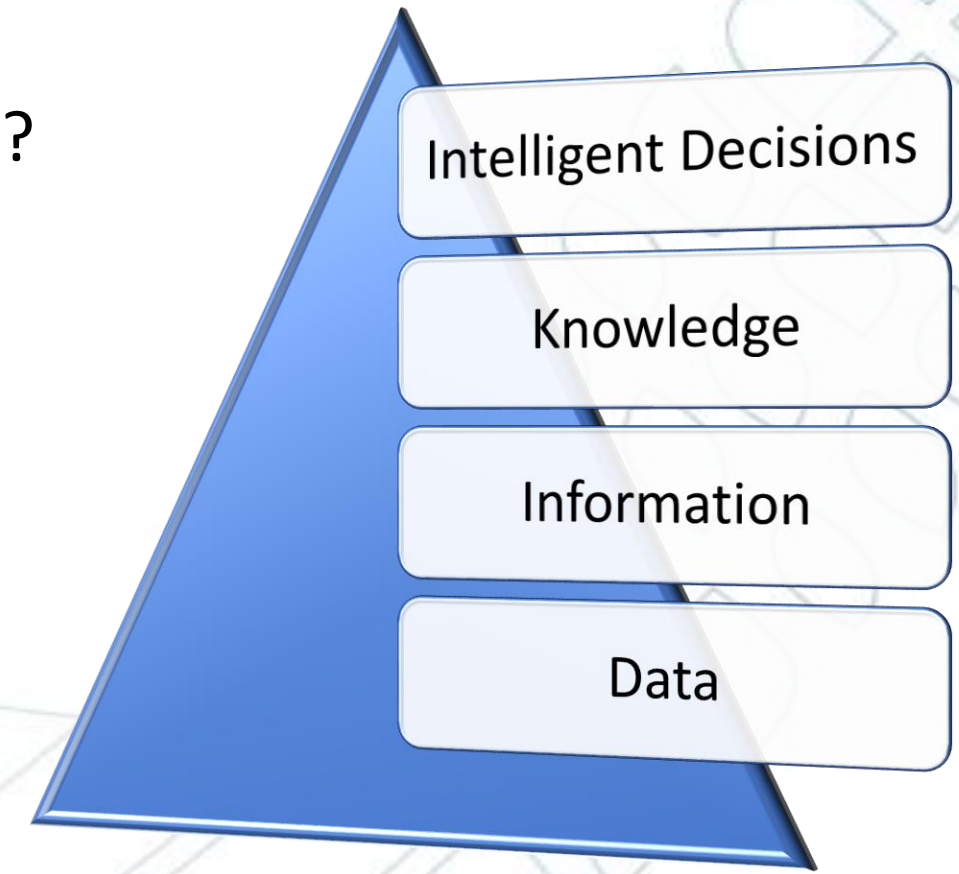
Implementing/Automating the U.S. Army Corp of Engineers Wetland Determination Form: Survey123, WAB, and Geocortex

NYGeoCon 2017

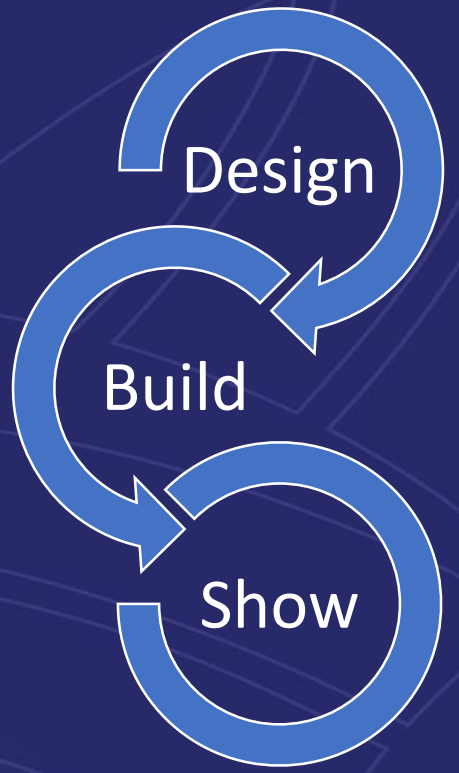
Agenda

- Why build apps to fill in a paper form?
- What apps we built

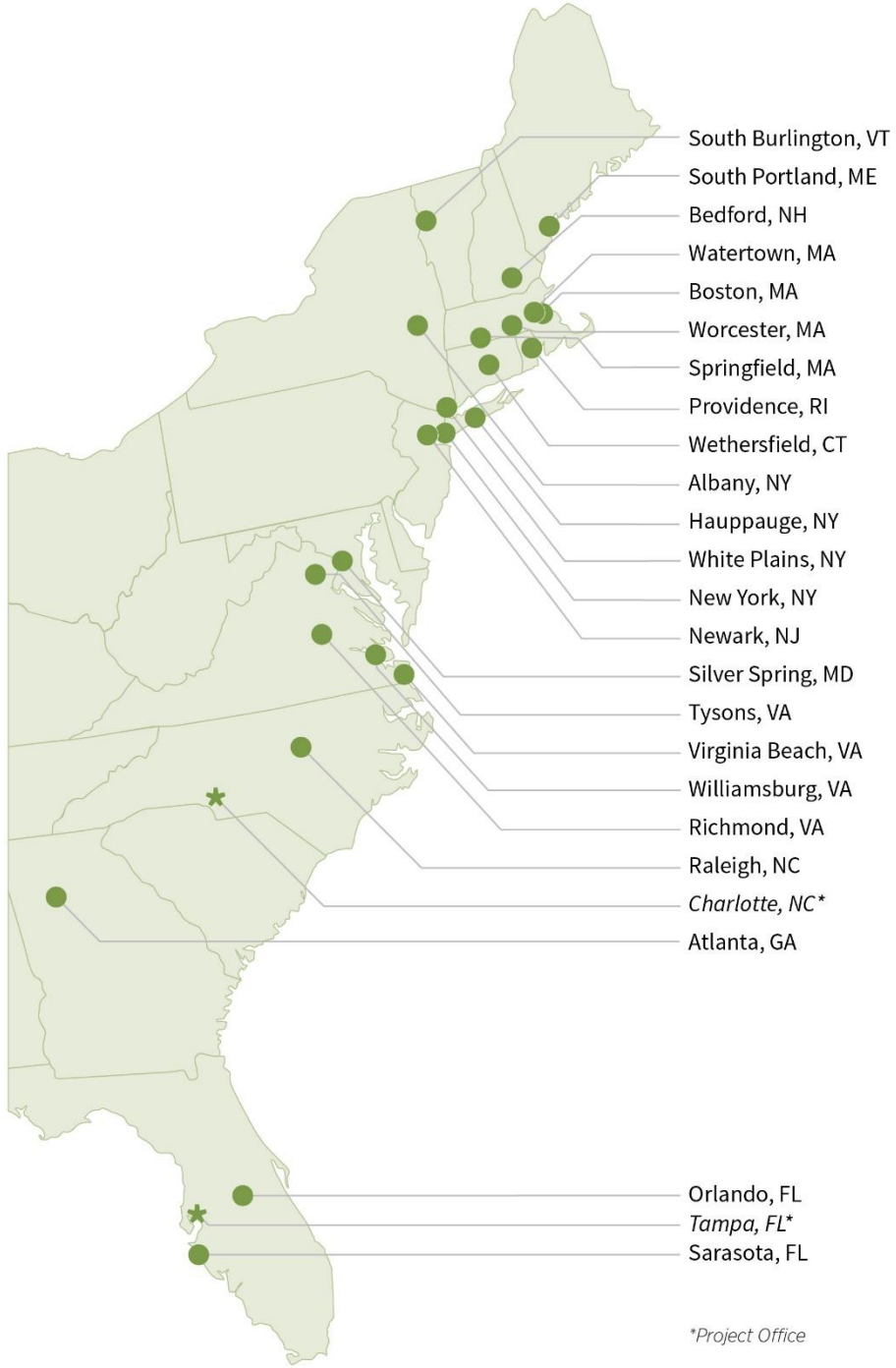
- Pro's/Con's
- Lessons learned
- How we feel about it



Why?



Meet VHB



1,350 passionate professionals
including engineers, scientists, planners, designers, GIS professionals, developers

25 offices along the East Coast

Founded in **1979**

** Acquired Fountains Spatial in 2016*

Core services

Transportation Planning & Engineering

Civil Engineering

Planning & Design

Environmental

Markets

Transportation agencies

Institutions

Real estate

Federal government

Energy

VHB's Applied Technology Group

- 50 staff focused on external technology services
  - Over 20 application/database developers
  - Over 30 GIS Analysts/CAD Technicians
- Esri Experience
  - Business Partner for over 16 years
  - Enterprise License Agreement
  - Business Partner Advantage Program (BPAP)
  - ArcGIS Online Specialty Campaign Certification
- Microsoft Experience
  - Enterprise License Agreement
  - Azure Cloud Solution Partner
  - SQL Server – on-premise & cloud
  - Power BI – business analytics

Wetland Determination Form (WDF)

The project was a result of internal initiatives:

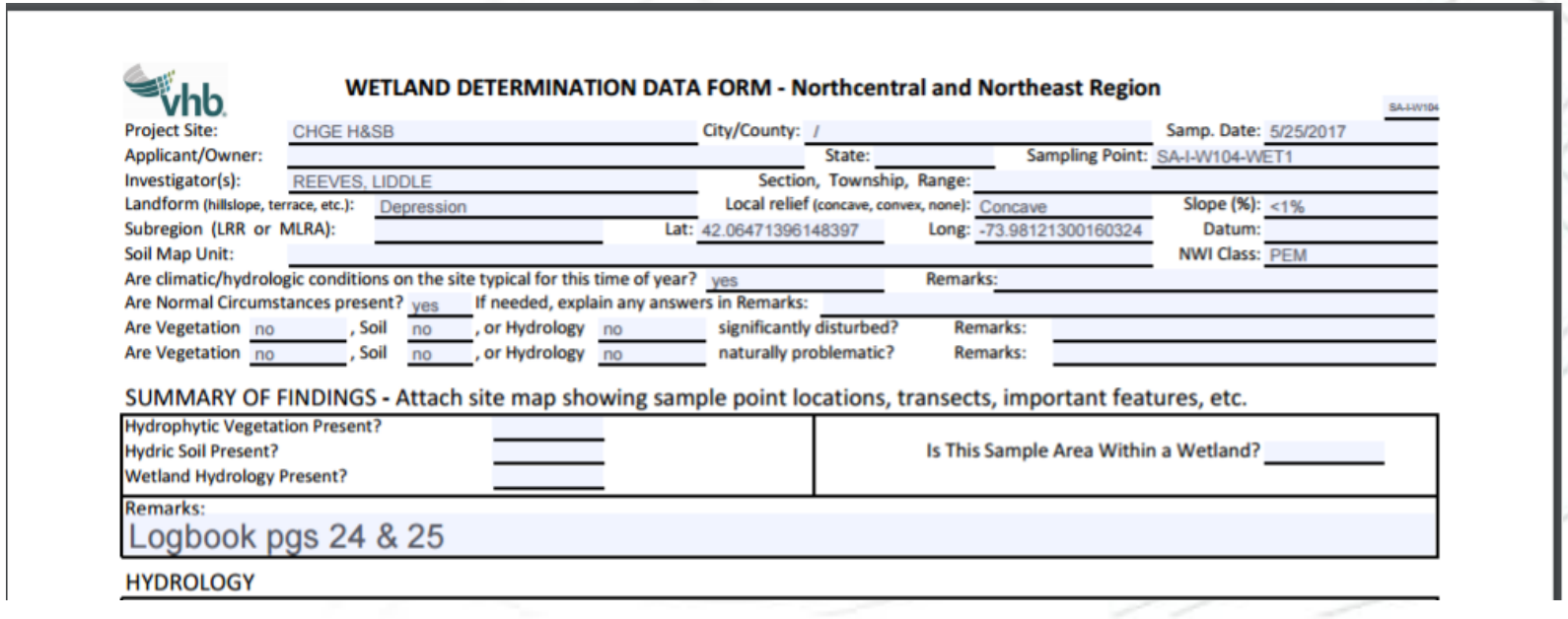
- to improve field survey and data reporting efficiency via mobile applications,
- to promote data collection consistency across offices and regions,
- and to develop a database of field information;

Purpose: To automate, as much as possible, the data collection and creation of the U.S. Army Corp of Engineers Wetland Determination Data Form

USACE WDF Project

Consists of a 2 applications:

- Mobile application - enter information in the field regarding potential wetlands
- Web application - view, QA/QC, edit, post process and create reports.



WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SA-I-W104

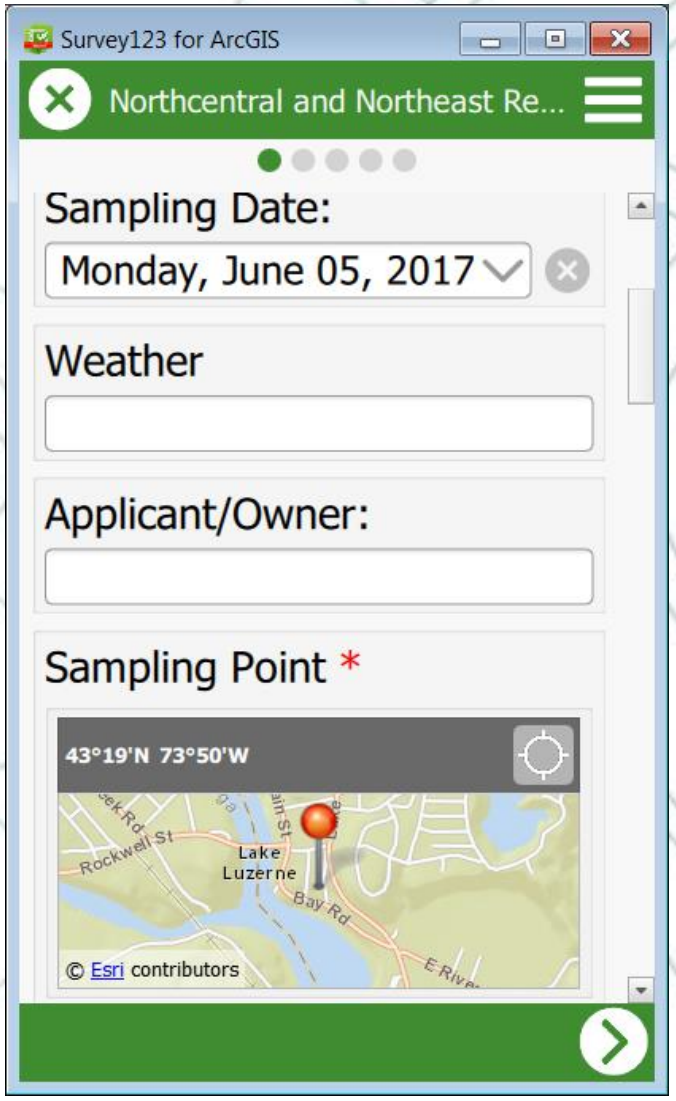
Project Site: CHGE H&SB | City/County: / | Samp. Date: 5/25/2017
Applicant/Owner: | State: | Sampling Point: SA-I-W104-WET1
Investigator(s): REEVES, LIDDLE | Section, Township, Range:
Landform (hillslope, terrace, etc.): Depression | Local relief (concave, convex, none): Concave | Slope (%): <1%
Subregion (LRR or MLRA): | Lat: 42.06471396148397 | Long: -73.98121300160324 | Datum:
Soil Map Unit: | NWI Classification: PEM
Are climatic/hydrologic conditions on the site typical for this time of year? yes | Remarks:
Are Normal Circumstances present? yes | If needed, explain any answers in Remarks:
Are Vegetation no, Soil no, or Hydrology no significantly disturbed? | Remarks:
Are Vegetation no, Soil no, or Hydrology no naturally problematic? | Remarks:

SUMMARY OF FINDINGS - Attach site map showing sample point locations, transects, important features, etc.

Hydrophytic Vegetation Present?
Hydric Soil Present?
Wetland Hydrology Present?
Is This Sample Area Within a Wetland?

Remarks:
Logbook pgs 24 & 25

HYDROLOGY



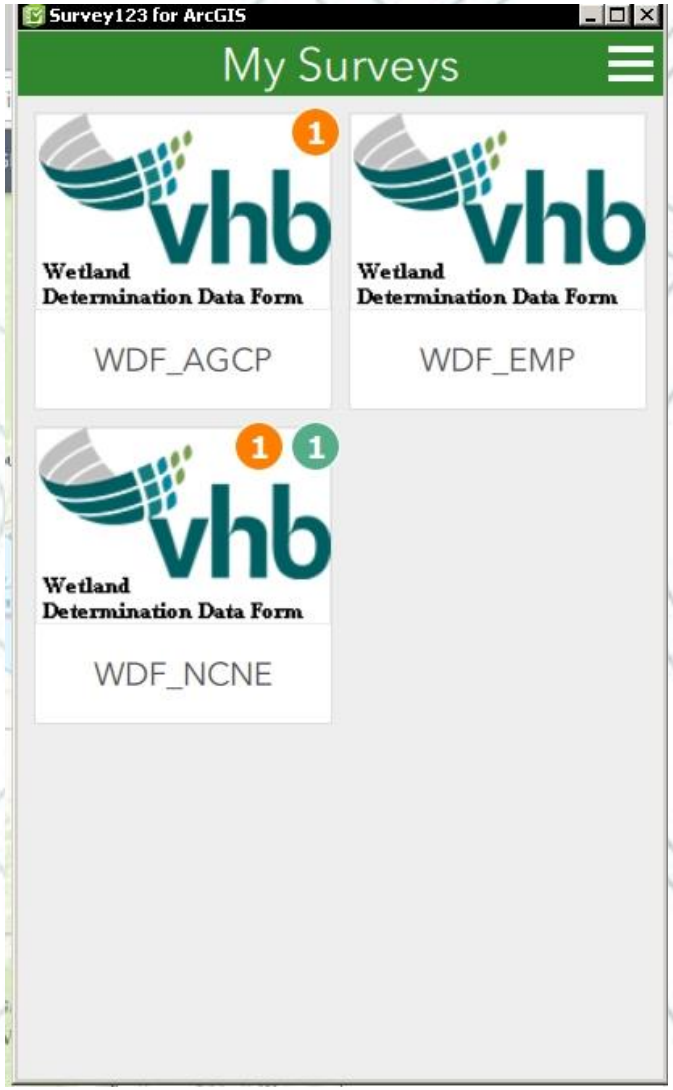
Region differences

Three versions of the WDF form for the field app, one for each region:

- NCNE - Northcentral Northeast
- EMP - Eastern Mountains and Piedmont
- AGCP - Atlantic and Golf Coast

Key Differences:

- Wetland Hydrology indicators (Primary and Secondary)
- Hydric Soil Indicators and Indicators for Problematic Hydric Soils
- Species (Tree, Sapling, Shrub, Herb, Vine) and regional Indicators



Field app

vhb

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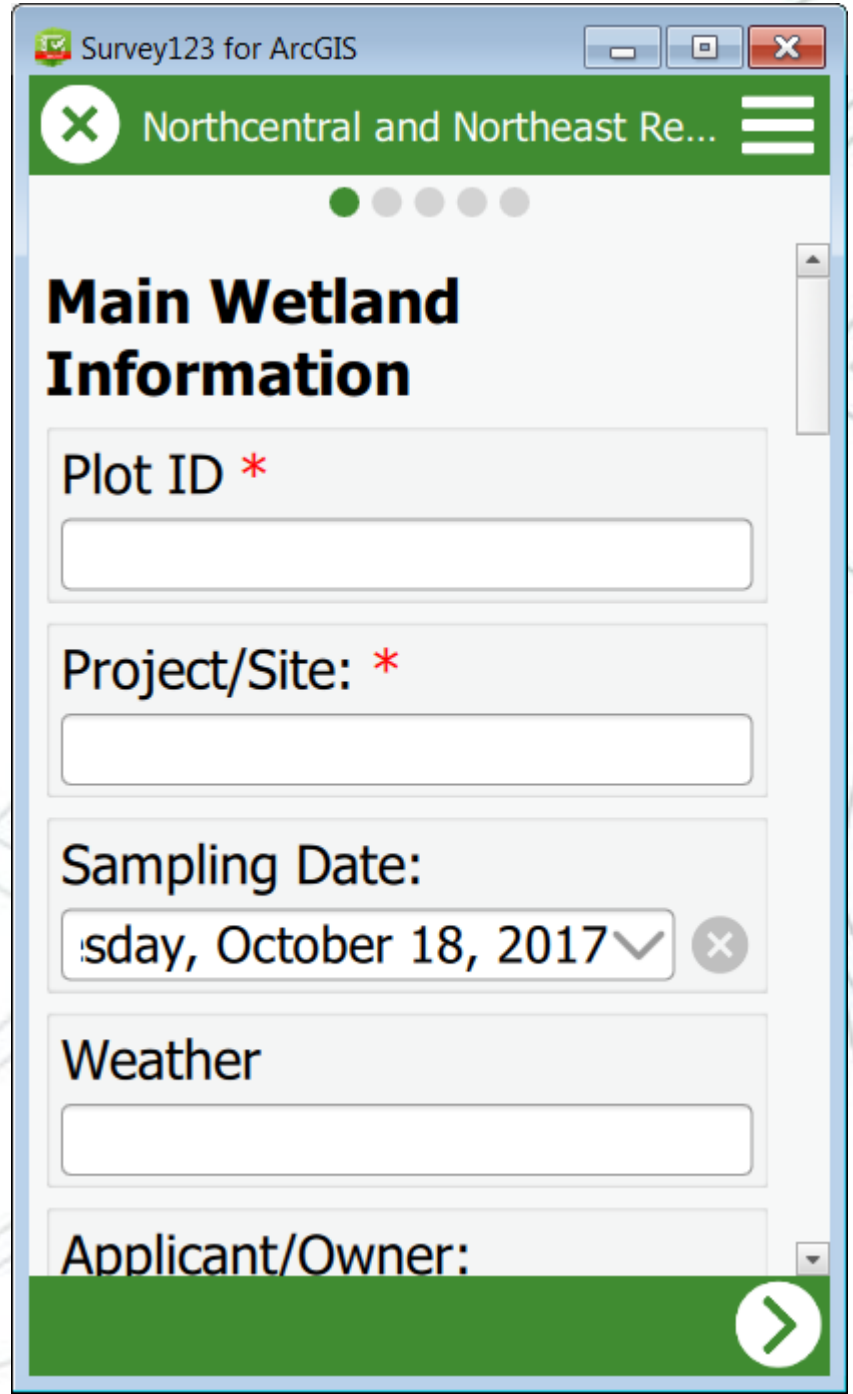
Technology Used

- Survey123 for ArcGIS
- AGOL hosted feature service

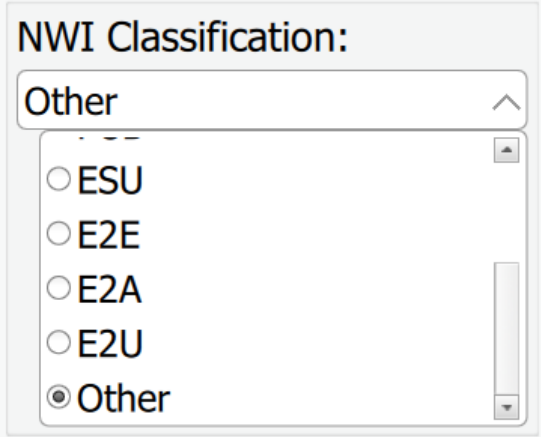


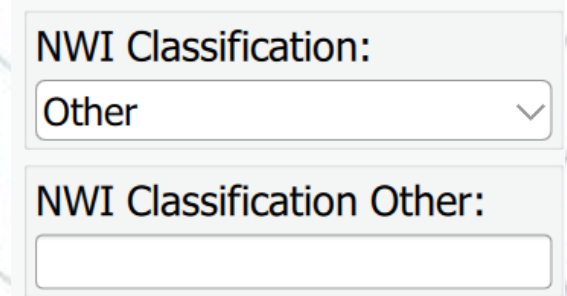
esri Partner Network Silver

ArcGIS Online Specialty

Five pages

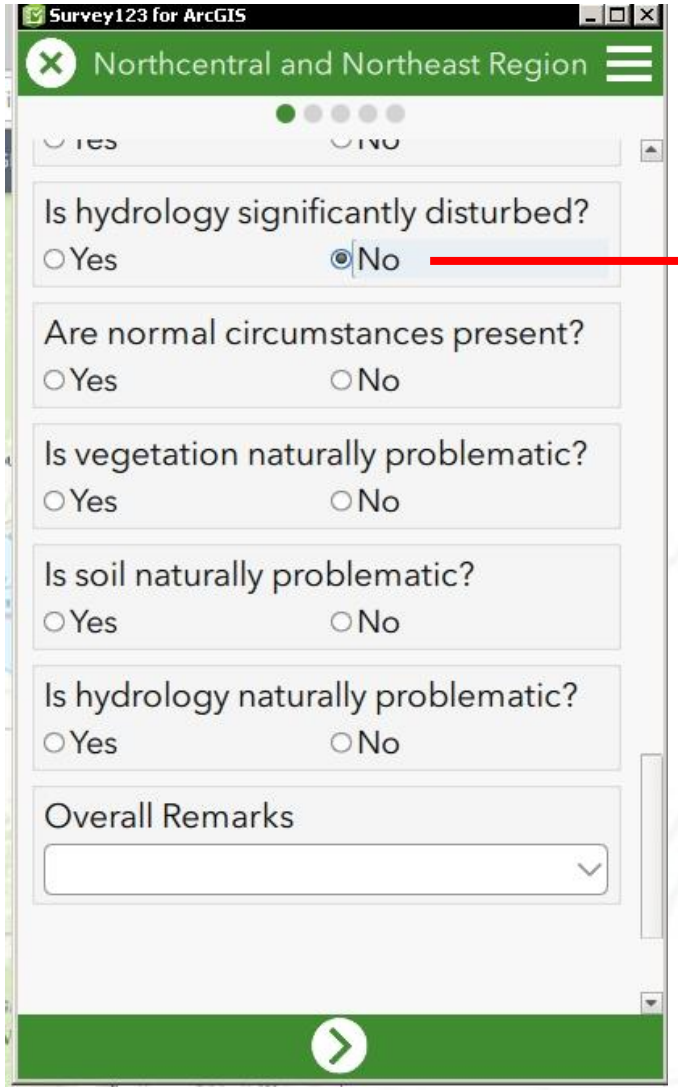
- Main Data page – 25 primary questions plus 7 additional
- Hydrology – 8 primary questions plus 4 additional
- Vegetation – Tree/Sapling/Shrub/Herb/Woody Vine – each with plot size and type and multiple species along with % cover
- Soils – multiple soils with depth, matrix color and %, texture; each with multiple Redox values; plus 6 primary questions and 1 additional
- Summary – multiple photos including directions and comments



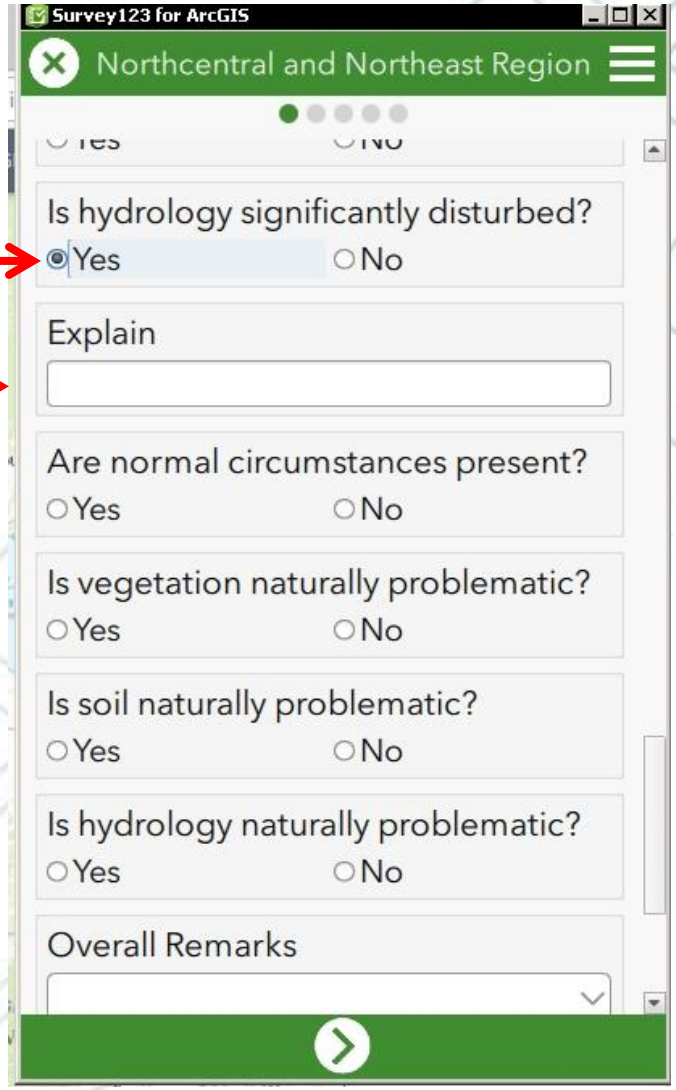


One of each type, with no additional, yields 35 questions

Additional Questions

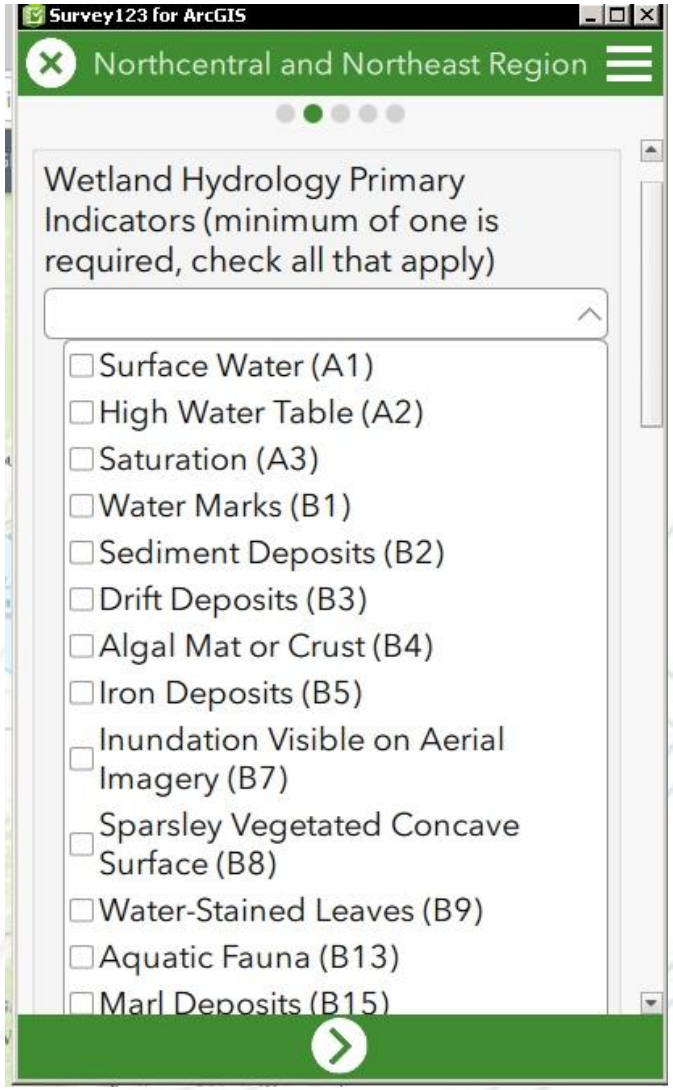


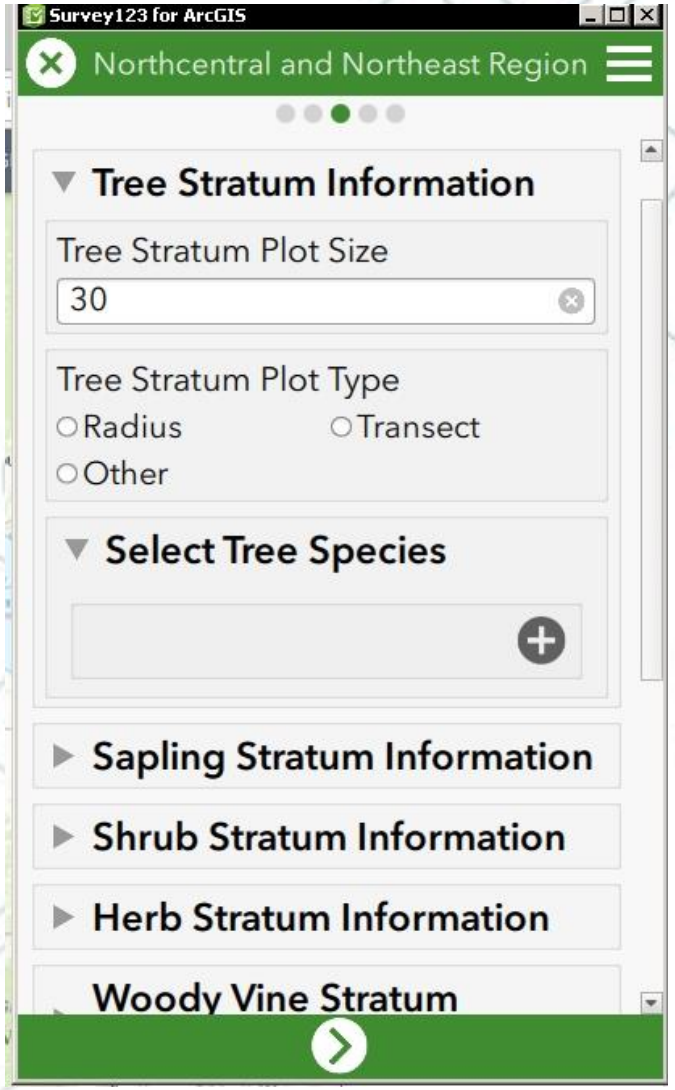
Some answers prompt additional questions



Check boxes vs radio buttons

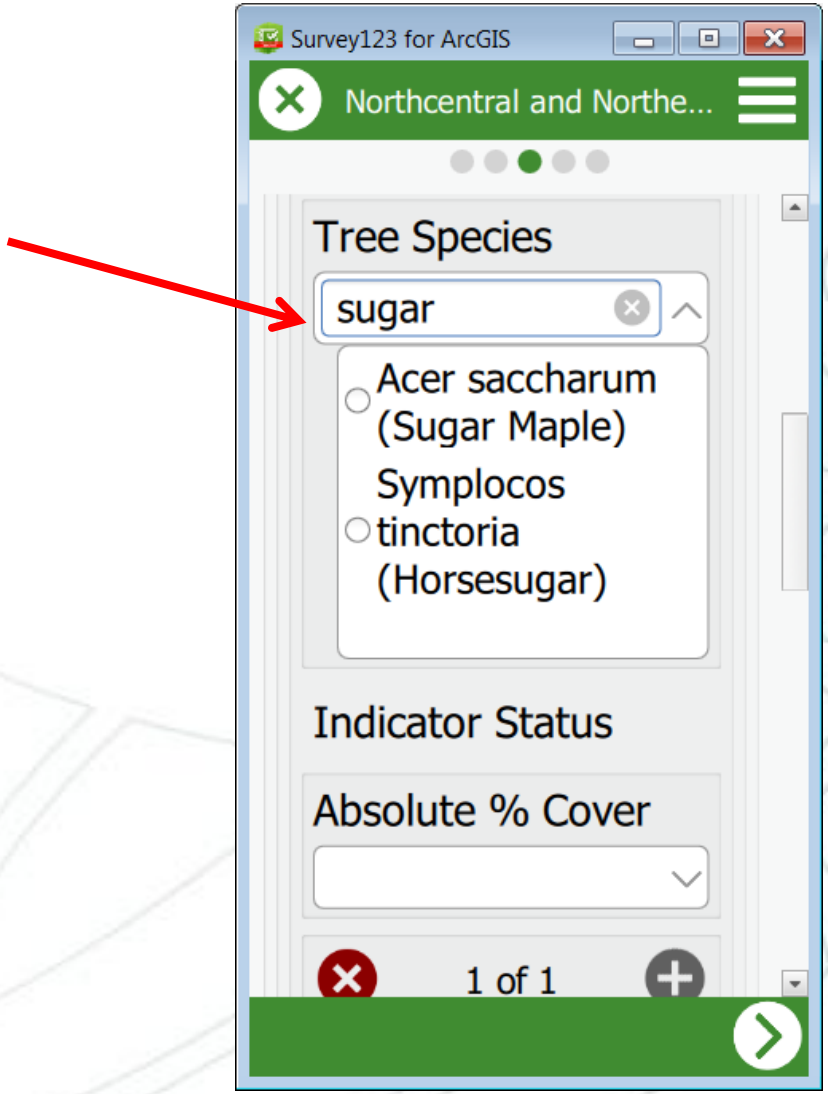
- Check boxes – used for Multiple Select answers
- Radio button (aka dot items) – Single Select answers



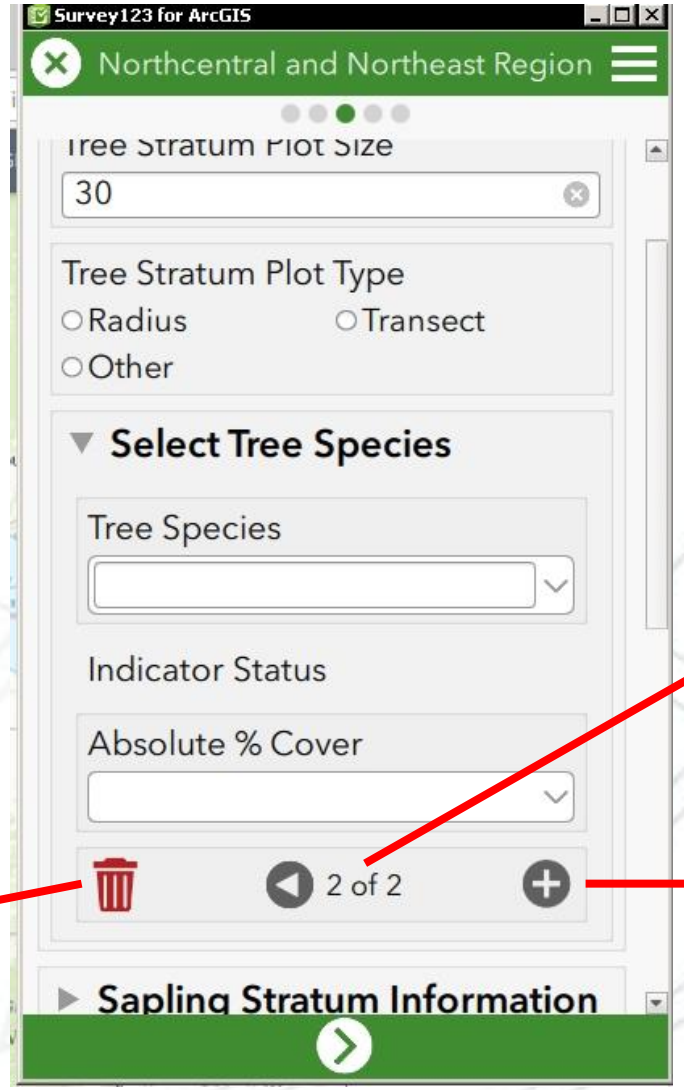


Autocomplete

Single Select with autocomplete search



Related Records



Related records

Delete

Add related record

Thoughts from the Developer

Pros:

- Survey123 form created within excel file
- AGOL Groups and feature services are easy to access and create
- Able to load on all iOS or Android devices

Cons:

- Development cycle of S123 didn’t allow certain needed features
- Need sub meter location detection

Web Apps

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Two back office Web maps/apps

1. WAB Web App
2. Geocortex Web App

Functions:

- Webmap for QA/QC
- Worksheet calculations
  - Dominance Test
  - Prevalence Index
  - Stratum Indicator Status
  - Stratum Dominance Species Test
- PDF output

1. WAB Web App

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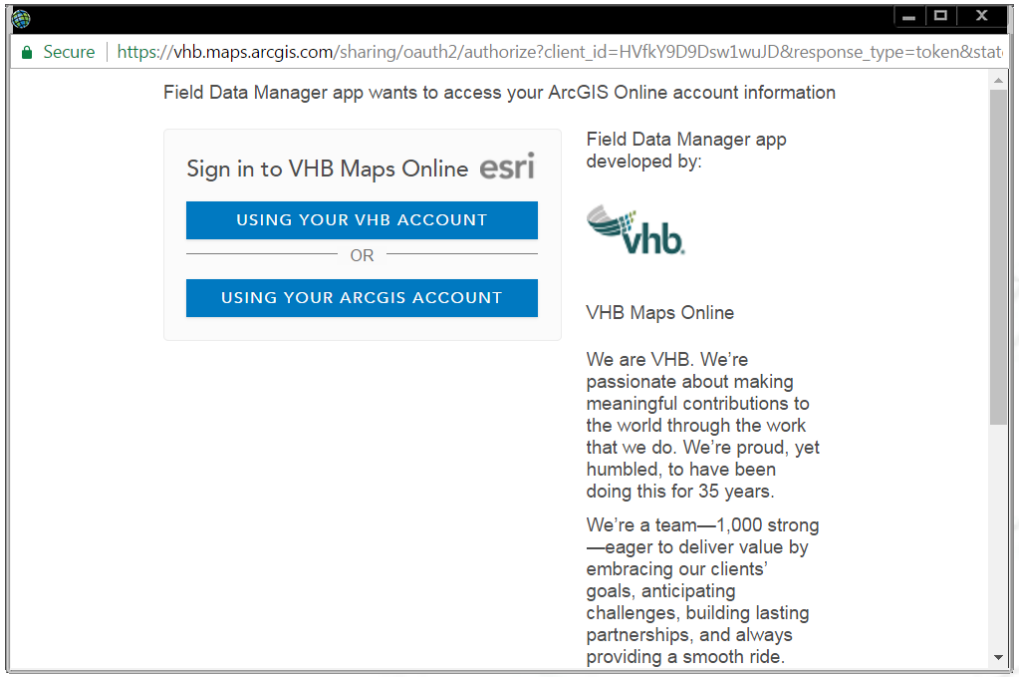
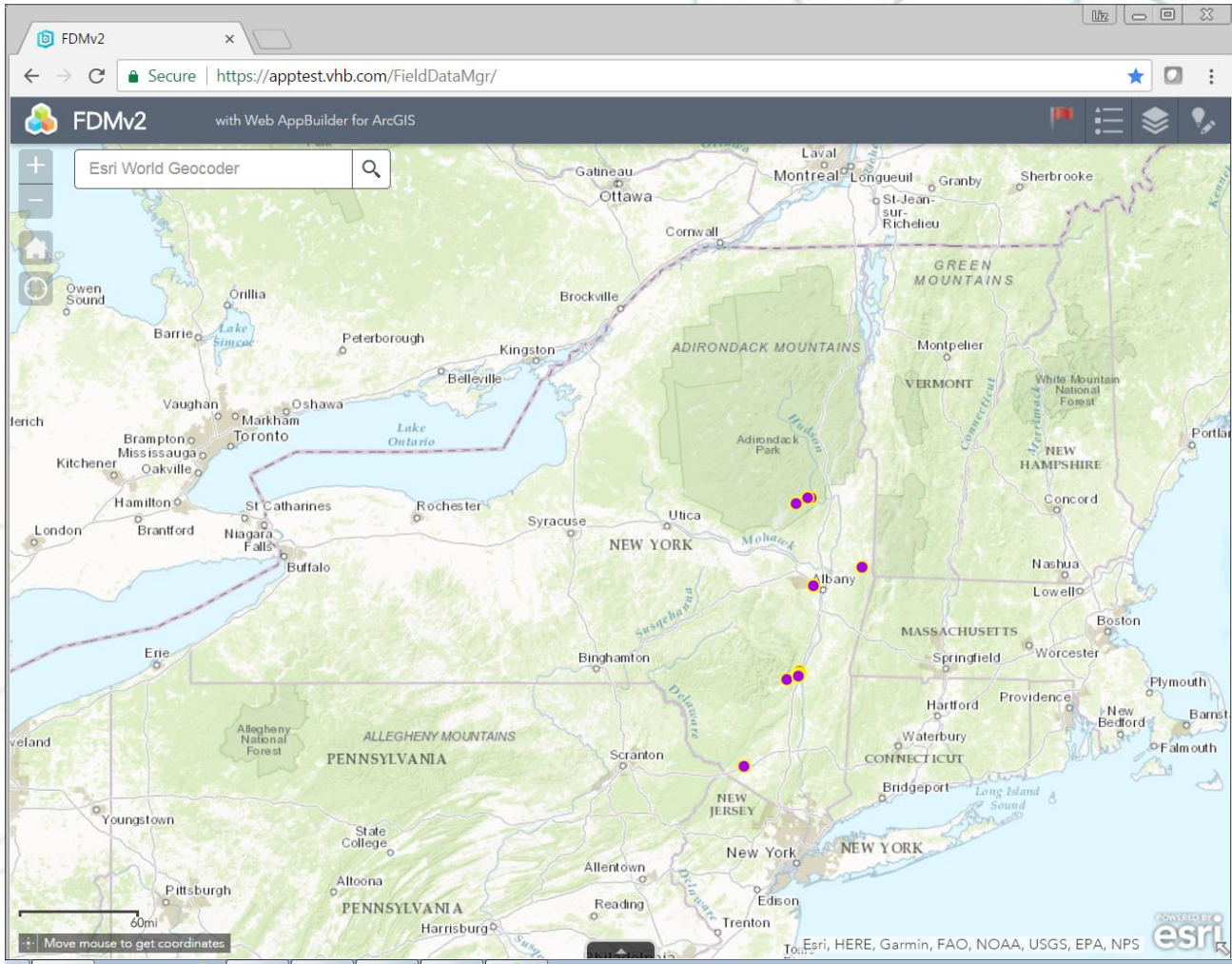
Technology Used

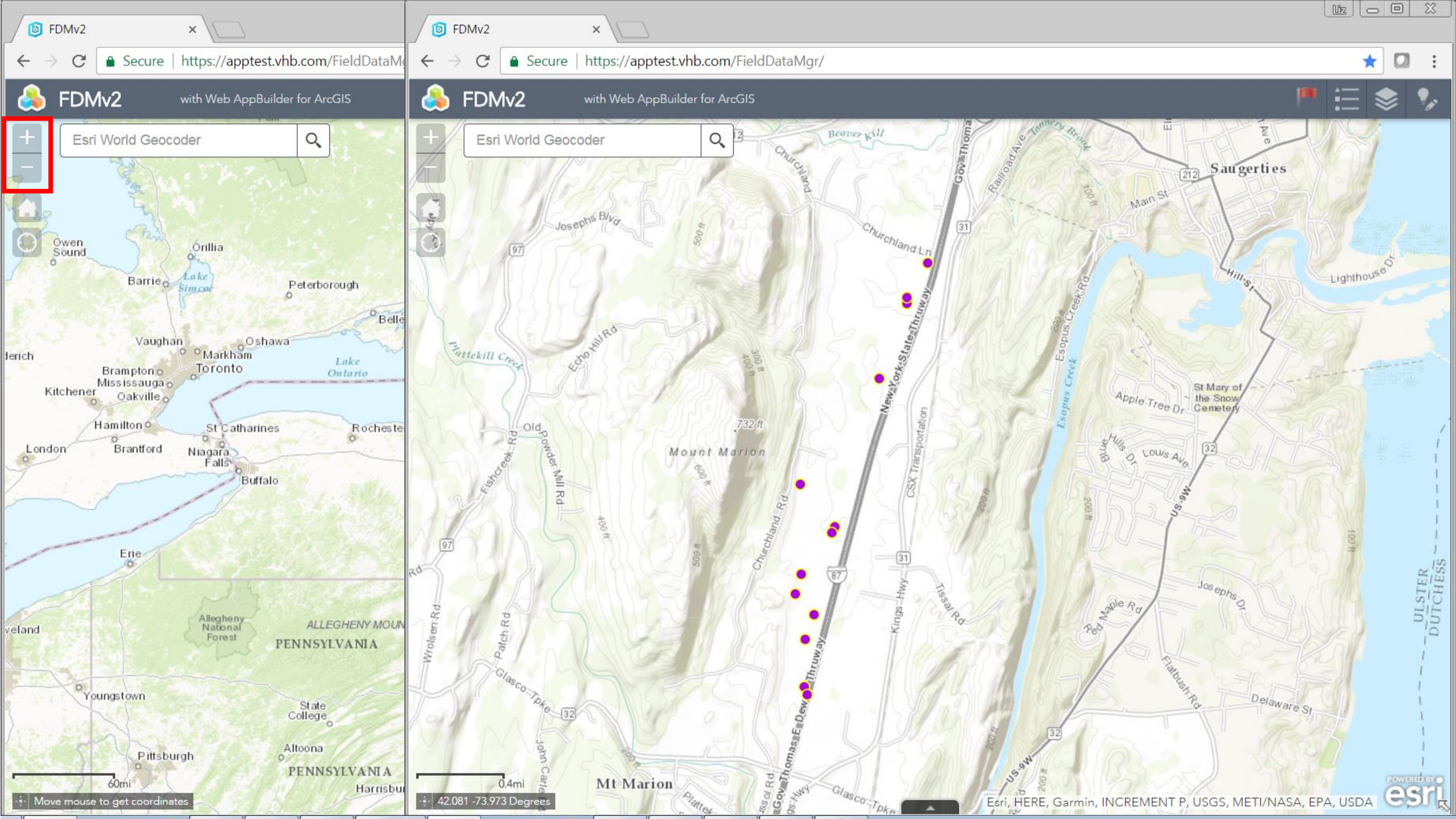
- AGOL
- Web AppBuilder
- Javascript
- C# for pdf generation

Field Data Manager Web Application

- Need to be connected to VHB network or VPN
- Need an AGOL account



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Esri World Geocoder
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Lake Simcoe
Peterborough
Vaughan
Oshawa
Markham
Toronto
Brampton
Mississauga
Kitchener
Oakville
Lake Ontario
Hamilton
St Catharines
London
Brantford
Niagara Falls
Buffalo
Erie
Allegheny National Forest
PENNSYLVANIA
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Churchland
Josephs Blvd
Churchland Ln
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Tannery Brook
Saugerties
Main St
Hill St
Lighthouse Dr
Esopus Creek Rd
Plattekill Creek
Echo Hill Rd
Mount Marion
732 ft
New York State Thruway
CSX Transportation
Apple Tree Dr
St Mary of the Snow Cemetery
Blue Hills Dr
Lous Ave
US-9W
Fishcreek Rd
Old Powder Mill Rd
Churchland Rd
Kings Hwy
Tissal Rd
Red Maple Rd
Josephs Dr
Flatbush Rd
Delaware St
Wrolsen Rd
Patch Rd
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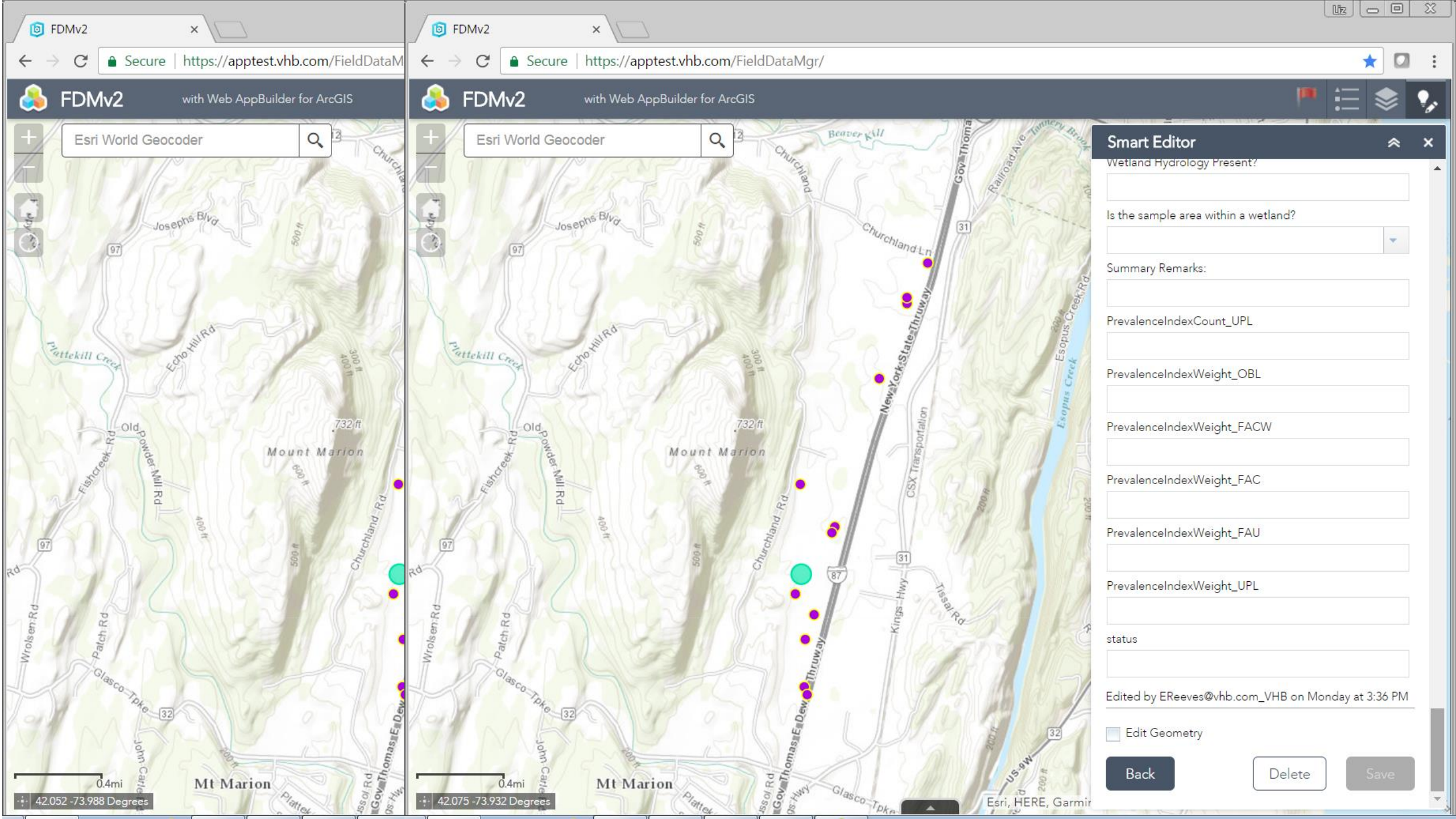
Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA
POWERED BY esri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CSX Transportation
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Esri, HERE, Garmin
Smart Editor
Wetland Hydrology Present?
Is the sample area within a wetland?
Summary Remarks:
PrevalenceIndexCount_UPL
PrevalenceIndexWeight_OBL
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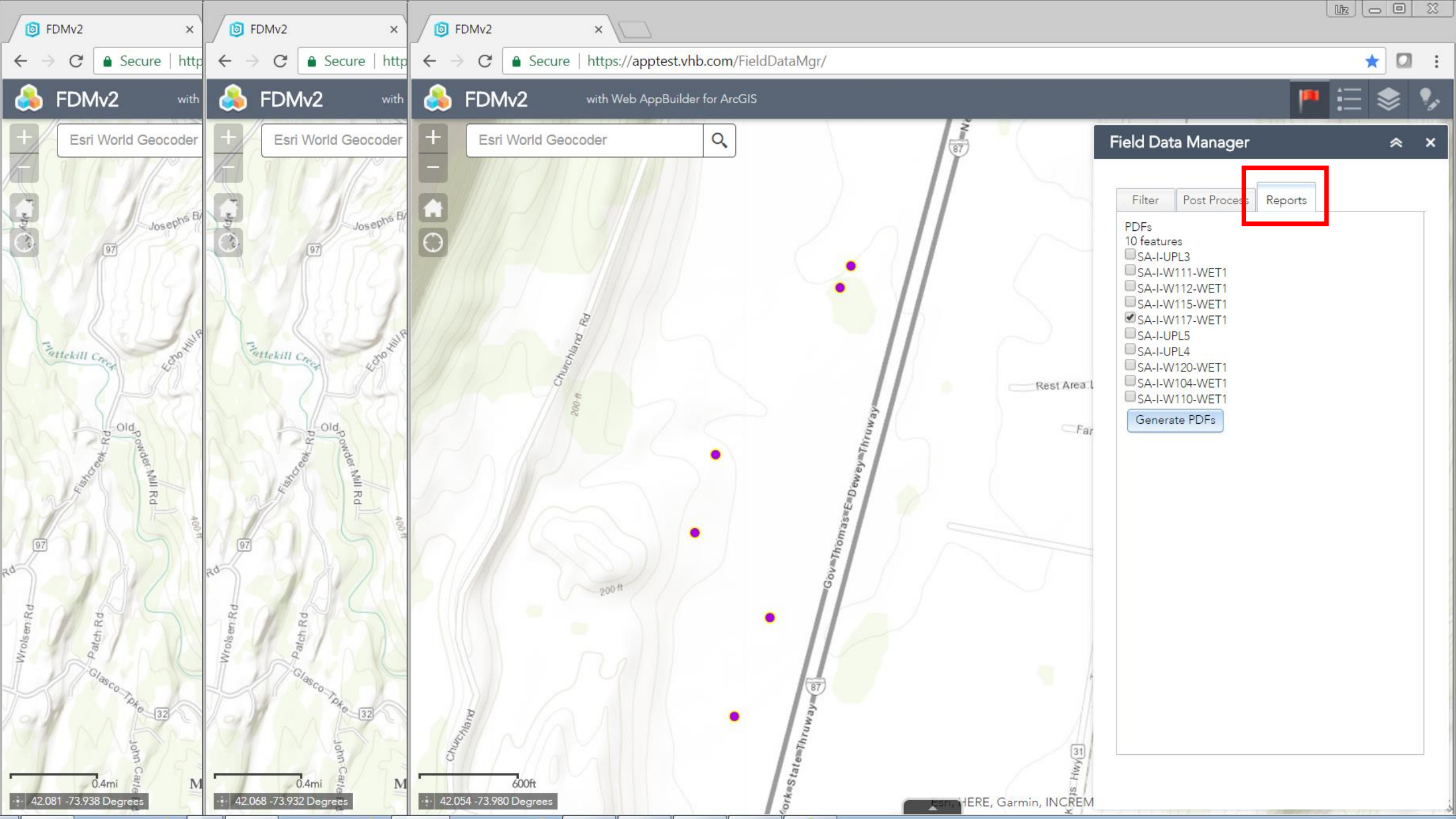
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SA-I-W112-WET1
SA-I-W115-WET1
SA-I-W117-WET1
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SA-I-UPL4
SA-I-W120-WET1
SA-I-W104-WET1
SA-I-W110-WET1
Generate PDFs
Churchland Rd
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Old Powder Mill Rd
Fishcreek Rd
Wrolsen Rd
Patch Rd
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John Carle
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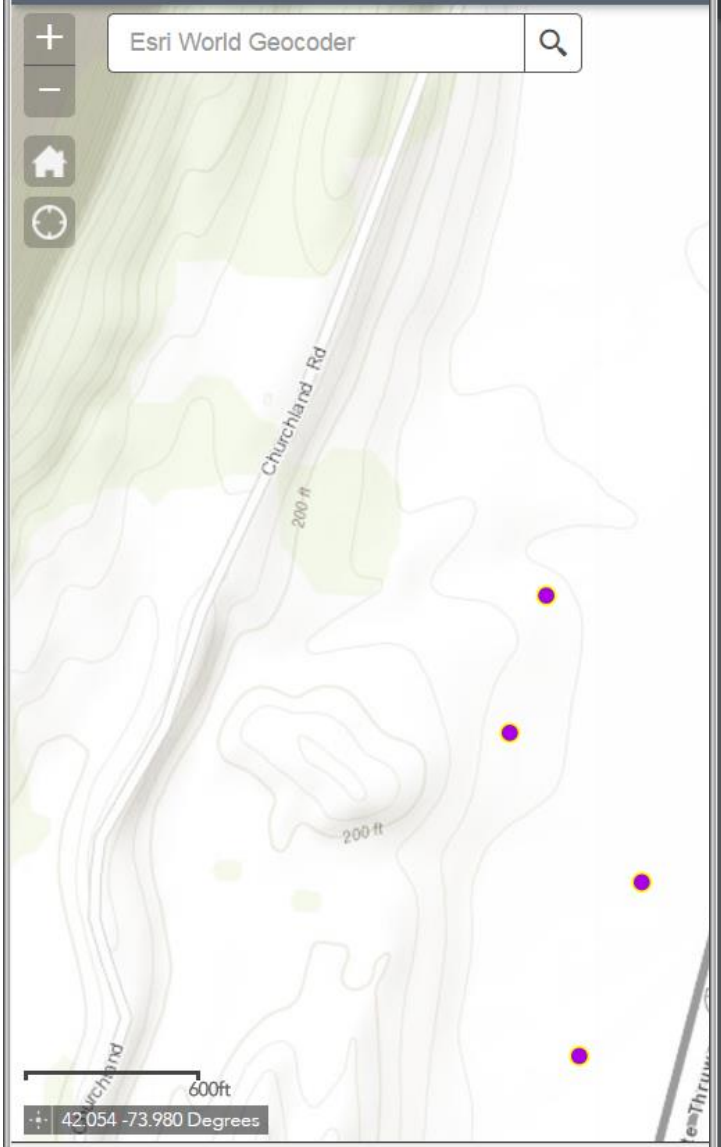
42.054 -73.980 Degrees
HERE, Garmin, INCREM

FDMv2

Secure | https://apptest.vhb.com/FieldDataM

FDMv2 with Web AppBuilder for ArcGIS

Esri World Geocoder



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WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

SA-I-W117

Project Site: CHGE HSB City/County: / Samp. Date: 6/1/2017
Applicant/Owner: State: Sampling Point: SA-I-W117-WET1
Investigator(s): CL ND Section, Township, Range:
Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 1-2%
Subregion (LRR or MLRA): LRR Lat: 42.04945728961623 Long: -73.98685344317462 Datum:
Soil Map Unit: NWI Class: PEM
Are climatic/hydrologic conditions on the site typical for this time of year? no Remarks:
Are Normal Circumstances present? yes If needed, explain any answers in Remarks:
Are Vegetation no, Soil no, or Hydrology no significantly disturbed? Remarks:
Are Vegetation no, Soil no, or Hydrology no naturally problematic? Remarks:

SUMMARY OF FINDINGS - Attach site map showing sample point locations, transects, important features, etc.

Hydrophytic Vegetation Present?
Hydric Soil Present?
Wetland Hydrology Present?
Is This Sample Area Within a Wetland?
Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

x	Surface Water (A1)		Water-Stained Leaves (B9)
x	High Water Table (A2)		Aquatic Fauna (B13)
x	Saturation (A3)		Marl Deposits (B15)
	Water Marks (B1)		Hydrogen Sulfide Odor (C1)
	Sediment Deposits (B2)		Oxidized Rhizospheres on Living Roots (C3)
	Drift Deposits (B3)		Presence of Reduced Iron (C4)
	Algal Mat or Crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron Deposits (B5)		Thin Muck Surface (C7)
x	Inundation Visible on Aerial (B7)		Other (Explain in Remarks)
	Sparsely Vegetated Concave Surface (B8)		

Secondary Indicators (minimum of two required)

	Surface Soil Cracks (B6)
x	Drainage Patterns (B10)
	Moss Trim Lines (B16)
	Dry-Season Water Table (C2)
	Crayfish Burrows (C8)
	Saturation Visible on Aerial (C9)
	Stunted or Stressed Plants (D1)
	Geomorphic Position (D2)
	Shallow Aquitard (D3)
x	Microtopographic Relief (D4)
	FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	yes	Depth (inches):	1
Water Table Present?	yes	Depth (inches):	4
Saturation Present?	yes	Depth (inches):	0

Wetland Hydrology Present? yes

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(in)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

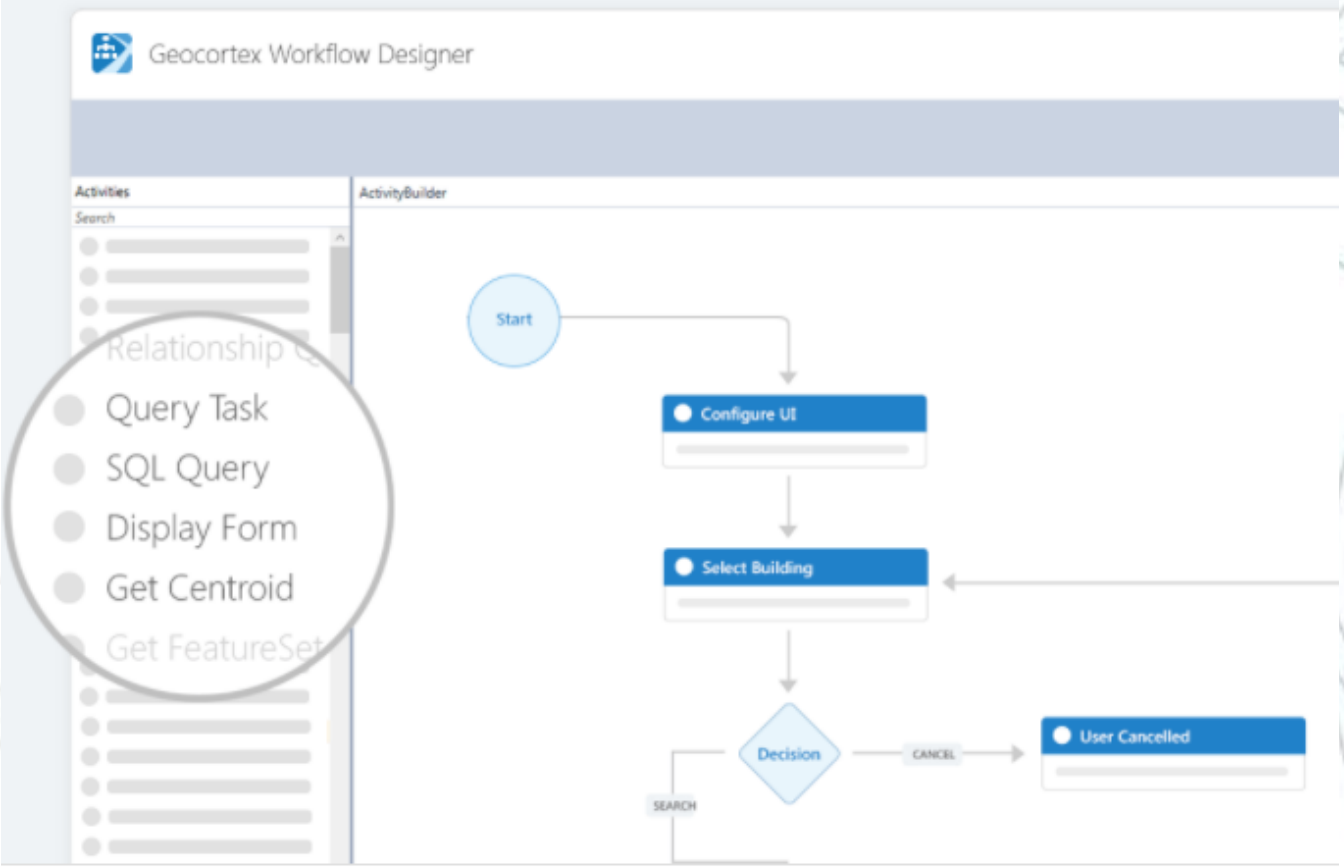
Thoughts from the Developer

- Pro: WAB provides an interface in which custom widgets fit seamlessly
- Con: Changes to AGOL layers sometimes requires multiple steps to republish
- Lesson Learned: Applying edits to AGOL can sometimes be slow. To prevent timeouts, use a save queue and send the edits one at a time.

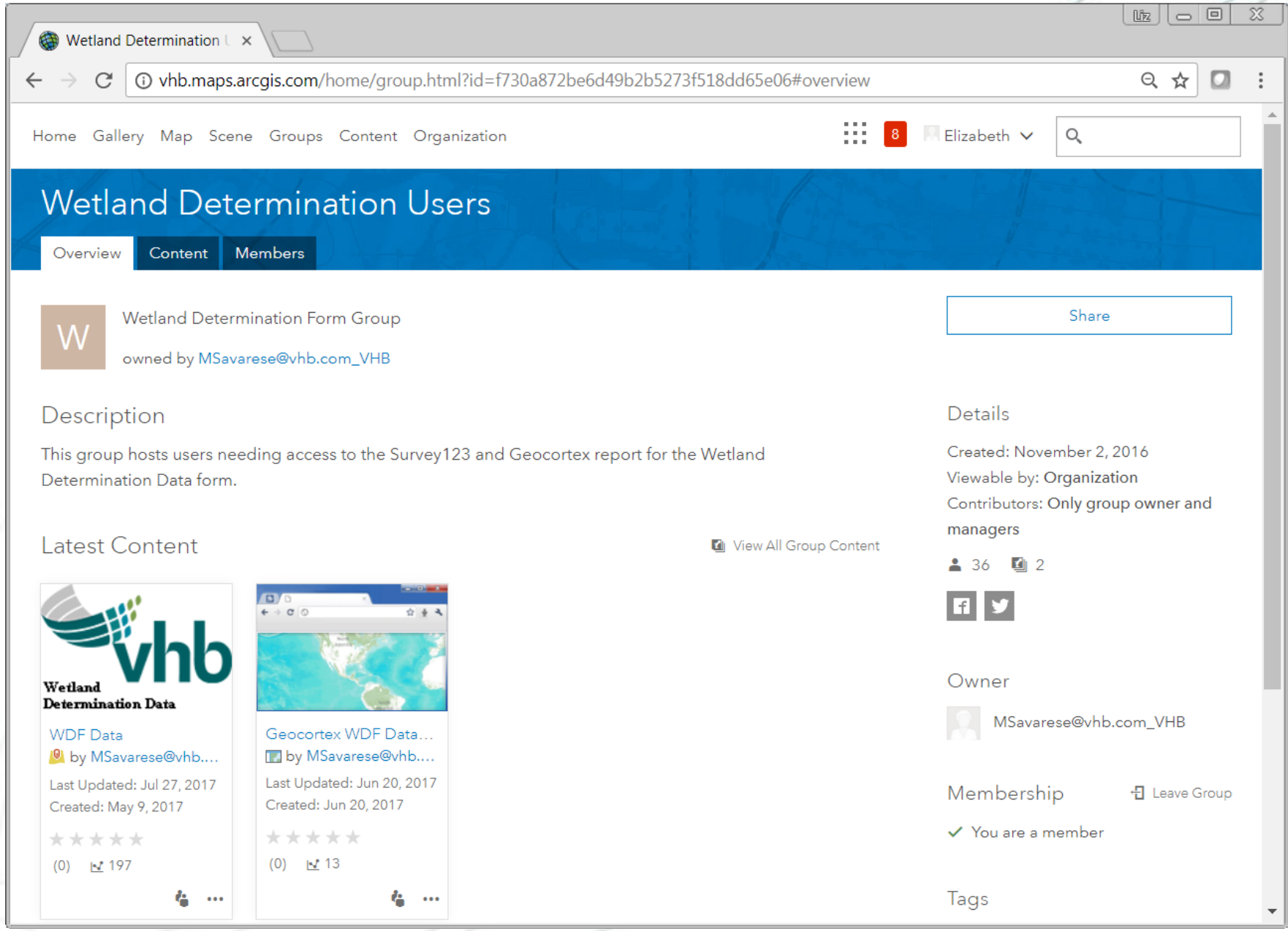
2. Geocortex Web App

Technology Used

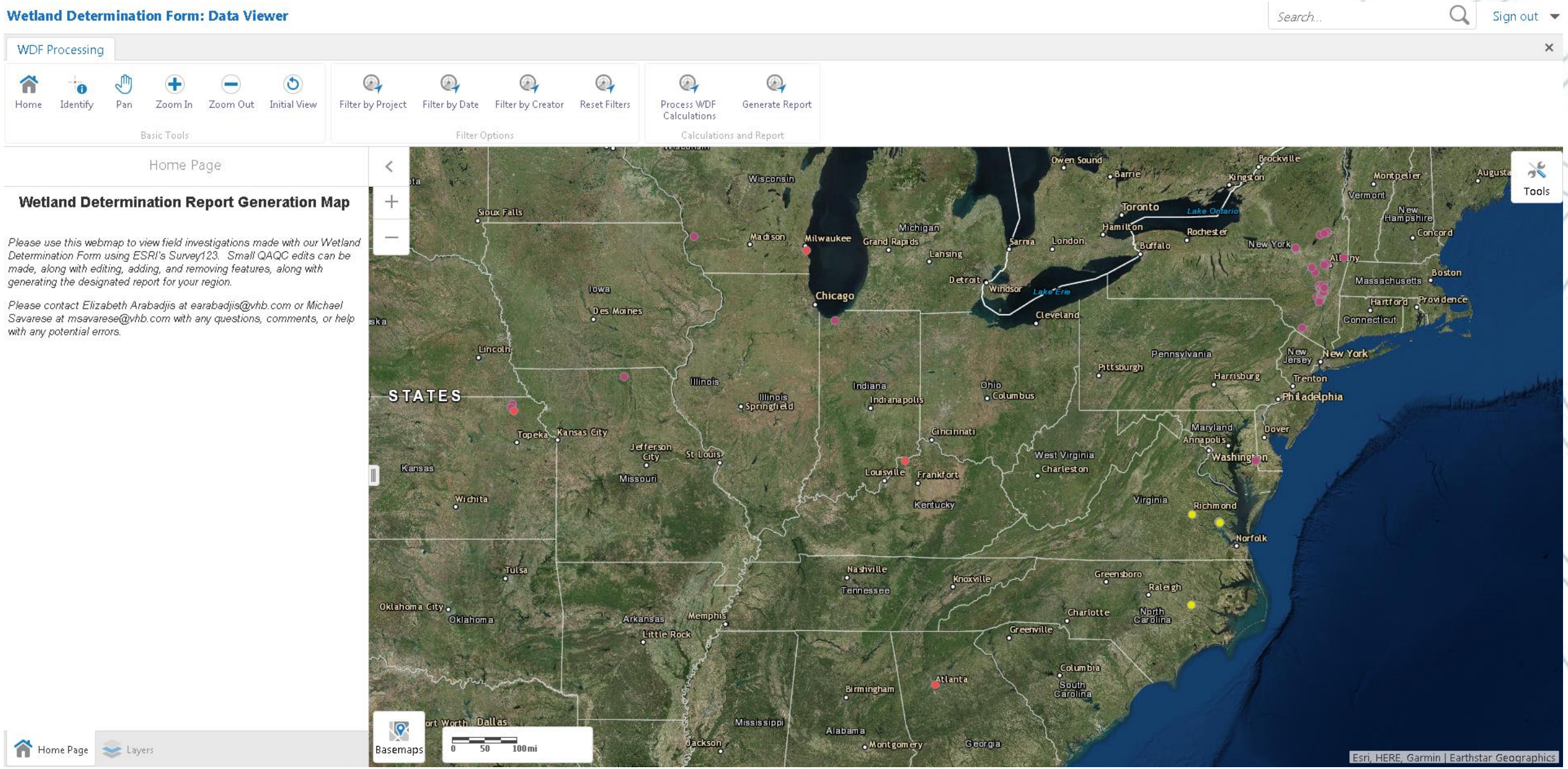
- Geocortex Essentials
  - Report Designer
  - Workflow Designer
  - HTML5 2.8 viewer



Geocortex Data Viewer

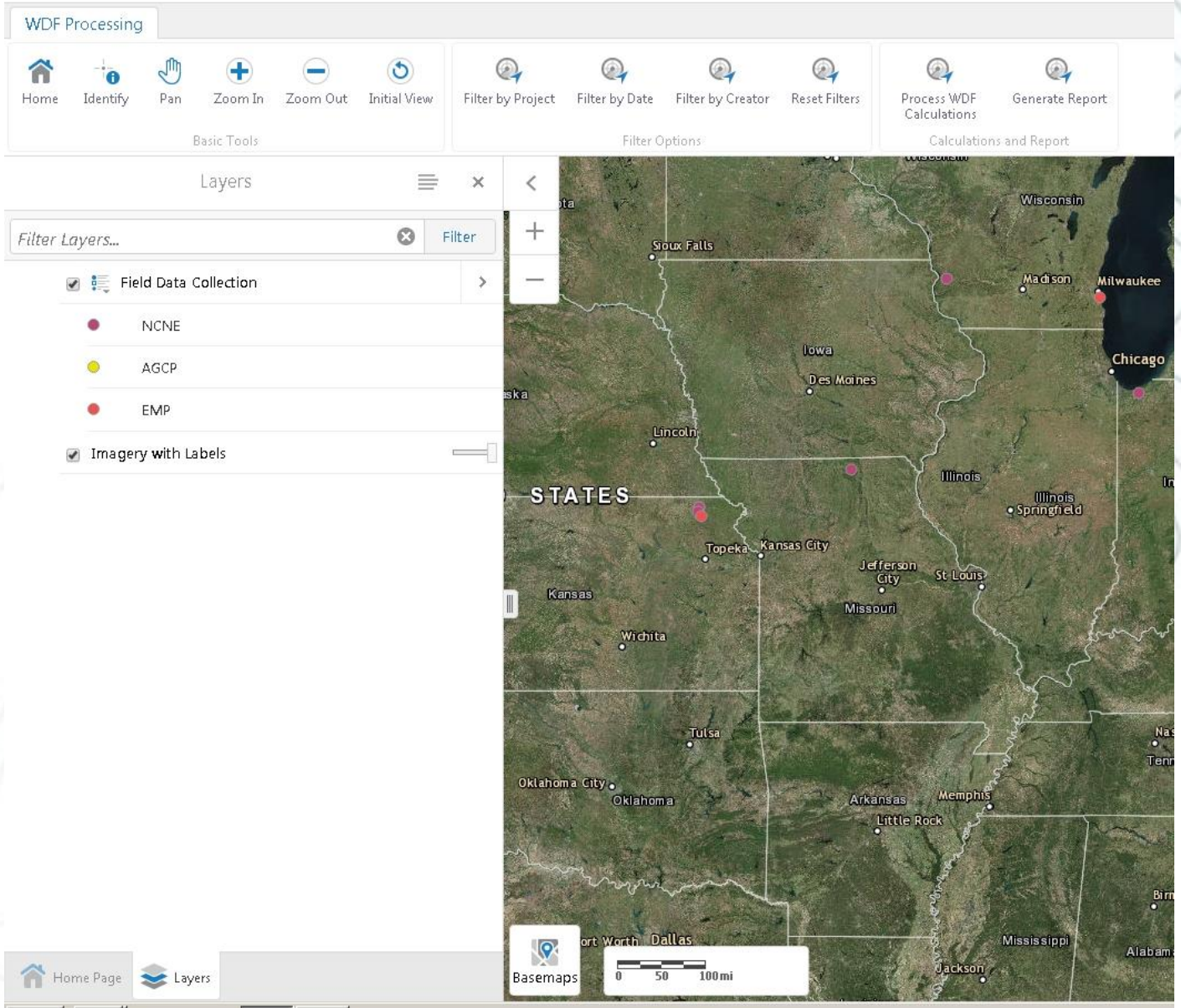


Geocortex Data Viewer



Geocortex Data Viewer

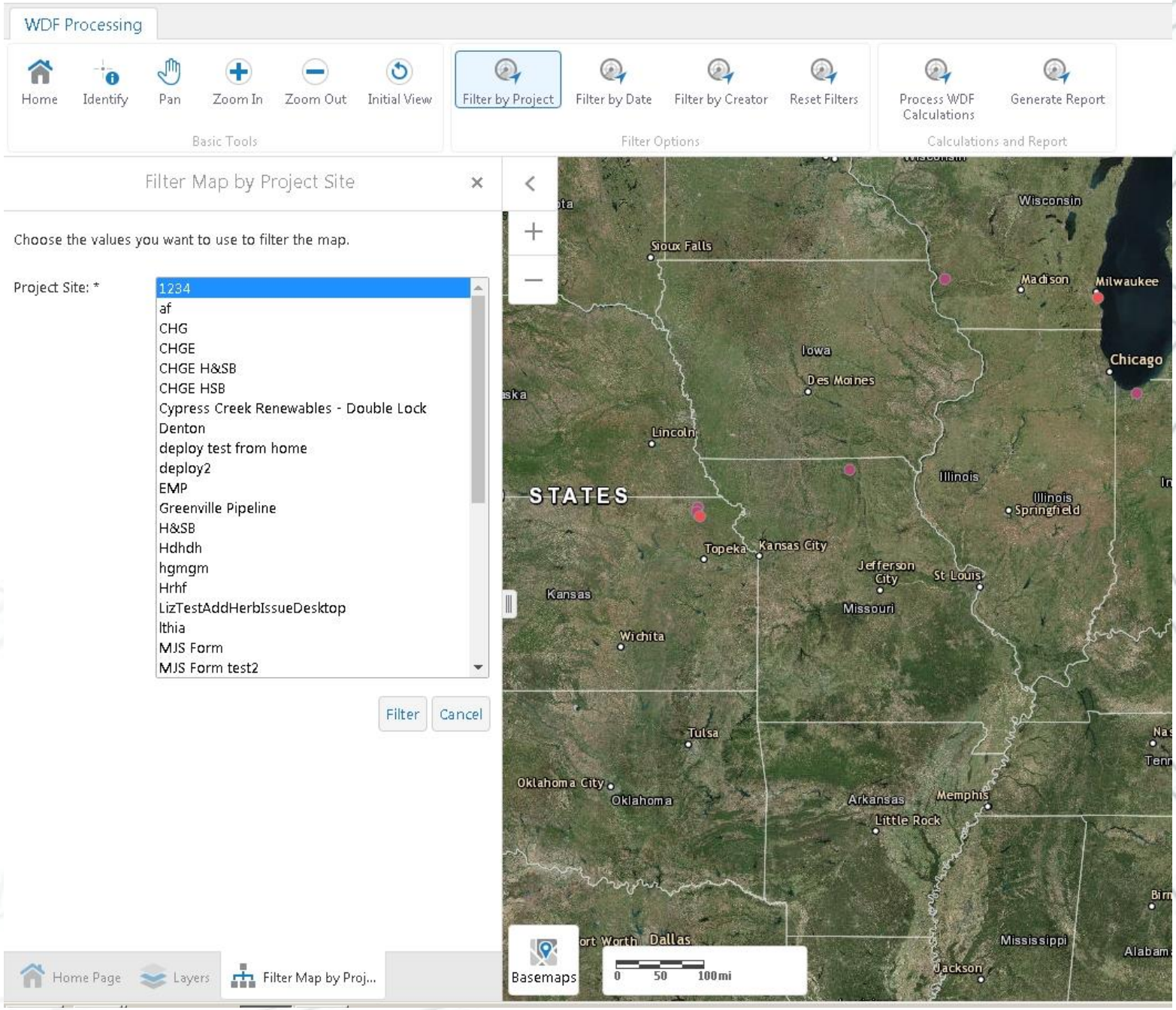
Regional Forms define color symbology



Filter #1

Filter by Project

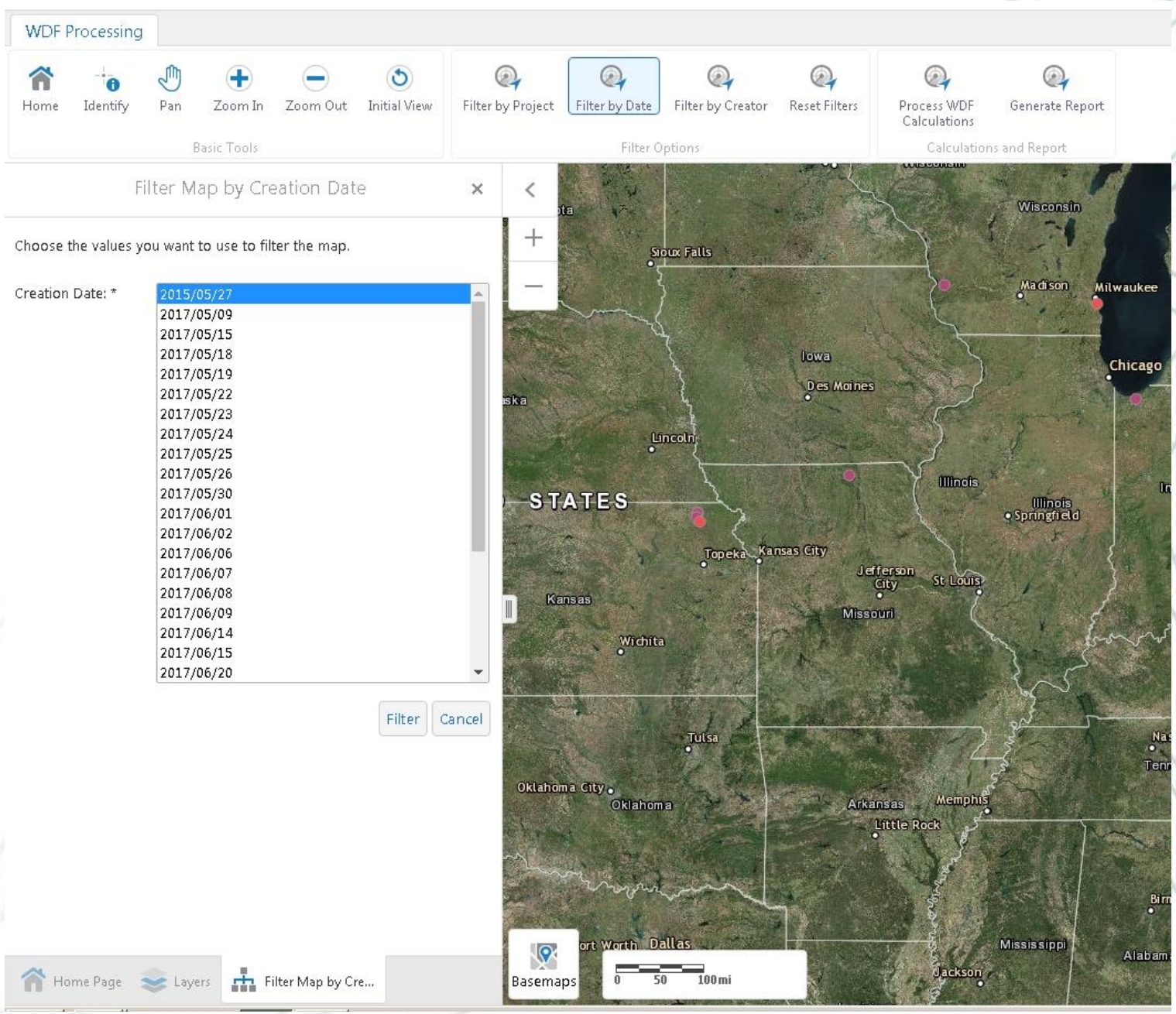
- Prompts the list of all records values for the Project field
- Allow single or multiple select
- Filter only shows those records in the map extent



Filter #2

Filter by Date

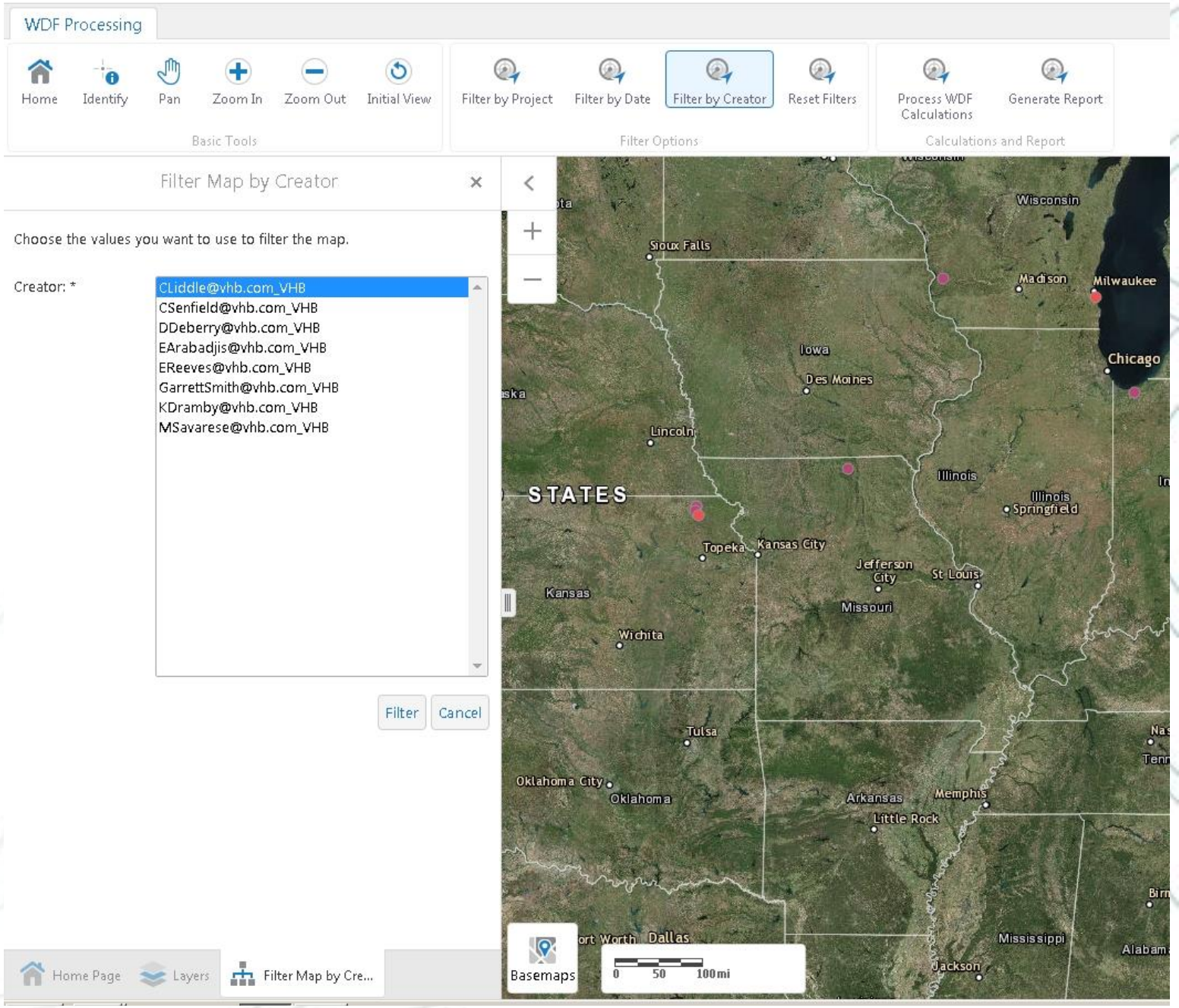
- Prompts the list of all records values for the Date Created field
- Allow single or multiple select
- Filter only shows those records in the map extent



Filter #3

Filter by Creator

- Prompts the list of all records values for the Creator field
- Allow single or multiple select
- Filter only shows those records in the map extent



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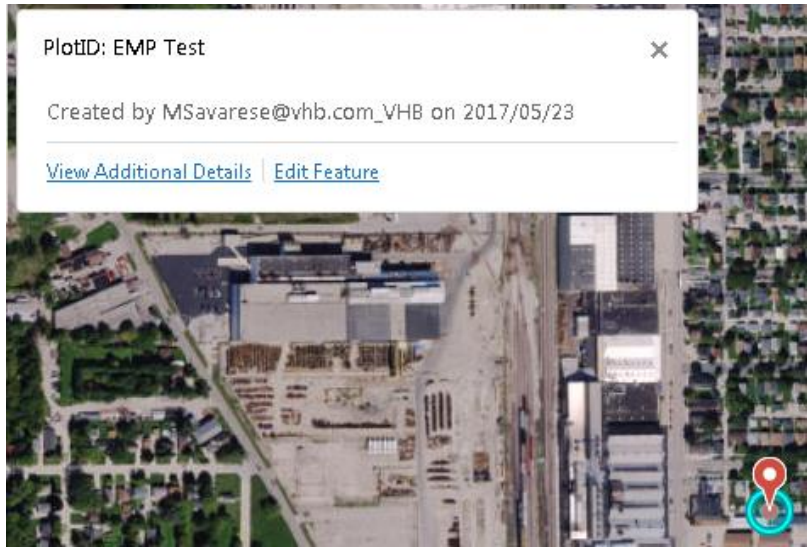
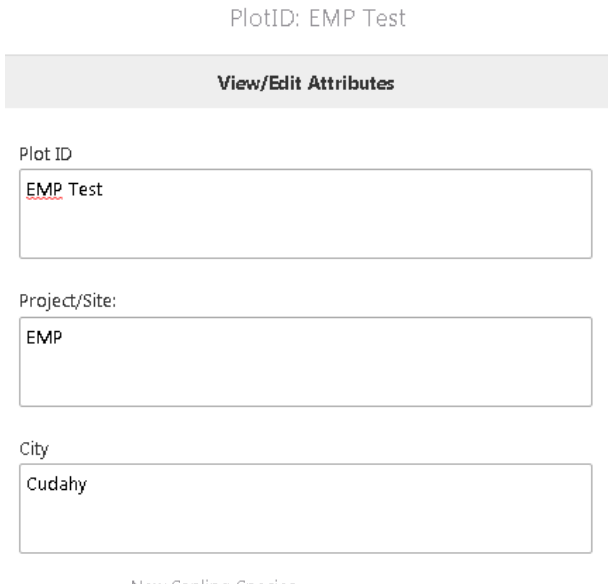
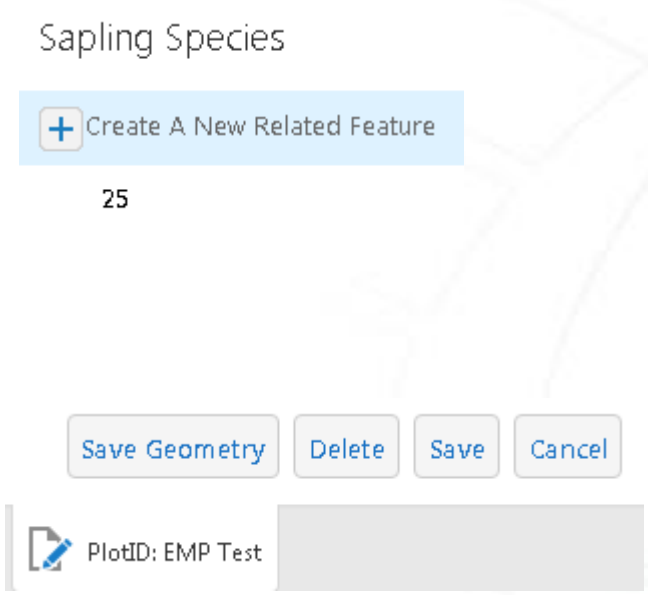
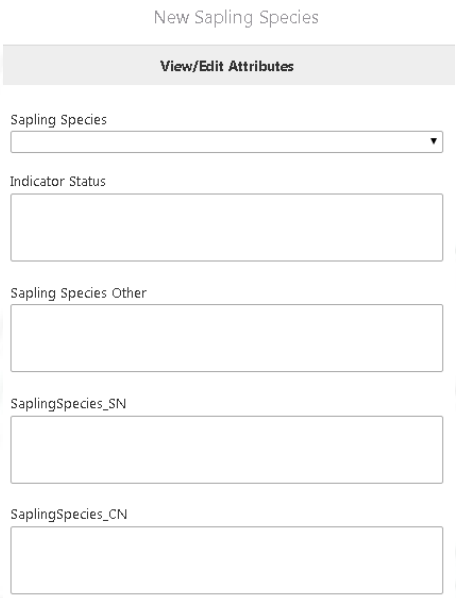








Editing Point Values:

- Select Point
- Click “Edit Features”

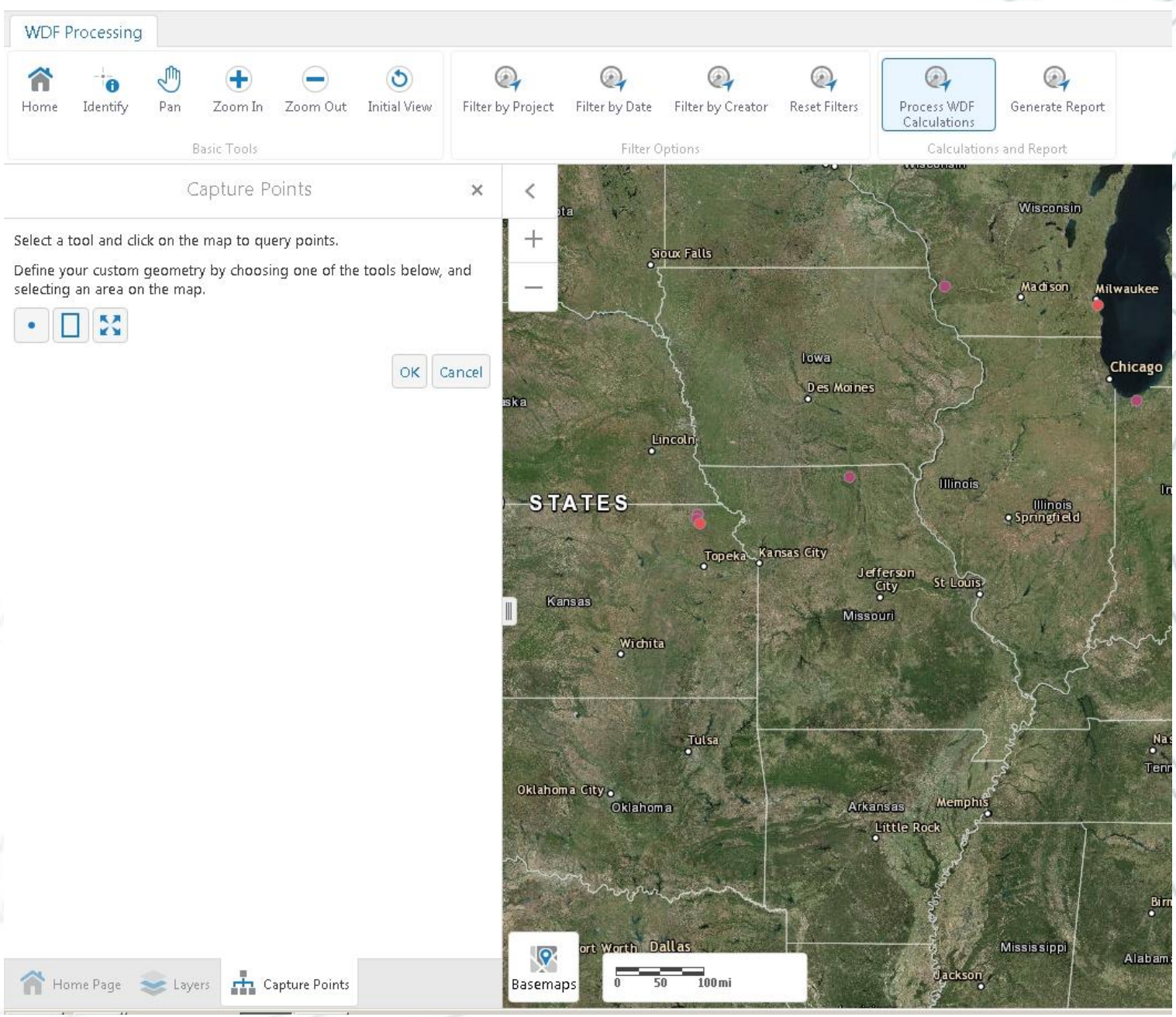
For updating Soil and Vegetation Information:

- Select Point
- Click “View Additional Details”
- Click “Create A New Related Feature”

Post Process and Report

Selection Options

- Point Item
- Select Rectangular Area
- Select Current Map Extents



WDF

WETLAND DETERMINATION DATA FO

Project Site: Cypress Creek Renewables - Double Lock City/
Applicant/Owner: Cypress Creek Renewables
Investigator(s): Chris Liddle and Andrew Mollel
Landform (hillslope, terrace, etc.): Depression
Subregion (LRR or MLRA): LRR Lat:
Soil Map Unit: LMF - Lansing and
Are climatic/hydrologic conditions on the site typical for this time of year?
Are Normal Circumstances present? yes If needed, explain any answers in
Are Vegetation yes, Soil no, or Hydrology no sig
Are Vegetation no, Soil no, or Hydrology no na

SUMMARY OF FINDINGS - Attach site map showing sample

Hydrophytic Vegetation Present?	yes
Hydric Soil Present?	yes
Wetland Hydrology Present?	yes

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:
Primary Indicators (minimum of one is required; check all that apply)

X	Surface Water (A1)		Water-Stained Leaves (B9)
X	High Water Table (A2)		Aquatic Fauna (B13)
X	Saturation (A3)		Marl Deposits (B15)
	Water Marks (B1)		Hydrogen Sulfide Odor (C1
	Sediment Deposits (B2)		Oxidized Rhizospheres on L
	Drift Deposits (B3)		Presence of Reduced Iron (
	Algal Mat or Crust (B4)		Recent Iron Reduction in T
	Iron Deposits (B5)		Thin Muck Surface (C7)
	Inundation Visible on Aerial (B7)		Other (Explain in Remarks)
	Sparsely Vegetated Concave Surface (B8)		

Field Observations:

Surface Water Present?	yes	Depth (inches):
Water Table Present?	yes	Depth (inches):
Saturation Present?	yes	Depth (inches):

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous

Remarks:

SOIL

Profile Description: (Describe to the depth needed to document the indicator o

Depth (in)	Matrix Color (moist)	%	Redox F Color (moist)	
0-14	10YR 2/1	100		
14-20	10YR 2/1	100		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

Hydric Soil Indicators:

	Histosol (A1)		Polyvalue Below Su MLRA 149B)
	Histic Epipedon (A2)		Thin Dark Surface (
	Black Histic (A3)		Loamy Mucky Min
	Hydrogen Sulfide (A4)		Loamy Gleyed Mat
	Stratified Layers (A5)		Depleted Matrix (F
	Depleted Below Dark Surface (A11)		Redox Dark Surface
	Thick Dark Surface (A12)		Depleted Dark Surf
	Sandy Mucky Mineral (S1)		Redox Depressions
	Sandy Gleyed Matrix (S4)		
	Sandy Redox (S5)		
	Stripped Matrix (S6)		[3]Indicat wetland h
X	Dark Surface (S7) (LRR R, MLRA 149B)		

Restrictive Layer (if observed):
Type: Rock
Depth (inches):

Remarks:

VEGETATION - Use scientific names of plants.

		Absolute % Cover
Tree Stratum (Plot size: 30)		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
		0
Sapling Stratum (Plot size: 30)		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
		0
Shrub Stratum (Plot size: 15)		
1.	*Lonicera tatarica*	10.5
2.		
3.		
4.		
5.		
6.		
7.		
8.		
		10
Herb Stratum (Plot size: 5)		
1.	*Impatiens capensis*	38
2.	*Phalaris arundinacea*	20.5
3.	*Carex crinita*	20.5
4.	*Epilobium lactiflorum*	10.5
5.	*Symphyotrichum novae-angliae*	10.5
6.		
7.		
8.		
9.		
10.		
11.		
12.		
		100
Woody Vines (Plot size: 30)		
1.		
2.		
3.		
4.		
5.		
		0

Remarks: (If observed, list morphological adaptations below).

Comments:
Representative view of the hydric soils from W2-WET1 plot.

Compass Direction:

Image Name:
Soils.JPG

Date Taken:
2017:09:08 11:41:48

Comments:
Representative view of W2-WET1 data plot.

Compass Direction:
E

Image Name:
Wetland_E.JPG

Date Taken:
2017:09:08 11:41:59

Thoughts from the Developer

- Pro: Very little coding needed for web map
- Con: Geocortex developer documentation hard to find on some topics
- Lessons Learned: The developer's first web map used by others:
  - Constantly look for Improvements and version updates
  - Ideas for implementation after used multiple users
  - Limits – can this idea get integrated?

Thoughts from PM

- Geocortex Site took less time to create, for many reasons:
  - Easier to use platform, no coding
  - Second version, no learning the project's purpose (calculations were understood)
  - more difficult to customize?
- The usual hurtles:
  - staff commitment
  - deliverables and sign offs
  - Training – new ideas mean a little 'hand holding' when training on new procedures
- Success:
  - Limited roll-out this field season, successful so far.
  - Next field season year will be used through-out.

Questions
and
Thank you