Vegetation Community Monitoring Protocol for the Heartland Inventory and Monitoring Network

Standard Operating Procedure 3 Establishing and Marking Permanent Sample Sites

Version 2.0 (2018)

Revision History Log:

| Previous Version # | Revision Date | Author | Changes Made | Reason for Change | New Version # |
| --- | --- | --- | --- | --- | --- |
| 1.00 | 6/18/2009 | K.M. James | Minor updates | Reflect current methods | 1.01 |
| 1.01 | 2018 | S.A. Leis | Include site rejection criteria, detail on tagging trees. | Improve clarity and repeatability. | 2.0 |
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This SOP gives step-by-step instructions for establishing and marking permanent sites. It provides instructions for permanently marking transect ends and the correct procedure for labeling site tags. It also explains the procedure for collecting the relevant data and filling in the “site establishment” data form in this SOP. Prior to installing any sampling infrastructure (e.g. rebar and tags), consult with the park so that they can review their compliance guidelines. Compliance may need to be reviewed to ensure that appropriate policies are followed.

Equipment List

* GNSS (Global Navigational Satellite System) unit (1)
* Clinometer (1)
* Compass (2)
* Digital Camera and photo logbook
* Flagging – for marking rebar and witness trees
* Multitool with pliers
* Maps
* Photobook (record of prior site documentation photos)
* Rebar or nails (4)
* Hammers – for hammering rebar and tree tags
* Tags (brass for rebar, aluminum stamped witness trees, and numbered mid- and overstory trees, nails, and wire
* DBH height gauge
* Chalk paddles
* Tapes (4)
* Yellow Caps – fit over the ends of each rebar to increase rebar visibility

Procedures

1. Sites are located within each park in a systematic random manner. A grid overlay is first created for a park using a random bearing. The vertices of the grid are spatially referenced to form a matrix of potential sample points. Soil, aspect and management unit attributes are assigned to each matrix point using a GIS to identify a pool of points for each stratum. Random points in communities or reference frames are proportional to the soil-slope-aspect combination. This way sampling intensity will be greatest in dominant types.
2. In the field, points are visited in random order. When arriving at a point, the suitability of the area as a site is assessed. If the site is suitable, a permanent site is installed. Alternatively, the reason for rejection is noted and the next point visited until all sites are located. Often the initial reference frame is modified after the first field visit to exclude areas that are not suitable for sampling, such as areas that are particularly narrow, steep, or erosive.

Guidelines for accepting or rejecting a monitoring site location:

* Site can be safely accessed and sampled.
* Site is at least 50 meters from a road, trail, or park boundary. Site is at least 50 meters from a pond, lake, or large stream. Site is free of artificial structures (e.g., kiosk, building, signpost, bench) and 50 m from buildings.
* Entire site reflects the target community.
* Community is similar across the sample site so that a single community is represented.
* Site can be sampled without damaging the plant community.
* Site will be sample-able most years attempted (for example, rarely flooded during sampling).

## The paired transects are 50 m long X 20 m apart and run parallel to each other and to the elevation contours. Once the decision is made to locate a site in a particular location, the upslope transect is laid out using a clinometer to keep the transect along the contour as described below.

1. A rebar is established as the first corner and an azimuth is determined that runs parallel to the contours. A clinometer is helpful for this determination. This corner is typically the beginning of the A line (AS).
2. A tape is then run out 50 m along the established azimuth and another rebar is driven in the ground. This is typically corner AF.
3. At an azimuth perpendicular (90°) to the first transect line, a distance is measured 20 m to the end point of the second transect. This is typically the end of the down-slope transect or transect B (corner BF). Once a rebar is established for the end point of the B line a back azimuth is shot to parallel the A line and a 50 m-tape is extended to the final corner of the site (BS) where the last rebar is sunk. *Note: tags can be ordered that are pre-engraved with the needed information*

Note: Rebar should only extend < 6 inches above the soil surface. Four inches is ideal. This is to reduce damage for maintenance crews working off road in the park. If a rocky site is encountered where rebar will not work, anchors with nails or bolts may work better.

1. Once all four rebar are established, they are tagged with brass tags stamped with the site number and rebar designation. **(Brass tags survive field conditions better than other tag materials tried in the past.)** For example, 10 AS is site number 10 and it is the start (S) of the A line (the upslope transect). The tags are wired to the rebar using the **multitool**. A plastic yellow cap is also placed on the end of the rebar for increased visibility and to protect tires**,** cow hoofs**, etc.** from damage. A digital photograph is taken at each **corner marker** looking down the transect. If available, two trees per **corner** are monumented as witness trees. Information is collected for each tree including species, diameter at breast height (dbh), azimuth from tree to rebar and distance to rebar. An aluminum tag with duplicate information to the **corner** tag is nailed to the tree using aluminum nails at eye height pointing towards the **corner**. Insert the nail at a downward angle so that the tag slides forward, away from the tree.
2. Once the corner markers are set, relocation data for each transect is collected. Coordinates for the ends of each transect are collected using a GNSS unit (SOP 2-Establishing and Marking Permanent Sample Sites). Metadata are then recorded, including type of monumenting and azimuth, see Data Form 1. Ancillary evidence of disturbance such as old roadbeds, fences and animal burrows is also noted when sample units are established.
3. In a woodland community, it is ideal to tag the overstory trees within a site. Installation of numbered tree tags is a form of quality assurance for diameter measurements of trees. Uniquely numbered trees will reduce identification errors over time and consistently placed tags result in consistent placement of diameter measurements across years and observers. Prior to installing tree tags, check with each park for restrictions, for example, at EFMO no tags are allowed, and at HOME tags are faced away from trails. Tag numbers must not repeat across the HTLN sites, e.g., all trees have a unique tag number. As with witness trees, use aluminum nails and tags. Trees ≥5 cm DBH within the site’s boundaries should receive a tag unless there are mitigating circumstances (i.e., park rules, safety issues, snag tree is too degraded to hold a tag). Trees stems on the transect lines should be at least 50% inside the site to be considered in the site. Place the tag facing the start side of the site (0 m) unless the park has restrictions or that is the downhill side of the tree. Follow park guidance in the event that tags must be faced away from a trail for example. When tagging a tree, place the nail just below breast height, so that diameter measurements are taken just above the nail. A height gauge provides for consistent placement of the tree tags. If the start side of the tree is on the downhill side, measure tag placement from the uphill side. Insert the nail at a downward angle so that the tag slides forward, away from the tree. Be sure the nail is secure but leave as much nail as possible outside the tree. This increases the life of the tag before the tree grows over the nail and tag. Nails maybe eased outward using a claw hammer if needed. Measurements can then be recorded as in SOP 10-Measuring Midstory and Overstory Trees.

Collecting and Recording Site Data

When a site is initially established, the Site Establishment Data Sheet for Plant Community Monitoring is filled out by the field crew installing the site. The intent of the survey is to prompt the field crew to assist in characterizing the structure and composition of the site. Several of the questions are consistent with the National Vegetation Classification Standards (NVCS) (http://usnvc.org/data-standard/) and data from these sections will help us to fit survey areas into that classification system. Although several of the questions are somewhat subjective, the information provided can be of tremendous value when consistency and good judgment are practiced in the field. The site establishment data sheet is provided at the end of this SOP. Additional notes about the sites should also be noted on this datasheet, including information about disturbance regimes.

**Plant Community Site Establishment Data sheet (SOP 3)**

**Park Code:** \_\_\_\_\_\_\_\_\_\_ **Site number:** \_\_\_\_\_\_\_\_\_\_ **Management Unit:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Reference Frame**:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Establishment date**(mm/dd/yyyy):\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Established by:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Soil series / site selection information:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Azimuth of transects (**from 0 – 50 m) to nearest degree:\_\_\_\_\_\_\_\_\_\_\_\_°

**Monumenting (physical):** Describe form of permanent marking utilized: corners, witness trees \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Monumenting (Spatial):** Notes on GNSS unit used, difficulties.

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**Slope angle (%):** Enter the steepness of the slope surface. Sight slope angle at both transect Start and Finish, with slope reader standing on A line and second person standing on B line. Use clinometer and sighting poles for an accurate reading. If a second person is not available, take readings in a kneeling position to improve accuracy, sighting to the same height above the ground as your eye when taking each reading. Record each reading in percent **(not degrees)**, which is usually the right-hand column of numbers in the clinometer. It is important to remember that percent slope changes more quickly than degrees slope, e.g., 45 degrees slope = 100 percent slope.

**A-Line**:**\_\_\_\_\_\_\_\_\_\_% from start to finish**. **B-Line**:**\_\_\_\_\_\_\_% from start to finish**.

**Slope aspect (deg):** Dominant aspect readings are taken at three points in the plot (beginning (Start), middle (Center) and end (Finish)) of transect A. The B-line is placed downhill of the A-line, thus measurements are taken to find the slope from the A-line to the B-line. Slope aspect can be obtained by determining the main direction that water would flow from the observed point. Measure to the nearest degree.

**Start:0m\_\_\_\_\_\_\_\_° , 25m\_\_\_\_\_\_\_\_°, Finish:50m\_\_\_\_\_\_\_\_\_°.**

**Topographic position:** Define the overall topographic position of the site using the provided NVCS category and definitions. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Topographic categories include:

* **Level** – no slope
* **Lower-slope** – gently inclined surface at the base of a slope, commonly gentle and almost linear in surface profile
* **Mid-slope** – intermediate slope position
* **Upper-slope** (high slope, shoulder slope) – the uppermost inclined surface at the top of a slope, typically convex in profile
* **Crest** (interfluve, summit, ridge) – linear top of a ridge, hill or mountain; the elevated area between two drainage-ways that sheds water
* **Ledge** (terrace) – nearly level shelf interrupting a steep slope or cliff face
* **Depression** – bottom surface of a basin
* **Streambed** – bed of single or braided watercourse, typically barren and formed of modern alluvium

**Hydrologic regime:** Define the overall hydrology of the site using the provided descriptive modifiers from NVCS. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hydrologic categories include:

* **Permanently flooded** – water covers the surface at all times of the year in all years
* **Semi-permanently flooded** – surface water persists throughout the growing season in most years; land surface is generally saturated when the water level drops below the surface
* **Seasonally/temporarily flooded** – surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years; the water table is normally very variable
* **Intermittently flooded** – surface water is present during times of increased precipitation, but generally dry
* **Seep** – intermittent, seasonal, or permanent flow of water from a subterranean source that is generally confined to a relatively discrete area
* **Upland** – the site cannot be characterized as a wetland as it either sheds or absorbs water quickly; the water table is almost always well below the soil surface

**Surface water:** This is the distance to standing water, circle one: **(1) in plot; (2) <50 m away; and (3) >50 m away**.

**Vegetation type:** Circle all that apply:

1. Moisture: Mesic/Xeric/Riparian corridor
2. Nativity (dominant): Native remnant/Restored/highly disturbed/nonnative
3. Woodland
4. Prairie
5. Glade (goat prairie)
6. Upland
7. Bottomland
8. Forest
9. Other\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Disturbance**, circle those that apply:

1. Road/trail
2. Grazing: herbivore \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Wallow: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Fire: Prescribed\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Wildfire \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Tree removal: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Natural phenomenon: windthrow, debris flow, rockslide, flooding
7. Animal excavation: (burrow, bed, trails)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Insect damage: tree defoliation by insects
9. Mowed/hayed
10. Erosion
11. Herbicide
12. Other\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Vegetation Types Aides

1. **Moisture**: Mesic (deep soils, soils visibly hold moisture)/Xeric (dry soils characterized by thin soil, rocky or sandy soil)/Riparian corridor (evidence of water flow via a stream bed within 50 m):
2. **Nativity** (dominant): Native remnant (original community unplowed or not replanted)/Restored (reconstructed via planting or other agricultural techniques)/highly disturbed (evidence of being cutover, intense soil disturbance, etc.)/nonnative (nonnative plants dominate the locations).
3. **Woodland** (mid- or overstory tree canopy >30%)
4. **Prairie** (herbaceous dominated with grassland plants)
5. **Glade** (goat prairie) (thinly soiled, trees may be present, both grassland and woodland plants are present and endemic species)
6. **Upland** (topographically uphill or on the upper elevations)
7. **Bottomland** (lower elevation, often associated with riparian areas).
8. **Woodland/Forest** (tree canopy >30%)

**Disturbance**, aides

1. **Road/trails**: Dirt or paved road, two track, footpath
2. **Grazing**: recently grazed vegetation, (evidence: animals present, dung, stems shredded or cut)
3. **Wallow or lick**: patch of bare ground, often indented where animal spent time resting/licking soil to get minerals.
4. **Fire**: prescribed--planned ignition (evidence: fire scars, scorch marks, lack of expected litter, ash present) Wildfire**--**unplanned ignition (evidence: fire scars, scorch marks, lack of expected litter, ash present)
5. **Tree Removal**: (Evidence: historical logging, removal of large trees, old stumps remain, or recent stumps and piles of sawdust and chips for more recent removal, masticated material).
6. **Natural phenomenon**: tornado, straight line winds, other storm, flooding, rockslide (evidence: broken treetops, overland flow of water or debris piles, piles of rocks or mud, flattened vegetation).
7. **Animal excavation:** (evidence: burrow, beds, holes, trails, tracks, pile of loose soil).
8. **Insect damage**: tree mortality or defoliation by insects.
9. **Mowing/haying** (evidence: vegetation of low uniform height, bales present)
10. **Erosion:** Substantial soil loss/movement caused by factors not described above.
11. **Herbicide** (evidence: blue dye on plants, yellowing or deformed plants)

12 **Other**: (examples, planting, agricultural type activity)