WESO Study Guide
What Went By: Wild, Wonderful Wetlands!

NOTE: This study guide is intended to help coaches understand the topics the event will cover, and the level of comprehension expected for those topics. It is recommended and expected that additional materials, websites and activities be used to help prepare the teams for this event.

WETLANDS

What Makes a Wetland, a Wetland?
Great question! Sometimes, you can look at a wetland and think to yourself, "That right there is a wetland." Other times, you may be standing in a wetland and not even know it. With the diversity of wetlands that exist across the landscape, there are three common features shared by all wetlands:

1. Water – You may see standing water in a wetland or the water may be hidden underground (within the soil). Wetlands may have standing water year-round, or for only part of the year. Some wetlands even have water that is slightly acidic.
2. Hydric soils – Wetlands have soil that is different from the surrounding land (uplands). Wetland soil is referred to as being hydric, which means it is saturated with, or full of, water. You can think of mud as being saturated soil. When soil is saturated for a long enough period of time, it becomes anaerobic.
3. Hydrophytic plants – Wetland plants are hydrophytes, which means that they have adapted to live in and around water. They can grow in wet soils where there is no oxygen or very little oxygen present.

Wetland Types for WESO's Wild, Wonderful Wetlands
NOTE: a superscript 2 identifies a concept that 2nd grade teams should know, while a superscript 3 identifies a concept that 3rd grade teams should know.

- Marshes[2,3]

    - Emergent marsh[2,3]
    - Wet meadow[2,3]
- Swamps[2,3]
    - Forested swamps[2,3]
    - Shrub swamps[2,3]
- Bogs[3]
- Fens[3]

NOTE: There is A LOT of information summarized in the table and wetland cross-section images that follow. Students should learn the names used in the table for the wetland types indicated for their grade levels and be able to recognize "big picture" differences between the various types.

For example, 2nd and 3rd grade teams:

- Where will you find cattails and rushes vs sedges and grasses vs trees vs shrubs?
- Which of the wetlands typically have deeper water vs shallower water?
- In which of the wetland types can you find the plant species listed in the "Wetland Plants" section below?

For example, 3rd grade teams:

- Which of the wetlands tends to be more acidic and which tends to be more alkaline?
- What is the difference between bogs and fens in terms of water movement?

Key Characteristics of Each Wetland Type (based on Michigan Natural Features Inventory and other sources)

2nd and 3rd Grades	**Marsh**	• Emergent marshes are found along lakes, ponds, rivers, streams • Soils very wet • Water levels and soil saturation may change throughout the year • Emergent marshes tend to have deeper water than wet meadows • Wet meadows are groundwater-influenced and	**Emergent marsh**	Typical plants include: cattails, bulrushes, water lilies, common arrowhead, Phragmites, sedges, duckweeds, waterlily and pondlilies, pondweeds, wild rice
			Wet meadow	Typical plants include: tussock sedge, spike-rush, other sedges, grasses, swamp milkweed, joe-pye-weed, lobelia, loosestrife, goldenrods,

		found on old lakebeds and in shallow depressions ● Can also be found along lake and stream edges where flooding is common ● Water levels typically are at or near the soil surface ● Characterized by large tussocks formed by tussock sedge ● Soils can be neutral to alkaline		cattails; may also see red-osier dogwood, willows, red maple, green ash, tamarack
	Swamp	● Swamps are typically found within low-lying areas along streams and rivers ● Swamps typically occur on saturated, organic soils where water levels may fluctuate seasonally and annually ● Vegetation can be highly variable due to local features such as frequency and duration of flooding, soil type, topography, etc	**Forested swamp**	Typical plants include: silver maple, green ash, redbud, sycamore, yellow birch, pawpaw, cottonwood; will also see buttonbush, dogwoods, water horsetail, goldenrods, cardinal flower, jewelweed, jack-in-the-pulpit, sedges, grasses, poison ivy
			Shrub swamp	Typical plants include: willows, dogwoods, elderberry, winterberry, swamp rose, blueberry, buttonbush; will also see sedges, grasses, bulrushes, swamp milkweed, marsh marigold, joe-pye-weed, goldenrods, water horsetail, skunk cabbage, poison ivy
3rd Grade only	**Bog[1]**	● Occur in kettle depressions, flat areas and shallow depressions ● Bogs can fill an entire depression or form against the perimeter of a lake/pond, often filling in the open water as they grow ● Nutrient availability is low ● Oxygen levels are low ● Surface water and peat layers are acidic ● Sphagnum holds water like a sponge		Typical plants include: sphagnum mosses, leatherleaf, blueberry, buttonbush, sundew, pitcher plant, tamarack, black spruce

		• Trees growing in bogs are susceptible to windthrow due to very shallow root systems	
	Fen[2]	• Occur on plains and in shallow channels and depressions • Saturated soil tends to be alkaline • Groundwater/spring-fed • Will have lateral flow of water across the landscape if there is slope Accumulate peat	Typical plants include: a variety of sedges and grasses, joe-pye-weed, goldenrods, asters, Kalm's lobelia, grass-of-Parnassus, sundew, pitcher plant, tamarack, cinquefoil, willows, dogwoods

[1] Taken from Bog - Michigan Natural Features Inventory

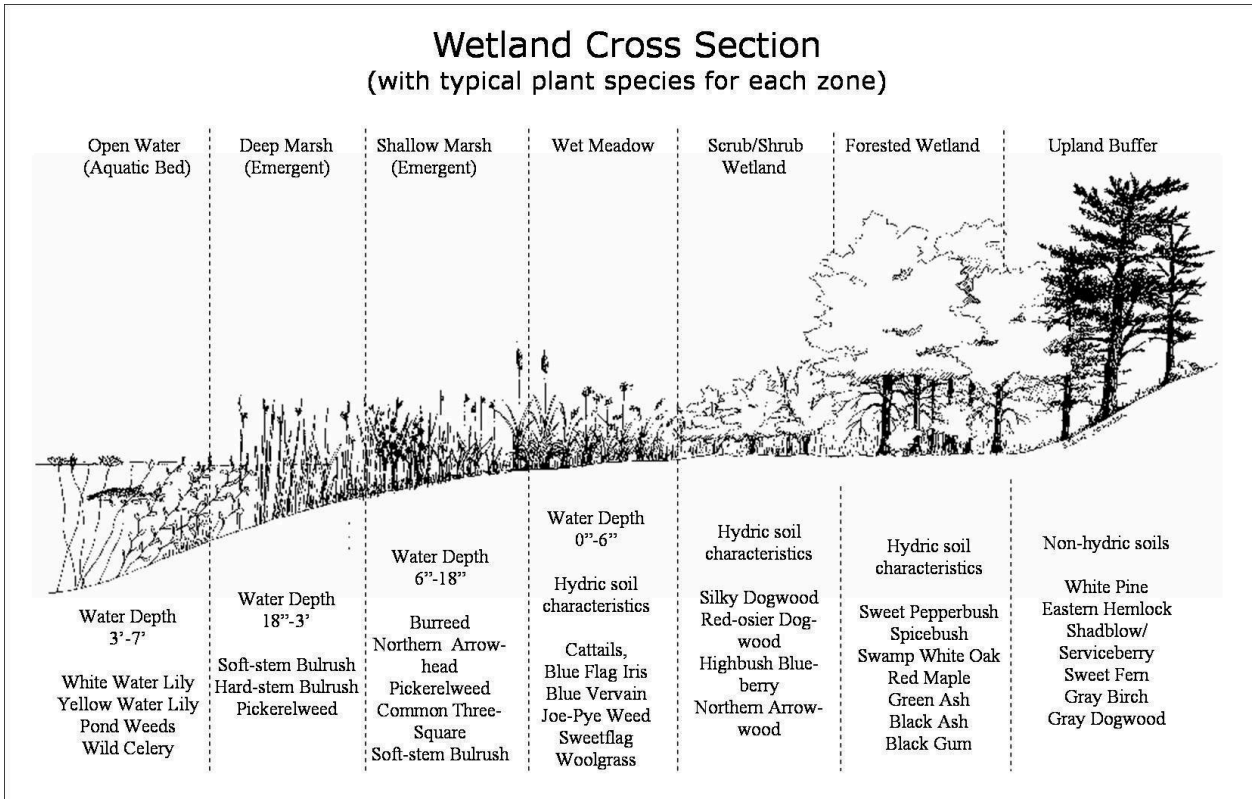
[2] Taken from Prairie Fen - Michigan Natural Features Inventory

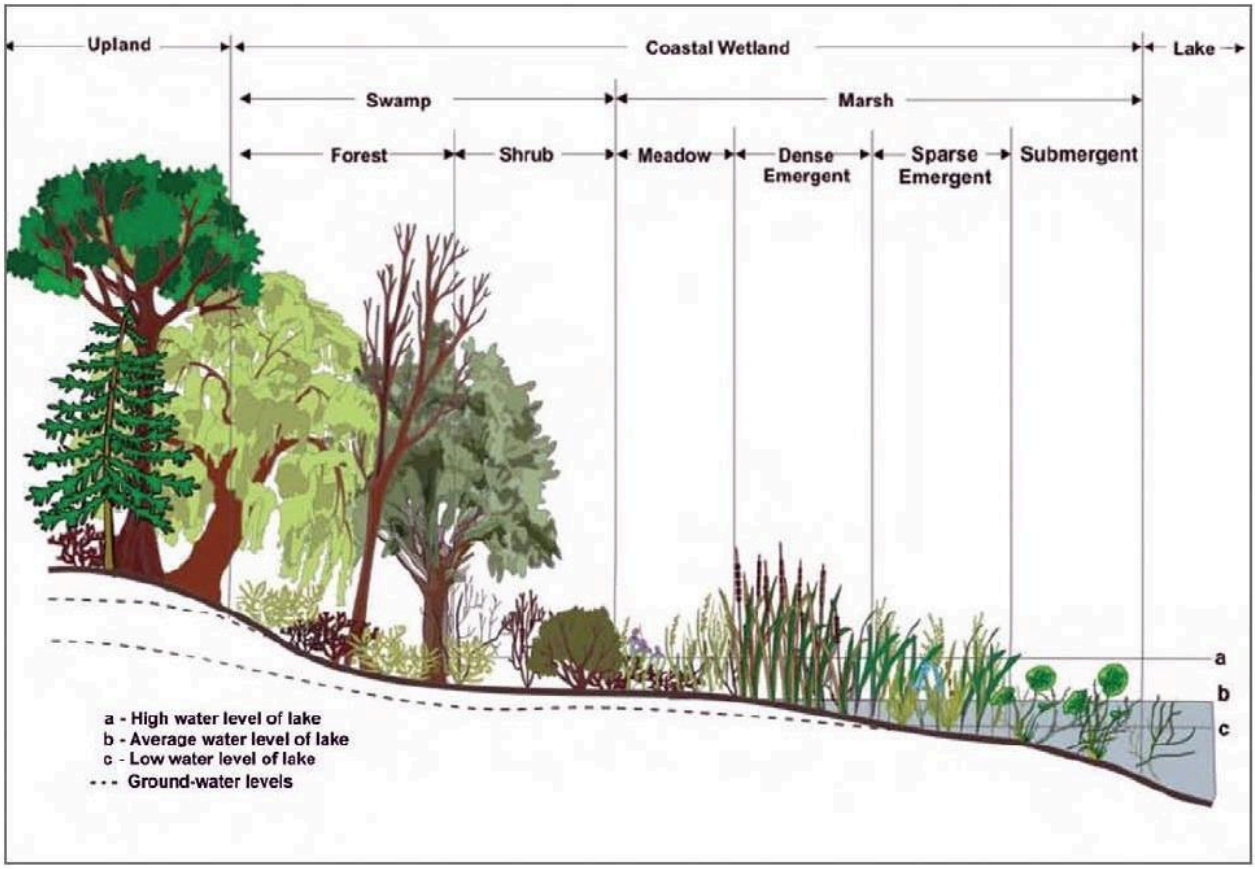
Vernal Pools

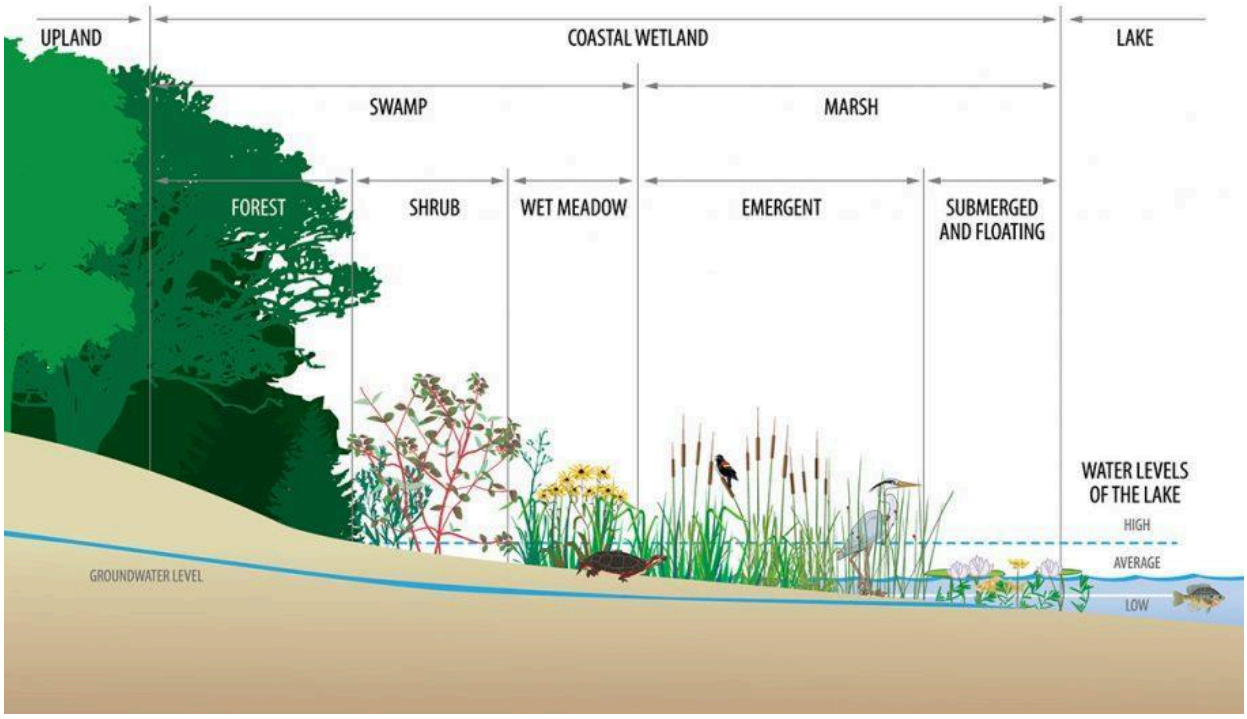
Based on what you read in the table above, in which of the wetland type(s) would you expect to find vernal pools?

After doing some online research, what can you and your students teach me about vernal pools and the animals I might find in them?

Illustrations from the Internet:




Upland
Coastal Wetland
Lake
Swamp
Marsh
Forest
Shrub
Meadow
Dense Emergent
Sparse Emergent
Submergent
a
b
c
a - High water level of lake
b - Average water level of lake
c - Low water level of lake
- - - Ground-water levels


UPLAND
COASTAL WETLAND
LAKE
SWAMP
MARSH
FOREST
SHRUB
WET MEADOW
EMERGENT
SUBMERGED AND FLOATING
WATER LEVELS OF THE LAKE
HIGH
AVERAGE
LOW
GROUNDWATER LEVEL

Courtesy of Michigan SeaGrant

Wetland Functions and Benefits

The following are some of the functions and benefits of wetlands:

- Clean/purify the water
- Provide flood protection, store excess water
- Stabilize shorelines, help prevent erosion
- Store water, giving it time to percolate down into the groundwater/aquifers
- Can trap loose sediment, excess nutrients, pollutants; act as carbon sinks
- Provide habitat for a variety of plants and animals; including breeding grounds, nurseries
- Support biodiversity and a diverse food web
- Provide recreational opportunities (e.g., birdwatching, kayaking, photography, etc)

Can your team identify some additional benefits that wetlands provide to humans?

To animals?

What are some threats to wetlands?

WETLAND PLANTS

What Makes a Wetland Plant, a Wetland Plant?
Wetland plants are specially adapted to live in water. They can survive with their roots in soil that offers little to no oxygen or they can float freely, without their roots tethering them to the substrate.

For the species listed below, students should be able to identify them based on images, associate them with at least one of the wetland types covered by this study guide, and identify them as being a native species or an invasive species. Students will only need to know them by their common names. Scientific names are provided for your research purposes, as there may be different common names for some of the plants.

Species List:

- Cattail (*Typha* spp)[2,3]
- Sedge (*Carex* spp)[3]
- Phragmites (*Phragmites australis* subspecies *australis*)[2,3] [invasive]

- Phragmites (*Phragmites australis* subspecies *americanus*)[3] [native]
- Silver maple (*Acer saccharinum*)[2,3]
- Green ash (*Fraxinus pennsylvanica*)[3]
- Buttonbush (*Cephalanthus occidentalis*)[2,3]
- Skunk cabbage (*Symplocarpus foetidus*)[2,3]
- Jack-in-the-Pulpit (*Arisaema triphyllum*)[2,3]
- Marsh marigold (*Caltha palustris*)[2,3]
- Cardinal flower (*Lobelia cardinalis*)[2,3]
- Jewelweed (*Impatiens capensis*)[2,3]
- Kalm's lobelia (*Lobelia kalmia*)[3]
- Pitcher-plant (*Sarracenia purpurea*)[3]
- Curly-leaf pondweed (*Potamogeton crispus*)[3] [invasive]
- Purple loosestrife (*Lythrum salicaria*)[3] [invasive]

WETLAND ANIMALS

What Makes a Wetland Animal, a Wetland Animal?
There is no one determining feature that makes an animal a wetland animal. While they may live and raise their families in wetlands, you may also find these animals in upland areas, rivers, the open water of lakes and ponds, agricultural fields, golf courses, rural communities, etc.

For the species listed below, students should be able to identify them based on images, calls (birds and amphibians only), and tracks (mammals only). Students also should be able to associate them with at least one of the wetland types covered by this study guide.

Species List:

- Muskrat[2,3]
- Mink[3]
- Beaver[2,3]
- Deer[2,3]
- Raccoon[2,3]
- Dragonfly[2,3] (generic adult and larva)
- Damselfly[2,3] (generic adult and larva)
- Caddisfly[3]

- Water boatmen[3]
- Bullfrog[2,3]
- Spring peeper[3]
- Snapping turtle[2,3]
- Painted turtle[3]
- Red-winged blackbird[2,3]
- American bittern[3]
- Wood duck[3]
- Great blue heron[2,3]

Books

The Secret Pool - Kim Ridley

Here's a link to field guides recommended for kids Best Field Guides For Kids: Make Reading Fun with Nature Guides (not specific to southeast Michigan, though)

VOCABULARY

- Acidic (in relation to wetland soils, water, plants) – having a pH less than 7; sour; lemon juice, vinegar, and stomach acid are acidic; acidic materials often react with other materials by breaking them down (corrosion); acidic materials can neutralize alkaline materials
- Alkaline (in relation to wetland soils, water, plants) – having a pH greater than 7; not sour and may feel slippery; baking powder, bleach, and soaps are alkaline; alkaline materials will react with acidic materials and can neutralize acidic materials
- Anaerobic – without available (free) oxygen
- Ecosystem – all the living and nonliving things in an area and their interactions
- Emergent vegetation – plants that are rooted in the substrate, grow through the water, and continue growing up above the water's surface.
- Growing season – the time of year that plants grow well, due in part to weather conditions. Different plants in the same area can have different growing seasons.

- Habitat – the place where plants and animals live. Habitats provide food, water, air, and shelter to the plants and animals that live in them.
- Hydric soil – soil that is saturated with water, either permanently or seasonally
- Hydrophytes – plants that can live under, in, or on the water; plants that have adapted to live in the low-oxygen conditions that result from soil being saturated with water
- Invasive species – organisms that move (or are moved) into an ecosystem and may grow aggressively, often outcompeting the native species that live there
- Marl – a loose, earthy deposit of sand, silt, and/or clay that contains a lot of calcium carbonate (calcium carbonate is also found in rocks like limestone and in egg shells, crustacean exoskeletons, snail shells, pearls, etc)
- Native species – organisms that occur naturally in an ecosystem or geographical area
- Preserve – to maintain something, to keep it from decomposing or spoiling
- Saturated – when a substance can no longer hold within itself any more of something
- Substrate – the surface that an organism grows on (or in)
- Transect – a line or thin section through an environment (can be made with measuring tape, rope, wooden or plastic rods, etc – or can be an imaginary line you follow between Point A and Point B), along which a researcher will make observations or measurements of the features along that line
- Upland – higher ground; water may filter through upland soil or flow over it, but an upland does not retain that water and become a wetland
- Vegetation – a general term that describes all the plants growing in an area
- Vernal pool – a shallow, temporary pond (it may look like a really big puddle!) that develops in forests in the spring from melting snow and rain and dries up in the summer; you can find insects, other crustaceans, snails, and amphibian eggs and larvae (frog and toad larvae are known as tadpoles and salamander larvae are called efts); you will not find fish in vernal pools (which is why these are great places to look for tadpoles!)
- Water level – the height reached by still water; water level can be the height of the surface of a lake, wetland, etc; the water level in soil is often referred to as the water table

- Wetland – a place where land and water meet; an area covered by water or that has very wet (saturated) soil for part of or all of the year
- Windthrow – trees that have been uprooted by wind; is not uncommon to see this in forested wetlands (swamps)

Go Explore a Wetland!

My favorite Washtenaw County localities for exploring wetlands include:

- Park Lyndon North
    - The North and South units of Park Lyndon are separated by North Territorial Road. I haven't explored Park Lyndon South, but really enjoy exploring Park Lyndon North
    - One of my favorite places in the area to go wandering – there's cool stuff to find throughout the year if you slow down and take a good look!
    - Park Lyndon | Washtenaw County, MI - Official Website
- Parker Mill County Park
    - Specifically, you'll want to hop on the Hoyt G Post trail and go for a wander.
    - The boardwalks and paved main path through the park, along with restrooms up by the parking lot, make this a reasonably accessible wetland.
    - Parker Mill County Park | Washtenaw County, MI - Official Website
- Matthaei Botanical Gardens
    - You can start at the wetland-ringed pond in front of the conservatory, then follow the Sue Reichert Discovery Trail before deciding which other trails and wetland areas to explore.
    - Matthaei Botanical Gardens | Matthaei Botanical Gardens & Nichols Arboretum

If you don't mind a bit more of a drive, these are a few other wetlands to consider visiting:

- Ives Road Fen, Lenawee County
    - A diverse mix of uplands and wetlands that slope down toward the River Raisin.

    - Really cool area, especially from a biodiversity standpoint!
    - Ives Road Fen Preserve | The Nature Conservancy in Michigan
- Crosswinds Marsh, Wayne County
    - This is a remediated wetland. It was built to compensate for the wetlands destroyed during the expansion of Detroit Metropolitan Wayne County Airport.
    - Wide boardwalks and gravel paths make this a fairly accessible wetland.
    - Crosswinds Marsh - Wayne County, Michigan
- Ottawa National Wildlife Refuge, Lucas and Ottawa Counties, Ohio
    - Specifically, the Metzger Marsh Unit and areas around Crane Creek.
    - You can hike along the dikes that separate the various pools and are almost guaranteed to see/hear a variety of animals, depending on the season.
    - Ottawa National Wildlife Refuge | U.S. Fish & Wildlife Service

While visiting your wetland of choice, think about and answer the following questions as you explore:

- Where is the water?
- Where is there not water, but you think it may still be part of a wetland? And why?
- Can you tell where the wetland ends and the upland begins?
- What kinds of plants do you see?
- Do you see or hear any animals? Or can you find signs that animals have been present here?

More Internet Resources

Wetlands for Kids: Fun Facts, Types, and Why They Matter - Academic Kids

wetland - Kids | Britannica Kids | Homework Help

Types of Wetlands

Functions & Values of Wetlands

Wetlands Overview/EPA

Economic Benefits of Wetlands/EPA

Threats to Wetlands

America's Wetlands: Our Vital Link Between Land and Water

What makes a wetland a wetland? (AD - Part 1) | U.S. Geological Survey

The Hidden Life of Vernal Pools | Smithsonian's National Zoo and Conservation Biology Institute

Michigan Vernal Pools Partnership

Vernal Pools