

Review Gilcrease Turnpike Wetland Assessment Results

OKRAM TRAINING: DAY 2



Day 2: Agenda

7:30 – 8:30 AM: Review Gilcrease Turnpike wetland assessment results

8:30 – 8:45 AM: **BREAK**

8:45 – 9:45 AM: Step by Step Instructions for OKRAM Metric Calculations- Dan Dvoretz

9:45 – 10:00 AM: **BREAK**

10:00 – 11:00 AM: Step by Step Instructions for OKRAM Metric Calculations
(Continued)- Dan Dvoretz

11:00 – 11:30 PM: **LUNCH (Pizza provided)**

11:30 – 12:00 PM: Travel to field site (Mohawk Park: meet at 36.218915, -95.892062)

12:00 – 3:00 PM: Independent application of OKRAM at Mohawk Park wetland

3:00 – 3:30 PM: Review of assessment

Goals

Discussion of Gilcrease Turnpike Wetland assessment results

In-depth look at metric, attribute and overall score calculations

Think about and discuss how scores reflect site condition

Discussion of site characteristics that lead to better OKRAM scores

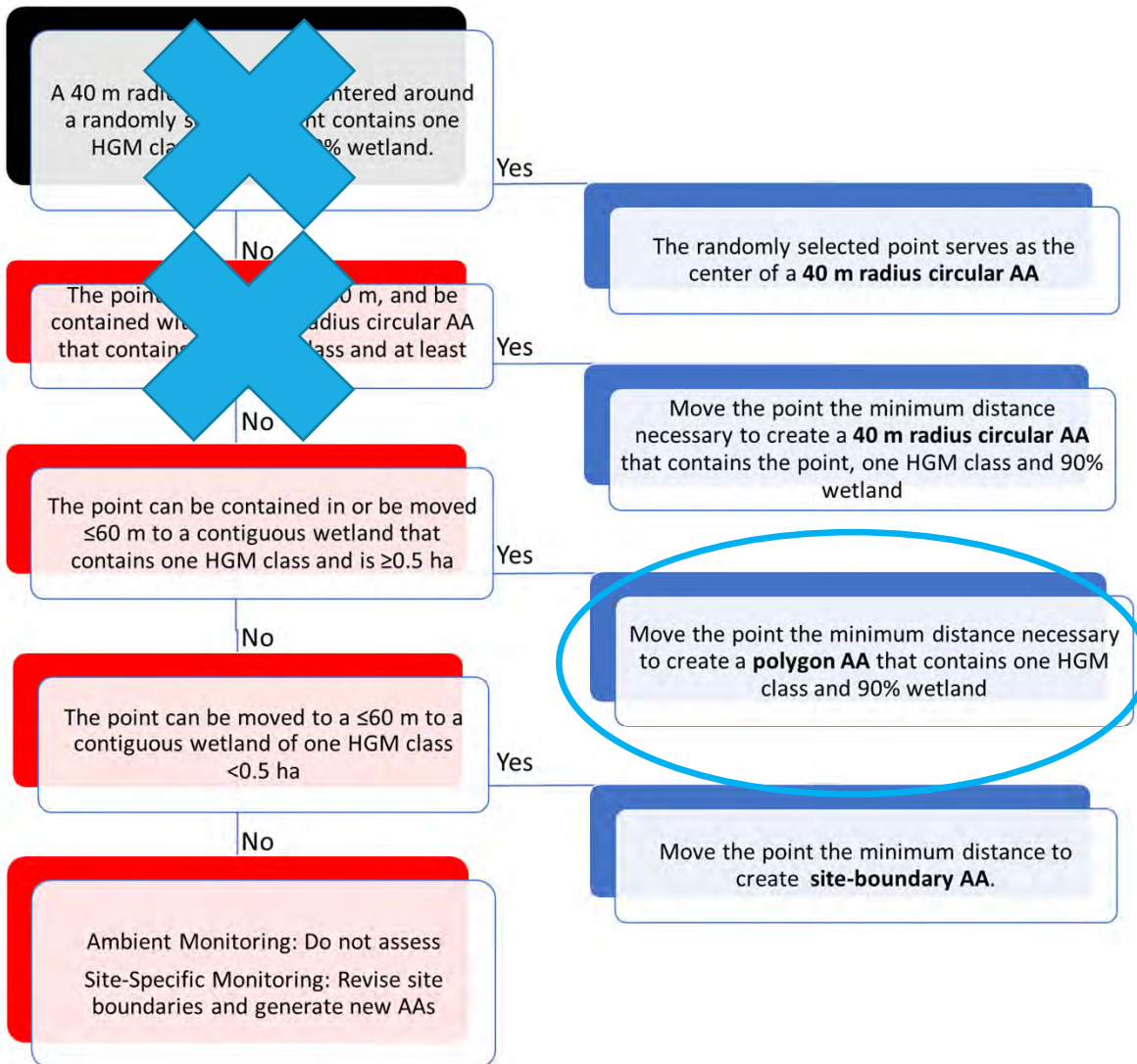
Discussion of how wetlands imbedded in urban landscape can still provide uplift

Outline

- Site 1 Assessment Review
- Site 1 vs. Site 2
- Historic Condition vs. Current Condition

Wetland 1: 100 meter buffer





Site 1 Assessment Review: Assessment Area



Site 1 Assessment Review: Site Description

Site Description	
Site Name	Training 1
Date of Assessment	8/23/2024
Assessor Name(s)	DD, CD, SG, BT
Assessor Affiliation(s)	OCC and OSU
Location Information	
Site Latitude	36.132832
Site Longitude	-96.054484
Coordinate System	GCS 1983
Level III Omernik Ecoregion	Cross Timbers
Directions/Access Notes	Park on shoulder of N. bound 21st exit from Gilcrease Tpke

Site 1 Assessment Review: Site Description

Assessment Area Information					
Size of Wetland	~0.55 ha				
# of Assessment Areas	1				
Assessment Area ID	1	AA Type	Polygon	AA size	0.5
Reason for Assessment	OKRAM Training				
HGM Classification (circle one class and any relevant subclasses)					
HGM Class	Depression	Flat	Slope	Lacustrine	Riverine
Regional Subclass	<i>Closed Impounded</i>	<i>Hardwood</i>	<i>Headwater</i>	<i>Disconnected Oxbow</i>	<i>Connected Oxbow</i>
	<i>Open Impounded</i>		<i>Low-gradient</i>	<i>Man-made Lacustrine</i>	<i>Beaver Complex</i>
	<i>Groundwater</i>				<i>In-Channel</i>
	<i>Open Surface Water</i>				<i>Floodplain (non-perennial)</i>
	<i>Closed Surface Water</i>				<i>Floodplain (upper perennial)</i>
					<i>Floodplain (lower perennial)</i>

Site 1 Assessment Review: Site Description

Additional Site Characteristics (circle dominant condition)							
Hydrologic Condition at time of assessment	Ponded/inundated		Saturated Soil (no surface water)			Dry	
Hydroperiod	Temporary <i>(inundated for <1 month)</i>		Seasonal <i>(inundated for extended periods of growing season)</i>		Semi-permanent/ Permanent <i>(inundated except during drought years)</i>		
Dominant Vegetation	Forested	Scrub/Shrub	Emergent	Submergent/ Floating Leaved			Unvegetated
Management	Unmanaged		Agriculture	Stormwater	Water treatment	Water supply	Wildlife

Site 1 Assessment Review: Hydroperiod



- Culvert discharges, ditches, or tile drains in to or out of the wetland
 - Moderate
 - Water enters wetland from culverts, diversions or ditches only during large storm events

Hydroperiod is impacted
 No Indicators of Altered Hydroperiod Present
 AA is not a Wetland

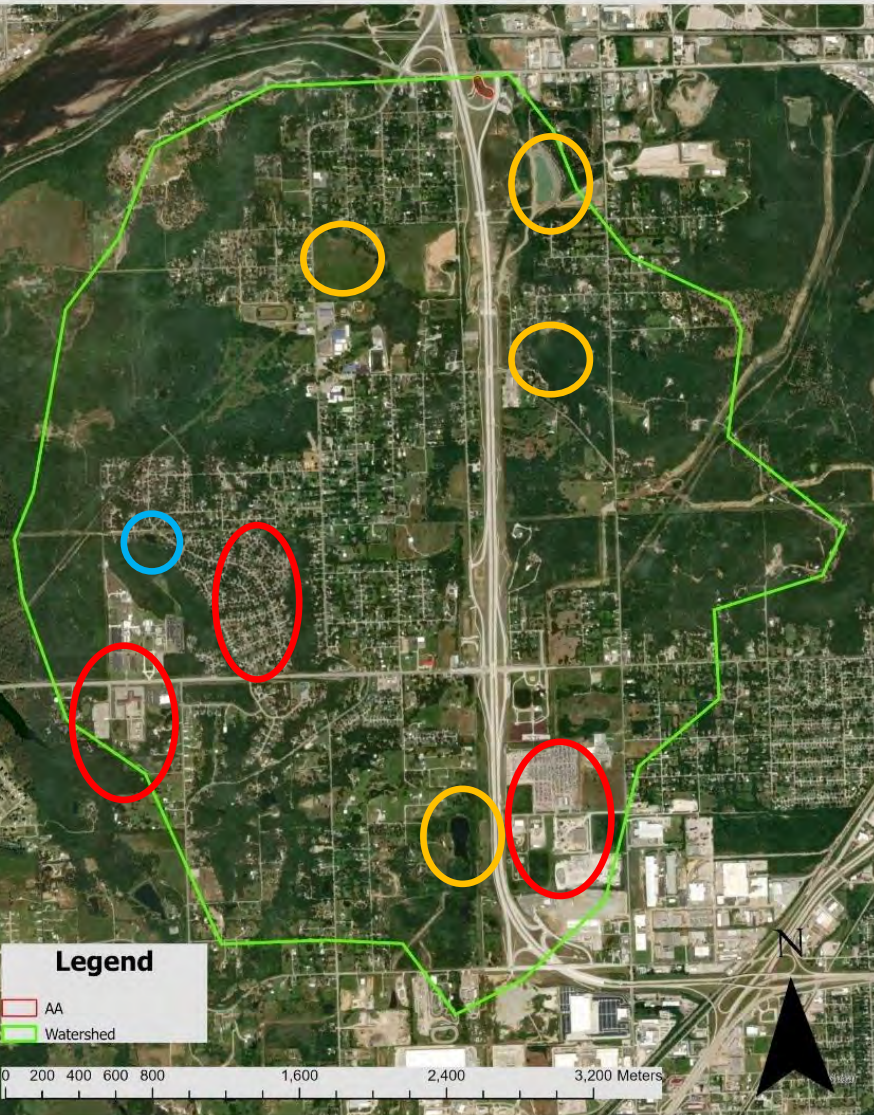
Indicators of Altered Hydroperiod	Minor	Moderate	Major	Complete Loss	Indicator Description
Fill/sedimentation					
Water being pumped into or out of the wetland					
Water control structures					
Culverts, discharges, ditches or tile drains into or out of the wetland		100			Direct stormwater inputs from turnpike and residential areas
Beaver dam removal					
Excavation/Dredging/Mining/Impoundment					
TOTAL IMPACTED AREA		100			
SEVERITY WEIGHT	0.25	0.5	0.75	1	
SEVERITY WEIGHTED AREA		50			
METRIC SCORE 1A	0.50				

Site 1 Assessment Review: Hydroperiod

Hydroperiod Score =
1 - (Extent * Severity Weight)

 $1 - (1 * 0.5) = 0.5$

Wetland 1: Watershed



Site 1 Assessment Review- Water Source

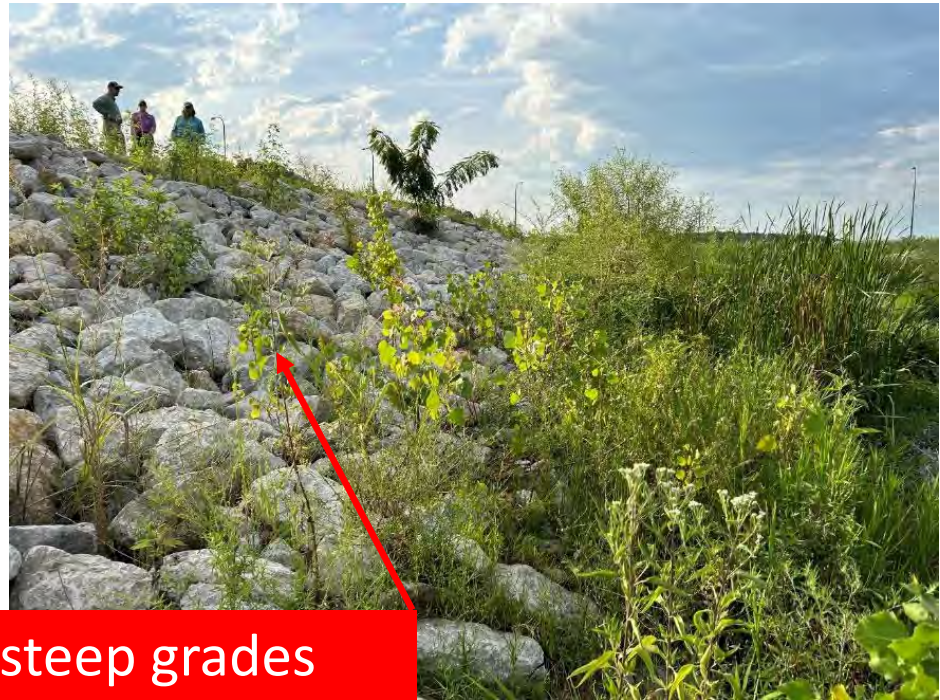
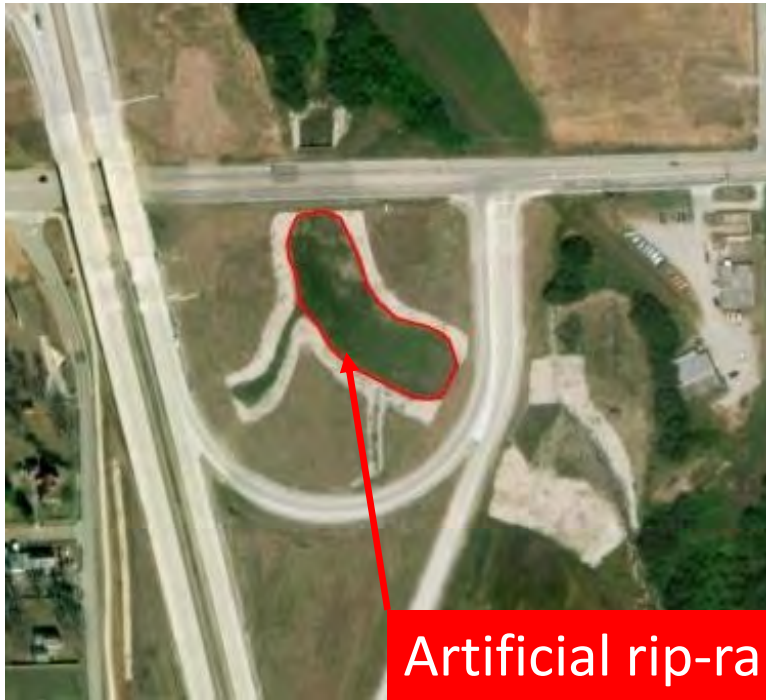
- Watershed is ~3,700 acres
- Upstream Impoundment @ 5,500 meters
- Roughly 700 acres impervious or 20%
- Roughly 2% ponds, 1% dryland ag, 1% excavation, and 1% woody encroachment
- Water Source score of 0.58

Site 1 Assessment Review: Water Source

HUC 8 Indicators of altered water source	Distance (m)	Reduction	
Upstream Impoundment	5,500	0.1	
Downstream Impoundment		0	
Catchment Indicators of altered water source	% Cover	Multiplier	Description
Impervious surface	20	1.5	
Dryland agricultural land that is tilled	1	0.5	
Woody encroachment	1	0.5	
Impounded water	2	2	
Topographic alteration (leveling, excavation, mining)	1	1	
Total Altered Cover			36.00
METRIC SCORE 1b			0.58

$$\text{Water Source} = (1 - 0.1) - [(0.2 * 1.5) + (0.01 * 0.5) + (0.01 * 0.5) + (0.02 * 2) + (0.01 * 1)] * (1 - 0.1)$$

Site 1 Assessment Review: Hydrologic Connectivity



Artificial rip-rap steep grades

Site 1 Assessment Review: Hydrologic Connectivity

<input checked="" type="radio"/> Connectivity is Impacted <input type="radio"/> No Indicators of Altered Connectivity Present <input type="radio"/> AA is not a Wetland		
Indicators of altered connectivity	Perimeter Percentage	Description
Levees, Berms, Dams, Weirs	90	Steep artificial rip-rap around all boundaries (except culverts)
Road Grades		
METRIC SCORE 1C	0.10	

Hydro Connectivity = $(100 - \text{altered perimeter})/100$.
 Hydro Connectivity = $(100 - 90)/100 = 0.1$

Site 1 Assessment Review: Hydrology

Hydroperiod:

- The frequency/duration of inundation is moderately altered as a result of stormwater inputs (0.5)

Water Source:

- The delivery of water from the watershed is moderately altered primarily from upstream impervious surfaces (0.58)

Hydrologic Connectivity:

- Water movement out of the wetland is restricted to channel inflow and outflow (0.1)

- Overall Hydrology score = (average of Hydroperiod, Water Source, and Hydro Con.) = 0.39

Site 1 Assessment Review: Excess Nutrients and Contaminants



Excess Nutrients or Contaminants Present
 No Indicators of Altered Nutrient and Contaminants Present
 AA is not a Wetland

Indicators of Altered Nutrient Cycling	Minor	Moderate	Major	Indicator Description
Livestock/animal waste				
Residential Runoff and Septic/sewage discharge	100			Residential areas within 200 meters with SW drain
Crop production				
Excessive algae or <i>Lemna</i> sp. (Do not count this metric if algae or <i>Lemna</i> blooms are a result of evapoconcentration of nutrients as wetland is drying.)				
TOTAL IMPACTED AREA	100			
SEVERITY WEIGHT	0.25	0.5	0.75	
SEVERITY WEIGHTED AREA	25			

- Residential Runoff and Septic/sewage discharge
- Minor
- Residential dwellings within 200 meters of wetland

Site 1 Assessment Review: Excess Nutrients and Contaminants

Indicators of Chemical Contaminants	Minor	Moderate	Major	Indicator Description
Point source discharge (ditch or pipes from industrial sources, etc.)				
Stormwater inputs (ditches, discharge pipes, culverts, adjacent impervious surface or railroad tracks)		100		SW input from Turnpike and residential
Increased salinity (e.g., salt crust)				
Industrial spills or dumping				
Oil sheen (does not include sheen from iron precipitates)				
TOTAL IMPACTED AREA		100		
SEVERITY WEIGHT	0.25	0.5	0.75	
SEVERITY WEIGHTED AREA		50		
METRIC SCORE 2a				0.25

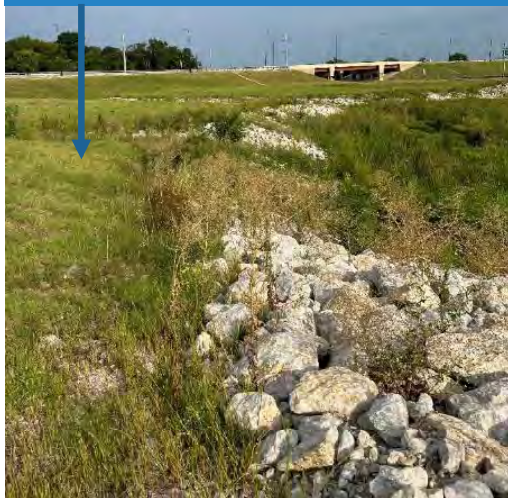
- Stormwater inputs
 - Moderate
 - Stormwater inputs from culverts



Nutrients/Con Score = 1 - (Extent * Severity Weight) = 1 - (1 * 0.25) - (1 * 0.5) = 0.25

Site 1 Assessment Review: Buffer Filter

Mowed Lawn directly adjacent to entire AA- low impact



Wetland 1: Buffer Lines



Urban area intersects east transect at 190 m- high impact

Site 1 Assessment Review: Buffer Filter

Buffer	Distance to High Impact	Distance to Moderate Impact	Distance to Low Impact	% Intact
1	250	100	0	0
2	250	100	0	0
3	190	100	0	0
4	250	100	0	0
5	250	100	0	0
6	250	100	0	0
7	250	100	0	0
8	250	100	0	0
Metric Score	0.00			

- ❑ %Intact = lowest value among:
 - ❑ High impact/250
 - ❑ Moderate impact/100
 - ❑ Low impact/30
- ❑ Transect 3
 - ❑ High impact = $190/250 = 0.76$
 - ❑ Low impact = $0/30 = 0$
 - ❑ 0 is selected for % intact
- ❑ Metric score is average of %intact for all 8 transects

Site 1 Assessment Review: Water Quality

Nutrients/Contaminants

- Stormwater inputs from turnpike and residential neighborhood is a major input of nutrients and contaminants (0.25)

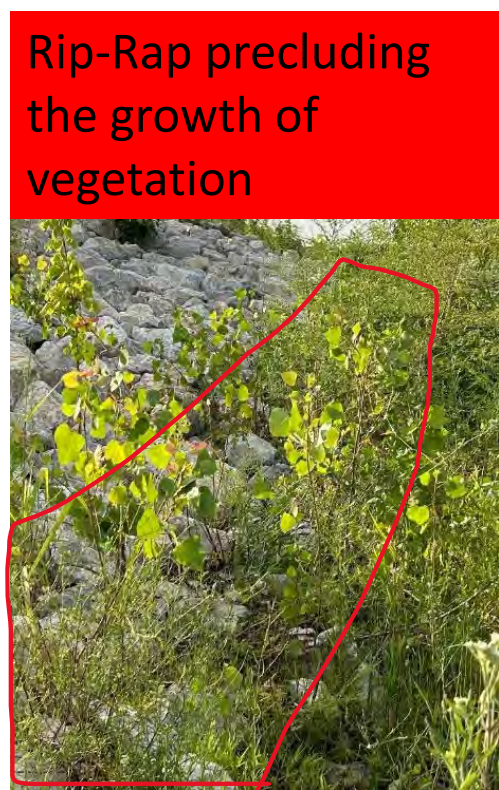
Buffer Filter

- The area surrounding the AA has an extremely minimal ability to slow the movement of water and prevent the contribution of excess nutrients and contaminants to the wetland (0.0)

- Overall Water quality score = (average of Nutrients/Contaminants and Buffer Filter) = 0.13

Site 1 Assessment Review: Vegetation Condition

	Vegetation Layers			
	Tree	Shrub/ sapling	Herbaceous / Emergent	Submergent / Floating
Percent Cover of Layer (live vegetation)	0	5	85	5
Indicators of Vegetation Removal from Anthropogenic Activities (Percentage of the AA impacted) ◊				
Tree and shrub cutting (estimate cover lost)				
Ground disturbance exposing soil surface				
Dead vegetation				
Mechanical disturbance from structures		5	5	5
Total Removed Cover		5	5	5
Sum of existing and removed cover		10	90	10



Site 1 Assessment Review: Vegetation Condition

	Vegetation Layers			
	Tree	Shrub/ sapling	Herbaceous/ Emergent	Submergent/ Floating
Percent Cover of Layer (live vegetation)	0	5	85	5
Indicators of Vegetation Disturbance (Percentage of live vegetation cover impacted)				
Haying, mowing, brush hogging				
Ground surface disturbance but revegetated				
Invasive species and or crop/pasture				
Native Monoculture			10	
Upland plant encroachment hydroperiod				
Percent disturbed cover per layer			8.5	



Cattails are a native monoculture at ~60% cover and is recorded as 10% (60-50)

Site 1 Assessment Review: Vegetation Condition

	Vegetation Layers			
	Tree	Shrub/ sapling	Herbaceous/ Emergent	Submergen / Floating leaved
Percent Cover of Layer (live vegetation)	0	5	85	5
Total Removed Cover		5	5	5
Sum of existing and removed cover		10	90	10
Percent disturbed cover per layer			8.5	
METRIC SCORE 4a	0.79			

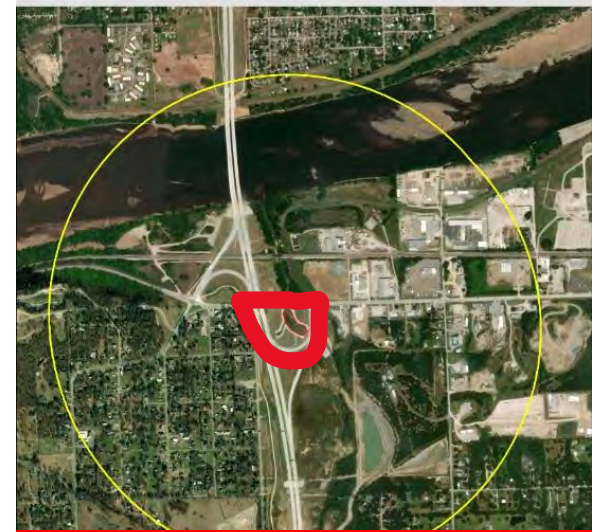
Veg. Condition = $1 - (\text{Disturbed} + \text{Removed}) / \text{Cover} + \text{Removed}$

$$\text{Veg. Condition} = 1 - (0.085 + 0.15) / (0.95 + 0.15) = 0.79$$

Site 1 Assessment Review: Habitat Connectivity

Area of Natural and Marginal Connected Habitat	0.5
Area of Natural Connected Habitat	0.5
Area within 1 km buffer	346
METRIC SCORE 3b	0.00
<p>Hab. Con = $\text{mean}(\text{Nat and Marg}) / 1 \text{ km buffer}$ Veg. Condition = $((0.5 + 0.5) / 2) / 346 = 0.001$</p>	

Wetland 1: 1000 meter buffer



Mowed lawn and turnpike limit connectivity to AA (0.5 ha)

Site 1 Assessment Review: Biota

Vegetation Condition

- Minor impacts from surrounding rip-rap limiting plant growth, and native monocultures reducing site diversity (0.79)

Habitat Connectivity

- Wetland has extremely minimal connectivity to surrounding natural habitats due to the position within the turnpike (0.00)

Biota score = (average of Veg. Con. and Hab. Con.) = 0.39

Site 1 Assessment Review: Overall Score

Final Score =
average of
Hydrology, Water
Quality and Biota
Attributes)
Final score = $(0.39 + 0.13 + 0.39) / 3 = 0.30$

4. OKRAM Overall Condition Score- Riverine

	Metric	Score
1	Hydrology	
1a.	Hydroperiod	0.50
1b.	Water source	0.58
1c.	Hydrologic Connectivity	0.10
	Hydrology Attribute	0.39
	<i>(metric 1a + metric 1b + metric 1c)/3</i>	
2	Water Quality	
2a.	Nutrients/Contaminants	0.25
2b.	Buffer Filter	0.00
	Water Quality Attribute	0.13
	<i>(metric 2a + metric 2b)/2</i>	
3	Biota	
3a.	Vegetation	0.79
3b.	Habitat Connectivity	0.00
	Biota Attribute	0.39
	<i>(metric 3a + metric 3b)/2</i>	
	Overall Condition Score	0.30

Outline

- Site 1 Assessment Review
- Site 1 vs. Site 2
- Historic Condition vs. Current Condition

Wetland 2: 100 meter buffer



Site 2 Assessment Review: Hydroperiod

Moderate stressor from direct stormwater inputs

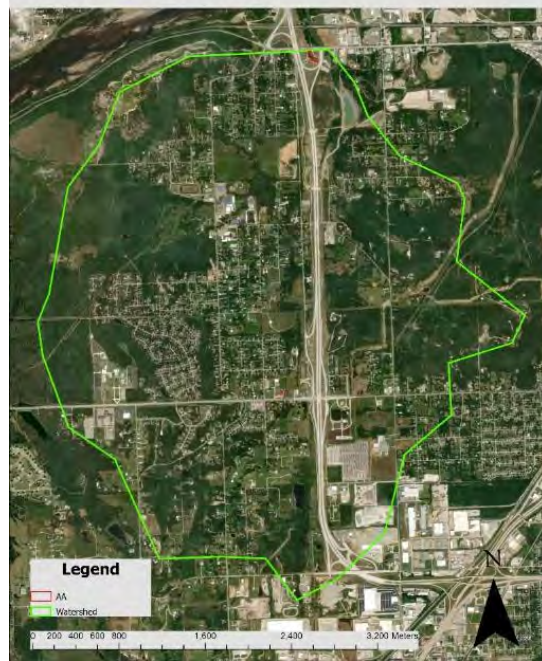


Moderate stressor from stormwater inputs into creek which serves as primary water source

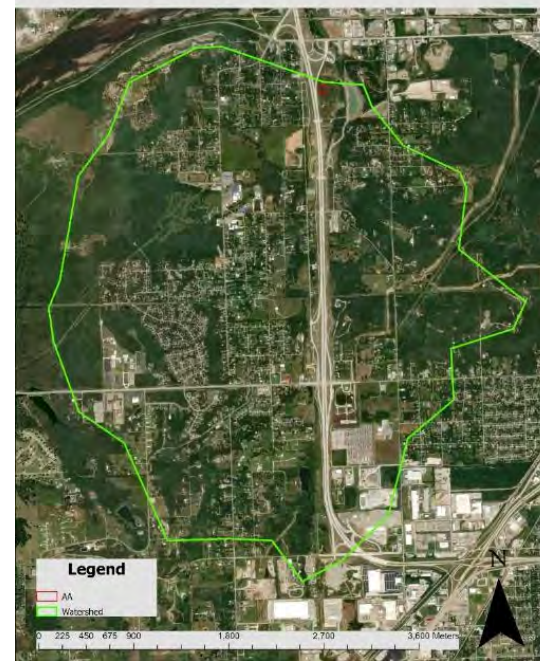
Both wetlands score 0.5 for Hydroperiod

Site 2 Assessment Review: Water Source

Wetland 1: Watershed



Wetland 2: Watershed



Both watersheds nearly identical and score 0.58 for Water Source

Site 2 Assessment Review: Hydrologic Connectivity

Site is surrounded by artificial steep grades (except culverts) and scores a 0.1

Wetland 1: 100 meter buffer



Wetland 2: 500 meter buffer



50% of wetland boundary is adjacent to steep road grade and scores a 0.5

Site 2 Assessment Review: Excess Nutrients and Contaminants

Both sites have residential and stormwater inputs of nutrients and contaminants and score 0.25



Site 2 Assessment Review: Buffer Filter

All buffer transects immediately intersect mowed lawn and the site scores 0 for Buffer Filter

Wetland 1: Buffer Lines



Wetland 2: Buffer Lines



All transects are > 30 m from low impact and >100 m from moderate impact. The site scores 1 for Buffer Filter.

Site 2 Assessment Review: Buffer Filter

Wetland 2: Buffer Lines



- Location within AA matters
- Moving AA could result in a Buffer Filter score of 0.68
- Larger wetlands tend to score better
- Multiple AAs provide average condition

Site 2 Assessment Review: Vegetation Condition

Site 1
minimal
alteration
from rip-rap
around
boundary
and cattails.
Site scores a
0.79



Site 2 has
diversity
strongly
impacted by
lack of trees
and cattail
monoculture.
Site scores a
0.33

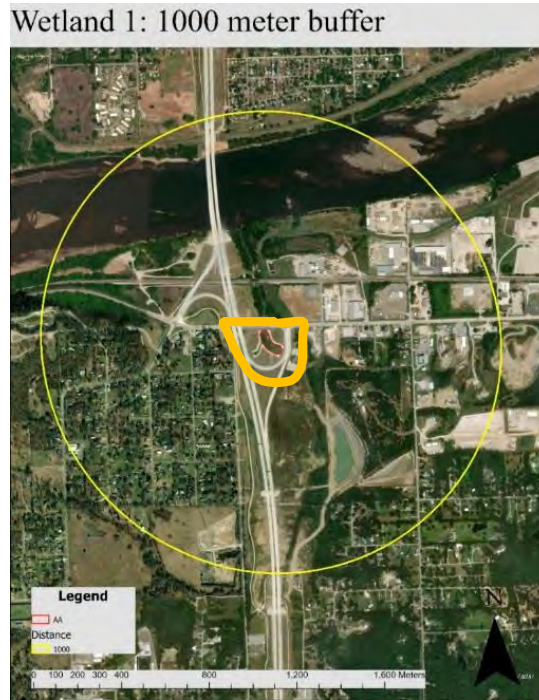
Site 2 Assessment Review: Vegetation Condition



- Need to consider the surrounding wetland context
- Considering the entire wetland on a trajectory towards reforestation would increase score
- Multiple AAs provide average condition

Site 2 Assessment Review: Habitat Connectivity

Site 1 has no connectivity due to surrounding turnpike and scores a 0.



Site 2 has greater connectivity due to larger wetland size and adjacent natural uplands and scores a 0.15.

Site 2 Assessment Review: Overall Score

Site 1- OKRAM Overall Condition Score- Riverine

	Metric	Score
1	Hydrology	
1a.	Hydroperiod	0.50
1b.	Water source	0.58
1c.	Hydrologic Connectivity	0.00
	Hydrology Attribute	0.36
	<i>(metric 1a + metric 1b + metric 1c)/3</i>	
2	Water Quality	
2a.	Nutrients/Contaminants	0.25
2b.	Buffer Filter	0.00
	Water Quality Attribute	0.13
	<i>(metric 2a + metric 2b)/2</i>	
3	Biota	
3a.	Vegetation	0.79
3b.	Habitat Connectivity	0.00
	Biota Attribute	0.39
	<i>(metric 3a + metric 3b)/2</i>	
	Overall Condition Score	0.29

Site 2- OKRAM Overall Condition Score- Riverine

	Metric	Score
1	Hydrology	
1a.	Hydroperiod	0.50
1b.	Water source	0.58
1c.	Hydrologic Connectivity	0.50
	Hydrology Attribute	0.53
	<i>(metric 1a + metric 1b + metric 1c)/3</i>	
2	Water Quality	
2a.	Nutrients/Contaminants	0.25
2b.	Buffer Filter	1.00
	Water Quality Attribute	0.63
	<i>(metric 2a + metric 2b)/2</i>	
3	Biota	
3a.	Vegetation	0.33
3b.	Habitat Connectivity	0.15
	Biota Attribute	0.24
	<i>(metric 3a + metric 3b)/2</i>	
	Overall Condition Score	0.46

Outline

- Site 1 Assessment Review
- Site 1 vs. Site 2
- Historic Condition vs. Current Condition**



Historic vs. Current: Pre-restoration



- Given location constraints and stormwater role, Site 1 provides wetland functions. However, minimal uplift opportunity from 1995 condition.
- Uplift potential for Site 2 is very high, essentially from a non-wetland site in 1995 which should score close to 0.0

Historic vs. Current: Site 1 Hypothetical Pre-restoration



4. OKRAM Overall Condition Score- Riverine

Metric	Score
1 Hydrology	
1a. Hydroperiod	1
1b. Water source	0.58
1c. Hydrologic Connectivity	0.75
Hydrology Attribute	0.77
<i>(metric 1a + metric 1b + metric 1c)/3</i>	
2 Water Quality	
2a. Nutrients/Contaminants	0.50
2b. Buffer Filter	0.25
Water Quality Attribute	0.38
<i>(metric 2a + metric 2b)/2</i>	
3 Biota	
3a. Vegetation	0.79
3b. Habitat Connectivity	0.15
Biota Attribute	0.47
<i>(metric 3a + metric 3b)/2</i>	
Overall Condition Score	0.54

Historic vs. Current: Site 2 Hypothetical Pre-restoration



Hydroperiod is impacted

No Indicators of Altered Hydroperiod Present

AA is not a Wetland

Hydroperiod = 0 (not a wetland- no hydrology)

Water Source = 0.58 (same as post- same watershed)

Connectivity = 0 (not a wetland- no hydrology)

Nutrients / Contaminants = 0 (not a wetland)

Buffer Filter = 0 (developed)

Vegetation = 0 (vegetation removed/developed)

Connectivity = 0 (developed)

Pre- restoration score = 0.06

Post-restoration score = 0.46

Increase of 0.4

Step by Step Instructions for OKRAM Metric Calculations

OKRAM TRAINING: DAY 2



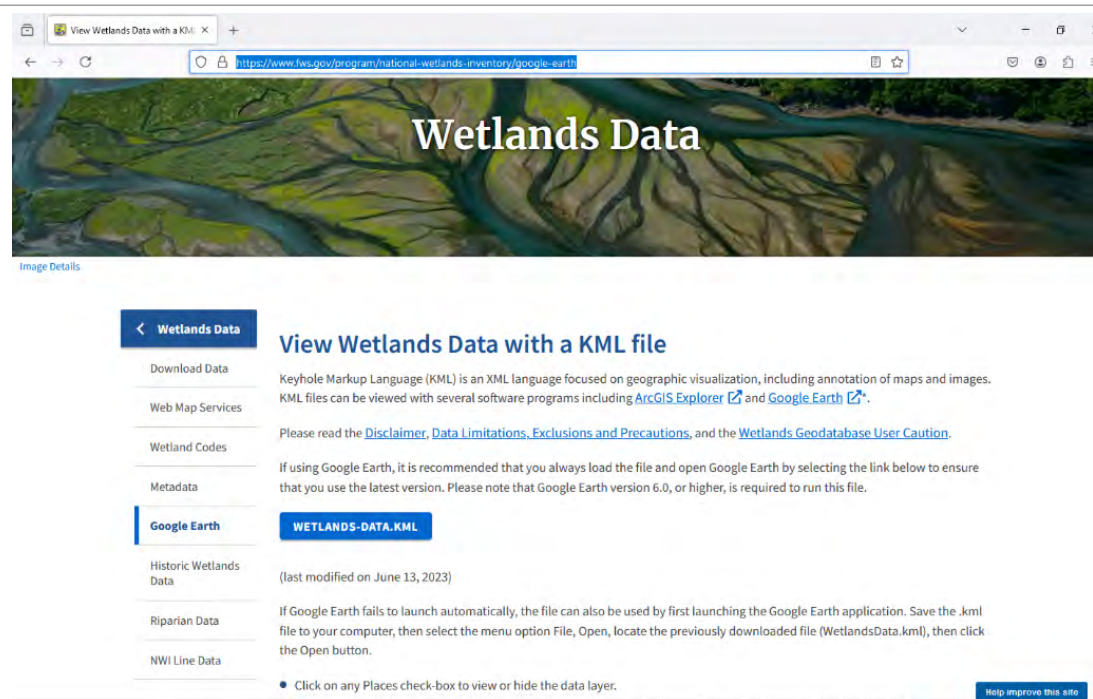
Outline

- ❑ Google Earth Tutorial
 - ❑ Delineate Wetland Boundary
 - ❑ Generate Random Point
 - ❑ Create AA
 - ❑ Create Buffers
 - ❑ Create Buffer Lines
 - ❑ Delineate Watershed
- ❑ Office Preparation and Preliminary Metric Calculation in Google Earth
 - ❑ Mohawk Wetland 3
 - ❑ Mohawk Wetland 4
 - ❑ OTA Liberty Trail 5 (3AAs)

Delineate a Wetland Boundary

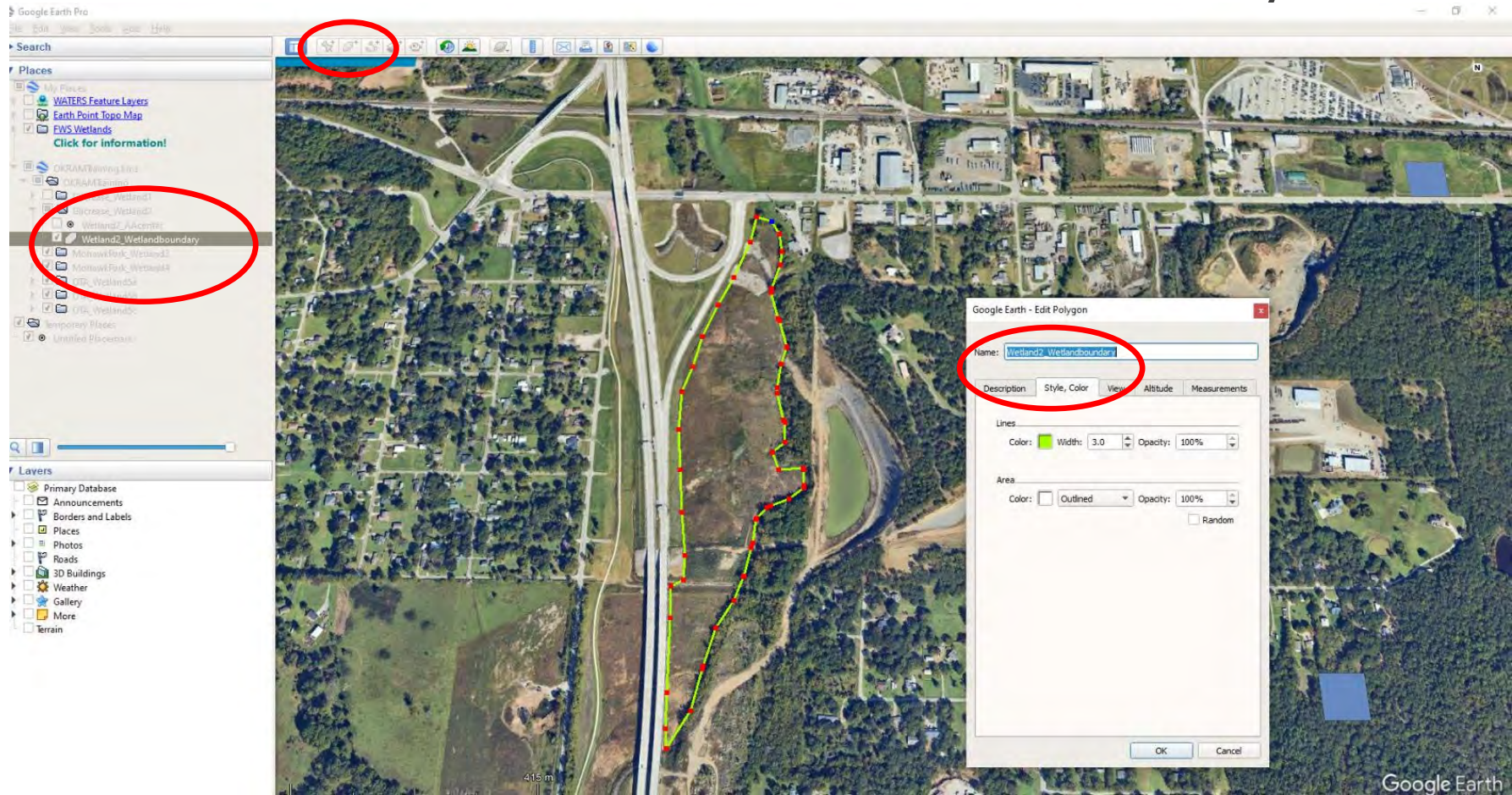
Download National Wetlands Inventory KML for use in Google Earth

<https://www.fws.gov/program/national-wetlands-inventory/google-earth>

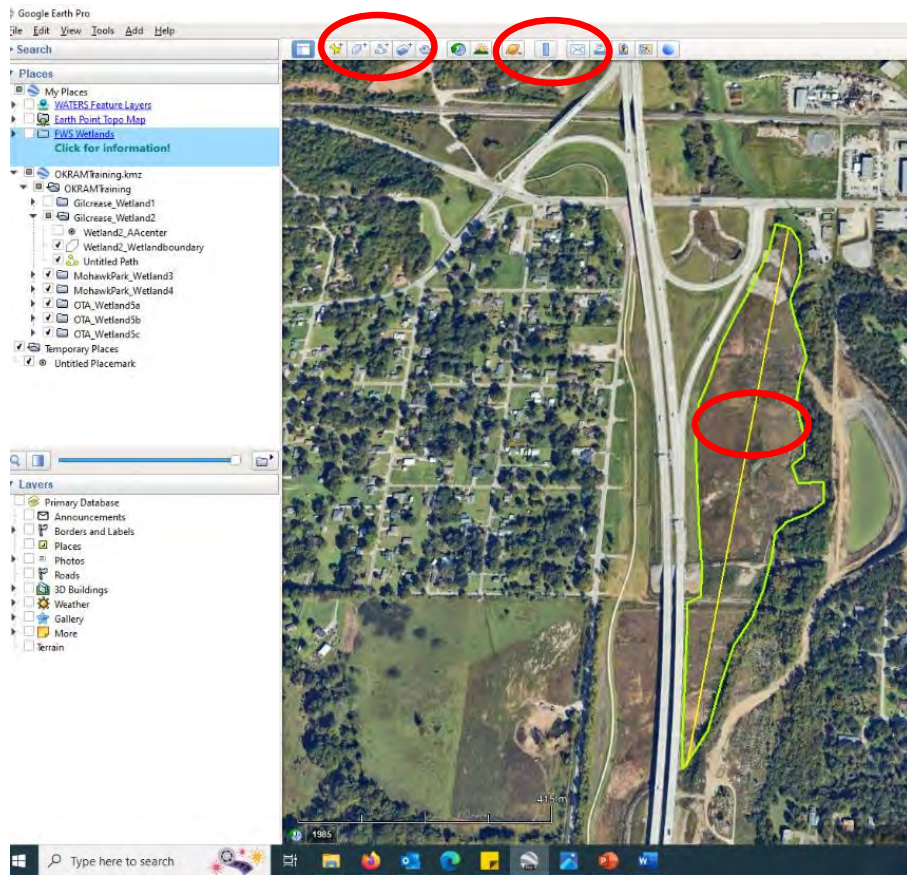


The screenshot shows a web browser window displaying the National Wetlands Inventory page for Google Earth. The browser address bar shows the URL: <https://www.fws.gov/program/national-wetlands-inventory/google-earth>. The main content area features a large image of a wetland landscape with the text "Wetlands Data" overlaid. Below the image is a navigation menu with the following items: "Wetlands Data" (selected), "Download Data", "Web Map Services", "Wetland Codes", "Metadata", "Google Earth" (selected), "Historic Wetlands Data", "Riparian Data", and "NWII Line Data". The "Google Earth" section is expanded, showing a button labeled "WETLANDS-DATA.KML" and the text "(last modified on June 13, 2023)". Below this, there is a paragraph of instructions: "If Google Earth fails to launch automatically, the file can also be used by first launching the Google Earth application. Save the .kml file to your computer, then select the menu option File, Open, locate the previously downloaded file (WetlandsData.kml), then click the Open button." At the bottom of the page, there is a note: "Click on any Places check-box to view or hide the data layer." and a "Help improve this site" button.

Delineate a Wetland Boundary



Generate a Random Point



https://www.random.org/integers/?num=1&min=403&max=405&col=1&base=10&format=html&rnd=new

Home Games Numbers Lists & More Drawings Web Tools Statistics Testimonials Learn More Login

Search RANDOM.ORG Search

True Random Number Service

Advisory: We only operate services from the RANDOM.ORG domain. Other sites that claim to be operated by us are impostors. If in doubt, contact us.

Random Integer Generator

Here are your random numbers:

484

Timestamp: 2024-09-06 16:56:53 UTC

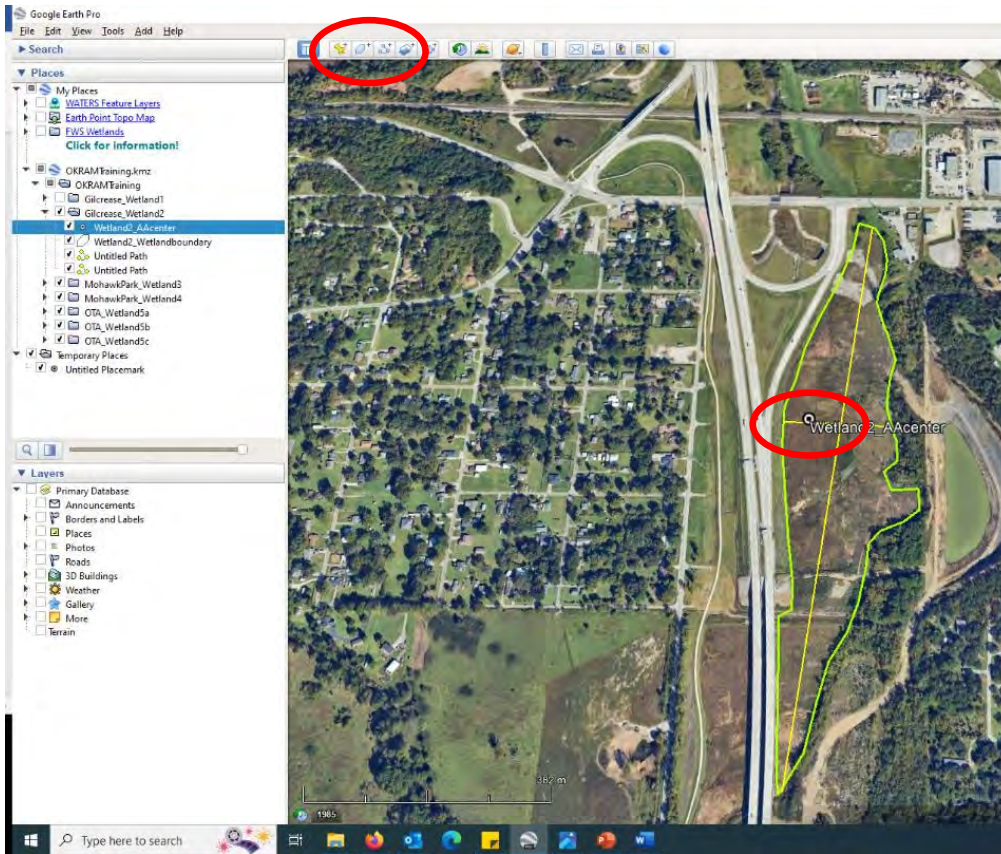
Again! Go Back

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each number can only occur once.

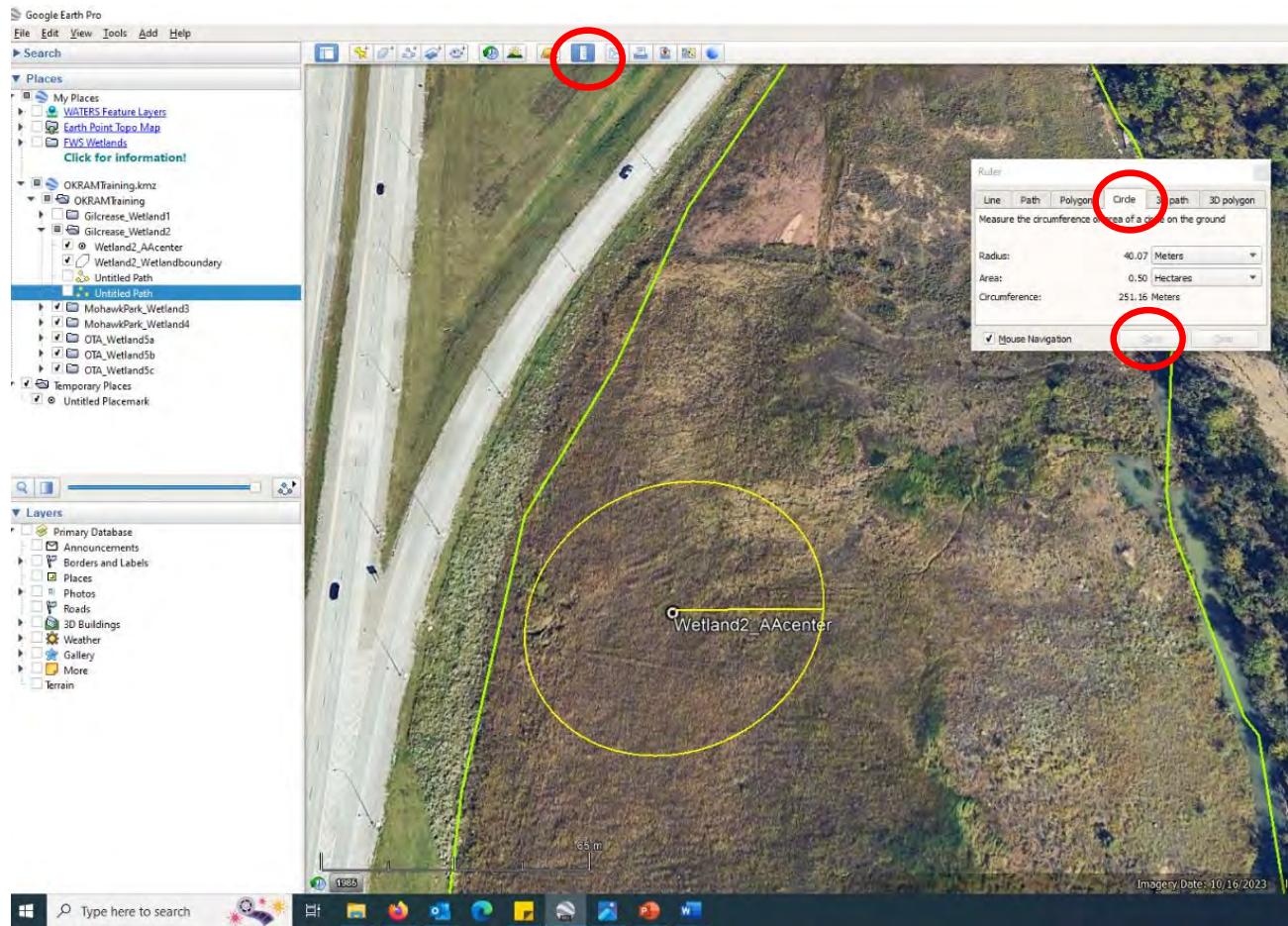
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Generate a Random Point

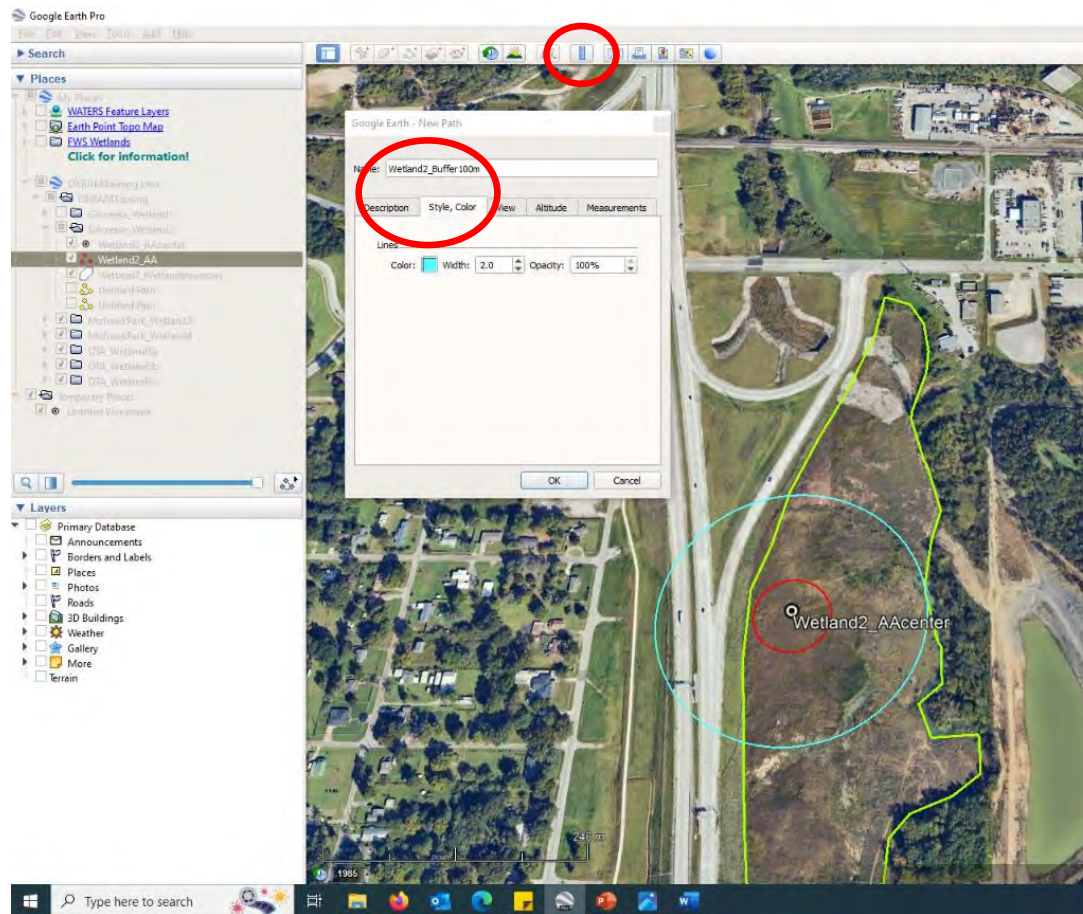


The image shows a screenshot of the RANDOM.ORG website. The browser's address bar displays the URL: `https://www.random.org/integers/?num=1&min=43&max=45&col=1&base=10&format=html&rnd=new`. The page header includes the site name 'RANDOM.ORG' and the tagline 'True Random Number Service'. A navigation menu contains links for Home, Games, Numbers, Lists & More, Drawings, Web Tools, Statistics, Testimonials, Learn More, and Login. A search bar is also present. A yellow advisory banner states: 'Advisory: We only operate services from the RANDOM.ORG domain. Other sites that claim to be operated by us are impostors. If in doubt, contact us.' The main heading is 'Random Integer Generator'. Below it, the text 'Here are your random numbers:' is followed by the number '45', which is circled in red. The timestamp 'Timestamp: 2024-09-06 17:01:12 UTC' is shown. At the bottom, there are 'Again!' and 'Go Back' buttons. The footer contains copyright information: '© 1998-2024 RANDOM.ORG' and links for 'Follow us: Twitter | Mastodon', 'Terms and Conditions', and 'About Us'.

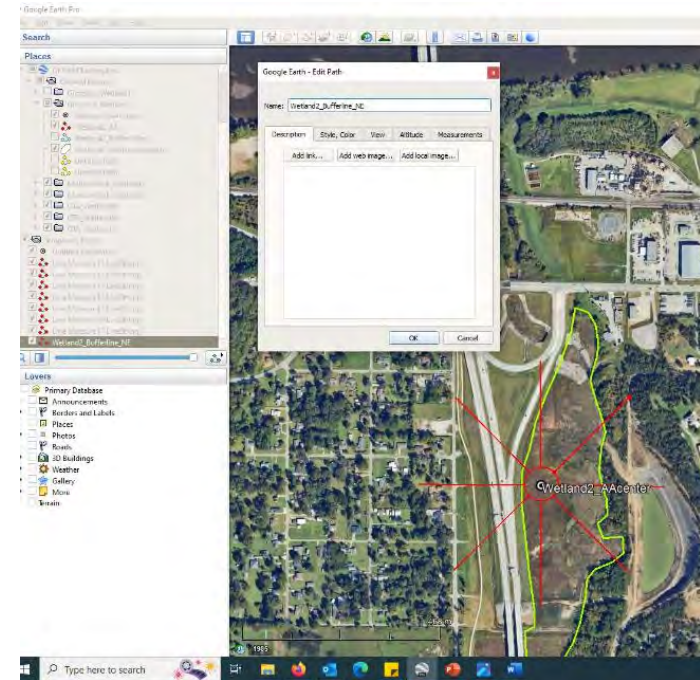
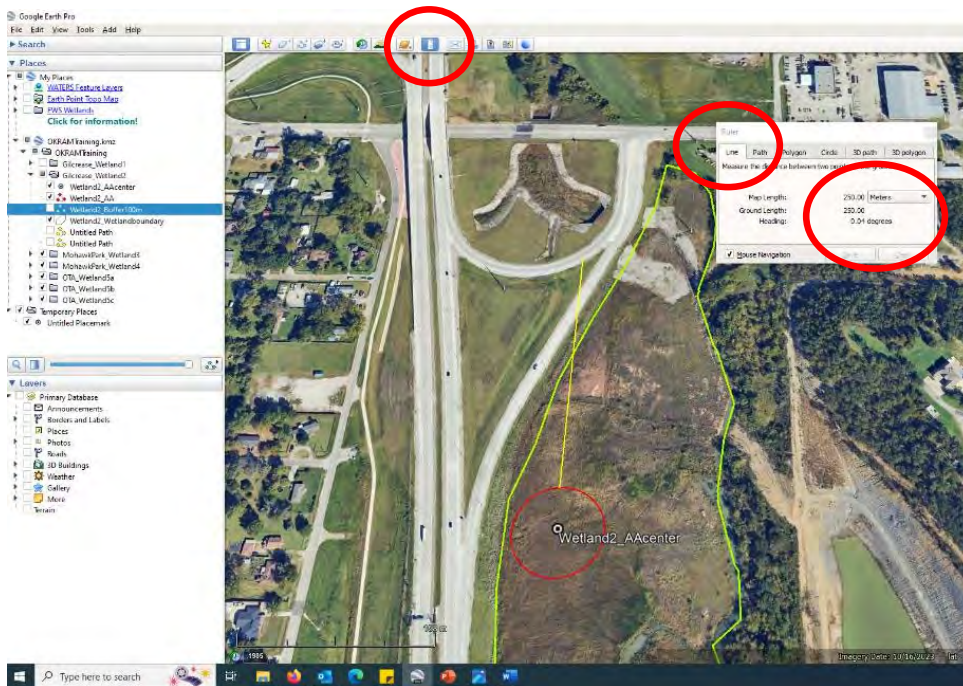
Create an AA



Create Buffers

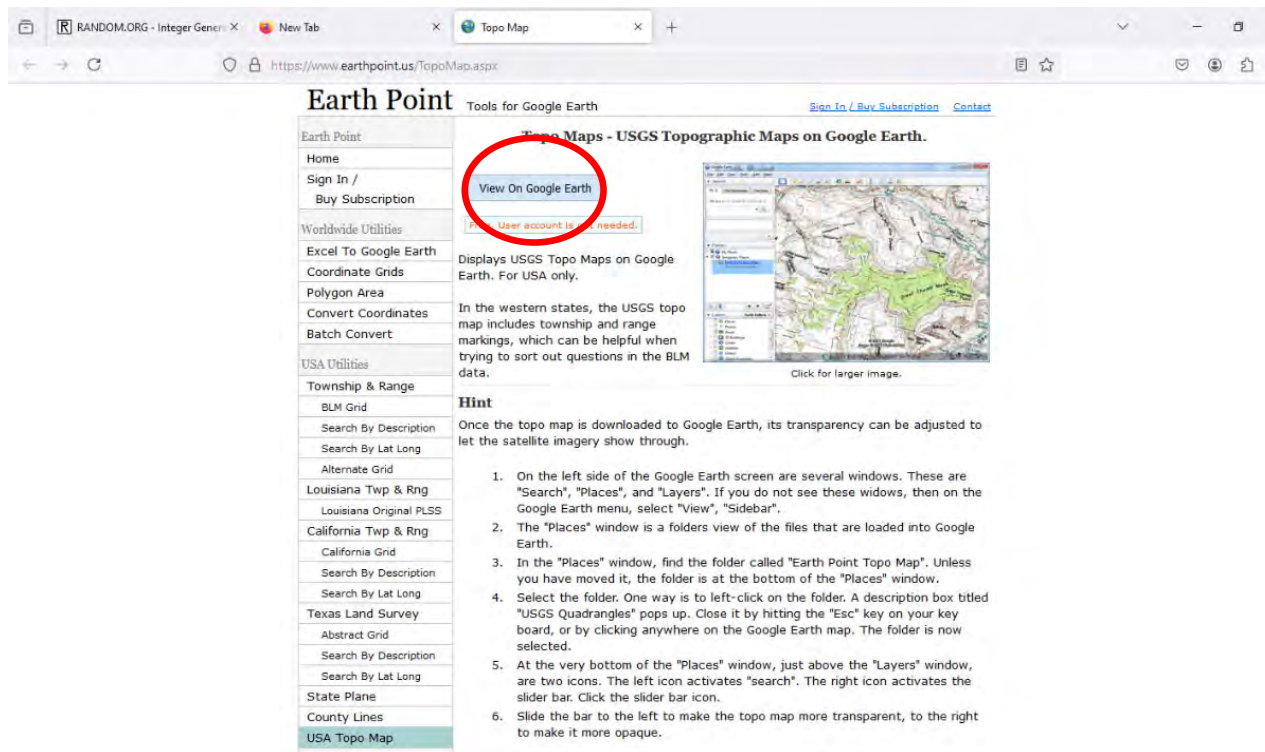


Create Buffer Lines



Delineate Watershed

Download USGS topo maps from: <https://www.earthpoint.us/TopoMap.aspx>



The screenshot shows a web browser window with the URL <https://www.earthpoint.us/TopoMap.aspx>. The page title is "Earth Point Tools for Google Earth". A navigation menu on the left includes "Home", "Sign In / Buy Subscription", "Worldwide Utilities", "USA Utilities", and "USA Topo Map" (which is highlighted). The main content area is titled "Topo Maps - USGS Topographic Maps on Google Earth." and features a "View On Google Earth" button circled in red. Below the button is a "Hint" section with a numbered list of instructions for using the maps in Google Earth. To the right of the text is a small inset image of a Google Earth interface showing a topographic map overlay.

Earth Point Tools for Google Earth [Sign In / Buy Subscription](#) [Contact](#)

Topo Maps - USGS Topographic Maps on Google Earth.

[View On Google Earth](#)

User account is not needed.

Displays USGS Topo Maps on Google Earth. For USA only.

In the western states, the USGS topo map includes township and range markings, which can be helpful when trying to sort out questions in the BLM data.

Hint

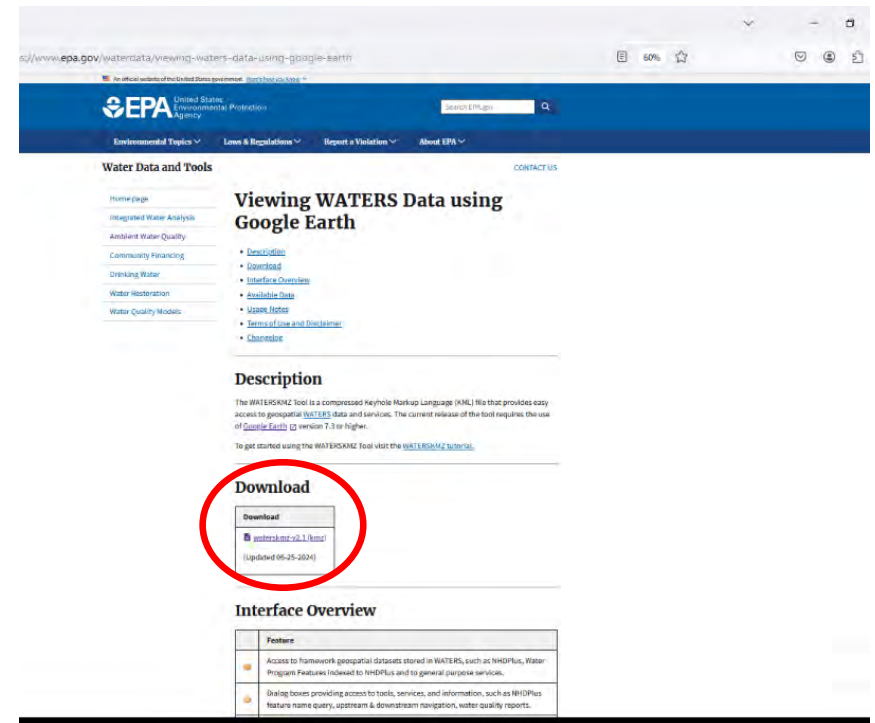
Once the topo map is downloaded to Google Earth, its transparency can be adjusted to let the satellite imagery show through.

1. On the left side of the Google Earth screen are several windows. These are "Search", "Places", and "Layers". If you do not see these windows, then on the Google Earth menu, select "View", "Sidebar".
2. The "Places" window is a folders view of the files that are loaded into Google Earth.
3. In the "Places" window, find the folder called "Earth Point Topo Map". Unless you have moved it, the folder is at the bottom of the "Places" window.
4. Select the folder. One way is to left-click on the folder. A description box titled "USGS Quadrangles" pops up. Close it by hitting the "Esc" key on your key board, or by clicking anywhere on the Google Earth map. The folder is now selected.
5. At the very bottom of the "Places" window, just above the "Layers" window, are two icons. The left icon activates "search". The right icon activates the slider bar. Click the slider bar icon.
6. Slide the bar to the left to make the topo map more transparent, to the right to make it more opaque.



Delineate Watershed

□ Download Waters data here:

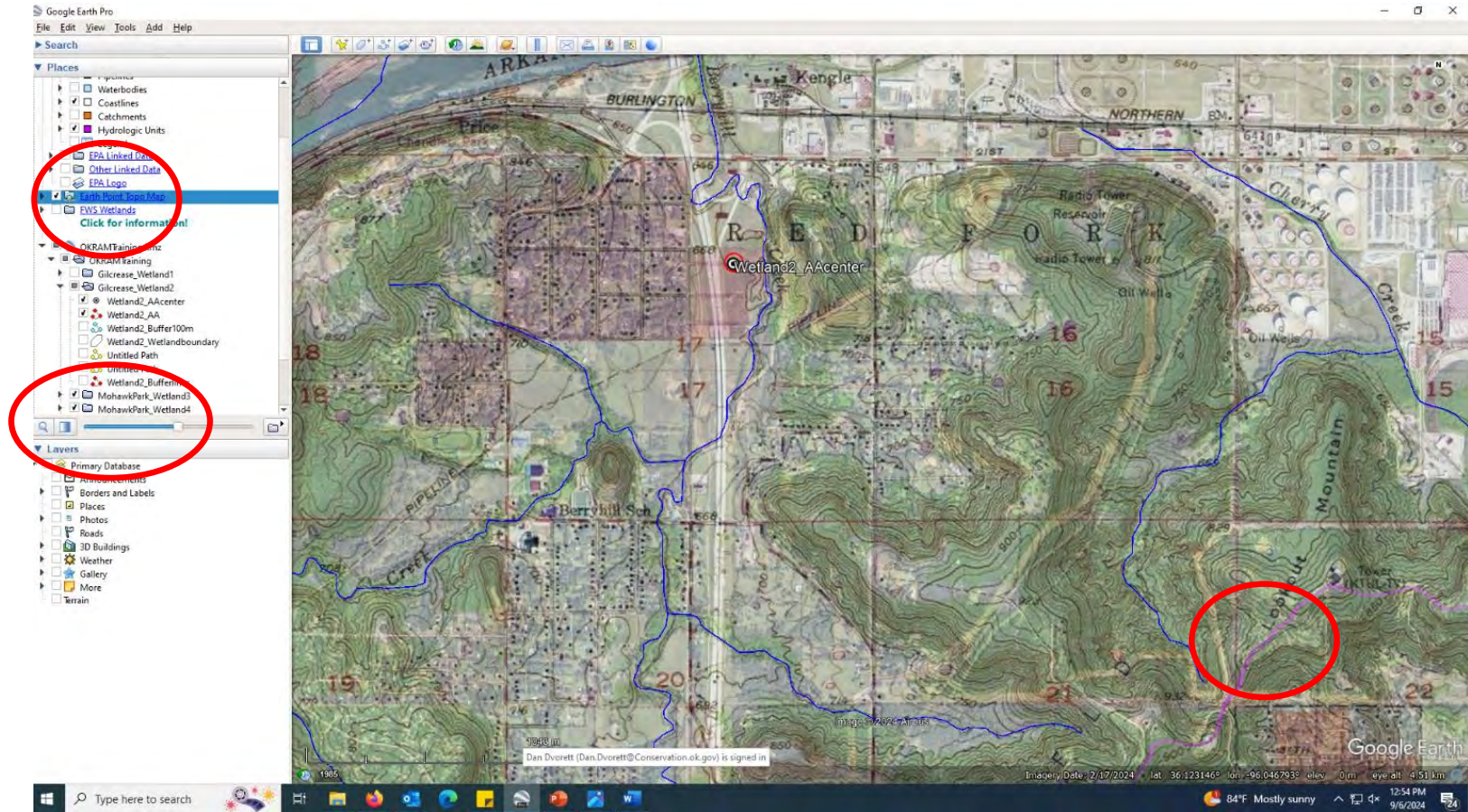
<https://www.epa.gov/waterdata/viewing-waters-data-using-google-earth>



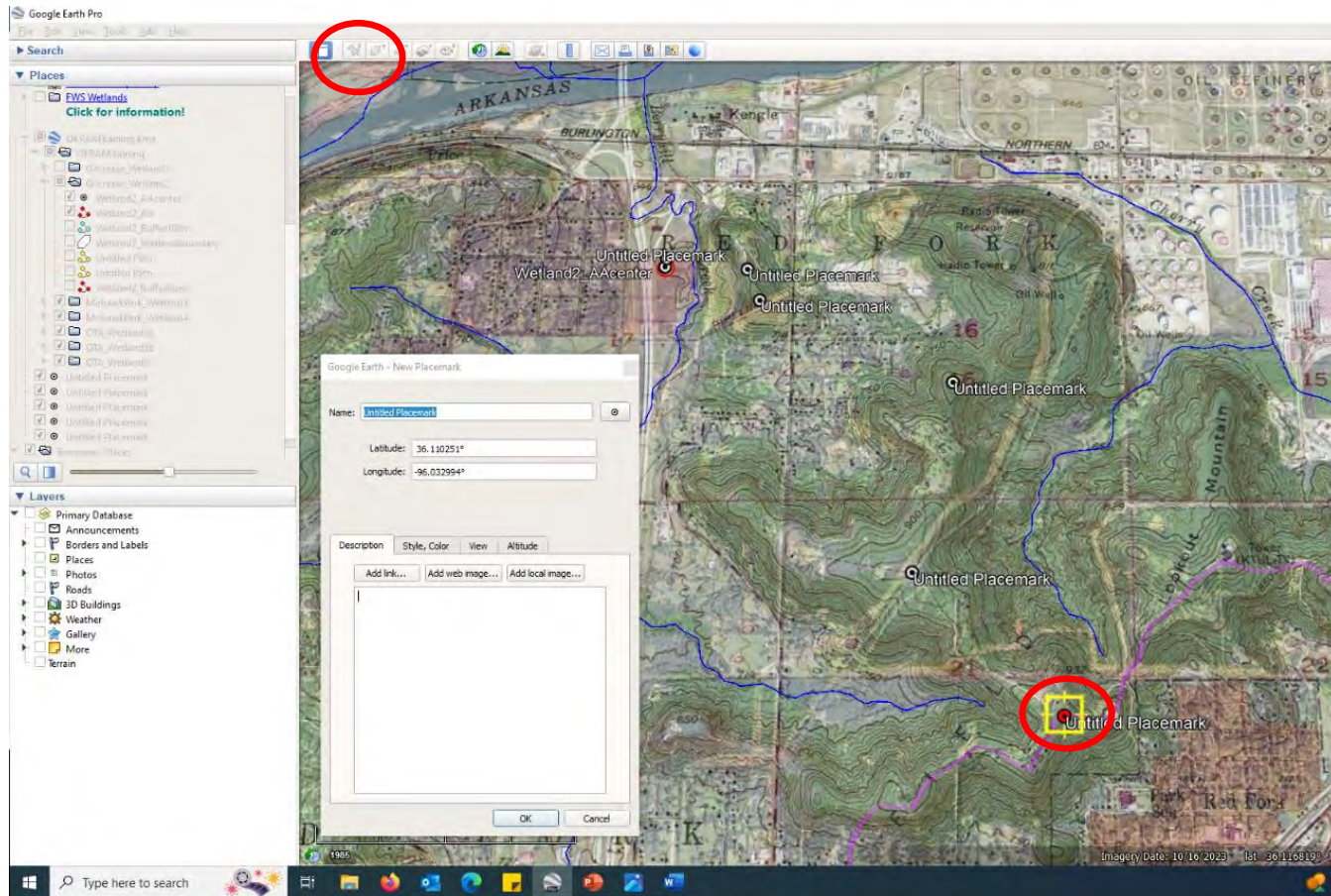
The screenshot shows the EPA website page for 'Viewing WATERS Data using Google Earth'. The page is titled 'Viewing WATERS Data using Google Earth' and includes a navigation menu with options like 'Home Page', 'Integrated Water Analysis', 'Ambient Water Quality', 'Community Financing', 'Drinking Water', 'Water Restoration', and 'Water Quality Models'. The 'Download' button is circled in red. Below the download button is an 'Interface Overview' table.

Interface Overview	
Feature	
	Access to framework geospatial datasets stored in WATERS, such as NHDRPlus, Water Program Features (inherited to NHDRPlus) and to general purpose services.
	Dialing boxes providing access to tools, services, and information, such as NHDRPlus feature name query, upstream & downstream navigation, water quality reports.

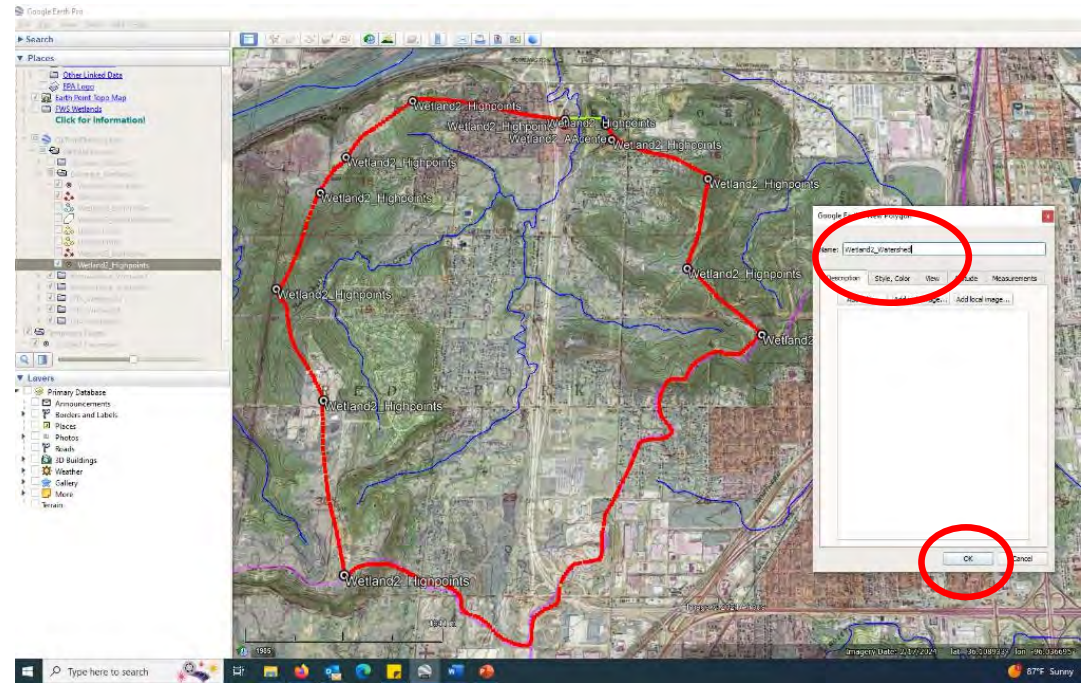
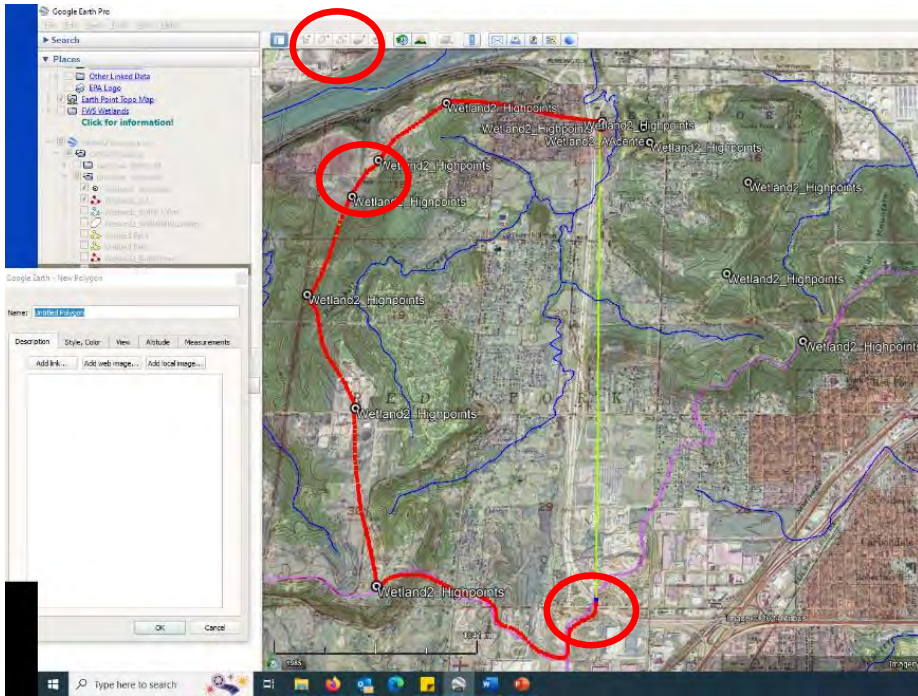
Delineate Watershed



Delineate Watershed



Delineate Watershed

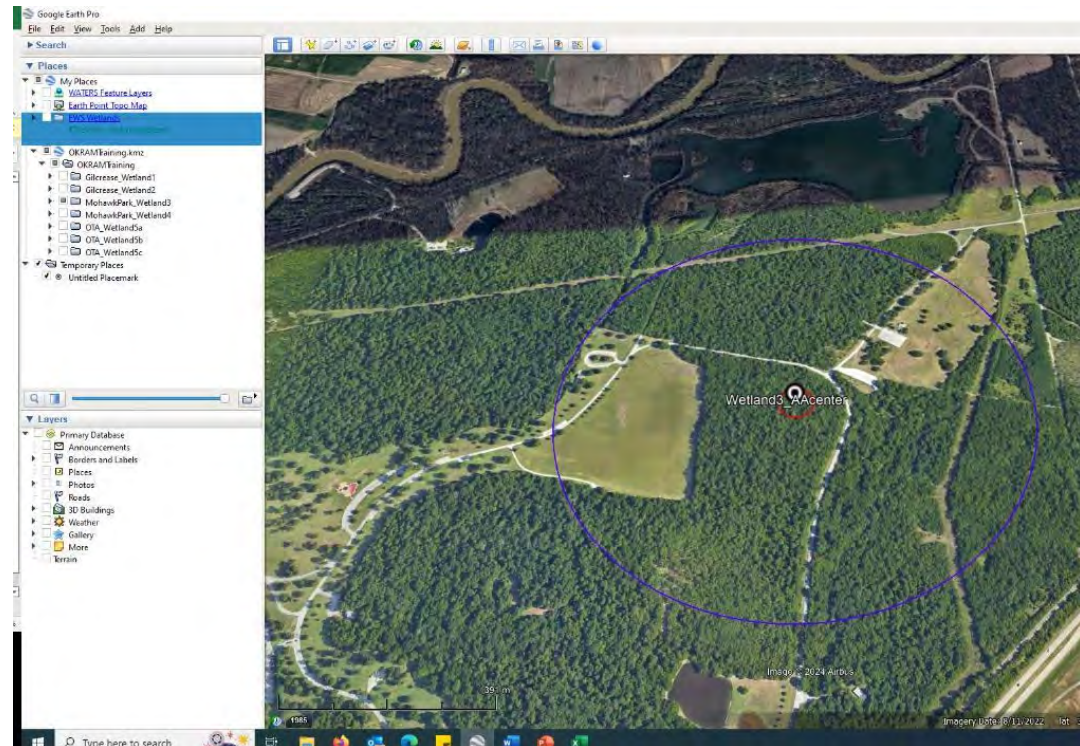


Outline

- ❑ Google Earth Tutorial
 - ❑ Delineate Wetland Boundary
 - ❑ Generate Random Point
 - ❑ Create AA
 - ❑ Create Buffers
 - ❑ Create Buffer Lines
 - ❑ Delineate Watershed
- ❑ Office Preparation and Preliminary Metric Calculation in Google Earth
 - ❑ Mohawk Wetland 3
 - ❑ Mohawk Wetland 4
 - ❑ OTA Liberty Trail 5 (3AAs)

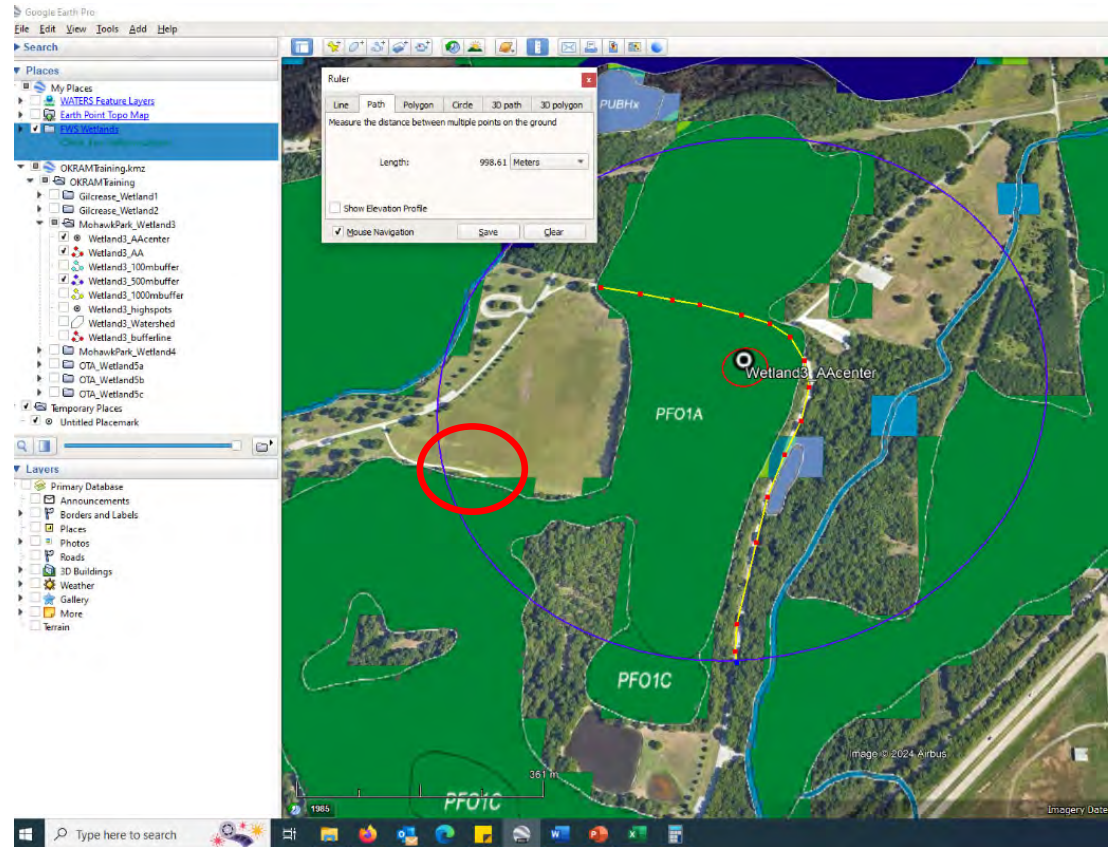
Mohawk3: Hydroperiod

- ❑ No hydroperiod alterations apparent within 500 m

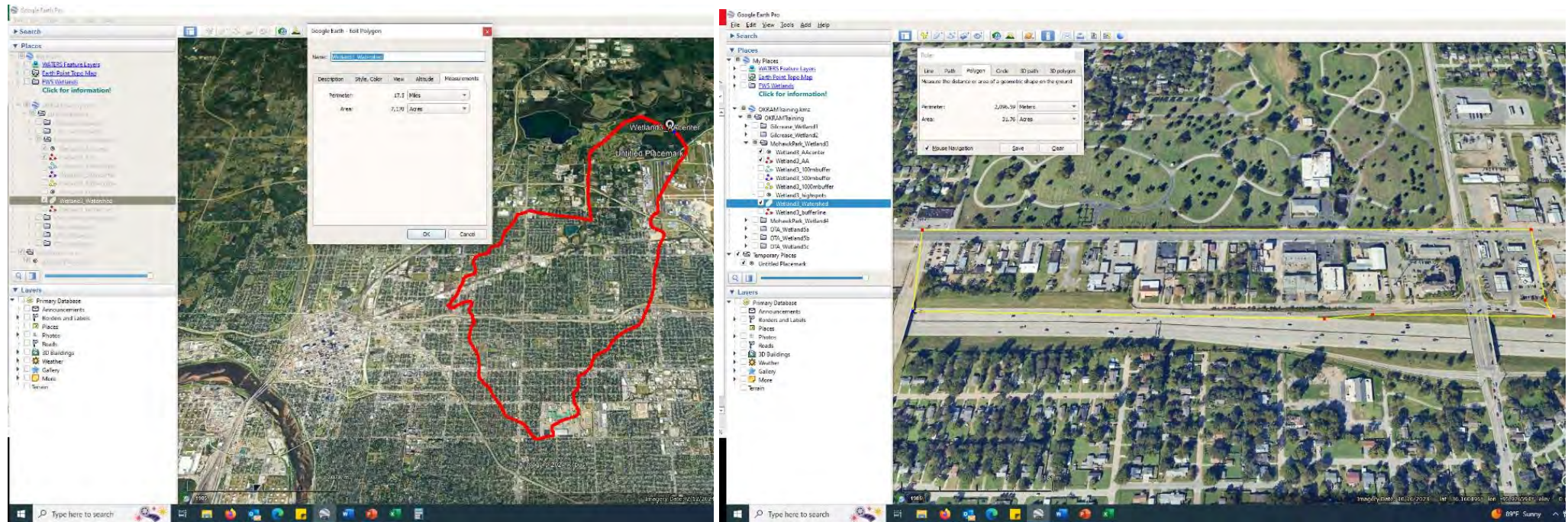


Mohawk3: Hydrologic Connectivity

- ❑ Road Grades = 1050
- ❑ Unimpacted = 1500
- ❑ Connectivity Barriers = 40%



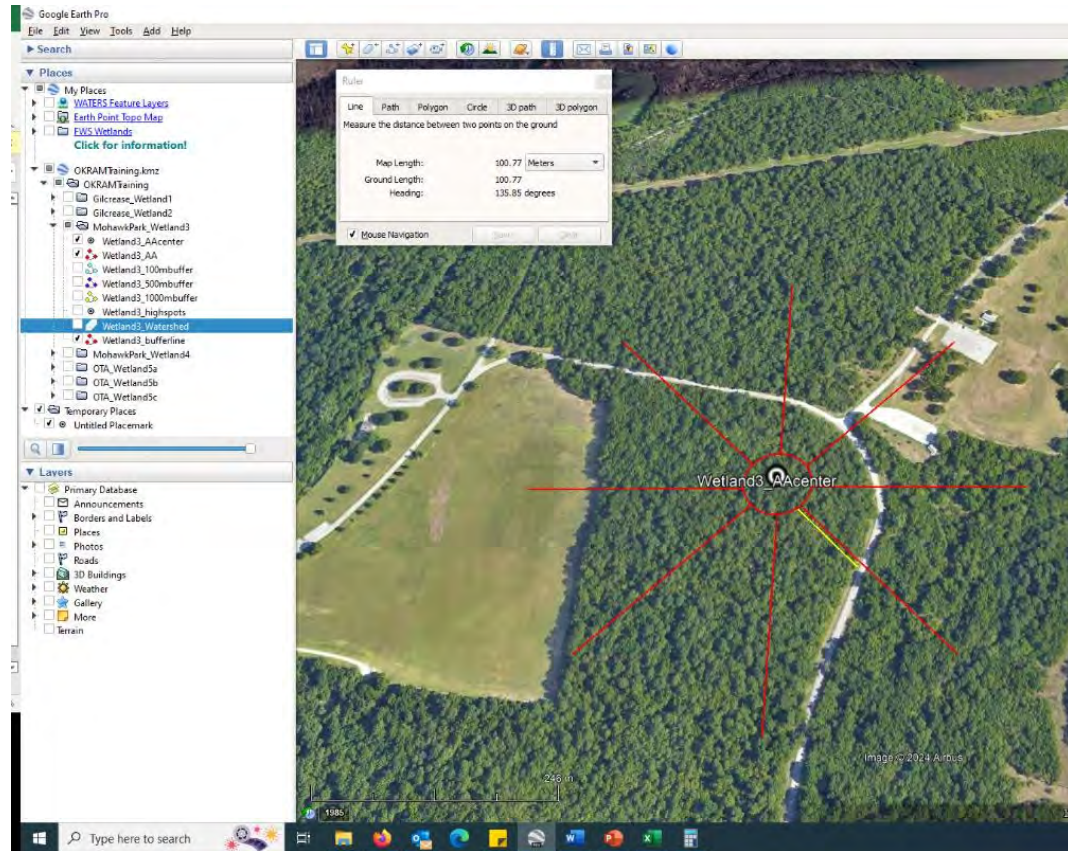
Mohawk3: Water Source



- ❑ Downstream impoundment within 500 meters
- ❑ Watershed = 7,100 acres, Impervious = 3,200 acres (45%), impounded water = 30 acres (1%)

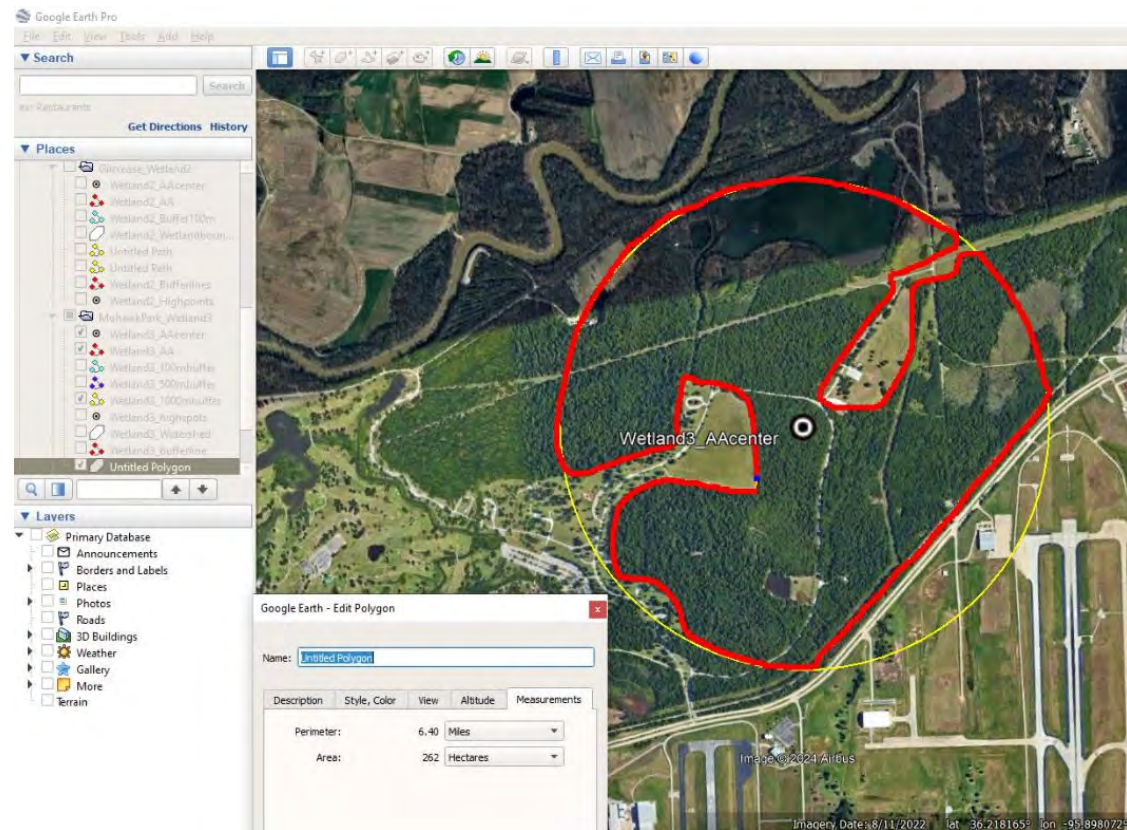
Mohawk3: Buffer Filter

- ❑ No impacts at relevant distances along any transects



Mohawk3: Habitat Connectivity

- ❑ 262 connected natural hectares
- ❑ 339 total hectares

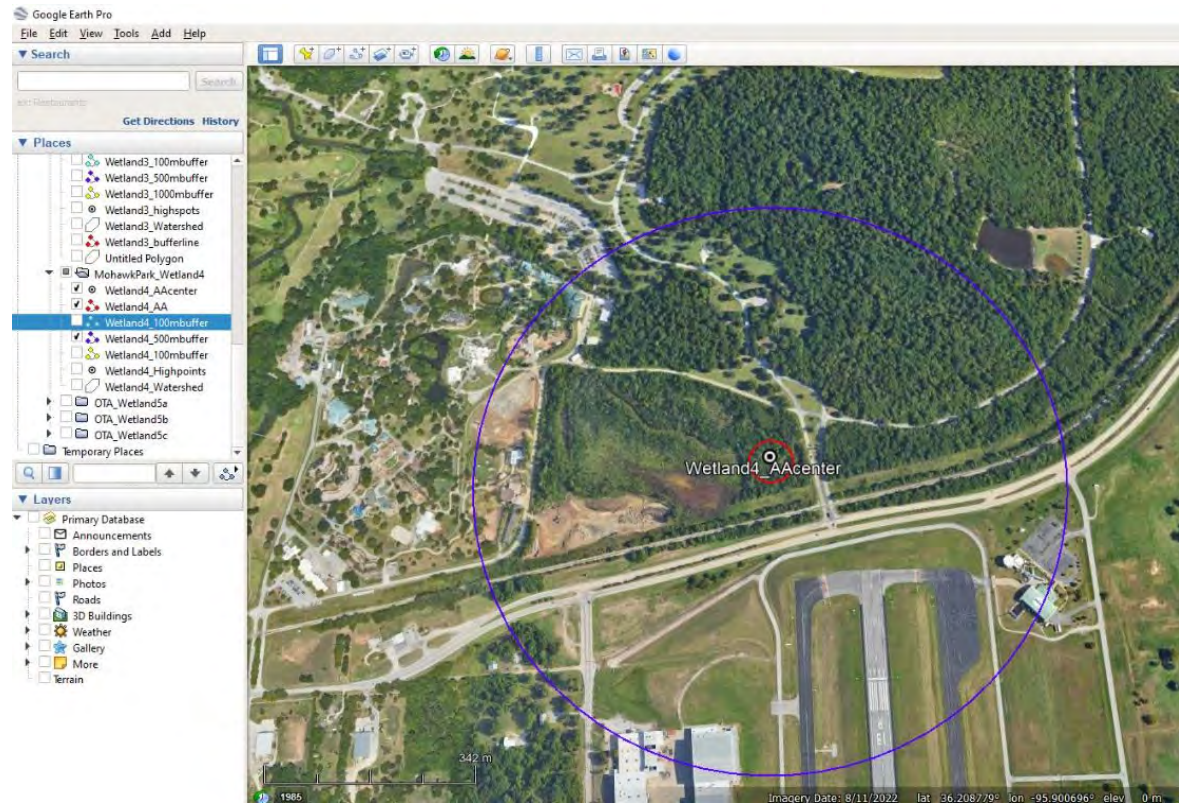


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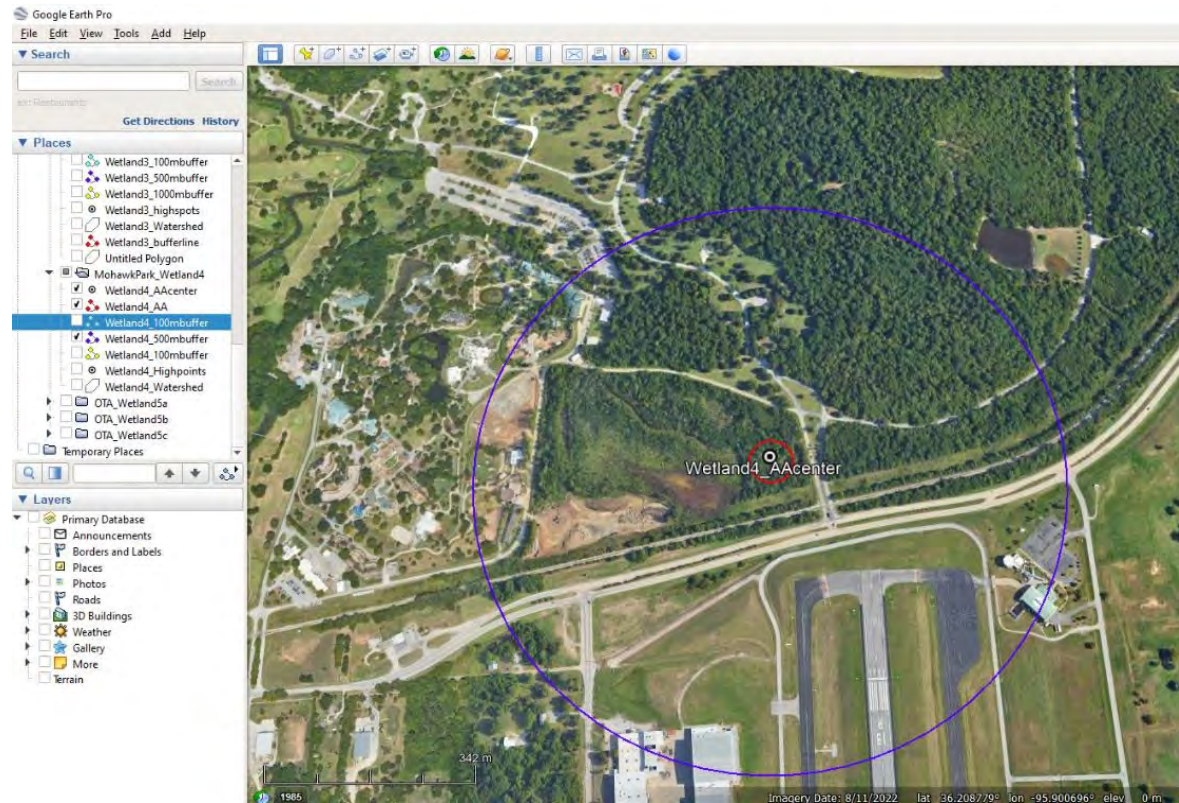
Mohawk4: Hydroperiod

- ❑ No hydroperiod alterations apparent within 500 m



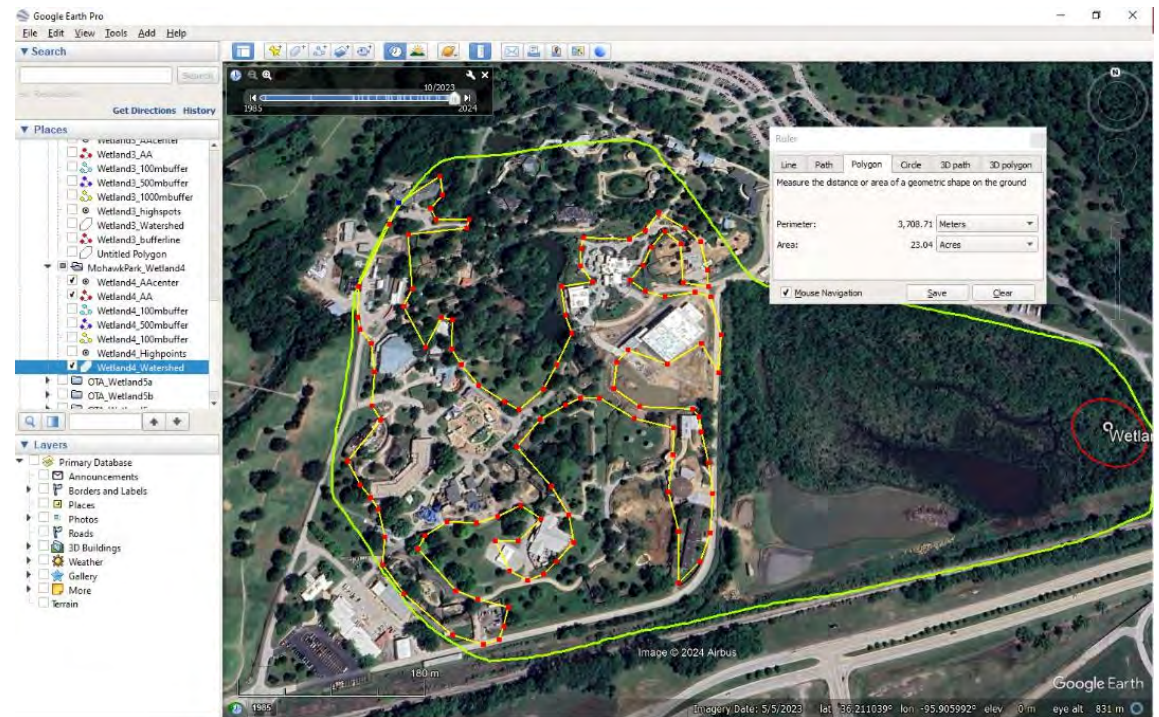
Mohawk4: Hydrologic Connectivity

- ❑ Wetland entirely surrounded by road and railroad grades



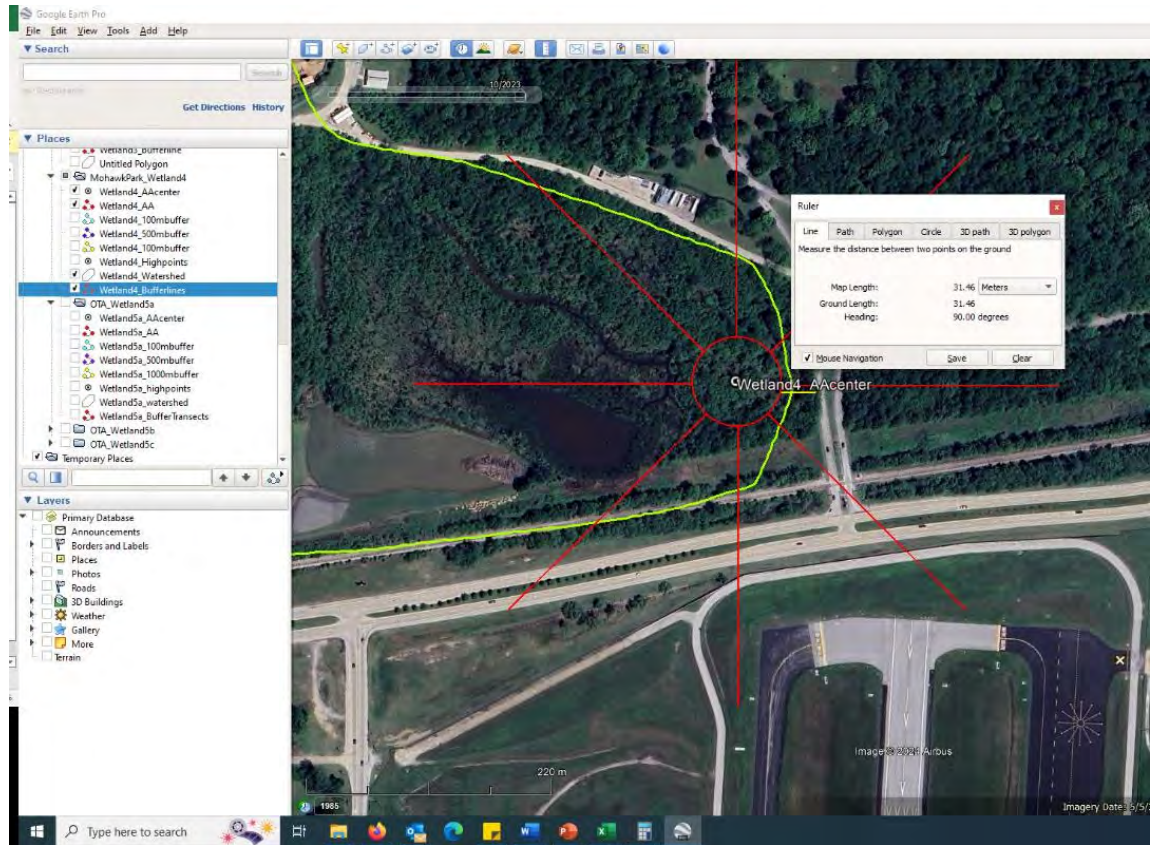
Mohawk4: Water Source

- ❑ Watershed = 100 acres,
- ❑ impervious surface = 25 acres (25%)
- ❑ Impounded water = 5 acres (5%)



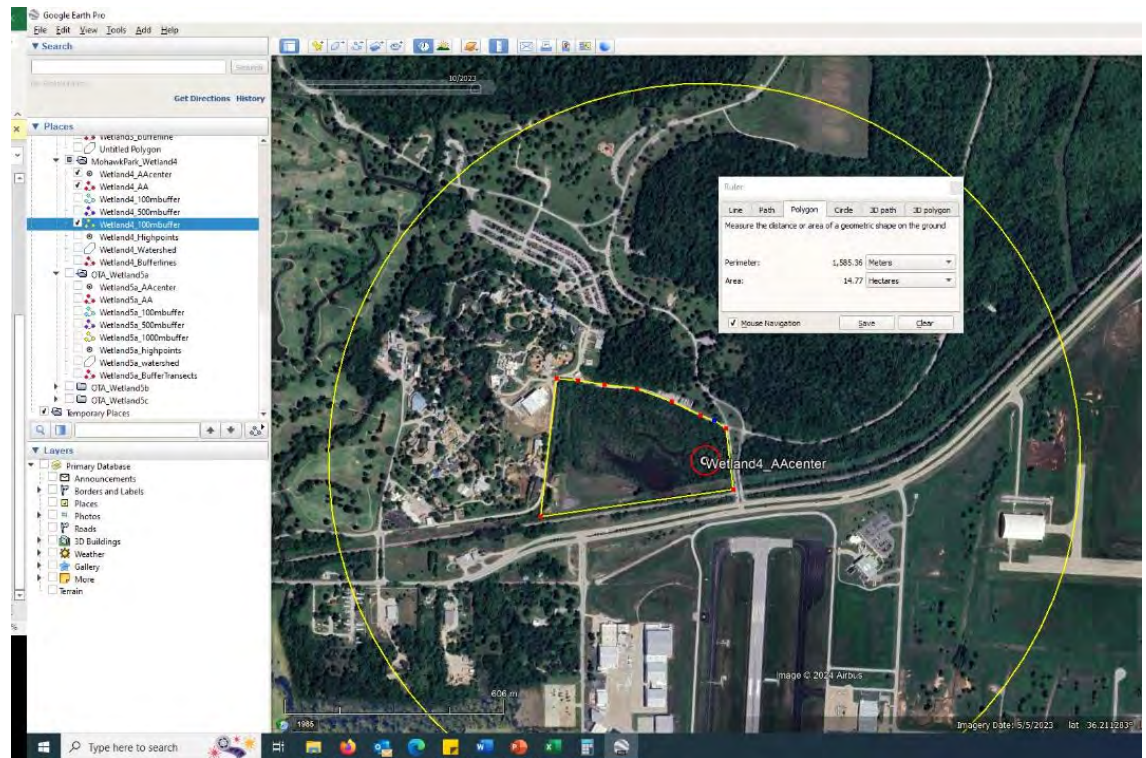
Mohawk4: Buffer Filter

- ❑ S buffer 20 meters until mowed right of way
- ❑ All other buffers are intact



Mohawk4: Habitat Connectivity

- ❑ 15 connected natural hectares
- ❑ 339 total hectares

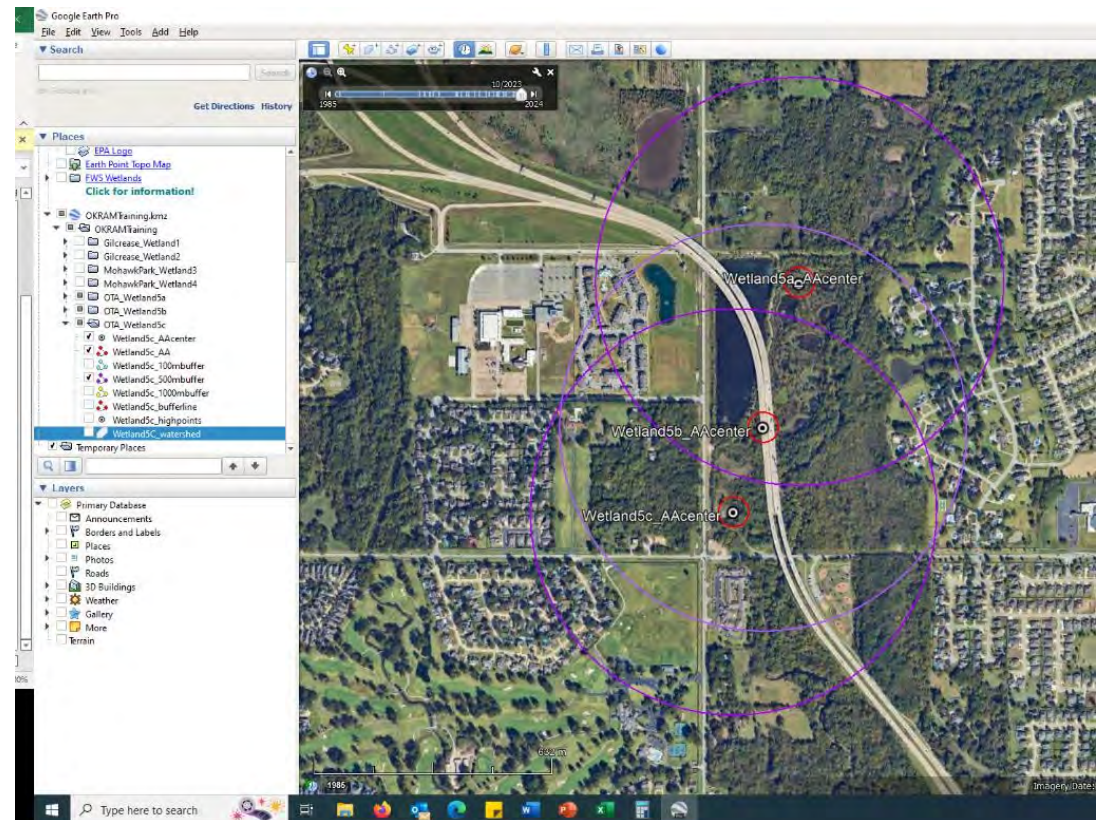


Outline

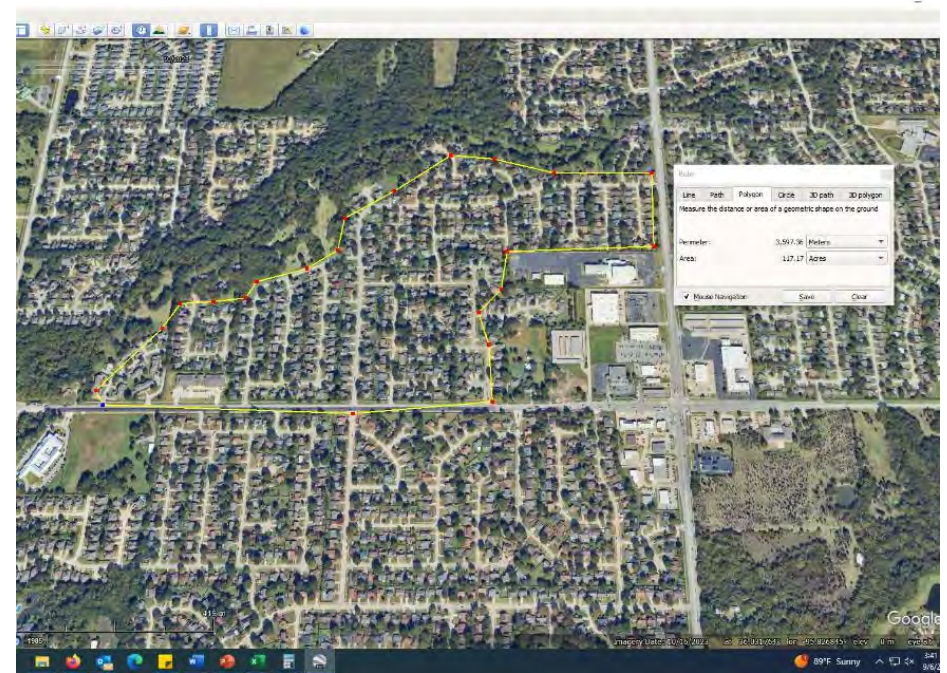
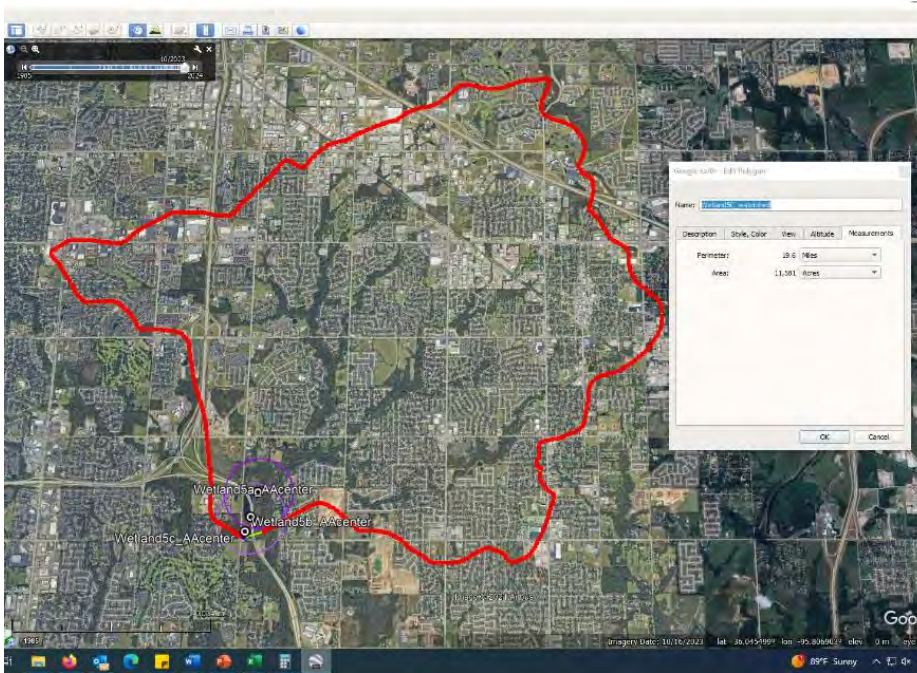
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OTA5a-c: Hydroperiod

- ❑ No hydroperiod alterations apparent within 500 m of AA's a and c
- ❑ Turnpike serves as a minor hydroperiod alteration for AA b.



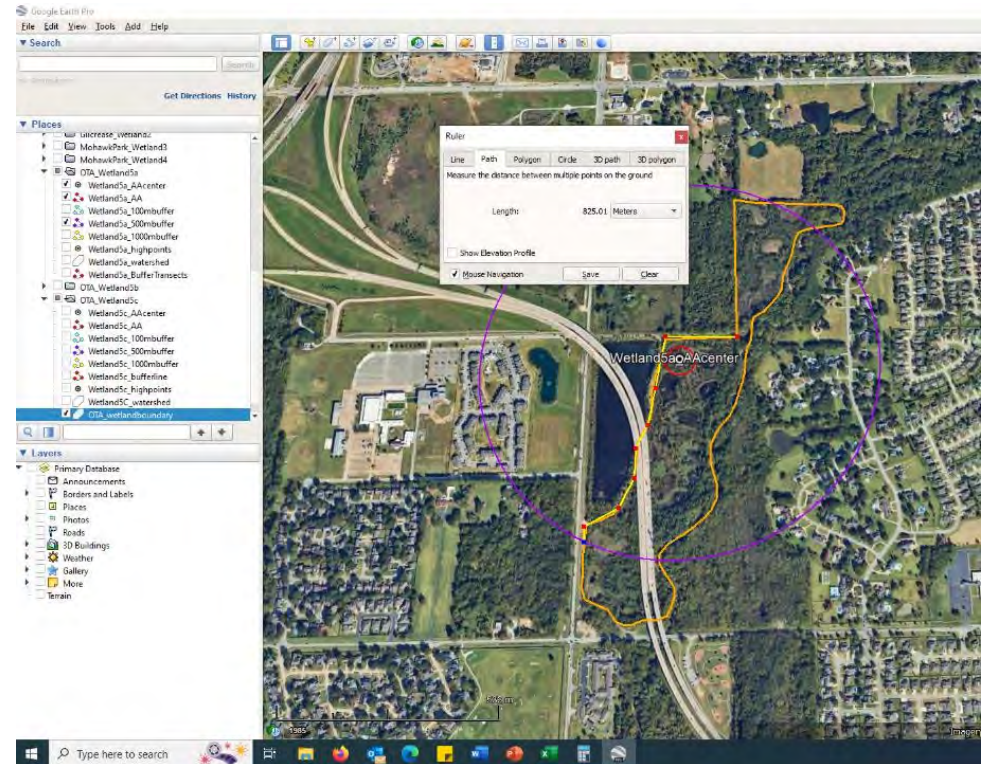
OTA5a-c: Water Source



- ❑ Watershed = 11,500 acres, Impervious = 6,000 acres (52%), impounded water = 50 acres (1%), dryland agriculture = 50 acres (1%)

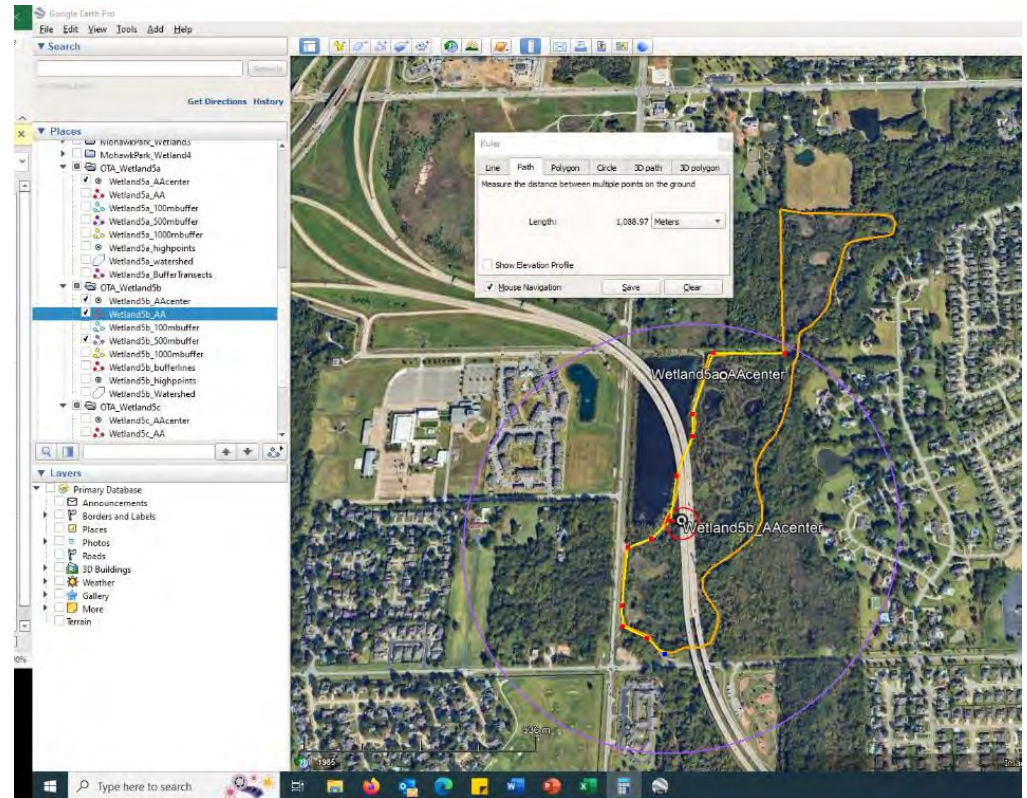
OTA5a: Hydrologic Connectivity

- ❑ Road Grades = 850
- ❑ Unimpacted = 1950
- ❑ Connectivity Barriers = 30%



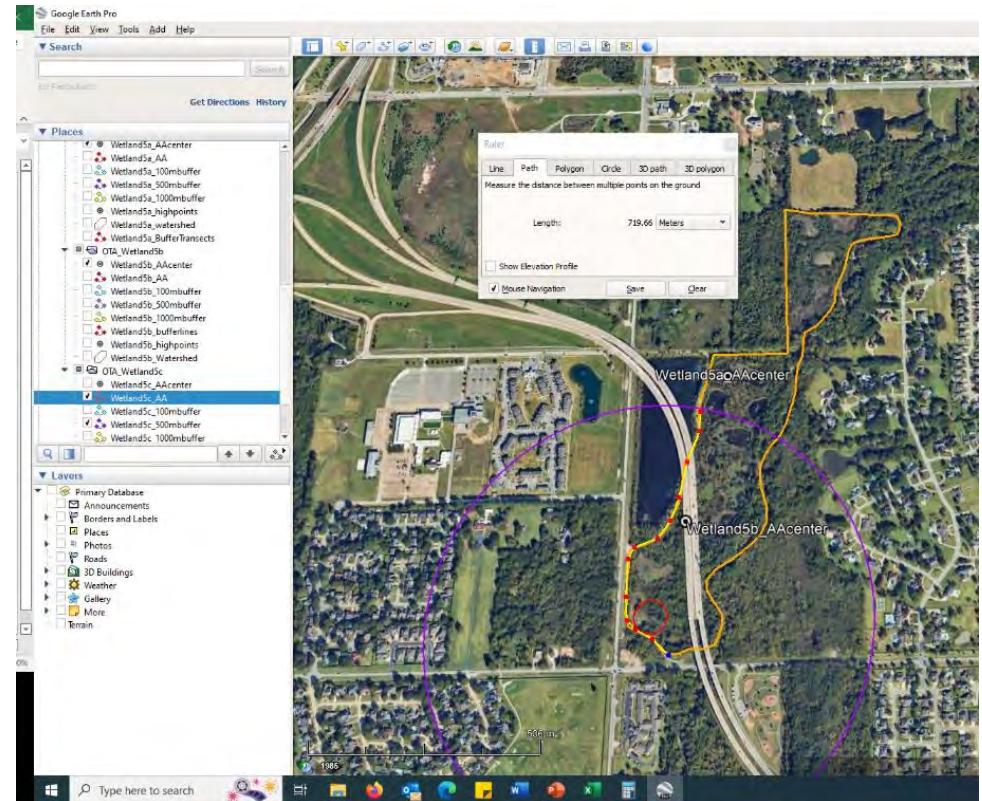
OTA5b: Hydrologic Connectivity

- ❑ Road Grades = 1100
- ❑ Unimpacted = 900
- ❑ Connectivity Barriers = 55%



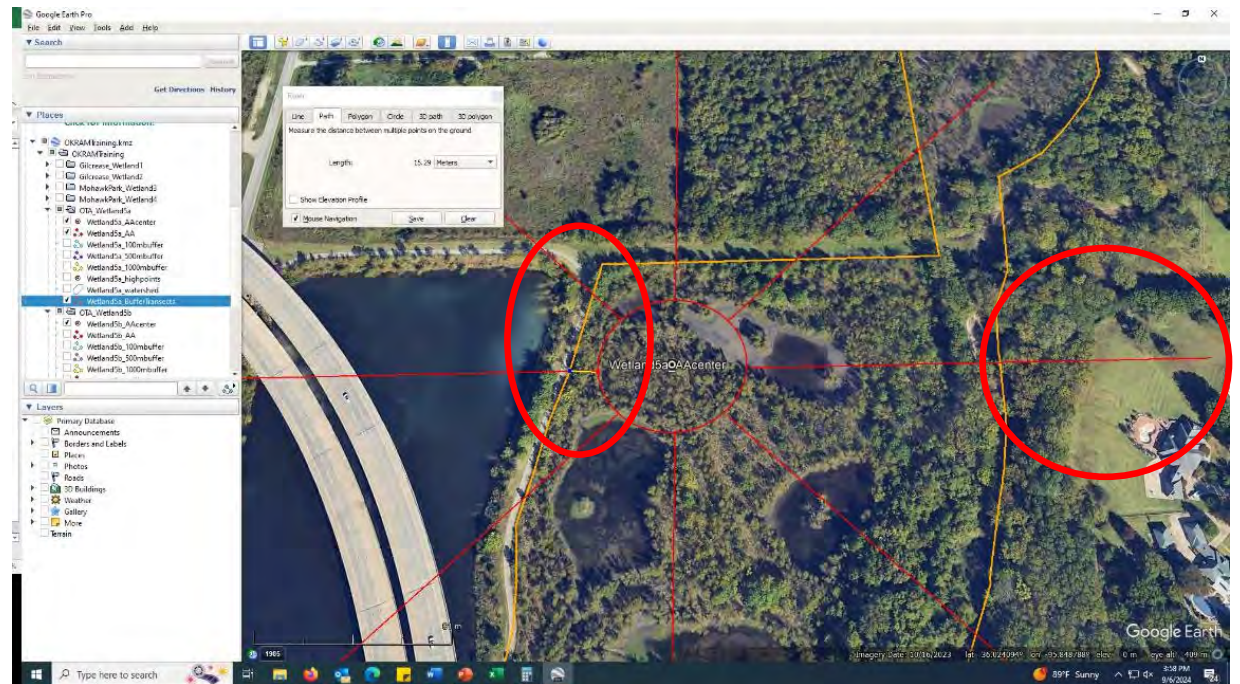
OTA5c: Hydrologic Connectivity

- ❑ Road Grades = 700
- ❑ Unimpacted = 700
- ❑ Connectivity Barriers = 50%



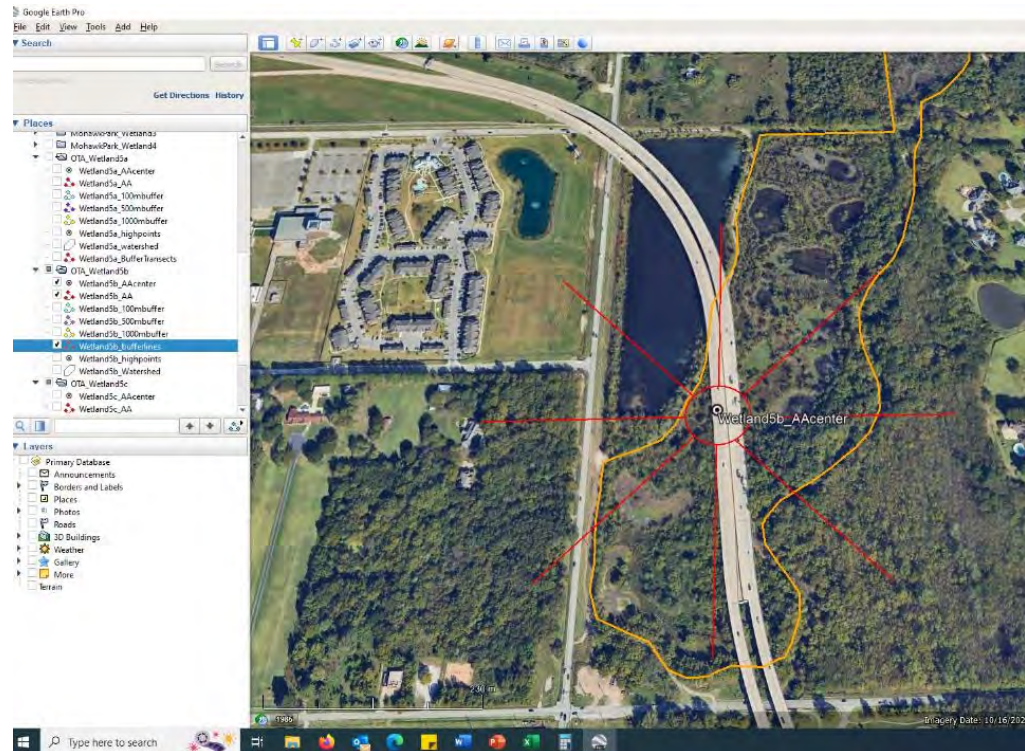
OTA5a: Buffer Filter

- ❑ Transect 3 is 180 m from high impact (urban)
- ❑ Transect 7 is 15 m from low impact (trail)
- ❑ Transect 8 is 25 m from low impact (trail)



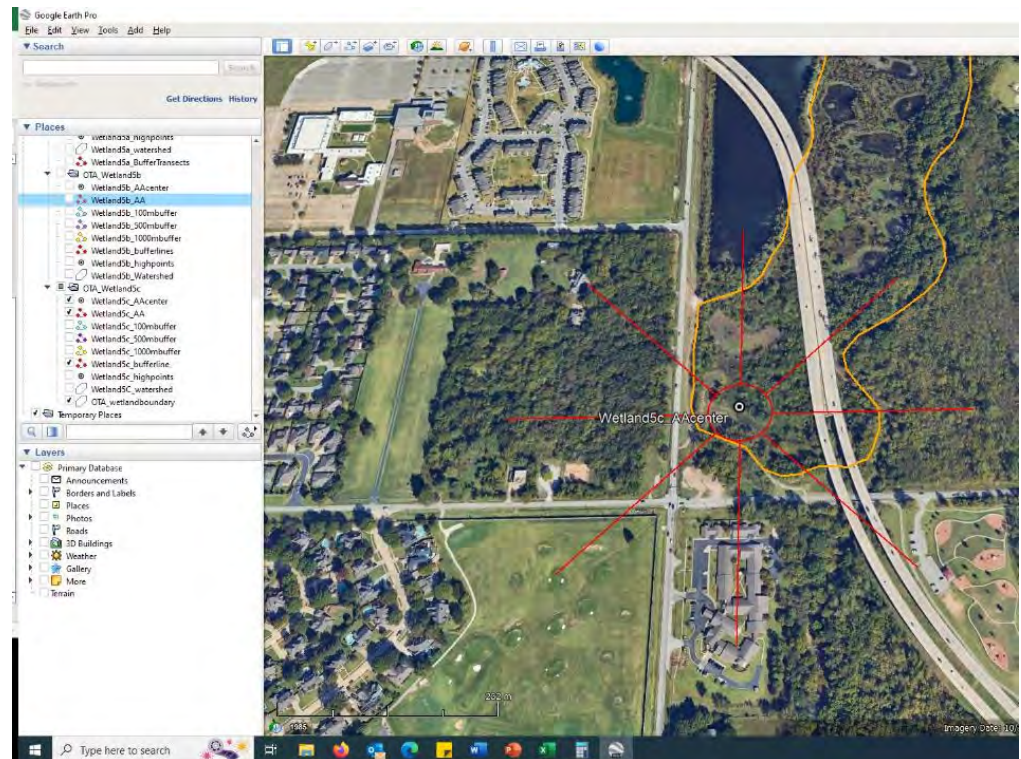
OTA5b: Buffer Filter

- ❑ Transects 1, 4 and 5 are 0 m from low impact (road)
- ❑ Transects 7 and 8 are 5 m from low impact (trail)



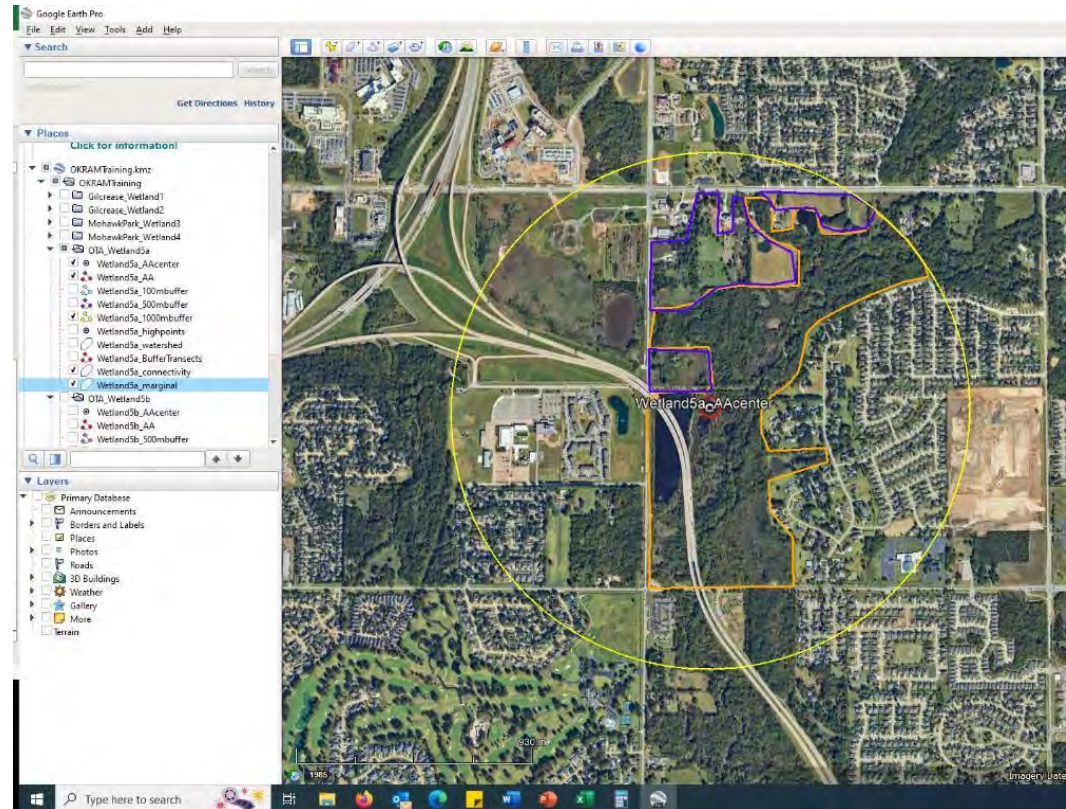
OTA5c: Buffer Filter

- Transect 5 is 5 m from low impact (trail)
- Transects 6 and 7 are 15 m from low impact (trail)



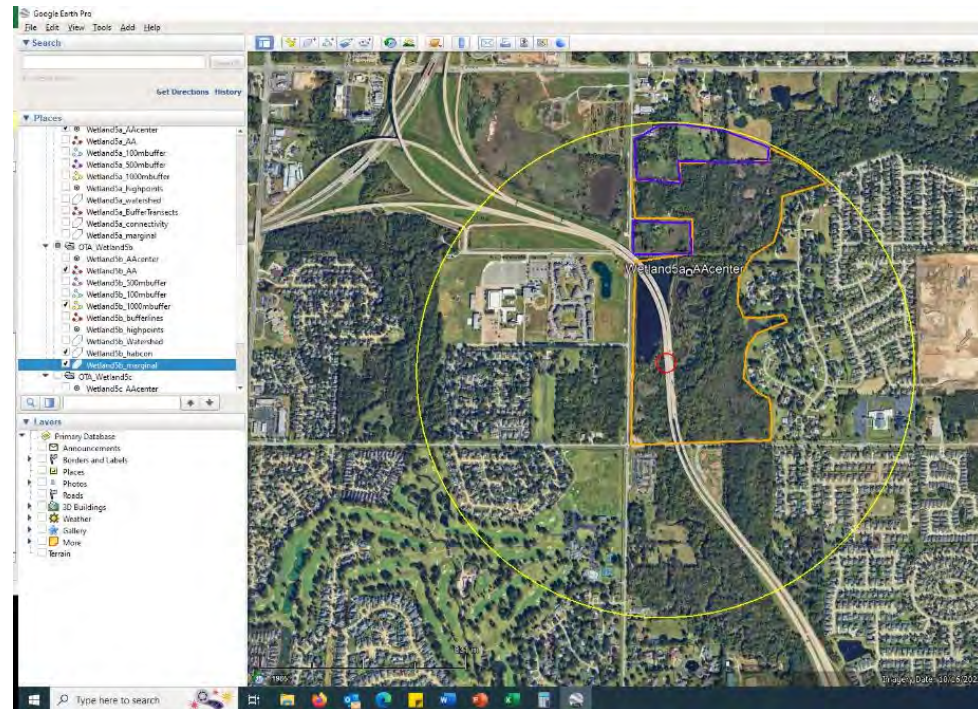
OTA5a: Habitat Connectivity

- ❑ 75 connected natural hectares
- ❑ 95 connected marginal and natural hectares
- ❑ 339 total hectares



OTA5b: Habitat Connectivity

- ❑ 60 connected natural hectares
- ❑ 70 connected marginal and natural hectares
- ❑ 339 total hectares



OTA5c: Habitat Connectivity

- ❑ 55 connected natural hectares
- ❑ 60 connected marginal and natural hectares
- ❑ 339 total hectares

