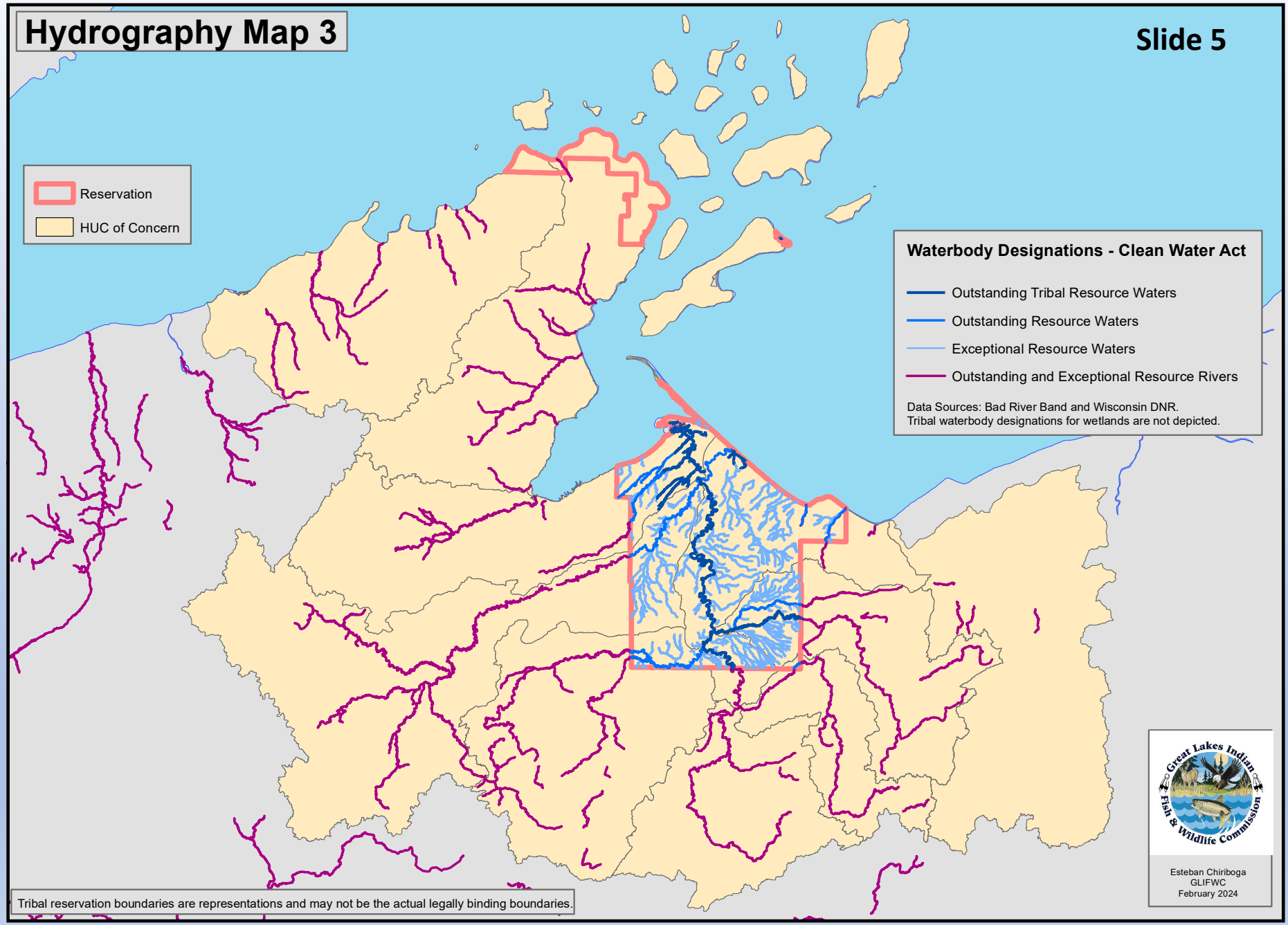
Data:

- All wetland and hydrography data used in the hydrologic connectivity mapping is maintained by, the State of Wisconsin, State of Michigan, U.S. Geological Service, and the U.S. Fish & Wildlife Service.

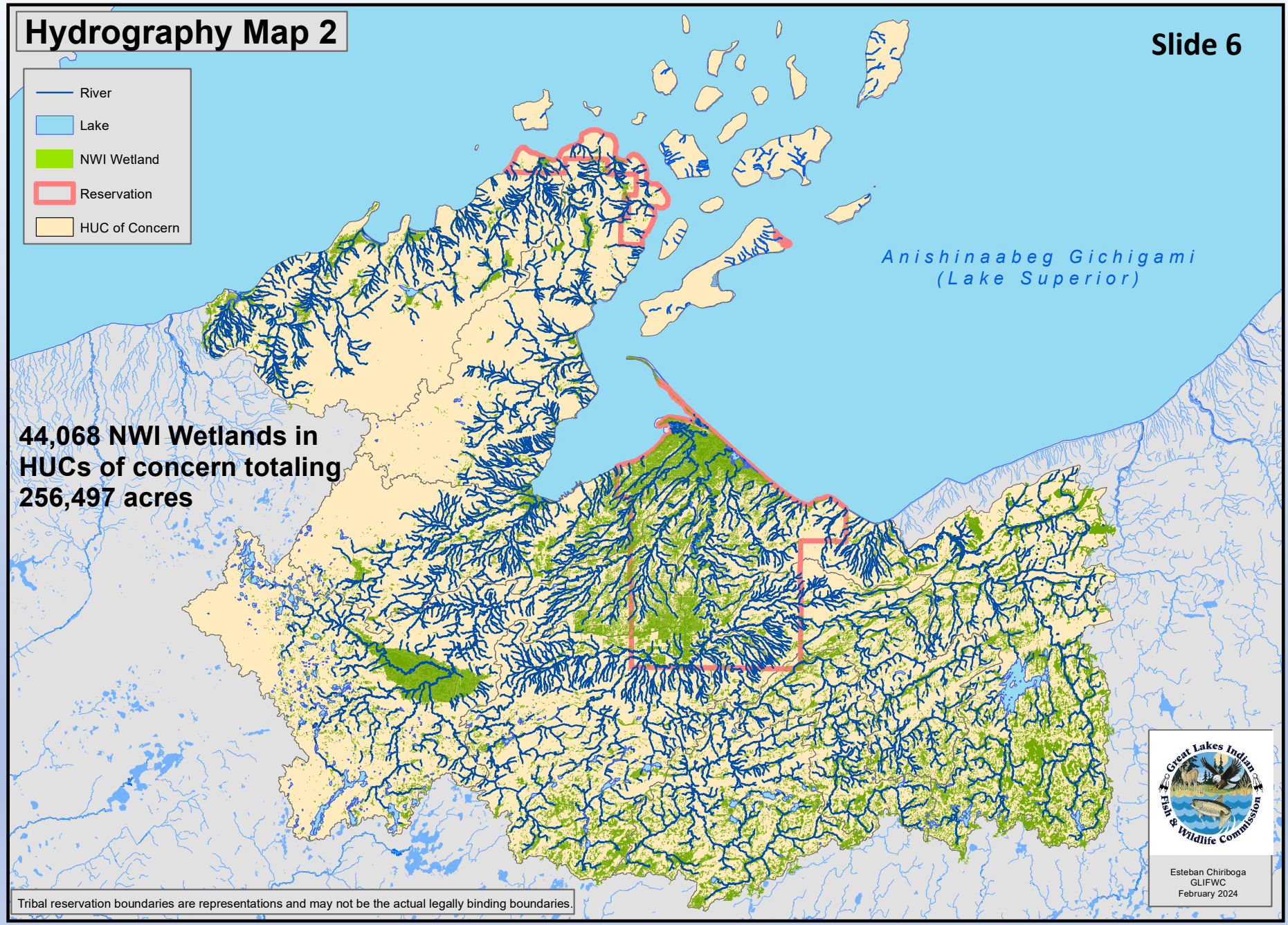

Hydrography Map 1
Slide 4
River
Lake
Reservation
HUC of Concern
Anishinaabeg Gichigami
(Lake Superior)
4,247 River Miles in
HUCs of Concern
Great Lakes Indian
Fish & Wildlife Commission
Esteban Chiriboga
GLIFWC
February 2024
Tribal reservation boundaries are representations and may not be the actual legally binding boundaries.

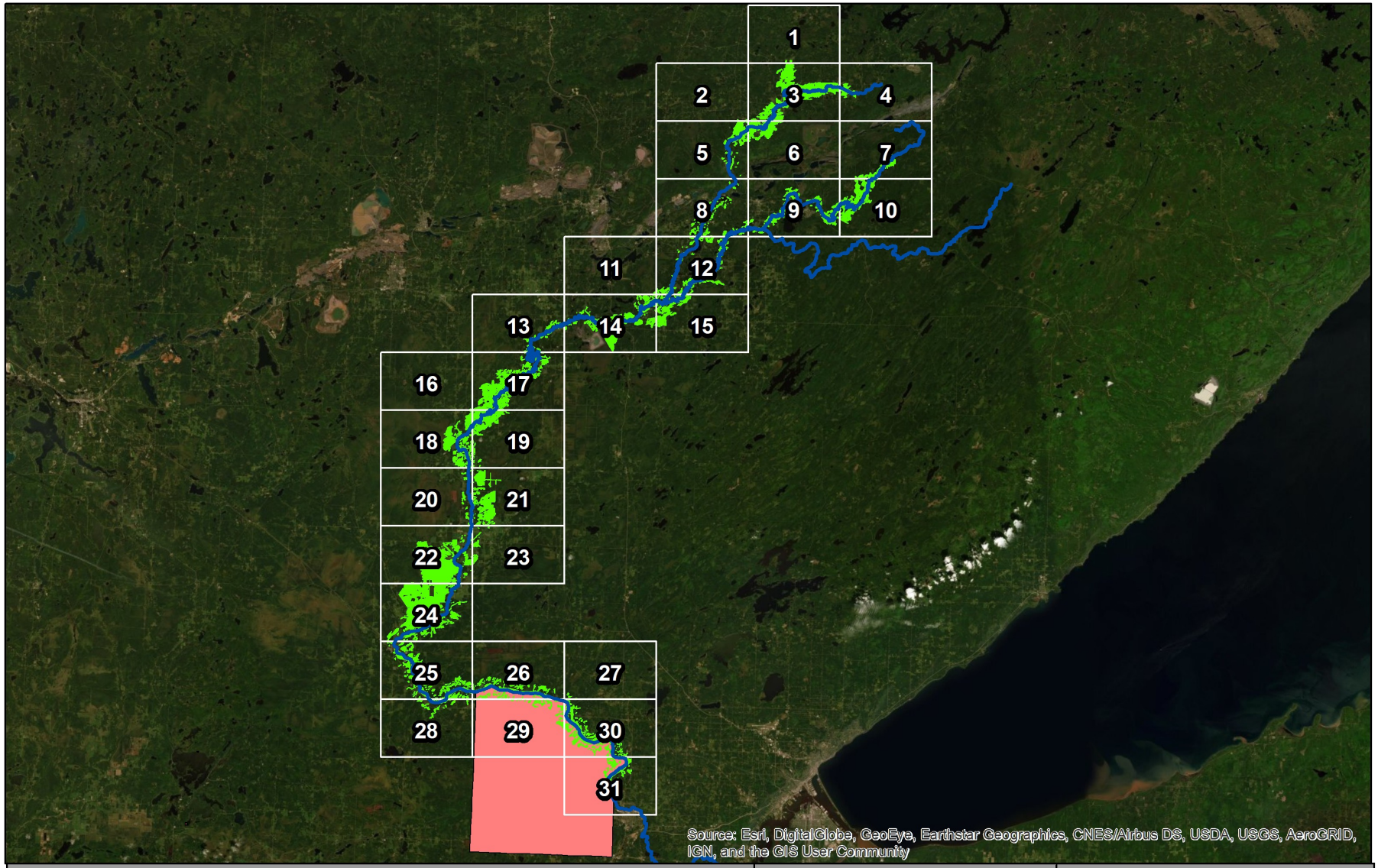
Hydrography Map 3

Slide 5



Esteban Chiriboga
GLIFWC
February 2024


Hydrography Map 2
Slide 6
River
Lake
NWI Wetland
Reservation
HUC of Concern
Anishinaabeg Gichigami
(Lake Superior)
44,068 NWI Wetlands in
HUCs of concern totaling
256,497 acres
Great Lakes Indian Fish & Wildlife Commission
Esteban Chiriboga
GLIFWC
February 2024
Tribal reservation boundaries are representations and may not be the actual legally binding boundaries.



Mapbook Index

0 3 6 12 18 24
Miles

Slide 7

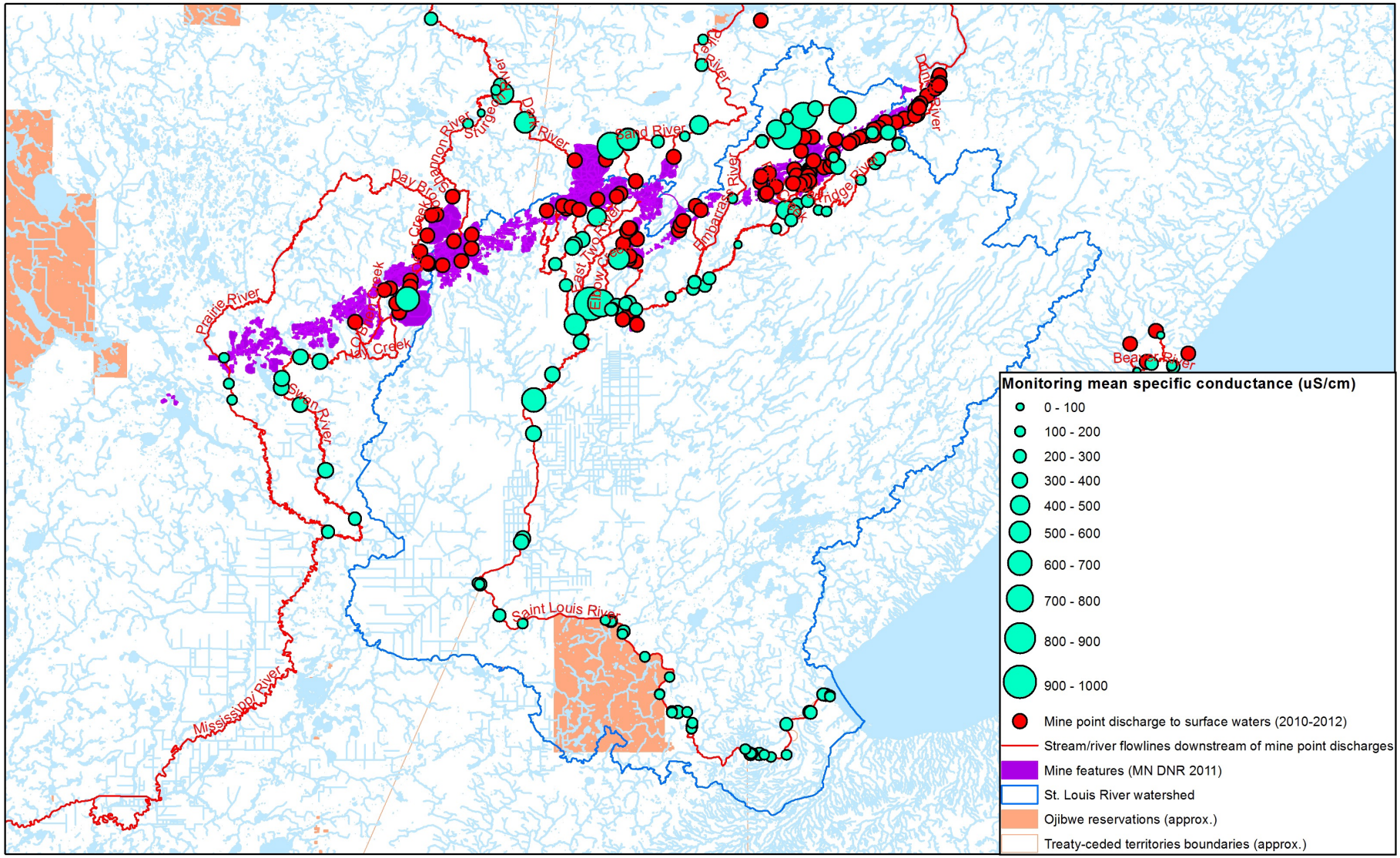
Wetlands
River
Inset Map Extent
Fond du Lac Reservation

N

Great Lakes Indian Fish & Wildlife Commission

Esteban Chiriboga
April 2022

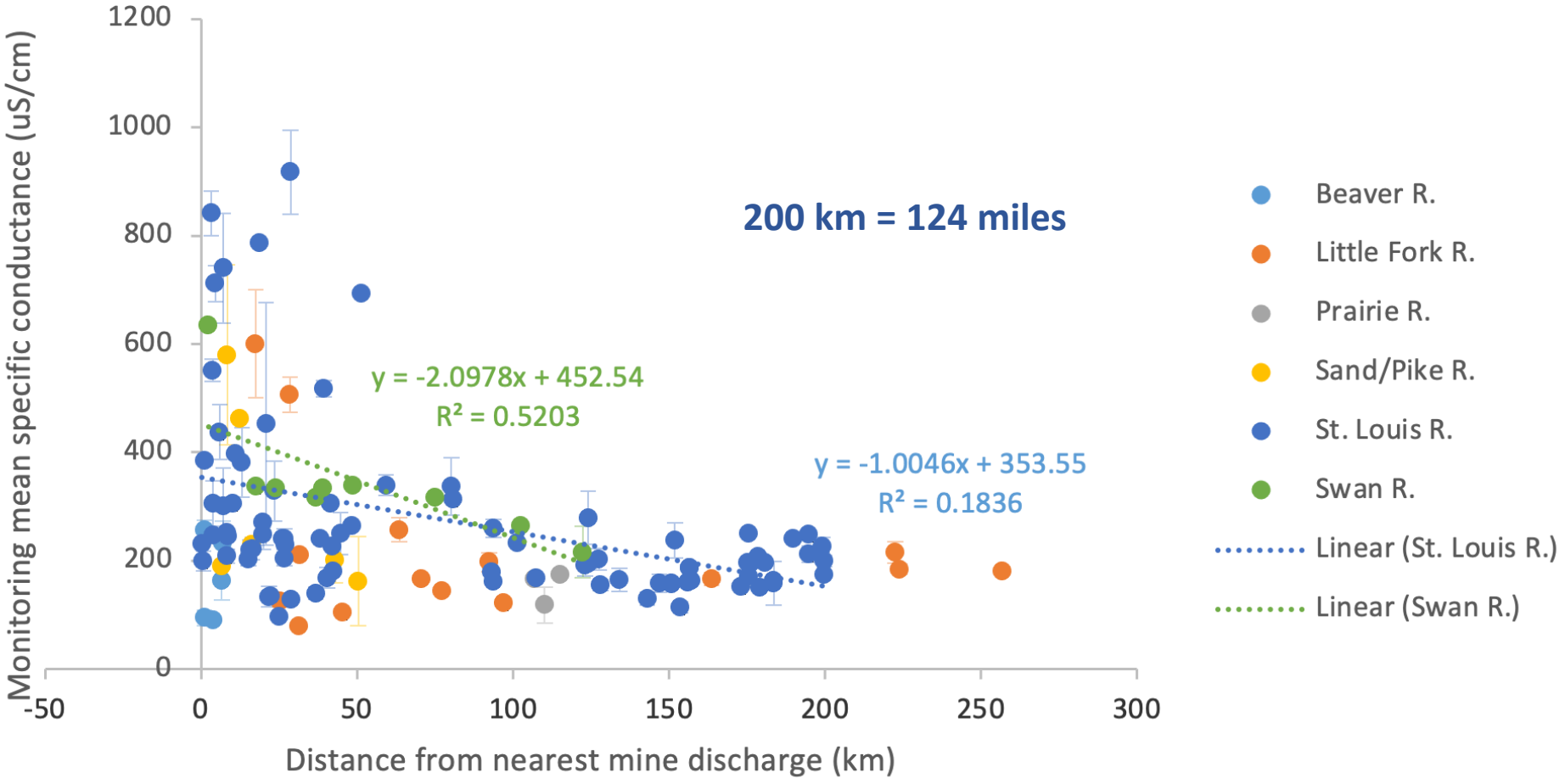
Slide 8



Tribal reservation and ceded territory boundaries are representations and may not be the actual legally binding boundaries.

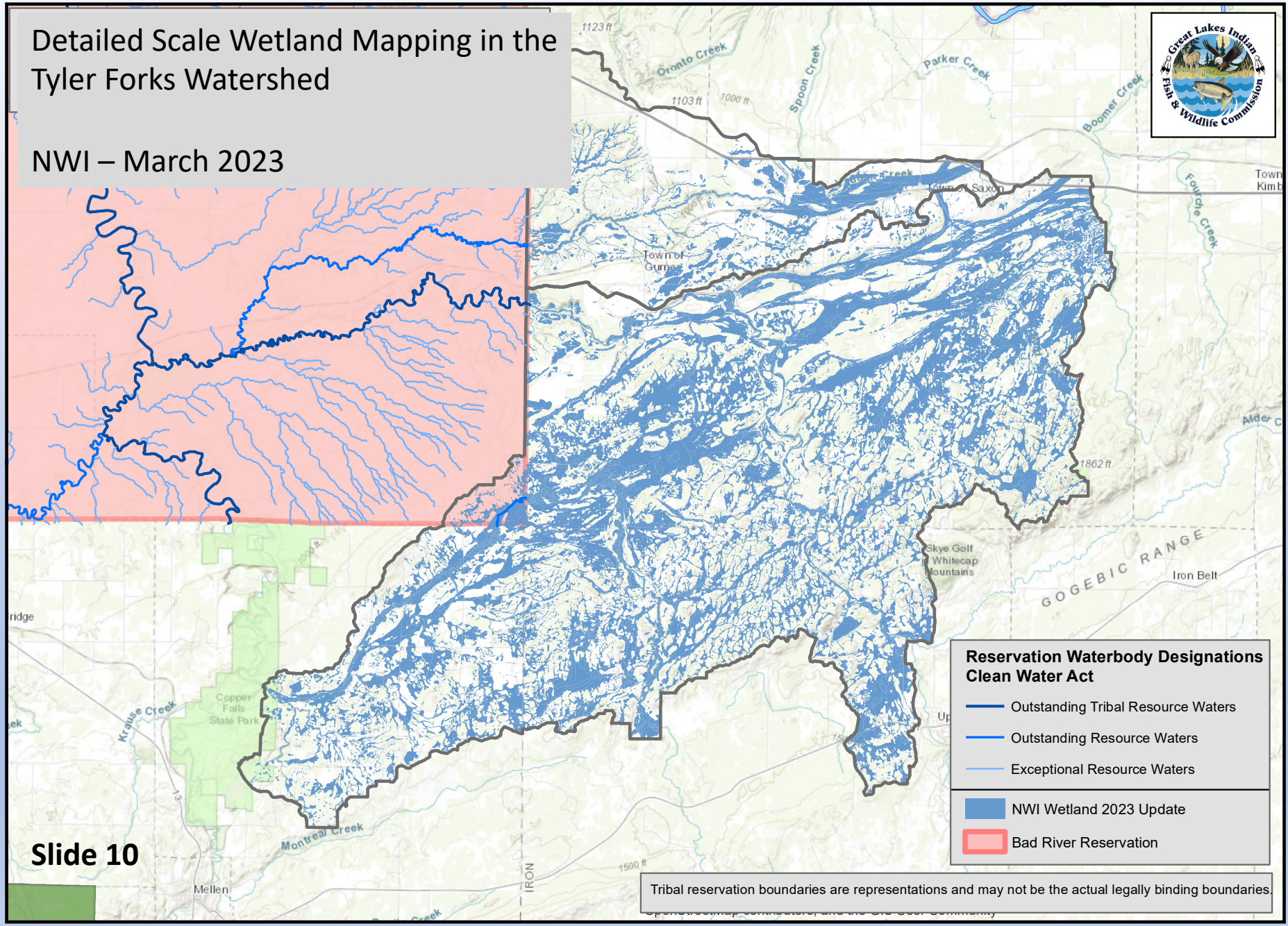
S. Cardiff / GLIFWC
Sept. 2013
NAD 83 UTM zone 15N

Persistence of high specific conductance downstream of mine sites in different river systems

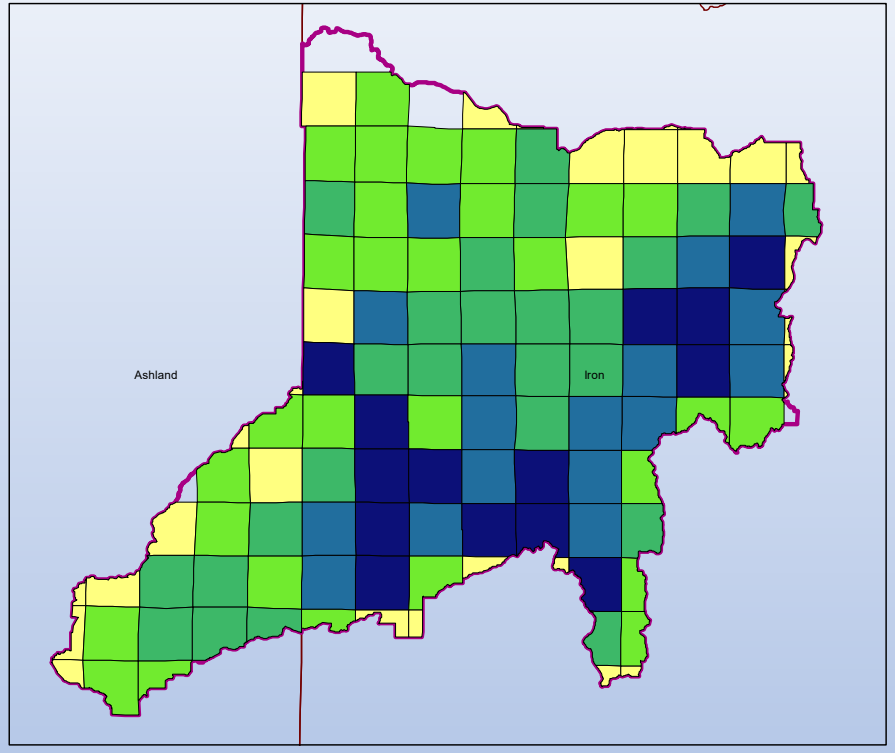


Detailed Scale Wetland Mapping in the Tyler Forks Watershed

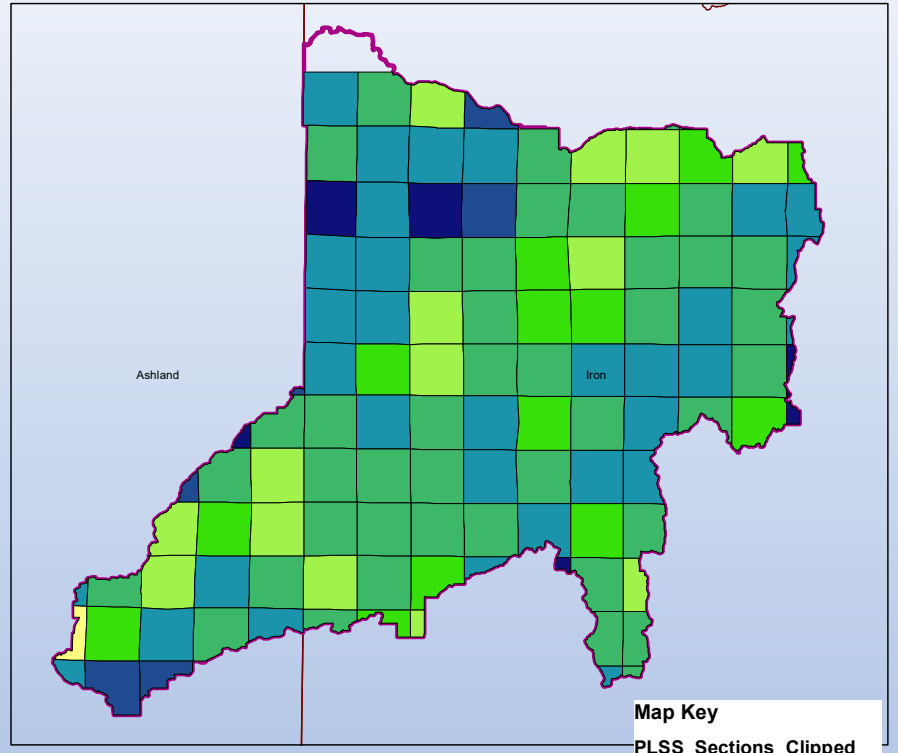
NWI – March 2023



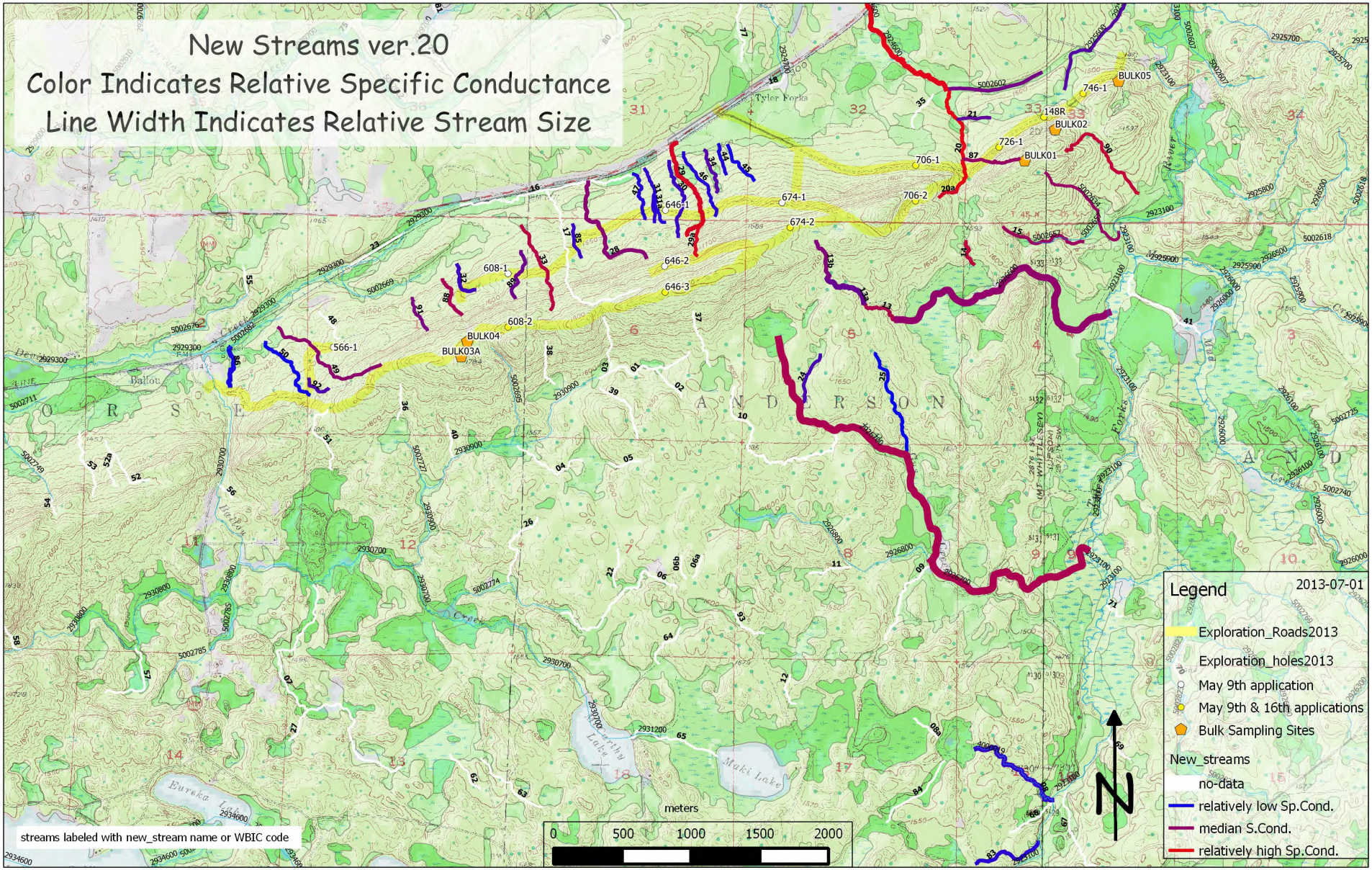
Hectare Increase: old WWI vs 1:1,000 NWI Update



Percent Increase: old NWI vs. 1:1000 NWI Update

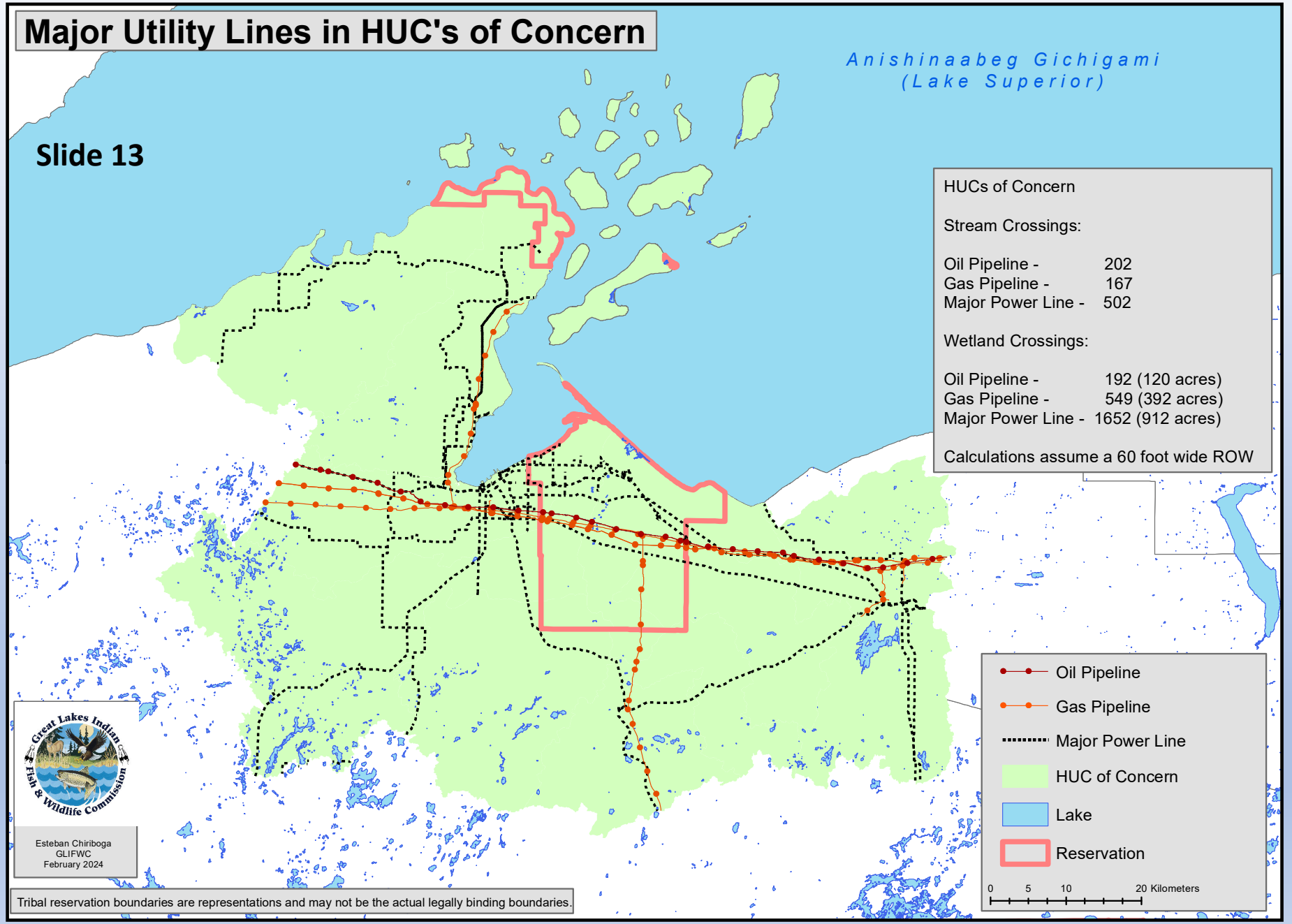


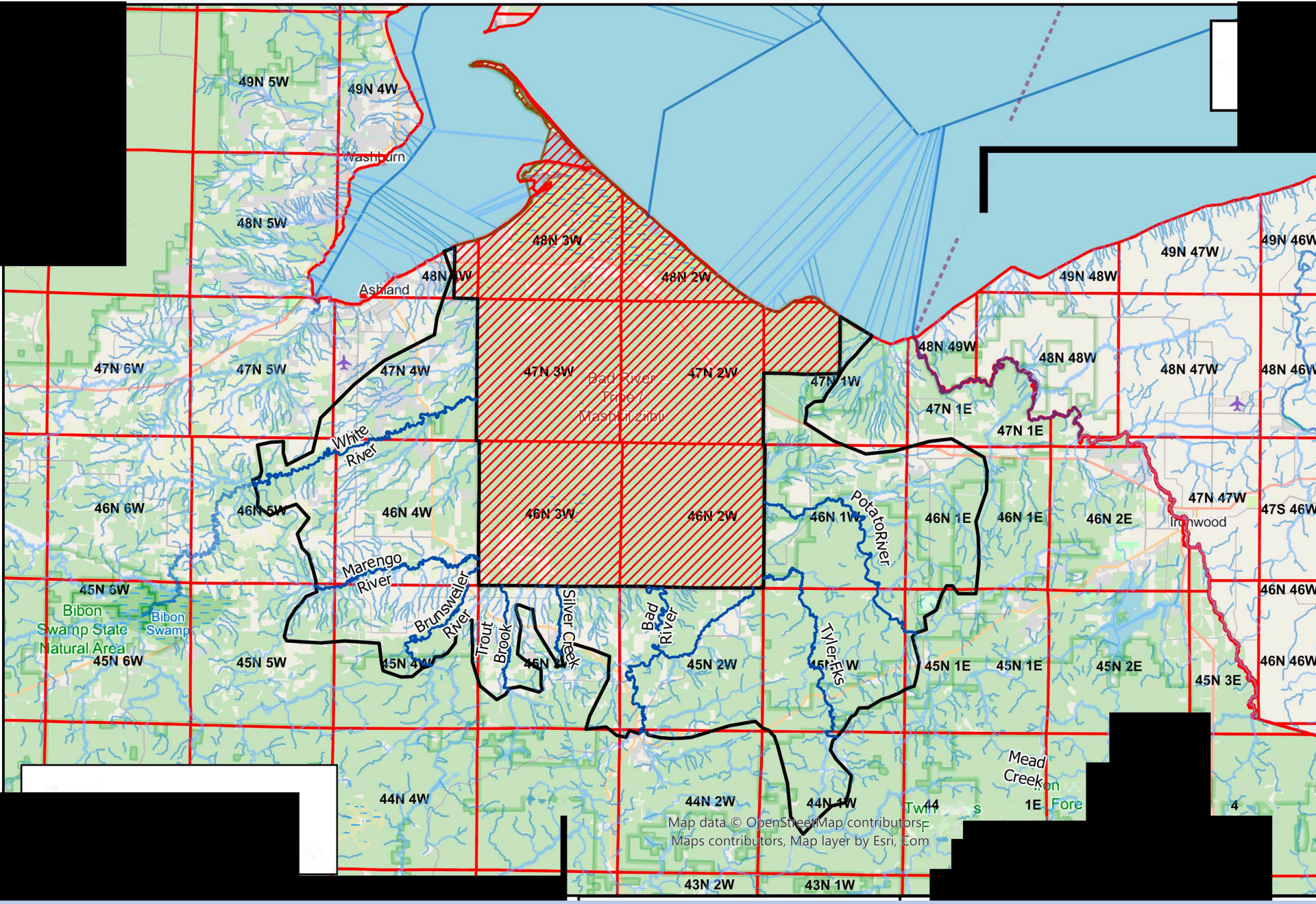
Slide 11


New Streams ver.20
Color Indicates Relative Specific Conductance
Line Width Indicates Relative Stream Size
streams labeled with new_stream name or WBIC code
meters
0
500
1000
1500
2000
Legend
2013-07-01
Exploration_Roads2013
Exploration_holes2013
May 9th application
May 9th & 16th applications
Bulk Sampling Sites
New_streams
no-data
relatively low Sp.Cond.
median S.Cond.
relatively high Sp.Cond.
BULK01
BULK02
BULK03A
BULK04
BULK05
608-1
608-2
646-1
646-2
646-3
674-1
674-2
706-1
706-2
726-1
746-1
148R
566-1
ANDERSON
ORSE
Tyler Forks
Eureka Lake
Maki Lake

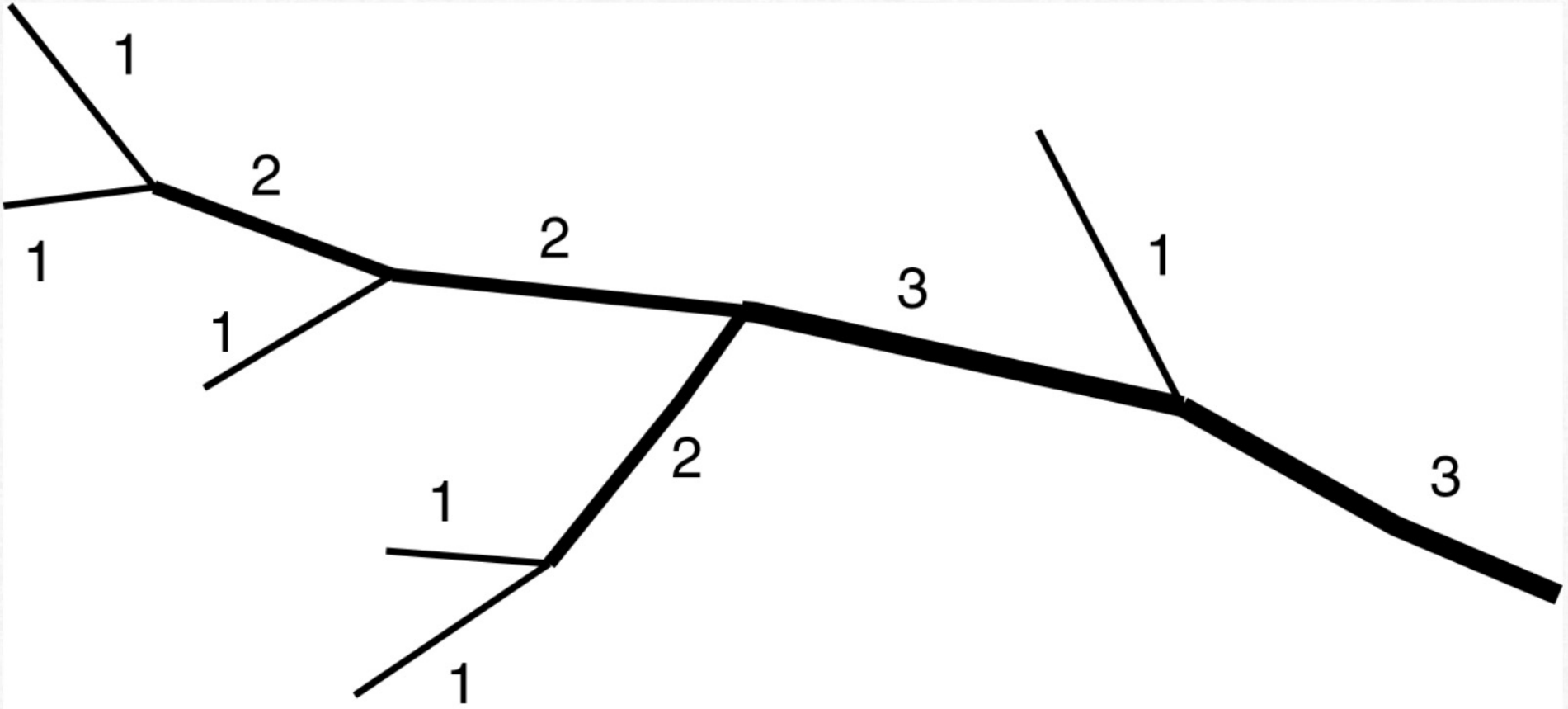
Major Utility Lines in HUC's of Concern

Slide 13




49N 5W
49N 4W
Washburn
48N 5W
48N 3W
48N 2W
Ashland
49N 47W
49N 46W
49N 48W
48N 49W
48N 48W
48N 47W
48N 46W
47N 6W
47N 5W
47N 4W
47N 3W
47N 2W
47N 1W
47N 1E
47N 1E
47N 47W
47S 46W
Ironwood
White River
Bad River
Tyler Forks
Mashkiiziibii
Potato River
46N 6W
46N 5W
46N 4W
46N 3W
46N 2W
46N 1W
46N 1E
46N 1E
46N 2E
46N 46W
Marengo River
Brunsweiler River
Trout Brook
Silver Creek
Bad River
Tyler Forks
45N 6W
Bibon Swamp State Natural Area
Bibon Swamp
45N 6W
45N 5W
45N 4W
45N 3W
45N 2W
45N 1W
45N 1E
45N 1E
45N 2E
45N 3E
46N 46W
Mead Creek
44N 4W
44N 2W
44N 1W
Map data © OpenStreetMap contributors
Maps contributors, Map layer by Esri, Com
43N 2W
43N 1W

Slide 14



Strahler Stream Order is a graphical classification system.

- Assumes that streams with the same order share similar broad characteristics on channel dimensions and biological community.
- Stream order is not a regulatory tool on individual projects or cumulative impacts.
- Stream order is not appropriate for determining compliance with water quality standards. Site specific data are needed for those determinations.

Thanks.

Concluding Statements

- Watersheds are simple and scientifically defensible constructs to use for pre-construction notices and for determining compliance with Bad River's water quality standards at the reservation boundary.
- Shortcomings of existing hydrographic data suggest that general permits don't adequately capture the extent of past, present, and reasonably foreseeable, water quality impacts.