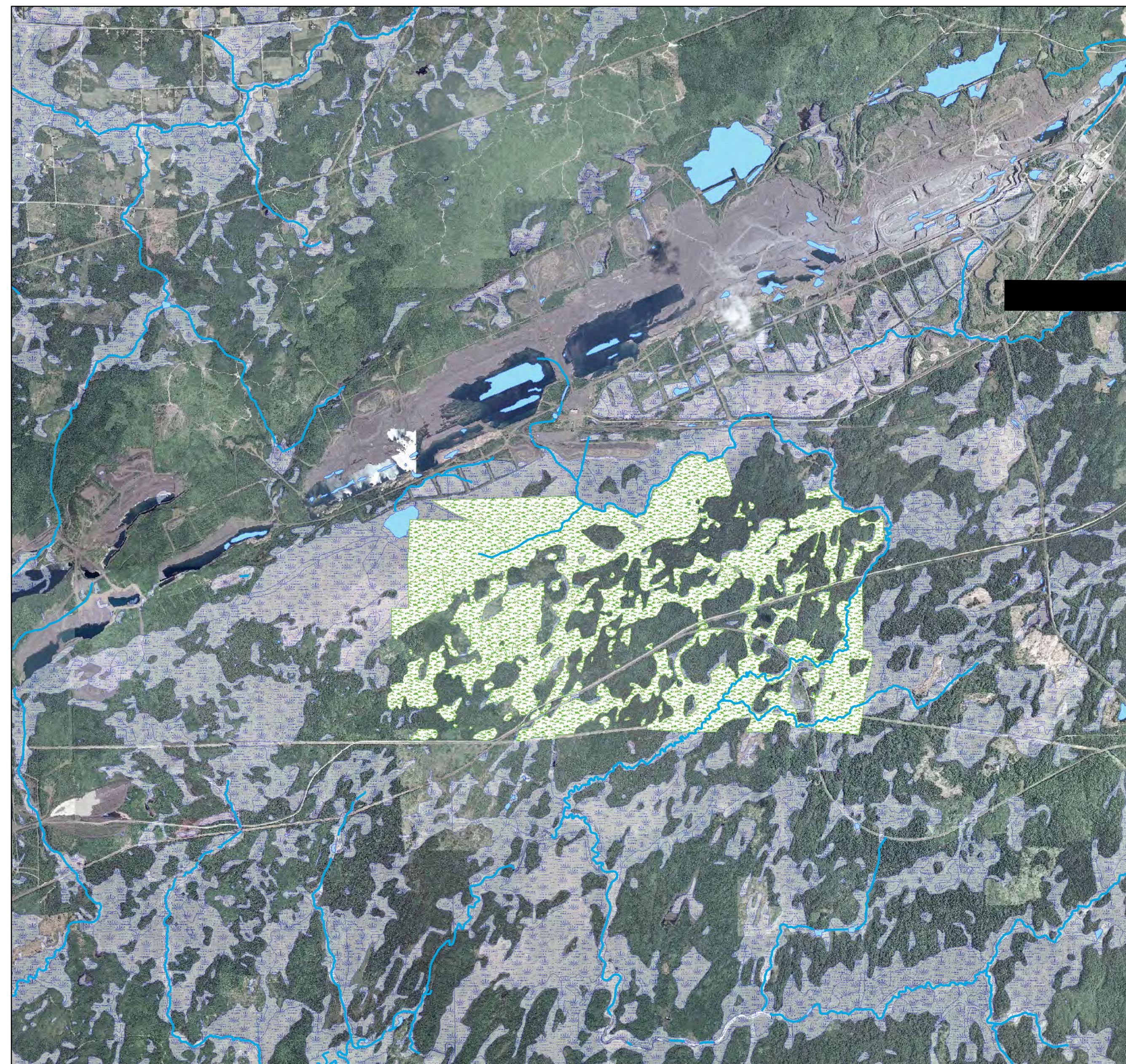


## Wetland Type Data

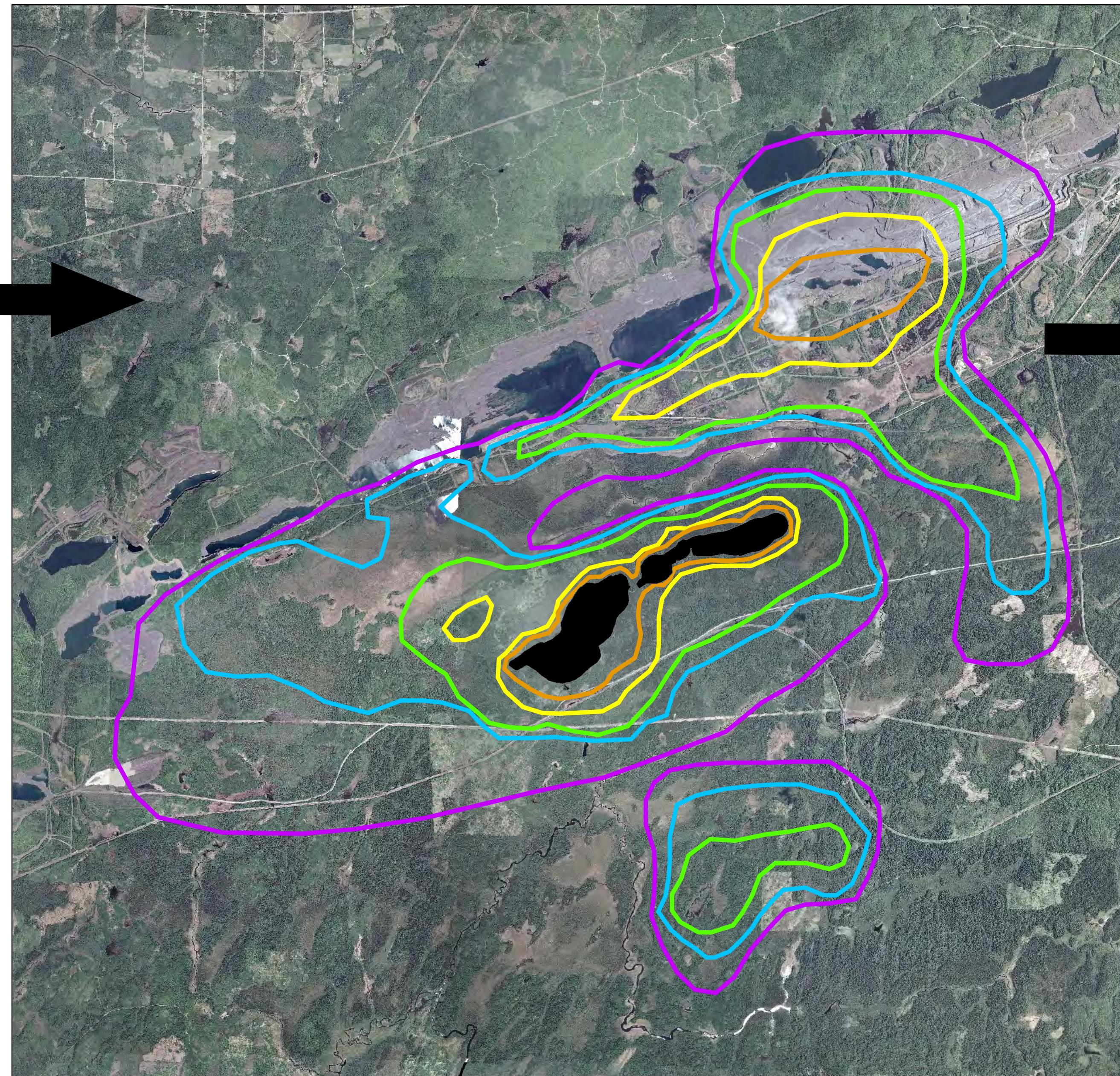


**Legend**

- Ground Truth Delineated Wetlands
- National Wetland Inventory (No ground truth data)

0.7 0.35 0 0.7 1.4 2.1 Miles

## Water Level Change Data



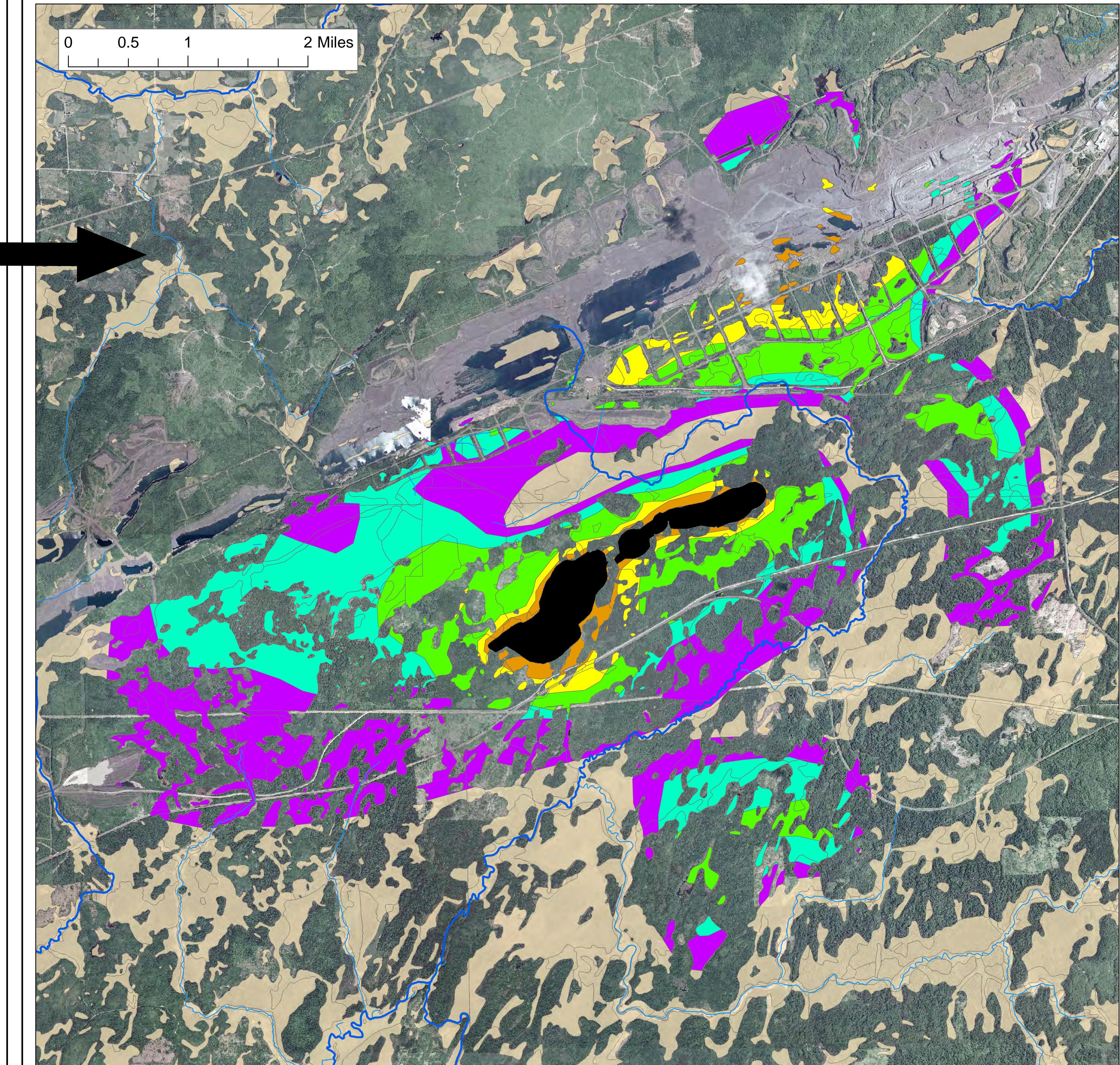
**Legend**

- 4 ft. Water Level Drop
- 2 ft. Water Level Drop
- 1 ft. Water Level Drop
- 0.75 ft. Water Level Drop
- 0.5 ft. Water Level Drop
- Mine Pit Footprint

Changes in water levels within wetlands can be predicted by computer models of pit dewatering and by analysis of modifications of the wetland watersheds.

The accuracy of the predicted water level changes depends on sufficient data on the wetlands' hydrology and the underlying hydrogeology.

## Potential Impact Zones

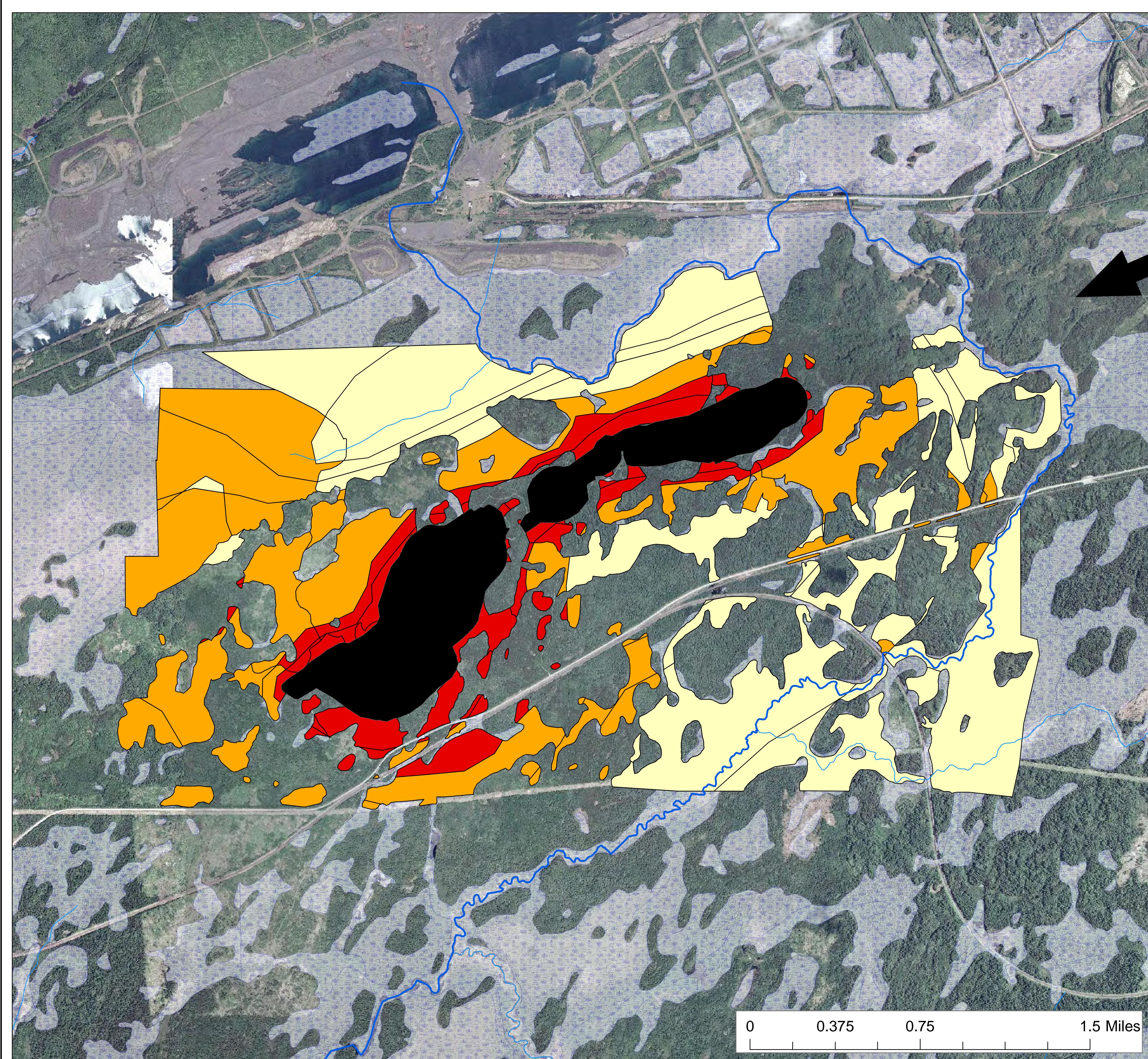


**Legend**

- Wetland areas with > 4 feet of water level drop
- Wetland areas with 2 to 4 feet of water level drop
- Wetland areas with 1 to 2 feet of water level drop
- Wetland areas with 0.75 to 1 foot of water level drop
- Wetland areas with 0.5 to 0.75 feet of water level drop
- Wetland areas with < 0.5 feet of water level drop
- Mine Pit Footprint

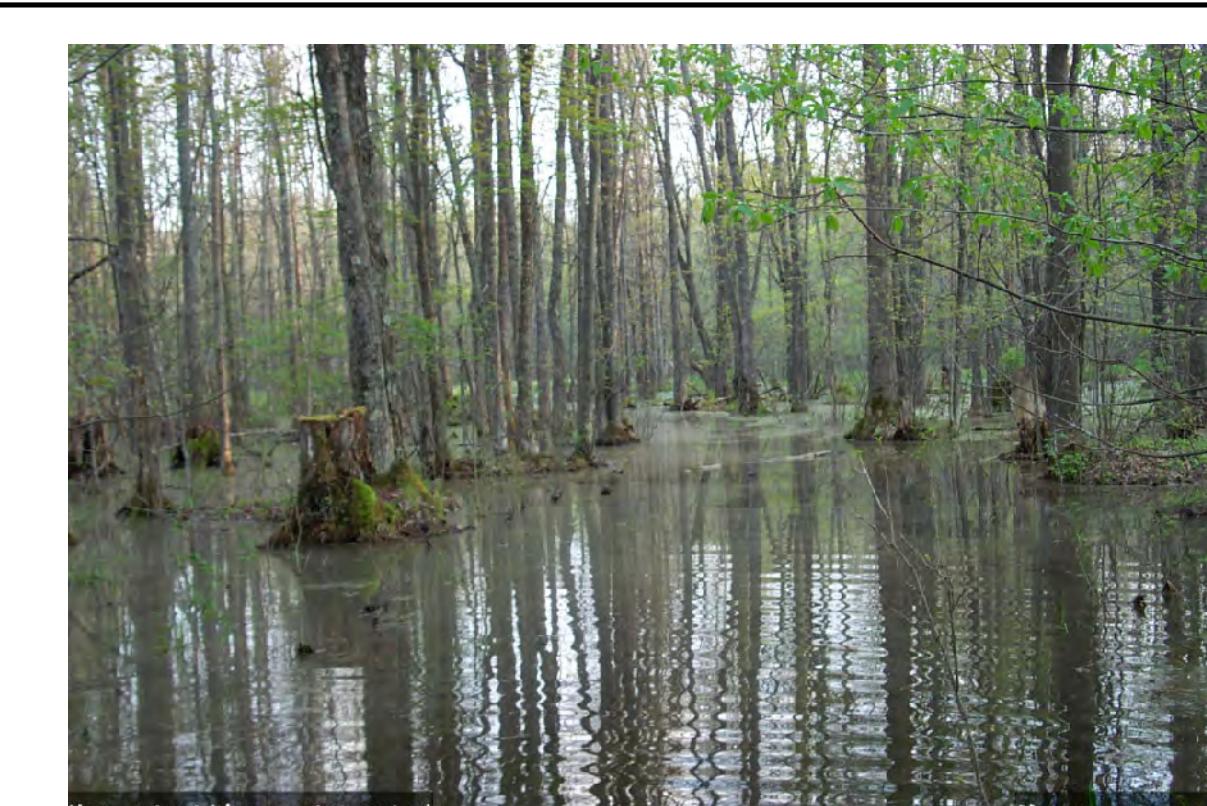
Geographic Information System data for wetlands and water level drop were overlaid to determine the portions of delineated wetlands that would be impacted by different amounts of water level drop.

## Severity of Indirect Wetland Impacts due to Mine Induced Water Level Drop



**Legend**

- Severe
- Moderate
- None to Slight
- No Criteria Developed
- Rivers and Streams
- Mine Pit Footprint



## Wetland Impact Criteria

Community	Community code	Water Level Drop (feet) Causing Impact		
		None-to-Slight	Moderate	Severe
Northern Wet Meadow	WMn82	< 0.5	0.5 to 3.0	> 3.0
Northern Shrub Fen	RFn81	< 1.0	1.0 to 2.0	> 2.0
Northern Poor Fen	APn91	< 0.75	0.75 to 2.0	> 2.0
Northern Spruce Bog	APn80	< 0.75	0.75 to 2.0	> 2.0
Northern Poor Conifer Swamp	APn81	< 0.5	0.5 to 2.0	> 2.0
Northern Rich Spruce Swamp	FPn62	< 0.75	0.75 to 2.0	> 2.0
Northern Alder Swamp	FPn73	< 1.0	1.0 to 4.0	> 4.0
Northern Cedar Swamp	FPn63	< 1.0	1.0 to 2.0	> 2.0
Northern Very Wet Cedar Forest	WFn53	< 2.0	2.0 to 4.0	> 4.0
Northern Wet Ash Swamp	WFn55	< 1.0	1.0 to 2.0	> 2.0
Northern Very Wet Ash Swamp	WFn64	< 2.0	2.0 to 4.0	> 4.0

Wetland impact criteria were based on work conducted by James Arndt and John Almendinger, "Wetland Plant Communities of the Crandon Mine Site, Forest and Langlade Counties, Wisconsin", February 11, 2003.

In portions of the project site where communities are classified in enough detail, the wetlands can be placed in community types. Wetland scientists have used ordination and best professional judgement to estimate how changes in water level would affect these community types. These impact criteria are specific to each community type because the different plant communities are more or less sensitive to changes in water level. In areas where there is incomplete characterization of the wetland plant communities, the impacts can not be projected on the landscape.

In areas of detailed wetland characterization (the GTDW) one can combine the impact criteria with mapping of community types and predicted water level drop to estimate the severity of impact from the proposed project. The methods presented here are dependent on wetland characterization to the level of plant community as described in "Field Guide to the Native Plant Communities of Minnesota, Minnesota Department of Natural Resources 2003" and estimates of water level changes in the wetland communities.

This poster demonstrates methods that can be used to predict indirect wetland impacts. The data used in this demonstration are incomplete and have been modified. This demonstration does not represent a true estimate of indirect impacts from any particular proposed project.

In this demonstration water level changes were estimated with a groundwater model of mine pit dewatering, however, water levels in wetlands can be changed by other factors such as watershed modification.



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