

Meandering Walk Sample Design and Field Methods

Equipment Needed

- Map showing site boundary and soil moisture class boundaries if applicable; satellite imagery or topography is helpful
- GPS unit with map, if used
- Survey protocol
- Datasheets or mobile device equipped for data entry
- Clipboard
- Pencils/pens
- Watch/clock
- List of species planted, if applicable
- List of species observed in prior surveys (if any), if desired
- Identification guides and/or keys
- Hand lens
- Plastic bags or plant press for specimen collection
- Camera to photograph unknown plants

Sampling Design

Sampling design details

The meandering walk is adapted from the Prairie Reconstruction Initiative (PRI) protocol, which was developed to assess changes in vegetation presence following the reconstruction of formerly agricultural land back to prairie, but works equally well in assessing vegetation in remnant prairie. This method involves walking through an individual prairie remnant or reconstruction and creating a species list. The spatial hierarchy of the PRI database is the basis for this monitoring protocol, where each individual reconstruction is called a “seed mix area”; for our study this area is equivalent to the management area. The seed mix area is an area that was planted at the same time, using the same methods, with the same seed mix. Alternatively, management area is an area that has been managed the same way over a pre-determined time period. If a given seed mix or management area encompasses more than one prairie type as indicated by soil drainage class (dry, mesic, wet; see Appendix 1 and Figure 1), the meandering walk should be stratified by prairie type, as species will establish differentially depending on moisture regime.

The meandering walk can be used to track the progress of a reconstruction or remnant, and the data collected cannot be used for statistical inference. Ideally, a nearly complete plant species list for the seed mix or management area will be assembled during each meandering walk.

Survey timing and schedule

One of the primary values of a meandering walk is that it will allow for early detection of problems with a reconstruction or remnant. Annual walks will best achieve this objective.

Surveys should be timed within the field season to maximize the number of species that can be successfully identified. Phenology will differ among species, and the biologist or manager at each site should consider the best timing to monitor that particular site. In many cases, early- to mid-summer is a good time to survey to catch early-season species that have not quite senesced as well as later emerging species that are big enough to be identified even if they are not yet in bloom. Timing of monitoring should be approximately the same between years on a given site.

Field Methods and Processing of Collected Materials

Pre-survey logistics and preparation

Mapping

Create a digitized polygon of the area(s) to be searched at the site and export a map to the GPS unit or print one for use in the field. This will be the permanent meandering walk search area for this site. It is preferable to conduct the meandering walk throughout the entire seed mix area (unique reconstruction) or management area; however, if that is impractical, an attempt should be made to include the diversity of plant communities or soil types on the entire site within the designated search polygon. Because we are stratifying sampling areas by soil moisture, it is ideal to monitor within soil types that correspond to dry, mesic or wet conditions. Soils data are available from the Natural Resources Conservation Service Web Soil Survey (NRCS WSS; <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>). See Appendix 1 for guidance on how to use the NRCS site to make your map. Soil drainage class may be used as a proxy for wet (very poorly drained, poorly drained), mesic (somewhat poorly drained, moderately well drained, well drained), and dry (somewhat excessively drained, excessively drained) prairie types (Figures 1 and 2). It is helpful to include soil polygons or topography on a satellite imagery base map for use in the field. The map and/or shapefile should be stored with the copy of the datasheets and data (sample map included with additional documents).

Planted and Previously Observed Species Lists

If desired, print a list of species that were planted at the site as well as the species list from previous surveys at the site. Such lists can alert observers to be on the lookout for certain plants.

Establishment of sampling units

In the meandering walk monitoring method, each discrete seed mix or management area is the sampling unit to be searched (see *Sampling design details* and *Mapping* above); if more than one prairie type (soil moisture category) occurs in the seed mix or management area, search each prairie type separately. Search each area using a meandering path, making sure to include all noticeable vegetation zones in the search.

Ideally, the entire seed mix or management area will be searched during the meandering walk. If you have a very large area, or areas that differ widely (i.e., different soil types, topographic variation, or differences in soil moisture or land use history), creating separate polygons and searching a few different areas could be a good option. If the seed mix or management area is

partially sampled, subareas must be determined prior to the field survey and a map with the appropriate subarea boundaries should be generated. The same area(s) should be searched in subsequent years.

Data collection procedures

For each search area use the following protocol (example datasheets are in Appendix 2):

1. At the top of the datasheet record:
 - a. Overall site, Planting unit, Seed mix area name, and Prairie type
 - b. Date
 - c. Observer(s)
 - d. Start time
 - e. End time
 - f. Total time
 - g. Area searched in acres
2. Within each search area, record all native and non-native species encountered during the search.
3. Use the appropriate column to identify how common each species is within your search area (rare, common, or abundant).
4. Use the appropriate column to state whether each species was localized on the site or widespread.

Data field details

Overall site: Record the name of the overall site.

Planting unit (NA in remnant sites): Record the name of the planting unit within the overall site, if applicable.

Seed mix area (NA in remnant sites): Record the name of the seed mix area (individual reconstruction). This is the area targeted by the meandering walk. Areas that were planted with different seed mixes should be labeled as different seed mix areas in our spatial hierarchy. If planting and management data for the same site are entered in the PRI database, it is imperative that the name and extent of the seed mix area in the monitoring portion of the database exactly match the name and extent of the seed mix area in the planting and management portions.

Prairie type: Dry, mesic, or wet, as defined by the soil drainage class(es) within the search area (see Appendix 1). In reconstructions, a single seed mix area often will contain only one of these categories because the seed mix was targeted to that prairie type. If more than one prairie type occurs in the seed mix or management area, it is best to stratify the walk and search each prairie type separately.

Date: Record the date of the survey as mm/dd/yyyy.

Observer(s): Record the observer(s) names. Be consistent across sites and years.

Start time: Record the time at the start of observations using a 24-hr clock (e.g., 14:32 = 2:32 pm).

End time: Record the time at the end of observations using a 24-hr clock (e.g., 17:02 = 5:02 pm).

Total time: Record the total amount of time spent conducting the meandering walk in hours and minutes (end time - start time).

Area searched: Record the total area searched in acres or hectares, making sure to keep and record consistent units. This is the approximate area searched and should coincide with the area of the delineated polygon.

Species: Record each native and non-native species encountered during the search. Within each search area, do a “botanist’s walk” to maximize the species list. This entails traversing parts of the site with different moisture types, topography or other characteristics that could yield unique species. The biologist or manager may want to guide technicians to be sure to visit certain parts of the site they know to be of interest. If you cannot identify a plant to species, give the highest level of detail possible. If you abbreviate species names, use a unique abbreviation for each species and keep a master list of abbreviations used. If you use common names, keep a master list of their corresponding scientific names.

Abundance: Record the general abundance of each species as rare, common, or abundant.

Distribution: Record the general distribution of each species as localized or widespread. A localized species is found in one or a few discrete spots in the seed mix area. A widespread species is found in many places within the seed mix area. While many localized species will also be rare (few total individuals), there may be a common or even abundant species that is localized (e.g., one solid patch of reed canary grass). Conversely, it is possible that individuals of a rare species may be found in several separate places (i.e., widespread).

Comments: Record any other relevant comments.

End-of-season procedures

If applicable, all paper datasheets should be stored in a secure location after entry and quality assurance quality control processes are completed. Datasheets should also be scanned locally for long-term storage.

All collected or photographed unknown plants should be examined as soon as practical after (or during) the field season to try to identify them. The appropriate datasheets and digital data records should be promptly amended to reflect the correct identity.

All electronic data collection and navigation devices, including cameras, should be checked to ensure all data on each device have been downloaded and all devices have been cleaned using the manufacturer’s recommended cleaning solution.

Appendix 1 -- Using the NRCS Web Soil Survey to Identify Soil Drainage Classes within a Survey Area

This SOP describes the basic steps you would use to find the soil drainage classes for a particular survey area using the Natural Resources Conservation Service's website.

1. Go to NRCS Soil Survey page:
<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
2. Click the green circular "Start WSS" button or click "Start Web Soil Survey" blue text
3. Click the "Area of Interest (AOI)" tab to define your map location
 - a. Zoom in on the map of the US or use the State/County dropdowns on the left and click "View" to zoom in; continue to zoom until your survey area more or less fills the view
 - b. Use the polygon AOI tool or the rectangle AOI tool to outline your area of interest (i.e., seed mix area that you plan to monitor)
 - c. To define a new AOI for a subsequent map, click "Clear AOI", then redo the above steps
4. Click the "Soil Map" tab to see the outlines of the soil polygons within your AOI. You can change the layout on your screen by choosing one of the two buttons just above the map and to the right -- either normal map layout or full width map layout. With normal layout, the table with the soils descriptions is to the left of the map. With full width layout, it is below the map.
 - a. You can click on a soil name to see a description of that soil (map unit).
5. Click the "Soil Data Explorer" tab to visualize properties of the soils within your AOI, specifically drainage class. Expand "Properties and Qualities Ratings" on the left sidebar.
 - a. Further expand "Soil Qualities and Features"
 - b. Click "Drainage Class"
 - i. The Map and Table checkboxes should both be automatically checked
 - ii. Click the "View Rating" button to see your AOI with the soil polygons color-coded by drainage class
 - iii. Click the "Legend" tab at the upper left of the map to see which color represents which drainage class, and match to dry, mesic, or wet prairie types (Figure 1)
 - iv. Figure 2 depicts an example map
6. Click "Download Soils Data" tab to download a shapefile of the soils map of your area of interest, if desired
7. Click "Shopping Cart (Free)" tab to download a report with a printed soils map of your area of interest, if desired

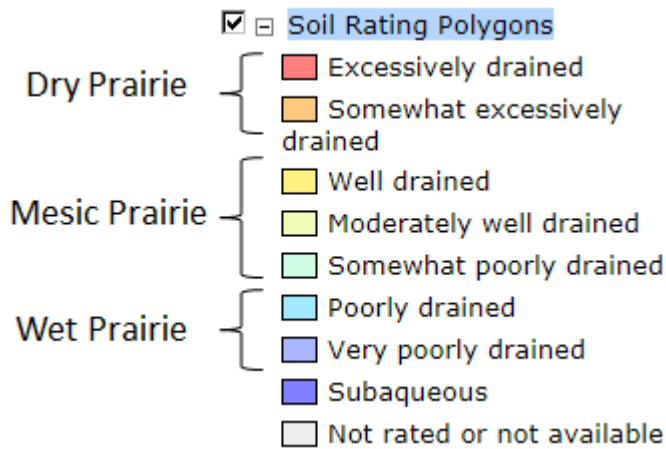


Figure 1. Correspondence of soil drainage class from the NRCS Web Soil Survey (“Soil Rating Polygons” in legend with colored boxes) to prairie types used in this protocol.

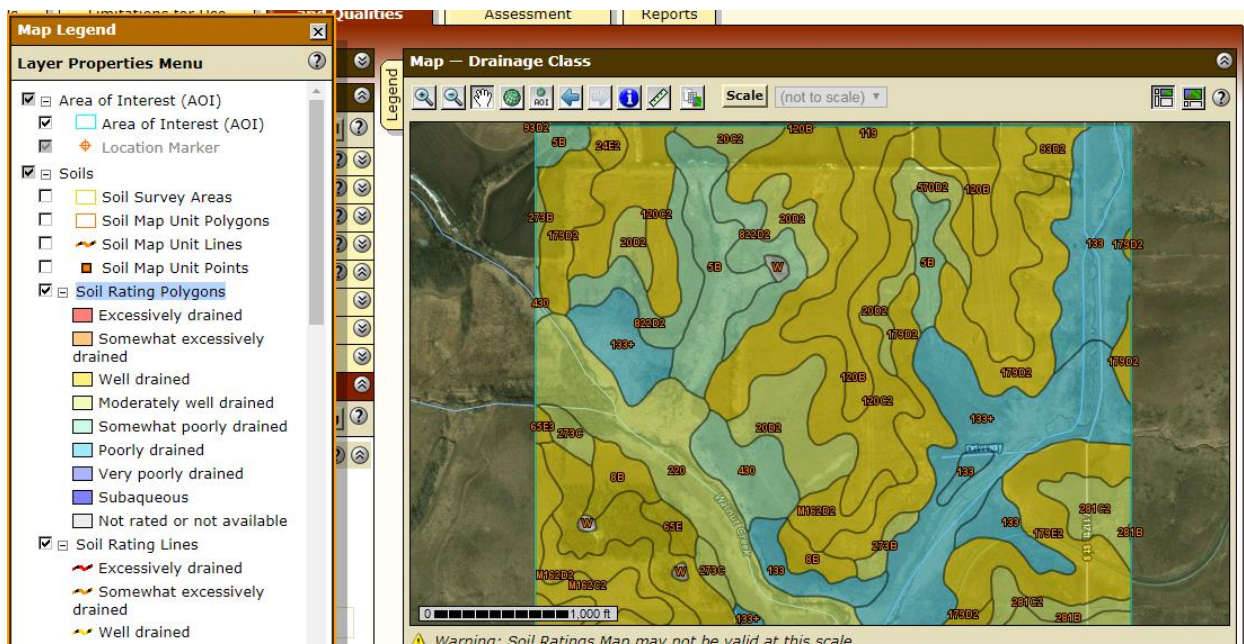


Figure 2. An example of a soils map that can be generated from the Web Soil Survey. Blue = wet, greens and yellow = mesic.

