Use of DATCP 01 – Verification of Depth to Bedrock

ATCP 50 Stakeholder Meeting – Silurian Meeting 2

March 24, 2022

WISCONSIN DEPARTMENT OF AGRICULTURE, TRADE AND CONSUMER PROTECTION (DATCP)

Matt Woodrow & Cody Calkins – Bureau of Land & Water Resources

WHY DATCP 01

Supports implementation of s. **NR 151.075 Silurian Bedrock Performance Standards**

- (5) Manure may not be mechanically applied on croplands or pastures until infield bedrock verification OR Silurian bedrock map information is used to identify where the Silurian bedrock soil depth is less than 5 feet.
- Spreading Restrictions
  - < 2 feet
  - 2-3 feet
  - 3-5 feet
  - 5-20 feet

DATCP 01 - GOALS

1. Identify methods for verifying depth to bedrock
   - Ranges:
     - 0-2 feet
     - 2-3 feet
     - 3-5 feet
     - 5-20 feet

2. Identify who are the qualified individuals to perform the various verification methods

3. Identify what needs to be documented & submitted

DATCP 01 – VERIFICATION OF DEPTH TO BEDROCK

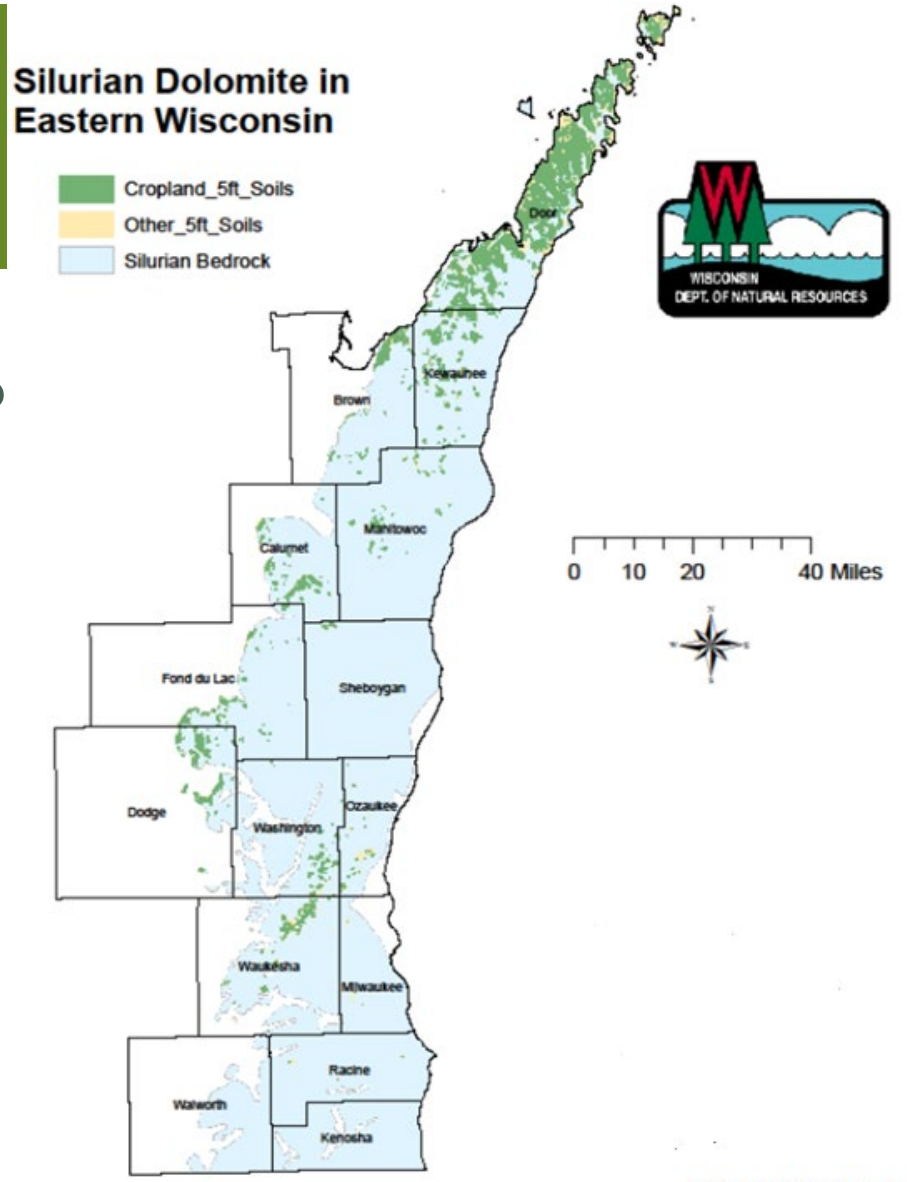
OVERVIEW OF TECHNICAL STANDARD

- **DATCP's first tech standard**
- **Standards Oversight Council (SOC) process**
  - **Full Process**

DATCP 01
PURPOSE

Methodology to verify and document depth to bedrock when a landowner wishes to contest the current depth categorization/maps

Depth to Silurian bedrock is 20 feet or less



DATCP 01
METHODOLOGY

Table 1 – Intrusive Methods

Method	Description	Minimum Sampling Density Required[1]	Allowable Boundary Depth Verifications
Hand probe	Rod less than 1" diameter is pushed into ground by hand.	At a minimum, one probe per 1/4 acre (~100 ft spacing) when disputing the 2 ft and/or 3 ft boundary.	2 ft 3 ft
Hand held or machine auger	Auger is advanced or turned into ground and rotated.	At a minimum, one probe per 1/4 acre (~100 ft spacing) when disputing the 2 ft and/or 3 ft boundary. At a minimum, one probe per 1 acre (~200 ft spacing) when disputing the 5 ft boundary.	2 ft 3 ft 5 ft
Direct push probe (e.g. Geoprobe, Giddings, loader/skid steer pushing rod, hammer probe)	Probe is advanced using hydraulic or percussive methods.	One probe per 1/4 acre (~100 ft spacing) when disputing the 2 ft and/or 3 ft boundary. One probe per 1 acre (~200 ft spacing) when disputing the 5 ft boundary. One probe per 10 acres (660 ft spacing) when disputing the 20 ft boundary.	Suitable for all depths
Excavation[2]	A pit is excavated for evaluation.	One pit per 1/4 acre (~100 ft spacing) when disputing the 2 ft and/or 3 ft boundary. One pit per 1 acre (~200 ft spacing) when disputing the 5 ft boundary. One pit per 10 acres (660 ft spacing) when disputing the 20 ft boundary.	Excavation equipment suitable to the depth of reach.

Follow Methodology section when conducting verification and **Table 1** and **Table 2** which provide the minimum sampling densities based upon verification method and depth to be verified.

INTRUSIVE METHOD EXAMPLE

Counties
Township/Range
Soils
Soil samples
Silurian 0-2ft
Silurian 2-5ft
Fields

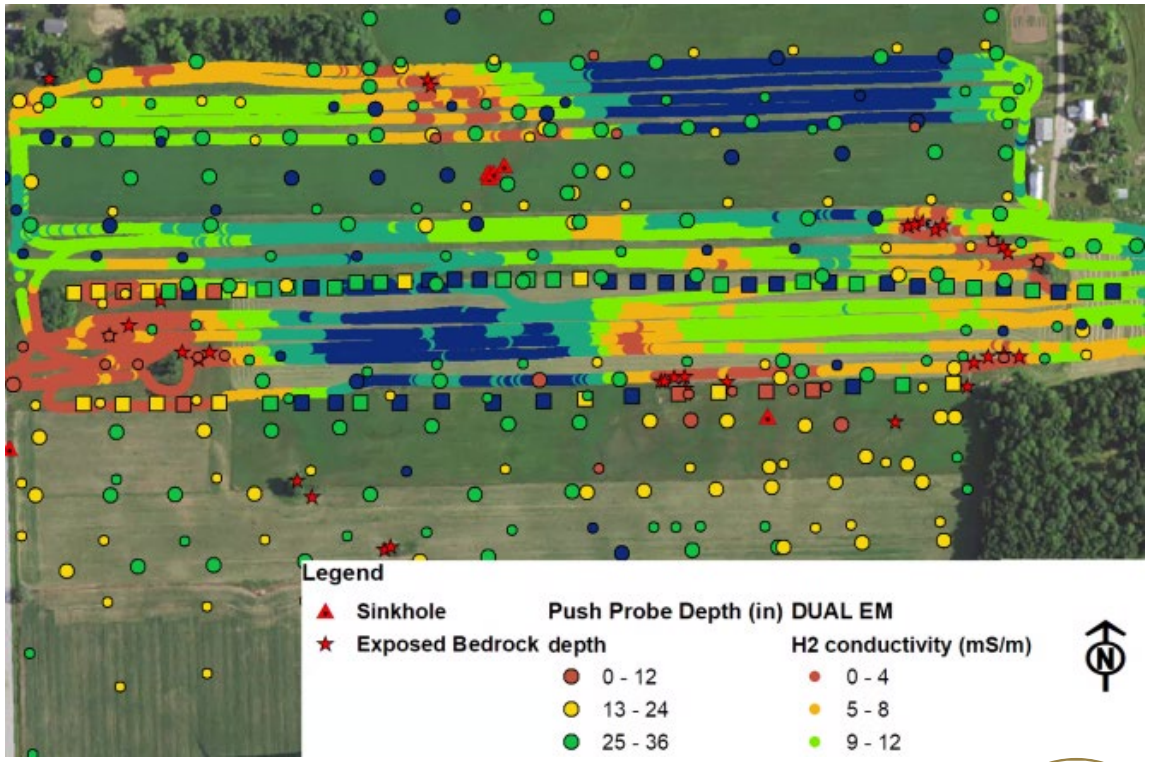
Table 2 – Geophysical Methods

Method	Description	Protocols	Output	Allowable Boundary Depth Verification
Contact Electrical Conductivity (e.g. Veris)	Electrodes in direct contact with the ground to measure the apparent electrical conductivity of the subsurface.	At least one survey line (covering the length of the field) per 100 ft spacing when disputing the 2 ft and/or 3 ft boundary.	Continuous profile of apparent bulk electrical conductivity along a survey line. Multiple profiles may be combined to produce a plan view map.	2 ft 3 ft
Electromagnetic (EM) surveys - Frequency domain conductivity (e.g., Dual EM, EM-31, EM-34, EM-38)	Using the induction principle, measures the apparent electrical conductivity of the subsurface.	At least one survey line (covering the length of the field) per 100 ft spacing when disputing the 2 ft and/or 3 ft boundary. At least one survey line per 200 ft spacing when disputing the 5 ft boundary. At least one survey line per 660 ft spacing when disputing the 20 ft boundary.	Continuous profile of electromagnetic apparent conductivity along a survey line. Multiple profiles may be combined to produce a plan view map.	2 ft 3 ft 5 ft 20 ft (depending on instrument model)
Electrical Resistivity Imaging	Electrodes in direct contact with the ground at specified spacings to measure the electrical conductivity of the subsurface.	At least one survey line (covering the length of the field) per 200 ft spacing when disputing the 5 ft boundary. At least one survey line per 660 ft spacing when disputing the 20 ft boundary.	Continuous profile of electrical resistivity along a survey line. Multiple profiles may be combined to produce a plan view map.	5 ft 20 ft
Horizontal-to-Vertical Spectral Ratio (HVSR)	A seismometer, records ambient seismic noise to estimate sediment thickness and depth to bedrock.	At a minimum, one measurement per 1 acre (200 ft spacing) when disputing the 5 ft boundary. One measurement per 10 acres (660 ft spacing) when disputing the 20 ft boundary.	Provides info about natural frequency at a point. Natural frequency can be converted to depth of sediments if the S-wave velocity is known.	5 ft 20 ft

Table 2 – Geophysical Methods

Method	Description	Protocols	Output	Allowable Boundary Depth Verification
Low Frequency Ground Penetrating Radar (GPR)	Radar waves are reflected at boundaries of geologic units.	At least one survey line (covering the length of the field) per 100 ft spacing when disputing the 2 ft and/or 3 ft boundary. At least one survey line per 200 ft spacing when disputing the 5 ft boundary. At least one survey line per 660 ft spacing when disputing the 20 ft boundary.	Continuous profiles of two-way travel times of radar waves along a survey line resulting in a cross section of the subsurface along a survey line.	2 ft 3 ft 5 ft 20 ft
Multi-channel analysis of surface waves (MASW)	Seismograph and an array of geophones to record the surface wave energy created from a source.	At least one survey line (covering the length of the field) per 200 ft spacing when disputing the 5 ft boundary. At least one survey line per 660 ft spacing when disputing the 20 ft boundary.	Cross-sections of shear wave velocity as a function of depth.	5 ft 20 ft
Resistivity Mapping with a Towed Array (e.g. OhmMapper)	Capacitance coupled discharge with a towed array in direct contact with the ground, to measure the bulk electrical properties of the subsurface.	At least one survey line (covering the length of the field) per 200 ft spacing when disputing the 5 ft boundary. At least one survey line per 660 ft spacing when disputing the 20 ft boundary.	Continuous profile of electrical resistivity along a survey line.	5 ft 20 ft
Seismic refraction	Seismograph and an array of geophones to record the seismic energy created from a source.	At least one survey line (covering the length of the field) per 200 ft spacing when disputing the 5 ft boundary. At least one survey line per 660 ft spacing when disputing the 20 ft boundary.	Layered profile of seismic velocities along survey lines.	5 ft 20 ft

DATCP 01
GEOPHYSICAL METHOD EXAMPLE



Pictures from presentation by Dave Hart (WGNHS)

DATCP 01
QUALIFICATIONS

Qualified persons are recognized as:

1. A certified professional crop consultant (CPCC)
2. A certified crop adviser (CCA) or certified professional agronomist (CPAg)
3. A Certified Professional Soil Scientist (CPSS)
4. Licensed Professional Geologist, Professional Hydrologist, Professional Soil Scientist, or Professional Engineer
5. Persons with DATCP Conservation Engineering Practitioner Certification for DATCP Technical Standard 01 – Verification of Depth to Bedrock
6. Landowners, operators or others not meeting the above criteria may complete a DATCP-approved training course appropriate for the individual verification method to become qualified if they also have related field experience and/or education. The individual must work with the qualified entity identified by DATCP to get their verification plan approved **before** starting any work and may only perform verification on their owned land.

DATCP 01

WHAT NEEDS TO BE DOCUMENTED

- Field investigation data shall be compiled, georeferenced and interpreted to create a depth to bedrock *field map*
- Verification information used to update the NRCS 590 Nutrient Management plan prior to manure application.
- Submitted to DATCP to be incorporated into SnapMaps

Attachment 3

Field Data Collection Requirements

This attachment describes information to be collected for infield depth to bedrock verification.

1. Owner/Facility Name, Address, Phone Number
2. Property Location Information
    a. County
    b. Civil Town/City/Village
    c. Parcel ID#
3. Probe/Boring/Test Pit Information
    a. Equipment operator name and agency/firm
    b. Data recorder name and agency/firm
    c. Test hole ID #
    d. Field ID
    e. Tillage Conditions
    f. Date(s) of each test hole
    g. Equipment/Method used (e.g. tile probe, hand auger, hydraulic push, excavator). Include probe/auger diameter and/or equipment make and model, as appropriate.
    h. GPS latitude/longitude location
    i. Total depth of boring/pit, measured to the nearest 1 inch
    j. Depth to bedrock, if encountered, measured to the nearest 1 inch
    k. Borehole abandonment method
    l. Notes
4. Geophysical Survey Information
    a. Equipment operator name and agency/firm
    b. Data recorder name and agency/firm
    c. Date(s) of data collection
    d. Field moisture condition (e.g., saturated, unsaturated, droughty)
    e. Equipment/method used. Include equipment manufacturer and model
    f. Data collection sample spacing
    g. GPS latitude/longitude location
    h. Anticipated total depth measured by geophysical instrument and the instrument configuration used to achieve depth
    i. Depth at which bedrock was encountered, measured from ground surface and the accuracy of depth interpretation. If bedrock was not encountered, indicate that bedrock was not encountered

EXISTING AND FUTURE DATA NEEDS AND EFFORTS

WHAT DO WE KNOW AND DON'T KNOW WE DON'T KNOW?

DATA AND MAPS

Existing

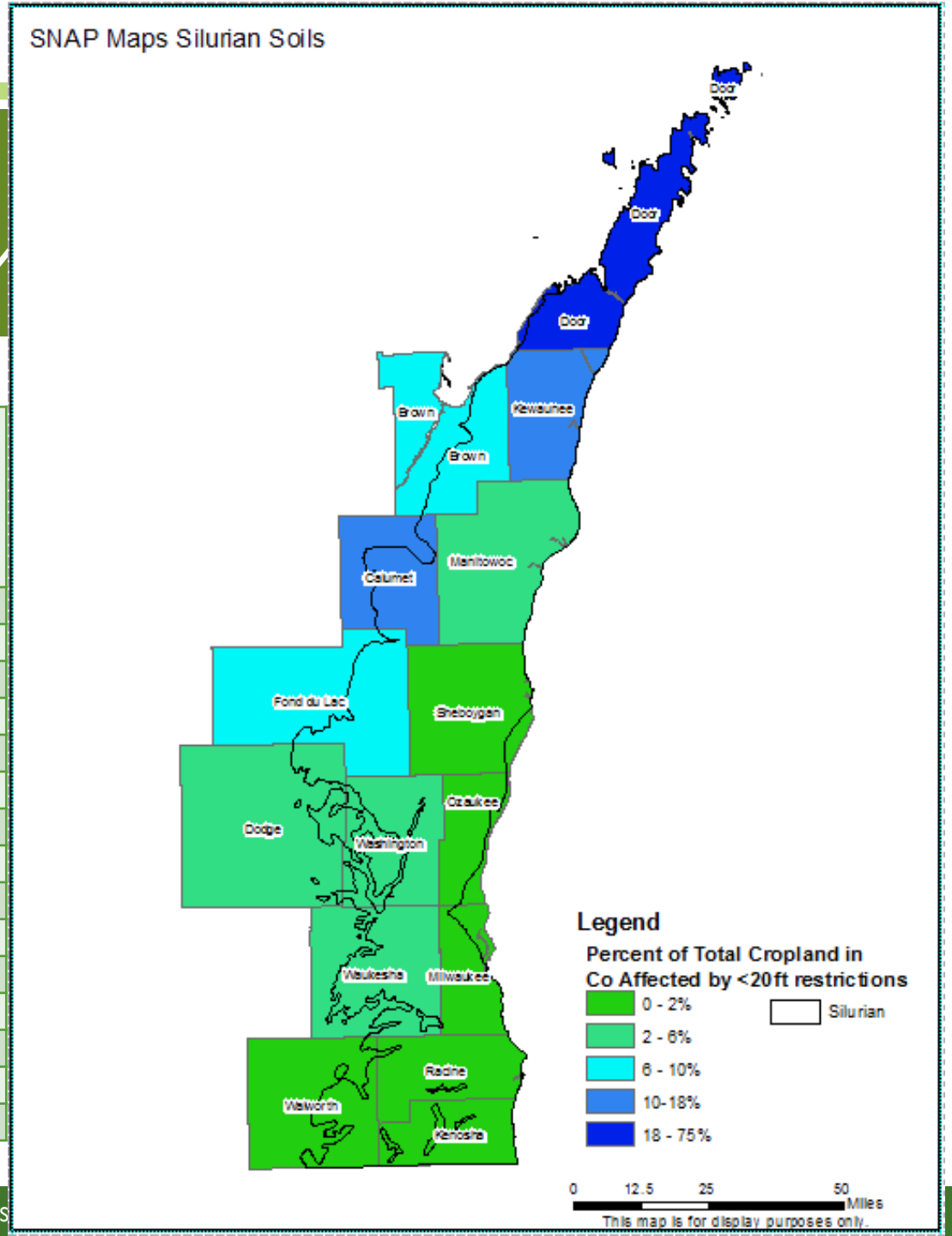
- SNAP Maps
  - Silurian 0-2, 2-5, 5-20
  - NRCS 590 Soils
    - P, R, N-Restricted, Wet, etc.
  - **NE WI Airborne Electromagnetic Survey**
  - Depth of Consolidated Materials (DNR)

Needs

- What mapping needs still exist and where?
  - **Ie. 2-3' and 3-5' do not exist currently**
- How reliable and accurate is existing data?
- What do we do with future and updated data?
- How do we handle disputes with existing maps?

EXISTING DATA COVERAGE – SNAP M

County	Total Cropland Acres (NLCD 2019 Data)	Total Silurian Cropland Acres	Percent County Cropland in Silurian	Percent of Total Cropland in Co Affected by <20ft restrictions
Brown	173856	101629	58%	8%
Calumet	135561	91158	67%	19%
Dodge	337724	49221	15%	5%
Door	92880	89628	96%	74%
Fond du Lac	273422	109087	40%	11%
Kenosha	75471	69157	92%	0%
Kewaunee	132019	131730	100%	17%
Manitowoc	206688	206622	100%	7%
Milwaukee	6943	6798	98%	0%
Ozaukee	58056	53033	91%	2%
Racine	102325	99109	97%	1%
Sheboygan	161293	154721	96%	2%
Walworth	201748	60875	30%	0%
Washington	96535	78602	81%	4%
Waukesha	62983	30742	49%	3%



AIRBORNE ELECTROMAGNETIC SURVEY – NORTHEAST WISCONSIN

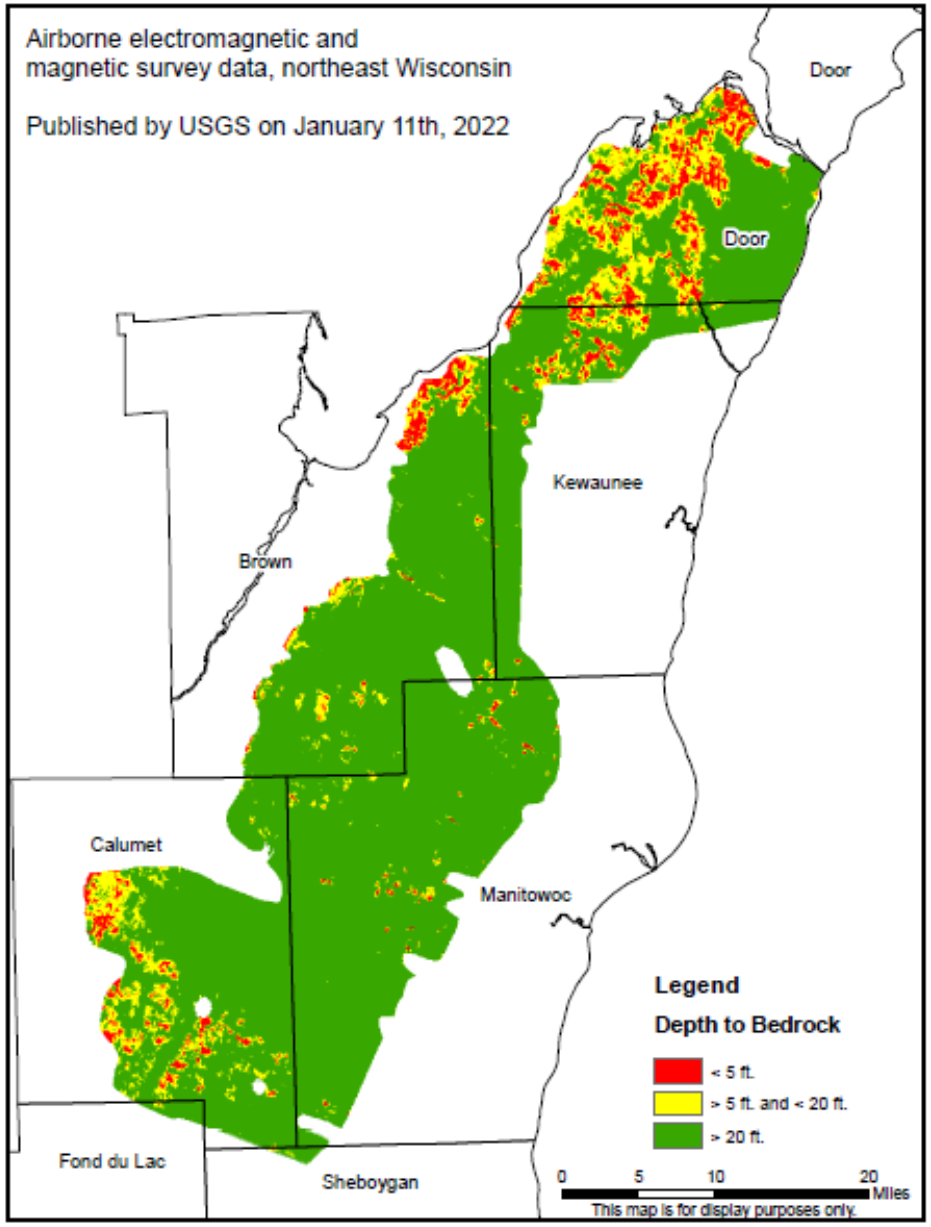
Result of the DATCP01 Technical Standard to support NR151.075 - Silurian Bedrock Performance Standard.

Flown in January 2021. Covers Brown, Caulmet, Dood, Fond du Lac, Kewaunee, Manitowoc, and Sheboygan counties.

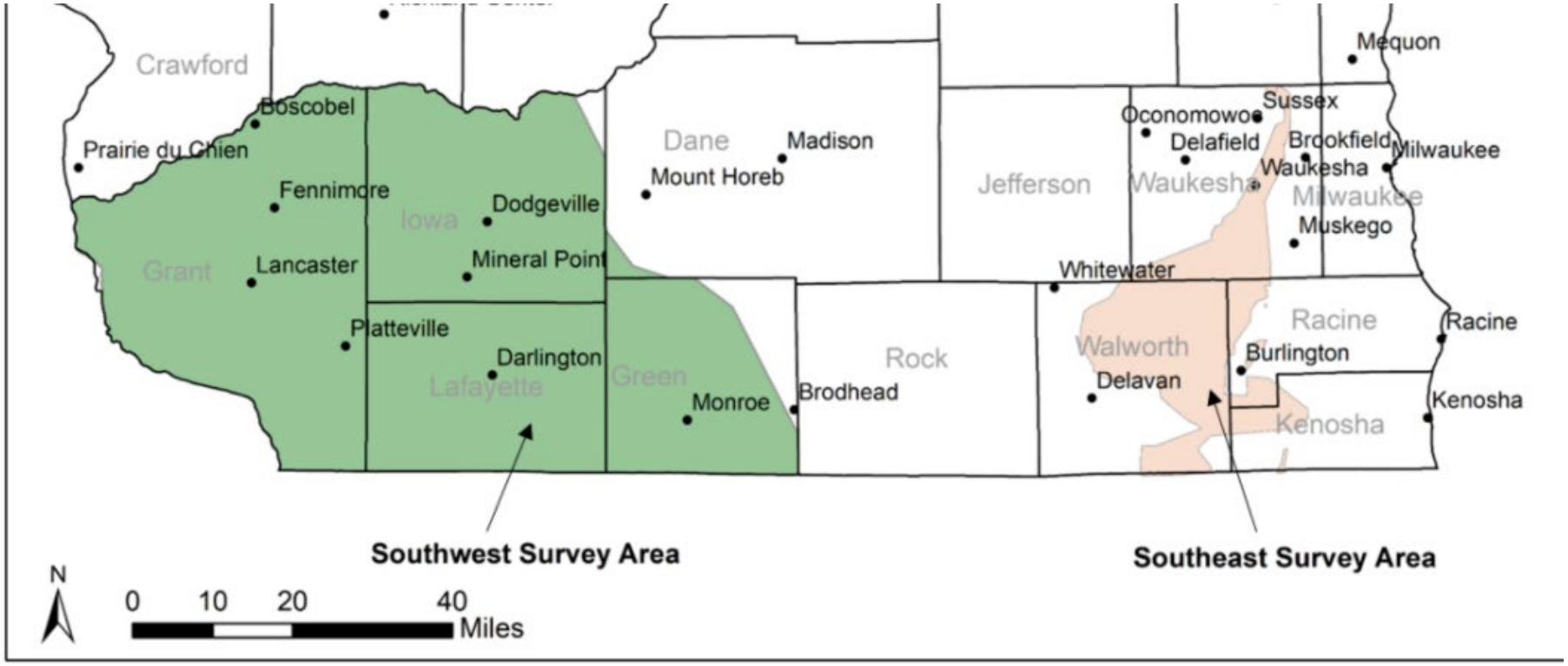
Next Steps:

Timeline

Time	Effort
Jan-Feb 2022	Assemble existing maps and AEM data into a single geographic database.
Feb-May 2022	Initial interpretation of assembled data
Feb 2022	Potential workshop date
May-July 2022	Internal reviw of assembled maps and data
Aug-Sep 2022	Revision of assembled maps and data into single map
Nov 2022	Potential workshop date
Sep-Nov 2022	External review and subsequent revision
Dec 2022	Transfer of map to DATCP



AIRBORNE ELECTROMAGNETIC SURVEY – SOUTHERN WISCONSIN



February / March 2022 flight date.

Similar process to the NE Survey.

Data collection also impacts parts of the Silurian Bedrock area.

Data will need to be evaluated and interpreted.

FUTURE DATA NEEDS

- Depth of Bedrock Measured to:
  - 2 – 3 feet
  - 3 – 5 feet

- Pathogen delivery to groundwater ranking

- Updates to existing buffer areas
- Buffers around concentrated flow areas

Questions?

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Bureau of Land & Water Resources – Division of Agricultural Resource Management

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