

“Future State” ER-Pro Database

Summary of “Finalized” Intensive Monitoring Protocols

Plot Site Characteristics (Use FS882(1))

Intensive Monitoring Protocols:

1. At each treatment (and control) site, randomly locate and permanently mark a plot center, 1 plot for every 3 ha.
 - a. There must be a minimum of 5 plots per installation, up to a maximum of 15.
 - b. Plots should be randomly chosen after Treatment Units have been determined, and after an analysis of forest type has led to stratification by tree density into sub-units (high, moderate, or low tree cover).
 - c. The Treatment Unit is to be tied to an Ecosystem Restoration Prescription, as having a consistent treatment applied over the full area that is sampled by the plots in the installation.
2. At each plot center, record:
 - a. The date (Day, Month, Year)
 - b. Name(s) of examiner(s) (Last, First; Last, First; etc.)
 - c. If this is a Control site (Yes/No) (Not in FS882)
 - d. The following site characteristics:
 - i. UTM Zone/Easting (m)/Northing (m) using GPS
 - ii. Elevation (m), Slope (%), Aspect (°)
 - iii. Meso-Slope Position, Surface Shape
 - iv. BEC Zone/Subzone/Variant/Site Series
3. Randomly select 5 plots from each site. At the center of these plots, take one photo in each of the cardinal directions (N, S, E, W) to photo-document changes to stand structure and understory cover, as per Routine Monitoring protocols.
 - a. Include a white piece of paper (field notebook size) with the cardinal direction and plot number in each photo (at the bottom right-hand side of the photo) and database the photos with this information (Plot# - Direction; e.g., the file for Plot#2 facing north at Fusee would be saved as: “Fusee 2-N.jpg”).
4. Record the following measures in the “Plot Representing” field:
 - a. Forest/Range Type (i.e., Closed Forest, Open Forest, Open Range, etc.),
 - b. whether this a control site (Yes/No), and
 - c. the Treatment Unit and Treatment Type.
5. Record any additional comments relevant to the site or plot characteristics/descriptions in the “Notes” field.

Stand Structure – including Wildlife Trees (Use FS882(4))

Intensive Monitoring Protocols:

1. At each of the plot centers, establish nested fixed-radius plots (Figure 1) to sample each layer as follows:
 - a. 5.64 m radius (record trees in these size classes as subplot 1)
 - i. 4R/Regeneration (<1.3 m height)
 - ii. 3S/Sapling (≥ 1.3 m height and <7.5 cm dbh)
 - iii. 2P/Pole (7.5 – 12.49 cm dbh)
 - b. 11.28 m radius (record trees in this size class as subplot 2)
 - i. 1M/Mature (12.5 – 30 cm dbh)
 - c. 25.23 m radius (record trees in this size class as subplot 3)
 - i. 1D/Dominant (>30 cm dbh)
2. Record species, diameter at breast height (cm),
3. Record wildlife tree class (WTC) (see “wood-condition”, defined in section 6 – Tree Attributes for Wildlife, p.10 of LMH 20) for each tree in layers 1D/1M/2P.
 - a. Conifers (8 classes)
 - i. Live
 1. Classes 1, 2
 - ii. Dead (Hard → Spongy → Soft)
 1. Classes 3, 4, 5, 6, 7, 8
 - b. Native broad-leaved deciduous (5 classes)
 - i. Live
 1. Classes 1, 2
 - ii. Dead (Hard → Spongy → Soft)
 1. Classes 3, 4, 7
4. Record wildlife use under the blank (other) field on the FS882 (4) form. Use codes from LMH20, section 6 – Wildlife Use (p 11) and User (p 13) codes (e.g., cavity nesting bird = CB).
5. Record any additional comments relevant to stand structure for each plot.

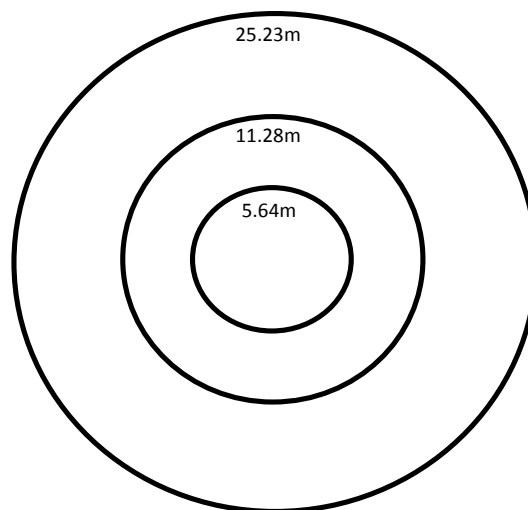


Figure 1. Nested plot configuration for Stand Structure measurements.

Overstory (Canopy) Cover – aka Crown Closure (Use LMH 25)

Intensive Monitoring Protocols:

1. Perform an ocular estimate of canopy cover to represent crown closure for each 25.23 m radius plot:
 - a. A layer (trees > 10m height)
 - b. B layer (trees and shrubs < 10m height)
2. Record two heights and ages of two co-dominant 1M trees in each plot.
3. Record any additional comments relevant to crown closure for each plot.

Understory Cover

Intensive Monitoring Protocols (As a Field card Use plot card FS505G coding shall still follow LMH 25):

1. At each of the plot centers:
 - a. Mark plot centre with a 15cm spike and a pigtail wire
 - i. Record UTM coordinate.
 - ii. Nail a plastic tree tag to the closest >15cm DBH tree to plot centre.
 1. Face tag toward plot centre.
 2. Spray paint tree marked, with blue or orange marking paint at breast and stump height
 - b. Establish four random 25 m transects (A, B, C, D) radiating out from plot center, forming spokes that are separated by 90° (bearing A randomly selected; Figure 2).
 - i. Record the bearing of each transect from plot center.
 - ii. Mark each transect end with metal stakes that are flush with the ground.
 - c. Permanently mark (w/15cm spikes) five Daubenmire frame locations on the right side of each transect at 5, 10, 15, 20 and 25 m from plot center (n = 20 frames total).
 - d. In each Daubenmire frame, estimate:
 - i. % herb and grass cover, by species, including non-native vegetation and rare or endangered species
 1. Ignore trees and shrubs. Use Table 3.1 to determine if it should be counted as a shrub or herb.
 - ii. Average height of vegetation
 - iii. Presence of cattle, deer, elk and sheep feces (Yes/No)
 - iv. Use Table 3.1, "List of low woody species", in the Vegetation section of LMH25 to determine if a species should be counted as a herb or shrub.
 - e. Rare or endangered plants:
 - i. If a rare or endangered plant covers < 5%, count individual plants to provide a density measure.
 - f. Non-native vegetation:
 - i. If a non-native species covers < 5%, count individual plants to provide a density measure.
2. Record any additional comments relevant to understory cover for each plot, including weeds and rare/endangered plants outside of the Daubenmire frames.

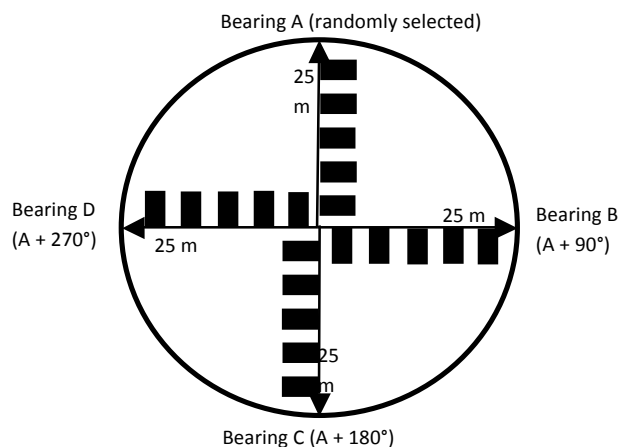


Figure 2. The 25 m transect spokes for Understory Cover measurements, each measured from the center of the randomly placed study plots. Quadrats are located at the 5, 10, 15, 20 and 25m marks of each transect (5 quadrats per transect, 20 quadrats per plot).

Shrub Cover

Intensive Monitoring Protocols: (As a Field card Use plot card FS505G coding shall still follow LMH 25):

1. For each of the transect segments (A, B, C, D) used to estimate understory cover (Figure 4):
 - a. Use the line-intercept method (Bonham 1983) to estimate % shrub cover along each one metre segment to 25m.
 - a. Record all shrubs, by species, that intersect transect lines to the nearest centimeter.
 - b. Use Table 3.1, "List of low woody species", in the Vegetation section of LMH25 to determine if a species should be counted as a herb or shrub.
3. Record any additional comments relevant to shrub cover for each plot/transect.

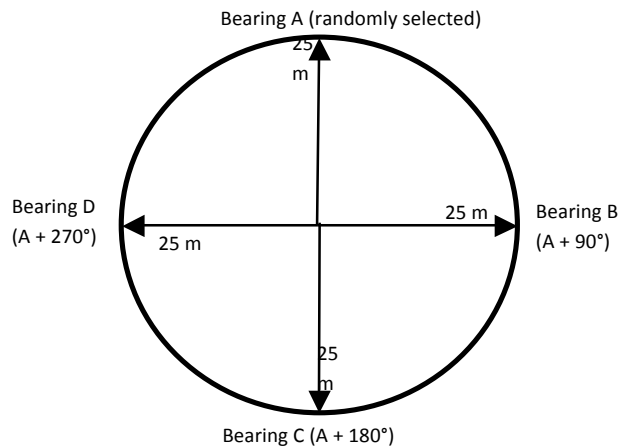


Figure 3. The 25 m length transect spokes for Shrub Cover measurements, each measured from the center of the randomly placed study plots.

Forage Production

Intensive Monitoring Protocols:

1. Randomly place four 1 m x 0.5 m quadrats in each of the 25.23 m radius plots (4 quadrats per plot).
 - a. Record bearing and distance of randomly placed quadrats.
 - b. Note: New randomly located production quadrats must be placed each subsequent year, at the end of the previous year to capture full growth in the next year.
 - i. Ensure production quadrats do not overlap Daubenmire frame locations.
 - c. Clip herbaceous vegetation and current annual growth of shrubs to ground level in mid-July, after peak growth is reached.
 - i. Note: Kinnikinick (*Arctostaphylos uva-ursi*) should not be clipped, as it is not of direct interest for ecosystem restoration.

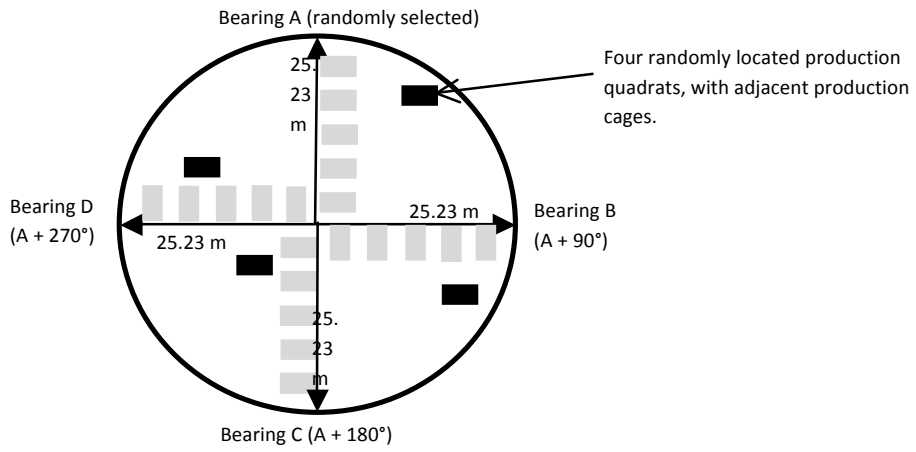
2. Bag samples, separated by functional group: Bunchgrasses (rough fescue, bluebunch wheatgrass, Idaho fescue, stipa spp.), Pinegrass, Other Grasses, Forbs and Invasive plants (for species see Field Guide to Noxious and Other Selected Weeds of British Columbia *Fourth Edition, 2002 and website: <http://www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm#noxious> or <http://www.for.gov.bc.ca/hra/Plants/publications.htm#IAPPtraining>). Shrub production will be determined on a site specific basis with a separate methodology.
 - i. Store in a paper bag, air-dried for 48 hours, then oven-dried at 70°C to constant mass.
 - ii. Weigh samples:
 1. Record Total Weight, with bag, to nearest 1 mg.
 2. Record Bag Weight to nearest 1mg.
 - iii. MS Access will be used to calculate the weight of each functional group in kg/ha.
 1. Raw data will be entered into MS Access, and averages will be calculated/stored within MS Access (1 row of data = 1 plot).

(a) MS Access Calculations: For each plot, determine the weight of each functional group in kg/ha.

 1. For each quadrat, calculate Vegetation Weight ($\text{g}/0.5\text{m}^2$), by functional group, by subtracting the Bag Weight from the Total Weight.
 2. Calculate the Mean Functional Group Weight ($\text{g}/0.5\text{m}^2$) by averaging the Vegetation Weight for each functional group.
 3. Multiply the Average Vegetation ($\text{g}/0.5\text{m}^2$) by 20 to determine weight in kg/ha for each functional group.*

3. Establish four 1m x 2m production cages adjacent to each of the production quadrats:
 - a. At the same time as the production quadrats, clip a 1 m x 0.5 m area within these cages to ground level.
 - b. Place new cages in new locations prior to the growing season, in which clipping will occur and will be interspersed among the plots.
 - c. Follow above methods for bagging/weighing samples.

4. Record any additional comments relevant to forage production for each plot/transect.



- 4- Figure 5. The 25 m transect spokes with Daubenmire frames (grey) and randomly located production quadrats and enclosure cages (black). One production quadrat and enclosure cage should be placed per quadrant, as divided by the four transect spokes.

Badger Use

Intensive Monitoring Protocols:

1. Count all badger dens w/in each 25.23 m radius plot.
 - a. Record presence of fresh holes (i.e., used within the past year) (Yes/No)
 - b. Count the number of badger feeding holes
 - i. NOTE: Badger feeding holes are defined as squirrel holes that have been enlarged by a badger, where the hole is wide at the opening, and dead-ends or narrows within ~30cm of the surface.
 - c. Make special note of natal dens.

Soils (Use FS882(2) Soil Card - LMH 25, section 2)

Per Randy Harris/Deb MacKillop:

1. 1 soil pit placed per plot, one plot per landform, soil type or stand density.
 - a. When establishing the plot, dig 1 soil pit in a location that is representative of the majority of the 25.23 m plot.
 - b. Ensure that the soil pit is located away from all other site measurement areas (i.e., transect lines, Daubenmires, pre-selected production quadrats, etc.)
 - i. Record bearing and distance of soil pit from plot centre.
 - c. Soil pits should be dug to 60cm in depth, unless root-restricting layers are encountered.
 - d. Use FS882 soil cards to record soil characteristics/attributes, ensuring that the following fields are completed:

General

- i. Plot number
- ii. Terrain fields (Texture, Surficial Material, Surface Expression and Geomorph Processes – if applicable)
- iii. Soil classification
- iv. Humus Form
- v. Rooting Depth
- vi. Root Zone particle size
- vii. Root restricting layers
- viii. Seepage (if present)
- ix. Drainage

Organic

- x. L, F, H layers and depth

Mineral Horizons / Layers

- xi. Horizon / Layers
- xii. Depth
- xiii. Texture
- xiv. % Coarse Fragments

Coarse Woody Debris (Use FS882(7) - LMH 25, section 7)

Per Deb MacKillop:

1. Establish two 25 m CWD transects, using segments B & D (as established for Understory Cover) of each 25.23 m radius plot.
2. Following the procedures in Section 7 of LMH 25 (CWD), on each of transect B & D, measure:
 - a. The diameter of all CWD (≥ 7.5 cm) at the point of intersection with each transect.
 - b. The length of all CWD (≥ 7.5 cm) that crosses each transect.
 - c. The species (where possible) of all CWD (≥ 7.5 cm) that crosses each transect.
3. MS Access will be used to auto-calculate CWD volume and piece density (by size class).