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# Wetland Condition and Function Monitoring

- The following guide is a companion to the website you will be using to monitor the condition and function of wetlands.
- We will refer to this as the assessment throughout this document.
- Condition is measure of the ecological health of a wetland.
- Function is a measure of the benefits and services a wetland provides.

# The Assessment

- There are three tasks to completing the assessment
  - Task A: Locating the Assessment Area (AA)
  - Task B: Completing the Wetland Assessment form
    - Step 1: Self Validation Section
    - Step 2: Classification
    - Step 3: Patch Types
    - Step 4: Diagrams
    - Step 5: Conditional
    - Step 6: Functional
  - Task C: Gathering Supplies and Uploading form to the website
- The entire assessment should take about 2 – 3 hours

Task A: Locating the Assessment Area (AA)

# Task A.1: Before you Leave

- Before you leave the car make sure you have all of the following:
  - GPS
  - Compass
  - Camera/Extra Batteries
  - At least 9 flags/flagging tape
  - Wetland Assessment forms
  - Pen/Pencil
  - The Wetlands Methods Binder (Aerial map/Site Photos)
  - Binoculars
  - Clip Board
  - Water Bottle/Sunscreen/Bug Spray/Bear Spray

# Task A.2: Locating the Assessment Area (AA)

- You will be given a GPS loaded with the location of the center point of your AA.
  - As you arrive to the site, be observant of your surroundings
    - (e.g. animals, plants, birds flying overhead, litter, animal/human tracks, fences, browsing, curling leaves, the quality of any surface water)
- Navigate as close as possible to the point.
  - Use the aerial photo and previous years site photos to find the center.
- Place a flag at the center location.

## Task A.3: Marking out the AA

- Pace out from the center flag 40 meters and place a flag.
- Try to place a flag going N, NE, E, SE, S, SW, W, and NW, but if vegetation is too dense in a given direction to see the flag you do not need to place one there, but do walk as far as you can in that direction to get a good sense of the AA
- If vegetation is too tall to see a flag you can tie flagging tape to a tree/shrub higher up.
- *See Box 1: Pacing*

# Box 1: Pacing

- You can learn to pace quickly.
- Use the provided tape and drag out 40 m of tape.
- Walk the 40 m along the tape with a casual, normal pace at least twice.
- Use the average to get your pace for 40 m.
- Note your pace someplace you can reference for later use.



Task B: Completing the Assessment form

# Step 1: Completing the Self Validation Section

- Fill out the Site ID (combine year and site ID; yyyy\_xx)
- Ex: **Site ID** (yyyy\_xx): \_\_\_\_\_2016\_9f\_\_\_\_\_

- Write your name, sign your signature and write the date in the first row (Assessment form completed “field work”)

	Name	Signature	Date
Assessment Form Completed (field work)			
Assessment Form Entered into Digital Database			
Digital Data Reviewed for Accurate Transcription			
Digital Data Reviewed for Anomalous Values			
Paper Copy Backup Completed and stored in project folder			
Digital Form Backup Completed and stored in digital site folder			
AA map modified based on field collection			
GIS database updated with GPS point and assesment score			
Photos stored in site digital folder			

## Step 1.2: Site Photos *\*See Box 2 for how to use a compass*

- Photograph the AA from the center point
- Five photos always in this order
  - 1) Photo of the AA number, 2) North, 3) East, 4) South, 5) West
- Make sure to document the picture number of each photo taken with the camera. (Ex. North- Photo 1124)
- Camera ID: The camera used to take the photos out in the field (e.g. small canon)

Site 29a

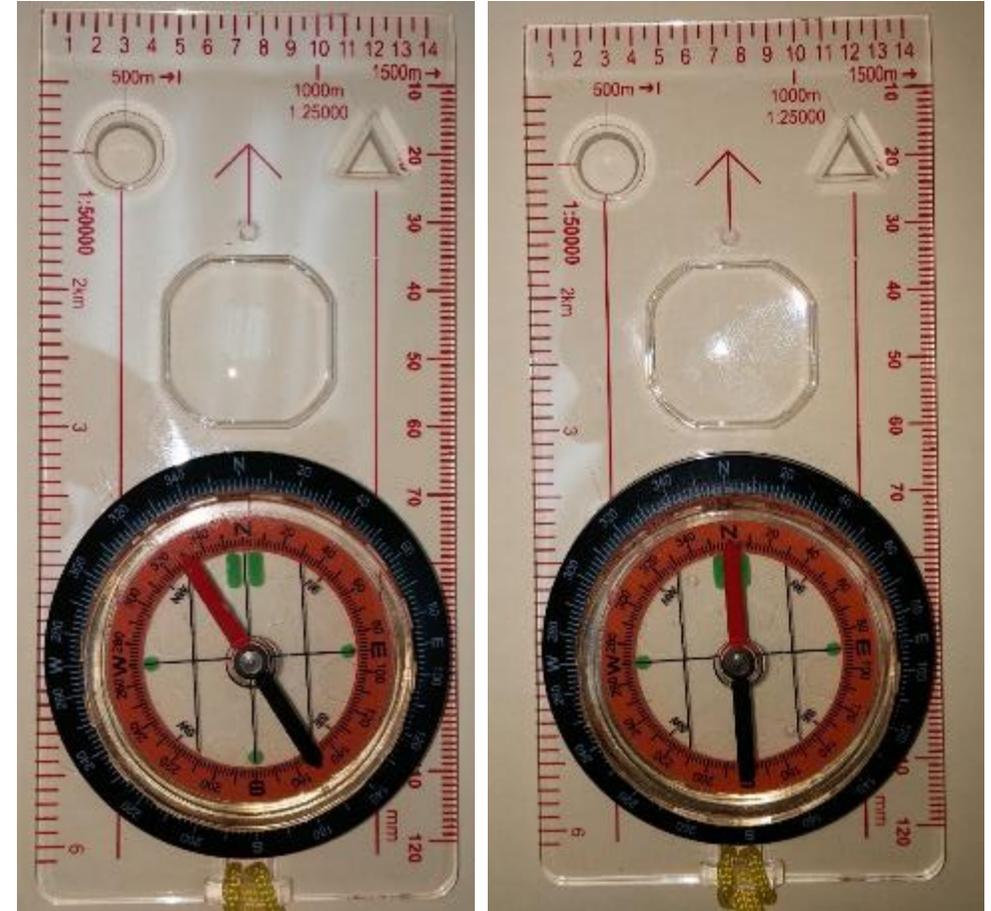


\*Try to minimize the sky and maximize the ground area in your photos.



## Box 2: Using a compass

- Line up the N in the inside ring with the N on the outside ring.
- Turn the compass on a flat plane until the red arrow is contained in the green dots.
- You just found north! The compass's arrow now points north.



Left photo: The two N's are aligned

Right photo: The compass was rotated to align the red arrow with the green dots. The compass's arrow now points north.

# Step 2: Classification

- What you need to fill out is:
  - Visit Date
  - Visit number of that site for the year
  - Observers
  - The Cowardin Water Regime that you decide the site is \*See next page
  - Any Cowardin Special Modifiers \*See Page blank
- *There are other questions on the form and website but you can disregard them (they are shaded gray in the form).*
  - *Only change them if your are 100% confident with your answer*

# Step 2: Classification- Water Regimes

- Cowardin Water Regimes: The prevailing pattern of water flow during the growing season (check the duration of surface water >10% of the AA) .
  - **P/P** – *Permanent/perennial*: Surface water is present throughout the year except during years of drought. Indicators: Cattail, Beaked Sedge
  - **S/I** – *Seasonal/intermittent*: Surface water is present for extended periods, especially early in the growing season, or may persist throughout the growing season, but may be absent at the end of the growing season; OR surface water does not flow continuously, as when water losses from evaporation or seepage exceed the available streamflow. Indicators: Some surface water or wet to soil surface
  - **T/E** – *Temporary/ephemeral*: Surface water is present for brief periods during the growing season, but the water table is well below the surface for most of the year; OR surface water flows briefly in direct response to precipitation in the immediate vicinity and the channel is above the water table.
  - **A** – *Absent*: Surface water is never present OR AA contains less than 10% surface water OR soils are saturated with no surface water.

# Step 2: Classification- Cowardin Special Modifiers

- Check all that are present **within the AA.**
  - **Beaver (b)** - Past and current: dam, lodge, channels (excludes trees)
  - **Excavated (x)** - Wetland has been dugged down (retain water)
  - **Partially ditched/drained (d)** - Wetland has been dugged to increase drainage
  - **Diked/Impounded (h)** – Addition of material to diminish drainage

# Step 3: Patch Types

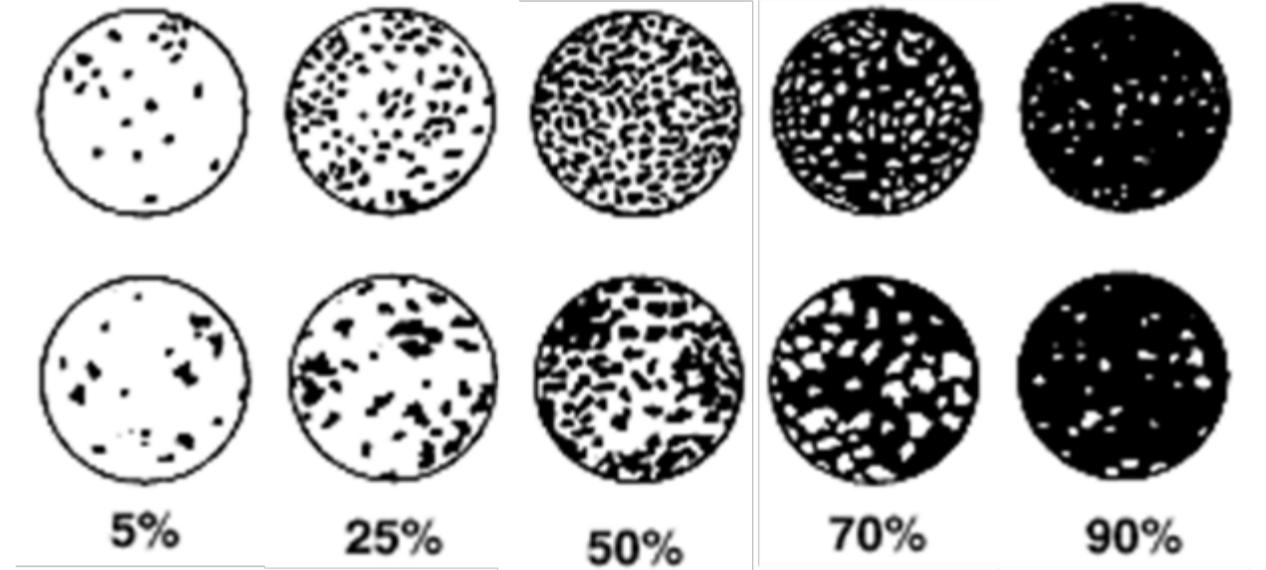
- Indicate on the data form the presence of the various patch types **within the AA.**
- Walk around your AA and become familiar with it.
  - Make sure to only note what is inside the flags, you will be venturing past them later on.
- Check all the types that that apply to the site (some sites may have no patch types)

*\*The Assessment Form asks for a percent cover of the AA, when entering the information in the database website answer with either a 'present or absent'.*

# Step 3: Patch Types

- Use the following bolded numbers to indicate the percent cover categories on the assessment form.
- **Checking the patch type:** Percent cover of the patch types within the AA. (label in the box 1-7)

- **1** - 0.1-0.99%
- **2** - 1-5%
- **3** - 6-25%
- **4** - 26-40%
- **5** - 51-75%
- **6** - 76-95%
- **7** - >95%



## Step 3: Patch Types – **open water** – pond or lake

Medium to large natural  
water body



## Step 3: Patch Types – **open water – pools**

Areas that hold stagnant or slow moving water form groundwater discharge but are not associated with a defined channel. E.g. Cattail sloughs



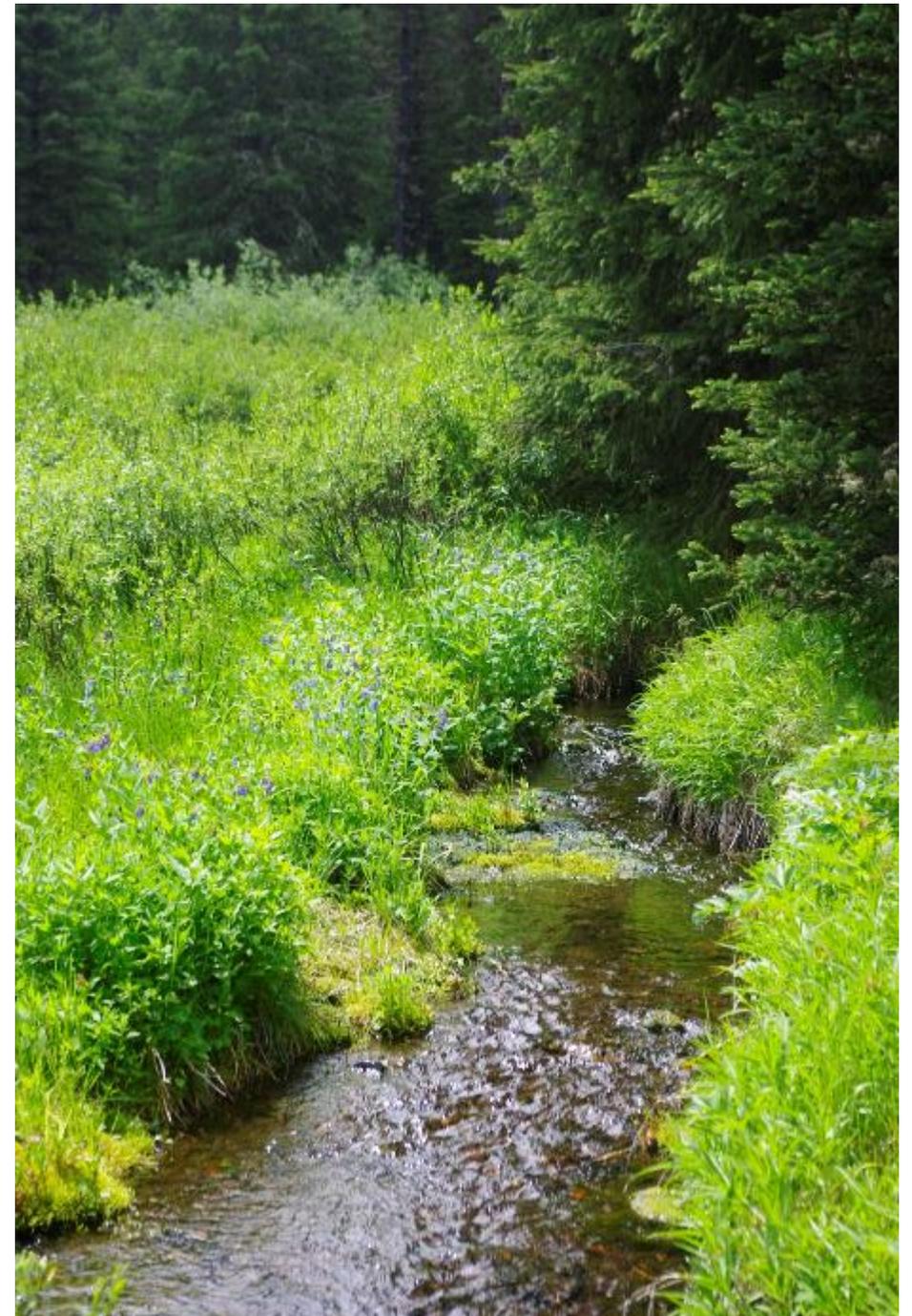
## Step 3: Patch Types – **Open water-river/stream**

Areas of flowing water associated with a sizeable channel.



### Step 3: Patch Types – **Open water** – small rivulet

Areas of flowing water associated with a narrow stream channel.



## Step 3: Patch Types – **Open water – oxbow/backwater channel**

Areas holding stagnant or slow moving water that have been partially or completely disassociated from the primary river channel.



## Step 3: Patch Types – **Open water-tributary / secondary channel**

Areas of flowing water entering the main channel from a secondary source.



## Step 3: Patch Types – **Open water beaver pond**

Areas that hold stagnant or slow moving water behind a beaver dam.



### Step 3: Patch Types – **Active Beaver Dam**

Debris damming a stream clearly constructed by beaver (note gnawed ends of branches)



## Step 3: Patch Types – **Beaver Channel**

Canals cut through emergent vegetation by beaver.



## Step 3: Patch Types – Braided River channel

River channel consisting of a network of small channels separated by small and often temporary islands or bars.



## Step 3: Patch Types – **Adjacent or onsite springs / seeps**

Localized point of emerging groundwater, often on or at the base of a sloping hillside.



## Step 3: Patch Types – **Debris Jam/ Woody Debris within a stream or channel**

Aggregated  
woody debris in a  
stream channel  
deposited by high  
flows



## Step 3: Patch Types – **Pool / Riffle Complex**

Deep, slow-moving pools alternating with shallow, fast-moving riffles along the relatively straight course of a stream or river.



## Step 3: Patch Types – **Point bars**

A low ridge of sediment (sand or gravel) formed on the inner bank of a meandering stream.



## Step 3: Patch Types – **Bank slumps or undercut banks in channel or along shoreline**

A bank slump is the portion of a stream or other wetland bank that has broken free from the rest of the bank but has not eroded away.

Undercut banks are areas along the bank or shoreline of a wetland that have been excavated by waves or flowing water.



## Step 3: Patch Types – **Mudflats**

An accumulation of mud at the edge of shallow waters, such as a lake or pond. Often intermittently flooded or exposed.



## Step 3: Patch Types – **Salt Flat / Alkali Flat**

Dry open area of fine-grained sediment and accumulated salts. Often wet in the winter months or with heavy precipitation.



### Step 3: Patch Types – **Animal Mounds or Burrow**

Mounds or holes associated with animal foraging, denning, predation, or other behaviors.



## Step 3: Patch Types – **Plant Hummock**

A mound composed of plant material resulting in a raised pedestal of persistent roots or rhizomes.

Temporarily can support your weight.



### Step 3: Patch Types – **Water Tracks / hollows**

Depressions between hummocks or mounds that remain permanently saturated or inundated with slow moving surface water.



## Step 3: Patch Types – **Natural Island**

Naturally occurring islands surrounded by water. Island can be dominated by either wetland or upland vegetation.



## Step 3: Patch Types – **Anthropogenic Island**

Island created by artificial means, often for nesting waterfowl.

## Step 3: Patch Types – **Floating Mat**

Mats of peat held together by roots and rhizomes of sedges. Floating mats are underlain by water and/or very loose peat.



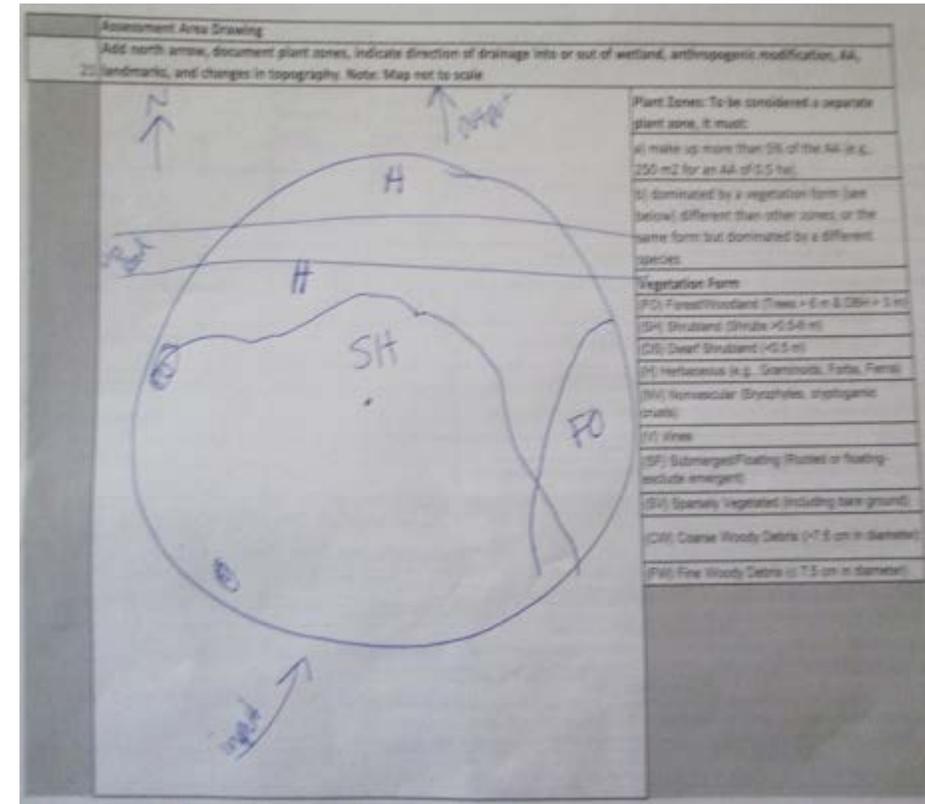
### Step 3: Patch Types – Marl/Limonite Beds

Marl is a calcium carbonate precipitate often found in calcareous fens. Limonite forms in iron-rich fens when iron precipitates from the ground water incorporating organic matter.



# Step 4: Diagram

- Use the assessment form to draw in the vegetation zoned within the AA. Document the different plant zones (**see next slide**), indicate the direction of drainage into or out of the wetland, anthropogenic modifications, landmarks, and changes in topography. (Note: map not to scale)
  - This will be referenced back to later on within step 5.
  - You can draw outside the circle
  - Key landmarks to add: ditches, berms, roads, streams/rivers



# Step 4: Diagram

- Plan zones to indicate on the diagram drawing. Use abbreviations to indicated different zones.
  
- ***When you are finished drawing your AA, take a photo of your drawing with the camera.***

**Plant Zones: To be considered a separate plant zone, it must:**

a) make up more than 5% of the AA (e.g., 250 m<sup>2</sup> for an AA of 0.5 ha).

b) dominated by a vegetation form (see below) different than other zones; or the same form but dominated by a different species

## **Vegetation Form**

(FO) Forest/Woodland (Trees > 6 m & DBH > 3 in)

(SH) Shrubland (Shrubs >0.5-6 m)

(DS) Dwarf Shrubland (<0.5 m)

(H) Herbaceous (e.g., Graminoids, Forbs, Ferns)

(NV) Nonvascular (Bryophytes, cryptogamic crusts)

(V) Vines

(SF) Submerged/Floating (Rooted or floating-exclude emergent)

(SV) Sparsely Vegetated (including bare ground)

(CW) Coarse Woody Debris (>7.6 cm in diameter)

(FW) Fine Woody Debris ( $\leq$  7.5 cm in diameter)

# Step 5: Conditional

- Conditional has two main parts
  - 1) Scope and impact of disturbances within the AA as well as the 200m buffer.
    - The Scope of disturbance is based on a scale of 0-6 (0 being no evidence and 6 being pervasive) \*see table on page **blank**
    - The Impact of disturbance is based on a scale of 0-4 (0 being no evidence and 4 being extreme) \*see table on page **blank**
  - 2) Condition of the Landscape Context, Vegetation Structures, Physicochemical, and Hydrology of the AA as well as the 200m buffer.

\*Don't fill out the gray cells in the assessment form

# Step 5.1: Conditional- Scope and impact of disturbances

- Take an another walk around outside of your AA, within the 200m buffer. (Bring the Binoculars)
  - Use the aerial map and GPS to estimate the location of your 200m buffer around your site. Use your knowledge of the area from observing the patch types to determine the disturbances.

# Step 5.1: Conditional- Scope and impact of disturbances

- Things to look for as you walk:

- 5.1 (AA and Buffer)

- Trash
- Fences taller than 42” or lower than 18”
- Signs of chemically-sprayed weeds
- Dead or diseased pine trees
- Beaver signs
- Signs of browsing
- Culverts
- Berms
- Native plants

- 5.2 (with in the AA)

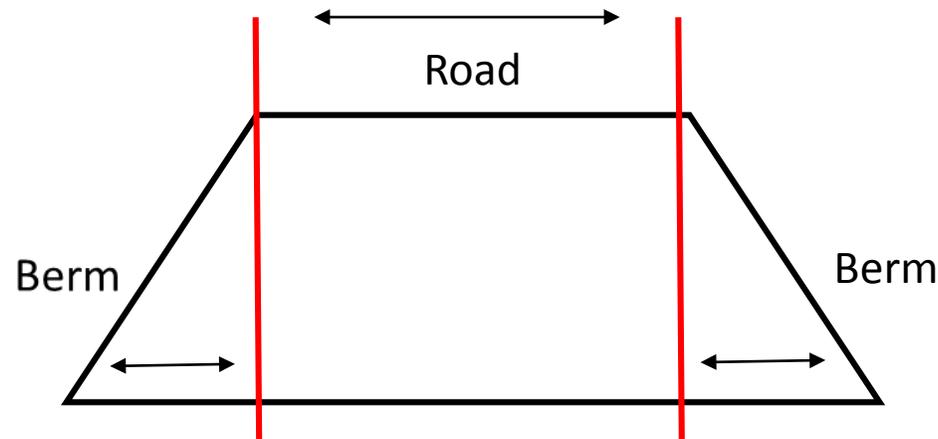
- Noxious Weeds
- Aggressive graminoids
- Plant litter (in the AA)
- Animal scat, tracks, and burrows
- Woody seedlings and saplings
- Soil disturbance
- Water: algae, turbidity, sheen
- Bodies of water that could flood into AA and how entrenched they are ([see page X](#))

# Step 5.1: Conditional- Scope and impact of disturbances

- When considering the impact of disturbances, any human modifications to the site is considered a disturbance. The modifications are “altering” the natural wetland.
- The impacts could be positive or negative.
  - Ex: A culvert that is supplying the wetland of its water. The impact is considered a benefit but the disturbance would still be considered an extreme impact due to the wetland may or may not exist without the culvert.

# Step 5.1: Conditional- Scope and impact of disturbances

- Note: Some of the disturbances overlap between the categories.
  - \*Make sure to only count the effects once.
- Ex: If a road is up on top of a berm. When considering the transportation disturbances, you can consider the road itself and what is exactly underneath it and not the sides. When thinking about the hydrological disturbances, you can consider only the sides of the berm (the angled area and what is exactly underneath) and not the top of the berm.



# Step 5.1: Conditional- Scope of disturbances

- Use this scale when deciding on the size of the scope of disturbances
  - Scope of Disturbances (cover area aka % of circle covered by disturbance)

## Scope of Disturbances

<b>6</b>	Pervasive - Covers nearly all (>75%) of the buffer or AA.
<b>5</b>	Large - Covers most (>50-75%) of the buffer or AA.
<b>4</b>	Moderate - Covers much (>25-50%) of the buffer or AA.
<b>3</b>	Restricted - Covers some (>10-25%) of the buffer or AA.
<b>2</b>	Small - Covers a small (1-10%) portion of the buffer or AA.
<b>1</b>	Nil - Covers little (<1%) of the buffer or AA.
<b>0</b>	N/A - No evidence of disturbance of the buffer or AA

# Step 5.1: Conditional- Impact of disturbances

- Use this scale when deciding on the size of the impact of disturbances
  - Impact of Disturbances- just for footprint of the disturbance (how the land exactly under the disturbance is altering the wetland). **Exception** – consider wider impact for “fences that impeded wildlife” and hydrologic disturbances”

## Impact of Disturbances

<b>4</b>	Extreme - likely to extremely modify OR, degrade, destroy, or eliminate the wetland.
<b>3</b>	Serious - likely to seriously modify OR, degrade or reduce wetland function or condition.
<b>2</b>	Moderate - likely to moderately modify OR, degrade or reduce wetland function or condition.
<b>1</b>	Slight - likely to only slightly modify OR, degrade, or
<b>0</b>	No evidence of modification OR, degradation, reduction

# Step 5.1: Conditional- Scope and impact of disturbances

- Some standardized impacts and disturbances
  - Roads and Unpaved roads will always have an extreme (4) impact.
  - Spot Spraying in a pasture has a moderate (2) impact.
  - Domestic or commercial developments will have an extreme (4) impact.

# Step 5.1: Conditional- Scope and impact of disturbances

- Transportation Disturbances
- Land Use Disturbances-Development or Recreation
- Land Use Disturbances-Agriculture
  - Fences that impede wildlife (taller than 42" and/or lower than 18") \***Can allow for larger impact based on movement across**
- Land Use Disturbances-Resource Extraction

# Step 5.1: Conditional- Scope and impact of disturbances

- Land Use Disturbances-Vegetation Removal/Conversion
  - Chemical vegetation control (chemical smell, curling leaves) Mechanical vegetation removal (eg brush mowing or heavy machinery; not mowing lawn)  
**\*Photo**
  - Human caused vegetation conversion (e.g. from shrubland to grassland, native to lawn; conversion from native to farm would be captured by "Land use disturbance - Agriculture" - above)
- Natural or Environmental Disturbances
  - Recent beaver activity (e.g. dams, beaver trees, and ponds) Recent would be since last visit **\*Photo**
- Hydrologic Disturbances **\*Can allow for larger impact based on movement across**

# Horse Paddock



Feedlot



# Plowing



# Shelterbelt



# Tree Plantation



# Gravel Pit



# Abandoned oil / gas wells



Oil Jack



# Chemical Vegetation Control



## Recent Beaver Activity (within the past year)

\*Note lighter color of  
chewed trees/stumps



# Browsing



Spring Box



# Culvert



# Weir or drop structure



# Engineered Channels – riprap



Berm



## Step 5.2: Conditional- Buffer Width

- Use the aerial map to describe how far you can travel from the center point in each direction before hitting a disturbance (do not count hayfields as a disturbance. (Use the following codes 1-4) for up to **200m from the AA center.**
- **1** - >200 m; No extreme disturbances from the center point to the outer 200 buffer edge.
- **2** - >100-200 m; Disturbance falls between the 100-200m from the center point
- **3** - 50-100 m; ; Disturbance falls between the 50-100m from the center point
- **4** - <50 m; Disturbance falls less then 50 meters from the center point OR no buffer exists.

\*See next slide for a list of disturbances to either include/exclude when determining the number.

# Step 5.2: Conditional- Buffer Width

Disturbances to <u>exclude</u> for buffer width	Disturbances to <u>include</u> for buffer width
<ul style="list-style-type: none"><li>• Additional wetland/riparian area</li><li>• Natural upland habitats</li><li>• Nature or wildland parks</li><li>• Bike trails</li><li>• Foot trails</li><li>• Horse trails</li><li>• Open rangeland with light grazing</li><li>• Swales and ditches</li><li>• Open water</li><li>• Vegetated levees</li></ul>	<ul style="list-style-type: none"><li>• Commercial developments</li><li>• Residential developments</li><li>• Paved roads</li><li>• Dirt roads</li><li>• Railroads</li><li>• Parking lots</li><li>• Fences that interfere with the movements of wildlife</li><li>• Sound walls</li><li>• Intensive agriculture (row crops, orchards, vineyards)</li><li>• Dryland farming</li><li>• Horse paddocks, animal feedlots</li><li>• Rangeland with intensive grazing</li><li>• Lawns</li><li>• Golf courses</li><li>• Sports fields</li><li>• Urbanized parks with active recreation</li><li>• Paved or heavily used pedestrian/bike trails (frequent traffic)</li></ul>

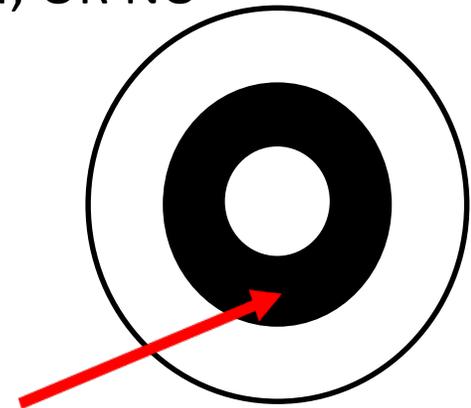
# Step 5.2 - Condition of the Buffer

- Circle the appropriate answer in the Assessment Form for the following questions
- Ex:

Buffer (Percent of AA)			
76-100%	51-75%	25-50%	<25%
Buffer Condition Plants			
Abundant	Substantial	Moderate	Low

## Step 5.2: Conditional- Buffer (Percent of AA)

- **Percent of AA with a Buffer** - (This area represents between the 40m ring and the 70m ring on the aerial map.) The percent corresponds with the amount covered by natural vegetation (including hayed but not farmed or residential yards) area around the AA perimeter.
  - **76-100%** - A buffer of at least 30 m occurs around 76-100% of the AA perimeter.
  - **51-75%** - A buffer of at least 30 m occurs around 51-75% of the AA perimeter.
  - **25-50%** - A buffer of at least 30 m occurs around 25-50% of the AA perimeter.
  - **<25%** - A buffer of at least 30 m occurs around <25% of the AA perimeter, OR NO BUFFER EXISTS.



# Step 5.2: Conditional- Buffer Condition Plants

- Buffer condition within **200m of the AA**
  - **Abundant** - (>95%) native vegetation cover and little or no (<5%) cover of non-native plants.
  - **Substantial** - (>75-95%) native vegetation cover and low (5-25%) cover of non-native plants.
  - **Moderate** - (50-75%) native vegetation cover.
  - **Low** - (<50%) cover of native vegetation, OR NO BUFFER EXISTS.

# Step 5.2: Conditional- Buffer Soil

- Buffer condition within **200m of the AA**
  - **Intact** - Soils are intact.
  - **Slightly to moderately** - Soils are slightly to moderately disturbed.
  - **Moderately to extensively** - Soils are moderately to extensively disturbed.
  - **Highly** - Soils are highly disturbed OR ground is unnaturally bare, OR NO BUFFER EXISTS.

# Step 5.2: Conditional- Cover of Natives

- Relative cover of native plants **within the AA**
  - **>99%** - of the vegetation cover within the AA is comprised of native vegetation.
  - **95-99%** - of the vegetation cover within the AA is comprised of native vegetation.
  - **80-94%** - of the vegetation cover within the AA is comprised of native vegetation.
  - **50-80%** - of the vegetation cover within the AA is comprised of native vegetation.
  - **25 - 50%** - of the vegetation cover within the AA is comprised of native vegetation.
  - **<25%** - of the vegetation cover within the AA is comprised of native vegetation.

# Step 5.2: Conditional- Cover of Noxious Weeds

- Relative cover of listed noxious weed species within the AA (see weed book)
  - **Trace** – Cover of noxious weeds
  - **1-3%** - Cover of noxious weeds
  - **3 - 10%** - Cover of noxious weeds
  - **>10%** - Cover of noxious weeds

# Step 5.2: Conditional- Cover of Aggressive Grasses

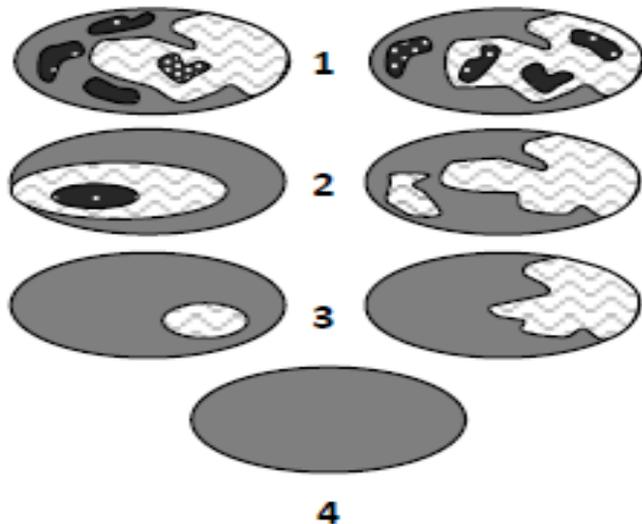
- Percent cover of aggressive grasses within the AA (% cover of reed canary grass, common reed, smooth brome, Kentucky bluegrass, common timothy, or meadow foxtail, quackgrass, cheatgrass)
  - <10% - Percent cover of aggressive grasses
  - 10-25% - Percent cover of aggressive grasses
  - 25-50% - Percent cover of aggressive grasses
  - >50% - Percent cover of aggressive grasses

## Step 5.2: Conditional- Litter

- Herbaceous Litter/Woody Debris Accumulation within the AA.
  - **Moderate** - Site has moderate amount of fine litter/woody debris. New growth is more prevalent than previous years' growth. Layers of litter in pools or areas of topographic lows are thin.
  - **Small** - Site is characterized by small amounts of litter/woody debris, with little plant recruitment, OR litter/woody debris is somewhat excessive.
  - **Scant** - Site has scant litter/woody debris OR litter/woody debris is excessive and is blocking plant recruitment.

# Step 5.2: Conditional- Plant Zones

- Interspersion of Plant Zones within the AA. (compare with diagram below)
  - **1** - Horizontal structure consists of a very complex array of nested or interspersed plant zones with no single dominant type.
  - **2** - Horizontal structure consists of a moderately complex array of nested or interspersed plant zones with no single dominant type.
  - **3** - Horizontal structure consists of a simple array of nested or interspersed plant zones with no single dominant type.
  - **4** - Horizontal structure consists of one dominant plant zone with no interspersion.



\*The horizontal structure is a mix of successional stages that creates a habitat mosaic of older forest, younger forest, openings or gaps in the landscape and edges.

(Imagine you are looking down at your area from above, how does the land differ in plant zones?)

# Step 5.2: Conditional- **Woody Species**

- **Woody Species Establishment and Regeneration within the AA.**
  - **All ages or Uncommon** – All age classes of native woody species present OR woody species are naturally uncommon or absent.
  - **Middle Age Group Missing** – Middle age group(s) absent. All other well-represented.
  - **Only mature** – Seedlings and saplings and middle age group(s) absent. The stand is comprised mainly of mature species
  - **Relict or Nonnative Trees** - Woody species predominately consist of relict or dying individuals or AA has a > 5% canopy cover of Russian Olive and/or Salt Cedar

Willow  
Seedling < 1 year,  
Sapling 1 - 2 year,  
Adult > 2 year

Confer: Seedling <  
3 yrs, Sapling 3 -  
10, Adult >10

# Step 5.2: Conditional- Soil Integrity

- Soil Surface Integrity **within the AA.**
  - **Natural** – Soil disturbance is limited to naturally caused disturbances such as flood deposition or game trails
  - **Human but Minimal** – Soil disturbance due to human causes (including livestock) is present but minimal. Depth of disturbance is limited to a few inches and does not show evidence of ponding or channeling water. Site will recover within a few years after disturbance removal.
  - **Human Common** – Soil disturbance due to human causes is common and will be slow to recover. Damage is not excessive and the site will recover with the removal of degrading human influences and moderate recovery times.
  - **Wide Spread** – Soil disturbance is widespread and substantially degrades the site. Water, if present, would be channeled or ponded. The site will not recover without restoration and/or long recovery times.

# Step 5.2: Conditional- Water Quality - Algae

- Water Quality - Algae **within the AA**. (N/A if not applicable)
  - **No Visual** – No visual evidence of degraded water quality. No potential source of water quality degradation observed. Water is clear with minimal algae growth.
  - **Some** – Some negative water quality indicators are present and/or some potential sources of water quality degradation observed. Algae are limited to small and localized areas within the wetland. Water may have a minimal greenish tint, cloudiness, or sheen
  - **Large Patches** – Algal growth occurs in large patches throughout the AA. Potential sources of water quality degradation are apparent. Water may have a moderate greenish tint or sheen.
  - **Extensive** – Algal mats may be extensive, blocking light to the bottom. Potential sources of water quality degradation are apparent. Water has strong greenish tint, sheen, or turbidity. The bottom is difficult to see during the growing season.
  - **NA** – no surface water present in the AA.

# Step 5.2: Conditional- Water Quality - Turbidity

- Water Quality - Turbidity **within the AA.** (N/A if not applicable)
  - **No Visual** – No visual evidence of degraded water quality. No potential source of water quality degradation observed
  - **Slightly Cloudy** – Water is slightly cloudy and/or some potential sources of water quality degradation observed, but there is no obvious source of sedimentation.
  - **Cloudy but Bottom Visible** – Water is cloudy, but the bottom is still visible. Potential sources of water quality degradation are apparent.
  - **Bottom not Visible** - Water is milky and/or muddy. The bottom is no longer visible. Potential sources of water quality degradation are apparent
  - **NA** – no surface water present in the AA.

# Step 5.2: Conditional- Water Quality - Sheen

- Water Quality - Sheen **within the AA** (sheen can be caused by bacteria. When disturbed, a bacteria sheen will break up into small platelets; petroleum sheens will quickly reform). (N/A if not applicable)
  - **No Visible** – No visual evidence of degraded water quality. No potential source of water quality degradation observed. Water is clear with no petroleum sheen.
  - **Some** – Some negative water quality indicators are present and/or some potential sources of water quality degradation observed. Petroleum sheen on the water is limited to small and localized areas within the AA.
  - **Sheen in Large Patches** – Petroleum sheen occurs in large patches throughout the surface water of the AA. Potential sources of water quality degradation are apparent. Water may have a moderate sheen.
  - **Sheen is Extensive** – Petroleum sheen is extensive throughout the surface of the water in the AA. Potential sources of water quality degradation are apparent. Water has a strong sheen.
  - **NA** – no surface water present in the AA.

# Step 5.2: Conditional- Input

- Water Inputs **into AA** during the growing season.
  - **Natural** – Sources are precipitation, groundwater, and/or natural runoff, or natural flow from an adjacent freshwater body, or the AA naturally lacks water in the growing season.
  - **Mostly Natural** – Sources are mostly natural but can include occasional or small effects of modified hydrology. No large point sources or dams control the overall hydrology.
  - **Primarily Human** – Sources are primarily from anthropogenic sources (e.g., urban runoff, pumped water, impoundments, regulated releases through a dam).
  - **Natural Eliminated** – Natural sources have been eliminated based on the following indicators: impoundment of all possible wet season inflows, diversions of all dry-season inflows, predominance of xeric vegetation, etc.

\*See next slide for examples of natural/modified inputs

## Step 5.2: Conditional- Input

<b>Natural Sources:</b>	<b>Count of Discrete Inlets:</b>
Overbank flooding	Channels
Alluvial storage/hyporheic flow	Spring
Throughflow	Ditches
Groundwater discharge	Culvert
Precipitation	Pipes
Snowmelt	Pumps
<b>Anthropogenic Sources:</b>	Other:
Irrigation run-off/ditches	
Urban run-off	
Pipes directly feeding into wetland	
Culvert	
Pumps	
Other:	

# Step 5.2: Conditional- Outlet

- Water Outlets of AA during the growing season.
  - **Natural** – Water leaves the site through natural runoff, natural flow, evaporation, or outlet is blocked by natural features (e.g., beaver dam), OR the site naturally lacks water in the growing season.
  - **Some Modifications** – Outflow is mostly natural, but there is some modification due to anthropogenic restrictions (e.g., filling or development, channelization).
  - **Primarily Human** – Withdrawals are primarily from anthropogenic sources, and outflow has been significantly altered by flow obstructions (culverts, paved stream crossings, impoundments, ditching).
  - **Natural Eliminated** – Natural outflow has been completely eliminated due to the following indicators: dike/levees, railroads, or roads with no culverts.

\*See next slide for examples of natural/modified outputs

## Step 5.2: Conditional- Outlet

<b>Types of Water Outlet</b>
Channelized flow (headwater wetland)
Recharge to adjacent stream
Throughflow
Non-channelized flow to contiguous wetland area
No natural outlet
<b>Anthropogenic Outlets:</b>
Culverts under roadways / trails
Ditches established to drain wetland
Natural outlet blocked/bermed
Water is being pumped out of the wetland
Other:

## Step 5.2: Conditional- Connectivity

- Surface Water Connectivity **of the AA.** Are there any artificial/man made structures of development within the AA that would restrict the flow of surface water (e.g. berm or ditch). (N/A if not applicable)
  - **Unrestricted** – Water, when present, has unrestricted access into or out of the wetland. There are no artificial obstructions to surface water flow.
  - **Limited Artificial obstructions** – Artificial obstructions limit the access of surface water into or out of the wetland, but the limitations exist for < 50% of the AA perimeter.
  - **Artificial 50-90%** - Artificial obstructions limit the access of surface water into or out of the wetland for 50-90%
  - **Artificial >90%** - Artificial obstructions limit the access of surface water into or out of the wetland for >90% of the AA perimeter.
  - **NA** – no surface water present in the AA.

# Step 5.2: Conditional- Hydroperiod

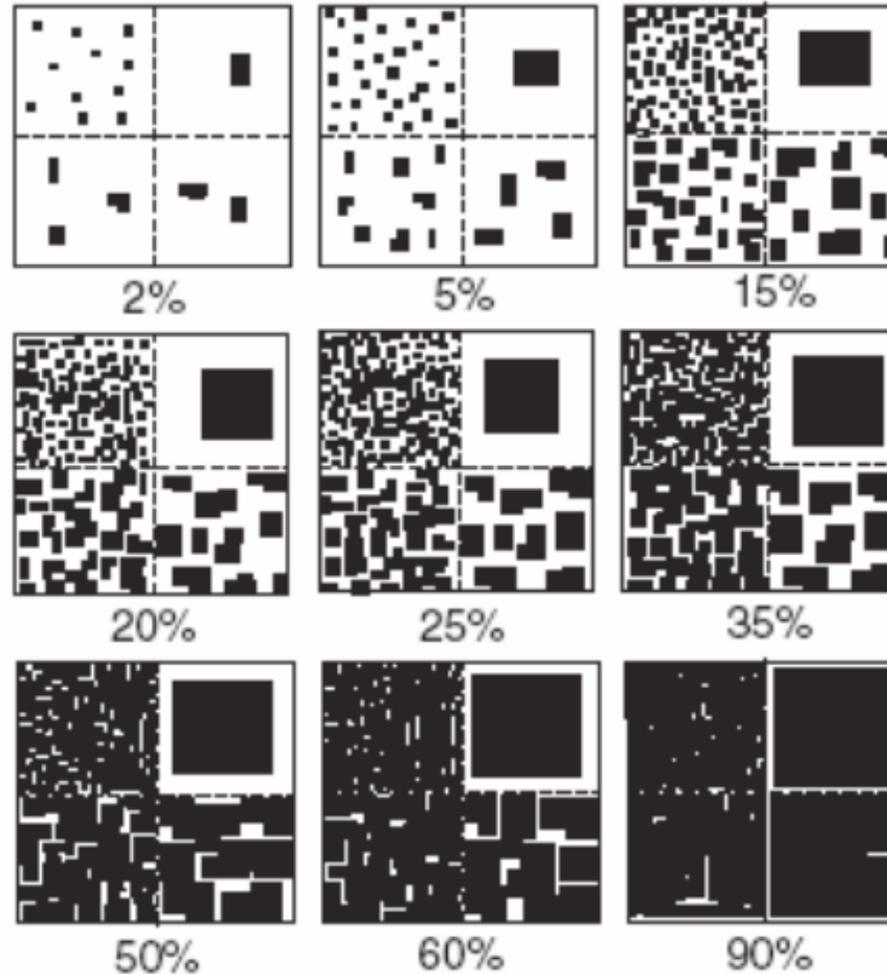
- Hydroperiod of **the AA.**
  - **Natural** – Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdowns. (see remainder of answers for indicators of deviation from natural)
  - **Greater than Natural Inflow** – Ditch, hose, pipe, or impoundment augmenting water to wetland (Augmented filling)
  - **Rapid Drydown-** Spring box, pump, ditch, hose or pipes pulling water from wetlands; and/or Encroaching upland vegetation or excessive exotics along perimeter or throughout the AA (natural filling with unnatural drawdown)
  - **Both greater Inflow/Drydown-** Both indicators of augmented filling and unnatural drawdown).

# Step 6: Functional

- Depending on the wetland being evaluated, up to 12 functions/values can be evaluate (such as flood attenuation, sediment/nutrition/toxic retention and removal, production export, groundwater discharge/recharge, etc.).
  - Many questions start with a Yes/No question. If yes, proceed to answer the rest of the questions for that section. If no, skip ahead to the next question topic.
- Check the appropriate box for each question.

# Step 6: Functional

Guide to estimate the percent cover in the AA and 200 Buffer



# Step 6: Functional - Disturbance

- **Disturbance:**
- **Predominant conditions within 200m of AA** (Select from one of the three)
  - **Undisturbed** - Managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings; and noxious weed is  $\leq 15\%$ .
  - **Moderately disturbed** - Not more than  $>50\%$  cultivated or disturbed, but may be moderately grazed or hayed or selectively logged; or has been subject to minor clearing; contains few roads or buildings; noxious weed is  $\leq 30\%$ .
  - **Highly disturbed** - Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed is  $>30\%$ .

# Step 6: Functional - Disturbance cont.

- **Conditions within the AA** (Select from one of the three)
  - **Undisturbed** - AA occurs and is managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings; and noxious weed is  $\leq 15\%$ .
  - **Moderately disturbed** - AA not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings; noxious weed is  $\leq 30\%$ .
  - **Highly disturbed**- AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed is  $> 30\%$ .

# Step 6: Functional - Evidence of overall wildlife use

- **Question 1** (Consider any actual wildlife sightings in the AA. Pick the one that describe the AA.)
  - **Abundant wildlife or high species diversity**
  - **Scattered wildlife groups or individuals OR relatively few species during peak periods**
  - **Few or no wildlife observations during peak periods**
- **Question 2** (Consider evidence of wildlife in the AA. Pick the one that best describe the AA.)
  - **Abundant wildlife sign such as scat, tracks, nest structures, games trails, etc**
  - **Common wildlife sign such as scat, tracks, nest structures, games trails, etc**
  - **Little to no wildlife sign**

# Step 6: Functional - Evidence of overall wildlife use cont.

- **Question 3** (Consider the potential habitat within the 200m surrounding the AA. ) \*See next slide for alternative definitions.
  - **Substantial** - adequate upland food sources (w/in 200m) AND no presence of extremely adverse habitat features (Refer to disturbances in the assessment form for the 200m buffer; limiting would be if you have any element that has a "Scope" of Large - Pervasive and a "Impact" of Serious - Extreme)
  - **Moderate** - adequate adjacent upland food sources but presence of adverse habitat features OR no adverse habitat features but sparse adjacent upland food sources
  - **Minimal** - sparse adjacent upland food sources AND presence of adverse habitat features

# Step 6: Functional - Evidence of overall wildlife use cont.

- **Question 3 in simple English**

Substantial	There is good habitat within the 200m AND there are no disturbances with “extreme impacts” within the 200mm (Refer to “Disturbances on p 4 of data form).
Moderate	There is good habitat within the 200m OR there are no disturbances with “extreme impacts” within the 200mm .
Minimal	There is not good habitat within the 200m AND there <u>are</u> disturbances with “extreme impacts” within the 200mm .

# Step 6: Functional – Species of Concern (SOC)

- **Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:**
  - AA is Documented/Observed (D) or Suspected (S) to contain
    - Primary or critical habitat (plants are present or habitat is a nesting/denning site for animals)
    - Secondary habitat (occasional use ie. plant habitat but no plants present, foraging areas for animals)
    - Incidental habitat (chance, inconsequential ie. species passing through)
    - No useable habitat
- See Appendix A for an up to date list of species of concerns.
  - Document any of the listed species that you observed within the AA. (Up to date photos and descriptions of each SOC in Appendix)

# Step 6: Functional - **General Fish Habitat Rating**

- **If Yes;** (Assess this function if any portion of the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [i.e., fish use is precluded by perched culvert or other barrier, etc.]).
  - **Hiding/Resting/Escape** Cover for the stream channel(s)  
(Includes: Submerged logs and veg, undercut banks, floating veg, large rocks)
    - **Optimal** –20 - 50% Cover of submerged area(s)
    - **Adequate** –(5- 19% Cover of submerged area(s)
    - **Poor** – < 5% or > 50% Cover of submerged area(s)

# Step 6: Functional - General Fish Habitat Rating cont.

- **Thermal Cover**

- **Streams <150ft.** - Streams  $\leq 150$  ft. wide
- **Lakes <20 acers in size** - Lakes and ponds  $\leq 20$  acres in size overhanging banks from 10 am to 2 pm in the summer,
- **Streams >150 ft.** - Streams  $> 150$  ft. wide or lake and ponds  $>20$  acres in size
  
- **Optimal** -  $\geq 50\%$  of the stream channel shaded by vegetation, side slopes, and/or overhanging banks from 10 am to 2 pm in the summer. OR maximum depth at baseflows (e.g., August, winter) is  $\geq 6.6$  ft.
- **Not Optimal** -  $<50\%$  shaded by vegetation

## Step 6: Functional - **General Fish Habitat Rating cont.**

- **Is fish use of the AA significant reduced by a culvert, dike, or other man-made structure.**
  - Yes
  - No

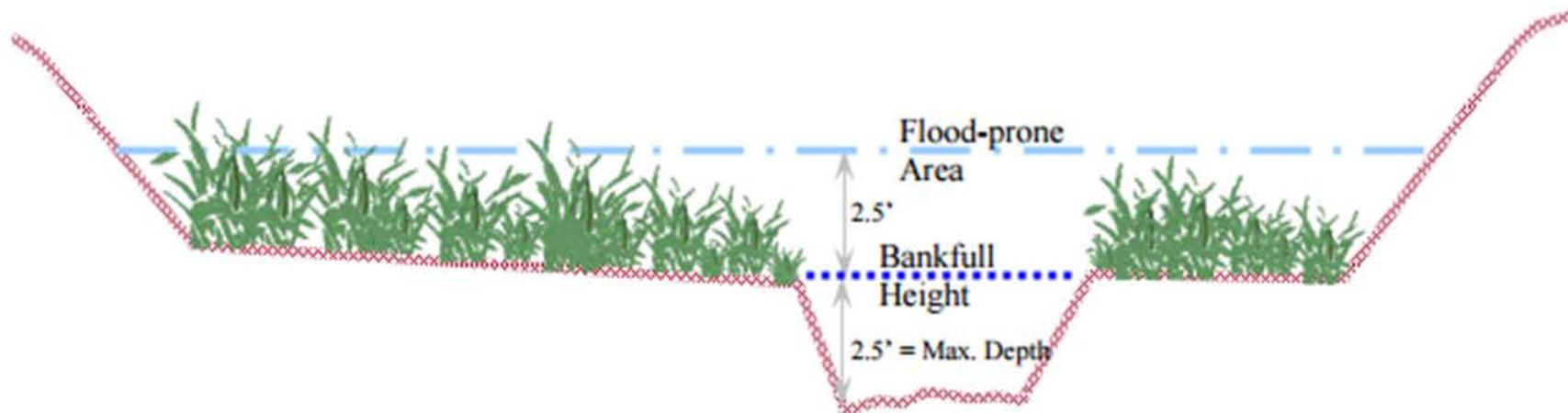
## Step 6: Functional - Flood Attenuation

**If Yes;** (Applies only to wetlands subject to flooding via in-channel or overbank flow.) Only if the AA occurs within, or contains a discernible floodplain (e.g., is subject to overbank flooding and possesses the opportunity to attenuate flood waters. *If the wetland within the AA does not occur within a channel or discernible floodplain, circle NA.*

# Step 6: Functional - Flood Attenuation cont.

- *If the stream/river doubles and the AA would flood answer this question.*

**Figure 2: Schematic of a Stream Cross-Section Showing the Relationship between Bankfull Height and the Flood-prone Area**



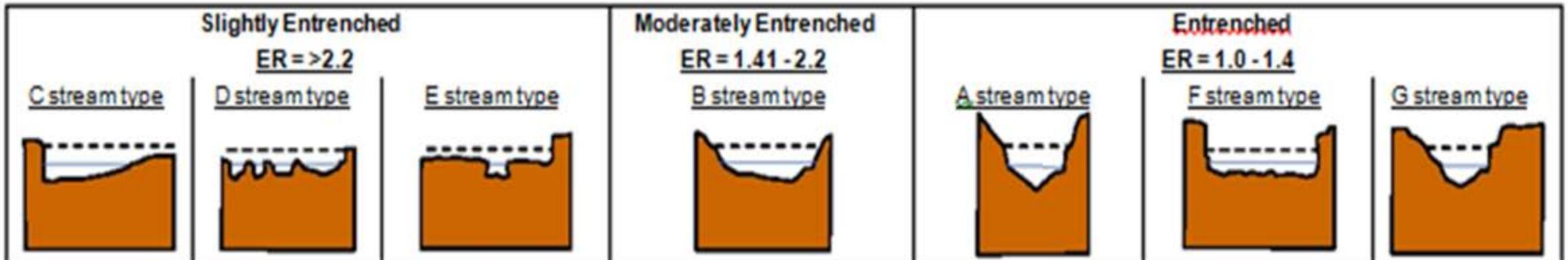
# Step 6: Functional - Flood Attenuation cont.

- **If Yes;**

- **Estimate Entrenchment of the channel in the AA** (Estimated Entrenchment of the channel contributing to potential flooding of the AA.)

- **Slightly Entrenched** - C, D, E Stream Types
- **Moderately Entrenched** – B Stream Types
- **Entrenched** – A, F, G stream Types

Grey line = normal level  
Dotted line = flooding



# Step 6: Functional - Flood Attenuation cont.

- **AA Outlet Information**

- **No Outlet or Restricted Outlet** - AA contains no outlet or restricted outlet (culverts, canyons, waterfalls and road berms)
- **Unrestricted Outlet** - AA contains unrestricted outlet

# Step 6: Functional - Short and Long Term Surface Water Storage

- **If Yes;** (Short and Long Term Surface Water Storage: Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.)
  - **Saturation Level**
    - **Entire Site Saturated** – Entire site saturated, or  $\geq 50\%$  flooded with  $\geq 12$  inches of water
    - **25-100% Saturated** – 25- 100% saturated, or 25 - 50% flooded with  $\geq 12$  inches of water
    - **<25 Saturated** –  $< 25\%$  saturated, or 0 - 25% flooded with  $\geq 12$  inches of water
  - **Wetlands in AA flood or pond** (more then or less then every other year)

# Step 6: Functional - Sediment/Nutrient/Toxicant Retention and Removal

- **If Yes;** (Applies to wetlands with potential to receive sediments, nutrients, or toxicants through influx of surface or ground water or direct input (eg Upstream crosses roads, active logging, or ag fields).
  - **Cover of wetland vegetation** (% cover of wetland vegetation in AA (look for wetland indicators)
    - <70%
    - >70%
  - **Evidence of flooding** (pooling of groundwater or pooling from overbank flow e.g. water marks, debris)
    - Yes
    - No

# Step 6: Functional - Sediment/Shoreline Stabilization

- **If Yes;** Sediment/Shoreline Stabilization: (Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage (all with an average width of greater than 2 feet), or on the shoreline of a standing water body which is subject to wave action.)
  - **% cover of Wetland** (*% Cover of wetland streambank or shoreline by species with high stability*)
    - **>65%** - *Streambank/Shoreline covered with Sedges, Willow, or Reed Canary*
    - **35-64%** - *Streambank/Shoreline covered with Sedges, Willow, or Reed Canary*
    - **<35%** - *Streambank/Shoreline covered with Sedges, Willow, or Reed Canary*

# Step 6: Functional - Production Export/Food Chain Support

- **If Yes;** Production Export/Food Chain Support: (Applies to sites that have potential for the AA to produce and export food/nutrients for both terrestrial **and** aquatic organisms) \*Needs surface water
  - **Percent of AA vegetated**
    - 100 - 50% of AA
    - 25 - 50% of AA
    - < 25% of AA
  - **Does the AA contain a surface or subsurface outlet?**
    - (a "No" would be a location that pools like a bathtub).

## Step 6: Functional - **Groundwater discharge/Recharge**

- **Groundwater Discharge/Recharge:** (check all appropriate indicators below or N/A if insufficient information or data). Should be representative of the AA as a whole,  $\geq 50\%$  of the AA)
  - Only check if you are 100% sure
  - Local knowledge of the land is helpful

*\*Some sites may have no checks*

# Step 6: Functional -Uniqueness Rating

- **Uniqueness Rating:** The AAs' Replacement Potential (*\*on the website this is a two part question. For the sake of the form, you only need to answer whether the AA has a fen or not. If you enter the data on the website, only pay attention to the first half of the answers*)
  - AA does not contain a fen:
  - AA contains a fen:
- Fen – A wetland defined with groundwater inflows and peat (organic soil) accumulation of at least 40 cm deep.



Task C: Gather Supplies and Upload Website

# Task C: Gather Supplies and Upload Website

- Make sure not to leave anything at the site.
  - Don't forget to pick up all the flags you placed, any trash, and all the supplies you brought out into the field.
- **When back to the office:**
  - Remember to enter your data, upload the site photos you took, upload your assessment drawing of the AA, upload a digital copy of your paper form into the appropriate folder, and put everything back in its proper place.

# Task C: Gather Supplies and Upload Website

Sign and Date all that apply to what you completed back at the office

\*Not all will be completed by you

	Name	Signature	Date
Assessment Form Completed (field work)			
Assessment Form Entered into Digital Database			
Digital Data Reviewed for Accurate Transcription			
Digital Data Reviewed for Anomalous Values			
Paper Copy Backup Completed and stored in project folder			
Digital Form Backup Completed and stored in digital site folder			
AA map modified based on field collection			
GIS database updated with GPS point and assesment score			
Photos stored in site digital folder			

# Appendix A

## Species of Concerns

# Appendix A: Species of Concern (SOC)

- Species of concern are divided into two sections.
  - Federally listed
  - State listed
- Even if you do not **see** any of the listed species, **you still need to look** through the suspected list of species for both the federally and state listed on the next page.
  - Photos and descriptions of the SOC are provided at the end of the appendix

# Appendix A: Species of Concern (SOC)

Table on the assessment form:

Habitat for federally listed or proposed species			
	Documented	Suspected	Species:
Federally Listed	<b>Federally listed species</b>		
	Primary or critical habitat		
	Secondary habitat		
	Incidental habitat		
	No useable habitat		
State Listed	<b>State S1 Species</b>		
	Primary or critical habitat		
	Secondary habitat		
	Incidental habitat		
	No useable habitat		
	<b>State S2 and S3 Species</b>		
	Primary or critical habitat		
	Secondary habitat		
	Incidental habitat		
	No useable habitat		

**Suspected Column:** (See next two slides for lists) Only check and write the species name for the specific site.

**Documented Column:** Only if you see the species in the AA.

# Appendix A: Species of Concern (SOC)

- On the next two slides, find your site number in the left column. Look across the row to the second column. If the site has any suspected species of concern, there will be a name followed by its habitat (e.g primary, secondary, incidental). You will use this data to fill out your assessment form with the appropriate suspected species and the listed habitat. Repeat this with the following slide for state listed SOC.
- Example: Site 25



2015_24a	Grizzly Bear - Secondary
2015_25	Grizzly Bear - Secondary
2015_26	Grizzly Bear - Secondary

Habitat for federally listed or proposed species

	Documented	Suspected	Species:
<b>Federally listed species</b>			
Primary or critical habitat			
Secondary habitat		✘	<b>Grizzly Bear</b>
Incidental habitat			
No useable habitat			

# Appendix A: (SOC) Federally Listed Suspected

2015_13b	Grizzly Bear - Secondary
2015_13c	Grizzly Bear - Secondary
2015_14e	Grizzly Bear - Secondary
2015_14g	Grizzly Bear - Secondary
2015_14h	Grizzly Bear - Secondary
2015_15g	Grizzly Bear - Secondary
2015_15h	Grizzly Bear - Secondary
2015_15i	Grizzly Bear - Secondary
2015_17a	Grizzly Bear - Incidental
2015_18b	Utes - Primary / Grizzly - Secondary
2015_18f	Utes - Primary / Grizzly - Secondary
2015_19c	Grizzly Bear - Secondary
2015_19d	Grizzly Bear - Secondary
2015_2	Grizzly Bear - Secondary
2015_23a	Grizzly Bear - Incidental
2015_23b	Grizzly Bear - Incidental
2015_23c	Grizzly Bear - Incidental
2015_23d	Grizzly Bear - Incidental
2015_24a	Grizzly Bear - Secondary
2015_25	Grizzly Bear - Secondary
2015_26	Grizzly Bear - Secondary

2015_28	Grizzly Bear - Secondary
2015_29a	Utes - Primary / Grizzly - Incidental
2015_30a	Utes - Primary / Grizzly - Incidental
2015_30b	Utes - Primary / Grizzly - Incidental
2015_30d	Utes - Primary / Grizzly - Incidental
2015_31d	Utes - Primary / Grizzly - Incidental
2015_32	Grizzly Bear - Secondary
2015_3c	Grizzly Bear - Secondary
2015_40	Grizzly Bear - Incidental
2015_53	Grizzly Bear - Secondary
2015_5a	Grizzly Bear - Secondary
2015_5e	Grizzly Bear - Secondary
2015_6a	
2015_6c	
2015_8a	
2015_8b	
2015_8e	
2015_8f	
2015_9c	Grizzly Bear
2015_9e	Utes - Primary / Grizzly - Secondary
2015_9f	Utes - Primary / Grizzly - Secondary

# Appendix A: (SOC) State Listed Suspected

2015_13b	Bison
2015_13c	Bison
2015_14e	
2015_14g	
2015_14h	
2015_15g	
2015_15h	
2015_15i	
2015_17a	Golden Eagle / Great Blue Heron
2015_18b	Bison
2015_18f	Bison
2015_19c	
2015_19d	Bison
2015_2	Pileated Woodpecker
2015_23a	Pileated Woodpecker
2015_23b	
2015_23c	Bison
2015_23d	Bison
2015_24a	
2015_25	
2015_26	

2015_28	
2015_29a	
2015_30a	
2015_30b	
2015_30d	
2015_31d	
2015_32	Bison
2015_3c	Bison
2015_40	
2015_53	
2015_5a	Golden Eagle / Great Blue Heron
2015_5e	Golden Eagle / Great Blue Heron
2015_6a	
2015_6c	
2015_8a	
2015_8b	
2015_8e	
2015_8f	
2015_9c	Golden Eagle / Great Blue Heron
2015_9e	Golden Eagle / Great Blue Heron
2015_9f	Golden Eagle / Great Blue Heron

# Appendix A: Species of Concern (SOC)

- Golden Eagle
- **Diagnostic Characteristics-** Bald Eagles have feathers only part way down the leg, and usually soar with wings held completely flat. Immature Bald Eagles usually have a strip of white along the underside of the wing, rather than in a round patch on the flight feathers like the immature Golden Eagle. Older immature Bald Eagles have irregular patches of white on their bodies, instead of the sharply defined patterns on Golden Eagles. Turkey Vultures soar with wings held in a more pronounced "V".



# Appendix A: Species of Concern (SOC)

- **Great Blue Heron**

- **Diagnostic Characteristics-** No other heron in Montana is the size or color of the Great Blue Heron, nor are other herons likely to be encountered in Montana during winter.



# Appendix A: Species of Concern (SOC)

- **Bison**

- **Diagnostic Characteristics-** Bison are unmistakable. The combination of large size, shoulder hump, and short, dark, curved horns on both sexes eliminates any other large ungulate.



# Appendix A: Species of Concern (SOC)

- **Pileated Woodpecker**
- **Diagnostic Characteristics-** Except for the probably extinct Ivory-billed Woodpecker (*Campephilus principalis*) of the southeastern United States and Imperial Woodpecker (*C. imperialis*) of montane western Mexico, the Pileated Woodpecker is the largest woodpecker in North America. Large size and prominent red crest distinguish this woodpecker from all other woodpecker species in Montana.



# Appendix A: Species of Concern (SOC)

- **Grizzly Bear**
- **Diagnostic Characteristics-** Adult Grizzly Bears differ from American Black Bears (*Ursus americanus*) in being larger and by having a hump above the shoulders, a concave (rather than straight or convex) facial profile, shorter and more rounded ears, a rump lower than the shoulder hump, and longer, less curved claws usually evident in the tracks. Identification can be difficult at times and Montana Fish, Wildlife and Parks has developed an Online Bear ID Test to help people better distinguish between American Black Bears and Grizzly Bears.



# Appendix A: Species of Concern (SOC)

- **Ute Ladies'-Tresses**
- **Diagnostic Characteristics-** *S. diluvialis* is intermediate between its putative progenitors, *S. romanzoffiana* and *S. magnicarporum*; the latter is not known from Montana. *S. diluvialis* is distinguished from *S. romanzoffiana* by its whitish, stout, ringent (gaping at the mouth) flowers, by its lip petal being exposed in lateral view, and by its sepals being free or connate at the base for a short distance rather than fused to form a hood above the lip. Additionally, the 2 species occupy different habitats, *S. romanzoffiana* almost always in mesic montane and subalpine settings, only rarely occurring in lower valley locations, whereas, *S. diluvialis* occurs in alkaline wetlands in the valley bottoms.

