

2026 ISCA/IAPSC Fall Tour - Kankakee Sands, Grand Kankakee Marsh
Illinois and Indiana

Newton County Health Department
4117 240 W, Morocco, IN

September 11th, 2026

ALL TIMES ARE CENTRAL TIME! (1 HOUR BEHIND EDT - ADJUST ACCORDINGLY)

- | | |
|--------------|--|
| 8:30 – 9:00 | Registration - Dena Anderson – IAPSC Sec/Treas |
| 9:00 – 9:15 | Welcome and Introductions |
| 9:15–9:45 | Brandon Curry Overview of Geology and History of the Kankakee Torrent |
| 9:45 – 11:45 | Travel to Iroquois County State Wildlife Area E3300 North Rd and 3000 E Rd.

Back to the Basics of Sands-Review of Soils Pits and Impacts on System design IL vs. IN |
| 11:45– 12:00 | Return to Newton County HD Meeting Room |
| 12:00 – 1:00 | LUNCH & Door Prizes |
| 1:00 – 2:15 | TNC--Kankakee Sands Buffalo Viewing Area OR Indiana Soil Pits |
| 2:15 -- 2:30 | Travel to Fair Oaks |
| 2:30 – 3:30 | Aerobic Digesters -Fair Oaks Farms, Carl Ramsey |
| 3:30 | Adjourn – SAFE TRAVELS! |

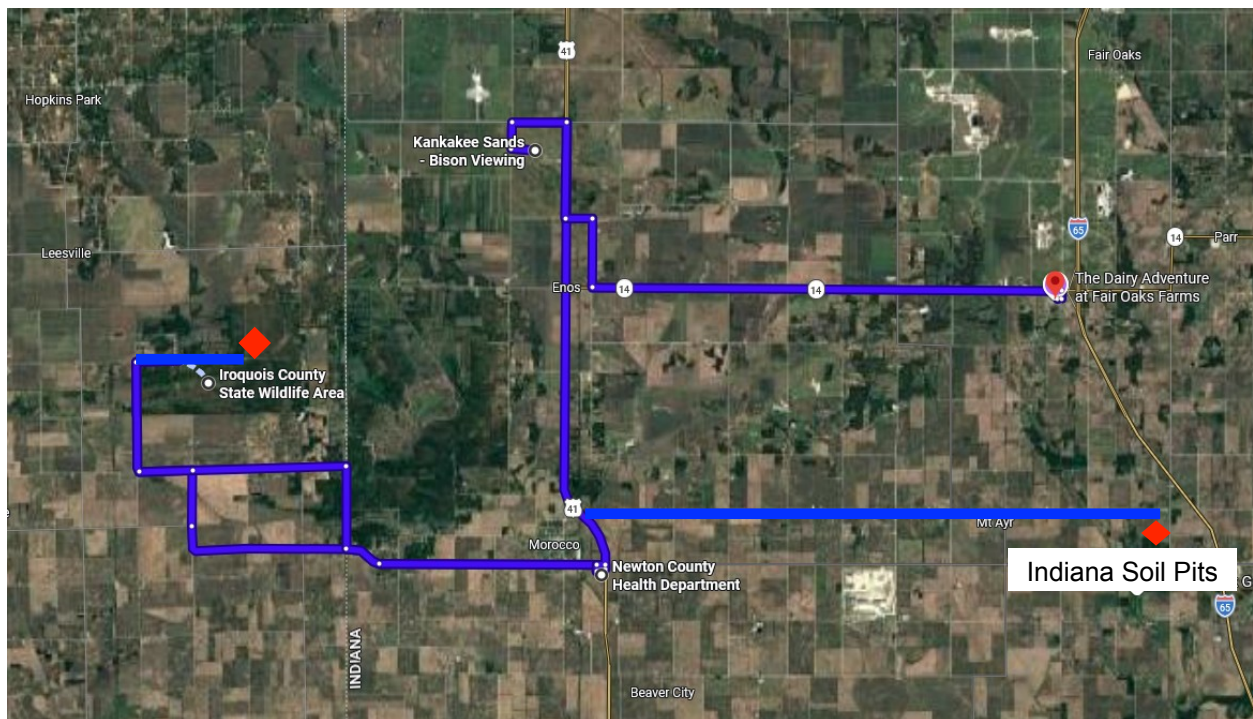
Camping will be at Willow Slough FWA (no electric) – contact Gary Struben or Dena Anderson for more information; Fairfield by Marriott hotel at Fair Oaks

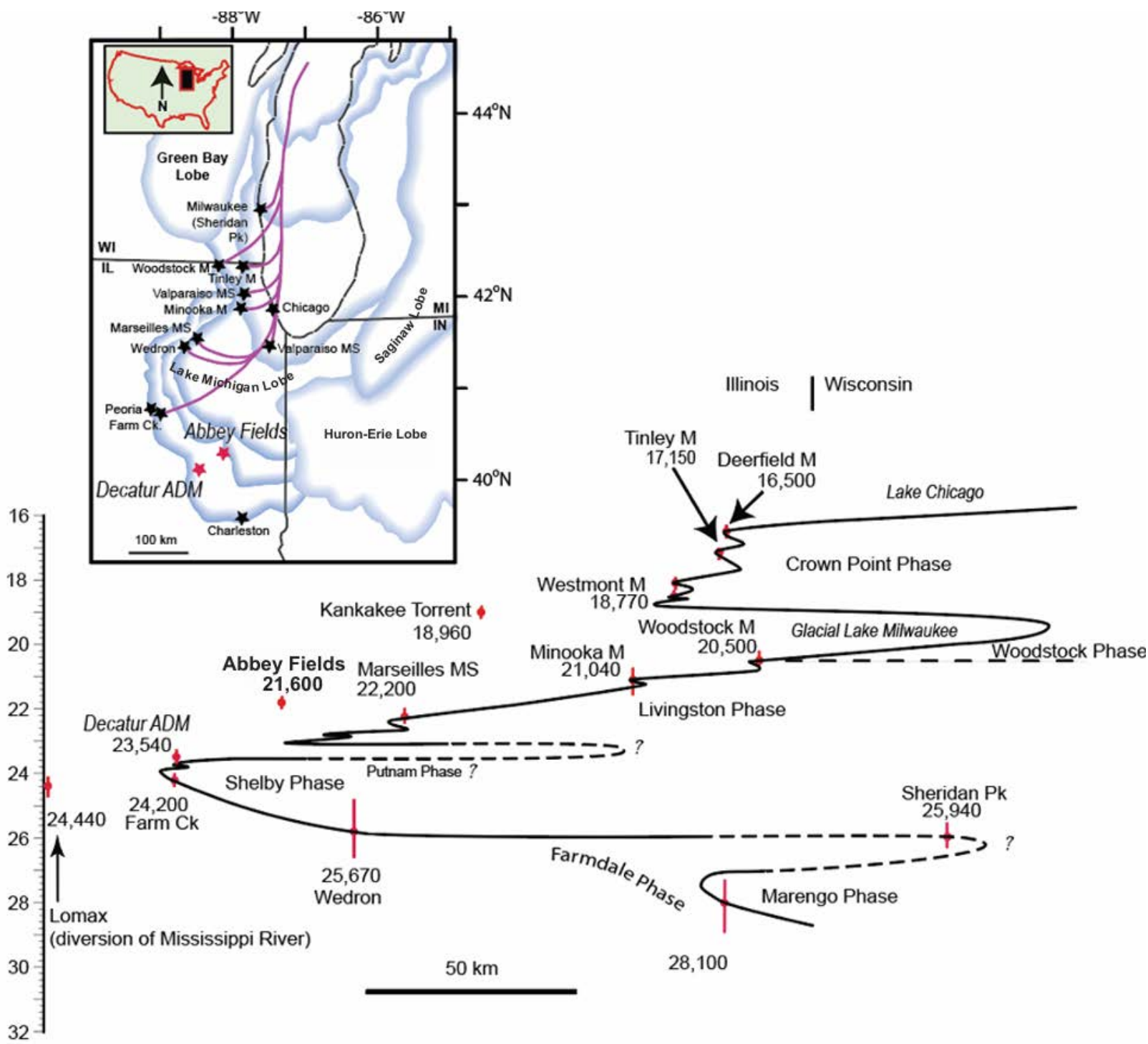
Registration:

<https://www.eventbrite.com/e/2026-iapsc-fall-tour-jointly-with-illinois-soil-classifiers-association-tickets-1998162886984?aff=oddtcreator>

2026 Annual ISCA/IAPSC Fall Tour

1. Newton County Health Department
 - a. 4117 240 W, Morocco, IN
2. Iroquois County State Wildlife Area,
 - a. 3000 E 3300 North Rd, Pembroke Township, IL
3. Newton County Health Department
 - a. 4117 240 W, Morocco, IN
4. Kankakee Sands Buffalo Viewing Area OR Indiana Soil Pits
 - a. K3 Sands Buffalo Viewing Area - S 400 W, Morocco, IN
 - b. Indiana Soil Pits -Adam Miller Farm. 4038 S. 1000 W. Rensselaer
5. Fair Oaks Farms
 - a. 856 N 600 E, Fair Oaks, IN





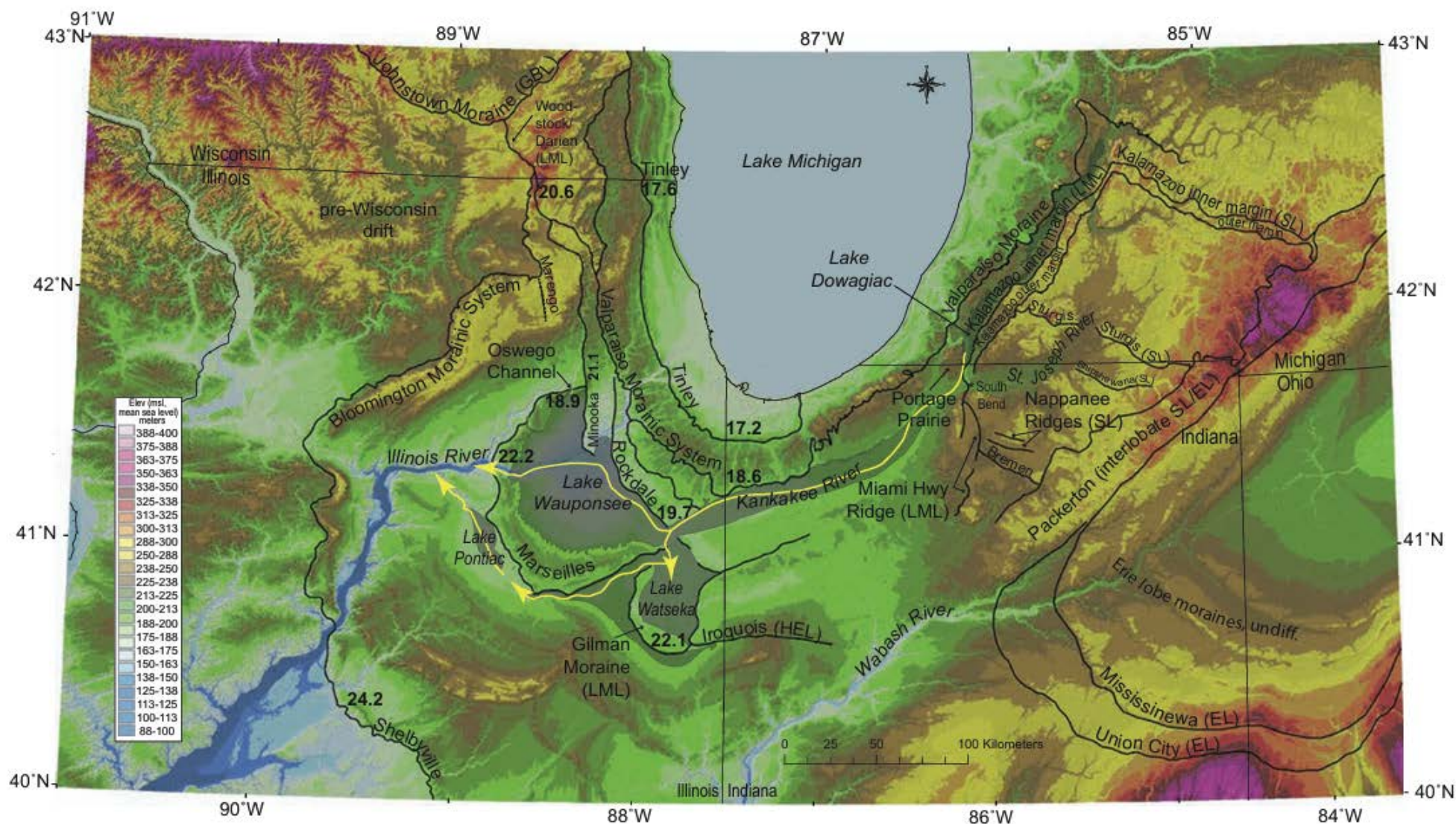
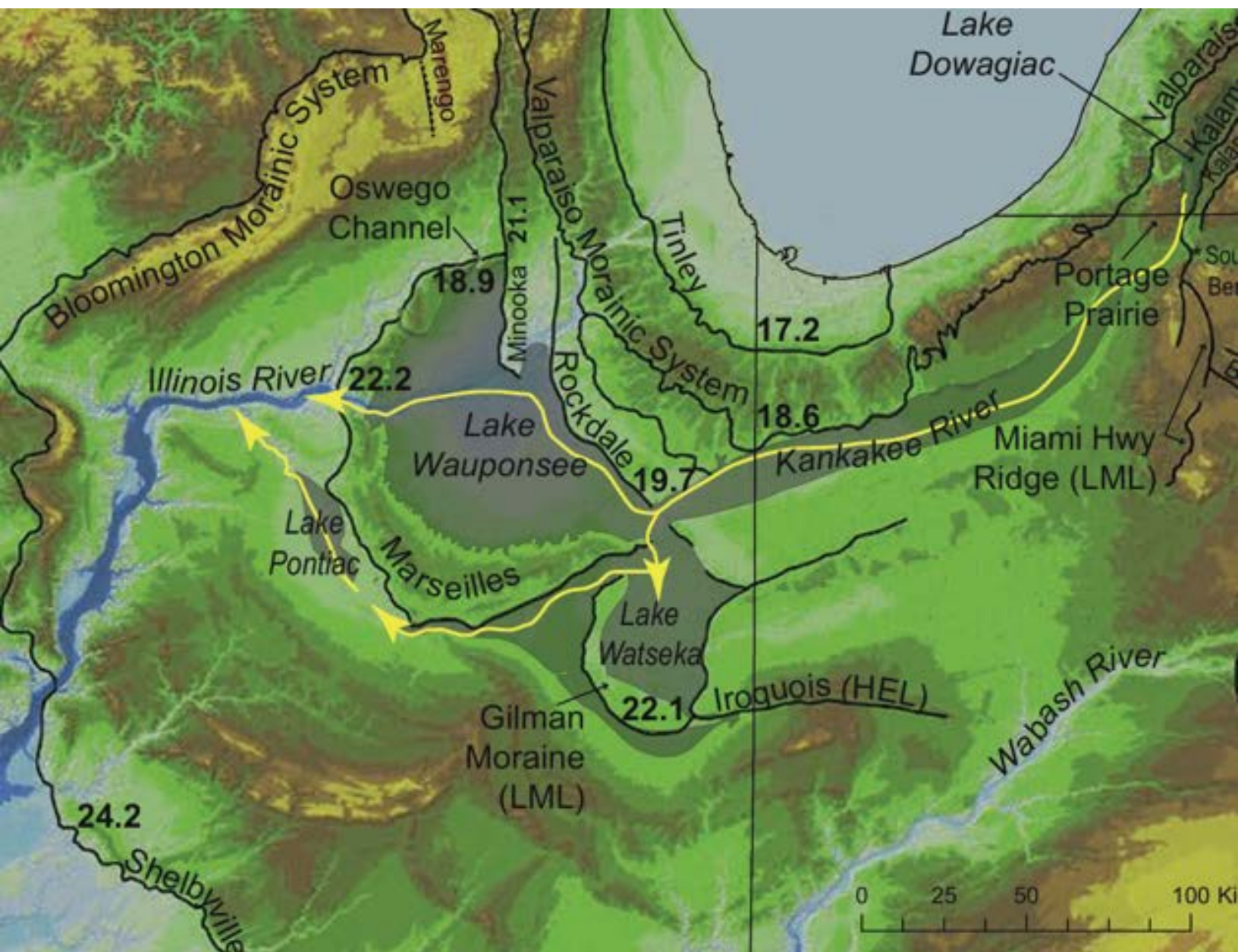


Figure 1. Regional digital elevation model of central United States showing approximate moraine fronts and their ages (bold; cal. k.y. B.P.). LML—Lake Michigan lobe; SL—Saginaw lobe; HEL—Huron-Erie lobe; EL—Erie lobe; GBL—Green Bay lobe. Yellow arrows indicate the flow of the Kankakee Torrent from its source near proglacial Lake Dowagiac in southwestern Michigan south and west to proglacial lakes Wauponsee, Watseka, and Pontiac to the valley of the Illinois River. Proglacial lakes are shaded gray. Previously referred to as glacial lakes (i.e., Willman and Frye, 1970; Willman, 1971; Hansel and Johnson, 1996; Curry et al., 2014), we refer to these lake basins as proglacial because they were dammed mainly by morainal sediment rather than mainly by ice.



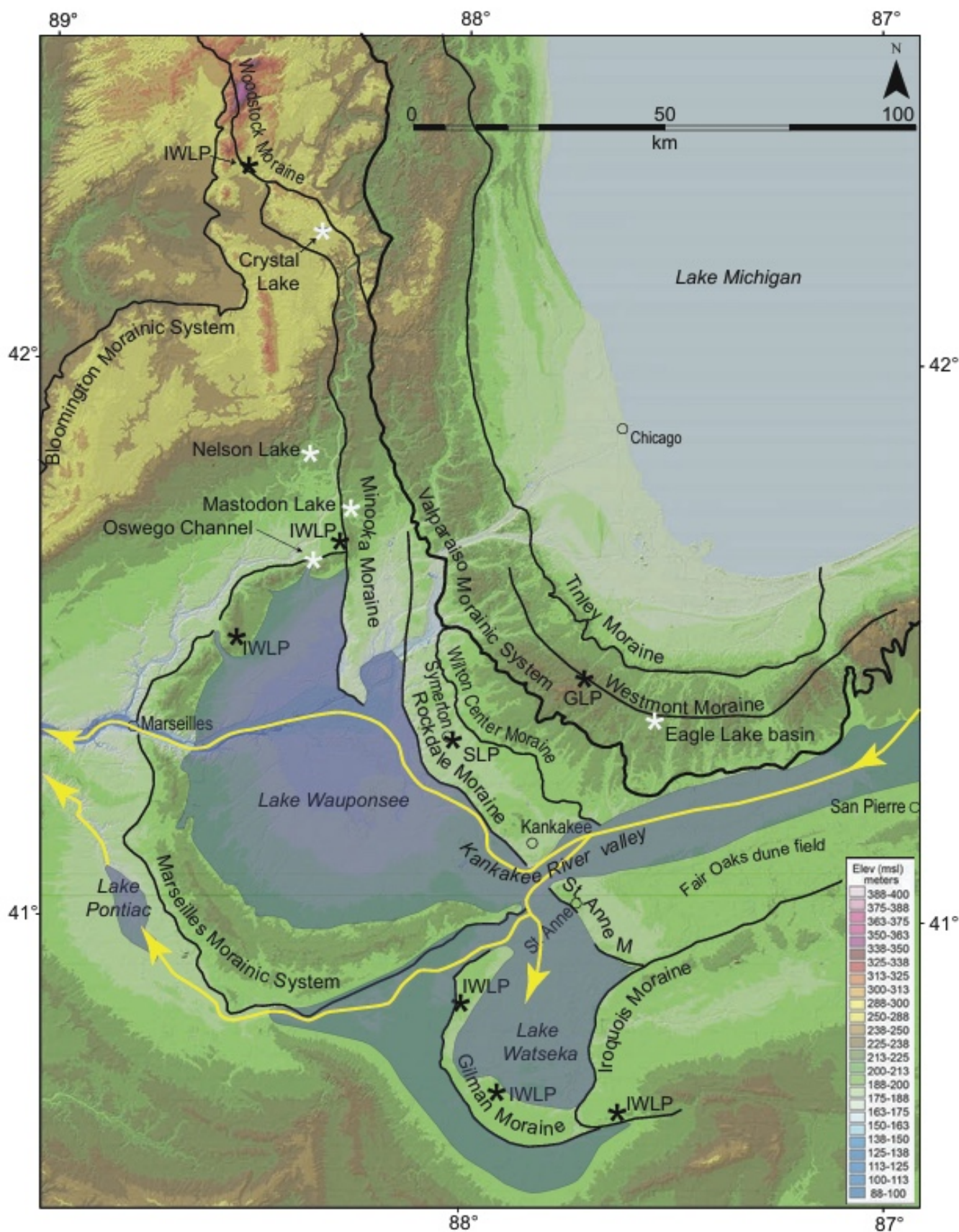


Figure 6. Bifurcated path of Kankakee Torrent (blue arrows) southwest of Lake Michigan. Asterisks mark sites that have yielded radiocarbon chronologies (Table 2). The Kankakee Torrent is bracket-dated by assayed plant macrofossils preserved in ice-walled lake plains at glacial Lake Pine (GLP) and Symerton (SLP). Black asterisks mark other ice-walled lake plain (IWLP) sites, several with radiocarbon ages. White asterisks mark kettles and other ice-collapse features. Circles locate municipalities mentioned in the text. Shading reveals proglacial Lake Waupondee, Lake Watseka, and Lake Pontiac at their approximate maximum extent.

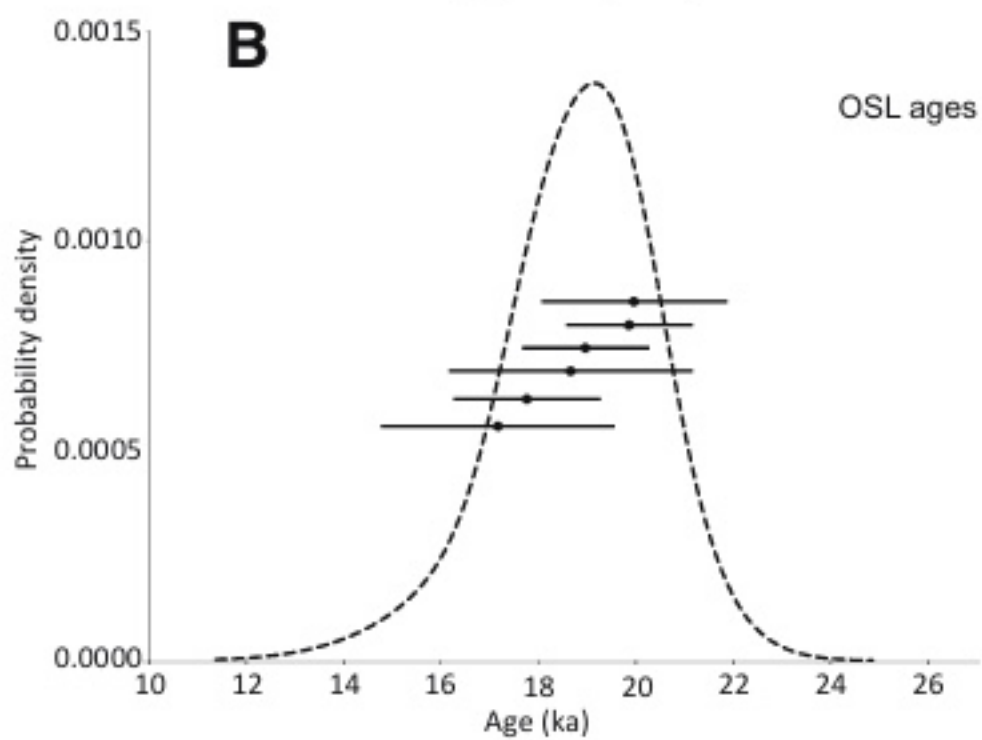
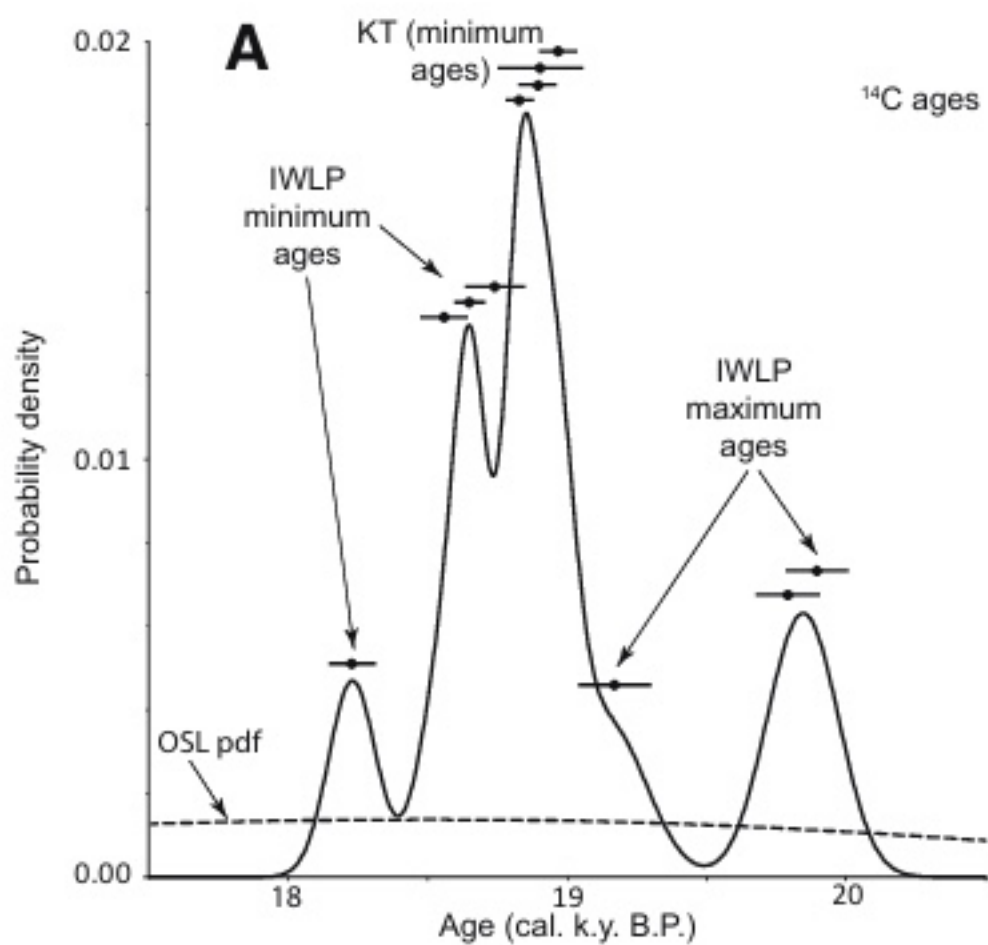




Figure 2. Reaches of the Kankakee Torrent starting with the Dowagiac River and St. Joseph River valleys (reach 1) and ending with the lower Mississippi River (reach 5). The sink of the torrent was the Gulf of Mexico; most sediment core records with evidence of the Kankakee Torrent are located on the Louisiana Slope (Aharon, 2003). AL, Alabama; AR, Arkansas; IA, Iowa; IL, Illinois;

Iroquois County Sites

Legend

▲ Feature 1

th Rd

County Rd 3300 N

741D

Oakville Site 1

741B

Granby2 Site 4

Morocco Site 2

S01A

Granby1 Site 3

49A

741D

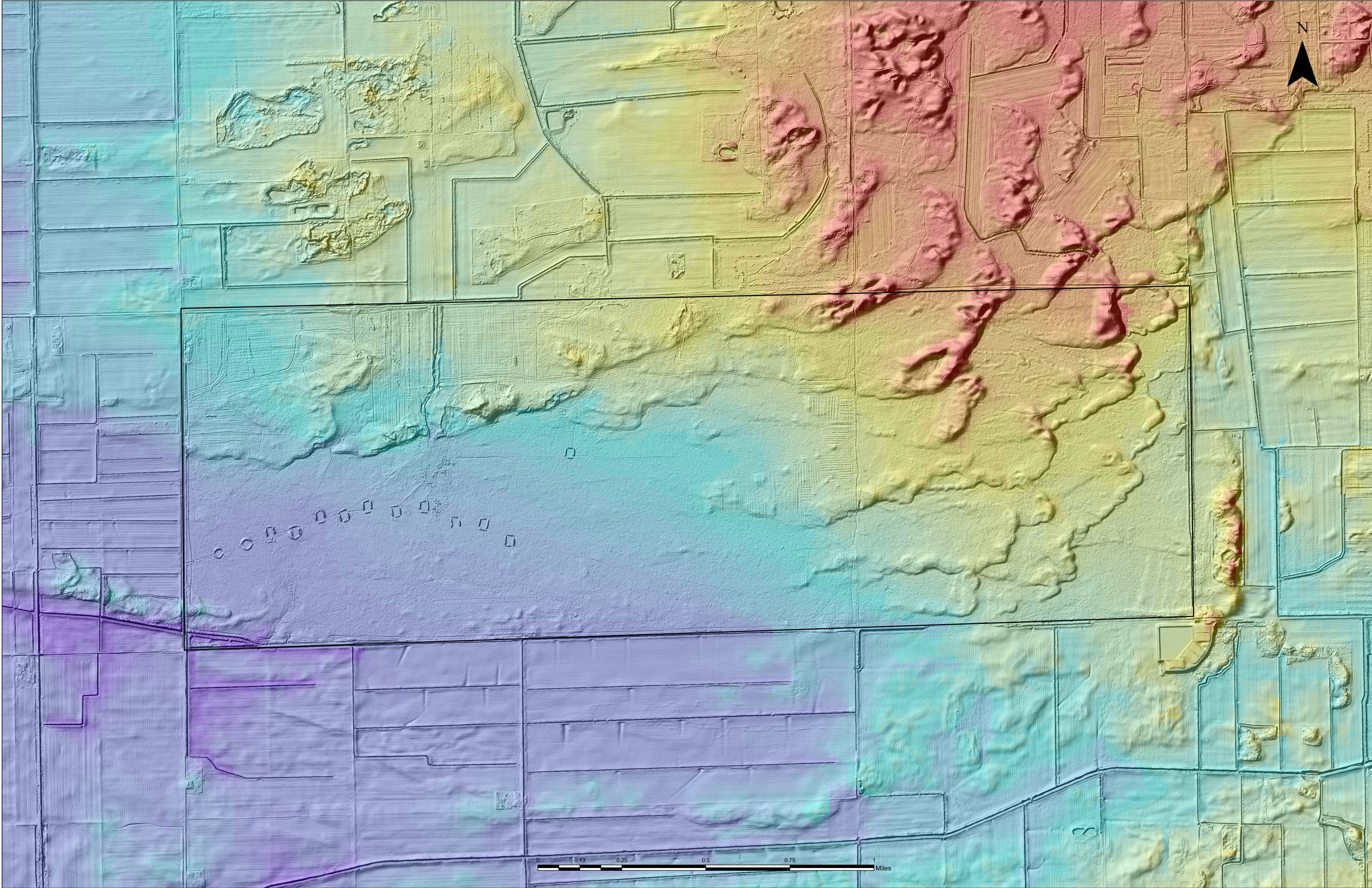
Google Earth

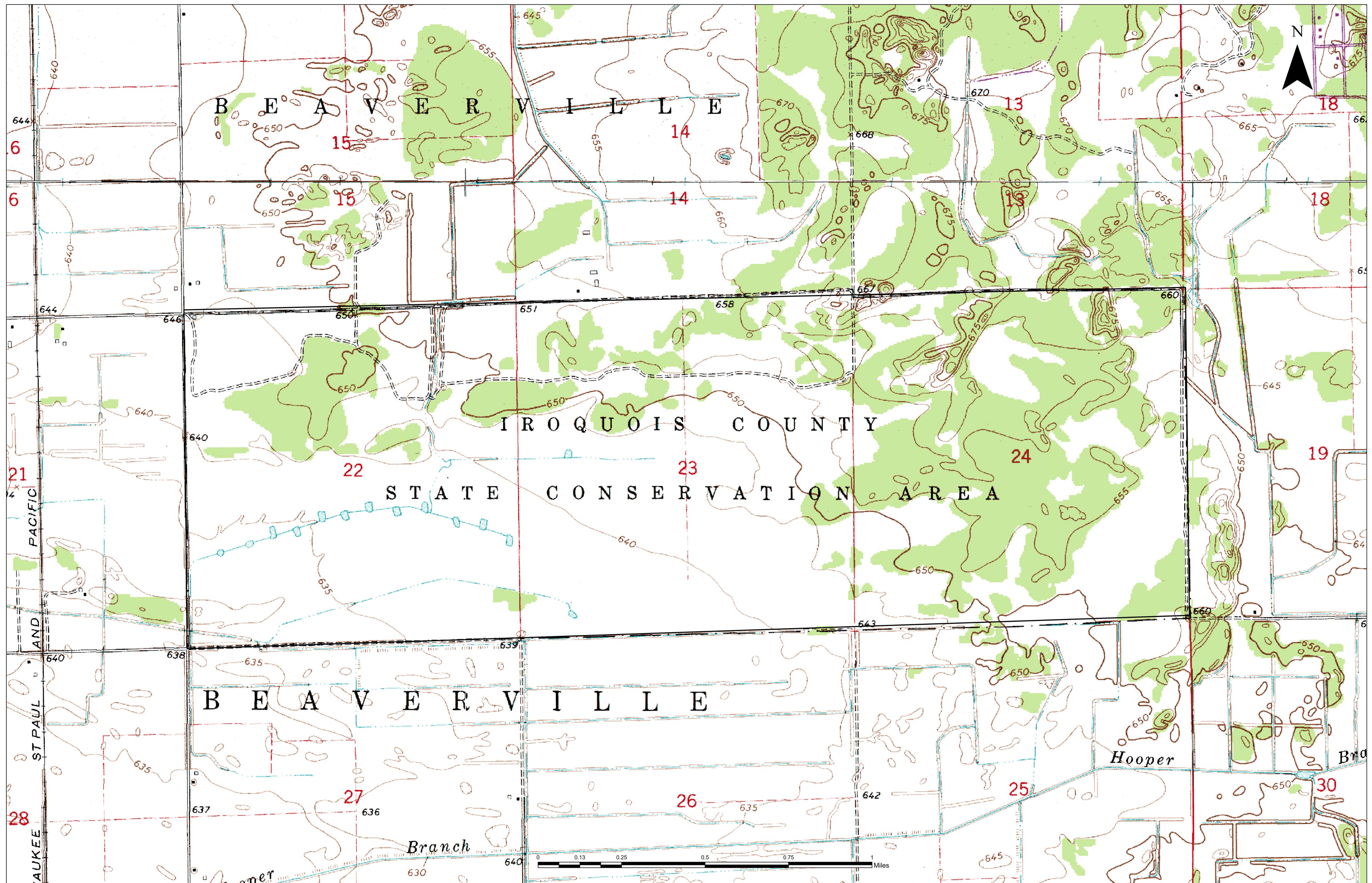
Image © 2026 Airbus

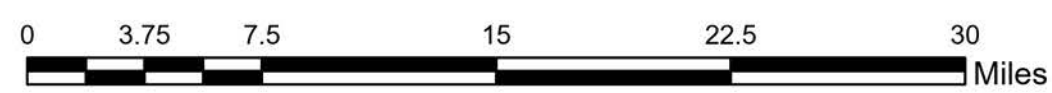
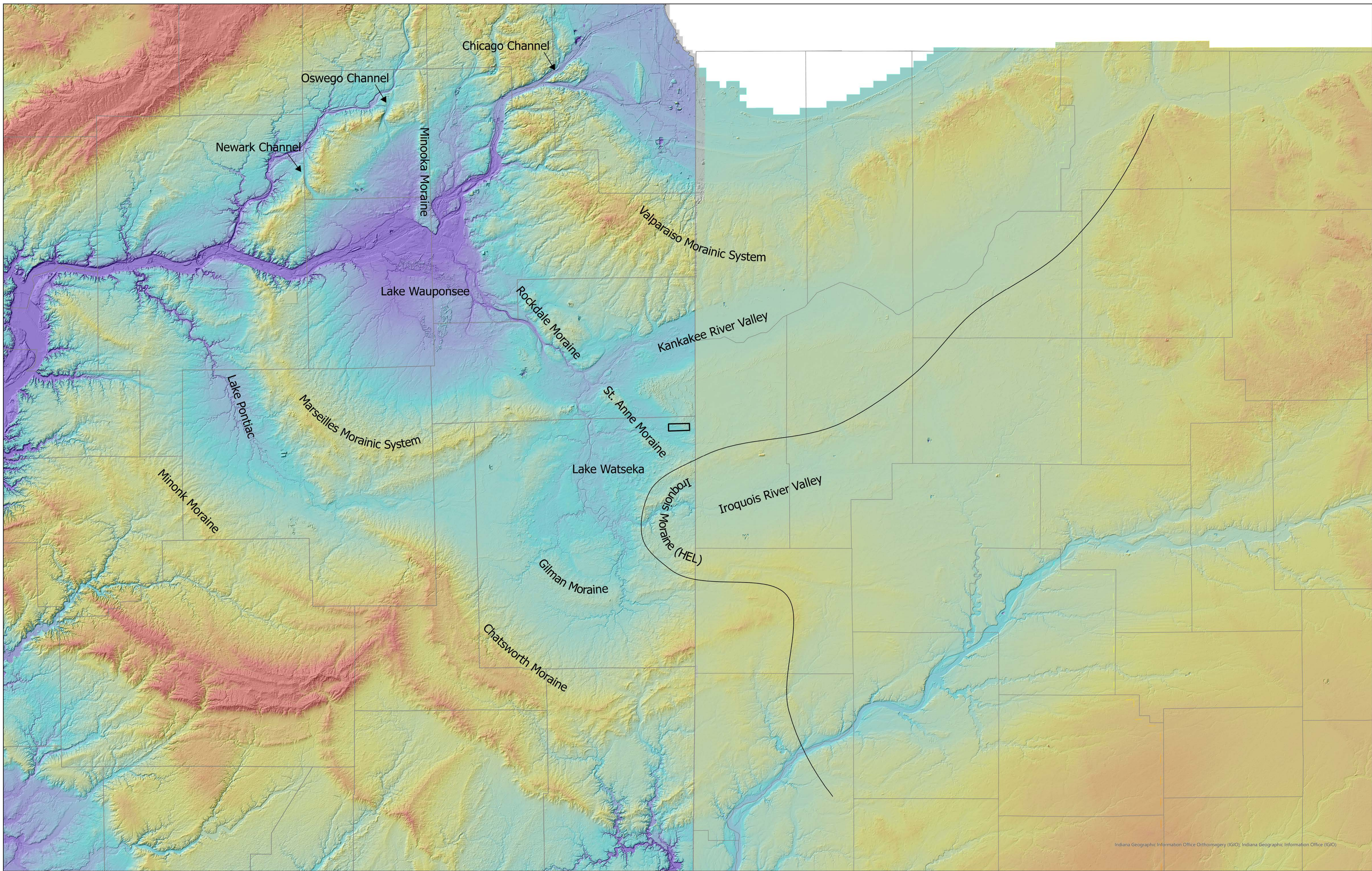
700 ft

9









Indiana Geographic Information Office Orthomaps (IGIO) Indiana Geographic Information Office (IGIO)

Drainage Class



Legend

IL_BNDY_State_Py

IL_BNDY_County_Py

Iroquois_State_Wildlife_

soilsa_a_in111

Drainage class

Drainage_Class

E

E and SWE

E and SWE and W

E and W

SWE

SWE and W

SWE-W

W and E

W-MW

W and SWP

W-SWE

W

W and SWE

W-MW and P

W-MW and SWP

W and MW

W and P-VP

MW

MW and P and SWP

MW and SWP

MW and W

SWP

SWP AND W

SWP and P-VP

SWP and P

SWP and MW

SWP and W-MW

SWP-P

P and MW and SWP

P and P-VP

P-VP and SWP

P and SWP and E

P and VP

P-VP

P

VP

<all other values>

soilmu_a_in111_Di

Drainage_Class

E

W

W and MW

MW

MW AND W

SWP AND E

SWP

P

P AND P or VP

P and VP

VP

VP AND P or VP

<all other values>

13

Soil Order



Legend

IL_BNDY_State_Py

IL_BNDY_County_Py

Iroquois_State_Wildlife_

soilsa_a_in111

Drainage class

Soilorder

<Null>

Alfisol

Alfisol and Entisol

Alfisol and Inceptisol

Alfisol and Mollisol

Alfisol and Mollisol and Inceptisol

Entisol

Entisol and Alfisol

Entisol and Inceptisol

Entisol and Mollisol

Histosol

Histosol and Mollisol

Inceptisol

Inceptisol and Alfisol

Inceptisol and Mollisol

Mollisol

Mollisol and Alfisol

Mollisol and Entisol

Mollisol and Inceptisol

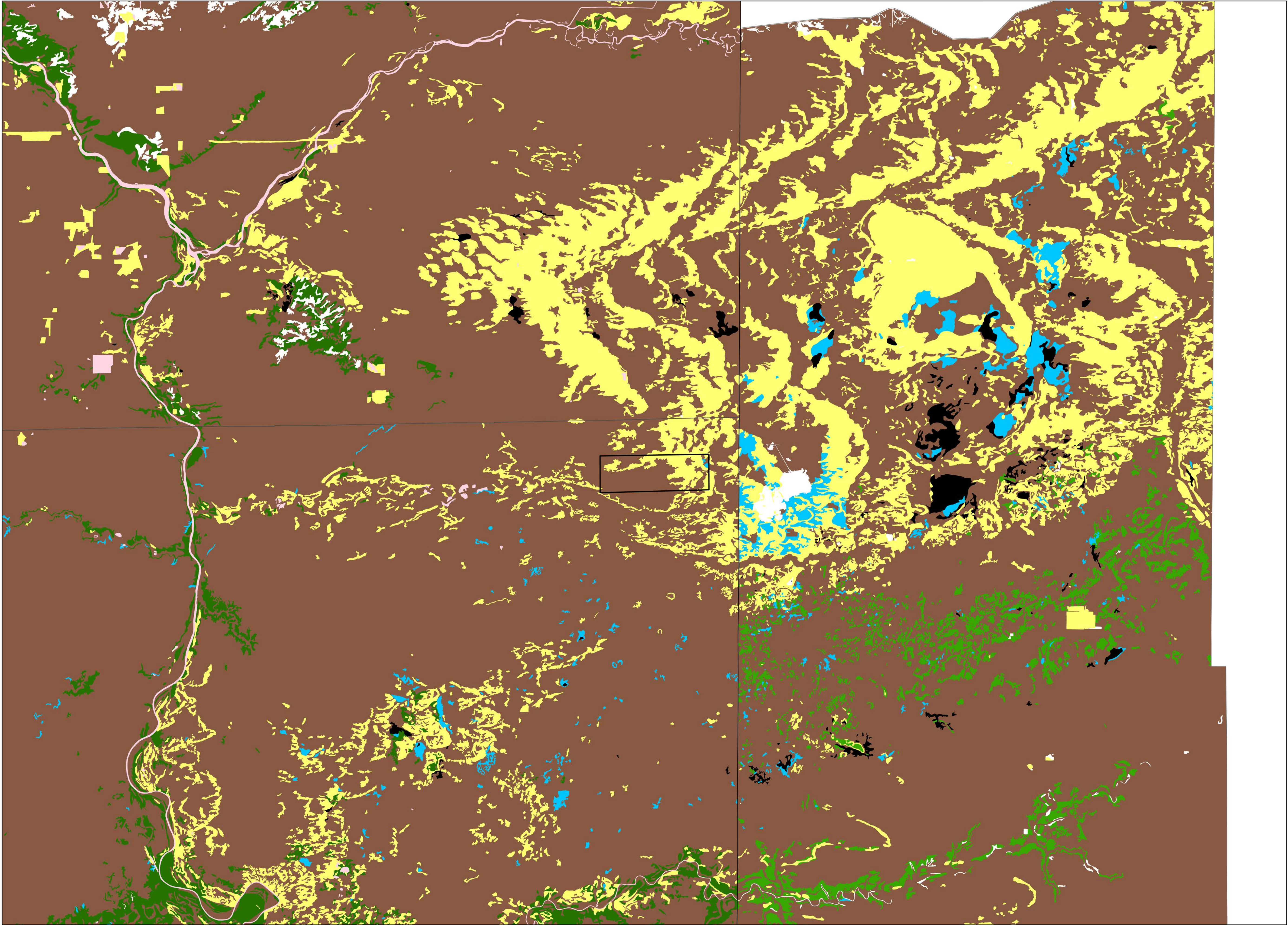
Ultisol

Ultisol and Alfisol

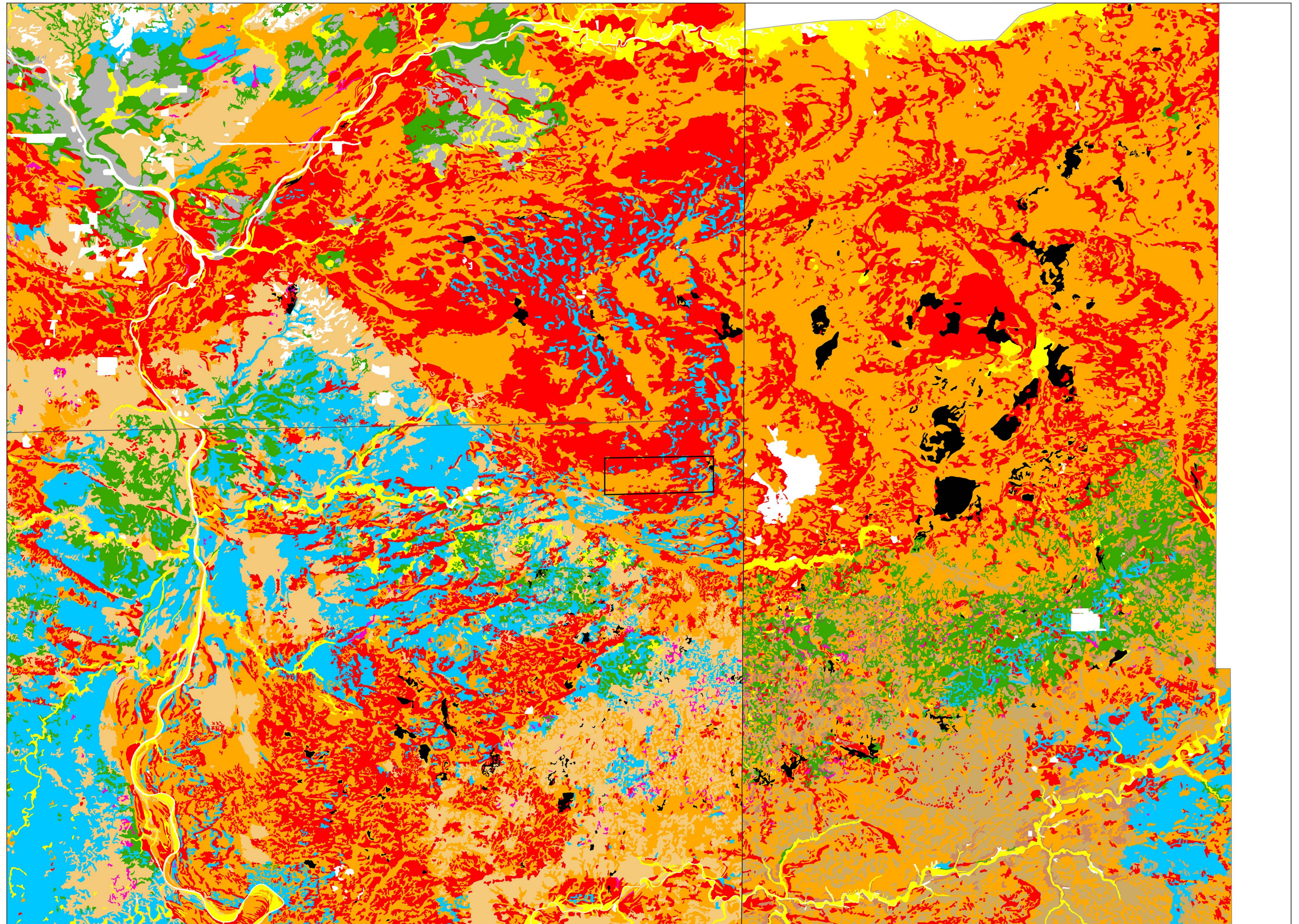
<all other values>

soilmu_a_in111_Di

Soil_order

AlfisolAlfisol and MollisolEntisolHistosolInceptisolMollisol<all other values>

Surficial Geology



Early 1800s Vegetation



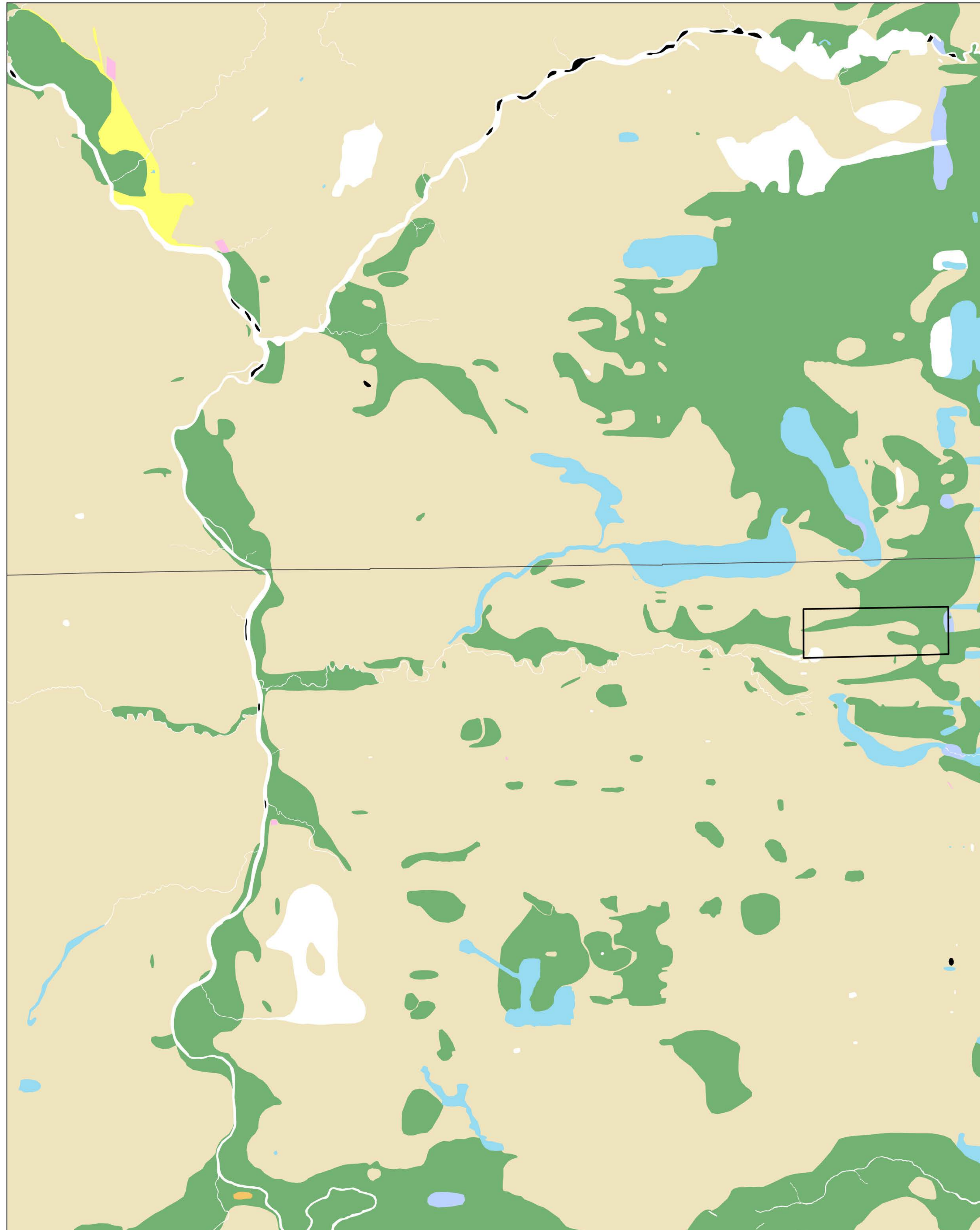
Legend

- IL_BNDY_State_Py
- IL_BNDY_County_Py
- Iroquois_State_Wildlife_
- soilsa_a_in111

Landcover Early 1800s

MAP

- barrens
- bottomland
- cultural
- forest
- marsh
- other wetland
- prairie
- slough
- swamp
- topo/geo
- water
- wet prairie
- <all other values>



Soil Profile Description

Soil Profile #	1	Date Described		County - Iroquois
Property Location	Iroquois County State Conservation Area			
Described By	MK, SW, MB, from 1.25" core			

Possible Soil Series Oakville

Horizon	Depth (in.)	Boundary	Matrix Color (moist)	Texture	Structure	Consistence (moist)	Redox Features	Reaction (10% HCl)	Coatings	Loading Rate (1)	Design Group	Notes
A	0-7	—	10YR 3/3	LFS/FSL	2 VF GR*	FR	—		—	0.91 3B*	III	* moderate structure not recognized on Exhibit B
BA	7-13	—	10YR 3/4	LFS	2 F SBK*	FR	—		—	0.91 3B*	III	* moderate structure not recognized on Exhibit B
Bw1	13-23	—	10YR 4/4	LFS	1 M SBK	VFR	—		—	0.91 3B	III	
BC	23-37	—	10YR 5/4	LFS	1 M SBK	VFR	—		—	0.91 3B	III	
C	37-60	—	10YR 5/4	LFS	SG	LOOSE	C1D 10YR 5/8		—	0.84 3A	IV	

Current Hydrology: Free Water @ _____ ± Upper Boundary of Capillary Fringe @ _____ ±

Notes: 3 feet separation distance required. **Seasonal High Water Table** - estimated at >60 inches. BC or Bw, Cambic horizon present? Is this a Mollic Udipsamment? If mollic, is it Hapludolls? Assuming the surface is LFS (not FSL) keys out as Typic Udipsamment, but if surface is FSL, that kicks it all the way to Typic Udorthent, I think? Could be a discussion point for this one...

LOCATION OAKVILLE IN+IL MA MI NY OH WI

Established Series
Rev. WEF-RAR-RAB
04/2025

OAKVILLE SERIES

The Oakville series consists of very deep, excessively drained soils formed in sandy eolian deposits on dunes and beach ridges on outwash plains, lake plains, and moraines. Slope ranges from 0 to 60 percent. Mean annual precipitation is about 864 mm (34 inches), and mean annual temperature is about 10.0 degrees C (50 degrees F).

TAXONOMIC CLASS: Mixed, mesic Typic Udipsamments

TYPICAL PEDON: Oakville fine sand, on a backslope position, 7 percent slope in a wooded area at an elevation of 218 meters (715 feet) above mean sea level. (Colors are for moist soil unless otherwise stated.)

A--0 to 8 cm (3 inches); very dark brown (10YR 2/2) fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many fine and very fine, and few medium and coarse roots throughout; very strongly acid; clear wavy boundary. [5 to 25 cm (2 to 10 inches) thick]

BE--8 to 15 cm (3 to 6 inches); dark yellowish brown (10YR 4/4) fine sand; weak fine and medium subangular blocky structure; very friable; many fine and very fine, and common medium and coarse roots throughout; very strongly acid; clear wavy boundary. [0 to 25 cm (10 inches) thick]

Bw1--15 to 38 cm (6 to 15 inches); strong brown (7.5YR 5/6) fine sand; weak medium subangular blocky structure; very friable; common very fine to coarse roots throughout; strongly acid; gradual wavy boundary.

Bw2--38 to 69 cm (15 to 27 inches); strong brown (7.5YR 5/8) fine sand; weak medium and coarse subangular blocky structure; very friable; common fine and very fine, and many medium and coarse roots throughout; very strongly acid; clear wavy boundary.

Bw3--69 to 107 cm (27 to 42 inches); brownish yellow (10YR 6/6) fine sand; weak medium and coarse subangular blocky structure; very friable; common fine and very fine, and many medium and coarse roots throughout; strongly acid; clear irregular boundary. [Combined thickness of the Bw horizon is 25 to 127 cm (10 to 50 inches).]

BC--107 to 150 cm 42 to 59 inches; light yellowish brown (10YR 6/4) fine sand; weak medium and coarse subangular blocky structure; very friable; common fine and very fine, and many medium and coarse roots throughout; strongly acid; clear wavy boundary. [0 to 51 cm (20 inches)]

C--150 to 203 cm (59 to 80 inches); light yellowish brown (10YR 6/4) fine sand; single grain; loose; common

fine and very fine, and many medium and coarse roots throughout; strongly acid.

TYPE LOCATION: Jasper County, Indiana; about 4 miles south of the Kankakee River (Dunns Bridge) in the Jasper-Pulaski State Game Preserve; 1,720 feet south and 1,820 feet east of the northwest corner of sec. 10, T. 32 N., R. 5 E.; USGS San Pierre topographic quadrangle; lat. 41 degrees 9 minutes 11.0 seconds N. and long. 86 degrees 58 minutes 57.0 seconds W., NAD 27; UTM Zone 16, 501466 easting and 4555751 northing, NAD 83.

RANGE IN CHARACTERISTICS:

Depth to the base of soil development: 46 to 165 cm (18 to 65 inches)

Particle-size control section: averages 50 to 90 percent fine sand, 0 to 25 percent very fine sand, and has a combined silt and clay fraction of less than 10 percent

Other property: regular decrease in organic matter with increasing depth

A horizon:

Hue: 10YR

Value: 2 or 3

Chroma: 1 or 2

Texture: fine sand, sand, loamy fine sand, or loamy sand

Reaction: very strongly acid to neutral

Ap horizon:

Hue: 10YR

Value: 3 or 4, 6 or more dry

Chroma: 1 to 4

Texture: fine sand, sand, loamy fine sand, or loamy sand

Reaction: very strongly acid to neutral

BE horizon:

Hue: 7.5YR or 10YR

Value: 4

Chroma: 3 or 4

Texture: fine sand, sand, loamy fine sand, or loamy sand

Reaction: moderately acid to neutral

Some pedons have a thin E horizon.

Bw horizon:

Hue: 7.5YR or 10YR

Value: 4 to 6

Chroma: 3 to 8

Texture: fine sand or loamy fine sand

Reaction: very strongly acid to neutral

BC horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6

Chroma: 3 to 6

Reaction: very strongly acid to neutral

C horizon:

Hue: 10YR or 2.5Y

Value: 4 to 7

Chroma: 1 to 6

Texture: fine sand, loamy fine sand, sand, or loamy sand

Reaction: very strongly acid to neutral

COMPETING SERIES: These are the [Acquango](#), [Aldo](#), [Biltmore](#), [Boplain](#), [Caesar](#), [Chute](#), [Dabney](#), [Gardiner](#), [Hodge](#), [Osolo](#), [Pahuk](#), [Penwood](#), [Perks](#), [Pinegrove](#), [Plainfield](#), [Poquonock](#), [Rikers](#), [Ronda](#), [Samoa](#), [Sardak](#), [Sarpy](#), [Scotah](#), [Spessard](#), [Suncook](#), [Tyner](#), [Wapanucket](#), and [Windsor](#) series. Acquango soils are very slightly saline to moderately saline in the series control section. Aldo, Caesar, Dabney, Osolo, Perks, Pinegrove, Plainfield, and Spessard soils average less than 50 percent fine sand in the particle-size control section. Biltmore soils have few to many mica flakes in the series control section. Boplain soils have a paralithic contact in the lower part of the series control section. Chute and Suncook soils are less than 46 cm (18 inches) to the base of soil development. Gardiner and Scotah soils have an irregular decrease in organic matter within the series control section. Hodge, Sardak, and Sarpy soils have carbonates within the series control section. Pahuk, Ronda, and Samoa soils do not have a Bw horizon. Penwood soils have hue redder than 7.5YR in the Bw horizon. Poquonock soils have a densic contact within the series control section. Rikers soils have anthrotransported material within the series control section. Tyner soils average more than 10 percent silt plus clay in the particle-size control section. Wapanucket soils have less than 70 percent sand in the lower part of the series control section. Windsor soils are from outside LRR L and M and typically average less than 50 percent fine sand in the particle-size control section.

GEOGRAPHIC SETTING: Oakville soils are on dunes and beach ridges on outwash plains, lake plains, and moraines. Slope ranges from 0 to 60 percent. Oakville soils formed in sandy eolian deposits. Mean annual precipitation ranges from 737 to 1067 mm (29 to 42 inches). Mean annual temperature ranges from 7.8 to 11.7 degrees C (47 to 53 degrees F). Frost-free period is 130 to 180 days. Elevation is 177 to 466 meters (580 to 1,530 feet) above mean sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are principally the [Brems](#), [Denham](#), [Granby](#), [Maumee](#), [Morocco](#), and [Newton](#) soils on outwash plains. The moderately well drained Brems and Denham soils are on lower backslopes and on footslopes of dunes. The very poorly drained Maumee and Newton soils are in depressions between dunes. The somewhat poorly drained Morocco soils are on swells between dunes. The moderately well drained [Miami](#) and [Morley](#) soils, and the well drained [Spinks](#) and [Lapeer](#) soils are associated on moraines and till plains. These soils are at the foot of the dunes or occur as knolls between the dunes. The well drained [Boyer](#) and [Oshtemo](#) soils, and the excessively drained [Carver](#) and [Windsor](#) soils are also associated on some outwash plains and lake plains. These soils are located between dunes and between beach ridges.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Excessively drained. Potential for surface runoff is negligible to low. Saturated hydraulic conductivity is high or very high. Permeability is rapid. These soils are droughty and require water irrigation to successfully grow most crops. Some areas on low stream terraces are rarely flooded.

USE AND VEGETATION: Soils are mostly in idle cropland or in woodland. Some areas are in pasture. Vegetables, small grain, and legume-grass hay are the principal crops when cultivated. Native vegetation is mixed hardwoods with oak and white pine the principal species.

DISTRIBUTION AND EXTENT: MLRA's 95A, 95B, 97, 98, 99, 101, 108B, 110, 111, 115B, 115C, 139, 142, 143, and 144A in southern Michigan, northern Illinois, northern Indiana, northwestern Ohio, New York, and eastern Wisconsin. The series is of large extent.

SOIL SURVEY REGIONAL OFFICE (SSRO) RESPONSIBLE: MORGANTOWN, WEST VIRGINIA

SERIES ESTABLISHED: Macomb County, Michigan, 1970.

REMARKS: Moderately wet phase, wet substratum phase, and clayey and loamy substratum phases have been correlated. Areas with these phases within the series control section will need to be evaluated during MLRA update activities. The Oakville series correlated in MLRA's 139, 143, and 144A are well outside of the distribution limits of the Oakville concept and will need to be evaluated during modernization projects.

Diagnostic horizons and features recognized in this pedon are:
Ochric epipedon: from the surface to a depth of 8 cm (3 inches) (A horizon).

NASIS Data Mapunit ID 155011 represents the typical pedon.
NASIS Data Mapunit ID 155012 represents the 12 to 18 percent slope phase.

ADDITIONAL DATA: Lab characterization data for the typical pedon (S95IN-073-007) and from several other pedons in this area are available at the National Soil Survey Laboratory in Lincoln, NE. This data (project number CP96-IN031) is a part of a wet soil study in Jasper County by Purdue University, West Lafayette, Indiana.

National Cooperative Soil Survey
U.S.A.

Soil Profile Description

Soil Profile #	3	Date Described		County - Iroquois
Property Location	Iroquois County State Conservation Area			
Described By	MK, SW, MB, from 1.25" core			

Possible Soil Series Granby/Morocco

Horizon	Depth (in.)	Boundary	Matrix Color (moist)	Texture	Structure	Consistence (moist)	Redox Features	Reaction (10% HCl)	Coatings	Loading Rate (1)	Design Group	Notes
A	0-6	—	10YR 2/1	FSL	2 F SBK —> 2 VF GR	FR	—		—	0.84 4D	IV	
AB	6-19	—	10YR 3/3	FSL	2 VF-F SBK	FR	C1P 7.5YR 4/6, 5/6 C1F 10YR 4/2		—	0.84 4D	IV	
Bw	19-25	—	10YR 4/3	LFS	1 FM SBK	VFR	M2D 10YR 5/3 C2D 7.5YR 5/6		—	0.91 3B	III	
BC	25-35	—	10YR 5/3	LFS	1 M SBK	VFR	M2F 10YR 5/2 C2D 10YR 5/6		—	0.91 3B	III	
Cg	35-46	—	10YR 5/2	LFS	SG	LOOSE	M3P 7.5YR 5/8		—	0.84 3A	IV	

Current Hydrology: Free Water @ _____ ± Upper Boundary of Capillary Fringe @ _____ ±

Notes: 3 feet separation distance required. Seasonal High Water Table - estimated at 6 inches. BC or Bw, Cambic horizon present? Is this a Mollic Udipsamment? If mollic, is it Hapludolls? Can it be an Entic Hapludolls?

Soil Profile Description

Soil Profile #	4	Date Described		County - Iroquois
Property Location	Iroquois County State Conservation Area			
Described By	MK, SW, MB, from 1.25" core			

Possible Soil Series Granby/Morocco

Horizon	Depth (in.)	Boundary	Matrix Color (moist)	Texture	Structure	Consistence (moist)	Redox Features	Reaction (10% HCl)	Coatings	Loading Rate (1)	Design Group	Notes
A1	0-11	—	10YR 2/1	FSL	2 VF SBK	FR	—		—	0.84 4D	IV	
A2	11-37	—	10YR 2/1	LFS	2 F SBK*	FR			—	0.91* 3B	III	* moderate structure not recognized on Exhibit B
A3	37-53	—	10YR 3/1	LFS	1 M SBK	FR	C1P 7.5YR 5/6 with possible depletions		—	0.91 3B	III	
C	53-58	—	10YR 6/3	LFS	SG	LOOSE	C1P 7.5YR 5/6 C1D 10YR 6/2		—	0.84 3A	IV	

Current Hydrology: Free Water @ _____ ± Upper Boundary of Capillary Fringe @ _____ ±

Notes: 3 feet separation distance required. **Seasonal High Water Table** - ?? Is this a Mollic Udipsamment? If mollic, is it Hapludolls? Has a Chroma of 1 and prominent redox concentrations in the lower part of the mollic – thus it meets the aquolls criteria (1B5a1), does it not? Further keys out as Cumulic Endoaquoll?

LOCATION MOROCCO

IN+IL MI WI

Established Series
Rev. FF-TRZ-RAB
03/2017

MOROCCO SERIES

The Morocco series consists of very deep, somewhat poorly drained soils formed in sandy outwash, glaciolacustrine, or eolian deposits on outwash plains, lake plains and dunes. Slope ranges from 0 to 3 percent. Mean annual precipitation is about 889 mm (35 in), and mean annual temperature is about 10.0 degrees C (50 degrees F).

TAXONOMIC CLASS: Mixed, mesic Aquic Udipsamments

TYPICAL PEDON: Morocco loamy fine sand, on a 0.5 percent slope in a cultivated field at an elevation of 209 m (687 ft) above mean sea level. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 23 cm (9 in); dark grayish brown (10YR 4/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common fine and very fine roots; very strongly acid; abrupt smooth boundary. [15 to 25 cm (6 to 10 in) thick]

Bw1--23 to 36 cm (9 to 14 in); light yellowish brown (10YR 6/4) loamy fine sand; single grain; loose; few very fine roots; few fine prominent strong brown (7.5YR 5/8) masses of oxidized iron in the matrix; common medium distinct light gray (10YR 7/2) iron depletions in the matrix; very strongly acid; clear wavy boundary.

Bw2--36 to 56 cm (14 to 22 in); very pale brown (10YR 7/3) loamy fine sand; single grain; loose; few very fine roots; common medium prominent brownish yellow (10YR 6/8) masses of oxidized iron in the matrix; very strongly acid; clear wavy boundary.

Bg--56 to 89 cm (22 to 35 in); light gray (10YR 7/2) fine sand; single grain; loose; many coarse prominent yellowish red (5YR 5/8) masses of oxidized iron in the matrix; very strongly acid; clear wavy boundary.

B'w1--89 to 127 cm (35 to 50 in); very pale brown (10YR 7/4) fine sand; single grain; loose; common medium prominent brownish yellow (10YR 6/8) masses of oxidized iron in the matrix; common medium distinct light gray (10YR 7/2) iron depletions in the matrix; very strongly acid; gradual wavy boundary.

B'w2--127 to 152 cm (50 to 60 in); very pale brown (10YR 7/4) fine sand; single grain; loose; common medium prominent brownish yellow (10YR 6/8) masses of oxidized iron in the matrix; common medium distinct light gray (10YR 7/2) iron depletions in the matrix; strongly acid; clear wavy boundary. [Combined thickness of the Bg or Bw horizon is 46 to 178 cm (18 to 70 in).]

C--152 to 203 cm (60 to 80 in); pale brown (10YR 6/3) sand; single grain; loose; common medium distinct

brownish yellow (10YR 6/6) masses of oxidized iron in the matrix; common medium faint light brownish gray (10YR 6/2) iron depletions in the matrix; strongly acid.

TYPE LOCATION: Jasper County, Indiana; about 4 miles southwest of Demotte; 270 feet north and 950 feet west of the southeast corner of sec. 7, T. 31 N., R. 7 W.; USGS Shelby, IN topographic quadrangle; lat. 41 degrees 8 minutes 43.6 seconds N. and long. 87 degrees 15 minutes 35.9 seconds W., NAD 27; UTM Zone 16, 478181 easting and 4554938 northing, NAD 83.

RANGE IN CHARACTERISTICS:

Thickness of the solum: 61 to 203 cm (24 to 80 in)

Depth to iron depletions: within a depth of 61 cm (24 in)

Ap or A horizon:

Hue: 10YR

Value: 2 to 6, 6 or more dry where the Ap or A horizon is 15 cm (6 in) or more thick

Chroma: 1 to 4

Texture: loamy fine sand, fine sand, loamy sand, or sand

Rock fragment content: 0 to 1 percent gravel

Reaction: very strongly acid to neutral depending on liming history

E horizon: (where present, up to 20 cm (8 in) thick)

Hue: 10YR

Value: 4 to 6

Chroma: 3 or 4

Texture: loamy fine sand, fine sand, loamy sand, or sand

Rock fragment content: 0 to 1 percent gravel

Reaction: very strongly acid to neutral depending on liming history

Bw or Bg horizon:

Hue: 5YR to 2.5Y

Value: 4 to 7

Chroma: 1 to 8

Texture: fine sand, sand, loamy fine sand, or loamy sand

Rock fragment content: 0 to 5 percent gravel

Reaction: very strongly acid to moderately acid

C or Cg horizon:

Hue: 2.5YR to 10YR

Value: 5 to 8

Chroma: 1 to 4

Texture: fine sand or sand

Rock fragment content: 0 to 7 percent gravel

Reaction: very strongly acid to moderately acid

COMPETING SERIES: These are the [Algansee](#), [Altmar](#), [Birchwood](#), [Brems](#), [Brockatonorton](#), [Deerfield](#), [Elnora](#), [Fortress](#), [Livonia](#), [Meckling](#), [Ottokee](#), [Partridge](#), [Succotash](#), [Tedrow](#), and [Zaborosky](#) series. Algansee soils have textural stratification in the lower part of the series control section. Altmar soils have more than 7

percent rock fragments in the particle-size control section. Birchwood soils have a densic contact within the series control section. Brems and Elnora, soils do not have iron depletions within a depth of 61 cm (24 in). Brockatonorton soils have a buried histic epipedon within the series control section. Deerfield and Morocco soils have overlapping soils properties and are not clearly differentiated from one another, however Deerfield soils have a depth to iron depletions ranging in excess of 61 cm (24 in). Fortress soils have a B horizon that is less than 25 cm (10 inches) thick. Livonia soils have slightly acid to moderately alkaline reaction. Meckling soils are calcareous throughout. Ottokee soils have lamella within the series control section. Partridge soils have a lithic contact between a depth of 51 and 102 cm (20 and 40 in). Succotash soils do not have a B horizon. Tedrow soils are less acidic than moderately acid in the lower part of the series control section. Zaborosky soils have carbonates within a depth of 152 cm (60 in).

GEOGRAPHIC SETTING: Morocco soils are on footslopes on outwash plains, low rises on lake plains, and low ridges and dunes on dune fields. Slope gradients range from 0 to 3 percent. Morocco soils formed in sandy outwash, glaciolacustrine, or eolian deposits. The sand fraction is fine or medium sand. Mean annual precipitation ranges from 762 to 107 cm (30 to 42 in). Mean annual temperature ranges from 8.3 to 11.7 degrees C (47 to 53 degrees F). Frost-free period is 120 to 180 days. Elevation is 177 to 466 m (580 to 1,530 ft) above mean sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Brems](#), [Maumee](#), [Newton](#), [Osolo](#), [Plainfield](#), and [Tyner](#) soils on nearby landscapes. The moderately well drained Brems soils are on higher positions on footslopes and swells. The very poorly drained Maumee and Newton soils are in depressions. The well drained Osolo soils are on slightly higher positions on swells. The excessively drained Plainfield and Tyner soils are on swells and knolls.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Somewhat poorly drained. Depth to the top of an apparent seasonal high water table ranges from 15 to 76 cm (0.5 to 2.5 feet) for some time in normal years. Potential for surface runoff is negligible. Saturated hydraulic conductivity is high or very high. Permeability is rapid.

USE AND VEGETATION: Soils are mostly used to grow corn, soybeans, and wheat. Irrigation is a common practice on cropped areas. Some areas are in pasture or forest. Native vegetation is hardwood forest with northern red oak and pin oak the principal species. White pine is also a common species in MLRA 97.

DISTRIBUTION AND EXTENT: MLRAs 95A, 97, 98, 105, 110, 111B, and 111C in northern Indiana, southern Michigan, northeastern Illinois, and central Wisconsin. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: AMHERST, MASSACHUSETTS

SERIES ESTABLISHED: Fulton County, Indiana, 1943.

REMARKS: Diagnostic horizons and features recognized in this pedon include:

1. Ochric epipedon: from the surface to a depth of 23 cm (9 in) (Ap horizon)
2. Aquic conditions: redoximorphic features present in all horizons below a depth of 23 cm (9 in).

NASIS Data Mapunit ID 124289 represents the typical pedon.

NASIS Data Mapunit ID 401576 represents Morocco in complex with Brems soils.

ADDITIONAL DATA: Lab characterization data is available for the typical pedon (JR7801) from the Purdue University Soil Characterization Laboratory, AES Bulletin No. 323, Volume 6, Pg. 154. Transect data (T98IN-131-001) for the typical pedon is on file in the MLRA project office, Plymouth, Indiana. Transect shows 80 percent Morocco soils and 20 percent Brems soils.

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Eolian sand
 Poorly drained
 Observed water table in borehole = 28 in.
 3" diameter core
 Described by MK, SW
 9-9-26

Horizon	Depth (in)	Matrix Color	Texture Class	Structure	Cons.	Coatings	Redox Features	State of Illinois		
								Soil Group	Loading Rate (gal/day/ft ²)	Design Group
A1	0-14	10YR 2/2	fSL	2, F&M, GR	FR	None	-	4D	0.84	IV
A2	14-19	2.5Y 3/2	fSL	2, F&M, SBK	FR	None	C, F, D 10YR 5/6&8	4D	0.84	IV
B _g	19-27	2.5Y 4/1	fSL	2, M, SBK	FR	None	C, F&M, P 10YR 5/6&8	4D	0.84	IV
BC _g	27-39	5Y 4/1	fSL	1, M, SBK	VFR	None	C, M&C, P 10YR 5/6&8	4B	0.75	V
C _g	39-61	2.5Y 4/1	fSL	0, MA	VFR	None	C, F&M, P 10YR 5/6&8	4K	0.84	IV

SHWT ≤ 19 in, gleyed matrix immediately below mollic epipedon.
 Epipedon = Mollic 0-19 in.
 Diagnostic subsurface Horizon = Cambic 19-39 in. (if fSL, if coarser none)
 Coarse-loamy, mixed, superactive, mesic Typic Endoaquoll
 Gilford series

Hydric determination = !!!!!!! what color are the A1 and A2????????? – I can assure you this soil is saturated and reducing in the top few inches. I have observed the water table within a few inches of the surface in this soil.

LOCATION GRANBY

MI+IA IL IN MN NY OH WI

Established Series

Rev. RWJ-WEF-GLH-MCB

01/2017

GRANBY SERIES

The Granby series consists of very deep, poorly drained or very poorly drained soils formed in sandy outwash or sandy glaciolacustrine deposits on outwash plains, lake plains, and glacial drainageways. Slope ranges from 0 to 3 percent. Mean annual precipitation is about 900 mm, and mean annual temperature is about 9 degrees C.

TAXONOMIC CLASS: Sandy, mixed, mesic Typic Endoaquolls

TYPICAL PEDON: Granby loamy sand, on a 1 percent slope in a cultivated field at an elevation of 190 meters above mean sea level. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 25 cm; black (10YR 2/1) loamy sand, dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; neutral; abrupt wavy boundary. (25 to 38 cm thick)

Bg1--25 to 41 cm; dark gray (10YR 4/1) sand; weak coarse subangular blocky structure; very friable; few medium faint light brownish gray (10YR 6/2) iron depletions in the matrix; slightly acid; gradual wavy boundary.

Bg2--41 to 81 cm; light brownish gray (10YR 6/2) sand; weak coarse subangular blocky structure; very friable; common medium faint dark gray (10YR 4/1) and gray (10YR 5/1) iron depletions in the matrix; neutral; clear wavy boundary. (Combined thickness of the Bg horizon is 30 to 102 cm.)

Cg--81 to 203 cm (32 to 80 in); light gray (10YR 7/2) sand; single grain; loose; common medium faint grayish brown (10YR 5/2) and few medium faint gray (10YR 5/1) iron depletions in the matrix; neutral.

TYPE LOCATION: Ottawa County, Michigan; about 7 miles west and 1/2 mile south of Allendale; 350 feet east and 400 feet north of the center of sec. 28, T. 7 N., R. 15 W.; USGS Borculo topographic quadrangle; lat. 42 degrees 57 minutes 58.42 seconds N. and long. 86 degrees 5 minutes 28.51 seconds W., NAD 27; UTM Zone 16, 574106 easting and 4757467 northing, NAD 83.

RANGE IN CHARACTERISTICS:

Thickness of the solum: typically 76 to 100 cm, but ranges from 51 to 132 cm

Depth to carbonates: 51 cm to greater than 203 cm

Ap horizon:

Hue: 10YR to 5Y, or is neutral

Value: 2, 2.5, or 3

Chroma: 0 to 2

Texture: sand, mucky sand, loamy sand, mucky loamy sand, loamy fine sand, mucky loamy fine sand, fine sand, mucky fine sand, fine sandy loam, sandy loam, or loam

Rock fragment content: 0 to 5 percent gravel

Reaction: moderately acid to neutral

Bw or Bg horizon:

Hue: 10YR to 5Y

Value: 4 to 6

Chroma: 1 to 3; or hue of 5Y and chroma of 3 or less with distinct or prominent redoximorphic features; pedons that do not have a dominant chroma of 2 or less have colors due to uncoated mineral grains

Texture: fine sand, sand, loamy sand, or loamy fine sand

Rock fragment content: 0 to 5 percent gravel

Reaction: moderately acid to slightly alkaline

C or Cg horizon:

Hue: 10YR to 5Y

Value: 4 to 7

Chroma: 1 to 4

Texture: sand, coarse sand, fine sand, loamy fine sand, or loamy sand

Rock fragment content: 0 to 14 percent gravel

Reaction: slightly acid to moderately alkaline

CaCO₃ content: 0 to 14 percent

Clayey substratum phase:

Depth: 152 to 203 cm (60 to 80 in)

Texture: silty clay, clay, or silty clay loam

Reaction: slightly alkaline or moderately alkaline

COMPETING SERIES: These are the [Gumz](#), [Kentland](#), [Loup](#), and [Maumee](#) series. Gumz soils have a lithologic discontinuity with till in the lower part of the series control section. Kentland soils have an organic layer in the middle part of the series control section. Loup soils are in drier climates that receive less than 720 mm of annual precipitation. Maumee soils have a mollic epipedon that is more than 38 cm thick.

GEOGRAPHIC SETTING: Granby soils are on outwash plains, lake plains, and glacial drainageways. Slope ranges from 0 to 3 percent. Granby soils formed in sandy outwash or sandy glaciolacustrine deposits. Mean annual precipitation ranges from 762 to 1067 mm (30 to 42 in). Mean annual temperature ranges from 9 to 12 degrees C. Frost-free period is 130 to 210 days. Elevation is 177 to 466 meters above mean sea level.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Chelsea](#), [Gilford](#), [Morocco](#), [Oakville](#), [Plainfield](#), [Pipestone](#), [Spinks](#), [Tedrow](#), and [Watseka](#) soils, and the competing [Gumz](#) soils. The excessively drained Chelsea, Plainfield, and Oakville soils and the well drained Spinks soils are on nearby beach ridges and moraines. The poorly drained or very poorly drained Gilford and Gumz soils are on similar landforms. The somewhat poorly drained Pipestone soils are associated with Granby soils at the northern extent of its range and are on swells. The somewhat poorly drained Morocco, Tedrow and Watseka soils are on higher positions on the landscape.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Poorly drained or very poorly drained. Depth to an apparent seasonal high water table ranges from 30 cm above the surface to 30 cm below the surface for some time in normal years. Potential for surface runoff is negligible. Saturated hydraulic conductivity is high or very high.

USE AND VEGETATION: Most areas are used to grow small grain, hay, corn, soybeans, small fruits, and vegetables. Some areas are in permanent pasture or woodland. Native vegetation is marsh grasses, reeds, sedges, aspen, oak, silver maple, elm, and eastern white pine.

DISTRIBUTION AND EXTENT: Primarily in MLRAs 98 and 99, and to a lesser extent in MLRAs 91B, 95A, 95B, 97, 101, 103, 105, 110, 111B, 111C, 141, 142, and 144A in southern Michigan, northern Indiana, northern Ohio, southern Minnesota, southern Wisconsin, northeastern Illinois and New York. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: AMHERST, MASSACHUSETTS

SERIES ESTABLISHED: Oswego County, New York, 1917.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon: from the surface to a depth of 25 cm (Ap horizon).

Aquic conditions: redoximorphic features immediately below the mollic epipedon and in all underlying horizons.

Loamy and gravelly substratum phases with loamy or gravelly textures at depths of 100 to 152 cm are no longer within the series concept.

A till substratum phase is presently recognized in Ohio and may become a new series as subsets with this phase are updated. The till substrata is dense, has 27 to 42 percent clay, and occurs at depths of 152 to 200 cm.

Drained and undrained phases are recognized in Indiana to differentiate between those mapunits that have been artificially drained in order to facilitate crop production and those with natural hydrology.

ADDITIONAL DATA: Soil Interpretation Records: MI0029 -MAAT<50; MI0395 - MAAT>50; MI0524 - MAAT>50, MUCKY SURFACE; MI0529 - MAAT<50, MUCKY SURFACE; MI0118 - HIGH PPT; MI0672 - LOW PPT; MI0623 - CLAYEY SUBSTRATUM.

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Section 905.APPENDIX A Illustrations and Exhibits

Section 905.ILLUSTRATION M Soil Suitability for On-Site Sewage Design

Section 905.EXHIBIT A Loading Rates in Square Feet Per Bedroom and Gallons/Square Feet/Day

Design Group	Soil Group (Most Limiting Layer)	Minimum Separation To Limiting Layer ¹	Permeability Range	Size of System	
				Residential Reg. Absorption (ft ² /bedroom)	Institutional/Commercial Allowable Application Rate (GPD/ft ²)
I	1A	NR ³	Very Rapid	NR ³	NR ³
II	2A; 2B; 2K	3 feet	Rapid	200	1.0
III	3B; 3K	3 feet	High Moderately Rapid	220	0.91
IV	3A; 3L; 4D; 4K	3 feet	Low Moderately Rapid	240	0.84
V	4A;; 4B; 4H; 4L; 5D	3 feet	Very High Moderate	265	0.75
VI	4F; 4M; 5B	3 feet	High Moderate	290	0.69
VII	4N; 5A; 5C; 5H; 5K; 6D	2 feet	Moderate	325	0.62
VIII	4O; 5E; 5I; 5L; 6A; 6B; 6E; 6H; 6K	2 feet	Low Moderate	385	0.52
IX ²	5F; 5M; 6C; 6L; 7D; 7F	2 feet	High Moderately Slow	445	0.45
X ²	5G; 6F; 6I; 7E; 7C; 7H	2 feet	Low Moderately Slow	500	0.40
XI ²	5N; 6G; 6J; 6M; 7F; 7I	2 feet	Slow	740	0.27
XII ²	7G; 7J; 7L; 8E; 8I	2 feet	Very Slow	1000	0.20
XII ²	5O; 6N; 6O; 7M; 7N; 7O; 8J; 8M; 8O	NR ³	NR ³	NR ³	0.00
XIII	9	SUBSURFACE DISPOSAL NOT RECOMMENDED			

NOTES:

- ¹ Limiting layers include fragipans; bedrock; compact glacial tills; seasonal high water table or other soil profile features that will materially affect the absorption of liquid from the disposal field.
- ² Soils in this group are less than the minimum percolation rate established in Appendix A, Illustration H as suitable for subsurface seepage systems.
- ³ NR = Subsurface disposal system not recommended.

Section 905.Appendix A Illustrations and Exhibits
Illustration M Subsurface Seepage Loading Rate Key
Exhibit B (some of the numbers below have been changed)

KEY FOR DETERMINING SEWAGE SUBSURFACE LOADING RATES (g/d/sq. ft.) FOR ILLINOIS SOILS (1)

	Single Grain, weak Platy (2)	Granular, Angular and Subangular Blocky; Prismatic									Structureless or massive				
		Loess, Outwash, Alluvium, Lacustrine(8)				Till (3)					Loess, Outwash, Alluvium, Lacustrine(8)			Till (3)	
		Weak		Moderate, Strong		Weak		Moderate, Strong							
Moist Consistence	lo,vfr, fr	vfr, fr	fi	vfr, fr	fi	vfr, fr	fi	fr	fi	vfi	vfr	fr	fi	vfr, fr	fi, vfi
Texture	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1. Fragmental; Ext. or vgrs	>1.00 (4)	N/A (5)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2. s, lcs, ls, grs, cs, grls	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	N/A	N/A	N/A	N/A
3. fs, lfs, csl	.84	.91	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	.91	.84	N/A	N/A	N/A
4. sl, fsl, grsl, grl, grsil,	.75	.75	N/A	.84	N/A	.69	N/A	.75	N/A	N/A	.84	.75	.69	.62	.52
5. l, sil, vfsl, scl, si, vfs, lvfs, grcl	.62	.69	.62	.75	.69	.45 (6)	.40 (6)	.62	.52	N/A	.62	.52	.45 (6)	.27 (6)	N/R (7)
6. sicl, cl (< 35% clay)	.52	.52	.45 (6)	.62	.52	.40 (6)	.27 (6)	.52	.40 (6)	.27 (6)	.52	.45 (6)	.27 (6)	N/R	N/R
7. sicl, cl (>35% clay)	N/A	N/A	.40 (6)	.45 (6)	.40 (6)	.27 (6)	.20 (6)	.40 (6)	.27 (6)	.20 (6)	N/A	.20 (6)	N/R	N/R	N/R
8. sc,sic,clay	N/A	N/A	N/A	N/A	.20 (6) (9)	N/A	N/A	N/A	.20 (6) (9)	N/R	N/A	N/A	N/R	N/A	N/R
9. Organics, Fragic, Lithic, Paralithic	SOIL PROPERTIES HAVE VERY SEVERE LIMITATATIONS: SUBSURFACE DISPOSAL NOT RECOMMENDED														

FOOTNOTES:

- 1) Disturbed soils are highly variable and require special on-site investigations.
- 2) Moderate or strong platy structures for the soil textures in Groups 4, 5 and 6 have a loading rate of 0.40 g/d/sq. ft. Platy structure having firm or very firm consistence and/or caused by mechanical compaction has a loading rate of 0.0 g/d/sq. ft.
- 3) Basal glacial tills structured by geogenic processes have the same loading rates as structureless glacial till.
- 4) This soil group is estimated to have very rapid permeability and exceeds the maximum established rate in Section 905. Illustration H, Exhibit A of this part.
- 5) N/A means not applicable.
- 6) These soil groups are estimated to have moderately slow to very slow permeability and is less than the minimum established rate in Section 905. Illustration H, Exhibit A of this part.
- 7) N/R means not recommended. These soils have loading rates considered too low for conventional subsurface disposal.
- 8) In some areas, lacustrine material may have physical properties similar to glacial till and should be placed in the glacial till columns.
- 9) Non-swelling (1:1 lattice clays) formed in bedrock residuum have a loading rate of .27 g/d/sq. ft. Swelling (2:1 lattice) clays are not recommended for subsurface disposal.

FIELD INDICATORS OF HYDRIC SOILS IN LRR K, L, M, N, O, P – ILLINOIS

Adapted* from Version 9.3 6/4/2026 – Can be used in all Illinois LRRs, unless otherwise stated.

A1. Histosol. Classifies as a Histosol. User Notes: A Histosol has 40cm (16") or more of the upper 80cm (32") as organic soil material. These materials include muck (Sapric), mucky peat (Hemic), or peat (Fibric).

A2. Histic Epipedon. A histic epipedon underlain by mineral soil with chroma 2 or less. User Notes: Surface horizon of organic material 20cm (8") or more thick. Aquic conditions or artificial drainage required.

A3. Black Histic. A layer of peat, mucky peat, or muck 20cm (8") or more thick starting within the upper 15cm (6") of the soil surface having hue 10YR or yellower, value 3 or less, chroma 1 or less underlain by mineral soil material with chroma 2 or less. User Notes: Does not require proof of aquic conditions or artificial drainage.

A4. Hydrogen Sulfide. A hydrogen sulfide odor within 30cm (12") of the surface. User Notes: This "rotten egg smell" indicates the sulfate-sulfur in the soil has been reduced to hydrogen sulfide gas, indicating that the soil is anaerobic.

A5. Stratified Layers. Stratified layers starting within 15cm (6") of the surface. At least one layer has a value 3 or less with chroma 1 or less and/or it is muck, mucky peat, peat, or mucky modified mineral texture. The remaining layers in the upper 15cm (6") have chroma 2 or less. User Notes: Many alluvial soils have stratified layers at the required depths but lack chroma 2 or less in the remaining layers. This indicator may occur in any type soil material.

A6. Organic Bodies. *For use in LRR P.* Presence of 2% or more organic bodies of muck or mucky modified mineral texture, approximately 0.5-1 inch in diameter, starting within 15cm (6") of the soil surface, typically on tips of fine roots, commonly 1cm-3cm (0.5"-1") in size. User Notes: The content of organic carbon should be known before this indicator is used. Hemic and fibric material do not meet the requirements, nor does partially decomposed root material.

A7. 5 cm Mucky Mineral. *For use in LRR P.* A layer of mucky modified mineral soil material 5 cm (2") or more thick starting within 15cm (6") of the soil surface. User Notes: "Mucky" is a USDA texture modifier for mineral soils. The organic carbon content ranges from 5% to 12%.

A9. 1 cm Muck. *For use in LRR P. For testing in LRR O.* A layer of muck 1cm (0.5") or more thick with value of 3 or less and chroma of 1 or less starting within 15cm (6") of the soil surface. User Notes: Organic soil material is called muck if the material has sufficiently decomposed to limit the recognition of plant parts. Muck is sapric material with at least 12% organic carbon. Mucky peat and peat do not qualify. The muck layer may occur at any depth in the upper 15cm (6"). Sand grains should not be evident.

A10. 2 cm Muck. *Used in LRR M & N. For testing in LRR K & L.* A layer of muck 2cm (0.75") or more thick with value 3 or less and chroma 1 or less, starting within 15cm (6") of the soil surface. User Notes: See 1 cm Muck User Notes above.

A11. Depleted Below Dark Surface. A layer with a depleted or gleyed matrix that has 60% or more chroma 2 or less starting within 30cm (12") of the soil surface and having a minimum thickness of either: (a) 15cm (6") or (b) 5cm (2") if the 5cm (2") consists of fragmental soils material.

Organic, loamy, or clayey layers above the depleted or gleyed matrix must have value 3 or less, chroma 2 or less starting within 15cm (6") of the surface and extend to the depleted or gleyed matrix. Sandy material must be 70% masked with organic material. User Notes: This indicator often occurs in Mollisols but also applies to soils with umbric and dark colored ochric epipedons. See also Depleted Matrix User Notes.

A12. Thick Dark Surface. A layer at least 15cm (6") thick with a depleted or gleyed matrix that has 60% or more chroma 2 or less starting below 30cm (12") of the surface. Layer(s) starting within 15cm (6") from the surface and above the depleted or gleyed matrix must have value 2.5 or less and chroma 1 or less to at least 30cm (12") and a value 3 or less and chroma 1 or less in any remaining layers above the depleted matrix. Loamy fine sand and coarser layers above the depleted matrix must be 70% or more masked with organic material. User Notes: The depleted matrix may occur in sandy or

loamy & clayey soil layers. This indicator has a black surface layer 30cm (12") or more thick and has value 3 or less, chroma 1 or less in any remaining layer above a depleted or gleyed matrix, often associated with soils in concave landscapes. See also Depleted Matrix User Notes.

A16. Coast Prairie Redox *For use in MLRA 150A of LRR T or with the COE Midwest Supplement "problem soils" in LRR M.* A layer starting within 15cm (6") of the surface that is at least 10cm (4") thick with matrix of chroma 3 or less with 2% or more distinct or prominent redox concentrations, occurring mainly on depressional landforms.

A18. Iron Monosulfide. Positive ID of dark-gray or black iron monosulfide concentrations with value 4 or less and chroma 2 or less, starting within 25cm (10") of the surface. User Notes: Positive ID requires 2 separate observations of FeS concentrations as stains, coatings, soft masses, or pore linings. Concentrations can oxidize rapidly, so observe immediately.

S1. Sandy Mucky Mineral. A mucky modified sandy mineral surface layer 5cm (2") or more thick starting within 15cm (6") of the soil surface. User Notes: "Mucky" is a USDA texture modifier for mineral soils. The organic carbon content ranges from 5% to 12% for sandy soils.

S3. 5 cm Mucky Peat or Peat. *For use in LRR M. For testing in K,L.* A layer of mucky peat or peat 5cm (2") or more thick with value 3 or less and chroma 2 or less, starting within 15cm (6") of the soil surface and underlain by sandy material. User Notes: Organic soil material is called peat if almost all of the plant fibers remain. Mucky peat is intermediate in decomposition between peat and muck. Minimum organic carbon of 12%.

S4. Sandy Gleyed Matrix. A gleyed matrix which occupies 60% or more of the layer within 15cm (6") of the soil surface. User Notes: Gley colors are not synonymous with gray colors. Gley colors are those colors that are found on the gley pages of the Munsell color charts.

S5. Sandy Redox. A layer starting within 15cm (6") of the soil surface that is at least 10cm (4") thick and has a matrix with 60% or more chroma 2 or less with 2% or more distinct or prominent redox concentrations as soft masses and/or pore linings. User Notes: Redox concentrations include iron and manganese masses (reddish mottles) and pore linings. Included within this concept of redox concentrations are iron/manganese bodies as soft masses with diffuse boundaries. Concentrations are often more visible as the soil dries. This is a very common indicator for sandy soils.

S6. Stripped Matrix. A layer within 15cm (6") of the surface in which iron/manganese oxides and/or organic matter have been stripped from the matrix exposing the primary base color of soil materials. The stripped areas and the translocated oxides and/or organic matter form a faint, diffuse splotchy pattern of two or more colors. The stripped zones are 10% or more of the volume and rounded and typically 1cm to 3cm (0.5" to 1") in diameter. User Notes: Commonly the splotches of color have value 5 or more and chroma 2 or less (stripped) and chroma 3 and/or 4 (unstripped). The matrix may lack the 3 and/or 4 chroma material. May be more evident on a horizontal slice of soil.

S7. Dark Surface. *For use in LRR K, L, M, N and P.* A layer 10cm (4") thick or more starting within the upper 15cm (6") of the surface with a matrix value of 3 or less and chroma of 1 or less. At least 70% of the particles appear to be masked. The matrix of the layer directly below the dark layer must have the same colors as described above or any color with chroma of 2 or less. User Notes: An undisturbed sample must be observed. A 10X hand lens is a valuable aid.

S8. Polyvalue Below Surface. *For testing in LRRs K and L.* A layer with value of 3 or less and chroma of 1 or less starting within 6 inches of the surface, and underlain by a layer(s) in which translocated organic matter unevenly covers the soil, forming a diffuse splotchy pattern. User Notes: This indicator applies to soils with a very dark gray or black surface or near surface layer that is <4 inches thick and is underlain by a layer in which organic matter has been differentially distributed by water movement.

S9. Thin Dark Surface. *For testing in LRRs K and L.* A layer 5cm (2") or more thick within 15cm (6") of the soil surface with value of 3 or less and chroma of 1 or less. $\geq 70\%$ of the visible soil particles must be masked by organic matter. This layer is underlain by a layer with value of 4 or less and chroma of 1 or less to a depth of 30cm (12") or to a spodic horizon. User Notes: This indicator applies to soils with a very dark gray or black surface or near surface layer that is 5cm (2") or more thick and is underlain by a layer in which organic matter has been leached downward and evenly distributed in the E horizon, commonly in Spodosols, but not required.

S11. High Chroma Sands. *For use along shorelines and near shore regions of the Great Lakes in LRRs K and L.* In coastal zones and dune-swale complexes, a layer 5cm (2") or more thick starting within 10cm (4") of the surface with chroma 4 or less and 2% or more redox concentrations. User Notes: Along shorelines some wetlands have high chroma sands (chroma 3 or 4) at the landward edge of marshes, on interdunal positions, and dune/swale complexes. These soils exhibit redox concentrations within 10cm (4") of the surface.

F1. Loamy Mucky Mineral. *(Not for use in LRR N. In LRR P use A7).* A mucky modified loamy or clayey surface layer 10cm (4") or more thick, starting within 6 inches of the soil surface. User Notes: "Mucky" is a USDA texture modifier for mineral soils. The organic carbon ranges 5% to 12%.

F2. Loamy Gleyed Matrix. A gleyed matrix that occupies 60% or more of a layer within 30cm (12") of the surface. User Notes: Gley colors are those colors that are found on the gley pages. They have hue of N, 10Y, 5GY, 10GY, 5G, 10G, 5BG, 10BG, 5B, 10B, or 5BP with value 4 or more. The gleyed matrix only has to be present within 30cm (12") of the surface.

F3. Depleted Matrix. A layer that has a depleted matrix with 60% or more chroma 2 or less and that has a minimum thickness of either:

- 5cm (2"), if the layer starts within 10cm (4") from the soil surface, OR
- 15cm (6"), if the layer starts within 25cm (10") from the soil surface.

User Notes: A depleted matrix requires a value of 4 or more and chroma of 2 or less. Redox concentrations, including soft iron-manganese masses and/or pore linings, are required in soils with matrix value 4/1, 4/2, and 5/2. A, E, and calcic horizons may have low chromas and high values and may be mistaken for a depleted matrix; however, they are excluded unless the soil has 2% or more distinct or prominent redox concentrations. The low chroma matrix must be a result of wetness and not a weathering or parent material feature.

F6. Redox Dark Surface. A layer at least 10cm (4") thick starting within 20cm (8") of the mineral soil surface that has:

- matrix value 3 or less and chroma 1 or less and 2% or more distinct or prominent redox concentrations as soft masses or pore linings, OR
- matrix value 3 or less and chroma 2 or less and 5% or more distinct or prominent redox concentrations as soft masses or pore linings.

User Notes: Redox concentrations in high organic matter mineral soils (Mollisols) are often difficult to see. In some instances, drying of the samples makes the concentrations (if present) easier to see.

F7. Depleted Dark Surface. Redox depletions, with value 5 or more and chroma 2 or less, in a layer at least 10cm (4") thick starting within 20cm (8") of the mineral soil surface and has:

- matrix value 3 or less and chroma 1 or less and 10% or more redox depletions, OR
- matrix value 3 or less and chroma 2 or less and 20% or more redox depletions.

User Notes: Care should be taken not to mistake the mixing of an E or calcic horizon into the surface layer as depletions. Redox concentrations should be within or surrounding the redox depletions.

F8. Redox Depressions. In closed depressions subject to ponding, 5% or more distinct or prominent redox concentrations occurring as soft masses or pore linings in a layer that is 5cm (2") or more thick and starts within 10cm (4") of the soil surface. User Notes: This indicator occurs on depressional landforms, such as potholes and floodplains. It does not occur in micro depressions on convex or planar slope shape positions.

F10. Marl. *For use in LRR K, L.* A layer of marl with value of 5 or more and chroma 2 or less starting within 10cm (4") of the soil surface. User Notes: Marl is a limnic material deposited in water by precipitation of CaCO_3 by algae. It has a value of 5 or more and reacts with diluted HCl. Marl is not the carbonatic substrate material associated with limestone. Some soils have the properties of Marl, except for the required Munsell value. These soils are hydric if the required value is present within 10cm (4") of the surface. Normally this indicator occurs at the surface.

F12. Iron-Manganese Masses. *For use in LRRs N, O, P; for testing in LRR K, L, M.* On flood plains, a layer 10cm (4") or more thick with 40% or more chroma 2 or less and 2% or more distinct or prominent redox concentrations occurring as soft iron/manganese masses with diffuse boundaries. The layer starts within 20cm (8") of the surface. Fe/Mn masses have value and chroma of 3 or less. The thickness requirement is waived if the layer is the mineral surface layer. User Notes: The Fe/Mn masses are generally small (2–5 mm) and black and have value and chroma of 3 or less.

F13. Umbric Surface. *For use in LRRs P and MLRA 122 of N.* A layer 25cm (10") or more thick starting within 15cm (6") of the surface in which the upper 15cm (6") has value of 3 or less and chroma of 1 or less and in which the lower 10cm (4") has the same colors as those described above or any other color that has chroma of 2 or less. User Notes: The thickness requirements may be slightly less than those for an umbric epipedon.

F21. Red Parent Material. *For use in MLRA 127 of LRR N and for testing in all LRRs in soils derived from red parent materials.* A layer derived from red parent materials that is at least 10cm (4") thick starting within 25cm (10") of the soil surface with a hue of 7.5YR or redder. The matrix has value and chroma greater than 2 and less than or equal to 4. The layer must contain 10% or more depletions and/or redox concentrations. User Notes: For use in red parent material. Redox concentrations and depletions must be distinct or prominent and total at least 10%. Developed for Piedmont Lowlands of Appalachian Mtns. and for areas along the AR & LA Red River.

F22. Very Shallow Dark Surface *For testing in all LRRs.* In depressions and floodplains subject to frequent flooding/ponding, one of the following must be observed:

- If bedrock occurs between 15cm and 25cm (6"-10"), a layer at least 15cm (6") thick starting within 10cm (4") inches of the soil surface with value 2.5 or less/chroma 1 or less, and the remaining soil to bedrock must have the same colors as above or any color that has chroma 2 or less, OR
- If bedrock occurs within 15cm (6"), more than half of the soil thickness must have value 2.5 or less and chroma 1 or less and the remaining soil to bedrock must have the same colors or any color with chroma 2 or less.

(*Mark Bramstedt 6/4/2026. This sheet is not a word-for-word version of the indicators. It is condensed and paraphrased, but should be technically accurate. Consult the latest version of the Hydric Soil Indicators for the official indicator language.)