Field Instructions for Vegetative Data and Soil Sample Collection

USDA NRCS established the Soil Carbon Monitoring Network (SCMN) to support the implementation of Sec. 21002(a)(2) of the Inflation Reduction Act (IRA) Pub. L. 117-169, § 21002, 136 Stat. 2018 (2022).

The goal of the SCMN is to collect field-based data to assess and track trends related to soil carbon sequestration associated with conservation programs and management practices on working croplands and grazing lands across the country.

This protocol is one in a series that outlines the NRCS approach for the SCMN. The protocols will be updated as needed.

Vegetation Information Overview

Sampling design for vegetation and biomass will vary based on the land use at the site and if the sampling point is at a Triangle (Natural Resource Inventory (NRI)) or a Cluster sample point. See the appropriate sections below for more detailed information.

Vegetation Information Collected

- Herbaceous data via line-point intercept (LPI) transects
  - Cropland: cover only (i.e., hits at ground level)
    - Bare soil
    - Live plant base or stem
    - Rock fragment
    - Mulch: herbaceous, wood, dung, or nonorganic mulch
  - Grazing land, rangeland, agroforestry systems
    - Height of vegetation in a 30.5-cm (12-in) circular zone tangent to each 0.9-m (3-ft) interval measurement point (excluding trees)
    - Canopy hits (up to six total) at each 0.9-m (3-ft) measurement point, by species: shrubs; tree seedlings; herbaceous plants (overstory trees excluded); herbaceous, woody, and nonorganic litter (dung is considered herbaceous litter); and fungi.
    - Basal layer hits: bare soil, live plant base (species recorded), rock fragments, bedrock, lichens, and moss; note: herbaceous and other litter is not counted as a basal hit
- Downed woody debris
  - Percent slope of transect or sampling plane from the cluster center toward the end of the transect using a clinometer
  - Number of twigs that cross the sampling plane (sampling plane length shown in brackets) by the following, specific size-class categories
    - 0 to 0.61 cm (0 to 0.24 in) (0 to 1.83 m (0 to 6 ft) along the sampling plane)
    - 0.64 cm to 2.51 cm (0.25 to 0.99 in) (0 to 3.66 m (0 to 12 ft) along the sampling plane)
    - 2.54 cm to 7.59 cm (1 in to 2.99 in) (the entire sampling plane from 0 to 10.67 m (0 to 35 ft))
    - 7.62 cm (3 in) or more in diameter (the entire sampling plane from 0 to 10.67 m (0 to 35 ft)); for each log or particle 7.62 cm (3 in) or larger in diameter

        - Record the approximate diameter of the log
        - Classify as sound or rotten
    - Dead fuel depth in three 30.48-cm (1-ft) portions along each transect; dead fuel depth is the highest point a dead particle of woody material passes through the vertical sampling plane across a 30.48-cm (1-ft) length of the plane as marked on the ground by the transect
        - Height to highest intersecting dead particle between 60.96 to 91.44 cm (2 to 3 ft) of the sampling plane
        - Height to highest intersecting dead particle between 91.44 to 121.92 cm (3 to 4 ft) of the sampling plane
        - Height to highest intersecting dead particle between 121.92 to 152.4 cm (4 to 5 ft) of the sampling plane
    - Vertical duff (decomposed and partially decomposed plant material) depth to the nearest 0.25 cm (0.1 in) at two points along each transect
        - 30.48 cm (1 ft) from the start of the transect
        - 1.83 m (6 ft) from the start of the transect
- Shrub and tree data via fixed radius plots
    - 5 m (16.4 ft) radius from center
        - Low shrubs: 5-m (16.4-ft) radius survey area; species and total stems per individual shrub.
        - Tall shrubs: 5-m (16.4-ft) radius survey area (min height: 1.4 m (4.5 ft)); species, height of tallest stem per shrub, canopy max width, canopy width perpendicular max, diameter class of largest stem per shrub at 10.2-cm (4 in) above ground, and total stems per shrub
        - Tree Saplings: 5-m (16.4-ft) radius survey area; total count by species, representative average height, and diameter by species
    - 10-m (32.8 ft) radius from center
        - Shrub Thickets: 10-m (32.8 ft) radius survey area; list of species comprising the thicket, representative height, representative stem diameter, and completed grid shading map of thicket coverage within survey area
        - Trees: 10-m (32.8-ft) radius survey area (minimum stem diameter is 7.62 cm (3 in)); species, height, canopy base height, canopy shape, canopy max width, canopy width perpendicular max, and stem diameter at 1.4-m (4.5-ft) height; note: if there is a 10-degree or greater lean for a tree, then the lean distance (distance from stem to the point directly below the tip of the tree) is also measured

Soil Sampling Overview

To meet the needs of both the modeling for the Inventory of U.S. Greenhouse Gas Emissions and Sinks (i.e., National Resource Inventory (NRI)) and to accommodate measurements of soil variability within a site, two sampling methods are employed. The first, referred to here as "Clusters," is used to establish within-site variability through distributed sampling in small clusters. These clusters are comprised of a central, deeper pedon of 100 cm (3.3 ft) and three equidistant satellite samples collected at a shallower depth (30 cm (approximately 1 ft)). At established NRI locations where data for the national inventory was previously collected, a repetition of the national inventory style sampling arrangement is used. This sampling style is referred to here as the "Triangle." The triangle is made up of an equilateral triangle with 18-m (59.1-ft) sides and 75-cm (29.5-in) deep core samples spaced 6 m (19.7 ft) apart. These samples are categorized into three subtriangles based at each point of the main triangle. The SCMN team collects the samples using a prescribed method in the following order: pneumatic probe, slide hammer, or excavation. Although not described here, a compliant cavity is also an accepted method when all other methods are exhausted.

Soil Samples Collected

- Clusters
  - One 100-cm (39.4-in) description core
  - One 100-cm (39.4-in) center pedon, divided by genetic horizons based on description core
  - Three 30-cm (11.8-in) satellite samples, divided into 0–10-, 10–20-, and 20–30-cm (0-3.9-, 3.9-7.9-, and 7.9-11.8-in, respectively) depths, then composited
- Triangle
  - Nine 75-cm (29.5-in) pedons
    - Divided into groups of three based on proximity to end points
    - Pedons divided into depth increments and then composited by depth within each of the three subgroupings; 0–10, 10–20, 20–30, 30–50, and 50–75 cm (0–3.9, 3.9–7.9, 7.9–11.8, 11.8–19.7, and 19.7–29.5 in, respectively)

The detailed instructions to complete sampling for each site are below.

Site Setup and Layout

Overview

Site setup includes both soil sample and vegetative layout. Soil sample layout must come first as it forms the basis for the vegetative data collection.

The SCMN team will use two tablets per sample site for data collection. One tablet will be used to set up site data and collect vegetation and biomass data; the other will be used to collect soil and soil sample data.

The SCMN team uses ArcGIS Survey123 to collect and manage soil carbon and vegetation data during field sampling. Field crews have two surveys available for use.

- SCMN Field Data Form v1.51, which contains all data fields that the field crew is required to collect
- SCMN Field Veg Data Form v1.6, which is a subset of vegetation-related questions

Data from these forms goes to the same data infrastructure and can be used simultaneously to record data at a site, speeding the data collection process.

To access either Survey123 form, you must be a member of the SCMN Regional POCs group on the States Portal.

If you have questions, or requests need to be added to the group, contact Dietrich Epp Schmidt at dietrich.eppschmidt@usda.gov.

Materials

- Cluster layout tool
- 811 and cultural resource clearance papers
- Map and aerial photos
- Photo releases (where necessary)
- Compass
- Flags (three colors; 1-m (3-ft) tall)
- GPS unit and extra batteries
- Tripod and magnetic case for tablet
- Tablet and extra charge packs
- Measuring tape reels (three; a minimum of 45.7 m (150 ft) each

Before Departing

Preload this information onto tablet prior to departing for the field as part of the tablet setup (see separate document on tablet setup and Survey123 setup).

- Aerial imagery
- Sample points overlaid on field maps
- Contact information for the landowner with confirmations of dates and times that sampling will occur
- GPS location to navigate to site

Procedure for Setting Up Trimble GPS Unit

1. Set up Trimble GPS unit (refer to video 2).
2. Install quick-connect and Trimble GPS head unit to the top of the survey pole; screw antenna to bottom of Trimble unit.
   a. Press and hold power button on Trimble GPS until lights come on.
   b. Extend survey pole to 1.8 m (5.9 ft) and attach pin to hold in place.
3. Connect tablet to Trimble GPS (refer to video 3).
   a. Select settings, Bluetooth, and the serial number of the Trimble unit you want to connect to.
   b. Select "Mobile Manager" and then select "Reconnect."
   c. Check configuration by going to the home screen and selecting "Skyplot" and "Configuration"; ensure configuration settings are set to the following:
      1) GNSS correction source: Auto
      2) GNSS output: NAD83(2011) (EPOCH:2017 S)
      3) Geoid: Geoid18 (CONUS)
      4) Antenna height: 1.8 meters (5.9 feet)
      5) Antenna type: R12i internal
      6) Measurement method: Bottom of antenna mount
4. Test that Bluetooth is connected to Trimble GPS by opening Google Maps and standing still with tablet while a person holding the Trimble moves away from you. The location dot should move with the Trimble GPS, not the tablet.

5. Proceed to each location using the tablet and GPS (refer to video 4).
   a. Select ArcGIS FieldMaps App.
   b. Select compass arrow in top-right corner.
   c. Select point that you want to navigate to.
   d. Select navigation tool; follow directions to point location.
6. Record each location in the “Core Location” box of Survey123 and set indicator flags.
   a. For a Cluster, flag the center pedon with a white flag numbered with the appropriate Cluster number.
   b. For a Triangle, flag the center point with a tall, orange flag.

Layout—Cluster Soil Sampling

1. Begin at the previously flagged center pedon flag.
2. Use the cluster layout tool to flag the satellite points (fig. 1).

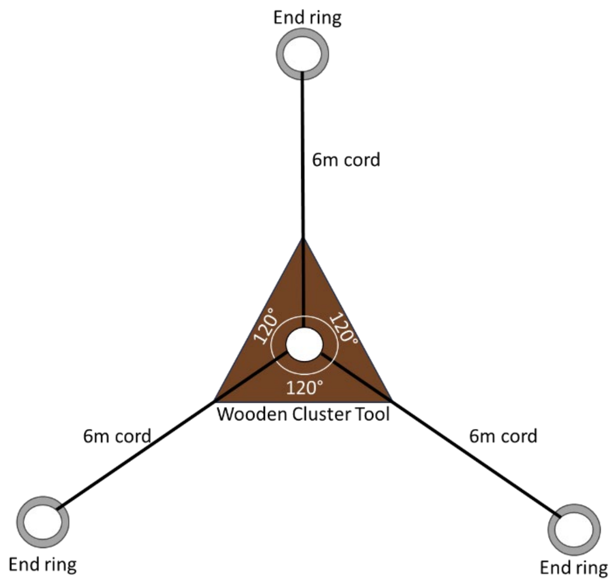

Figure 1.—Cluster layout tool consists of a wooden triangle with a hole in the center, 6-m (19.7-ft) cords fixed at 120-degree angles, and washers tied to the ends of the cords to weigh down the cords.

   a. Set the hole of the cluster layout tool over the flag for the center pedon.
   b. Walk in a random direction, holding the cord loosely.
      1) Walk until the cord is taught; place the ring on the ground.
      2) Place a flag at the end in front of the end ring.
   c. Return to the center pedon to collect the next cord.
   d. Align the cord with the indicator lines on the wooden triangle and walk in that direction, holding the cord loosely.
      1) Walk until the cord is taught; place the ring on the ground.
      2) Place the next flag at the end of the cord in front of the end ring.
   e. Repeat steps c and d for the final cord (fig. 2).

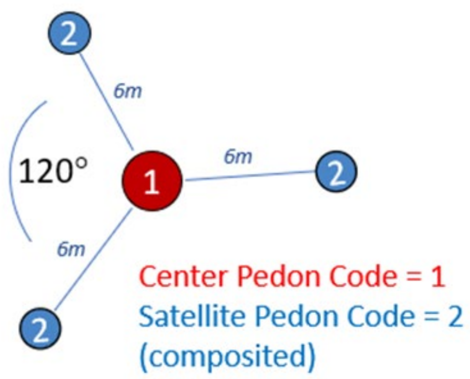

Figure 2.—Clusters are made up of a central pedon (1) and three equidistant (6-m (19.7-ft)) satellite samples (2) that are 120 degrees apart.

Layout—Triangle Soil Sampling

If collecting a triangle, set flags at nine sample points surrounding the center point to create a sampling layout that creates an equilateral triangle oriented to magnetic north with 18 m (59.1 ft) sides and smaller sub-triangles at each corner with 6 m (19.7 ft) sides. Note: Do not collect samples at the center point of NRI Triangles (fig. 3).

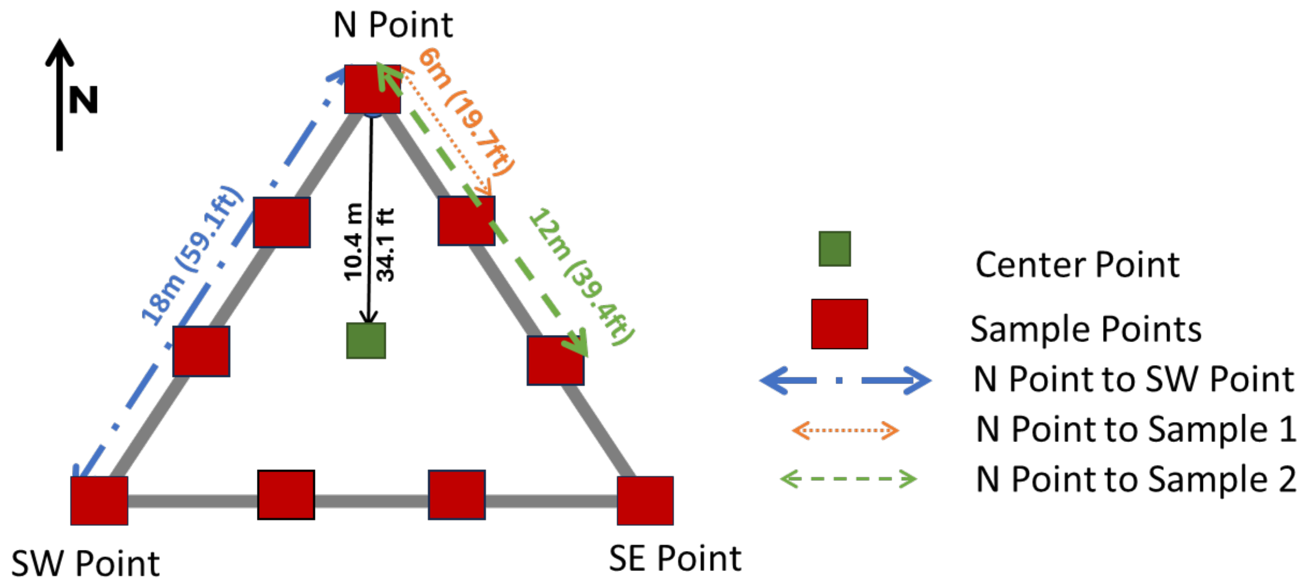

Figure 3.—Triangle layout for soil sampling is oriented to magnetic north. The center point (star) is not sampled; it is meant only as a geospatial marker. The sample points (circles) are arranged 6 m (19.7 ft) apart, arranged on an equilateral triangle. The distance from the center point to the three furthest points is 10.4 m (34.1 ft). The distance from point to point is 18 m (59.1 ft) (blue multi-size dashed line).

1. Beginning at the center point established using the Trimble GPS, walk due north 10.4 m (34.1 ft); place a flag (take an additional tape measure).
2. From this north point, walk southeast 18 m (59.1 ft).

   a. Adjust position until the southeast point is both 18 m (59.1 ft) from the north point and 10.4 m (34.1 ft) from the center point.
   b. Ideally, this step would be completed with three people—one person standing at the center point, one at the north point, and one adjusting and placing the southeast point.
3. Place a flag at 6 m (19.7 ft) and 12 m (39.4 ft) along the tape from the north to southeast points.
4. Repeat steps 2 and 3 for the southwest point.
5. Walking a tape from the southwest point to the southeast point, ensure that the distance between the two is also 18 m (or 59.1 ft).
6. Place a flag at 6 m (19.7 ft) and 12 m (39.4 ft) along the tape stretching from the southwest to southeast points.

Photo List

Photographs are required as part of the setup process. The user should follow the prompts in the Survey123 app. The required photos include the following:

- Triangle: north from center point
- Triangle: west from center point
- Triangle: east from center point
- Triangle: south from center point
- Site: site photo
- Distributed Cluster: transect and cover (one each)
- Upon completion of soil sample collection, a photo of all soil sample bags arranged by Cluster ID and Layer ID.

Line-Point-Intercept (LPI) Transects

Intro

Direct measurement of perennial biomass requires collection in the field and processing and analysis of the perennial plant material in a lab setting, effectively destroying it. This is often not possible in working lands where many plants are an agricultural crop and property of landowners on whose land they are being sampled (e.g., an apple tree). To determine perennial biomass at SCMN sites, use mathematical relationships between nondestructive measurements of plants and their size and mass to estimate perennial biomass. The methods to estimate perennial biomass will vary by vegetation type as addressed below. Collect vegetative data immediately after laying out the site and before soil sampling.

Line Transect for Herbaceous and Shrub Composition, Cover and Height

This method is adapted from chapter 9 of the “National Resources Inventory Grazing Land On-Site Data Collection: Handbook of Instructions” (NRCS, 2024). The purpose of this method is to gather information on herbaceous and shrub vegetation maximum heights and cover of plants, bare soil, and litter for the sample area (fig. 4). This method is not suited to document plant species diversity or for direct measurement of annual plant biomass.

Hypothetical site map showing a 10-acre site is broken up into three strata with two clusters randomly assigned within each strata.

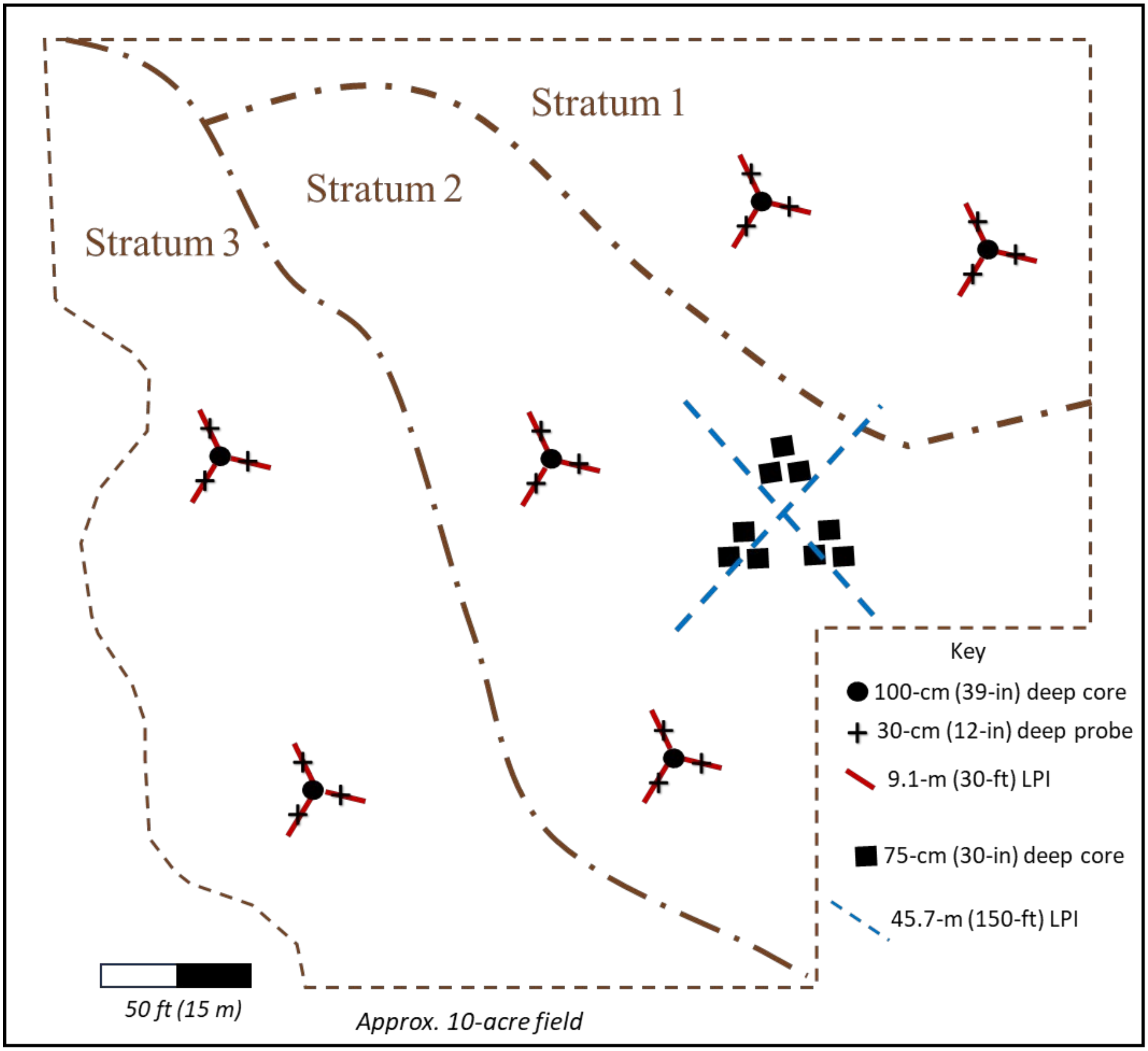

Figure 4.—Hypothetical site map with indicated LPI method adapted from the "National Resources Inventory Grazing Land On-Site Data Collection: Handbook of Instructions." Three 9.1-m (30-ft) transects are used at each cluster, running from the center pedon to just beyond the satellite points. Two 45.7-m (150-ft) transects overlay the triangle, running northwest to southeast and southwest to northeast so that the intersection at the center of the two lines is the center point.

Transect ID: Site ID — Cluster ID — Transect ID

- Site ID: inherited
- Cluster ID: inherited
- Transect ID: 1–3
  - Cluster: (1–3) assigned center point to satellite of cluster
  - Triangle: (1) northwest to southeast, (2) southwest to northeast

Materials

- Tablet with ArcGis Survey123 app
- 9.1-m (30-ft) pre-knotted cord at 91.4 cm (3-ft) intervals
- 10.7-m (35-ft) measuring tape (if pre-knotted cord not available)
- Survey pin or similar tall, thin indicator
- Printed transect datasheets
- Pen
- Scrap paper or small notebook
- Tent peg
- 45.7-m (150-ft) preknotted cord or measuring tape

Procedure—Clusters

1. Transect data should be collected by a minimum of two people.
   a. An observer walks the transect line and calls the hit observations.
   b. A recorder records the observation hits called out by the observer. If a tablet is available, this information should be recorded directly into Survey123; otherwise, use the paper forms (SCMN_VegFieldForms_Nov2024.xlsx).
2. For the area within 9.1 m (30 ft) of the center pedon but outside of the transect lines, record a list of the ten most common plants on a sheet of paper along with the PLANTS database ID. Note: IDs from PLANTS can be looked up at https://plants.usda.gov/ using the scientific or common name. This speeds up the entry process as the most common observations are already looked up.
3. For each Cluster, ready three 9.1-m (30-ft) transect lines with 91.4-cm (3-ft) interval marker knots anchored at the soil core. If pre-knotted lines are not available, measuring tapes are acceptable—though this may slow down layout efforts.
4. Anchor the start of the transect line or measuring tape at the center pedon of the cluster using a tent peg. Walk each transect line in the direction of a satellite point, passing through satellite point.
   a. Anchor the transect line at its end beyond the satellite point (9.1 m (30 ft) if using a tape).
   b. While running out transect tapes, hold the tape in your left hand and walk along the right side of the transect line to prevent disturbing the left side of the line, which will be sampled.
5. Extend the LPI transect an additional 152.4 cm (5 ft) and mark with a white flag; this will function as the end marker for downed woody material (fig. 5).

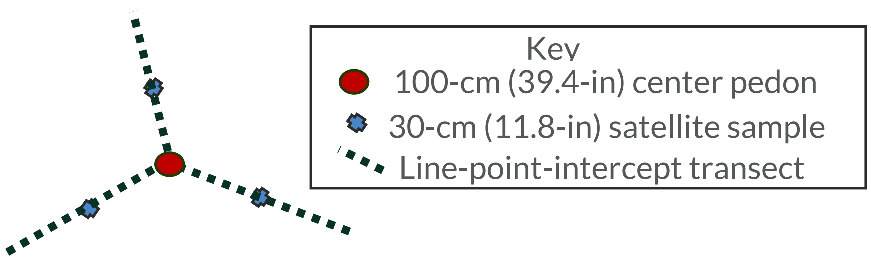

Figure 5.—Layout of the Cluster LPI. Achor three 9.1-m (30-ft) transects at the center pedon and extended beyond the satellite points to align trajectory.

6. Return to the center pedon and select any transect.
   a. Standing on the right side of the transect and facing toward the satellite, the observer will walk toward the satellite, stopping at each interval.
   b. Interval marks should be 0.9, 1.8, 2.7, 3.7, 4.6, 5.5, 6.4, 7.3, 8.2, and 9.1 m (3, 6, 9, 12, 15, 18, 21, 24, 27, and 30 ft, respectively).
7. At each interval, the observer holds the survey pin lightly in one hand, hovers it over the left side of the transect line, and drops it to the ground near the interval marker.
8. The observer calls out all canopy hits where plants touch the pin starting from the topmost canopy layer and moving downward towards the soil surface. Up to six canopy layers may be recorded in addition to the basal layer (fig. 6).

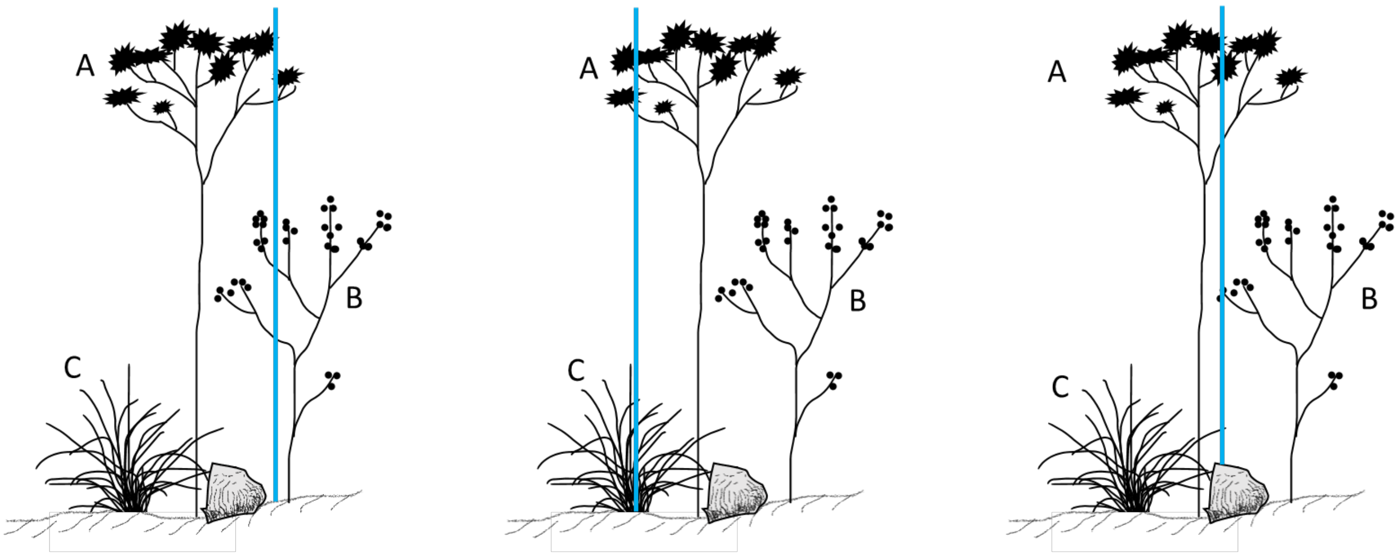

Figure 6.—Example of survey pin indicating hits of LPI. The left would record plant A, plant B, and a bare soil basal hit. The middle would record plant A, plant C, and a Plant C base basal hit. The right would record plant A, plant B, plant C, and a rock basal hit.

9. The recorder records what the observer calls out
   a. Canopy hit possibilities for cropland sites include
      1) Live plant base or stem (PLANTS ID and height not specified)
      2) Herbaceous, woody, or nonorganic mulch
   b. Canopy hit possibilities (canopy layers 1–6) for all other sites include
      1) Plant—record PLANTS database ID and height of first canopy layer if the pin intersects a stem or leaf or other attached plant part as it is lowered at the point.
         a) Record each species only once at its topmost canopy layer.
         b) Do not record additional hits of the same species in subsequent canopy layers except for the basal layer, which will be the base of a species previously recorded in a higher canopy layer.
      2) Litter—record herbaceous, woody, or nonvegetative litter.
         a) Herbaceous and woody plant litter is plant litter that is no longer attached to a rooted plant. Record dung as herbaceous litter.

b) Woody plant litter is all woody or succulent material larger than 0.64-cm (0.25-in) diameter.
c) Nonvegetative litter is artificial material used in agriculture, such as plastic mulch.

3) Fungi—record fungi, such as mushrooms.
4) None—record if no hits above the basal hit.

c. Upon reaching the soil surface, for all sites, the basal hit possibilities include
   1) Bare soil
   2) Plant—living or dead base of a plant where it emerges from a substrate such as duff, rock, or soil
   3) Duff or embedded litter—decomposed or partially decomposed plant material, often beneath a layer of litter
   4) Lichen
   5) Moss
   6) Biological crust
   7) Rock fragments—loose or embedded rocks that are not part of and are more than 0.64 cm (0.25 in) in diameter; record smaller rock fragments as soil
   8) Bedrock or lava flow—continuous, connected rock layer
   9) Unidentified plants—at any point, should a plant be unidentifiable, take a photo for later identification and record a unique code
      a) The unique code should be used consistently for data collection until the plant is identified.
      b) It should not be confused with the code or symbol of an existing plant in the PLANTS database (e.g., use "UNKN1, UNKN2, etc."; UNKN is not a plant code currently used for any species in the PLANTS database).
      c) Tag photos or name photo files with the unique plant code given to the unknown species.

10. Continuing to travel on the right side of the transect line, repeat step 7 and 8 for each interval.
11. Repeat for each of the three 9.1-m (30-ft) transect lines.

Procedure—Triangle.

1. Ready two 45.7-m (150-ft) transect lines with 0.91-m (3-ft) intervals.
2. Beginning from the reference point at the center of the triangle and facing north, turn 315 degrees northwest and walk 22.9 m (75 ft).
3. Place one end of the 45.7-m (150-ft) transect here and anchor with a peg.
4. Walk the transect 165 degrees southeast, passing over the reference point of the triangle until you reach 45.7 m (150 ft).
5. Anchor the other end of the transect here so that the 22.9-m (75-ft) marker on the tape is over the reference center point for the triangle (fig. 7).

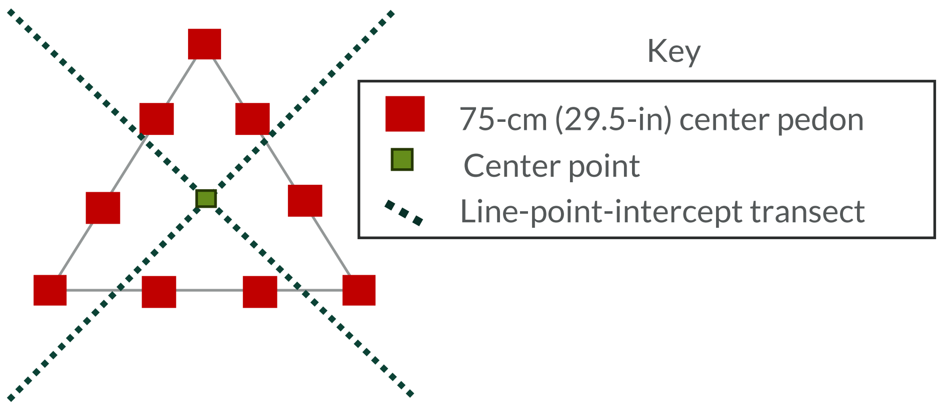

Figure 7.—Layout of the triangle LPI transects that are oriented northwest to southeast and southwest to northeast, overlapping at the 26th interval located over the top of the center point.

6. Return to the reference point and face 45 degrees northeast and walk 22.9 m (75 ft) in that direction.
7. Anchor one end of the transect there.
8. Turn 225 degrees southwest and walk the transect in that direction, passing through the triangle reference point, to 45.7 total meters (150 total feet).
9. Anchor the other end of the transect here so that the 22.9-m (75-ft) marker on the tape is over the reference center point for the triangle.
10. While running out tapes, walk only on the south side of the transect lines so you don't disturb the north side, which will be sampled.
11. Beginning at 0 m (0 ft), take observations at 51 points along each of the two 45.7-m (150-ft) transects (102 total point observations).
    a. Always take observations while standing on the south side of either transect.
    b. Readings are made by dropping the pin on the north side of either transect; this leaves the north side of each transect undisturbed during readings.
    c. The 26th observation at the 22.9-m (75-ft) marker is identical for the two transects since this is their intersection point; record the observation at this point for each transect.
12. Follow the same observation and recording steps used in the cluster LPI hits.
    a. All other procedures follow those given above for LPI data collection in Clusters.
    b. Only the transect length, number of observations, and starting points are different for the Triangle LPI.

Downed Woody Material in Agroforestry Settings

A plant identification expert will measure downed woody debris at each Cluster and at Triangle plot centers in silvopasture, forest farming, or riparian forest buffer fields. Follow this protocol prior to soil sampling at each Cluster or Triangle plot to avoid disruption of woody debris. For each cluster point, establish three 10.7 m (35-ft) sampling transects running through each satellite by pinning a tape at the cluster pedon center and anchoring beyond each satellite to the required length for a total of three transects at each cluster pedon. For Triangle sample layouts, establish 10.7-m (35-ft) transects from the center of the triangle running toward each point of the larger triangle for three total transects.

For these sampling purposes, downed woody material overlap from the LPI transects an additional 1.5 m (5 ft). Use each transect line as the basis for a vertical sampling plane.

1. Record slope (percent) of transect or sampling plane from the Cluster center toward the end of the transect using a clinometer.
2. Record number of twigs that cross the sampling plane (sampling plane length shown in parentheses) by specific size-class categories.
   a. 0 to 0.61 cm (0 to 0.24 in) (0 to 1.83 m (0 to 6 ft) along the sampling plane)
   b. 0.64 to 2.51 cm (0.25–0.99 in) (0 to 1.83 m (0 to 6 ft) along the sampling plane)
   c. 2.54 to 7.59 cm (1.0–2.99 in) (the entire sampling plane from 0 to 3.66 m (0 to 12 ft))
   d. 7.62 cm (3 in) or more in diameter (the entire sampling plane from 0 to 10.67 m (0 to 35 ft)); for each log or particle 7.62 cm (3 in) or larger in diameter
      1) Measure the approximate diameter of the log.
      2) Classify as sound (not soft or lacking significant decomposition) or rotten (soft or significantly decomposed) (fig. 8).

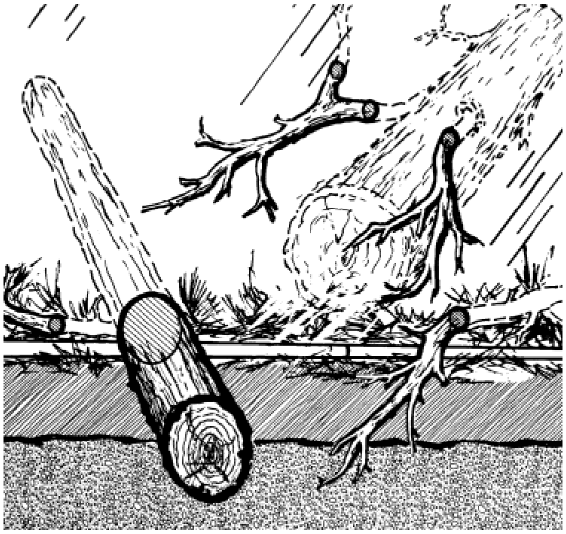

Figure 8.—Demonstration of vertical plane used to assess downed woody material transect.

3. Record dead fuel depth in three, 30.5-cm (1-ft) portions along each transect; dead fuel depth is the highest point a dead particle of woody material passes through the vertical sampling plane across a 30.5-cm (1-ft) length of the plane as marked on the ground by the transect.
   a. Height to highest intersecting dead particle between 60.96 to 91.44 cm (2 to 3 ft) of the sampling plane
   b. Height to highest intersecting dead particle between 91.44 to 121.92 cm (3 to 4 ft) of the sampling plane
   c. Height to highest intersecting dead particle between 121.92 to 152.4 cm (4 to 5 ft) of the sampling plane
4. Vertical duff (decomposed and partially decomposed plant material) depth to the nearest 0.25 cm (0.1 in) at two points along each transect.
   a. 30.5 cm (1 ft) from the start of the transect
   b. 1.8 m (6 ft) from the start of the transect

Refer to the “Handbook for Inventorying Downed Woody Material” (Brown, 1974) for more detailed information and diagrams that depict this method.

Fixed Radius Plots

Intro

The fixed radius plot design is adapted from the USDA NRCS “National Forestry Handbook,” Title 190, Part 636.21(c) (2004) and is a common sampling unit used in forestry. The purpose of measurements taken within plots is to record tree and shrub attributes, such as plant height, diameter, and crown size, which can be used to estimate the above- and belowground biomass of trees and shrubs from known or later-developed mathematical relationships.

Materials

- Metric measuring tapes; two over 10 m (32.8 ft)
- Tent stakes; five
- Clipboard, pen, and woody biomass datasheets
- Flags
- Telescoping pole
- Diameter tape
- Clinometer or Trupulse (height measure) calipers

Definitions

- Trees: stems with a diameter of 7.62 cm (3 in) or larger at breast height 1.4 m (4.5 ft); species has potential to reach at least 6.1 m (20 ft) in height
- Tree saplings: stems at least 1.4 m (4.5 ft) in height with a diameter less than 7.62 cm (3 in) at breast height 1.4 m (4.5 ft); species has potential to reach at least 6.1 m (20 ft) in height
- Tree seedlings: stems less than 1.4 m (4.5 ft) in height; species has potential to reach at least 6.1 m (20 ft) in height; note: this size class will not be measured
- Tall shrubs: nontree woody plants with a height of at least 1.4 m (4.5 ft) above ground; tall shrubs may be multistemmed if one of the stems arising from a common root crown meets this criterion
- Low shrubs: nontree woody plants with stems that do not reach 1.4 m (4.5 ft) height; multistemmed shrubs are low shrubs if all stems of the plant are less than 1.4 m (4.5 ft) in height
- Multistemmed: a woody tree or shrub with stems arising from the same root collar; note: species with stems arising from lateral roots or that form clonal patches do not fit this definition (see thicket)
- Shrub thicket: shrubs that form areas of dense, continuous canopy cover arising from common rhizomes or lateral roots (e.g., blackberry, willow)

Procedure—Cluster and Triangle

1. Beginning at the center pedon for clusters or center point for the triangle, stretch a tape to the appropriate length of 5 m (16.4 ft).
2. Walk towards any satellite point.

3. Beginning at the satellite point, walk in a circle and flag any shrubs or tree saplings within that 5 m (16.4 ft) radius (fig. 9).

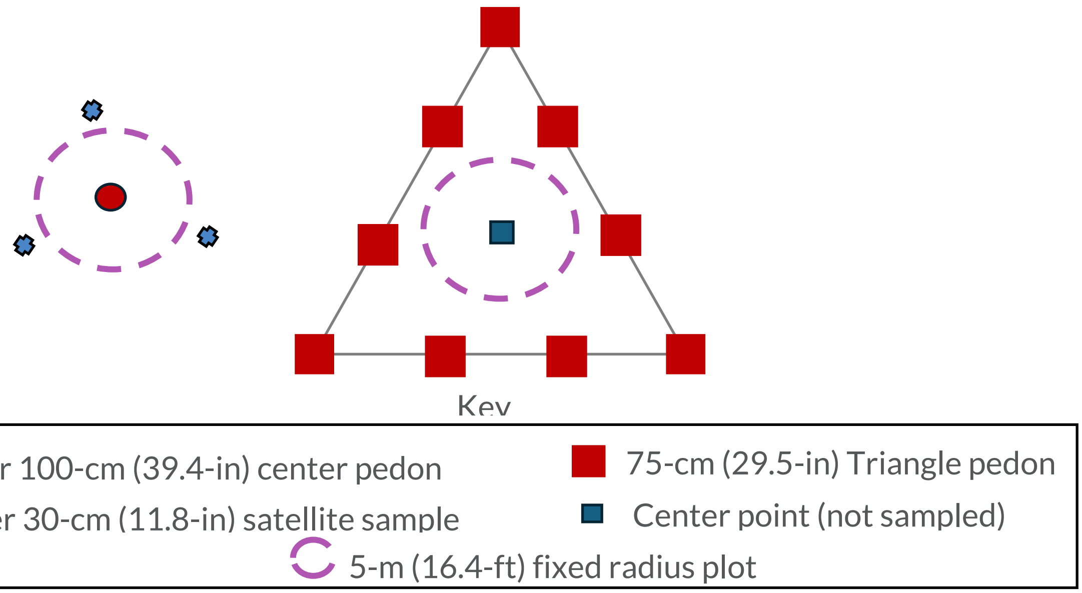

Figure 9.—Scale representation of the 5-m (16.4-ft) fixed radius plot layout for Triangle (left) and Clusters (right).

4. Do the following for low shrubs within the 5-m (16.4-ft) radius of the center pedon:
   a. Record the site and Cluster IDs for the appropriate woody biomass (Low Shrub Survey123 form).
   b. Beginning at the center pedon of each cluster or the central point of the triangle, insert a peg to center the survey area, tie to the peg, measure out 5 m (16.4 ft), and flag.
   c. Travelling clockwise, place a flag every two steps while rotating around the peg with the tape to create a 5-m (16.4-ft) radius survey boundary.
   d. For each individual low shrub, record the following:
      1) Unique identifying number
      3) Species
      4) The total number of stems (must be at least one but may be numerous for multi-stemmed plants) (fig. 10)

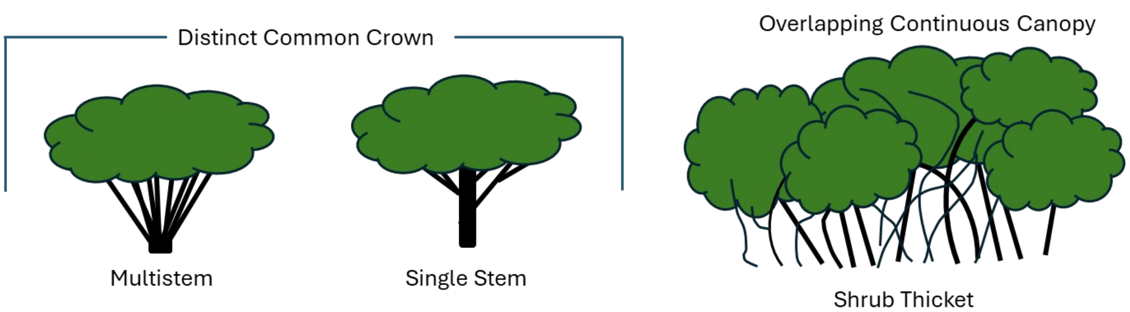

Figure 10.—Crown and stem arrangements in low shrubs. Shrubs may have a single, central stem or multiple stems.

5. Do the following for tall shrubs within the 5-m (16.4-ft) radius of the center pedon:
   a. Record the site and Cluster IDs for the appropriate woody biomass (Tall Shrub Survey123 form).
   b. Beginning at the center pedon of each cluster or the central point of the triangle, insert a peg to center the survey area, tie to the peg, measure out 5 m (16.4 ft,) and flag.
   c. Travelling clockwise, place a flag every 2 steps while rotating around the peg with the tape to create a 5 m (16.4 ft) radius survey boundary.
   d. For each individual tall shrub, record
      1) Unique identifying number
      2) Species
      3) Maximum height (height of the tallest stem)
      4) Diameter class of the largest stem at 10.16 cm (4 in) above ground; diameter classes are less than 2.54 cm, 2.54–7.59 cm, 7.60–12.67 cm, and 12.68 or more centimeters (less than 1 in, 1–2.99 in, 3–4.99 in, and 5 or more inches, respectively)
      5) The total number of stems (must be at least one but may be numerous for multi-stemmed plants)
      6) Crown spread measured standing over or on either side of the shrub and pulling tape to either edge of the shrub's canopy crown; crown spread considers the full crown spread across all stems in multi-stemmed plants (fig. 11)
         a) Spread: width of the widest point (crown spread 1)
         b) Secondary width perpendicular to the spread (crown spread 2)

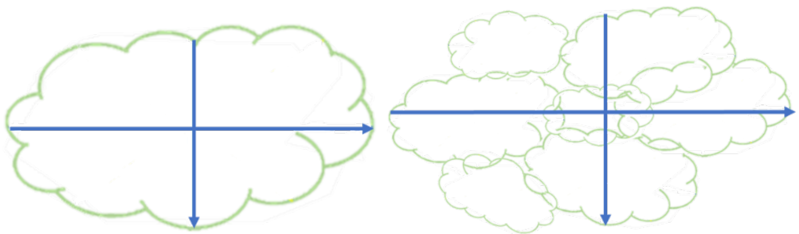

Figure 11.—Depiction of two measurements of crown spread. The crown may be connected to a single stem or many stems of a multi-stemmed plant.

6. Do the following for tree saplings within the 5-m (16.4-ft) radius of the center pedon:
   a. Record the site and Cluster IDs for the appropriate woody biomass (Tree Sapling Survey123 form).
   b. Beginning at the center pedon of each cluster or the central point of the triangle, insert a peg to center the survey area, tie to the peg, measure out 5 m (16.4 ft), and flag.
   c. Travelling clockwise, place a flag every 2 steps while rotating around the peg with the tape to create a 5-m (16.4-ft) radius survey boundary.
   d. For each species with saplings (trees less than 7.62 cm (3 in) DBH) present in the 5-m (16.4-ft) survey area, record
      1) Species
      2) Total count of saplings by species (see sapling definition above)
      3) Typical or representative sapling height for each species

7. Upon completing the 5-m (16.4-ft) circuit and returning to the starting satellite point, extend the tape to 10 m (32.8-ft) in line with the same satellite point.
8. Walk a circle using the 10-m (32.8-ft) tape as a radius and flag any trees and shrub thickets within the 10-m (32.8-ft) radius. The observer will need to weave as necessary to avoid getting tangled (fig. 12).

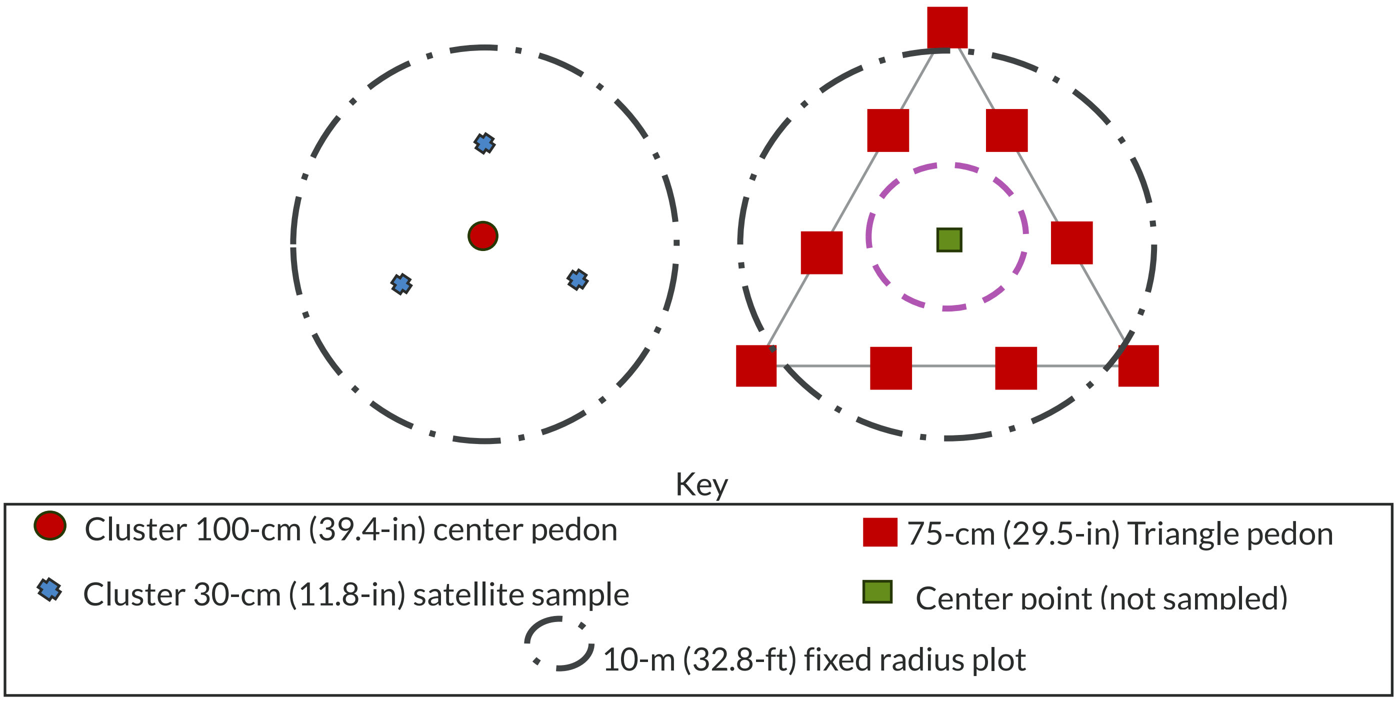

Figure 12.—Scale representation of the 10-m (32.8-ft) fixed radius plot layout for Clusters (left) and the Triangle (right)

9. Do the following for the shrub thickets within the 10-m (32.8-ft) radius of the center pedon:
   a. Record the site and Cluster IDs for the appropriate Woody Biomass: Shrub Thicket Survey123 form.
   b. Beginning at the center pedon of each Cluster or the central point of the Triangle, insert a peg to center the survey area; tied to the peg, measure out 10m (32.8ft) and flag. Travelling clockwise, place a flag every two steps while rotating around the peg with the tape to create a 10-m (32.8-ft) radius survey boundary.
   c. For each shrub thicket within the 10-m (32.8-ft) survey boundary, record
      1) Unique identifying number
      2) Species (list all woody species comprising the thicket)
      3) Representative or visual average height (typical height within the thicket) by species
      4) Representative or visual average diameter at 10.16 cm (4 in) above ground (typical diameter within the thicket) by species
   d. Shade in the area occupied by the thicket using the gridded shrub thicket cover form (fig. 13).

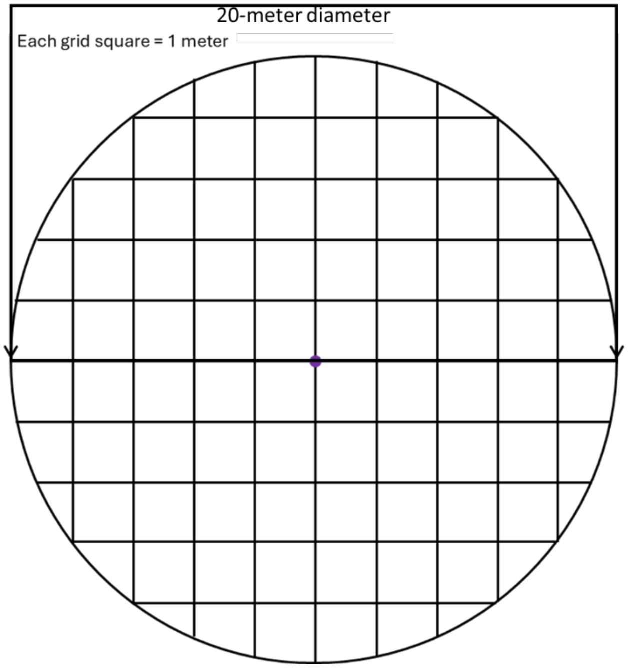

Figure 13.—20-m (65.6-ft) diameter (10-m (32.8-ft) radius) grid for estimating thicket coverage based on the number of 1-m squares covered.

10. Do the following for all trees within the 10-m (32.8-ft) radius of the center pedon:
    a. Record site and Cluster IDs for the appropriate woody biomass (Tree Survey123 form).
    b. Record the diameter (inches and tenths of inches) of the stem at breast height (1.4 m (4.5 ft) above ground level) using diameter tape. If there are multiple stems emerging from the same root, record each separately at breast height (1.4m (4.5 ft)) (fig. 14).

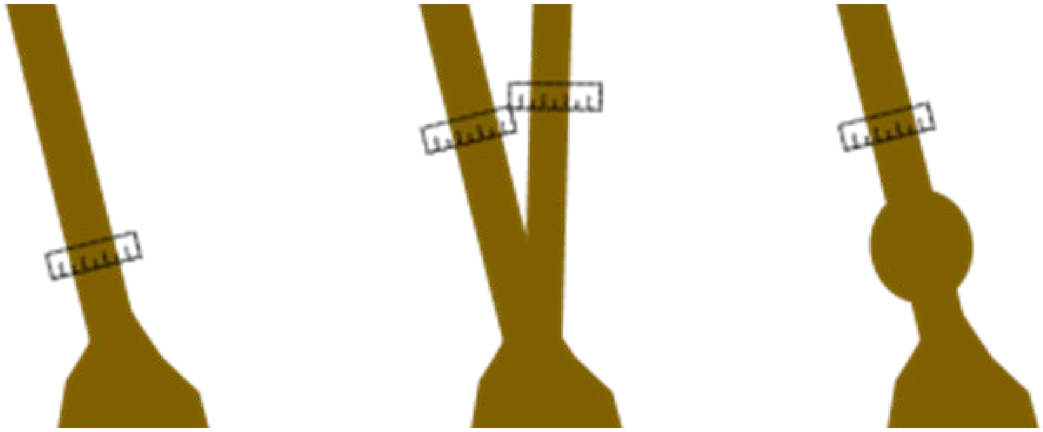

Figure 14.—Diameter at breast height measured at 1.4 m (4.5 ft) from surface (left), unless adjusted as described to accommodate splits (center), burls (right), or other trunk abnormalities.

    c. Record canopy crown base height (feet and tenths of feet) of the lower end of the tree's canopy or where the canopy of the tree begins. Ignore the isolated lower branches that are not continuous with the main canopy of the trees in making this determination (fig. 15).

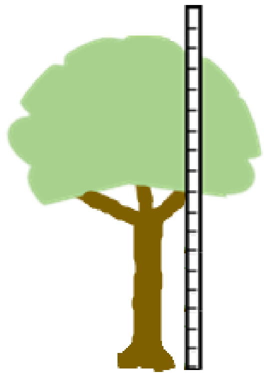

Figure 15.—Crown base height (arrow is the distance from the lowest part of the crown to the ground)

d. Record the tree height, which is the height (feet and tenths of feet) at the tallest point (fig. 16).

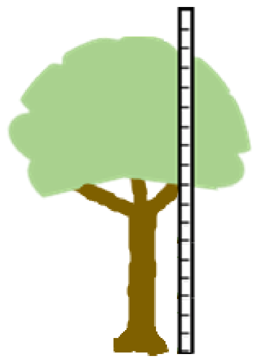

Figure 16.—Tree height (arrow) is the distance from the highest part of the crown to the ground.

e. Record the canopy shape. See figure 17 for a visual representation of possible shapes.

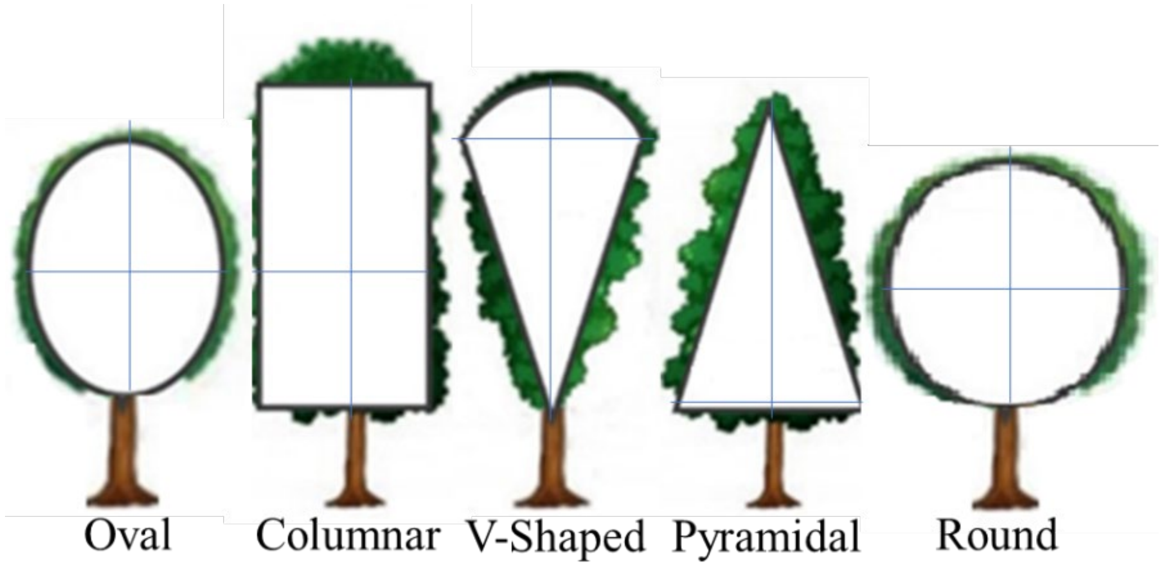

Figure 17.—Canopy shape description using basic geometric shapes to estimate overall crown form as described in Liu et al., 2021.

f. Record the crown spread as viewed from below. Conduct this measurement from directly beneath the tree using a vertical pole or other visual aid to mark the canopy edges of the tree at the ground level and thereafter pulling a tape between the two sets of points to read the canopy diameters in each direction (fig. 18).
   1) Canopy spread 1: width of the widest point
   2) Canopy spread 2: secondary width perpendicular to the spread

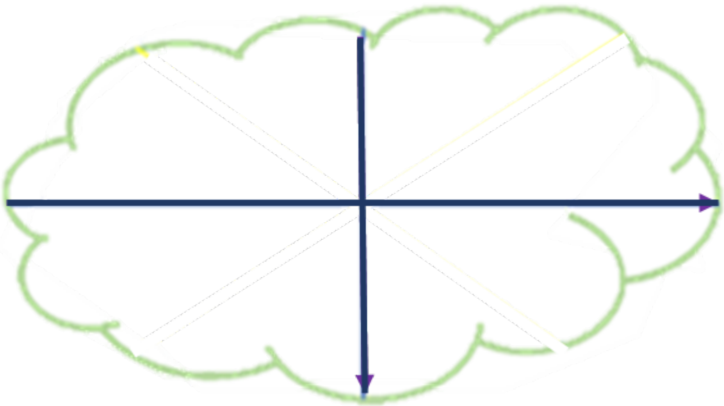

Figure 18.—Crown spread viewed from below.

g. Indicate whether there is significant lean to the main stem of the tree (a lean greater than 10 degrees); if yes, then measure the lean distance (the horizontal distance from the base of the tree stem to the point directly below the tip, or top, of the tree main stem (fig. 19).

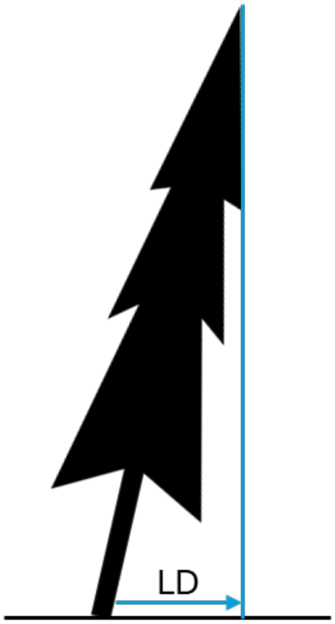

Figure 19.—Lean distance (LD) of a tree.

h. Provide notes in the notes field for abnormal or unique tree form or evidence of regular pruning, topping, or coppicing of stems or whether stem growth form is highly irregular or does not easily conform to crown shape classifications.
i. For dead standing trees (snags), record the same data as for live trees, if possible, but indicate in notes that the tree is dead. If the species cannot be determined, use a code for unknown (e.g., “UNKN1,” “UNKN2,”, etc.).

Soil Sampling

Introduction

The SMN team will use two sampling layouts to best meet the needs of both the methods for the NRI and to collect on-site variability. The first layout is a Triangle that follows the guidance of Colorado State University's (CSU's) soil carbon sampling strategy in which nine 75-cm (29.5-in) cores are collected within a tight geographic area to best limit heterogeneity within the site. The second uses multiple sampling points distributed across the site to best capture variability. This strategy requires the stratification of the site based on factors of interest before teams go to the site. Assign two clusters per strata for repeatability.

Sample ID

The sample ID is made up the event ID, site ID, Custer ID, Pedon ID, and the Layer Code in that order. It is written as Event ID — Site ID — Cluster ID — Pedon ID — Layer Code. Information on each ID type is below. Figure 20 shows a pictorial example of how the different IDs are derived and combined together into the sample ID.

- Event ID: two-digit year and team type (team type: SPSD (S) or contractor (C))
- Site code: made up of FIPS code and site code
  - USPS State abbreviation: two-character State code
  - FIPS code: three-digit county code
  - Site code: opportunity or NRI sites: 0XX | Node sites: 1XX assigned sequentially in each county (regardless of initial establishment year) once site has been through access and clearance
- Cluster ID: 1–7; (1–6) Clusters or (7) Triangle
- Pedon ID: 1–3
  - Clusters: central pedon (1) or composited satellites (2)
  - Triangle: north-facing sub-triangle (1); east-facing sub-triangle (2); west-facing sub-triangle (3)
- Layer ID: depth increment (1-X)
  - Triangle: (1) 0–10 cm, (2) 10–20 cm, (3) 20–30 cm, (4) 30–50 cm, (5) 50–75 cm (0–3.9, 3.9–7.9, 7.9–11.8, 11.8–19.7, and 19.7–29.5 in, respectively)
  - Contractor-collected Cluster: (1) 0–10 cm, (2) 10–30 cm, (3) 30–60 cm, (4) 60–100 cm (0–3.9 in, 3.9–11.8 in, 11.8–23.6 in, 23.6–39.4 in, respectively)
  - SPSD-collected Cluster: (1) 0–10 cm (0–3.9 in), (2–X) genetic horizons

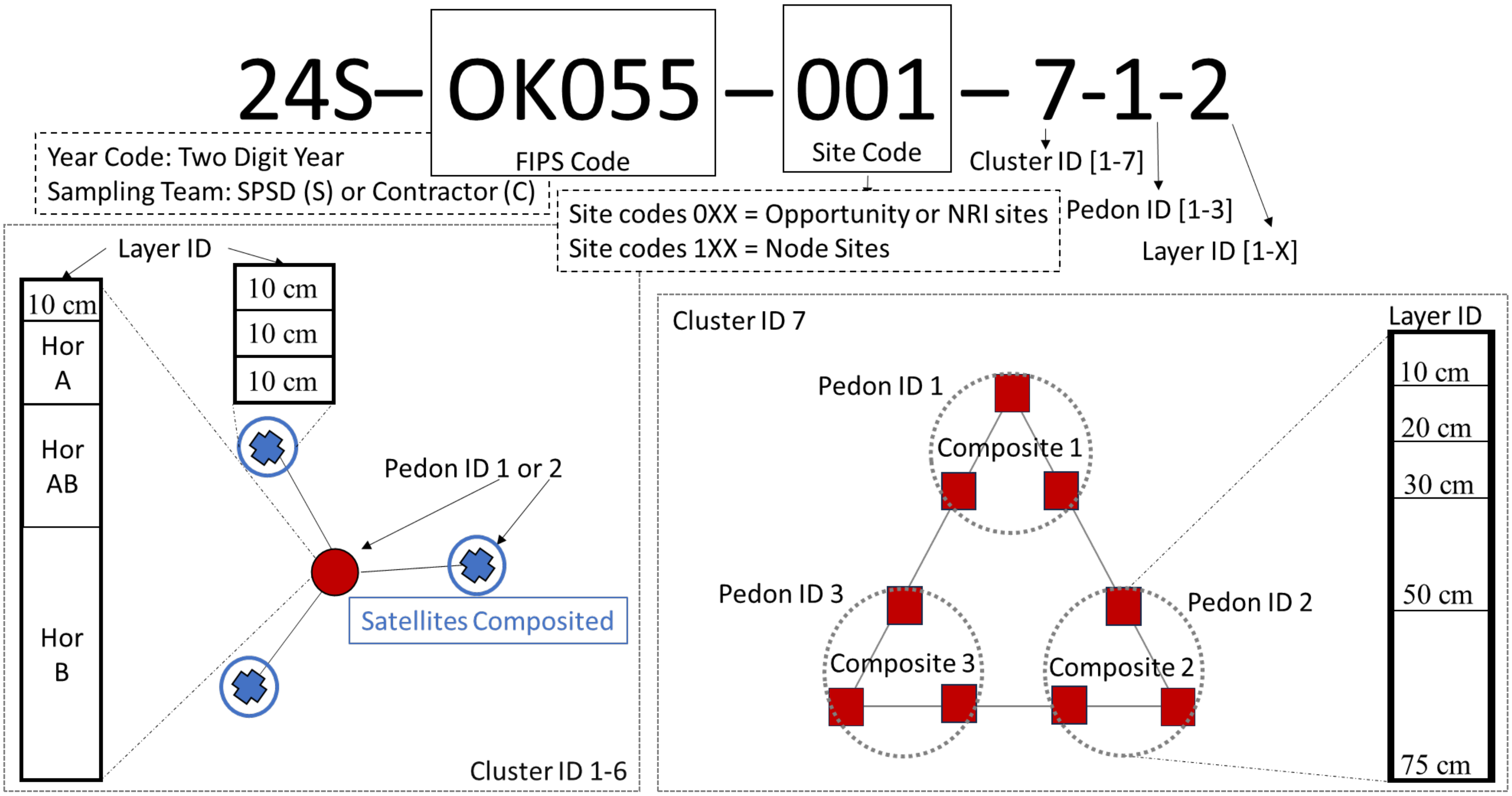

Figure 20.—Sample ID to be written on soil bags.

Materials

- Pneumatic probe method
  - Pneumatic probe
  - 6.5-cm (2.6-in) hydraulic sampling tubes (2)
  - Hydraulic sampler tube connectors
  - Capped PVC tube for pushing out cores
  - Work gloves, safety glasses, and hard hat
- Slide hammer probe method
  - Slide hammer kit
  - 5-cm (1.97-in) rings (more than 50) and PVC caps
  - Extra extension rod
  - Bucket auger
  - Open-box wrenches over 40.6 cm (16 in) (2)
  - Knife and wire brush
  - Extra 5.08-cm (2-in) bulk density cup and cap
  - Extra compact slide hammer (pump only)
- Alternative manual methods
  - Compliant cavity kit
  - Shovel
  - Auger

    - Bulk density ring with lids
    - Mallet and wooden block
    - Portable vacuum
  - Soil sampling (all methods)
    - Folding table or truck-mounted table
    - Water spray bottle and rags
    - Wire brush for cleaning core tube (optional)
    - Metal sample trays (optional)
    - Board with mounted measuring stick
    - Grass clippers for removing vegetation
    - Flat, wide paint brush (optional)
    - JMC Backsaver soil sampler
    - Preprinted sample ID tags and packing tape (optional)
    - Putty knife, machete, butcher knife, or other dull cutting tool
    - Prelabeled quart sample bags (54)
    - Prelabeled 18.9-liter (5-gallon) composite bags (15)
    - Stapler with extra staples
    - Plastic-lined canvas bag (optional)
    - Sharpies for label alterations
    - Extra unlabeled quart sample bags (5)
    - Buckets for unneeded soil
    - 1M HCL for effervescence testing
  - Site Cleanup and Final Checks
    - Data collection completed: all Survey123 fields populated
      - Giddings or other probe width recorded
      - GPS coordinates
      - Pictures taken
    - Soil sample bags sealed and labeled
    - Soil bags placed inside lined canvas bag
    - All flags removed
    - Soil equipment clean of soil particles
    - Trash collected
    - Holes backfilled

Procedure: Setting up Core Processing Table and Equipment

Set up the folding table on a flat surface in a location outside of any sampling area.

1. Place the equipment box nearby.
2. Input site, date, team, and layout information into Survey123.
3. Compare sample bag labels to Survey123 assigned labels to ensure accuracy.
4. Take the following materials out of the equipment box:
    a. Cutting boars
    b. Soil catchment metal pans

c. Labeled sample bags
d. Flat paint brush
e. PVC tube for pushing out soil core
f. Core cleaning wire brush
g. Soil knives

5. Make sure to have a few canvas bags ready to place finished and sealed sample bags in.
6. Measure the inner tube diameter of the tip of the probe (cm) and record in Survey123.

Procedure—Core Extraction Method 1, Backsaver Probe

1. Align the bottom tip of the probe with the soil surface (fig. 21, left).
2. Place a booted foot on the foot brace of the probe (fig. 21, right).
3. Apply firm and steady pressure to insert the probe into the soil.

Figure 21.—Align the Backsaver probe tip with the soil surface (left) and apply firm pressure to insert into soil (right).

4. Once the appropriate depth has been reached, press on the foot lever at the user's right foot to ratchet the probe out of the soil

Insert a gloved hand or tool into the open side of the probe and remove the soil core, taking care not to separate or damage aggregates (fig. 22).

Figure 22.—Extracted Backsaver soil core aligned with measuring stick.

Procedure—Core Extraction Method 2, Pneumatic Probe

1. Position truck at the first location. Be sure to make a note about any modifications in the sampling location in the notes section of Survey123.
2. Clear debris from ground surface (if necessary, use clippers or scissors).
3. Prep hydraulic sampler setup (if necessary, use anchors to facilitate deep sampling).
4. Extract soil core to approximately 75 cm (29.5 in) (fig. 23, left). If bedrock or an otherwise impermeable layer is reached, then extract the core to the depth possible (see step 8).
5. Measure the depth of the hole and compare to the core length. Record both lengths in the notes section of Survey123.
6. Use this information to adjust for compression in the soil core if the core length is less than the depth of the hole.
7. An alternative method of checking for a compressed core is to mark the sampling tube with the ground level of the soil outside the tube when it is fully inserted.
    a. Note whether the soil inside the tube is at the same level.
    b. If the soil is lower inside the tube, then it is compacted; note this on the field sheet.
8. Position sampling tube on top of the cutting board (2 by 6 board or similar surface) located on the table. If the core appears to consist of a lot of large rocks or roots, leave them in the sample.
9. Gently push soil from sampling tube with PVC tube from the cutting end towards the open end (fig. 23, right).

Figure 23.—Extraction of soil core with pneumatic probe (left) and pushing soil core out of tube (right).

   a. You may need to loosen soil in core with a knife near open grooves.
   b. It may also be necessary to tap the sampling tube with a hammer to prevent the core from sticking to the sides and compressing.
10. If the core is too short or significantly compressed, set the core aside (you may still use this core if a second core is even shorter or more compressed).
   a. Move 50 cm (19.7 in) perpendicular to the original sample location and extract another core; repeat steps 5 to 7.
   b. If the core is still too short, use the core that reached the deeper depth and record the final depth.
   c. This is important for the bulk density calculations afterwards. If using the second core, update the location in Survey123,
   d. In some cases, sampling vertic soils in dry conditions may pose a challenge for sampling a complete core.
   e. If sample locations are positioned over large cracks, it may be necessary to offset similar to the cases of short cores.
   f. Note: any modifications from the standard protocol should be noted in the field sheets (offsets, large cracks, etc.).
11. Clean out core with wire brush and inspect to ensure no residual soil is left in core before next soil core is extracted.
12. Move truck to next location and repeat. Sample triangle locations starting with the outer corner of the main triangle and moving around the outer perimeter of the larger triangle.
13. Holes should be backfilled with soil from the field or from the edge.

Procedure—Core Extraction Method 3, Slide Hammer

To achieve sufficient soil volume collection, repeat this method twice for each pedon. The Backsaver probe may be used to collect the description core required in the “Core Description” section.

1. Clear any vegetation from the soil surface (fig. 24).

Figure 24.—A knife is used to clear any debris or organic material from the soil surface.

2. Screw the sampling attachment onto the extension bar, unscrew the top cylinder, and insert the sampling ring into the bottom cylinder (fig. 25, left).
3. Tighten the top cylinder to fingertip-tight, but do not overtighten (fig. 25, right).

Figure 25.—The sampling ring being inserted into the bottom cylinder (left) and top cylinder is tightened to close the probe (right).

4. Mark the desired depth on the side of the probe; set the end of the probe on the soil surface and pump the handle while applying pressure to drive the probe into the soil until it reaches the mark placed (fig. 26).

Figure 26.—The end of the probe on the exposed soil surface (left) and the handle pumped to drive the probe into the soil (right).

5. Excavate the side of the hole to extract the cylinder. Slide a knife underneath the probe to keep the soil in the probe and lift the probe from the hole (fig. 27).

Figure 27.—Probe being extracted from the hole (left); using a knife to keep the soil in the probe (right)

6. Unscrew the top outer cylinder and set aside.
7. Invert the sample probe to dislodge the sample cylinder and catch gently as it slides out of the lower portion of the probe (fig. 28).

Figure 28.—The top outer cylinder of the probe is unscrewed (top left), removed, and set aside (top right). The sampling ring is visible inside the probe (bottom left) and can be extracted by inverting and gently shaking the probe (bottom right).

8. Scrape the top and bottom of the top cylinder to make flush, and place cylinder and all into sample bag (fig. 29).

Figure 29.—Excess soil visible outside the boundary of the ring (left); soil outside the boundary is scraped away using a knife or other flat blade (right).

9. Use a tape measure and hand trowel to excavate to the next sampling depth. For deeper holes, swap to the coring attachment (fig. 30).

Figure 30.—A tape measure is used to measure the hole depth (left). The hole is excavated using a bucket auger as necessary (right).

10. Repeat steps 2–9 for all required depths. If the probe no longer lifts free easily, pump the handle upward from the down to the up position to work free (fig. 31).

Figure 31.—Pumping the probe handle from the down position (left) to the up position (right) to work free.

11. Re-open the sampling bag and press the soil sample out of the sampling cylinder.
12. Use a knife to scrape the edges of the cylinder; use a wire brush to remove all soil particles.
13. Reseal the bag and place in the canvas soil sampling bag out of direct sunlight.

Procedure—Core Extraction Method 4, Excavation

When using this method, you can dig a 60.96 cm by 60.96 cm (2 ft by 2 ft) to ease core extraction without having to resubmit cultural clearance or utility information. Use a Backsaver probe to collect the description core required in the "Core Description" section. A 10-cm (3.94-in) bulk density ring is sufficient for a sample collection based on horizon designation from the description core.

1. Clear any vegetation from the soil surface.
2. Measure the height and diameter of the soil density ring; the ring should be 10-cm (3.94-in) tall.
3. Place a soil density ring on the soil surface and use a mallet and board to hammer it into the soil.
4. Extract the ring and place in a catchment pan.
5. Clean the outside of the ring and discard any soil.
6. Scrape the top and bottom of the ring to ensure soil is flush with the lip of the ring; discard any soil in the pan (fig. 32).

Figure 32.—Bulk density ring in a catch pan (left). The outside of the ring must be cleared of soil or debris (right).

7. Remove soil from inside the ring into the catchment pan (fig. 33).

Figure 33.—Soil being removed from inside the bulk density ring into the catchment pan.

8. Dump the soil from the catchment pan into the labeled soil bag.
9. Replace the ring in the same hole; excavate around the side of the ring to allow access.
10. Repeat steps 1–9 to collect sample depths 1–10 cm (.39–3.94 in) and 10–20 cm (3.94–7.87 in).
11. Use a shovel or trowel and a tape measure to excavate down to the next required depth, piling soil to the side but out of the way so that it does not fall back into the sampling hole.
12. Follow steps 1–9 to collect sample depths 30–50 cm (11.81-19.69 in).
13. Repeat the collection twice to collect full-depth increments
14. Repeat again for sample depths 50–80 cm (19.69-31.5 in); discard the bottom half of the last collection.

Core Description

Collect an additional 100-cm (39.4-in) core s from near the center pedon (25 cm (9.84 in) east or west) without compromising data collection. Collect core by either pneumatic probe or by Backsaver probe, as appropriate.

The same person should be responsible for all core descriptions at the site to ensure consistency since horizon delineation is at the expert's discretion.

Describe cores according to the "Field Book for Describing and Sampling Soils" (Soil Survey Staff., 2024). The minimum required information for each horizon is horizon designation, depth, color, texture, rock fragment modifier (percent coarse fragments by volume), redoximorphic features, and structure (where possible).

Enter the following information into Survey123 for each layer:

- Layer number
  - Top depth (cm)
  - Bottom depth (cm)
  - Horizon designation
  - Sampling depth increments
- Roots
  - Quantity
  - Quantity class
  - Size
  - Location
  - Percent
- Texture class
  - Texture modifier
  - Moist color
  - Color hue
  - Color value
  - Color chroma
- Structure
  - Grade
  - Size
  - Type

- ID
- Parting to

Subdivide Cores—Cluster

1. Prior to splitting the cores, remove any above-ground vegetation or foreign soil (use scissors, if needed).
2. Align the top of the core with the 0-cm mark on the board.
3. Cut in depth increments using cutting board and knife.
4. Visually inspect the core for any voids or gaps that may occur if a rock is pushed out of the core or because of former root channels. If a rock occurs at a boundary between two increment depths, place the rock in the depth increment in which it mostly occurs.
5. Divide cores into horizons as described above in the "Core Description" section. Note: Contractor teams divide into depth increments (cm): 0–10, 10–30, 30–60, 60–100 (0–3.9, 3.9–11.8, 11.8–23.6, 23.6–39.4 in, respectively).
6. Catch each depth increment in a clean metal pan.
7. Select bag and make sure the sample ID label is correct.
8. Select a 10-cm (3.94-in) section of each horizon, using the beginning and ending increment depths (fig. 34).


Figure 34.—Soil core on cutting board (left) and cutting soil core into depth increments (right).

   a. Carefully transfer the selected section into the labeled bag.
   b. If a full sample depth increment cannot be collected, write the actual depth increment collected for the core ID on the bag and in the appropriate Survey123 field.
9. Fill out the appropriate Survey123 fields; write any notes necessary.
10. Brush out the pan and clean the cutting board and blade in between samples; keep any soil that falls out after cutting with the next sample interval.
11. Carefully and fully seal each bag by rolling the open end of the bag and compressing to expel most of the air from the bag.; this assures the soil stays moist.
12. Place in plastic-lined canvas bag (keep out of the sun).
13. Repeat the core extraction, description, subdivision of cores, and bagging procedures for all sample cores.
14. After returning from the field and prior to shipping, place soil samples in a cold or air-conditioned room; optimally, the samples should arrive at the appropriate laboratory within one week of sample collection

Procedure—Subdivide, Triangle

Follow the same subdivision of cores as in the cluster core samples with noted exceptions.

1. Divide all cores into depth increments of 0–10, 10–20, 20–30, 30–50, 50–75 cm (0–3.9, 3.9–7.9, 7.9–11.8, 11.8–19.7, and 19.7–29.5 in, respectively)
2. Consolidate the three cores for each smaller sub-triangle, by depth, in the same sample bag.
   a. If unable to get a full core to 75-cm (29.5-in) depth at each of the sample locations, make sure to record the total depth sampled for each of the three replicates on the sample bag.
   b. If the total number of consolidated samples is less than three, make sure this is written on the sample bag and in the notes section.

Procedure—Cleanup Site and Data Quality

After completing the sampling at an NRI point location, gather all equipment and store properly. Store samples in plastic-lined cardboard boxes.

1. Ensure notes are filled out completely in the appropriate Survey123 prompts.
2. Ensure you have collected all GPS coordinates.
3. Ensure you have necessary pictures and that you recorded them.
4. Remove all flagging.
5. Check all equipment and properly store it in boxes or on the probe truck.
6. Clean cores and core accessories.
7. Make sure you fill all holes with soil from the same site.
8. Ensure you pack all soil samples in plastic-lined canvas bags.
9. Review each data form line to ensure you legibly and correctly populated all data.

Special Considerations for Temporary Storage Prior to Shipping

After completing the sampling at a network point location, store samples in a cool, dry place out of direct sunlight.

Special Considerations for Sample Quarantine

There are two levels of quarantine that apply to soils sampled for the SCMN project. The first category of quarantine is for the USDA, Animal and Plant Health Inspection Service (APHIS). The second category is State-specific, such as Oklahoma preventing the spread of fire ants.

Shipping

Sample shipping should follow all APHIS guidelines. Coordinate directly with the contact at the receiving laboratory.

Shipment Information

The following information is required for each site on data forms that accompany samples for shipment.

- Date collected
- Regional coordinator
- Collector (at least one primary contact for each portion)
- All USPS State abbreviations and FIPS codes in shipment
- All site IDs
- List of all sample IDs included

References

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