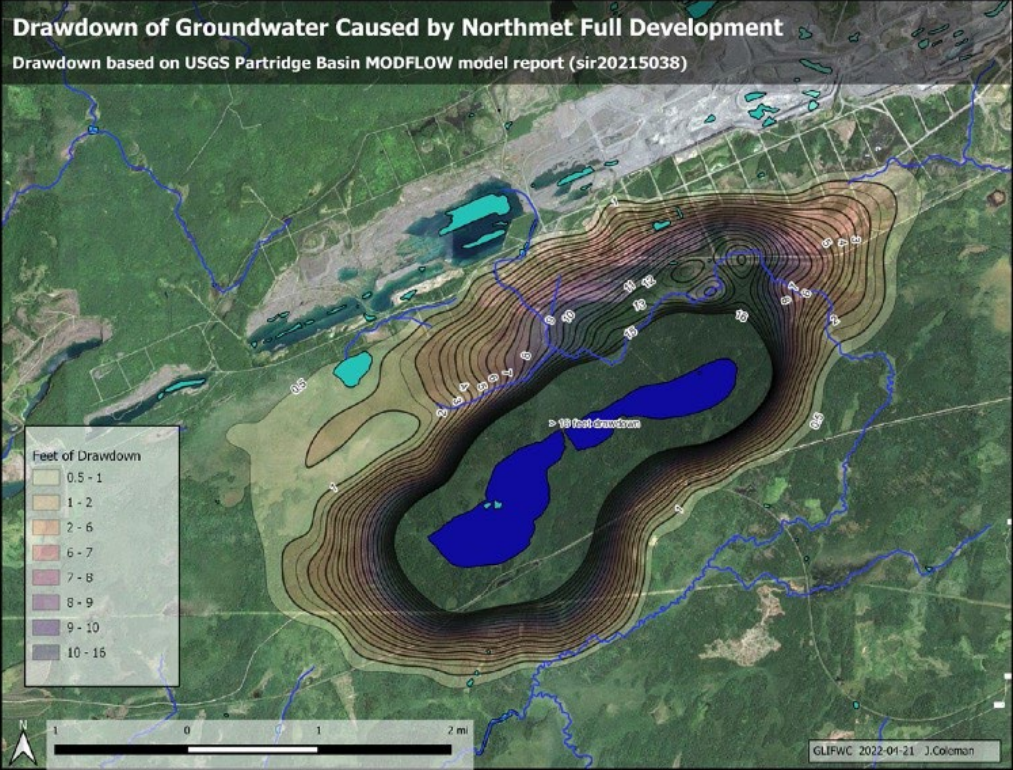


Mapping of Wetlands Upstream of the Fond du Lac Reservation

Great Lakes Indian Fish & Wildlife Commission

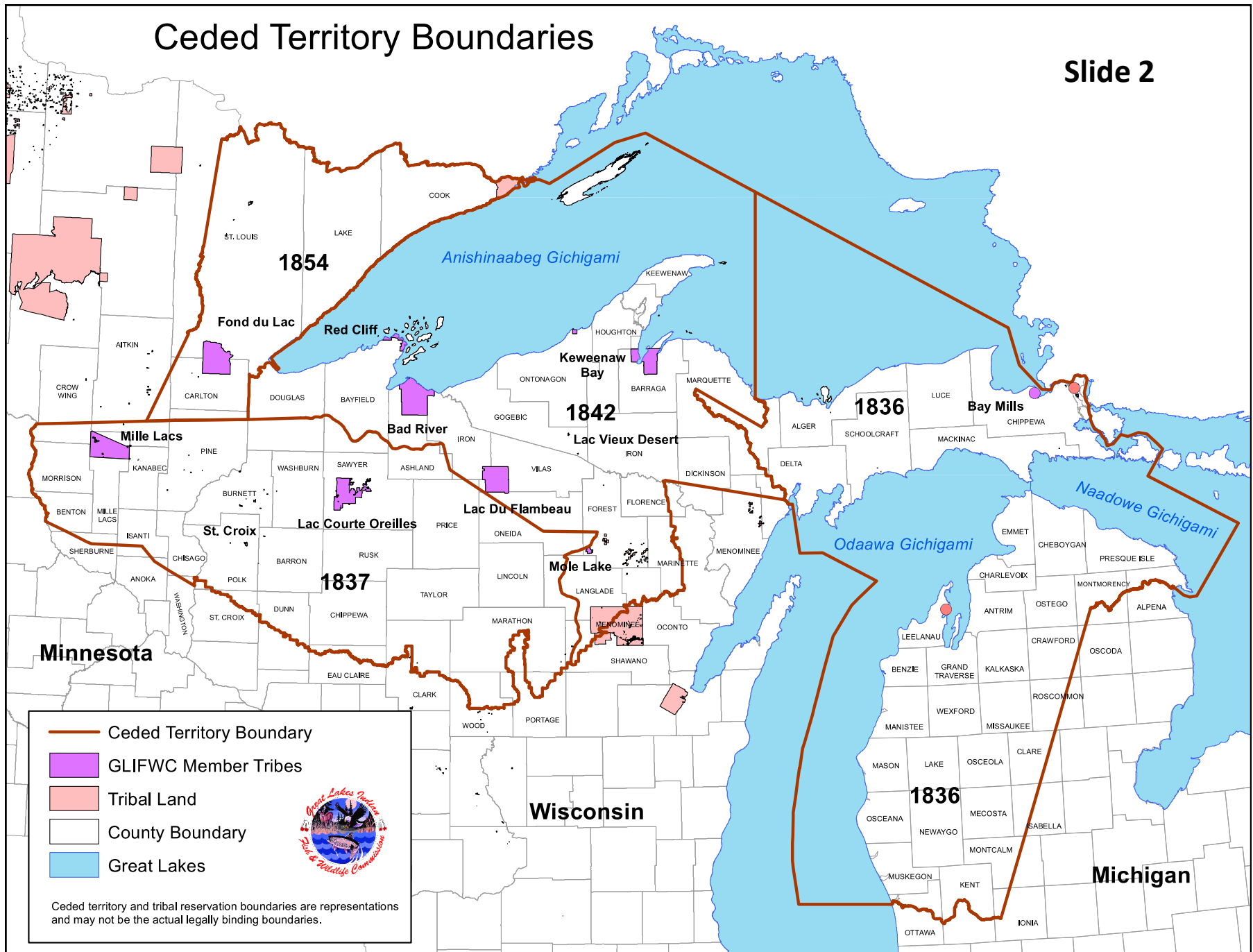
May 2022

Esteban Chiriboga, John Coleman, and Scott Cardiff



Ceded Territory Boundaries

Slide 2



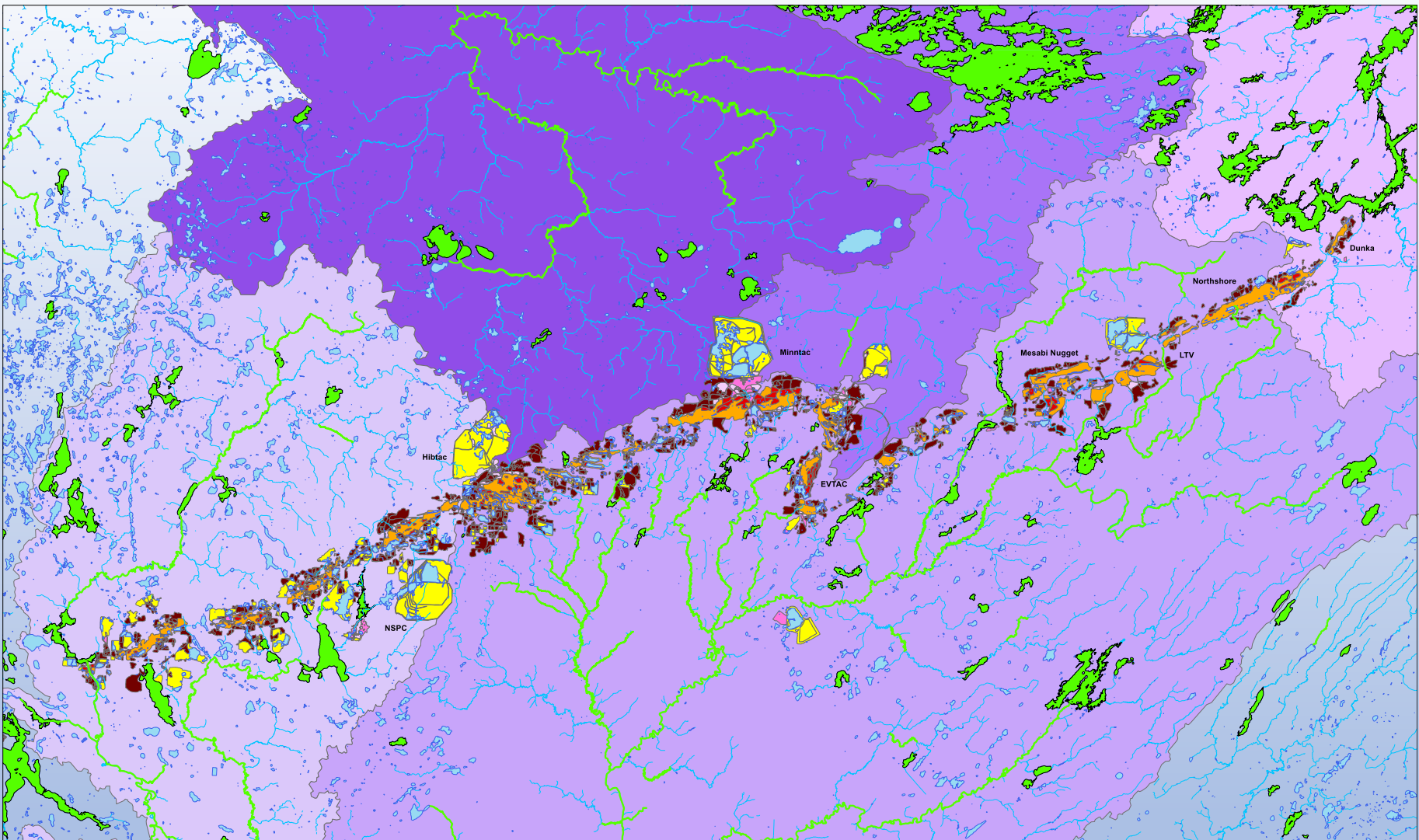
Purpose of Mapping:

1. Illustrate the hydrologic connection that exists between the Iron Range / PolyMet and the Fond du Lac Reservation.
2. Provide wetland type/acreage data to experts.
3. Describe GLIFWC's work characterizing indirect impacts to wetlands from the proposed PolyMet mine.

Data:

- All wetland and hydrography data used in the analysis was created, and is maintained by, the State of Minnesota and FEMA.
- PolyMet mine features created by the mining company.
- USGS Groundwater model is available at:

<https://pubs.er.usgs.gov/publication/sir20215038>



Iron Range Mine Features, Major Minnesota Watersheds and 303d Listed Waters

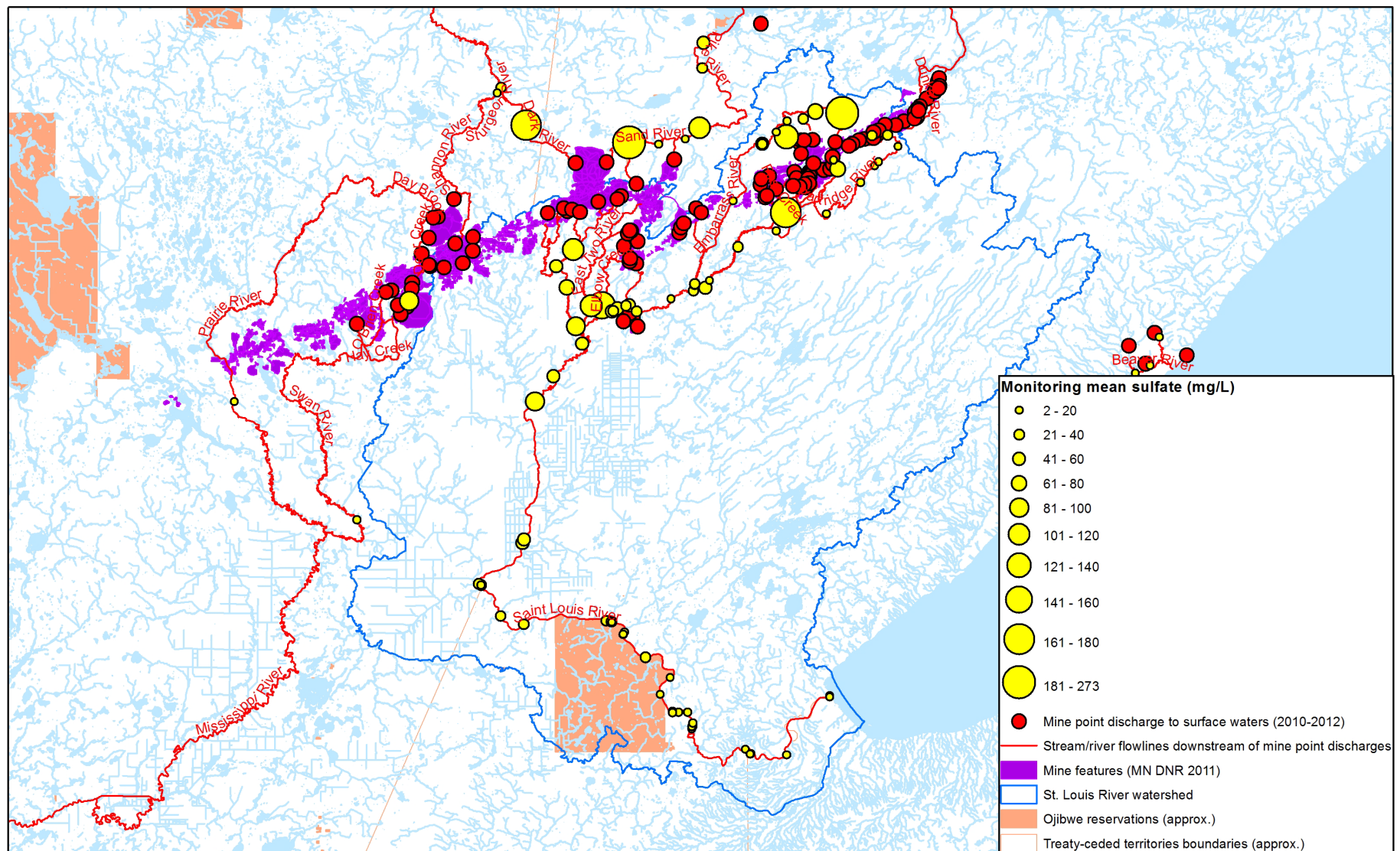
Mine Features	Major Watershed	
 Mine Pits	 Little Fork River	 2018 Impaired Lakes (Draft)
 Tailings Basins	 Mississippi River - Grand Rapids	 2018 Impaired Rivers (Draft)
 Stockpiles	 Rainy River - Headwaters	 Lakes
 In-Pit Stockpiles	 St. Louis River	 Rivers
 Other Mine Features	 Vermillion River	

Esteban Chiriboga
GLFWC @ LICGF
April 9, 2017

3 1.5 0 3 6 9 12 Miles

Sulfate data from MPCA.

Map and additional details are available in Attachment 2, exhibit 7 of will affect submission.



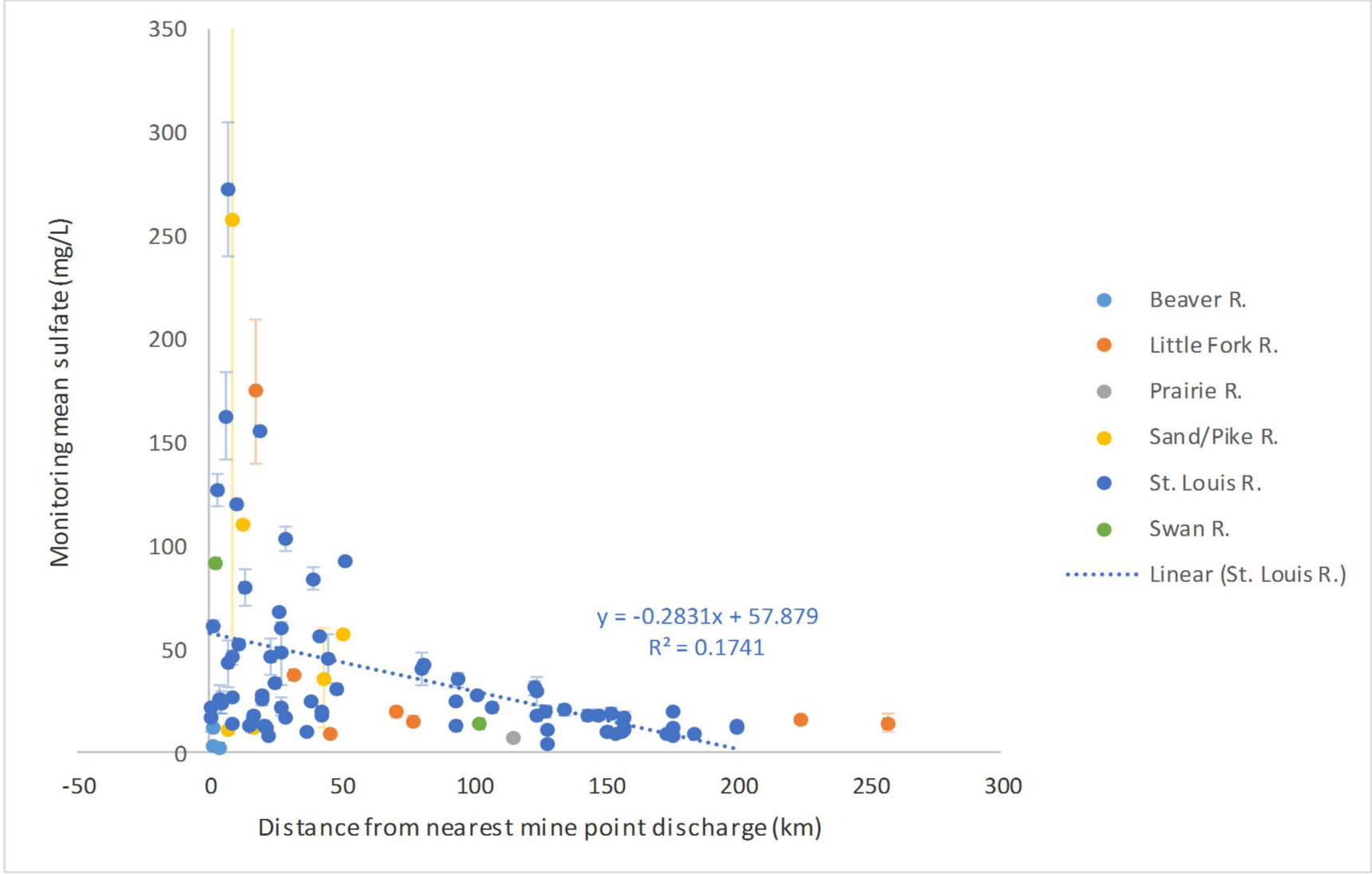
Tribal reservation and ceded territory boundaries are representations and may not be the actual legally binding boundaries.

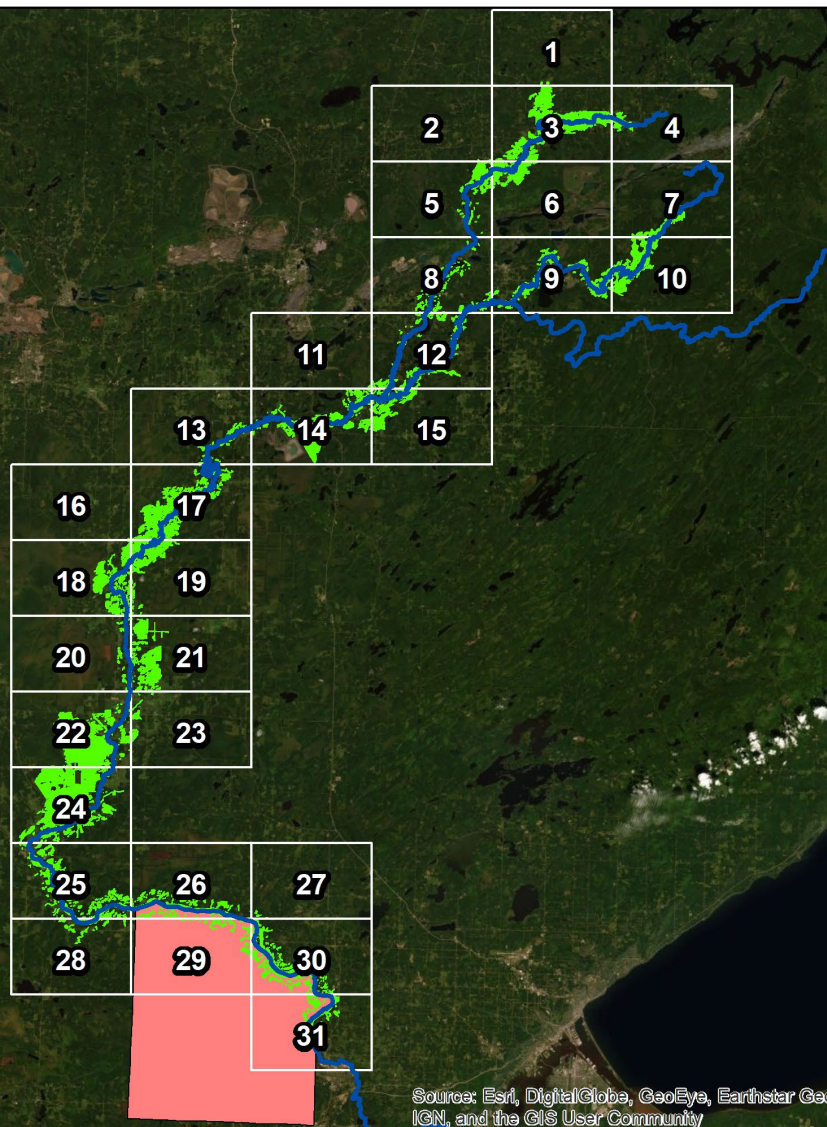
0 5 10 20 30 40 Kilometers
0 2.5 5 10 15 20 Miles

Slide 5



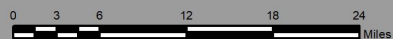
S. Cardiff / GLIFWC
Sept. 2013
NAD 83 UTM zone 15N





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

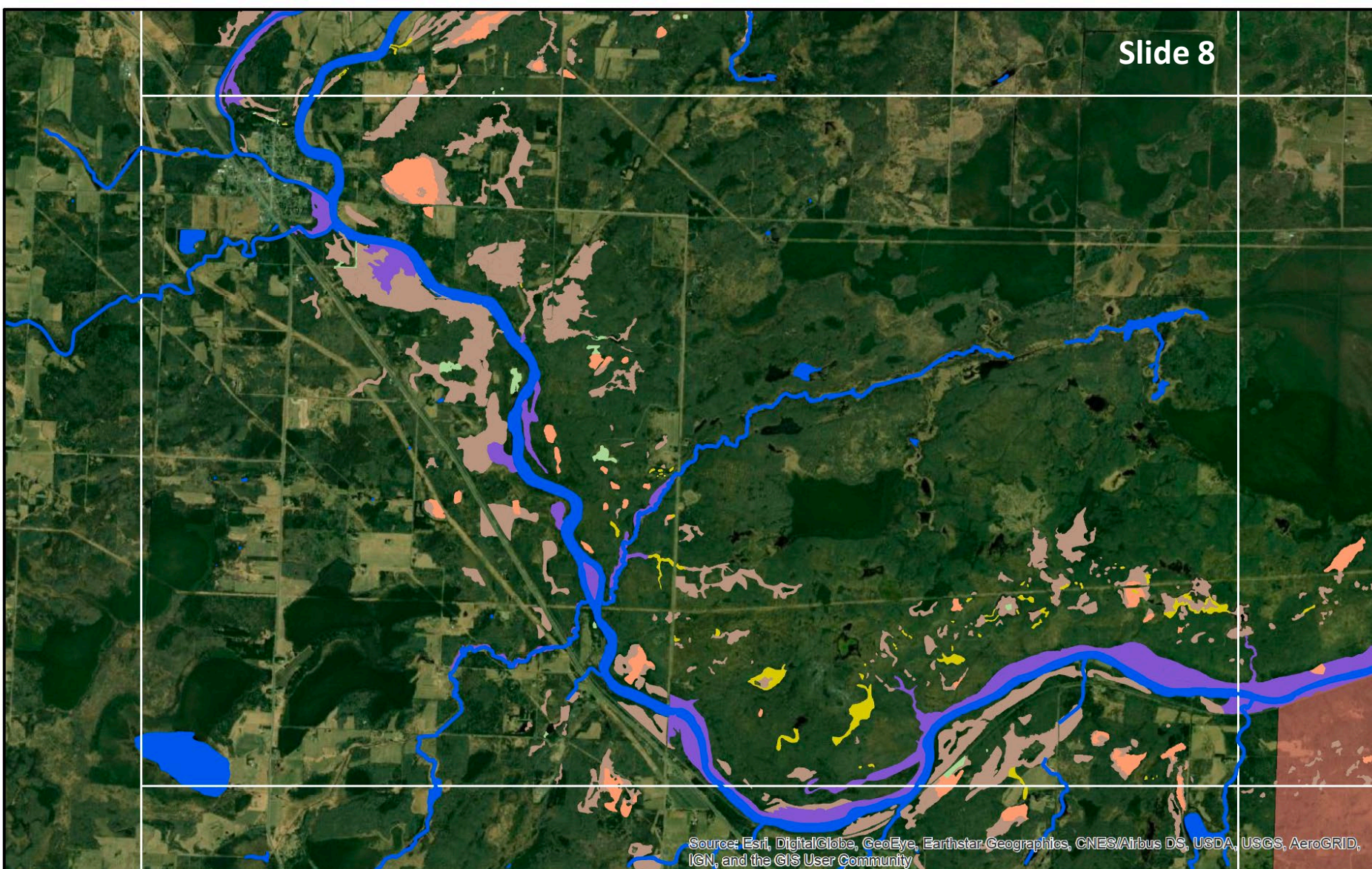
Mapbook Index



- Wetlands
- River
- Inset Map Extent
- Fond du Lac Reservation









Esteban Chiriboga
April 2022



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

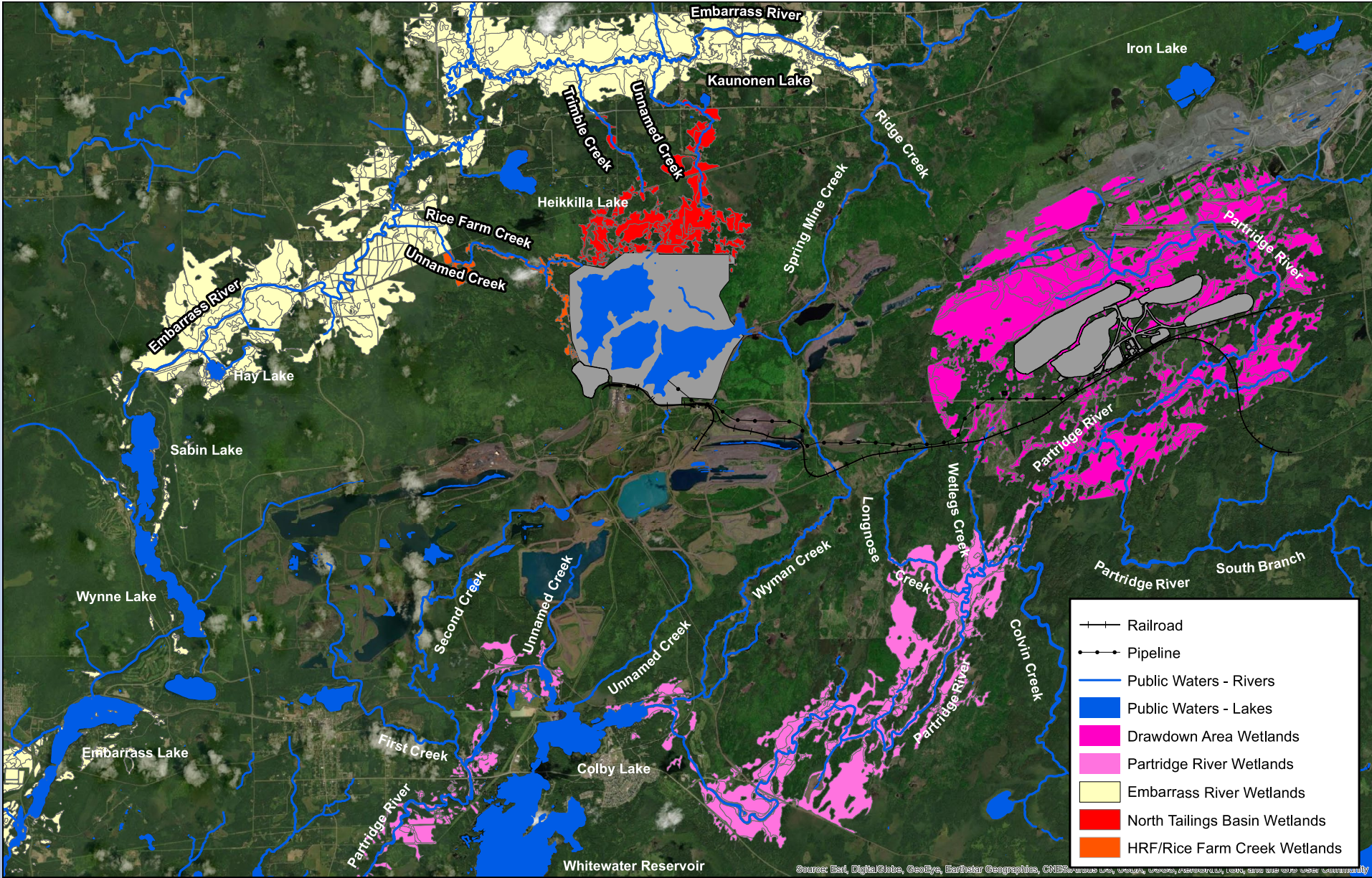
HGM Wetland Classification

- | | |
|---|--|
|  Depression |  Mineral Flat |
|  Lentic |  Peatland |
|  Lotic |  Slope |

- | |
|--|
|  Lakes |
|  Rivers |
|  Inset Map Extent |
|  Fond du Lac Reservation |

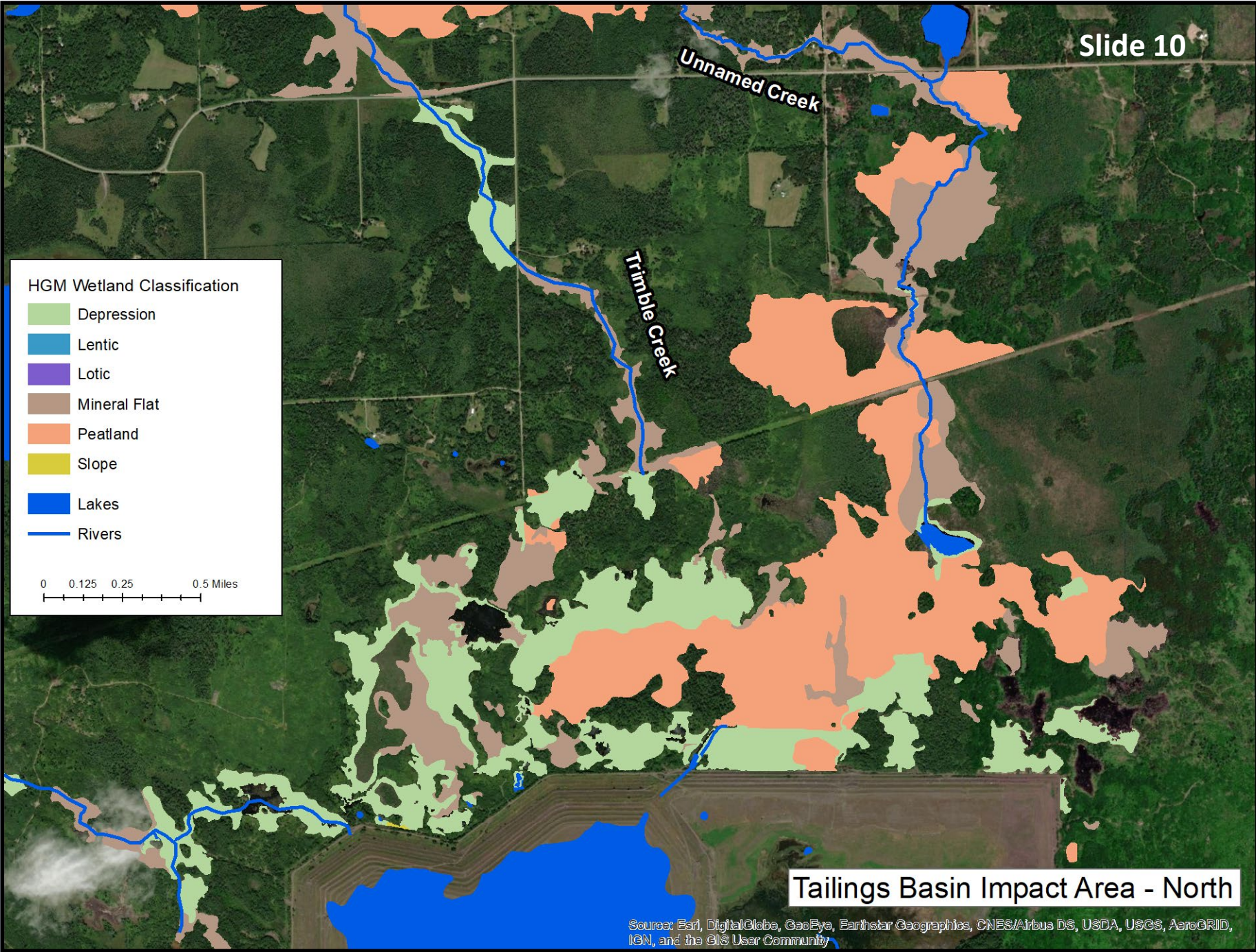
Map 25



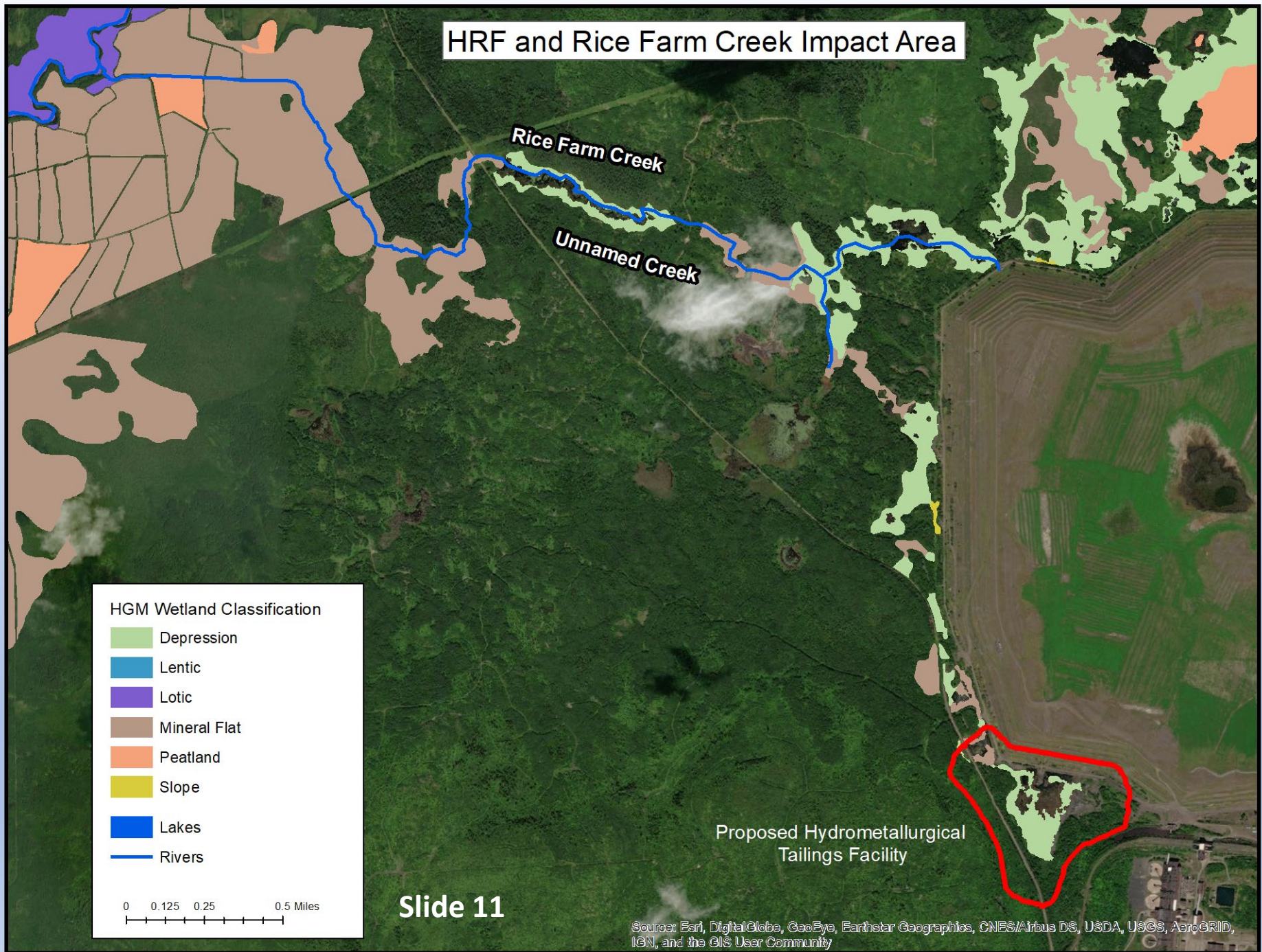


Attachment 5 of will-affect submission.

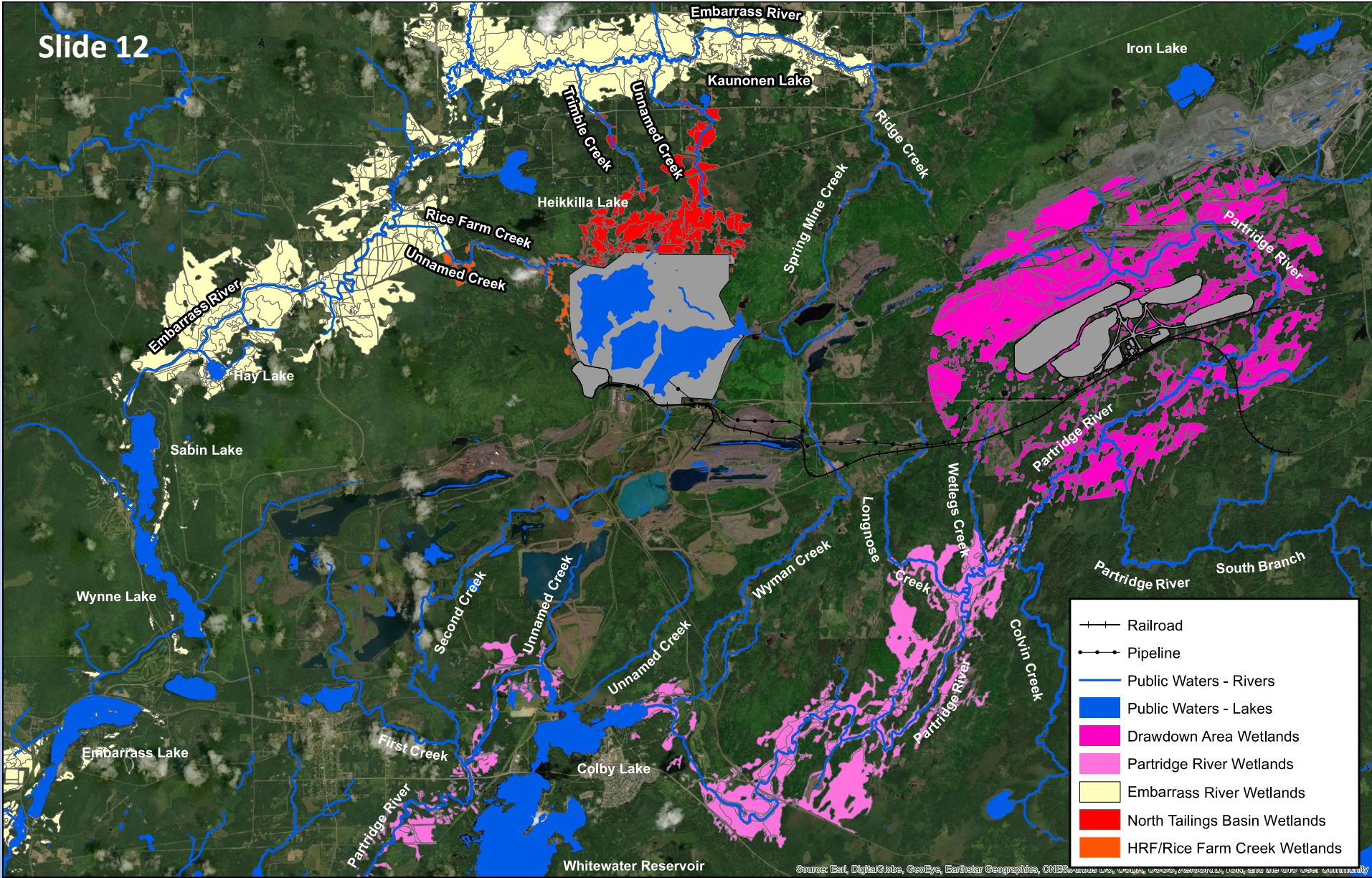
Slide 9



HRF and Rice Farm Creek Impact Area

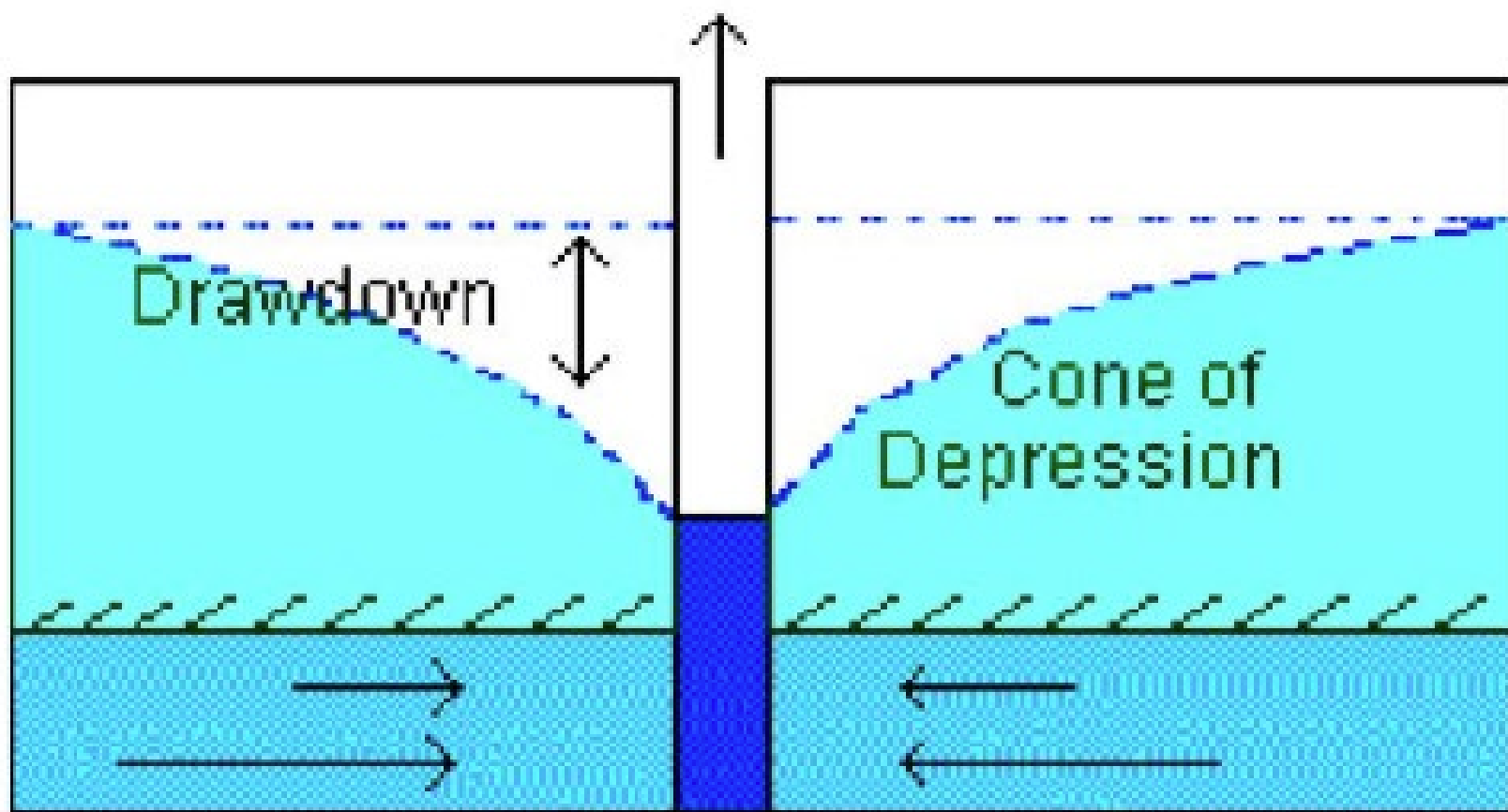


Slide 12



Attachment 5 of will affect submission.

Drawdown



Context.

- Early in the project, GLIFWC and Fond du Lac argued for using a quantitative method to determine indirect wetland impacts due to groundwater drawdown.
- Use of the "Crandon Method" has several advantages.
 - Used by the St. Paul District of the Army Corps for the Crandon Mine EIS.
 - Quantitative method for indirect wetland impact prediction. Combines a groundwater drawdown model with wetland delineation and detailed plant lists collected in transects across the wetlands.
 - Identifies acres of wetland where groundwater drawdown impacts are reasonably foreseeable.
- The lead agencies (Corps and MNDNR) rejected this approach because of the mining company's assertion that the wetlands in the mine site area were "perched" bogs or disconnected from groundwater.

Context.

- When the second EIS process began, the lead agencies convened a set of Impact Assessment Planning (IAP) groups to improve the environmental analysis of the proposed mine.
- The wetland IAP group was tasked with providing recommendations to the lead agencies on many issues, including on how to assess impacts from groundwater drawdown.
- According to the Wetland IAP Final Summary Memo written by the Army Corps (July 1, 2011). A quantitative assessment of indirect wetland impacts from groundwater drawdown using additional field data and a groundwater model (the Crandon Method) was the recommendation from Fond du Lac Band, Grand Portage Band, Great Lakes Indian Fish and Wildlife Service, U.S. Fish and Wildlife Service, 1854 Treaty Authority, Minnesota Pollution Control Agency and the U.S. Environmental Protection Agency.
- The summary memo states that the Army Corps, MNDNR, ERM (Lead agency consultant) and Barr Engineering (PolyMet consultant) disagreed with the group.

- Compared water level fluctuations of the Canisteo mine pit to pit water level fluctuations in wells located in the vicinity.
- Based on that data, created 4 analog zones and calculated wetland acres in each zone.
- Likelihood of impact within each zone was calculated based on the wetland classification for each wetland.

The analog method has many shortcomings which were communicated to the lead agencies. GLIFWC's position is that this method could produce some useful information but that it is not a replacement for a quantitative method. In addition, the FEIS notes on page 5-259:

“The indirect effects analysis performed for the EIS were not performed to characterize impacts but were done to inform where monitoring should take place for those areas that were identified as having a potential for indirect wetland effects.”

GLIFWC strongly believes that an EIS needs to assess past, present and reasonably foreseeable impacts of a proposed action. Simply monitoring for an impact so that mitigation can be done after the impact has already occurred is a flawed approach.

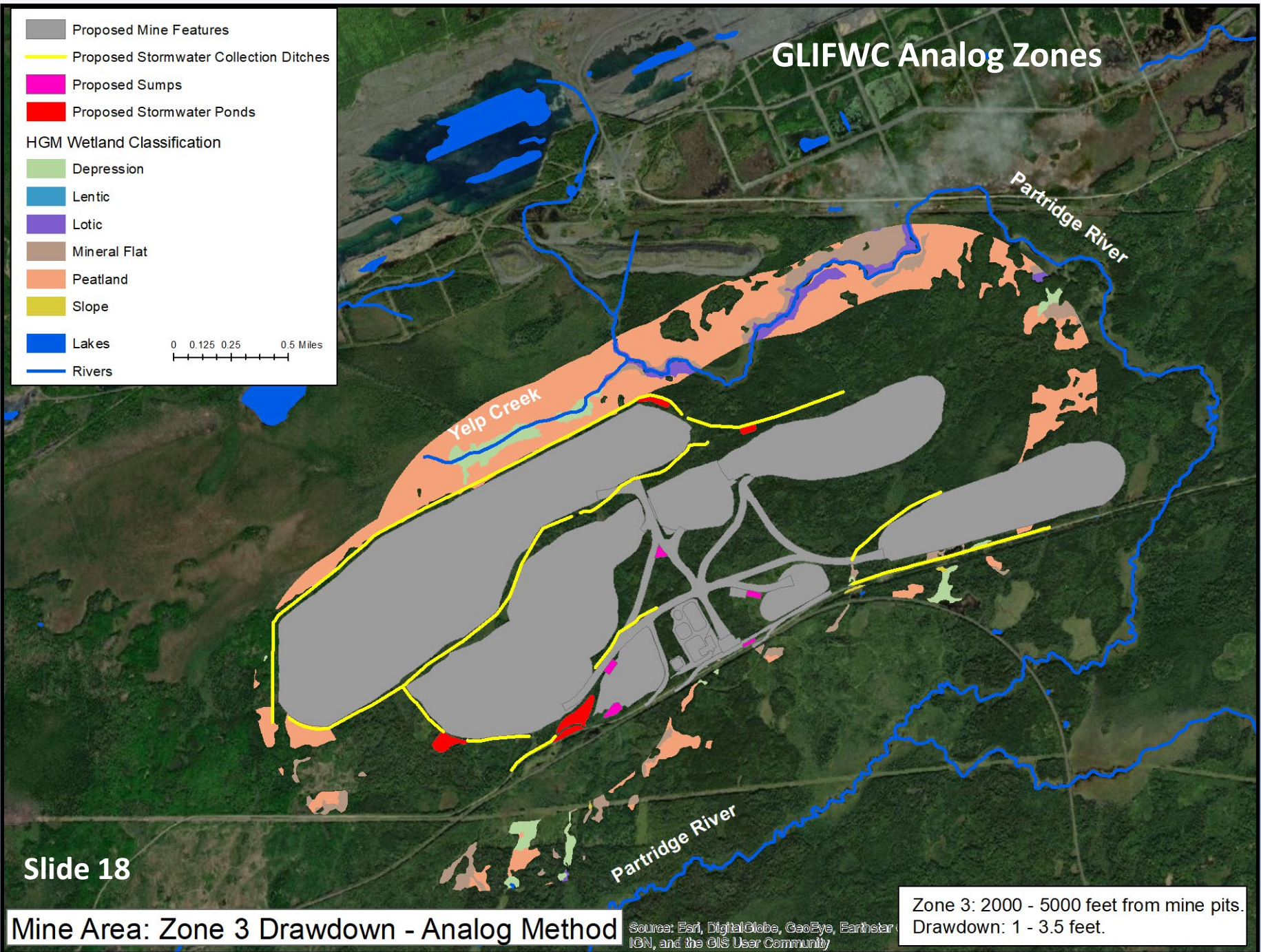
GLIFWC Analog Zones

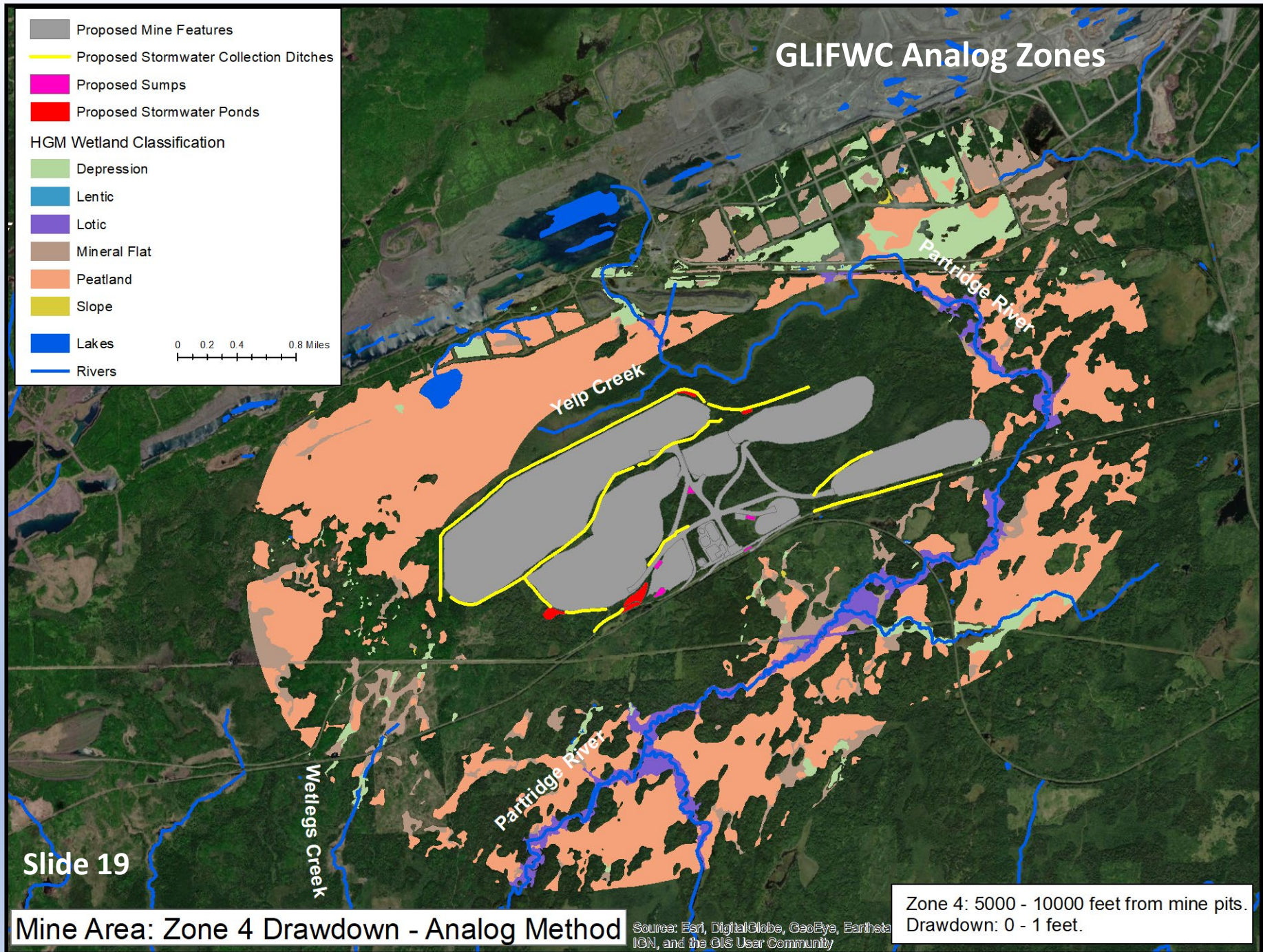
Slide 17

0 0.3 0.6 1.2 1.8 2.4 Miles

Impact Zones

- Impact Zone 1 (5 to 10 feet of drawdown)
- Impact Zone 2 (3.5 to 5 feet of drawdown)
- Impact Zone 3 (1 to 3.5 feet of drawdown)
- Impact Zone 4 (0 to 1 foot of drawdown)
- Proposed Mine Pits (year 20)





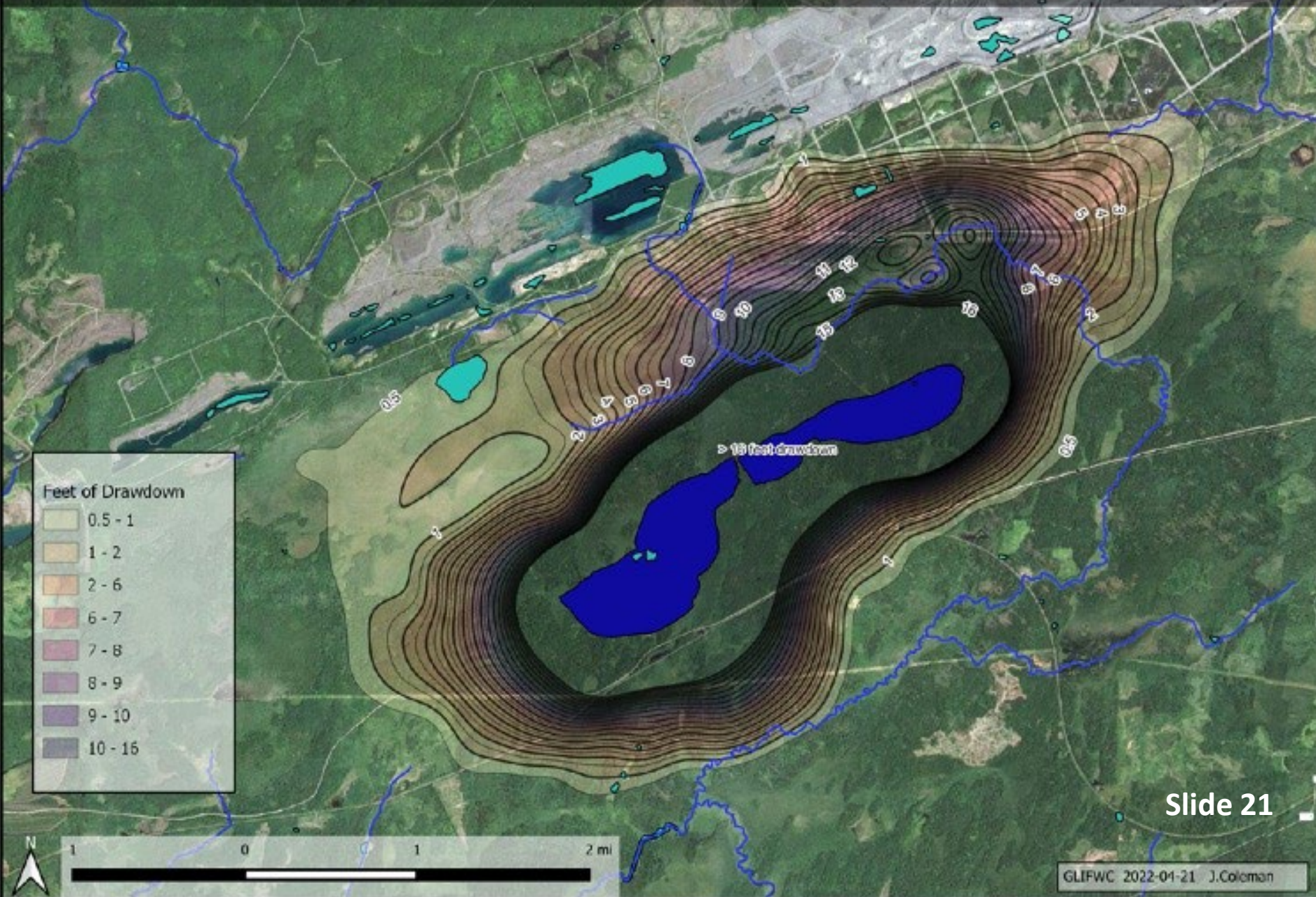
**Prepared in cooperation with the
Great Lakes Indian Fish & Wildlife Commission**

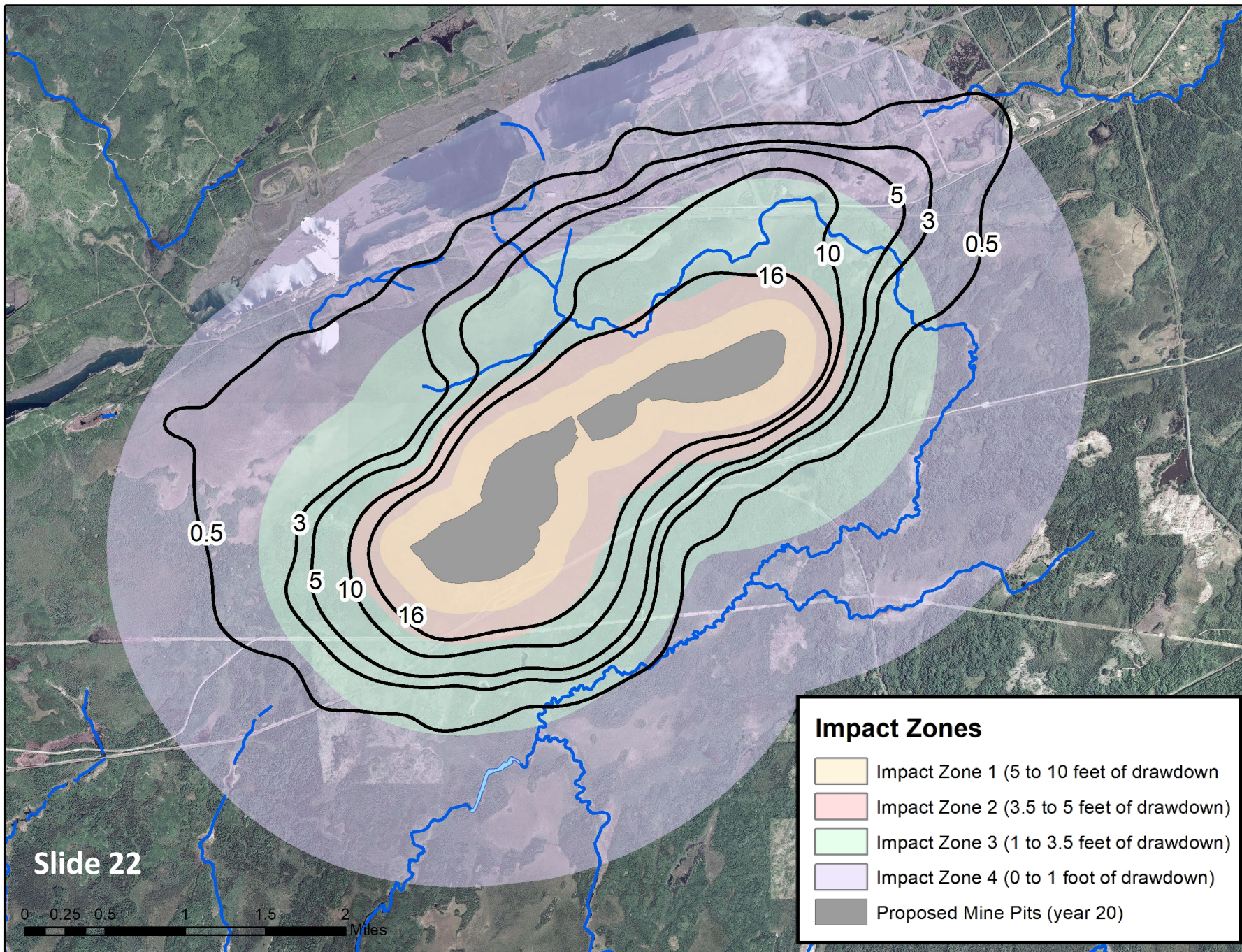
Groundwater/Surface-Water Interactions in the Partridge River Basin and Evaluation of Hypothetical Future Mine Pits, Minnesota

<https://doi.org/10.3133/sir20215038>

Drawdown of Groundwater Caused by Northmet Full Development

Drawdown based on USGS Partridge Basin MODFLOW model report (sir20215038)





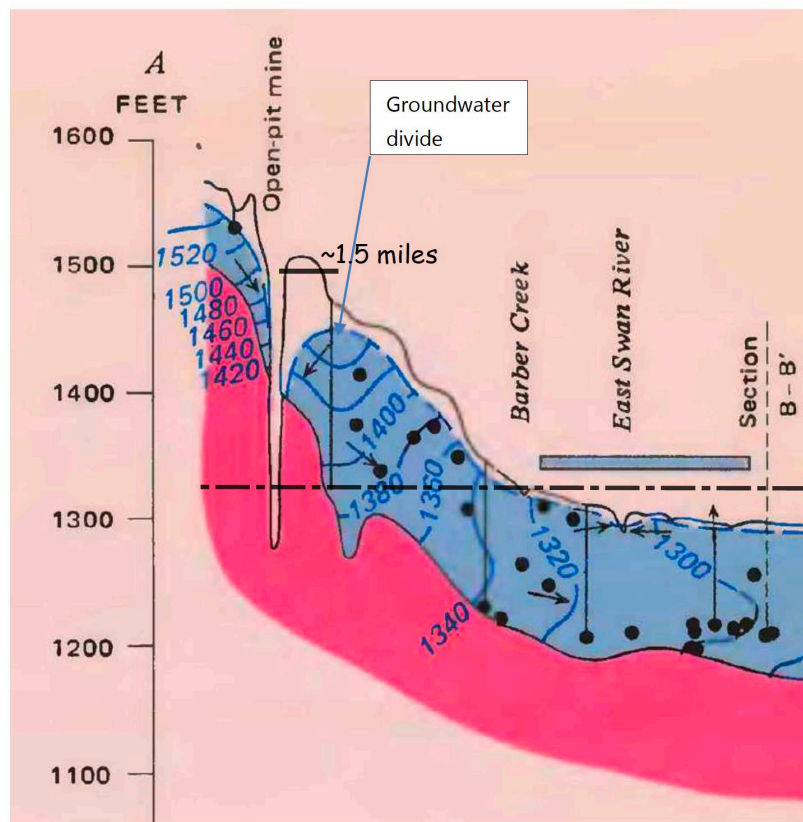


Figure 2 Portion of a Cross Section Showing Hydraulic Head Contours in the Drift Aquifer Adjacent to an Open-pit Mine (from Cross-section A-A' of Reference (2)). The portion shown has a length of approximately 17 miles

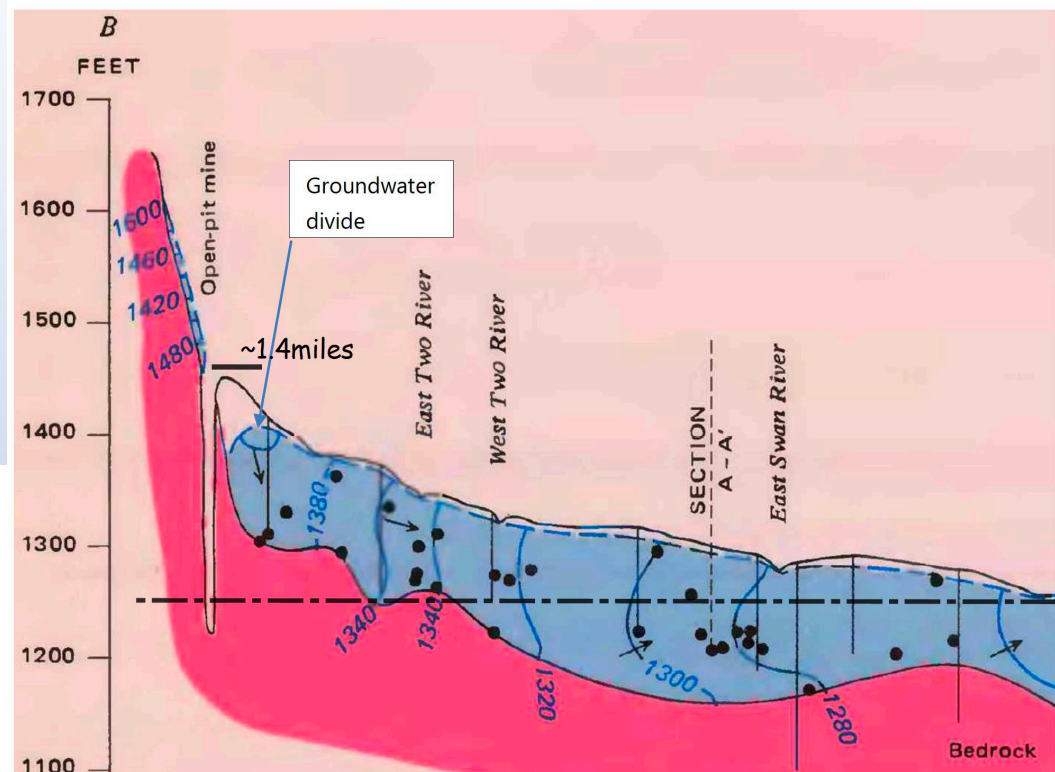


Figure 3 Portion of a Cross Section Showing Hydraulic Head Contours in the Drift Aquifer Adjacent to an Open-pit Mine (from Cross-Section B-B' of Reference (2)). The portion shown has a length of approximately 22 miles

Thanks.

