

Oklahoma Rapid
Assessment
Method
for Wetlands
(OKRAM)
Background



Schedule

Day 1 (9/17/2024):

7:30 – 8:30 AM: OKRAM Background and Development- Craig Davis

8:30 – 8:45 AM: **BREAK**

8:45 – 9:45 AM: Introduction to OKRAM Assessment- Dan Dvoretz

9:45 – 10:00 AM: **BREAK**

10:00 – 11:00 AM: Introduction to OKRAM Assessment (Continued)-
Dan Dvoretz

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

11:30 – 12:00 PM: Travel to field site (Gilcrease Turnpike: meet at
36.133098, -96.053387)

12:00 – 3:30 PM: OKRAM application tutorial at Gilcrease Turnpike
wetlands

Day 2 (9/18/2024):

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

Day 3 (9/19/2024):

8:00 – 11:00 AM: Independent application of OKRAM (OTA Liberty Trail: meet at 36.024338, -95.850851)

11:00 – 12:30 PM: **LUNCH on own** and travel back to CityPlex

12:30 – 1:30 PM: Review of OTA Wetland Assessment Results and Site-Specific Assessment- Dan Dvoretz

1:30 – 1:45 PM: **BREAK** (course evaluations)

1:45 – 2:45 PM: OKRAM Applications- Brooks Tramell

2:45 – 3:30- Additional Questions



Oklahoma Wetlands





Habitat & Biodiversity



Recreation

Nutrient Regulation



Soil & Sediment Regulation



Disturbance & Natural Hazard Regulation



Food Production

Cultural & Aesthetic Values

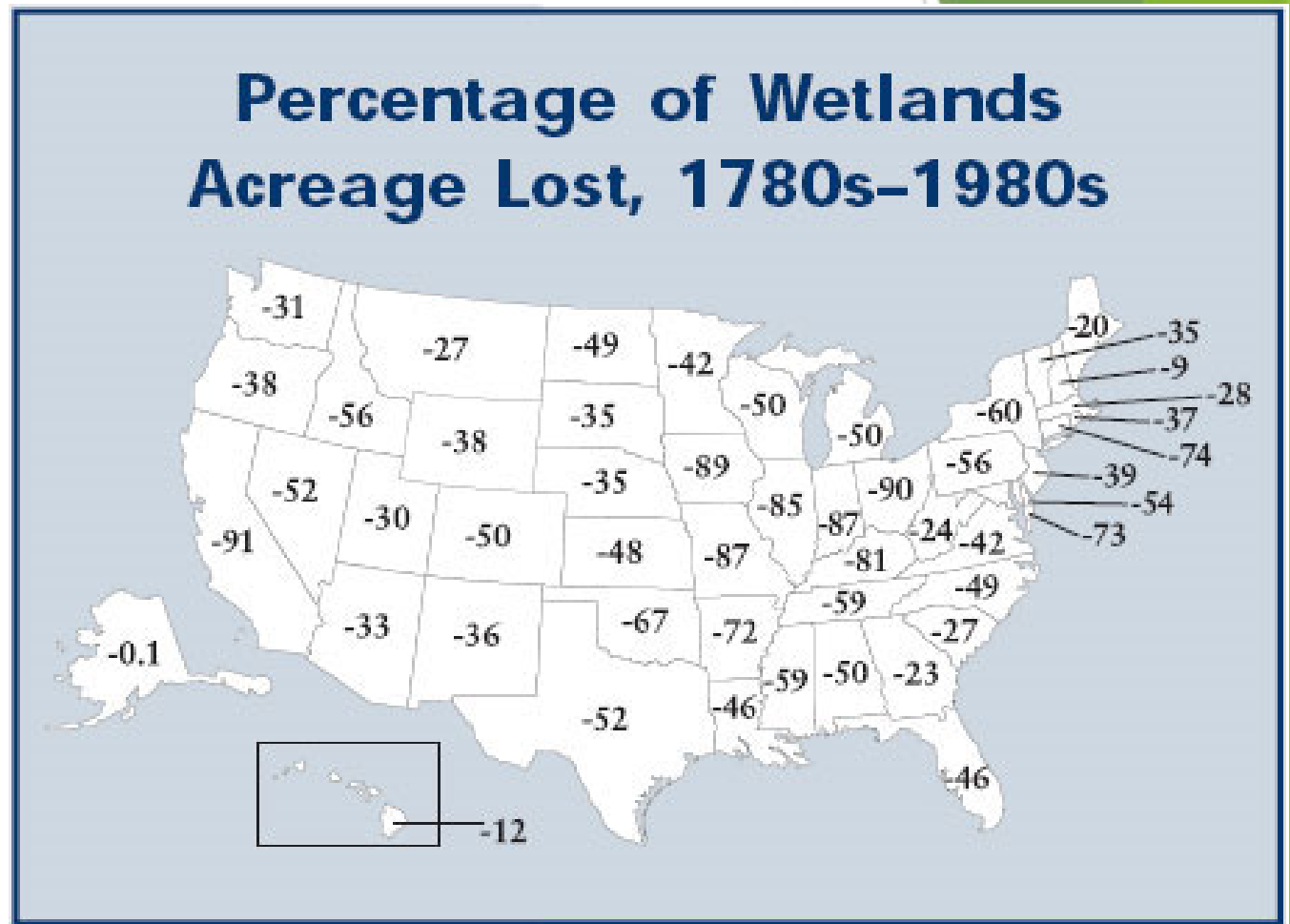


Water Supply



Historic Wetland Loss (1780's - 1980's)

- 53% decrease in wetland acreage across the U.S.
- 67 % decrease in wetland acreage in Oklahoma



Dahl TE (1990) Wetlands-losses in the United States, 1780's to 1980's. Washington, D.C., U.S. Fish and Wildlife Service Report to Congress.



Reference

Completely Degraded



Wetland monitoring and assessment is critical to the State's Wetlands Program.

- Appraise health and condition of wetlands
- Determine effects of impairment on functions and services provided by wetlands
- Determine status and trends of wetlands
- Identify high quality wetlands for protection and low quality wetlands for restoration and enhancement
- Monitor compensatory mitigation
- Provide guidance on where to focus restoration efforts
- Assist with development and support of water quality standards



Evolution of Wetland Assessment Research in Oklahoma



Indices of Biotic Integrity



Developing Monitoring Strategy for Oxbows



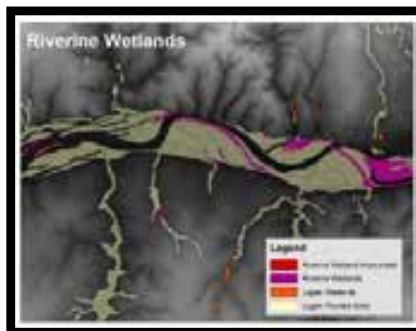
Developing Water Quality Monitoring Protocols for Wetlands

HGM Classification & Subclass Development

Evaluation of Floristic Quality Assessment

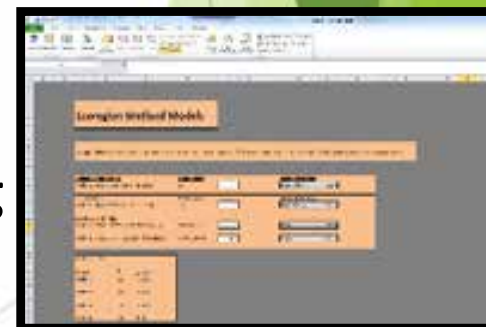


HGM Functional Assessment



Reclassification of NWI Polygons

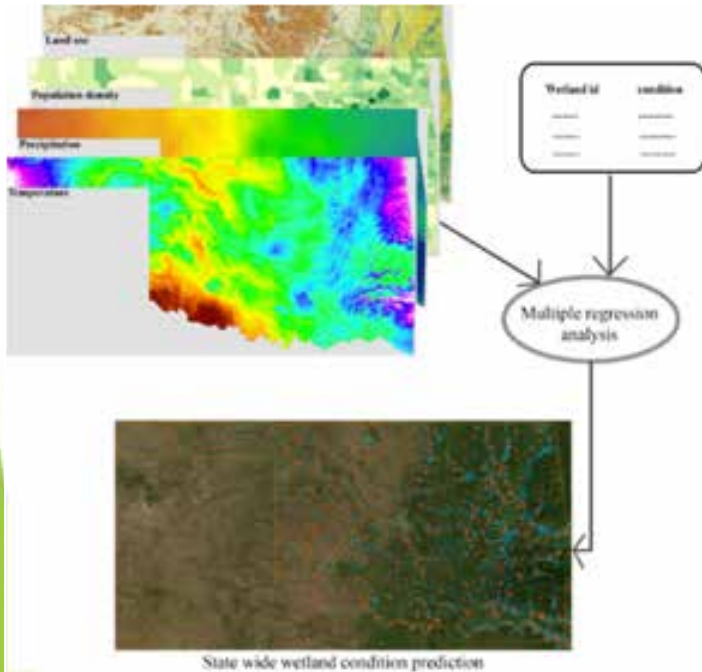
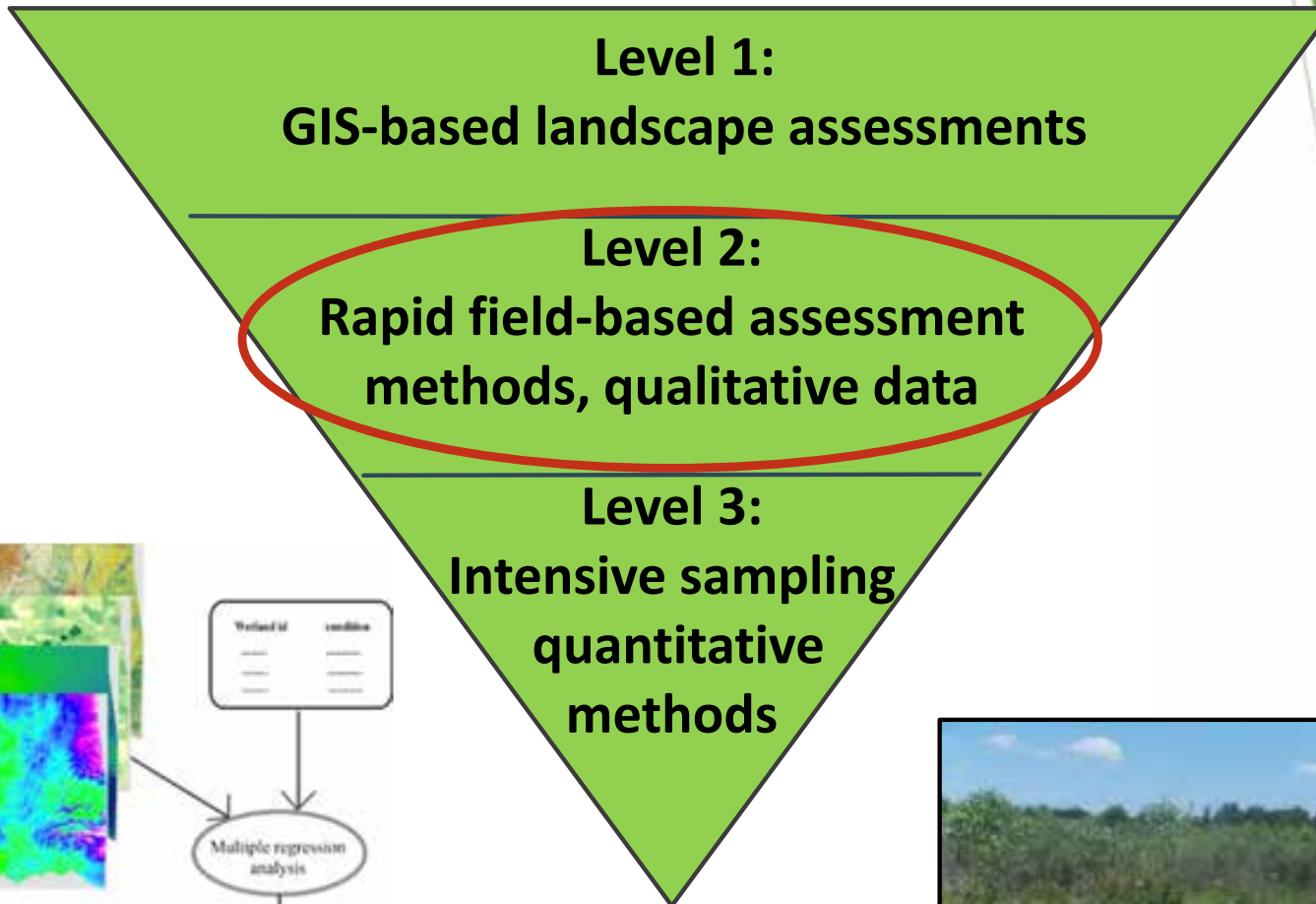
Developing Landscape GIS Models for Predicting Wetland Condition



Rapid Assessment Methods (RAMs)

- Field-based diagnostic tool that provides a rapid, repeatable numeric assessment of the overall condition of wetlands (i.e., capacity or potential of a wetland to provide functions and services normally expected for a similar wetland in an unaltered state)
- RAMs use metrics based on observable field indicators (e.g., vegetation, alterations to hydrology, land use practices) to define wetland condition
- Individual metrics are aggregated into an overall condition score that reflects degree of deviation from least altered state
- RAMs are considered rapid in that their application requires approximately 1 day for completion (includes both field and office time) by 2 trained practitioners

EPA's 3-Tiered framework



Oklahoma Rapid Assessment Method (OKRAM)

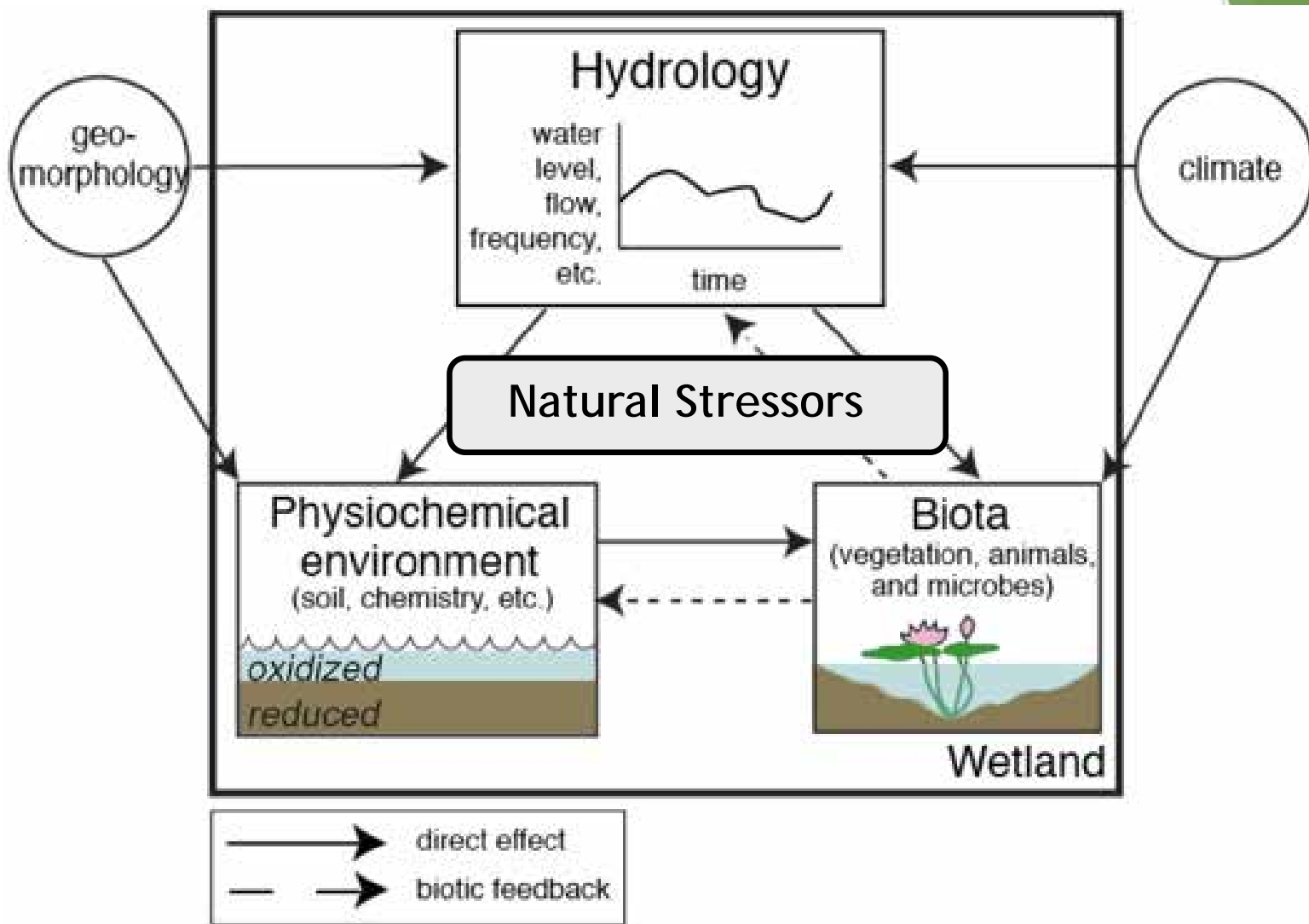


- **Stressor-Based Assessment**
 - Desktop and field components
 - Spatial impact and severity
- **Eight metrics combined into one score**
 - Hydrologic, Water Quality and Biotic
 - Validated
- **Rapid (½ day office and ½ day field)**
- **Repeatable (user and seasonality)**

What OKRAM is Not

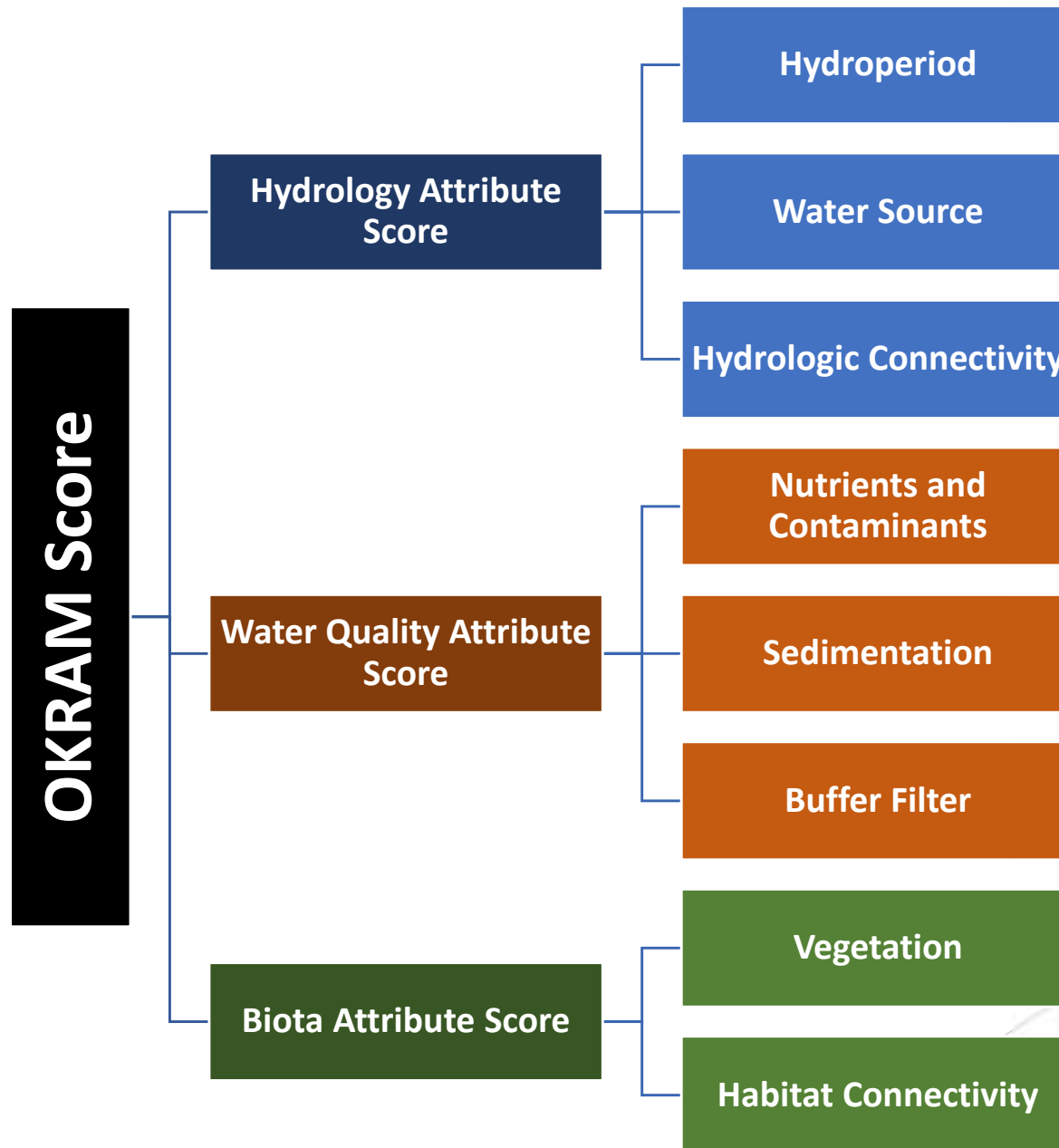
- OKRAM is not a tool for identifying or delineating wetlands
- OKRAM is not a wetland classification system, but OKRAM does rely on the Hydrogeomorphic (HGM) Classification System for characterizing wetlands
- OKRAM does not directly measure wetland functions nor the capacity for those functions to occur
 - However, if the overall condition is determined to be excellent, then the functions associated with that condition are presumed to exist; further, if the condition is degraded, certain functions are presumed to be degraded, limited, or nonexistent depending on the level of degradation and wetland type

Wetland Stressors



Anthropogenic Stressors

OKRAM Attributes and Metrics



2011

2012

2013-14

2015

2016-17

2018-19

2021-22

2023-24

Oklahoma Rapid Assessment Method (OKRAM)

User Manual - Version 1.1

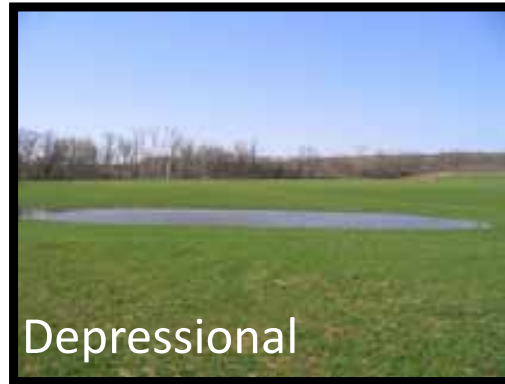
July 2024

Oklahoma State University and Oklahoma Conservation Commission



HGM Wetland Classification

1. Depressional
2. Lacustrine Fringe
3. Riverine
4. Slope
5. Mineral Soil Flats
6. Organic Soil Flats
7. Tidal Fringe



HGM Wetland Classification

Dichotomous Key for HGM Wetland Classification in Oklahoma

1. Wetland is within the 5 year floodplain of a river but not fringing an impounded water body.	<i>Riverine (5)</i>
1. Wetland is associated with a topographic depression, flat or slope.	2
2. Wetland is located on a topographic slope (slight to steep) and has groundwater as the primary water source. Wetland does not occur in a basin with closed contours.	<i>Slope (15)</i>
2. Wetland is located in a natural or artificial (dammed/excavated) topographic depression or flat.	3
3. Wetland is located on a flat without major influence from groundwater.	<i>Flat (Hardwood Flat)</i>
3. Wetland is located in a natural or artificial (dammed/excavated) topographic depression.	4
4. Topographic depression has permanent water greater than 2 meters deep and wetlands are restricted to the margin of the depression.	<i>Lacustrine Fringe (10)</i>
4. Topographic depression does not contain permanent water greater than 2 meters.	<i>Depression (11)</i>

HGM Wetland Subclasses

Depressional Subclasses

11. Wetland was created by human activity.	12
11. Wetland was not created by human activity.	13
12. Wetland does not have discernible water outlets.	Closed Impounded Depression
12. Wetland has discernible water outlet.	Open Impounded Depression
13. Wetland primary water source is groundwater.	Groundwater Depression
13. Wetland primary water source is surface water.	14
14. Wetland does not have any discernible water outlets.	Closed Surface Water Depression
14. Wetland has discernible water outlets.	Open Surface Water Depression

Slope Subclasses

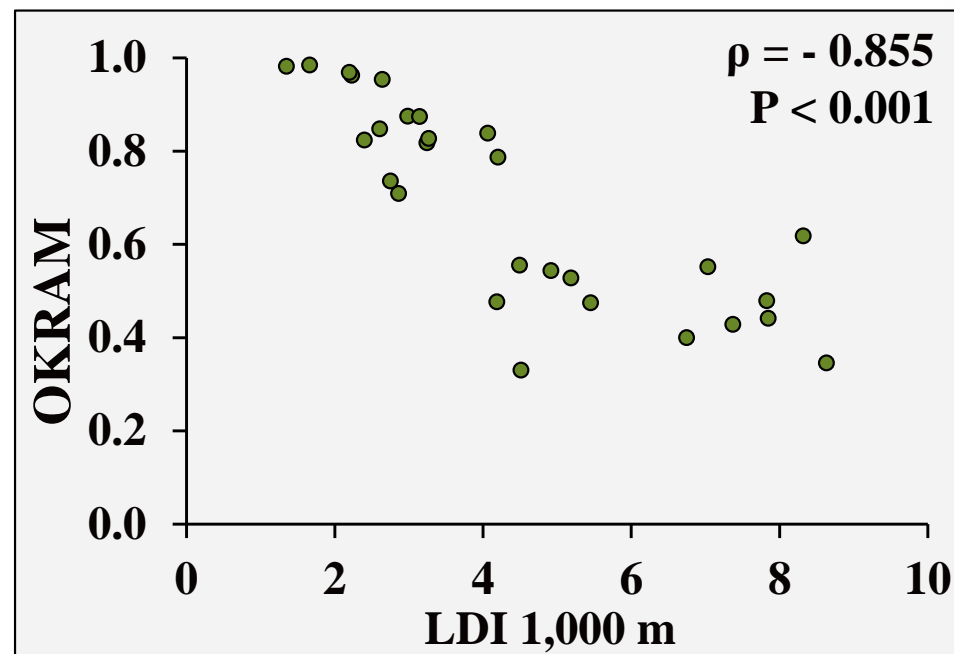
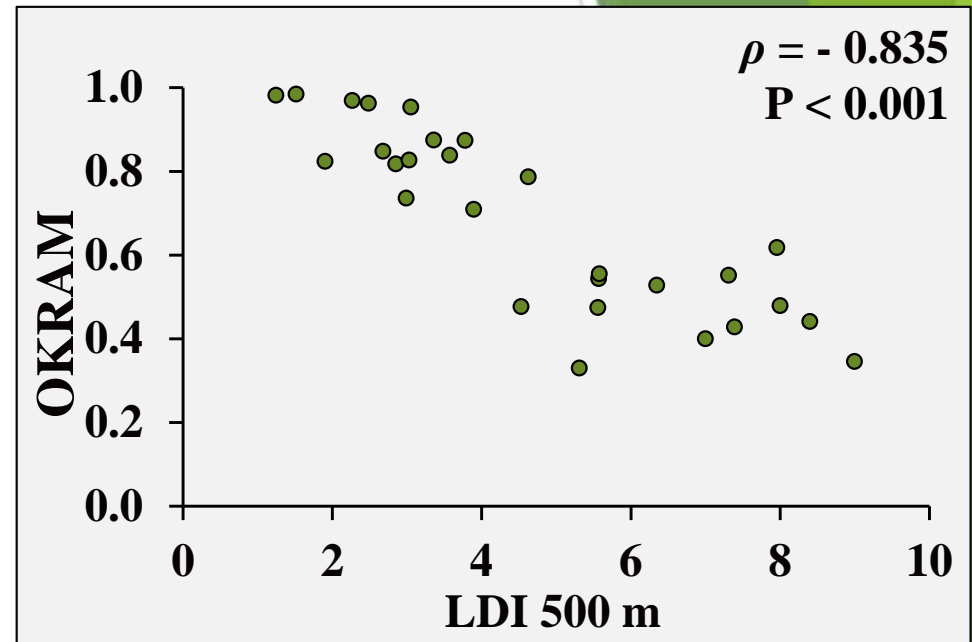
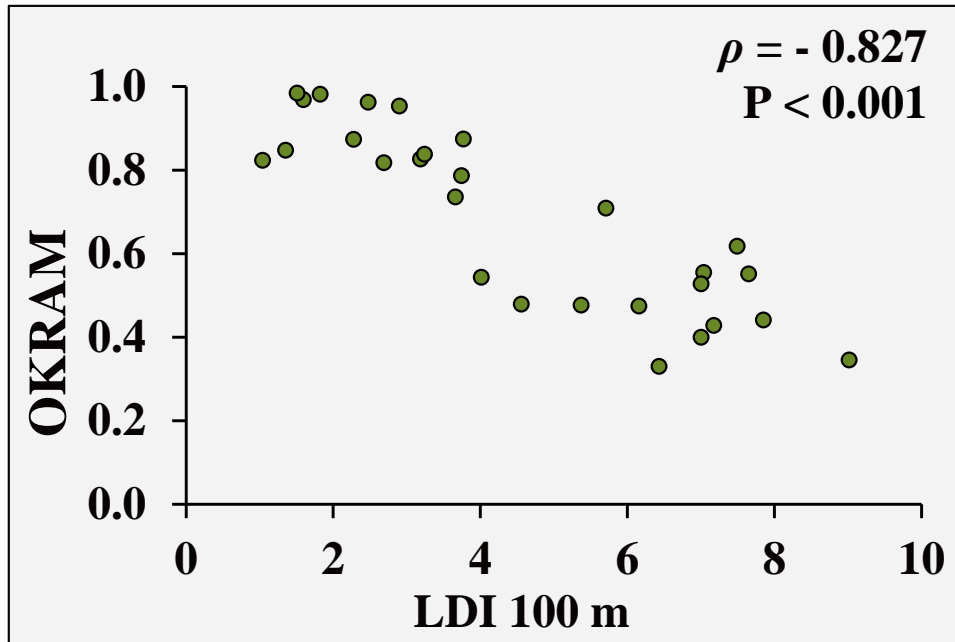
15. Wetland is hydrologically connected to a low order (Strahler ≤ 4), high gradient, or ephemeral stream.	Headwater Slope
15. Wetland is hydrologically connected to a high order (Strahler ≥ 5), low gradient river. Slope may be imperceptible or extremely gradual (includes wet meadows).	Low Gradient Slope

HGM Wetland Subclasses

Riverine Subclasses	
5. The wetland is a remnant river channel that is periodically hydrologically connected to a river or stream every 5 years or more frequently.	Connected Oxbow
5. The wetland is not an abandoned river channel.	6
6. The hydrology of the wetland is impacted by beaver activity.	Beaver Complex
6. The hydrology of the wetland is not impacted by beaver activity.	7
7. The wetland occurs within the bankfull channel (includes vegetated ephemeral channels, bars and islands).	In-channel
7. The wetland is directly adjacent to the river channel or occurs on a topographic floodplain (may include back-channels, swales or other topographic relief).	8
8. Stream is intermittent or ephemeral (not perennial)	Floodplain
8. Stream is perennial	9
9. Stream is a 1st or 2nd order (upper perennial)	Floodplain
9. Stream is a 3rd order or higher (lower perennial)	Floodplain

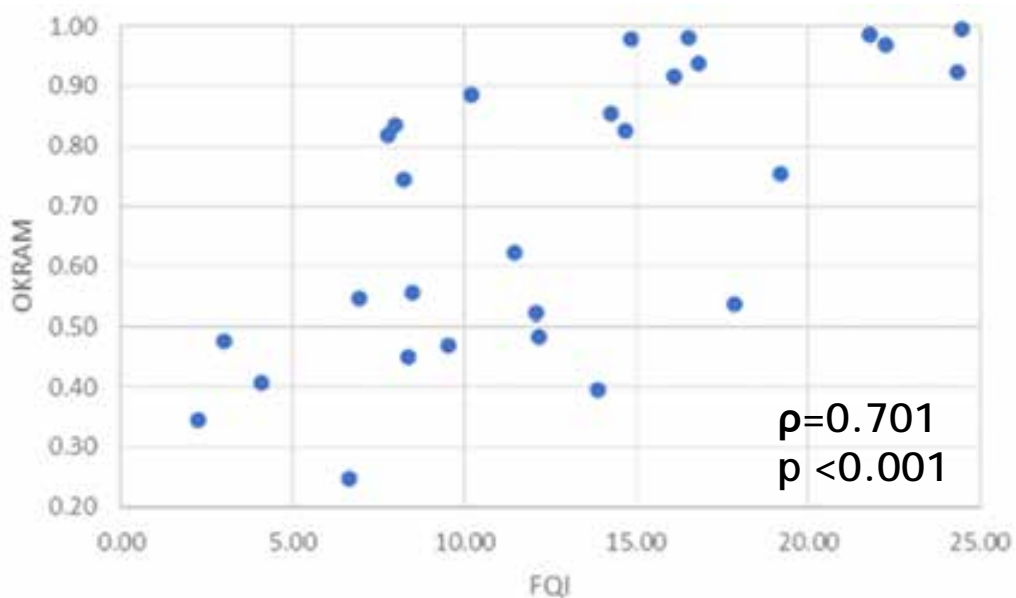
Lacustrine Subclasses	
10. Wetland is associated with a remnant river channel that is hydrologically disconnected from the stream or river of origin.	Disconnected Oxbow
10. Wetland is associated with a reservoir or pond created by impounded or excavation.	Man-made Lacustrine Fringe

Importance of Validation (Depressional Wetlands)

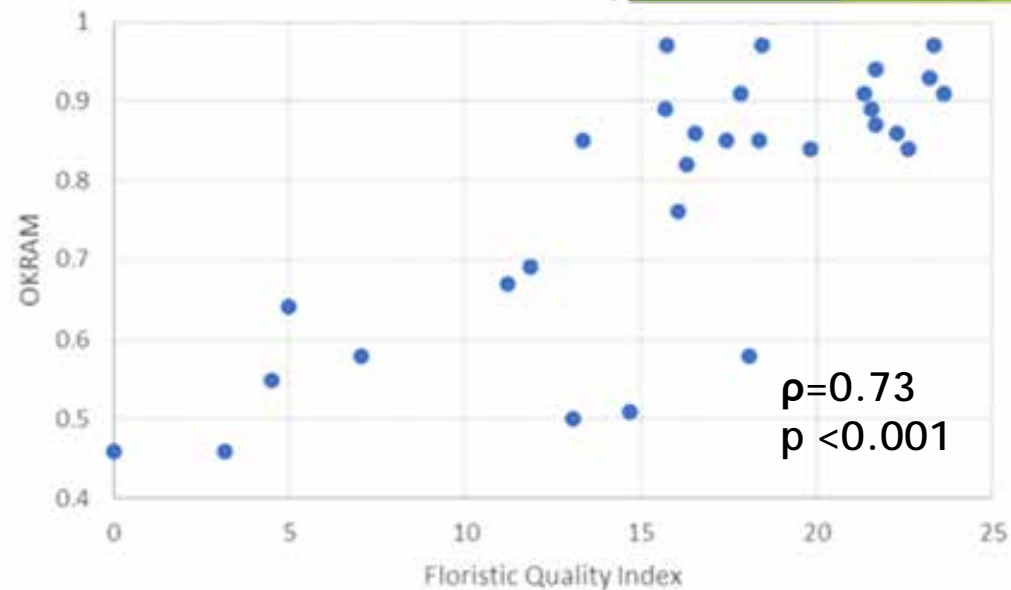


Validation of Depressional and Riverine Wetlands

Depressional Wetland



Riverine Wetland



OKRAM: Repeatability

- Evaluator repeatability (2015)
 - Multiple evaluators applied OKRAM at the same time with ~2% difference in overall score
- Seasonal Effects (Summer 2015 and Spring 2016)
 - Same wetland visited twice had a ~2% difference in overall OKRAM score



Validation of OKRAM for Depressional, Lacustrine Fringe, Riverine, and Slope Wetlands

HGM Class	Initial Application	Validation	Statewide Application
Depressional	YES	YES	YES
Lacustrine Fringe	YES	Requires Modification	Not Yet
Riverine	YES	YES	On-going
Slope	YES	Beginning Soon	Not Yet



Validation of Lacustrine Fringe Wetlands

OKRAM and Level 1 data

- Strong relationships between OKRAM and LDI

OKRAM and Level 3 data

- No relationships with vegetation, invertebrates, or water quality data
- Few relationships with soil chemistry data
- Difficult to apply OKRAM due to manmade reservoirs being highly regulated
- Modification of hydrologic metric needed to account for human-manipulated lake levels

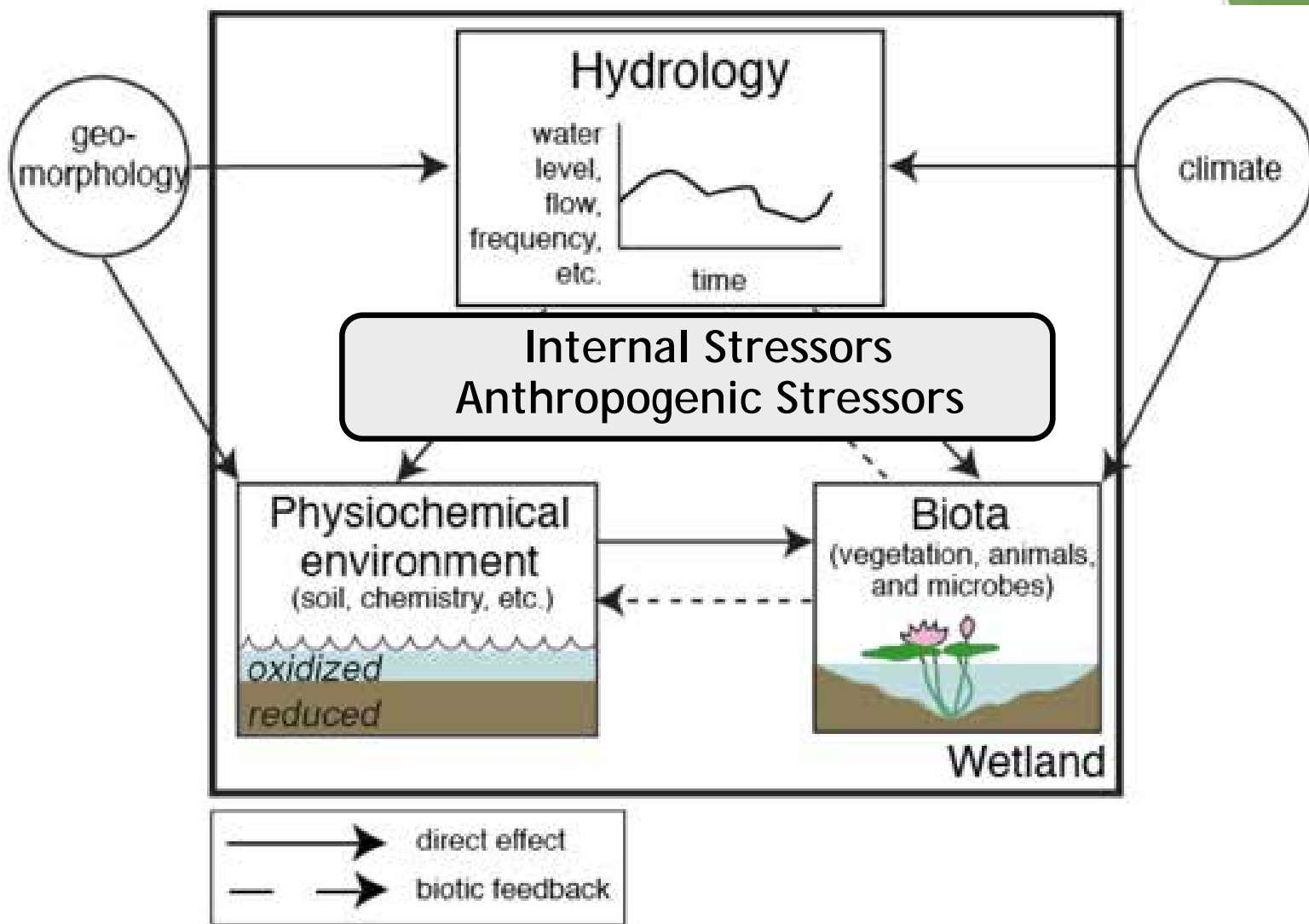


Applications of OKRAM

- Prioritize wetland restorations
- Identify high quality wetlands for protection
- Long-term monitoring of wetland condition (e.g., response to management activities, restoration of surrounding landscape, elimination or reduction of landscape-level stressors)
- Track progress of mitigation projects (e.g., comparing pre- and post-restoration or re-habilitation of a site)
- Set targets for mitigation projects
- Control variation among wetlands for research projects



Wetland Stressors



External Stressors
Anthropogenic Stressors

Attribute & Metric Development

Primary Literature
What attributes & metrics would best capture condition of wetlands?



Existing RAMs
What attributes & metrics are currently be used by other RAMs (e.g., California RAM, FACWET)?

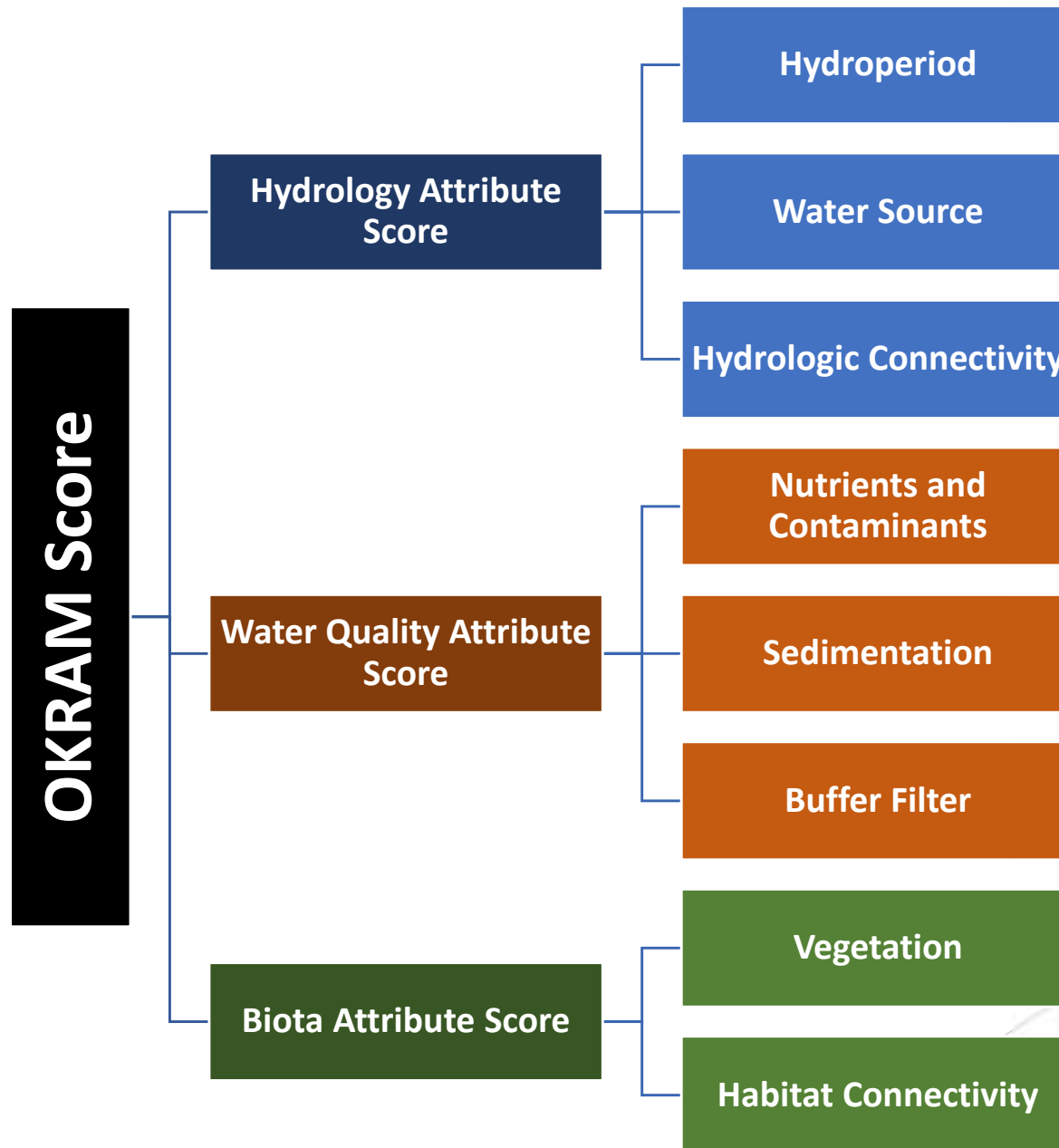


Applicability to Oklahoma Wetlands
Focus on Landscape-scale, but must be linked to Local-scale

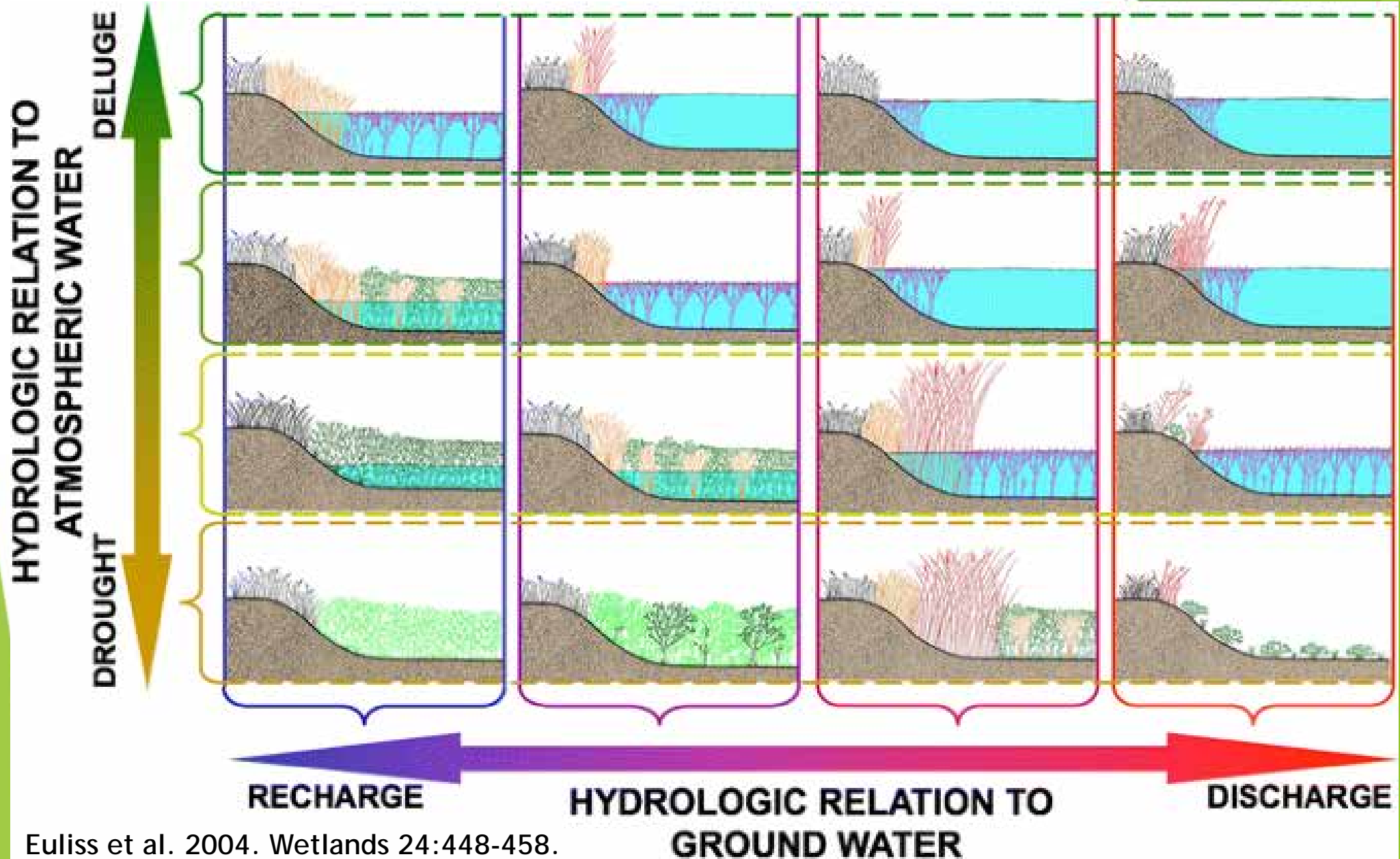


OKRAM
Hydrology Attribute
Water Quality Attribute
Biota Attribute

OKRAM Attributes and Metrics

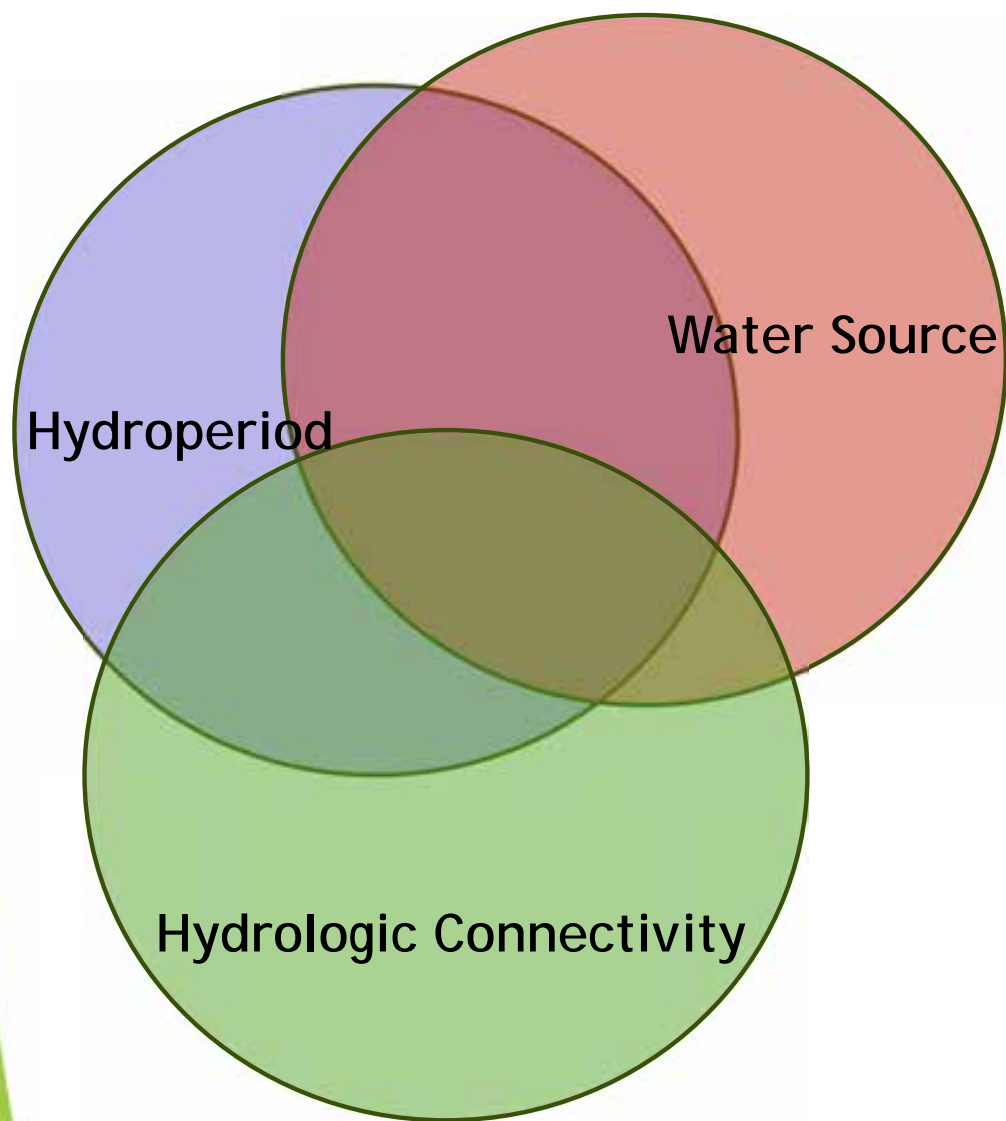


Hydrology Attribute Wetland Continuum



Euliss et al. 2004. Wetlands 24:448-458.

Hydrologic Stressors in Wetlands



- Wetland stressors can act individually and in combination to influence wetland health.
- Hydroperiod, Water Source, and Hydrologic Connectivity metrics account for both the individual and interactive effects of hydrologic stressors.
- OKRAM hydrologic metrics also account for internal (within the wetland) and external (landscape) stressors

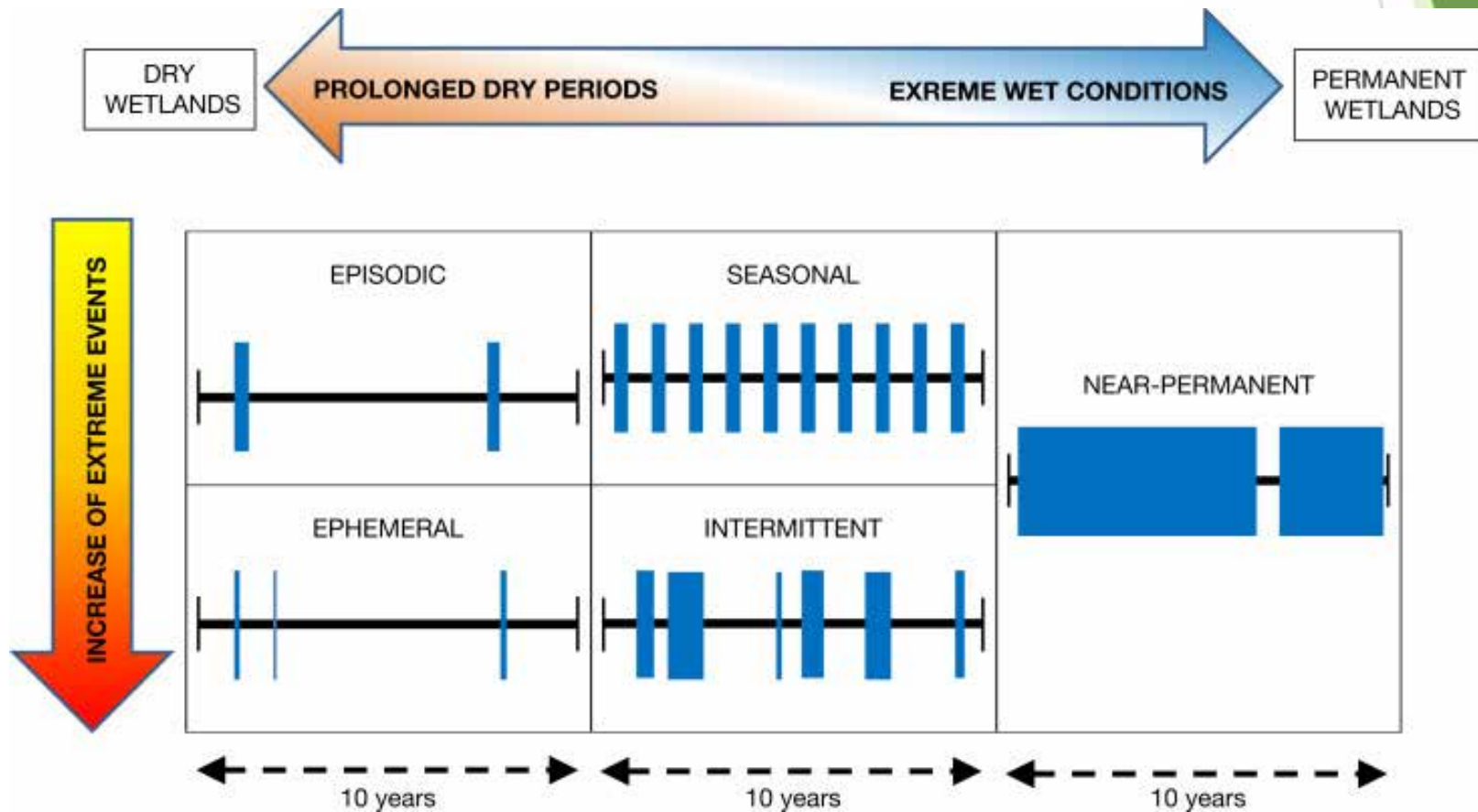
Hydroperiod Metric: duration and frequency of inundation



Depressional (Playa)



Riverine (Oxbow)



Water Source Metric: degree of landscape alteration in the watershed surrounding the wetland



Potential Impacts

- Increased sedimentation
- Modified hydroperiod
- Increased nutrient inputs



- Increased pollution and refuse
- Modified hydroperiod
- Exotic plants
- Modified hydroperiod

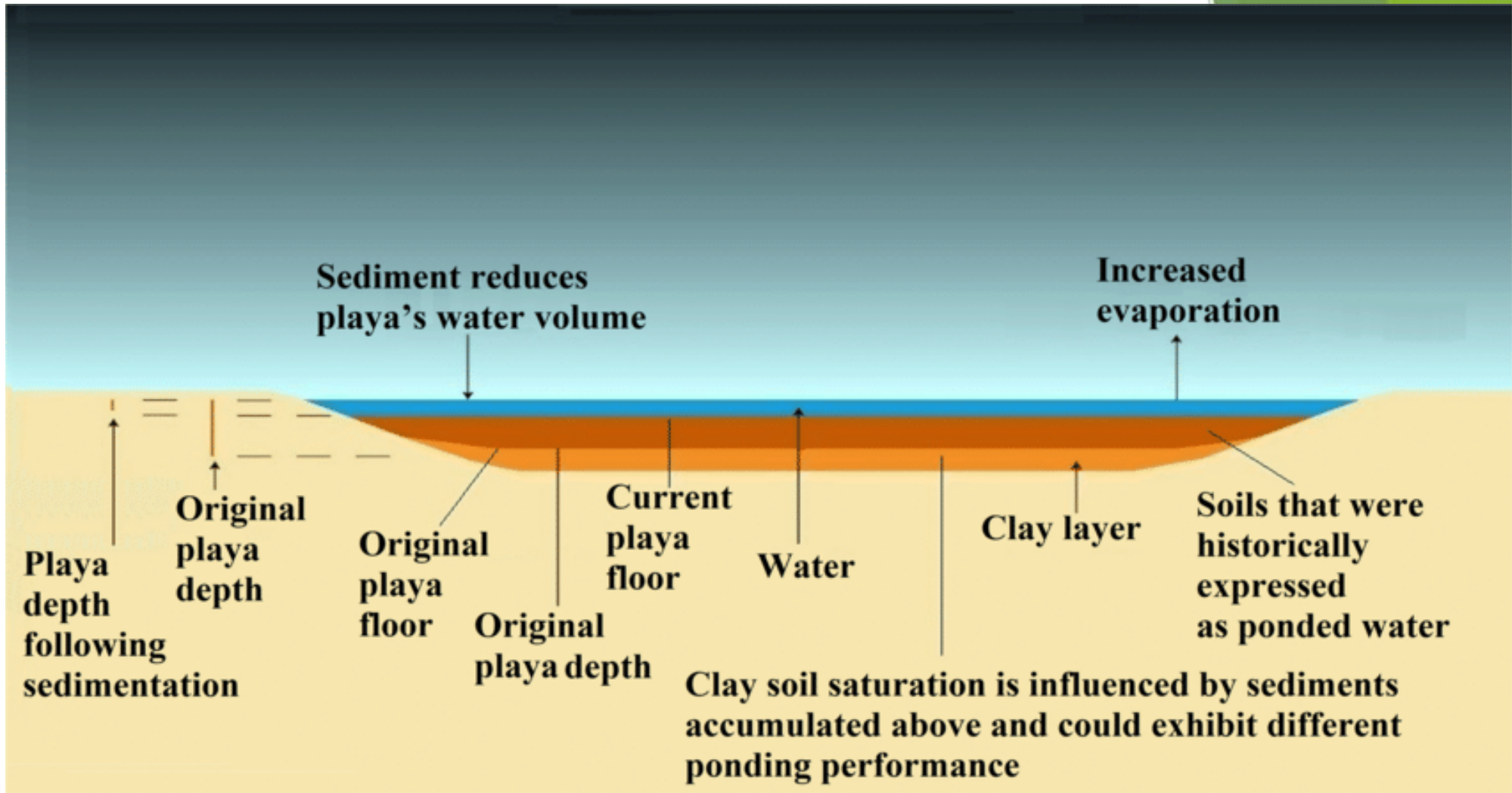
Hydrologic Connectivity Metric: ability of water to move between the wetland and adjacent ecosystems



Potential Impacts

- Impacts water depth and duration of inundation
- Affects biogeochemical processes
- Affects biotic community

Water Quality Attribute



Wetlands naturally transform excessive nutrients through biogeochemical processes that are driven by anaerobic conditions in the wetland. However, unnatural inputs of nutrients can overwhelm capacity of wetlands to process the nutrients resulting in degraded wetlands. Sedimentation can also significantly impact wetlands.

Water Quality Stressors in Wetlands



Buffer Filter

BUFFER –

An area of permanent vegetation used to reduce sediment, nutrients, pesticides, and other contaminant loadings in runoff.

Nutrients & Contaminants
Sedimentation

Excessive Nutrients and Contaminants Metric: focus is on anthropogenic-associated nutrients and contaminants



Sediment Metric: focus is on anthropogenic-associated sediment loading of the wetland



Buffer Filter Metric: capacity of surrounding uplands to prevent nutrients, sediment, and contaminants from reaching the wetland



Biota Attribute



Local vegetation conditions will influence biota, while connectivity of habitat within the surrounding landscape will affect occurrence and diversity of different animal communities at different scales

Vegetation Condition Metric: focus is on the degree of anthropogenic alteration to the vegetation present in the wetland



Habitat Connectivity Metric: focus is on the degree of anthropogenic alteration to the landscape surrounding the wetland that could impact wildlife movement



Introduction to OKRAM Assessment

OKRAM TRAINING: DAY 1



Outline

- ☐ **Assessment Areas**
- ☐ Wetland Classification
- ☐ Site Description
- ☐ OKRAM Metrics
- ☐ OKRAM Scoring
- ☐ Office Preparation
- ☐ Day 1 Assessment: Gilcrease Turnpike

Assessment Area (AA)

Definition:

Portion of a target wetland where OKRAM is applied

Purpose:

Maximize comparability between OKRAM assessments

Requirements:

1 HGM class
Collectively <10% upland and water deeper than 1m
Does not overlap another assessment area

Assessment Area (AA)



Ambient Monitoring

Generating population level
condition estimates

1 AA per wetland



Site-Specific Monitoring

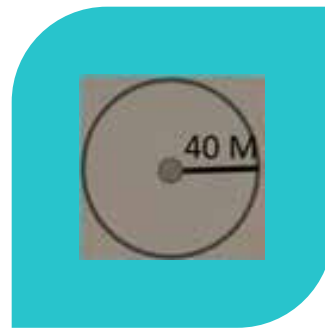
Generating a representative
score for 1 wetland

Multiple AAs

Assessment Area (AA): Ambient



RANDOMLY
ASSIGN POINT



GENERATE
STANDARD AA

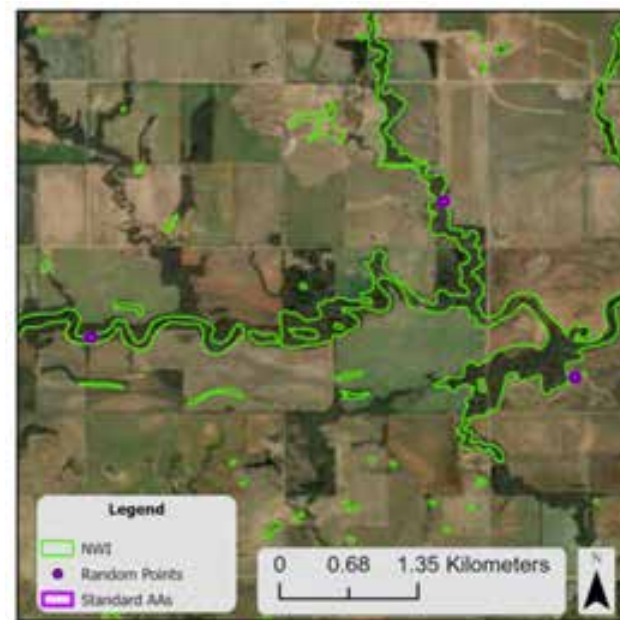
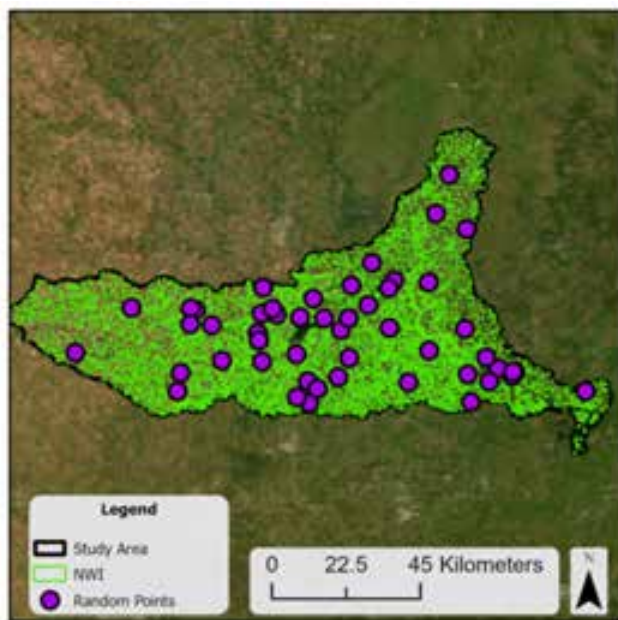


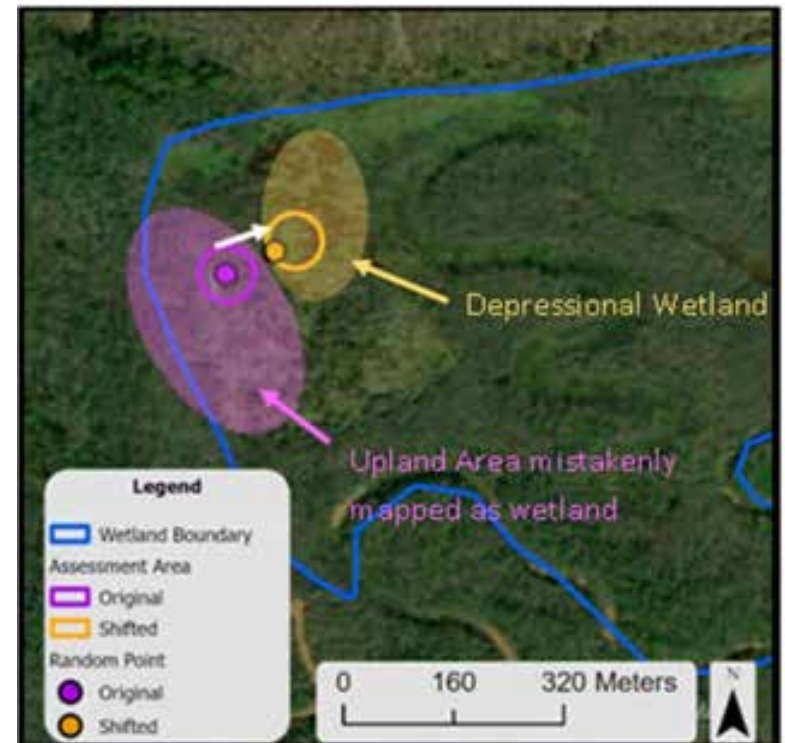
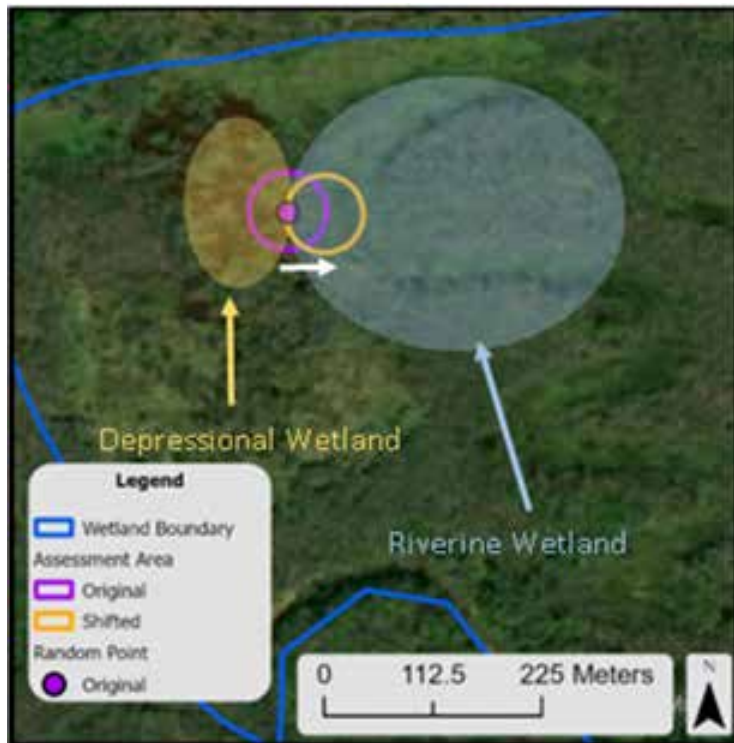
MOVE AND
ADJUST

Reduce bias, maximize comparability, ensure consistency

Assessment Area (AA): Randomly Generate Standard AAs

- ☐ Randomly Assign Points
- ☐ Generate Standard AAs

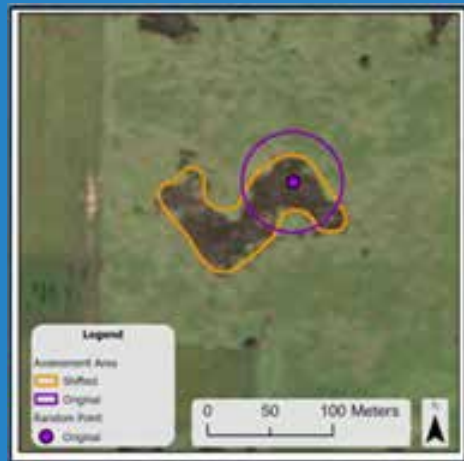




Assessment Area: Move

☐ Can be moved up to 60m

Assessment Area (AA): Adjust



Standard AA

- 40 m radius circle

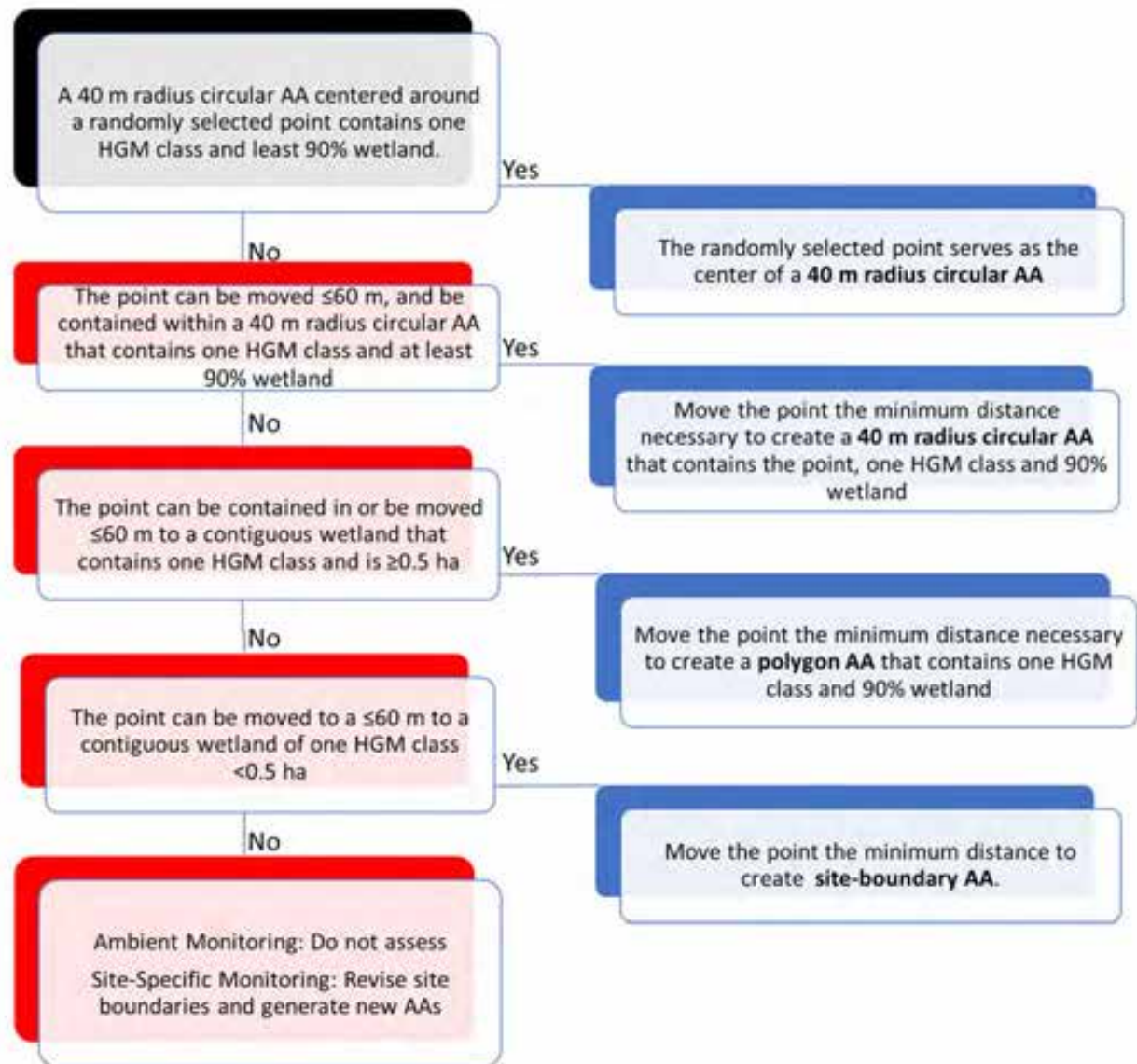
Polygon AA

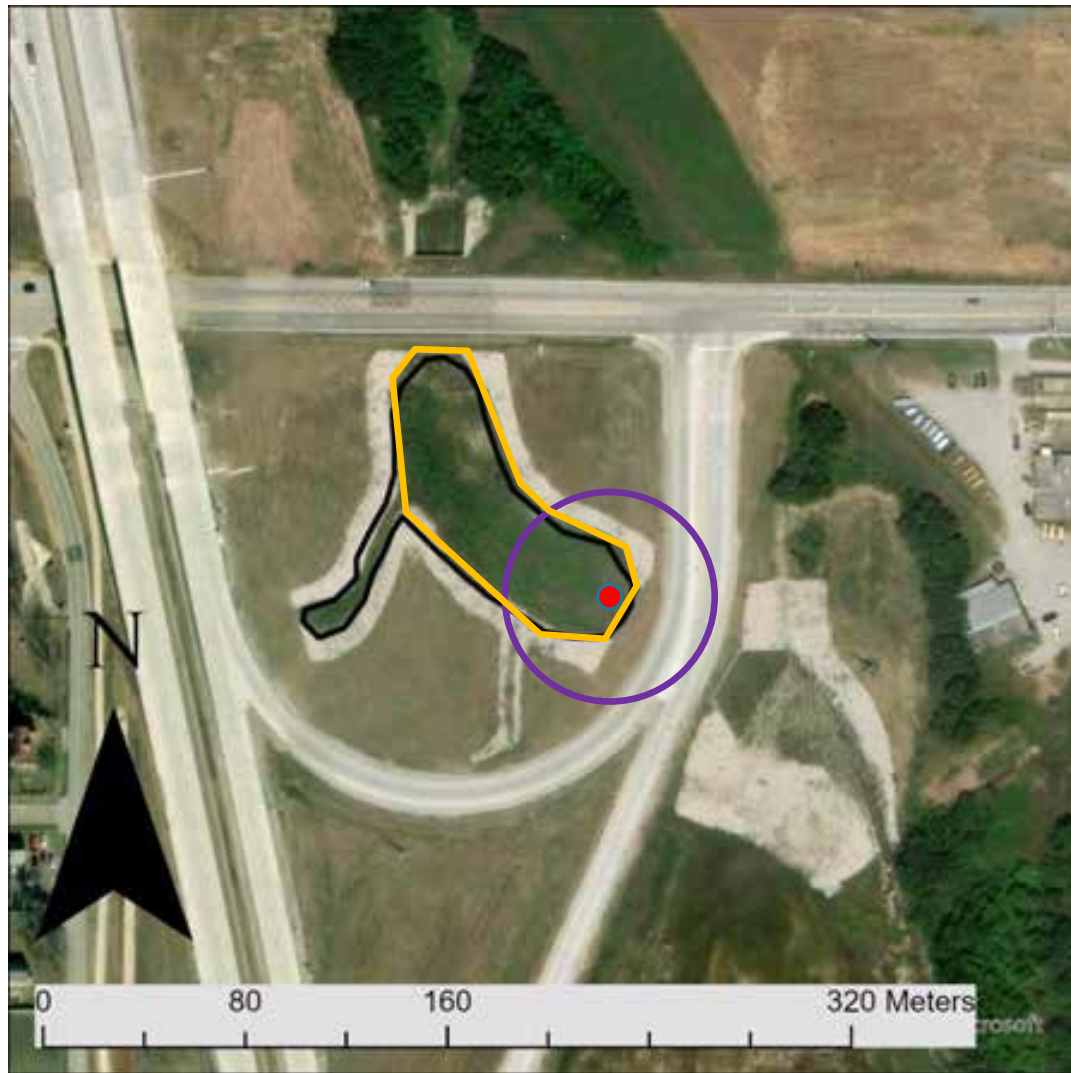
- 0.5 ha AA (rectangle preferred)

Site Boundary AA

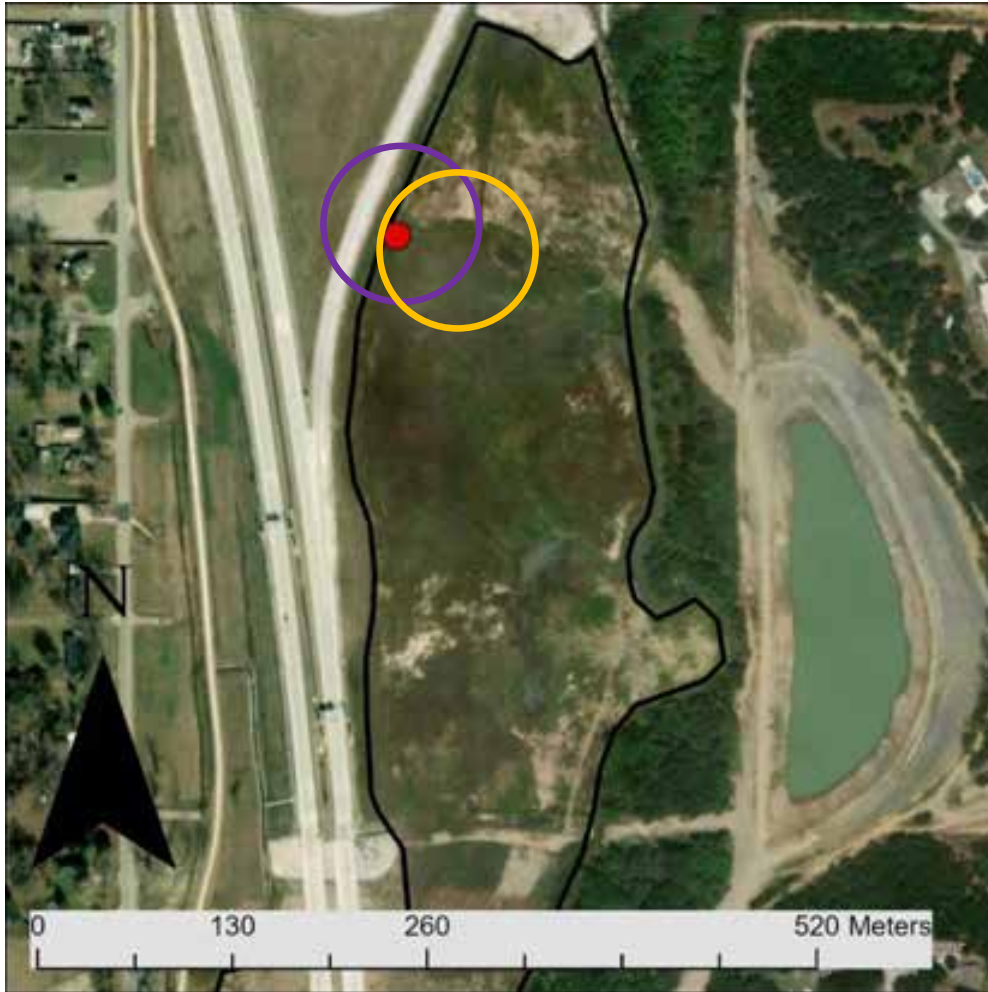
- Wetland is the AA (< 0.5 ha)

Assessment Area (AA): Adjust Flow Chart





Assessment
Area (AA):
Day 1 Site 1



Assessment
Area (AA):
Day 1 Site 2

Outline

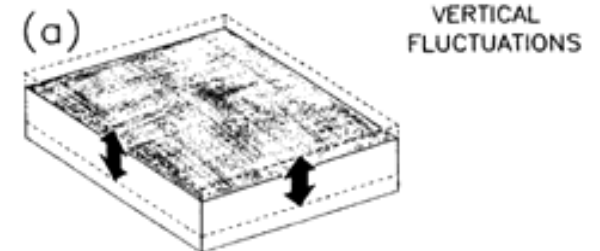
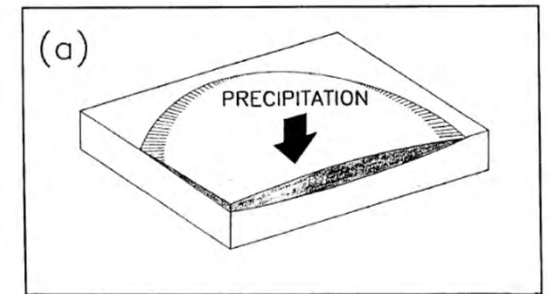
- Assessment Areas
- **Wetland Classification**
- Site Description
- OKRAM Metrics
- OKRAM Scoring
- Office Preparation
- Day 1 Assessment: Gilcrease Turnpike

Wetland Classification: HGM

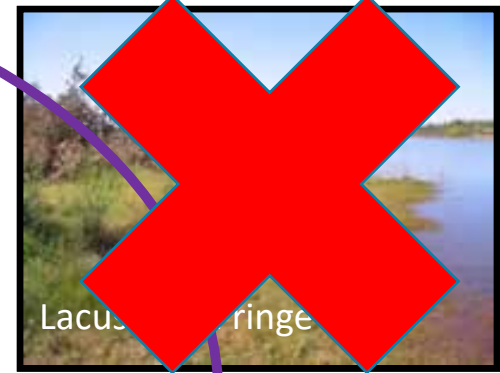
- ❑ Functional classification based on three components
 - ❑ Geomorphic setting
 - ❑ Water source and transport
 - ❑ Hydrodynamics



Basin



Wetland Classification: HGM Oklahoma



Wetland Classification: Riverine

□ Wetland is within the 5 year floodplain of a river but not fringing an impounded water body.



Wetland Classification: Depressional

- Topographic depression does not contain permanent water greater than 2 meters.



Wetland Classification: Lacustrine

□ Topographic depression has permanent water greater than 2 meters deep and wetlands are restricted to the margin of the depression.



Dichotomous Key for HGM Wetland Classification in Oklahoma	
1. Wetland is within the 5 year floodplain of a river but not fringing an impounded water body.	<i>Riverine(5)</i>
1. Wetland is associated with a topographic depression, flat or slope.	2
2. Wetland is located on a topographic slope (slight to steep) and has groundwater as the primary water source. Wetland does not occur in a basin with closed contours.	<i>Slope (15)</i>
2. Wetland is located in a natural or artificial (dammed/excavated) topographic depression or flat.	3
3. Wetland is located on a flat without major influence from groundwater.	<i>Flat (Hardwood Flat)</i>
3. Wetland is located in a natural or artificial (dammed/excavated) topographic depression.	4
4. Topographic depression has permanent water greater than 2 meters deep and wetlands are restricted to the margin of the depression.	<i>Lucustrine Fringe (10)</i>
4. Topographic depression does not contain permanent water greater than 2 meters.	<i>Depression (11)</i>
Dichotomous Key for Riverine Wetland Subclassification in Oklahoma	
5. The wetland is a remnant river channel that is periodically hydrologically connected to a river or stream every 5 years or more frequently.	Connected Oxbow
5. The wetland is not an abandoned river channel.	6
6. The hydrology of the wetland is impacted by beaver activity.	Beaver Complex
6. The hydrology of the wetland is not impacted by beaver activity.	7
7. The wetland occurs within the bankfull channel (includes vegetated ephemeral channels, bars and islands).	In-channel
7. The wetland is directly adjacent to the river channel or occurs on a topographic floodplain (may include back-channels, swales or other topographic relief).	8
8. Stream is Intermittent or ephemeral	Floodplain (Non-perennial)

Wetland Classification: Dichotomous Key and Subclasses

Wetland Classification: Transitional Areas

- ❑ Transitional areas and human activity make classification challenging
- ❑ Dichotomous key but discretion needed



Outline

- Assessment Areas
- Wetland Classification
- Site Description
- OKRAM Metrics
- OKRAM Scoring
- Office Preparation
- Day 1 Assessment: Gilcrease Turnpike

Site Description	
Site Name	
Date of Assessment	
Assessor Name(s)	
Assessor Affiliation(s)	
Location Information	
Site Latitude	
Site Longitude	
Coordinate System	
Level III Omernik Ecoregion	
Directions/Access Notes	

Site Description: General Site Information

Assessment Area Information						
Size of Wetland						
# of Assessment Areas						
Assessment Area ID		AA Type			AA size	
Reason for Assessment						
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>	
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 Description: AA and Wetland Characterization

Additional AA Description						
Site Name						
Date of Assessment						
Location Information						
Site Latitude						
Site Longitude						
Additional Assessment Area Information						
Assessment Area ID		AA Type		AA size		
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>	
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
Additional Assessment Area Notes						

Site Description:
Additional AAs
(site-specific)

Outline

- Assessment Areas
- Wetland Classification
- Site Description
- **OKRAM Metrics**
- OKRAM Scoring
- Office Preparation
- Day 1 Assessment: Gilcrease Turnpike

Broad overview of metrics prior to collaborative field assessment

Tomorrow

Today

Detailed instructions on how to process data and complete all steps prior to independent assessment

OKRAM
Metrics



OKRAM Metrics: Notes on Application

- OKRAM Guidebook provides tips on how to process data using GIS
- Hand calculations on aerial imagery/topographic maps printed to scale are acceptable
- Worksheets autocalculate scores

OKRAM Metrics- General Framework

Severity and Extent of Impact

- Hydroperiod
- Hydrologic Connectivity
- Excess Nutrients and Contaminants
- Sediment (Depressional Only)
- Vegetation

Landscape Impacts

- Water Source
- Buffer Filter
- Habitat Connectivity

OKRAM Metrics- Severity and Extent of Impact

□ Evaluate the **extent of impact** and **severity** of anthropogenic stressors that cause wetlands to deviate from 'reference' or 'least-altered condition'



EXTENT OF IMPACT



SEVERITY

OKRAM Metrics- Extent of Impact

- Extent of impact is usually (but not always) much greater than spatial extent of stressor and often 100% of AA

A ditch may occupy 2% of an AA by area but impacts the entire wetland's hydroperiod by draining water



However, fill material placed on a small portion of a wetland may only impact a subset of the AA



OKRAM
Metrics-
Severity

Minor

Moderate

Major

Complete Loss

OKRAM Metrics: Severity

Indicator Severity Matrix

2. Water Quality

a. Contaminants

Indicators	Severity		
	Minor	Moderate	Major
Point source discharge other than wastewater treatment (ditch or pipes from industrial sources, etc.)	n/a	Discharge from industrial point source to adjacent water body that is intermittently connected to wetland	Direct discharge from industrial point source to the wetland
Stormwater inputs (ditches, discharge pipes, culverts, adjacent impervious surface or railroad tracks)	Adjacent impervious surfaces such as paved roads or railroads (within 10 meters of wetland)	Stormwater inputs from culverts or discharge pipes	n/a
Increased salinity (e.g., salt crust, excessively high conductivity)	Oil and gas exploration/extraction within 30 meters of wetland (e.g., pumpjacks, tank batteries)	Salt crust present on soil surface (excludes saline wetlands such as those in the Great Salt Plains of Alfalfa County)	n/a
Industrial spills or dumping	Few small containers (5 gallons or less) scattered in the wetland with no signs of chemical contamination AND/OR evidence of limited dumping of trash	55 gallon drums or large industrial containers present, and signs of limited chemical contamination (e.g., sterile ground, dead vegetation) AND/OR construction/ demolition debris, appliance/ automotive parts AND/OR Evidence of drilling mud application.	Knowledge or evidence of industrial spill within or directly adjacent to the wetland AND/OR Mine tailings draining to wetland.

OKRAM
Metrics:
Severity

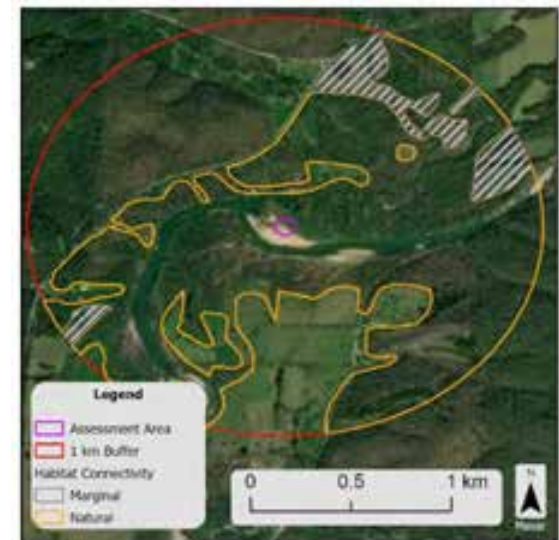
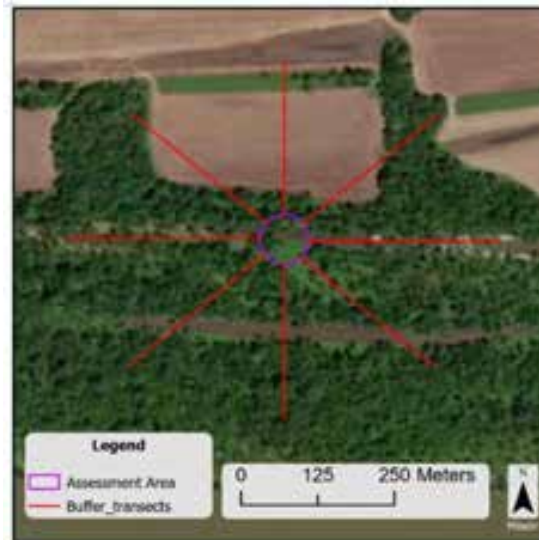
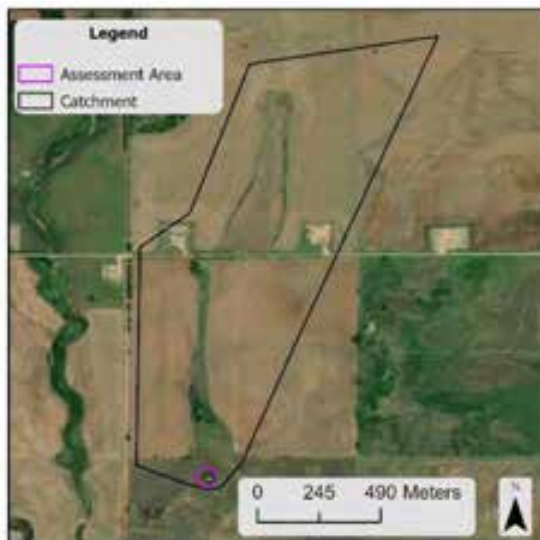
Stressor checklists are meant to be as exhaustive as practicable to minimize bias

Unique situations still arise, and stressors should be matched as best as possible to category and severity.

Documentation and photos are required

OKRAM Metrics- Landscape Impacts

- ❑ Evaluation of spatial extent and location of land-use alteration that affects the movement of water, chemicals and biota between upland and wetland



OKRAM Metrics

Attribute

Metric



Hydrology

Hydroperiod

Water Source (Depressional / Riverine)

Hydrologic Connectivity



Water Quality

Nutrients/Contaminants

Sediment (Depressional)

Buffer Filter



Biota

Vegetation

Habitat Connectivity

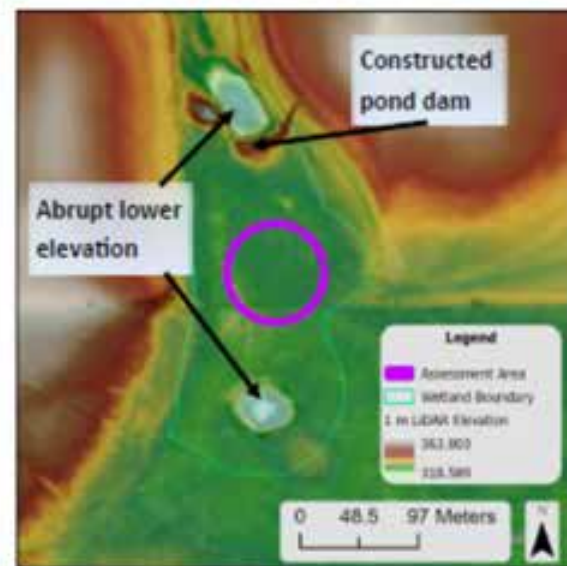
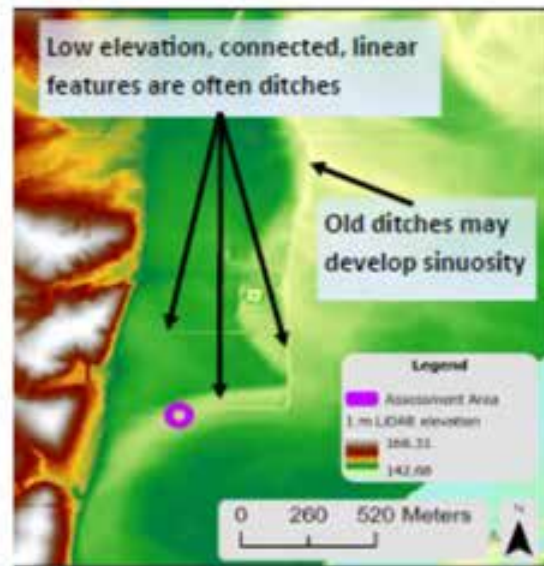


OKRAM Metrics- Hydroperiod

STRESSORS THAT INCREASE
AND/OR DECREASE THE
EXPECTED FREQUENCY
AND/OR DURATION OF
INUNDATION

OKRAM Metrics- Hydroperiod (Step 1)

- Mark potential hydroperiod stressors within 500 meters of the AA for further inspection in the field



OKRAM Metrics- Hydroperiod (Step 2)

- In the field confirm hydroperiod stressors identified in the office, as well as any other stressors found. Annotate an aerial photo with the areal extent of impact



OKRAM Metrics- Hydroperiod (Step 2- continued)

☐ Match the alteration to the indicator and severity description provided

1. Hydrologic condition

a. Hydroperiod

Indicators	Severity			
	Minor	Moderate	Major	Complete Loss
4. Culverts, discharges, ditches or tile drains in to or out of the wetland	Old drainages present that appear to have minor influences on current wetland hydrology (e.g. old ditches that have sedimented in or tile drains that have been damaged)	Water drained from wetland only during high water events AND/OR water enters wetland from culverts, diversions or ditches only during large storm events AND/OR water is consistently discharged into wetland from irrigation (e.g., agricultural or residential).	Water is drained from wetland at all times of the year but still retains wetland hydrology AND/OR water from culvert, diversion, irrigation or ditch is the dominant water source for the wetland.	Wetland completely dried OR Wetland completed converted to permanent deepwater

OKRAM Metrics: Hydroperiod (Steps 3-4)

- Check one of the following
 - Hydroperiod impacted
 - No indicators of altered hydroperiod (autogenerates score of 1)
 - AA is not a wetland (autogenerates score of 0)
- Record the indicators identified.

<input checked="" type="radio"/> Hydroperiod is impacted <input type="radio"/> No Indicators of Altered Hydroperiod Present <input type="radio"/> 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		AA ditched for improved agricultural production
Beaver dam removal					
Excavation/Dredging/Mining/Impoundment					
TOTAL IMPACTED AREA			100		
SEVERITY WEIGHT	0.25	0.5	0.75	1	
SEVERITY WEIGHTED AREA			75		
METRIC SCORE 1A					0.25

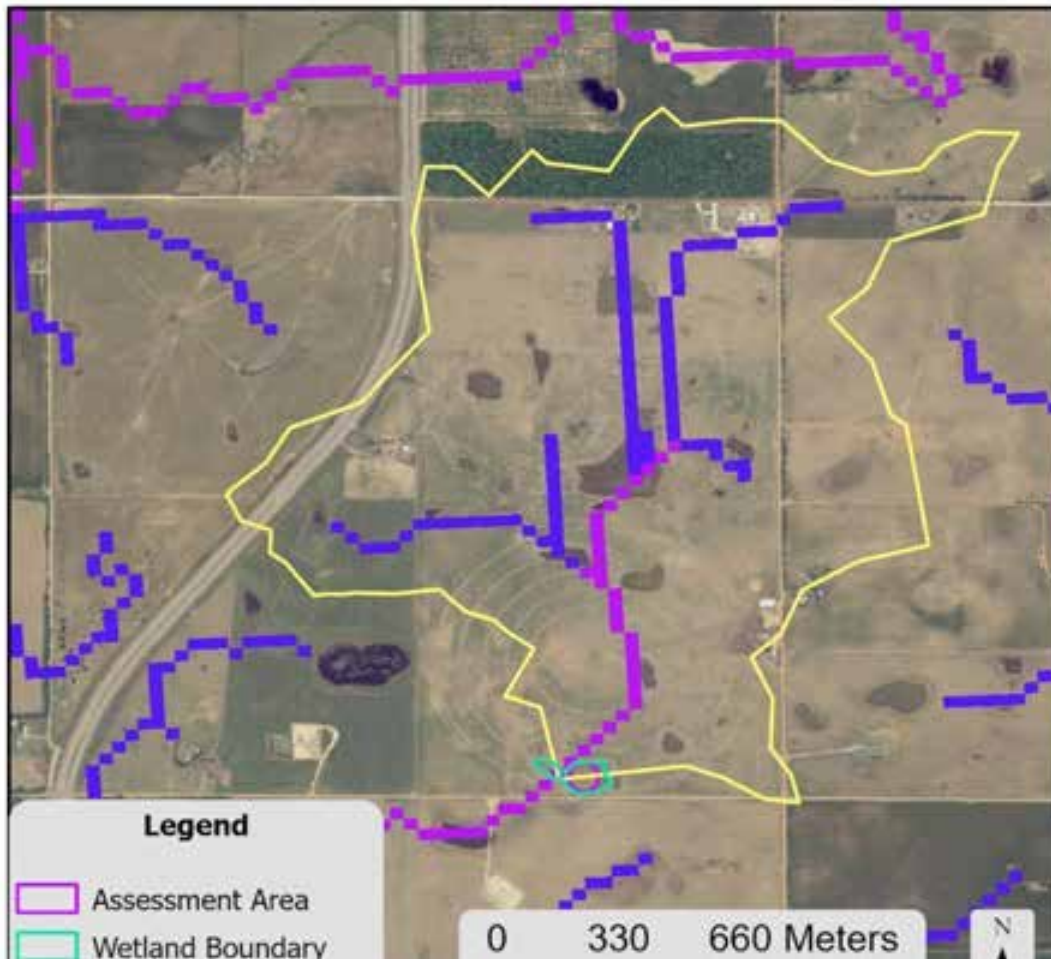
OKRAM Metrics: Hydroperiod (notes)

- ❑ Overlapping extents of stressors within wetlands are only recorded once for the highest severity indicator present

METRIC CALCULATION

$$\text{Hydroperiod Score} = 1 - ((\text{MiE} * 0.25) + (\text{MoE} * 0.5) + (\text{MaE} * 0.75) + \text{CL})$$

Where, MiE= extent of minor stressor indicators, MoE = extent of moderate stressor indicators, MaE= extent of major stressor indicators, and CL = extent of complete loss of wetland function from stressors.



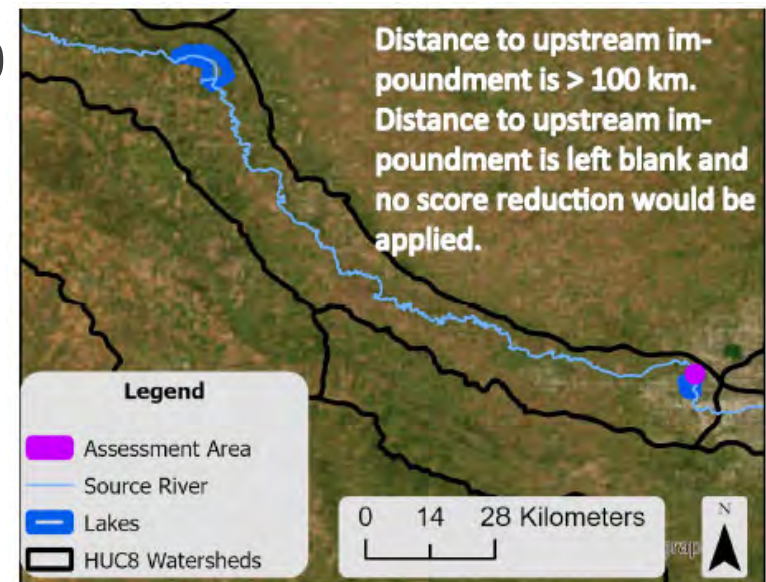
OKRAM Metrics- Water Source

MEASURE OF LAND-
USE ALTERATION
WITHIN THE
WATERSHED THAT
IMPACTS
MOVEMENT OF
WATER TO WETLAND

OKRAM Metrics: Water Source (Riverine) (Step 1)

- Follow the source river upstream. If an impoundment is reached within 100 km (of stream distance) or before reaching the headwaters of the stream, record the distance

Distance	Score reduction
≤ 500 m	0.3
>500 m but ≤ 5 km	0.2
≥ 5 km but ≤ 100 km	0.1
100 km	none



OKRAM Metrics: Water Source (Riverine) (Step 2)

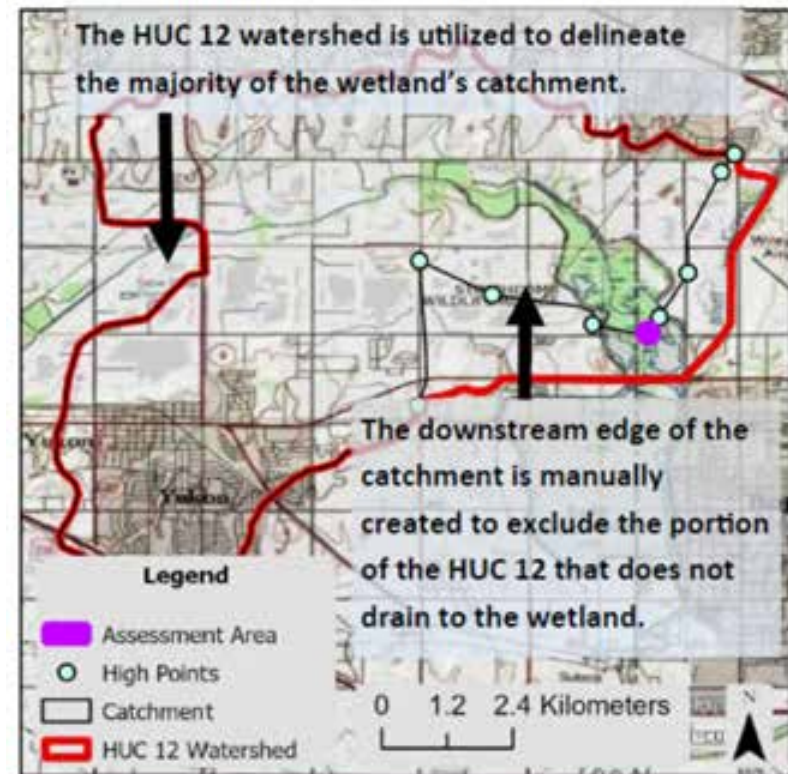
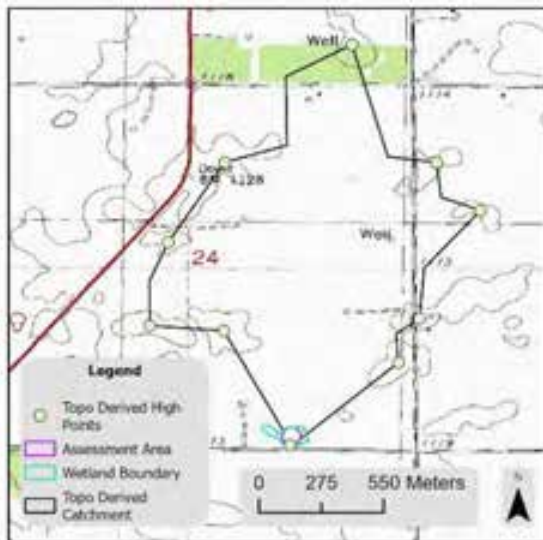
- Follow the source river downstream. If an impoundment is reached within 100 km (of stream distance) or before reaching downstream confluence, record the distance

Distance	Score reduction
≤ 500 m	0.3
>500 m but ≤ 5 km	0.2
≥ 5 km but ≤ 100 km	0.1
100 km	none



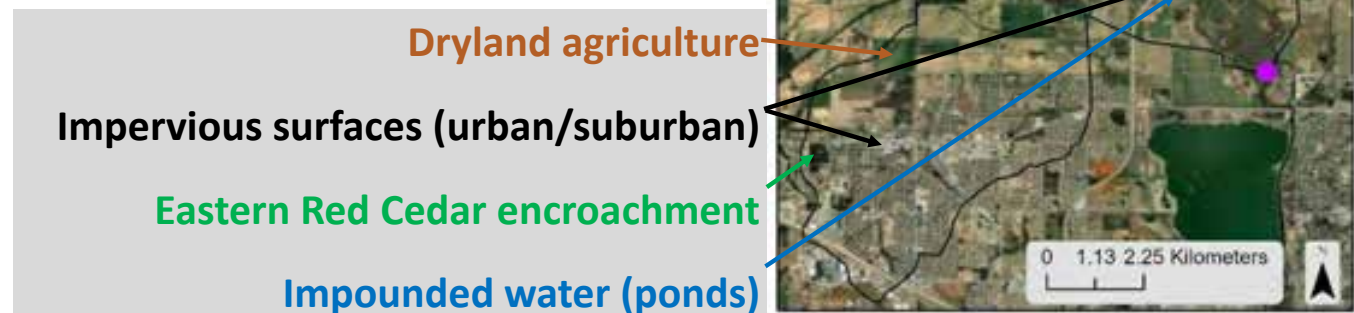
OKRAM Metrics: Water Source (Riverine) (Step 3)

- Delineate the watershed for the AA



OKRAM Metrics: Water Source (Riverine) (Step 4)

□ In the office, identify indicators of altered water source within the catchment



OKRAM Metrics: Water Source (Riverine) (Step 5)

- ❑ Where possible, confirm indicators of altered water source in the field.



OKRAM Metrics: Water Source (Riverine) (Step 6)

In the Water Source worksheet, record the upstream and downstream distance to impoundment, and record the percent cover (0-100) of each indicator of altered water source

No Indicators of Altered Water Source Present: <input type="checkbox"/>			
HUC 8 Indicators of altered water source			
	Distance (m)	Score Reduction	
Upstream Impoundment			0
Downstream Impoundment	0		0.3
Catchment Indicators of altered water source			
	% Cover	Severity Multiplier	Description
Impervious surface (paved roads and ditches, parking lots, structures and roof tops, and compacted gravel and dirt roads)	35	1.5	
Irrigated agricultural land (center pivot, ditch, flood etc.)		1.5	
Dryland agricultural land that is tilled	10	0.5	
Woody encroachment (e.g. eastern red cedar (<i>Juniperus virginiana</i>) and salt cedar (<i>Tamarix sp.</i>))	0.25	0.5	
Impounded water	0.02	2	
Topographic alteration (leveling, excavation, mining)		1	
Total Altered Cover			57.67
METRIC SCORE 1b Alternate			0.30

OKRAM Metrics: Water Source (Notes)

- For depressional wetlands skip steps 1 and 2 (distance to impoundments)

Metric Calculation

$$\text{Water Source} = (1 - UsI - DsI) - \left(\left(\sum_{1}^{i} \frac{(C_i * W_i)}{100} \right) * (1 - UsI - DsI) \right)$$

Where, UsI = upstream impoundment score reduction , DsI = downstream impoundment score reduction, C_i is the cover stressor i and W_i is the severity weight for cover i .

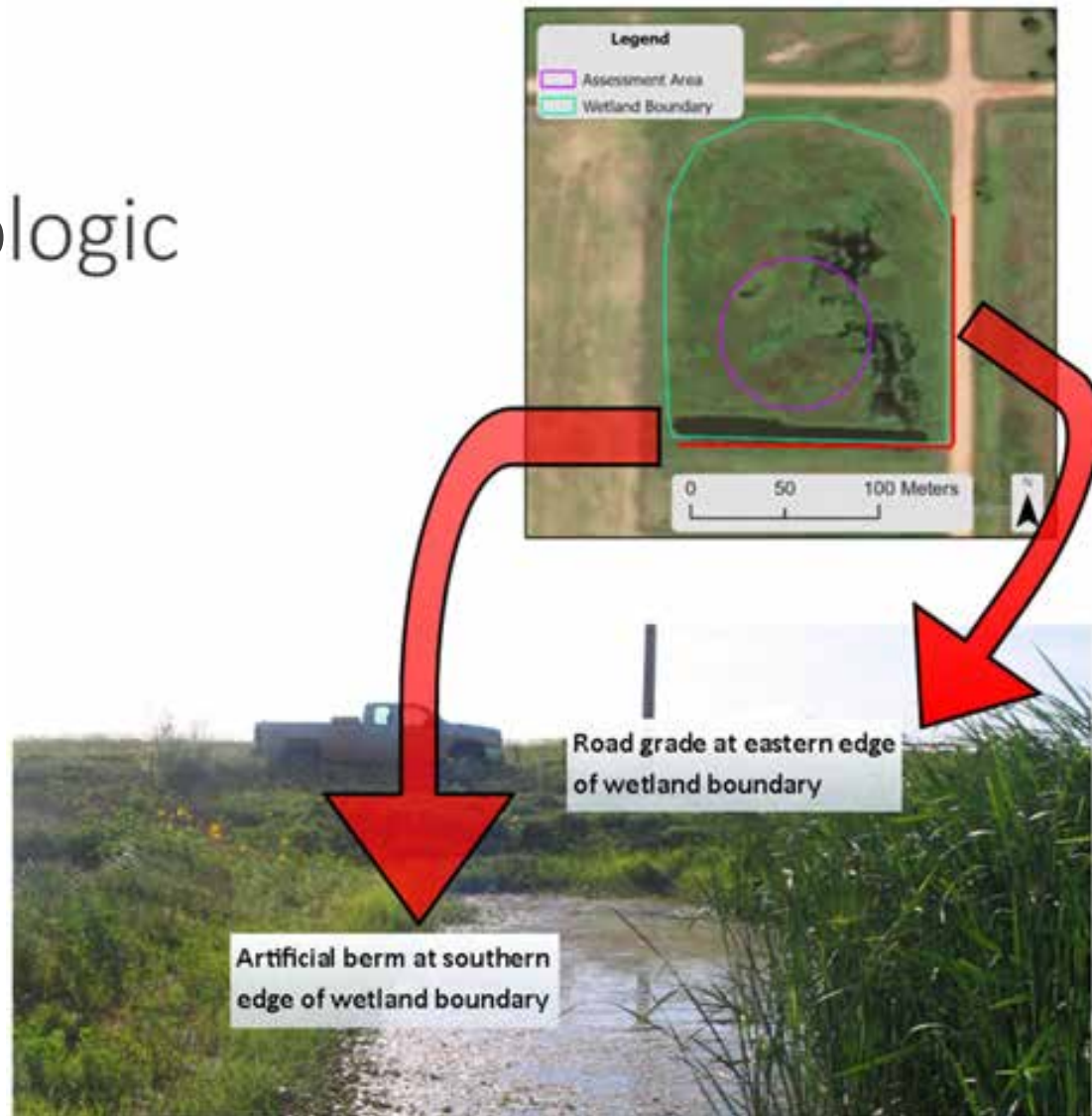


OKRAM Metrics- Hydrologic Connectivity

MEASURE OF
STRESSORS/BARRIERS TO
RESTRICT MOVEMENT OF
WATER BETWEEN WETLAND
AND ADJACENT ECOSYSTEMS

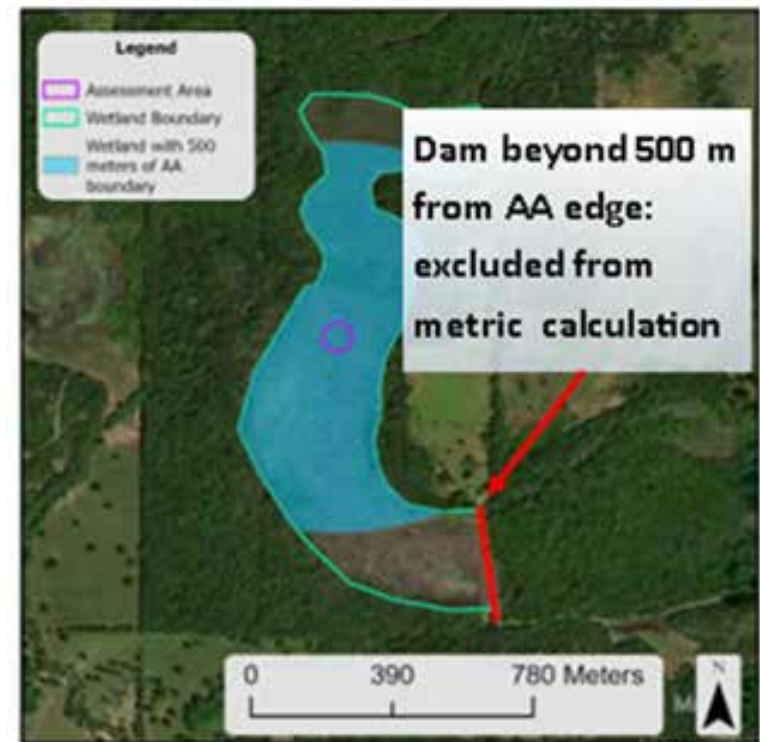
OKRAM Metrics- Hydrologic Connectivity (Step 1)

- When in the field, outline all areas around the boundary of the entire wetland that encompasses the AA where hydrologic connectivity has been altered on an aerial photo.



OKRAM Metrics- Hydrologic Connectivity (Step 1- Continued)

□ In larger wetlands, the assessment of the connectivity metric should be restricted to the portion of the wetland within 500 meters of the AA boundary.



OKRAM Metrics- Hydrologic Connectivity (Steps 2-3)

- Check one of the following
 - Connectivity impacted
 - No indicators of altered Connectivity (autogenerates score of 1)
 - AA is not a wetland (autogenerates score of 0)
- Record the percentage of the perimeter with connectivity barriers
- The metric is autocalculated in the worksheet
 - $(100 - \text{altered perimeter})/100$.

<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, or other artificially steep grades	22	
Road Grades	23	
METRIC SCORE 1C		0.55



OKRAM Metrics- Excess Nutrients and Contaminants

INPUTS OF EXCESS NUTRIENTS
AND CHEMICAL CONTAMINANTS
THAT ALTER WETLAND
BIOGEOCHEMICAL PROCESSES

OKRAM Metrics: Nutrients and Contaminants (Step 1)

- When in the field, outline on an aerial photograph all areas within the AA where nutrient cycling has been altered, matching the alteration to the indicator and the severity from the matrix.



OKRAM Metrics: Nutrients and Contaminants (Step 1- Continued)

Indicators	Severity		
	Minor	Moderate	Major
Residential Runoff and Septic/sewage discharge	Residential dwellings within 200 meters of wetland	Residential dwellings within 50 meters of wetland	Discharge from wastewater/sewage treatment plant
Excessive algae or Lemna sp. (Do not count this metric if algae or Lemna blooms are a result of evapoconcentration of nutrients as wetland is drying.)	Sparse mats or blooms of filamentous algae, Lemna, or cyanobacteria. Small contiguous patches are less than 200 square meters	Mats or blooms of filamentous algae, Lemna, or cyanobacteria may cover large areas but will not be contiguous for more than 0.1 hectares and will contain intermittent gaps where no mats or blooms or present.	Mats or blooms that are contiguous for areas larger than 0.1 hectares.

OKRAM Metrics: Nutrients and Contaminants (Step 1- Continued)



- When in the field, outline on an aerial photograph all areas within the AA where chemical contaminants have been observed, matching the alteration to the indicator and the severity


Indicators	Severity
Increased salinity (e.g., salt crust, excessively high conductivity)	Minor Oil and gas exploration/extraction within 30 meters of wetland (e.g., pumpjacks, tank batteries)
Industrial spills or dumping	Few small containers (5 gallons or less) scattered in the wetland with no signs of chemical contamination AND/OR evidence of limited dumping of trash

<input checked="" type="radio"/> Excess Nutrients or Contaminants Present <input type="radio"/> No Indicators of Altered Nutrient and Contaminants Present <input type="radio"/> 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	Treatment plant input
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.)				excessive <i>Lemna</i> for 50% of AA
TOTAL IMPACTED AREA			100	
SEVERITY WEIGHT	0.25	0.5	0.75	
SEVERITY WEIGHTED AREA			75	
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)				
Increased salinity (e.g., salt crust)				
Industrial spills or dumping	100			Leaking pump jack within 20 meters of AA
Oil sheen (does not include sheen from iron precipitates)				
TOTAL IMPACTED AREA	100			
SEVERITY WEIGHT	0.25	0.5	0.75	
SEVERITY WEIGHTED AREA	25			
METRIC SCORE 2a				0.00

OKRAM Metrics: Nutrients and Contaminants (Step 2)

- Check one of the following
 - Excess nutrients/ contaminants present
 - No indicators of excess nutrients/ contaminants (autogenerates score of 1)
 - AA is not a wetland (autogenerates score of 0)
- Record the indicators identified.

OKRAM Metrics: Nutrients and Contaminants (notes)

- ❑ Overlapping areas of nutrient indicators are only counted once for the highest severity indicator present.
 - ❑ Overlapping areas of chemical contaminants are only counted once for the highest severity indicator present.
 - ❑ However, nutrients indicators may overlap chemical contaminant indicators.
- 

OKRAM Metrics: Nutrients and Contaminants (notes)

□ The metric is autocalculated in the worksheet but can be calculated with the following equation:

$$\text{Nutrient and Contaminant Score} = 1 - ((\text{MiE} * 0.25) + (\text{MoE} * 0.5) + (\text{MaE} * 0.75))$$

Where, MiE= extent of minor stressor indicators, MoE = extent of moderate stressor indicators, and MaE= extent of major stressor indicators.



OKRAM Metrics- Sediment (Depressional)

INPUTS OF EXCESS
SEDIMENT THAT IMPACT
WETLAND STRUCTURE,
HYDROLOGY, AND
BIOLOGICAL COMMUNITIES

OKRAM Metrics- Sediment (Step 1)

□ In the field, outline on an aerial photo all areas within the AA where sediment loading has been altered, matching the alteration to the indicator and severity from the matrix.



OKRAM Metrics- Sediment (Step 1- Continued)

Indicators	Severity		
	Minor	Moderate	Major
Sedimentation (e.g., presence of sediment plumes, fans or deposits)	Excessive turbidity (in excess of expectation for the system), silt laden vegetation	Sediment plumes or fans, silt deposits less than 0.5 centimeters in thickness	Silt deposits greater than 0.5 centimeters in thickness
Upland erosion (e.g., gullies, rills)	Sparse rills connecting upland to wetland. Sediment washing down cattle/wildlife trails.	Dense rills connecting upland to wetland	Gullies connecting upland to wetland

OKRAM Metrics- Sediment (Steps 2 - 3)

- Check one of the following
 - Excess sediment present
 - No indicators of excess sediment (autogenerates score of 1)
 - AA is not a wetland (autogenerates score of 0)
- Record the indicators identified.

<input checked="" type="radio"/> Excess Sedimentation Present <input type="radio"/> No Indicators of Excess Sediment Present <input type="radio"/> AA is not a Wetland				
Indicators of Altered Sediment loading	Minor	Moderate	Major	Indicator Description
Sedimentation (e.g., presence of sediment plumes, fans or deposits, turbidity, silt laden vegetation)			100	Excessive sedimentation from adjacent tillage, turbid water
Upland erosion (e.g., gullies, rills)				sparse rills
TOTAL IMPACTED AREA			100	
SEVERITY WEIGHT	0.25	0.5	0.75	
SEVERITY WEIGHTED AREA			75	
METRIC SCORE 2b			0.25	

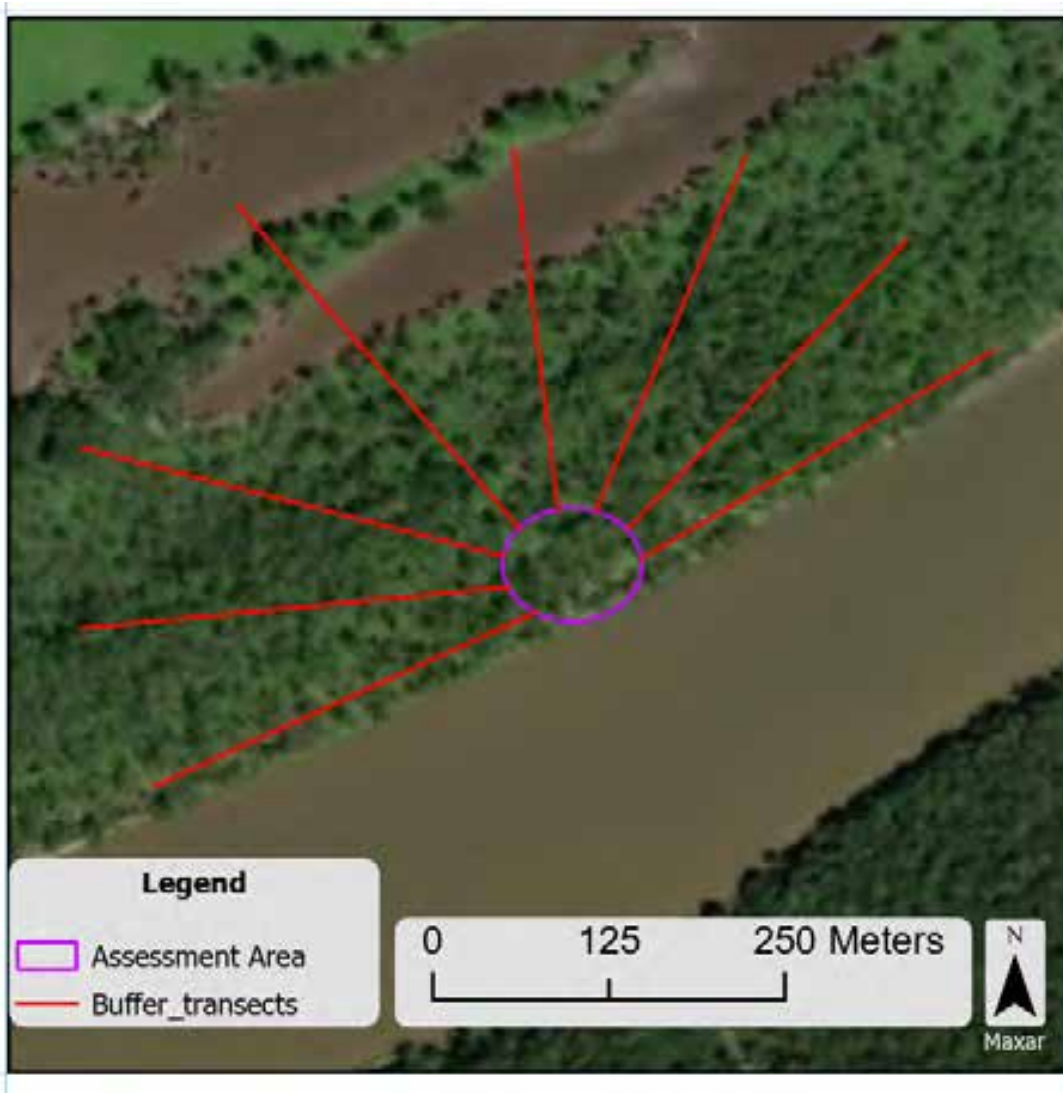
OKRAM Metrics- Sediment (notes)

❑ Overlapping areas of indicators are only counted once for the highest severity indicator present. Therefore, the total percent cover of indicators cannot exceed 100.

❑ The metric is autocalculated in the worksheet

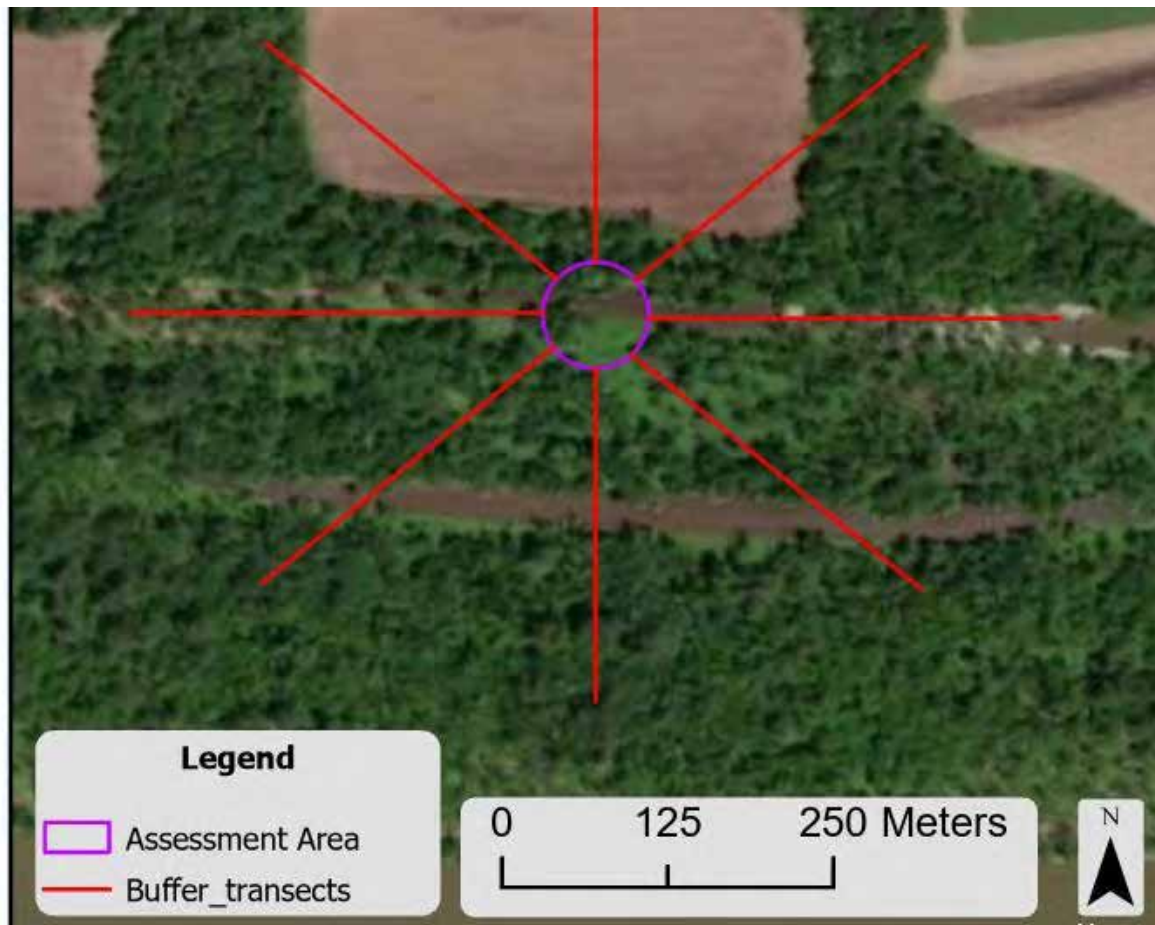
$$\text{Sediment Score} = 1 - ((\text{MiE} * 0.25) + (\text{MoE} * 0.5) + (\text{MaE} * 0.75) + \text{CL})$$

Where, MiE= extent of minor stressor indicators, MoE = extent of moderate stressor indicators, and MaE= extent of major stressor indicators.



OKRAM Metrics- Buffer Filter

MEASURE OF THE
CAPACITY OF
SURROUNDING
UPLANDS TO
PREVENT INPUT OF
NUTRIENTS,
CONTAMINANTS
AND SEDIMENT



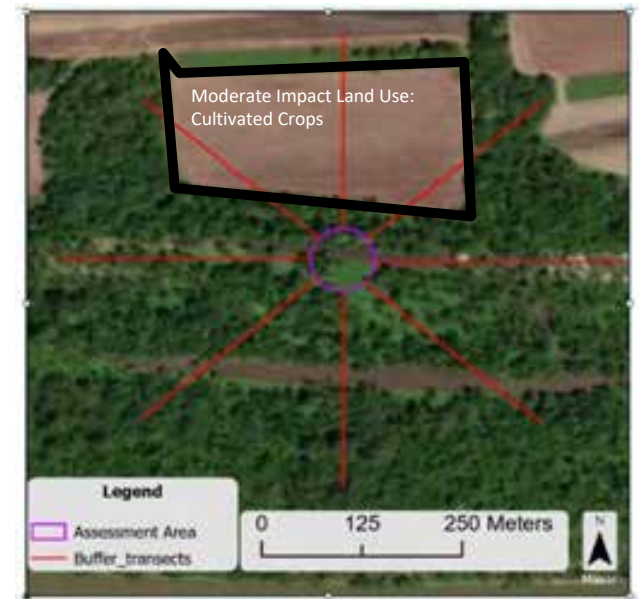
OKRAM Metrics: Buffer Filter (Step 1)

- ❑ In the office, draw eight evenly spaced 250 m lines, or buffer transects, emanating perpendicularly from the AA perimeter starting at due North on an aerial photograph.

OKRAM Metrics: Buffer Filter (Step 2)

- While in the field, annotate human impacted land-use along each of the buffer transects. Record land-use as high impact, moderate impact or low impact

Land use category	Types of Land-use Beyond Buffer	Required width
High Impact	Concentrated livestock husbandry or urban area	250m
Moderate Impact	Conventional tilled agriculture, landscaped park, golf course, suburban area, active construction sites, vegetation removal, earth moving	100m
Low Impact	No till agriculture, hay meadow, active roads, minimal use recreation area, silviculture, managed pasture, trails, railroad tracks, mowed lawn	30m
No Impact	Natural uplands and wetlands, rangeland with domestic livestock that mimics natural grazing (flash and low density grazing), water bodies not directly adjacent to AA, wildland parks	n/a



OKRAM Metrics: Buffer Filter (Step 3)

□ In the buffer worksheet, record the distance until high impact land use is encountered (max 250), moderate impact land-use is encountered (max 100) and low-impact land-use is encountered (max 30) along each transect.

Buffer	Distance to High Impact	Distance to Moderate Impact	Distance to Low Impact	% Intact
1	250	39	30	0.39
2	250	48	30	0.48
3	250	100	30	1
4	250	100	30	1
5	250	100	30	1
6	250	100	30	1
7	250	100	30	1
8	250	85	30	0.85
	0.84			

OKRAM Metrics: Buffer Filter (notes)

- ❑ For each buffer transect, the percent intact distance is autocalculated by dividing the distance to 'impact' by the 'required buffer width'
- ❑ The lowest value for each transect is automatically selected and recorded in the '% Intact' field.
- ❑ The metric score is autocalculated by averaging all eight buffer values.

Buffer	Distance to High Impact	Distance to Moderate Impact	Distance to Low Impact	% Intact
1	250	39	30	0.39
2	250	48	30	0.48
3	250	100	30	1
4	250	100	30	1
5	250	100	30	1
6	250	100	30	1
7	250	100	30	1
8	250	85	30	0.85
	0.84			



OKRAM Metrics- Vegetation Condition

MEASURE OF THE DEGREE OF
ANTHROPOGENIC ALTERATION
TO THE VEGETATION
COMMUNITY

OKRAM Metrics- Vegetation (Step 1)

□ In the field, conduct a visual assessment of the current percent cover (0-100) of each vegetation layer, including only live vegetation.



Vegetation Layer	Description
Tree	Woody stems \geq 8 cm diameter at breast height (DBH)
Shrub	Woody stems < 8 cm DBH
Herbaceous / Emergent	All non-woody plants growing on dry land or with stems emerging above the water surface
Submergent	Non-woody plants growing below the water surface
Floating Leaved	Non-woody plants with leaves floating on the surface of the water (rooted to the substrate or free-floating)



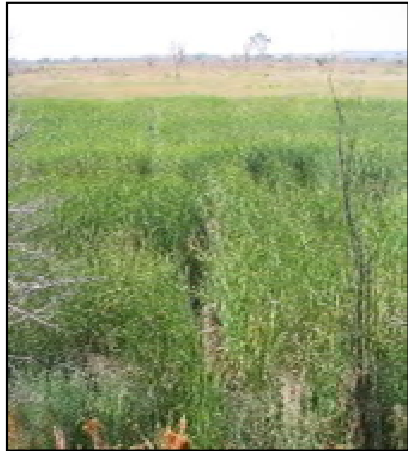
OKRAM Metrics: Vegetation (Step 2)

- If the wetland has been converted from a forested wetland to a non-forested wetland (<30% canopy cover), select the 'Historic Forested Wetland has been Cleared' checkbox.



OKRAM Metrics: Vegetation (Step 3)

- Determine the percentage of the AA (0-100) of all "Indicators of Vegetation Removal" from anthropogenic activities
 - Tree or shrub cutting
 - Ground disturbance (e.g., animal rooting, trampling)
 - Unnatural patterns of dead vegetation (herbicide)
 - Structures



OKRAM Metrics: Vegetation (Step 4)

- Determine the percent cover within each vegetation layer (0-100) of all 'Indicators of Vegetation Disturbance'
 - Haying, mowing, brush hogging
 - Revegetated ground disturbance
 - Invasive species, crop/pasture
 - Native monocultures
 - Upland plant encroachment

OKRAM Metrics: Vegetation (Step 5)

☐ Fill in worksheet

	Vegetation Layers			
	Tree	Shrub/ sapling	Herbaceous/ Emergent	Submergent/ Floating leaved
<input checked="" type="checkbox"/> Historic Forested Wetland has been cleared (canopy cover now <30%)- excludes restoration projects on a trajectory towards reforestation				
Percent Cover of Layer (live vegetation)	0	20	90	
Indicators of Vegetation Removal from Anthropogenic Activities (Percentage of the AA impacted) ϕ				
Tree and shrub cutting (estimate cover lost)				
Ground disturbance exposing soil surface (e.g., excessive grazing \ddagger , animal trampling, rooting, or mechanical disturbance)				
Dead vegetation (e.g., herbicide application, or altered hydroperiod \ddagger)				
Mechanical disturbance from structures (e.g. rip-rap, or roads etc.)				
Total Removed Cover				
Sum of existing and removed cover		20	90	
Indicators of Vegetation Disturbance (Percentage of live vegetation cover impacted)				
Haying, mowing, brush hogging		100		
Ground surface disturbance but subsequently revegetated (e.g., animal trampling, rooting or mechanical disturbance)				
Invasive species and or crop/pasture *			30	
Native Monoculture \ddagger				
Upland plant encroachment and/or stunted vegetation as a result of altered hydroperiod (increased or decreased) \ddagger				
Percent disturbed cover per layer		20	27	
METRIC SCORE 4a	0.29			

OKRAM Metrics: Vegetation (notes)

- ❑ The metric is autocalculated :

$$\text{Vegetation condition score} = 1 - (\text{VegDisturbed} + \text{VegRemoved}) / (\text{VegCover} + \text{VegRemoved})$$

- ❑ If the “Historic Forested Wetland has been cleared” is selected, the overall score is reduced by 0.5 and the metric is calculated as follows:

$$\text{Vegetation condition score} = 0.5 - (0.5 * (\text{VegDisturbed} + \text{VegRemoved}) / (\text{VegCover} + \text{VegRemoved}))$$

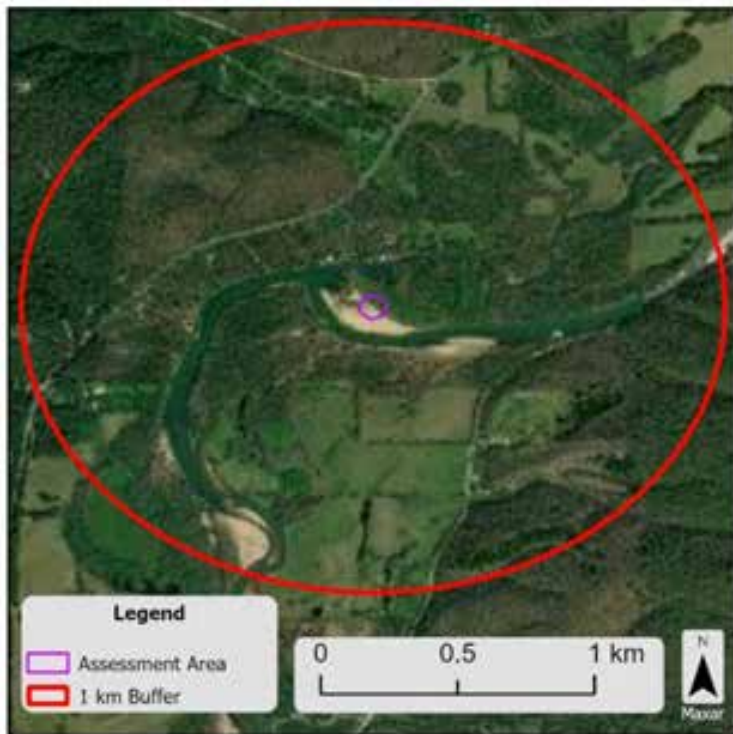


OKRAM Metrics- Habitat Connectivity

A LANDSCAPE
MEASURE OF THE
ABILITY OF WILDLIFE
TO MOVE BETWEEN
THE WETLAND AND
ADJACENT HABITAT

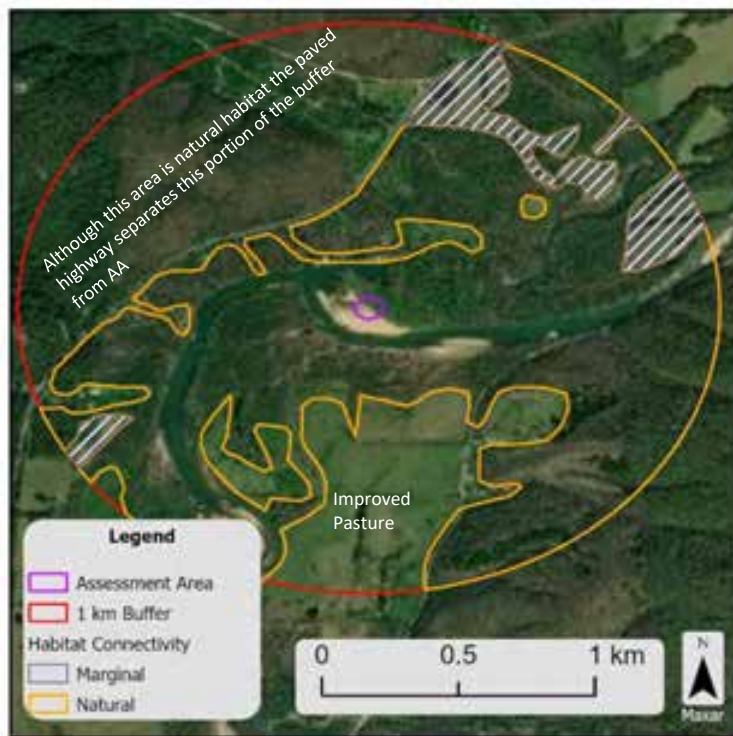


OKRAM Metrics: Habitat Connectivity (Step 1)



- In the office, delineate a 1 km buffer around the boundary of the AA on an aerial photograph before visiting the wetland.

OKRAM Metrics: Habitat Connectivity (Step 2)



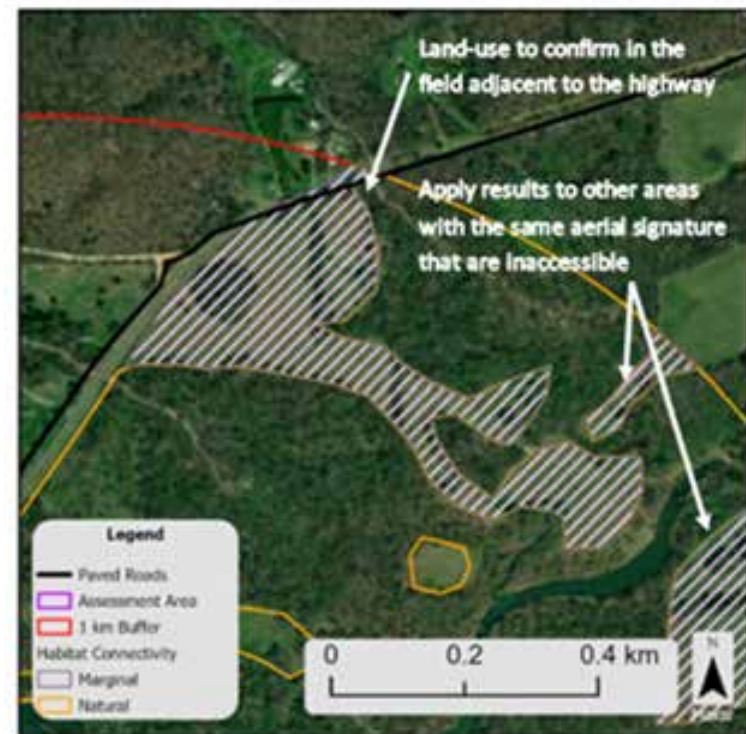
- ❑ In the office, assign all habitat within the 1000 m buffer into three categories, natural, marginal and dispersal barriers.
- ❑ Delineate a polygon around the AA that only includes connected natural habitat.
- ❑ Delineate a second polygon around the AA that includes connected marginal and natural habitat

OKRAM
 Metrics: Habitat
 Connectivity
 (Step 2-
 continued)

Natural Habitat (includes linear disturbances that minimally impact wildlife)
open water
other wetlands
natural uplands
nature or wildland parks...
Marginal Habitat
hay meadows
pine plantations
pedestrian/bike trails with near constant traffic
forests converted to rangeland
Dispersal Barriers (not included in connected habitat)
Natural or marginal habitat less than 25 meters wide
commercial developments
fences that interfere with animal movements
intensive agriculture (e.g., row crops, orchards, vineyards)
dryland farming...

OKRAM Metrics: Habitat Connectivity (Step 3)

- Print aerial imagery with habitat types marked from Step 2. Confirm land-use within the 1 km buffer in the field for all areas that are feasibly accessible based on landowner permission, time required for access or other logistical constraints.



OKRAM Metrics: Habitat Connectivity (Steps 4-5)

- ❑ Calculate the area within the 1 km buffer created in Step 1
- ❑ Calculate the area within the natural habitat and the natural/marginal habitat polygons
- ❑ Fill in the buffer and connected habitat areas in the Habitat Connectivity Worksheet.

Area of Natural and Marginal Connected Habitat	206
Area of Natural Connected Habitat	188
Area within 1000 m buffer	340
METRIC SCORE	0.58

OKRAM Metrics: Habitat Connectivity (notes)

The Habitat Connectivity metric can be calculated manually using the following equation:

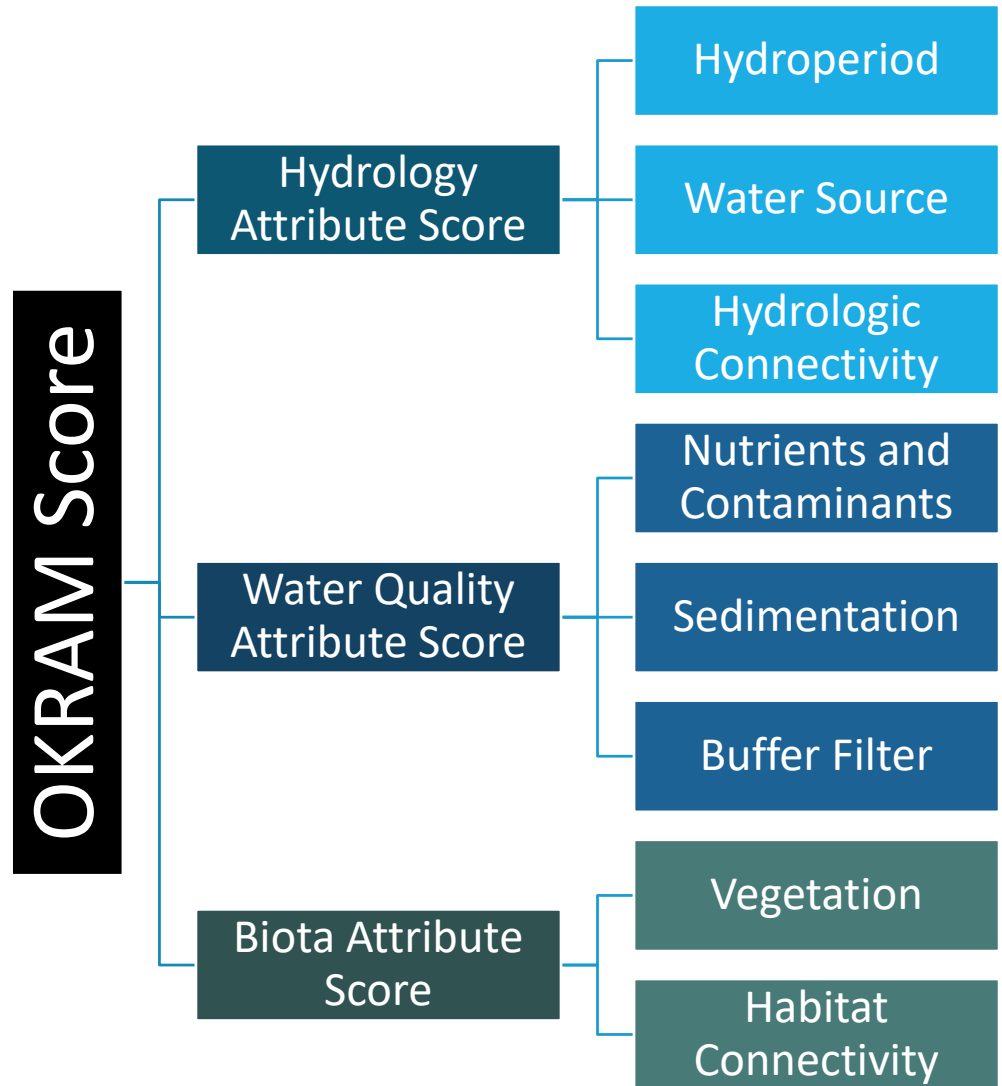
$$\text{Habitat Connectivity score} = (\text{NMH}/\text{BA} + \text{NH}/\text{BA})/2$$

Where, NMH = the area of natural and marginal habitat connected to the AA, NH = the area of natural habitat connected to the AA and BA = the area within the 1 km buffer.

Outline

- Assessment Areas
- Wetland Classification
- Site Description
- OKRAM Metrics
- **OKRAM Scoring**
- Office Preparation
- Day 1 Assessment: Gilcrease Turnpike

OKRAM Scoring: Framework



4. OKRAM Overall Condition Score - Depressional

Metric	Score
1 Hydrology	
1a. Hydroperiod	1.00
1b. Water source	0.32
1c. Hydrologic Connectivity	0.75
Hydrology Attribute	0.69
<i>(metric 1a +metric 1b + metric 1c)/3</i>	
2 Water Quality	
2a. Nutrients/Contaminants	0.50
2b. Sediment	0.75
2c. Buffer Filter	0.80
Water Quality Attribute	0.68
<i>(metric 2a +metric 2b + metric 2c)/3</i>	
3 Biota	
3a. Vegetation	0.69
3b. Habitat Connectivity	0.59
Biota Attribute	0.64
<i>(metric 3a + metric 3b)/2</i>	
Overall Condition Score	0.67

OKRAM Scoring: Depressional Calculation

OKRAM Scoring: Riverine Calculation

- Water Source includes distance to impoundment
- No Sediment
- Typically scores similarly even if wrong module selected

4. OKRAM Overall Condition Score- Riverine

	Metric	Score
1	Hydrology	
1a.	Hydroperiod	1.00
1b.	Water source	0.22
1c.	Hydrologic Connectivity	0.75
	Hydrology Attribute	0.66
<i>(metric 1a + metric 1b + metric 1c)/3</i>		
2	Water Quality	
2a.	Nutrients/Contaminants	0.50
2b.	Buffer Filter	0.80
	Water Quality Attribute	0.65
<i>(metric 2a + metric 2b)/2</i>		
3	Biota	
3a.	Vegetation	0.69
3b.	Habitat Connectivity	0.59
	Biota Attribute	0.64
<i>(metric 3a + metric 3b)/2</i>		
Overall Condition Score		0.65

OKRAM Scoring: Condition Categories

- Good: 1 – 0.85
 - Minimal human impact at local and landscape scales
- Fair: 0.84 – 0.5
 - Some combination of local and landscape disturbance
- Poor: 0.49 – 0
 - Significantly impacted by both local and landscape stressors



OKRAM: Score Interpretation

OKRAM scores better for:

- Larger wetlands
- Buffered wetlands
- Connected wetlands
- Unmanaged hydrology



Landscape context presents a ceiling to OKRAM score but need to consider best-achievable

- For example, an urban depressional wetland with 100 m upland buffer and no local impacts will likely score between 0.6 and 0.7





Upland (non-wetland) sites score 0 for OKRAM



A well-planned restoration in a highly impacted landscape can still provide significant uplift



In-kind restoration in impacted landscapes, still provides opportunity for restoring equal/greater condition

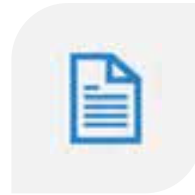
OKRAM: Score Interpretation



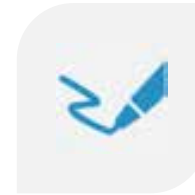
Outline

- Assessment Areas
- Wetland Classification
- Site Description
- OKRAM Metrics
- OKRAM Scoring
- Office Preparation
- Day 1 Assessment: Gilcrease Turnpike

Office Preparation



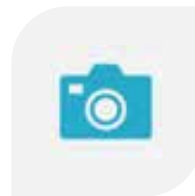
1. COMPILE
FRAME
MATERIALS



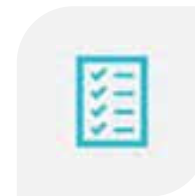
2. DELINEATE
APPROXIMATE
WETLAND
BOUNDARY



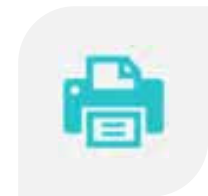
3. GENERATE
PRELIMINARY
ASSESSMENT
AREA



4. PRINT
AERIAL
PHOTOS

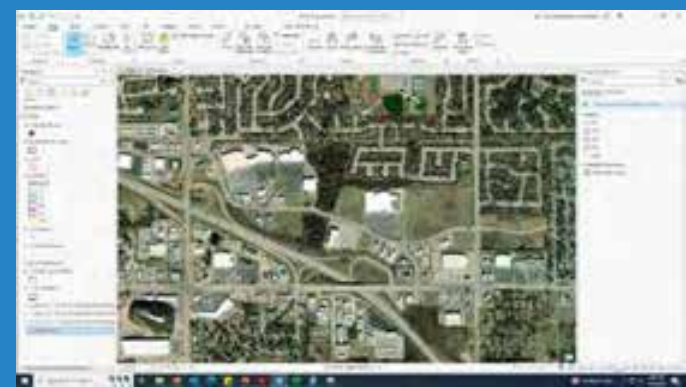
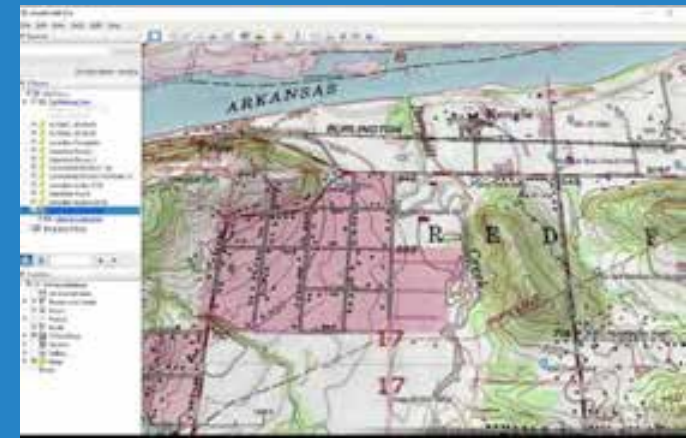


5. COMPLETE
PRELIMINARY
ASSESSMENT



6. PRINT
DATASHEETS

Office Preparation: Compile Frame Materials



Minimum requirements

- Current high resolution aerial imagery
- USGS topographic maps

Helpful layers

- National Wetlands Inventory
- Digital Elevation Models
- Watershed Boundaries
- National Land Cover Dataset

Choose visualization/processing software

- ArcPro
- QGIS
- Google Earth

Office Preparation: Delineate Wetland Boundary and Generate Preliminary AA

- Delineate Boundary
 - NWI
 - Project Boundary
- Select Random Point within Wetland
- Generate standard 40 m circular AA

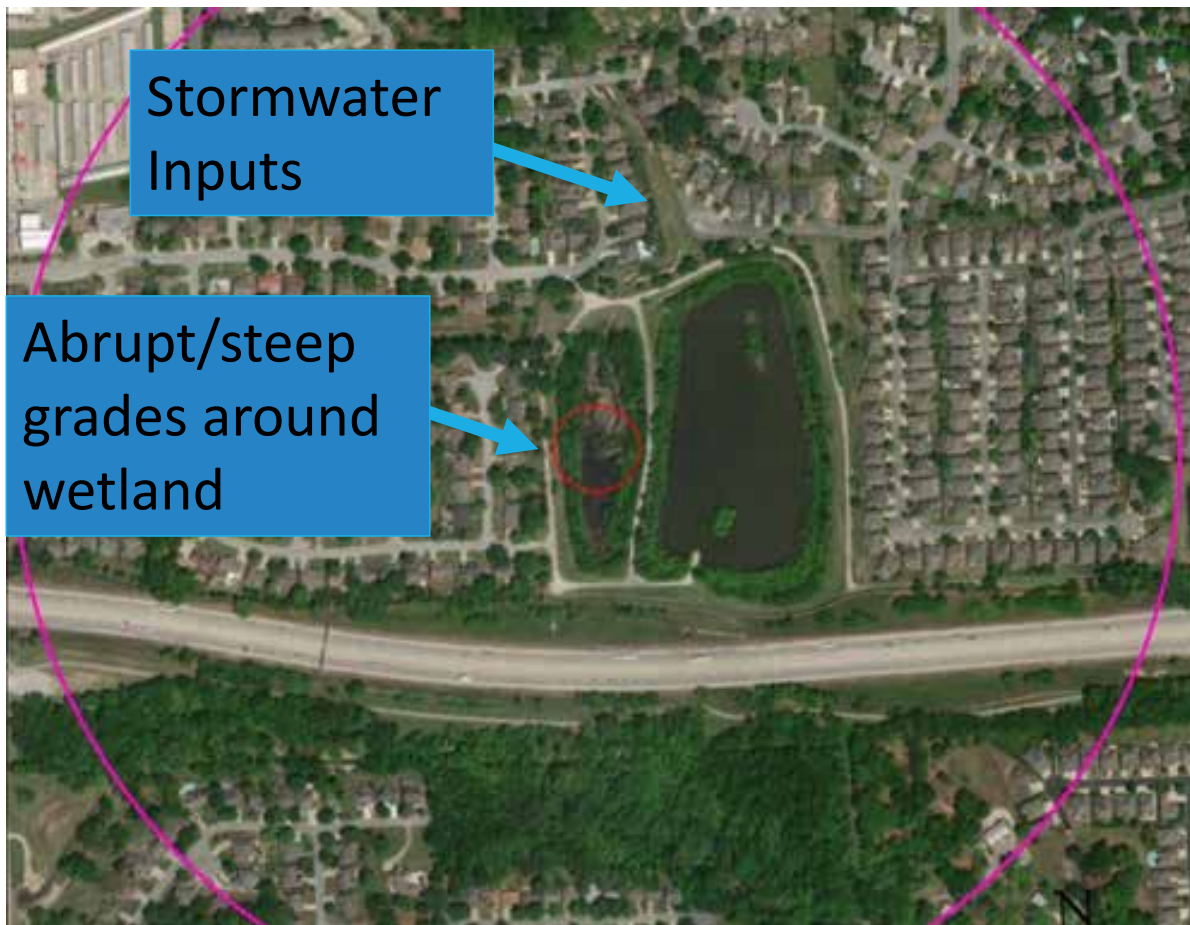


Office Preparation: Print Aerial Photos



Office Preparation: Print Aerial Photos





Office Preparation:
Complete Preliminary
Assessment

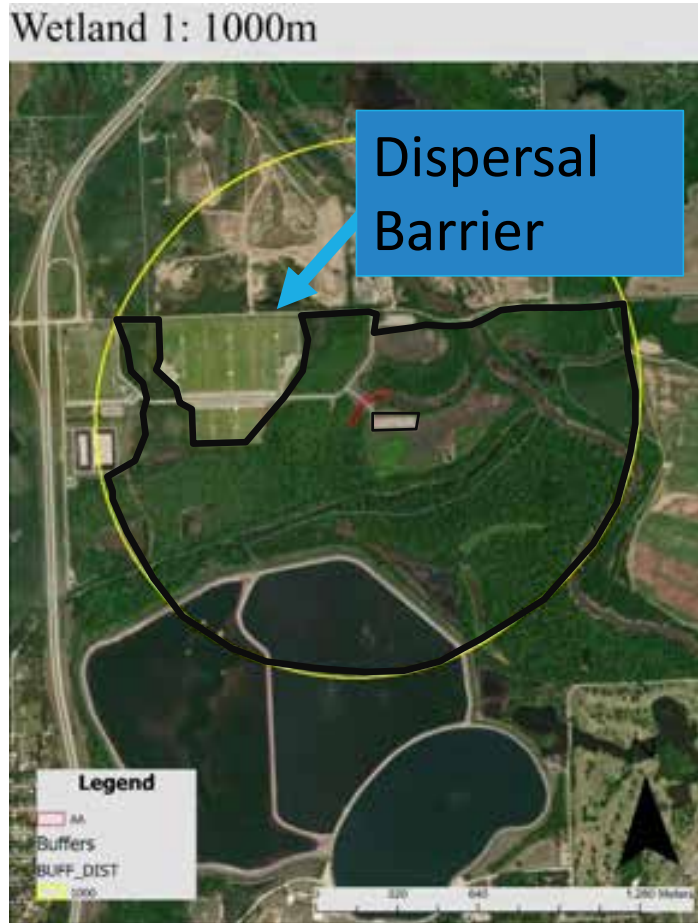
- 500 Meter Buffer
 - Hydroperiod Stressors
 - Barriers to Hydrologic Connectivity
- Mark places for inspection in the field

Wetland 1: Water Source



Office Preparation: Complete Preliminary Assessment

- Water Source
 - Delineate Stressors within the watershed and calculate area
 - Mark questionable areas of land-use for investigation in the field



Office Preparation: Complete Preliminary Assessment

- ☐ 1000 m buffer
- ☐ Delineate connected habitat

3. Hydrologic condition
A. Indicators

1. In the office, mark potential hydrological processes that occur within 100 meters of the AA to some degree for further inspection in the field.

2. In the field, confirm hydrological processes identified in the office, as well as any other hydrological processes observed. Record the indicator observed in the field in the indicator and the severity from the table on the following worksheet (24 Hydrological Indicators). Scrubate on each image with the serial extent of record from all identified indicators.

3. If no hydrological processes are identified, select the "No Indicators of Observed Hydrological Processes" button. This will automatically a score of 1. If the site is not a wetland, select the "Not a wetland" button. This will automatically a score of 0. Otherwise, if indicators of alteration are present, ensure the "Hydrological is impacted" button is selected and continue on to step 4.

4. Record the percentage (0-100) of the AA impacted by each indicator in the appropriate severity column. Overlapping areas of indicators are only scored once for the highest severity indicator present. Therefore the total percent cover of indicators cannot exceed 100. The score is calculated in the worksheet.

5. Calculate the score for the AA in the appropriate column.

Indicators of Altered Hydrological	None	Minor	Major	Complete Loss	Indicator Description
1. Wetland					
2. Wetland					
3. Wetland					
4. Wetland					
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6. Wetland					
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8. Wetland					
9. Wetland					
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98. Wetland					
99. Wetland					
100. Wetland					



3. Hydrologic condition
A. Indicators

Indicator	None	Minor	Major	Complete Loss	Indicator Description
1. Wetland					
2. Wetland					
3. Wetland					
4. Wetland					
5. Wetland					
6. Wetland					
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96. Wetland					
97. Wetland					
98. Wetland					
99. Wetland					
100. Wetland					

Office Preparation: Datasheets

- Depressional and Riverine metrics
- Datasheets for every AA
- Field laptop

Outline

- Assessment Areas
- Wetland Classification
- Site Description
- OKRAM Metrics
- Office Preparation
- OKRAM Scoring
- Day 1 Assessment: Gilcrease Turnpike

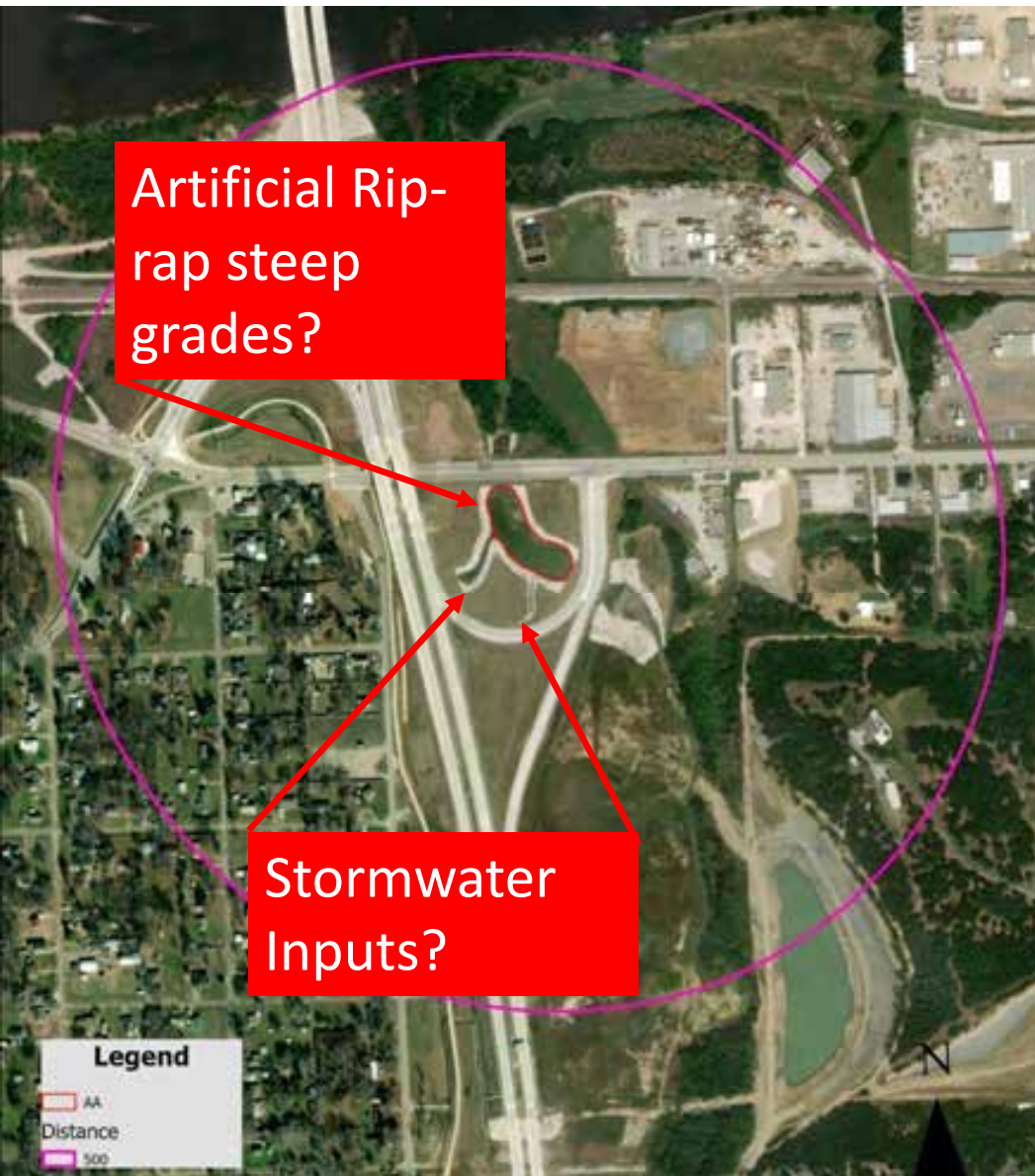
Day 1 Assessment: Gilcrease (Area History)

- 1943
- 1964
- 2024



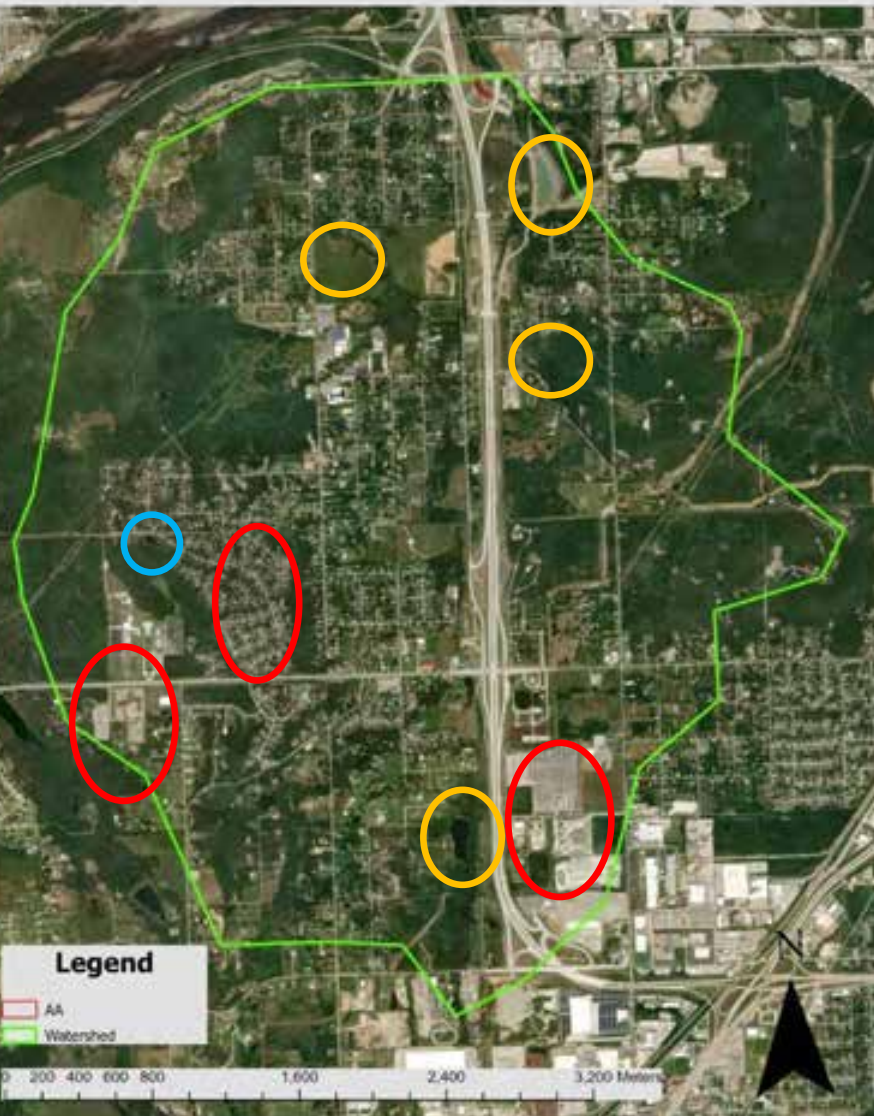


Day 1 Assessment: Gilcrease- Site 1



Day 1 Assessment: Gilcrease- Site 1- Hydroperiod and Hydrologic Connectivity

Wetland 1: Watershed



Day 1 Assessment: Gilcrease-Site 1- Water Source

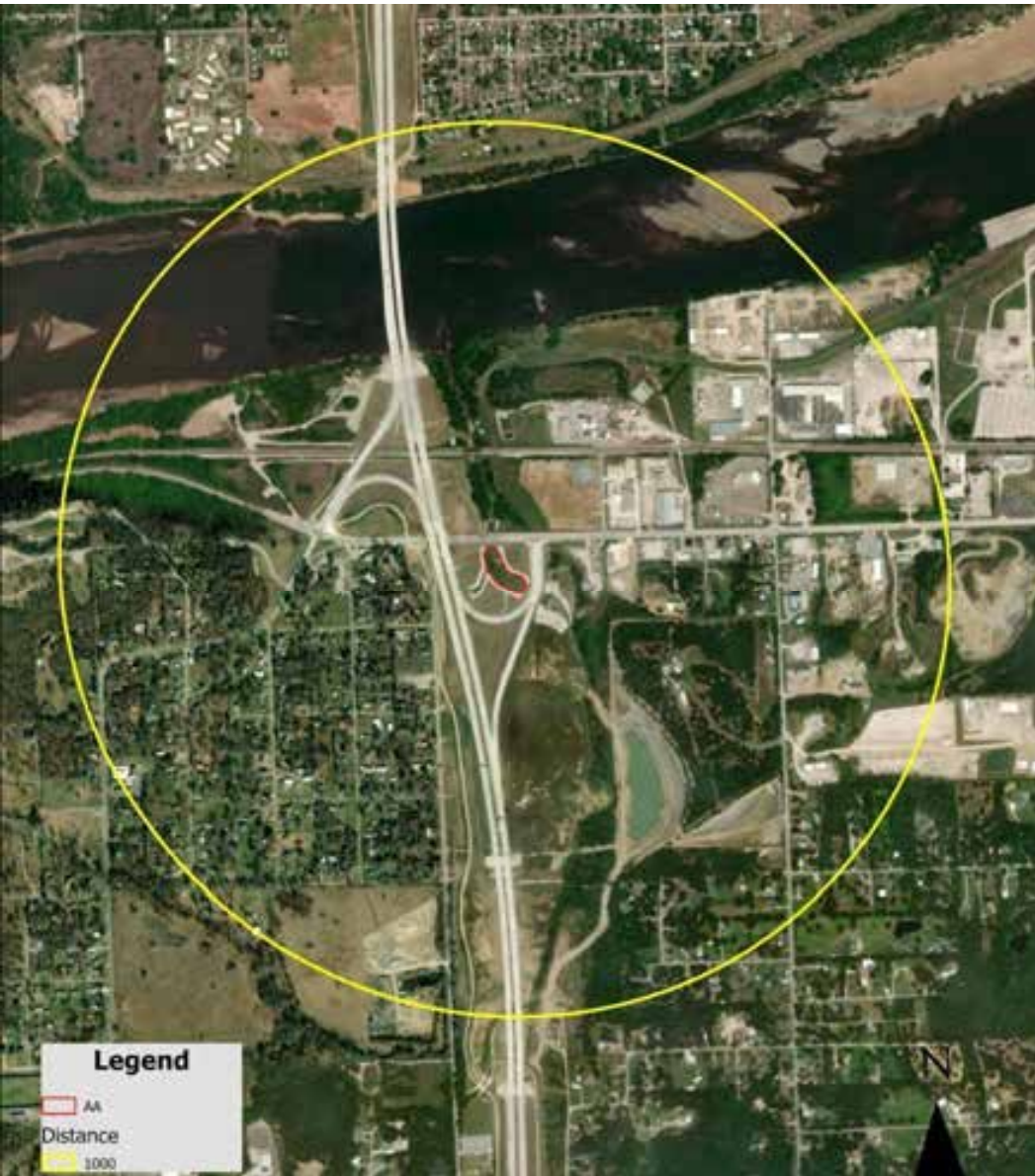
- Watershed is ~3,700 acres
- Upstream Impoundment @ 5,500 meters
- Roughly 700 acres impervious or 20%
- Roughly 2% ponds, 1% dryland ag, 1% excavation, and 1% woody encroachment
- Projected Water Source score of 0.58

Wetland 1: Buffer Lines



Day 1 Assessment: Gilcrease-Site 1- Buffer Filter

- All buffers encounter mowed lawn/right of ways or roads immediately beyond AA boundary
- Projected Buffer Filter Score of 0



Day 1 Assessment: Gilcrease- Site 1- Habitat Connectivity

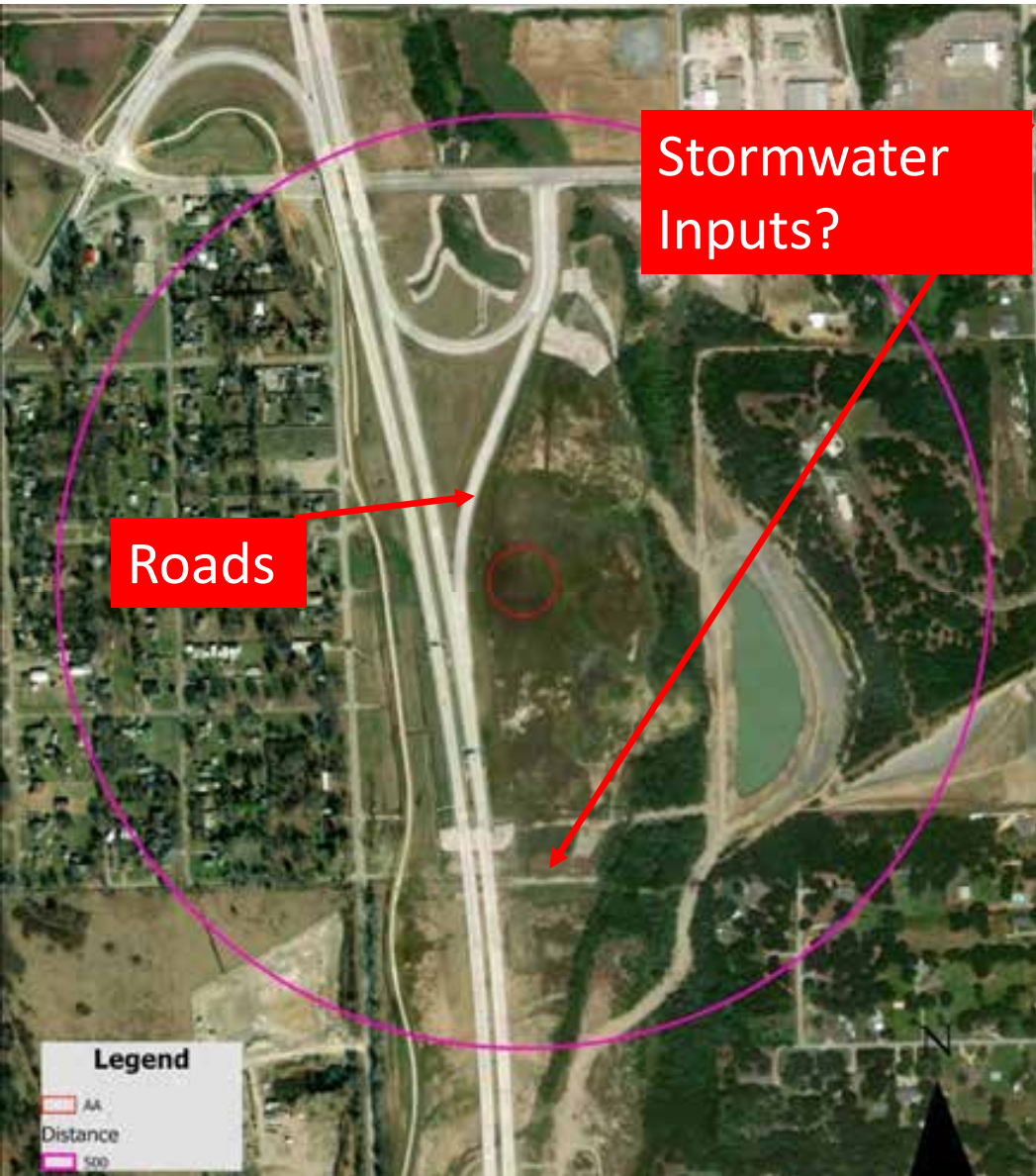
- AA surrounded by mowed lawn/right of ways and roads
- Projected Habitat Connectivity score of 0

Wetland 2: 100 meter buffer



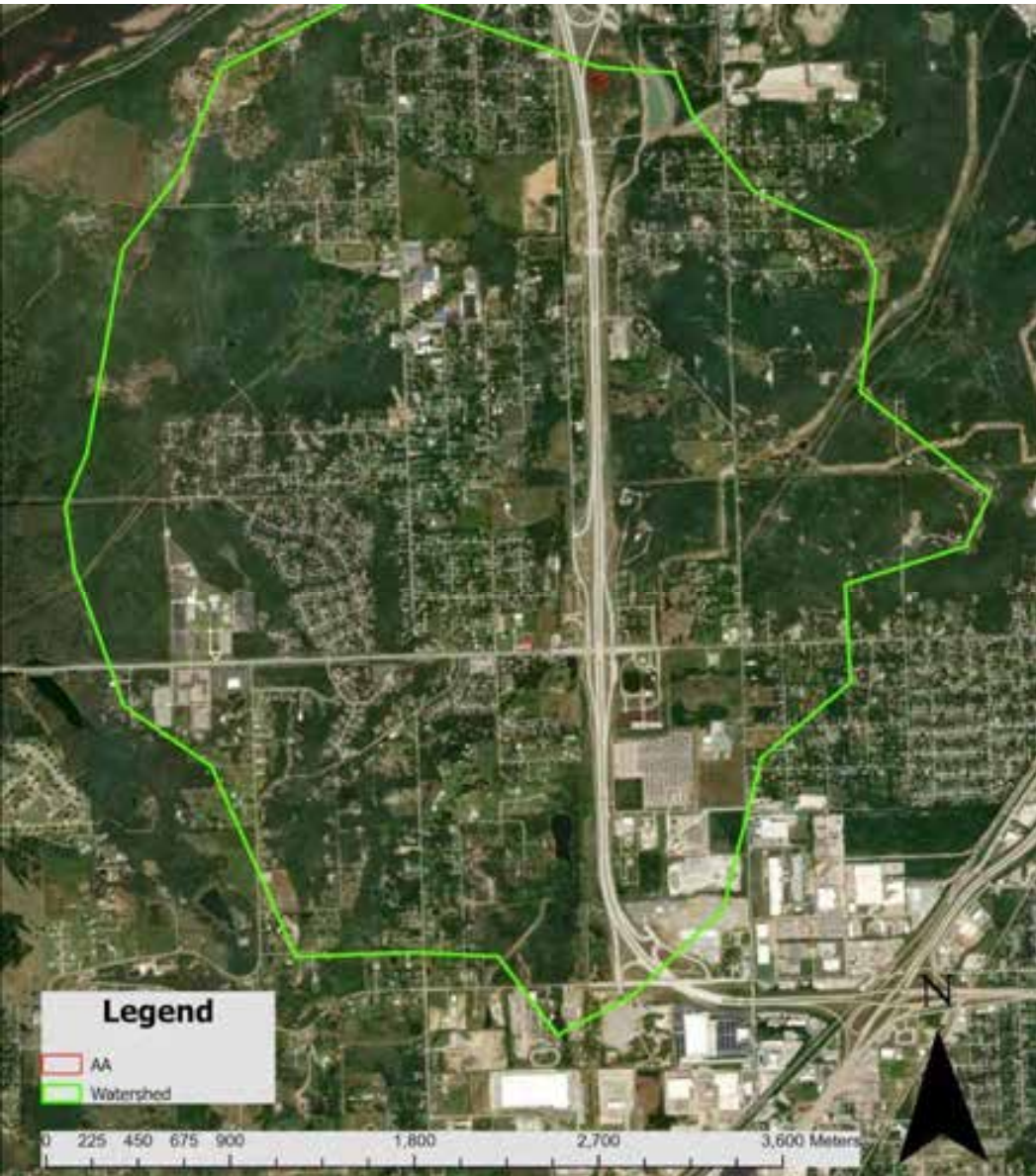
Day 1 Assessment: Gilcrease- Site 2

- Larger and more connected than Site 1



Day 1 Assessment: Gilcrease- Site 2- Hydroperiod and Hydrologic Connectivity

- Hydrologic Connectivity likely greater than Site 1



Day 1 Assessment: Gilcrease- Site 2- Water Source

- Same as Site 1



Day 1 Assessment: Gilcrease- Site 2- Buffer Filter

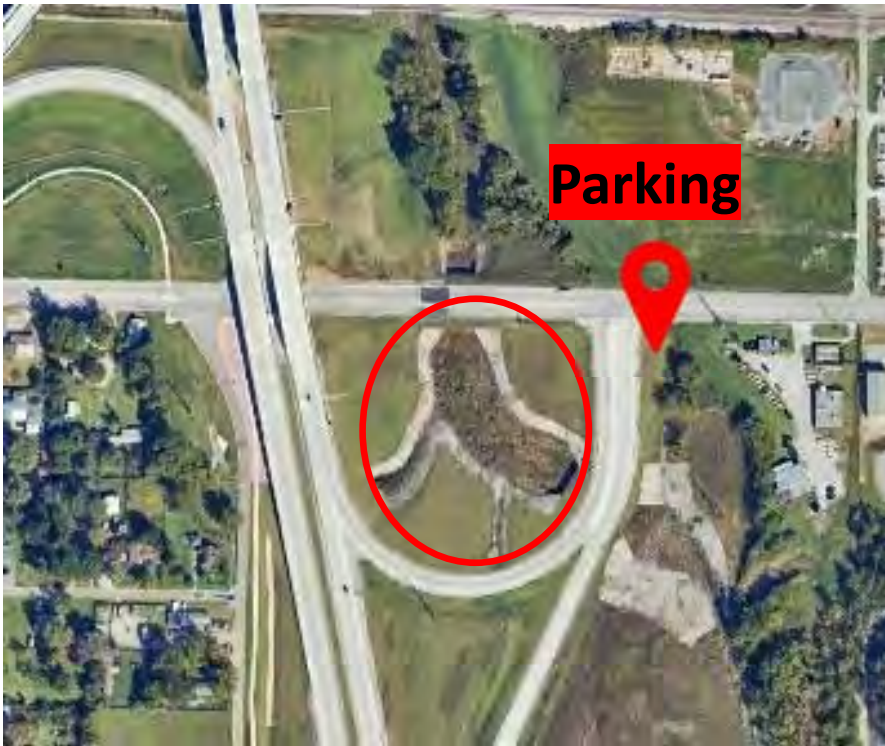
- Larger wetland and location of AA means buffer distances appear adequate from impacts
- AA will likely score a 1



Day 1 Assessment: Gilcrease- Site 2- Habitat Connectivity

- Larger wetland and location of AA means habitat connectivity is greater and is potentially closer to a 0.15

Day 1 Assessment: Gilcrease- Sites 1 and 2



- ❑ Directions:
 - ❑ Gilcrease Express North
 - ❑ Exit 4 at 21st Street
 - ❑ Park on shoulder of exit ramp before reaching 21st Street
- ❑ Parking Coordinates:
 - ❑ 36.133098, -96.053387