Version 3.0
Last Updated: 07/07/2023

Vegetation Survey Standard Operating Procedure – WLFW Northern Bobwhite & Grassland Birds

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Across each 500x500-m grid, we will conduct **two different types of vegetation surveys**:

1. Cell-scale vegetation surveys: Fine-scale community vegetation surveys will occur in four of the 50x50-m cells. These surveys will only be conducted at locations that received point-count surveys.
2. Grid-scale surveys: A habitat characterization survey demarking major land cover types across the whole grid. These surveys will be conducted at all ARU deployment locations.

Survey Timing
To ensure vegetation is fully grown at the time of survey and plants are identifiable, vegetation surveys should be conducted during the late summer (late July through August).

Cell-scale Vegetation Surveys

Materials:

Phone w/ Survery123 app	Compass
Meter (Transect) Tape	1x1-m Quadrat
Robel Pole	GPS

Items for securing transect tape (optional)

[Note: directions for building quadrats and Robel poles here.]

Surveyors will conduct 4 cell-scale surveys per grid. Two should be conducted in cells where a bobwhite was detected during any of the 2-3 point counts conducted during the previous breeding season (i.e., presence cells), and two should be cells where no bobwhite were detected (i.e., pseudoabsence cells). [Note: If no bobwhite were detected during any prior point count visits, do 4 pseudoabsence cells. Similarly, if only one bobwhite was detected during the prior point count visits, do 1 presence cells and 3 pseudoabsence cells.]

Presence and pseudoabsence cells are selected randomly from the qualifying cells. Surveyors will be provided a list with the cell IDs in random order. The list will also have the central coordinates for each cell and a randomly-assigned transect direction (north-south or east-west) for each cell. Surveyors should first highlight the cell IDs where a bobwhite was detected during one or multiple point count surveys from the previous spring. To select the presence cells, proceed down the list until you reach the first two highlighted cells. Likewise, to select your pseudoabsence cells, proceed down the list until you reach the first two cells that are *not* highlighted. If either a presence or pseudoabsence cell falls outside the *property* boundary, do

the next available cell per the above instructions. However, all accessible cells within the property boundary should be included, even if the cell falls outside of the *practice* boundary.

If a cell falls within a crop field, complete the survey only if it is possible to do so without trampling crops (e.g., a fallow field). Otherwise, skip and do the next available cell. Do not include crop species in any of the vegetation classes (e.g., don't count soybeans as a forb or corn as a native graminoid). Use the notes section whenever a cell or individual quadrat falls within an unusual landcover type (e.g., "this cell falls within a crop field currently planted with a cover crop of crimson clover", "this quadrat falls within a food plot").

Data Entry & Data Management

Cell-scale surveys will be entered in the field via the Survey123 App. Prior to going into the field, please download the app and download the WLFW Cell-scale Veg Survey (link here). You do not need an ArcGIS online account; simply click "continue without signing in" when you open the app. As long as you have the app and survey pre-downloaded, you will not need cellular data to conduct the survey; the survey will cache the data until you have service/wi-fi and are ready to submit. You will need to turn your location services on and grant permission for the app to access your location. A survey should be submitted for each cell (i.e., 4 surveys per grid).

When you complete a survey, you are given the option to "send now" or "save in outbox". You may use the "send now" option if the survey is complete and you have sufficient service. Otherwise, you can cache the data by using the "save in outbox" option. Cached surveys can be updated before submission, if for example, you had a previously unknown plant that you IDed later via photos. Additionally, surveys can be edited after submission if needed.

Cell-scale Survey Steps:

1. Once you have identified the locations for the cell-scale surveys, including two presence and two pseudoabsence cells, place your first transect. For both presence and pseudoabsence cells, the 22-m transects will be centered on the central coordinates of the cell of interest (i.e., meter mark "11" should be at the central coordinates). Transects should be oriented north-south or east-west according to the random assignment on the cell ID list. See Figure 1. It is imperative that surveyors avoid trampling vegetation during transect deployment. It is suggested that surveyors first carefully secure the center of the transect at the coordinates of interest. [Note: measurements are taken at this location, so again, please avoid trampling the vegetation.] Surveyors can then stretch one end of the transect taut while walking well outside of the projected transect line (e.g., if deploying the southern end of a north-south transect, surveyors should not walk due south, but rather head south at an angle). Once the transect line is taut, surveyors may then walk in an arch bringing the transect into line and verifying with a compass bearing. This is then repeated for the other end of the transect. Surveyors may use landscape stables to secure the transect and keep it taut on the ground, or light fiberglass posts may be desired if the transect needs to be secured above brambles or other dense vegetation.

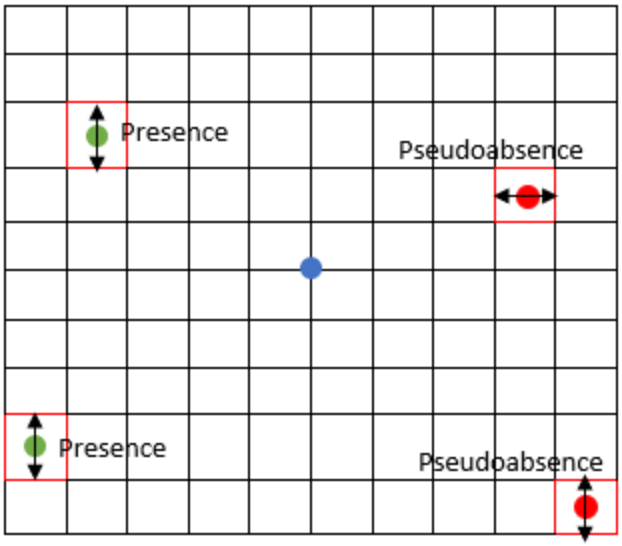

Figure 1: Presence and pseudoabsence points with randomly assigned transect directions (north-south or east-west). Notice the transects are centered on the central coordinates of the cells of interest. The blue dot represents the grid's center (where the point counts were conducted).

2. Surveyors will conduct a Daubenmire Cover Class Assessment and a Robel-pole Vegetation Structure Assessment for every 5-m interval on the transect starting at meter mark "1". In other words, both assessments will be conducted at meter marks 1, 6, 11, 16, and 21.

   <u>Quadrat Assessment</u>
   At the above-mentioned intervals, place the 1x1-m quadrat on the ground so that it is centered on the meter mark of interest. See Figure 2. The survey will prompt you to record the coordinates of each quadrat via your phone's internal GPS. It will also prompt you to provide a photo of each quadrat. Please take the photo from directly above the quadrat's center. Make sure the entire quadrat is visible within the frame and that the quadrat fills the frame as best as possible (not zoomed in too much or too little).

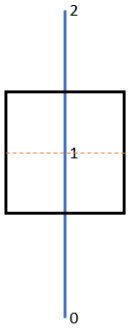

Figure 2: Example of quadrat placement at meter mark "1" on a transect. The blue line represents the southernmost end of a north-south transect, numbers represent meter marks, and the black square represents the quadrat.

Surveyors will record a Daubenmire cover value for each of the following categories: native graminoid, nonnative graminoid, forb, shrub, vine, litter, and bare ground. [Note: you will *not* record a cover value for each individual plant *species*, only for the general categories. You will be asked to identify the dominant and codominant species of graminoid, forb, shrub, and vine, but cover values should include all species within each category, not just the dominant species.] Additionally, surveyors will record a count of the number of saplings/seedling trees within the quadrat.

Daubenmire Cover Class Category:
Native Graminoid: grasses, sedges, and rushes that are native to North America.
Nonnative Graminoid: grasses, sedges, and rushes that are *not* native to North America.
Forb: herbaceous (i.e., non-woody), broad-leaved plants. In general, any herbaceous plant that is not a graminoid is a forb.
Shrub: woody-stemmed plants that average <5m in height when fully grown.
Vine: woody vines. [Note: species that are strictly herbaceous (e.g., morning glories, *Ipomoea* sp.) are classified as forbs.]
Litter: dead woody stems less than 10cm tall -or- any dead plant material (e.g., logs, sticks, leaves) that is not rooted in the ground.
Bare Ground: ground that is devoid of plants or plant debris (litter).

Count Number Occurring in the Quadrat:
Seedling/Sapling: tree species that are <5m in height at the time of survey.

Please watch the following YouTube video on the Daubenmire Cover Class Method: https://www.youtube.com/watch?v=wKcKQzNbsds (relevant information starts at 09:51). [Note: our methods differ in three important ways from what is shown in the video. 1) We will be using 1x1-m square quadrats, not the rectangular quadrats shown in the video. 2) Cover class values are recorded for the above-mentioned categories, not parsed out into individual species. 3) we will be using smaller percent ranges across more class values (see table below). Surveyors will only need to record the cover class value. Midpoints and averages will be calculated automatically during analysis.]

Daubenmire Cover Class Reference

Class	Range (%)
0	<1
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81-90
10	91-98
11	99-100

Identify and record the dominant and co-dominant plant species for native graminoids, nonnative graminoids, forbs, shrubs, and vines. If only one species for a category is present in a quadrat, record "NA" for the co-dominant species and likewise for the dominant species if no species for a category is present.

Biologists should become comfortable recognizing and using scientific names for plants. While common names are typically easier to remember, there is no standardization of common names (i.e., the same common name can refer to multiple species, or a single species may have multiple common names). The survey has dropdown lists of species (or genera) based on the list downloadable here. For these species, both scientific names and common names are provided for ease of entry. Please note, you may know species by common names other than the ones provided, so don't assume something is not on the list just because you don't see your pet name for it. However, this is not a comprehensive list. If you need to record a species not listed, please ID to species, select the "other" option on the survey, and fill in the scientific name *only* (i.e., do not include a common name in parenthesis).

Biologists may use apps such as Seek, PictureThis, iNaturalist, etc. However, biologists should not blindly trust identifications made by these apps. Biologists may use the app as a starting point, but biologists must research the diagnostic characteristics of the suggested ID and confirm they align with the observed plant. [Note: iNaturalist is the preferred app because it provides AI-suggested IDs that are then confirmed by human identifiers. However, biologists *must* set the geoprivacy to "obscured" for all observations made while working on private contracts.]

For unknown plants that need to be identified, good pictures are vital. At a minimum, biologists should take a closeup photo of each potentially diagnostic structure (e.g., fruit, flowers, stems, leaves, etc.) and at least one photo showing the entire plant structure.

Robel-pole Vegetation Structure Assessment

The Robel pole consists of a 4-foot-long white rod with 10cm bands of alternating colors. Bands are numbered consecutively from the bottom starting with 0. A 4-m string is attached at 1m in height on the Robel pole and the opposite end is attached to one end of a 1-meter pole (hereafter the "viewing pole").

Surveyors will secure the Robel pole so that the bottom is flush with the ground and the pole is stable and perfectly vertical. The pole is placed at the meter mark of interest, taking care not to trample vegetation while setting it up. Measurements are taken in the 4 cardinal directions. Surveyors will pull the connecting string taut and place the bottom of the viewing pole (i.e., the side opposite the one with the connecting string) so that it is flush with the ground and perfectly vertical. Surveyors will then squat or kneel so they can view the Robel pole by looking just above the top of the viewing pole. See Figure 3. The reading consists of identifying the last band visible on the Robel pole before it disappears in the vegetation. The band need not be visible in its entirety; if any part of the lowest band is visible, it should be counted. [Note: the lowest visible band must be recorded even if viewed through a hole in the vegetation and not at the top of the vegetation.]

Figure 3: Robel pole in use. Note: the observer pulls the connecting string taut and takes the reading with their eye just above the viewing pole so that the reading is always taken from the same distance and height.

3. Once the transect measurements are gathered, surveyors should stand at the central coordinates of the cell. Surveyors will provide a count of the trees (i.e., living trees >5m in height at the time of survey) and snags (i.e., dead trees >5m in height) for the *entire* 50x50-m cell. It is understood that the exact bounds of the cell will be unknown, but surveyors should visualize the cell to the best of their ability. From the central coordinates, visualize 25-m out in the four cardinal directions and ~35-m out in the four ordinal directions. Mentally connect the dots to visualize the cells bounds.

4. Once the Daubenmire Cover Class and Robel-pole Structure Assessments have been completed for every 5 meters (1, 6, 11, 16, and 21) on the first transect and the number of trees and snags are counted for the 50x50-m cell, surveyors should repeat steps 1-3 for the remaining 3 grid cells of interest.

Grid-scale Surveys

For each point, biologists will be provided a map with numbered polygons representing patches of differing landcover as discerned from an aerial image. In the field, biologists will answer a questionnaire about each polygon.

Polygons may be based on slightly outdated imagery. Biologists may split polygons if they discover the landcover type represented by a single polygon on the map is not actually homogeneous. For example, a map may show a polygon representing a crop field; however, the biologist may discover that half of the field has since been converted to pasture. The biologist should delineate the separation on the map and renumber the polygons to account for all patches based on the current landcover.

[Note: grid-scale surveys must be conducted by ground truthing. Biologists should not attempt to complete the questionnaire by memory.]

**More details on grid-scale surveys coming soon. **

Please see the attached example datasheet. Please reach out if you have any questions regarding the Standard Operating Procedures.