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Field Methods for Condition Assessment Using Rooted Frequency Vegetation Sampling and Soil Measurements in Meadowsion Sampling and Soil Measurements in Meadows

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Rooted frequency Methods in Meadows

Introduction

Rooted frequency of plant species, ground cover, and rooting depth/density are metrics used to provide a standardized system for determining ecological condition and long-term trend in meadow sites. This report describes field methods for collecting data for rating ecological condition.

Selecting a monitoring site

Select a site for monitoring by walking around the area and determining the boundaries of meadow hydrogeomorphic types (HGM types) (from Weixelman et al. 2011) and the various plant communities. Pay attention to landform changes, soil moisture, and associated vegetation breaks. Select a site that is homogenous in hydrogeomorphic type, landform, and vegetation plant community. Within this homogenous site, randomly locate a starting point for the first transect. Keep the transects away from the edges where ecotones may occur. Place a reference post within 50 to 100 feet of the study site. The reference post is a t-post or a 5 to 6 foot steel fence post driven into the ground so that 3-4 feet remain aboveground. Record the position of the reference post with a GPS unit (latitude and longitude, NAD 1983 CONUS datum). Record the distance and bearing from the reference post to the start of the first transect line (see Figure 3). The reference post helps to identify and relocate the study site.

Condition is calculated using the plant composition data on rooted frequency of plant species. Ground cover and soil rooting data help provide information on amount of exposed soil and rooting characteristics of plants on the site. The vegetation data are recorded using rooted frequency in quadrat frames. The size of the quadrat frame depends on the ecological type. For moist and wet meadow types (depth to soil mottling or saturation < 100cm), it has been found that a 10 cm X 10 cm frame is adequate (see Figure 1 and 2). On dry meadows, a nested frame is sometimes necessary (20 X 20 cm) to insure the most prevalent species have frequencies between 20 and 80 percent. See Figure 3 for the typical rooted frequency plot layout. If there are few key species on the transect, as might be found on sites in low ecological condition, their frequencies may be less than 20 percent. Three permanent transect lines are established and marked (see Figure 3).

Directions for setting up transect lines

Choose a random point from the reference post within the homogeneous plant community to start the first transect and stretch the tape to 25 meters (see Figure 3). Rebar stakes are driven in at the 0 meter, 12.5 meter, and 25 meter marks. Drive the rebar in flush with the ground. Next, layout the second transect parallel and five meters from the first transect and stretch the tape in the same manner (see Figure 3). Drive in rebar at the 0 meter, 12.5 meter, and 25 meter marks again. Lay out the third transect in the same manner, parallel to and 5 meters from the second transect (see diagram). Drive in rebar at the 0 meter, 12.5 meter, and 25 meter marks on all three transects. Quadrat frames are placed at 1-meter intervals on each transect, starting at 1-m and ending at 10-m, then continuing at the 15-m mark and ending at the 24-m mark. The result is 20 quadrat frames on each of the three transect lines (see Figure 3).

At each plot, use either a 20 cm square nested quadrat frame, or a 10 cm square quadrat frame for recording species occurrence. For each quadrat, record a hit for each vascular plant species rooted inside the quadrat. When using the nested frame, species occurring in the smallest nested frame are recorded as occurring in the #4 frame. Species occurring in the largest frame are recorded as occurring in the #1 frame (see Figures 1 and 2). For the 10 cm square quadrat, all species rooted within the frame are noted for each quadrat. After all transects are completed, the tallies are summarized for each species for a single frame size. Generally, the 10 cm size frame is used for calculating frequency of occurrence. The number of hits are summed for each successional category of late, mid, and early seral plant species and the tally for each group is divided by the total number of tallies. This gives the relative number of tallies for each successional grouping. In this way, the relative number of hits (adding to 100%) for late, mid, and early seral are calculated for each plot. An explanation for calculating condition from relative frequencies of rooted frequency plant data can be found in Ratliff (1985) on pages 45 and 46, see citation below.

Directions for recording ground cover

Ground cover is recorded by dot count at each of the four corners of the frame (see Figure 2). Each end has a mark or a filed groove to use as a sight. Use a sharp pointed object such as a survey pin or a pencil and sight down toward the ground and record the ground cover category. The ground cover types are bare ground (particles < 1/8" diameter), pavement (1/8" to 3/4" diameter), rock (3/4" or larger diameter), litter, and vegetation (basal area of plant). This gives a total of 240 sample points for ground cover per plot. Percent bare ground is then calculated as the number of times that bare ground was recorded divided by the total number of points (240).

Directions for recording root depth

The depth and abundance of fine and very fine roots (< 2mm in diameter) are recorded to provide data on the extent of rooting in the soil profile. This is often termed the sod depth. In the field, auger a hole using a 3-inch diameter soil auger. Rooting depth is defined as the maximum depth where there are at least 100 roots (< 2mm diameter) per square decimeter of soil. A square decimeter is about the size of the palm of your hand. A rule of thumb here is that there needs to be a root per square centimeter over the area of the palm of your hand to qualify as 100 roots per square decimeter. Augering down through the soil profile in 5 cm increments and examining soil samples will help determine the maximum rooting depth. The rooting depth is often the first parameter that responds to a management change. The root depth is determined from using soil pits or holes made with the soil auger within the study area. Three auger holes are made at the site to determine rooting depth (see Figure 3). An auger hole is located on each of the three transects. On transect #1, the auger hole is located 12.5 m from the start and 1 m toward the center of the plot (see Figure 3). On transect #2, the auger hole is at the 12.5 m mark. On transect #3, the auger hole is located 12.5 m from the start and 1 m toward the center of the plot (see Figure 3).

Directions for taking photos:

A minimum of ten photographs are taken at each study site. A general view from the reference stake is taken toward the study. Three general views are taken from the 0 meter mark of each transect down the transect. Two additional vertical photographs are taken of two frames on each of the three transects. These photos are taken of quadrats at the 1 m and 5 m marks on the tape. A dry erase board or chalkboard or other means of identifying the study, transect number, and plot number as appropriate are included. Photos are numbered by belt transect and meter location. For example, T-2 M-3, would be at the three meter mark on the third transect.

The initial, middle, and end of each belt is staked with a 3/8 inch by 18 inch rebar (see Figure 3). The rebar is driven flush with the soil surface and then capped with plastic caps (Ben Meadows Permamark Survey Markers #101310). If rocks are available, stack several next to the 0 pin of the first transect.

Citations:

Ratliff, Raymond D. 1985. Meadows in the Sierra Nevada of California: state of knowledge. Gen. Tech. Rep. PSW-GTR-84. Berkeley, CA: Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture; 52 p

Weixelman, D. A., B. Hill, D.J. Cooper, E.L. Berlow, J. H. Viers, S.E. Purdy, A.G. Merrill, and S.E. Gross. 2011. Meadow Hydrogeomorphic Types for the Sierra Nevada and Southern Cascade Ranges in California: A Field Key. Gen. Tech. Rep. R5-TP-034. Vallejo, CA. U.S. Department of Agriculture, Forest Service, Pacific Southwest Region, 34 pp.

Figure 1. Close-up of the nested frame orientation for rooted frequency along the metric tape.

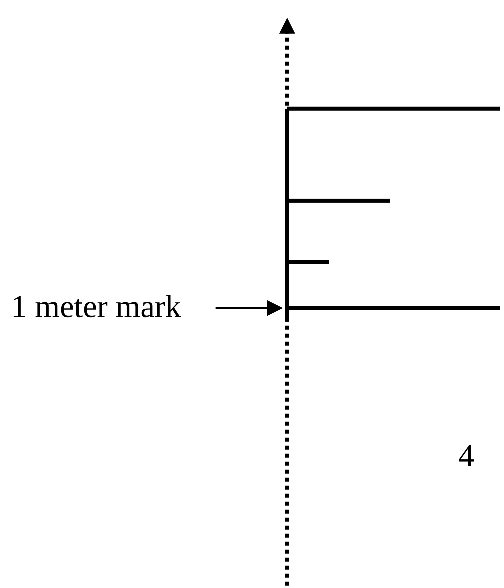


Figure 2. Dimensions of rooted nested frequency quadrat.

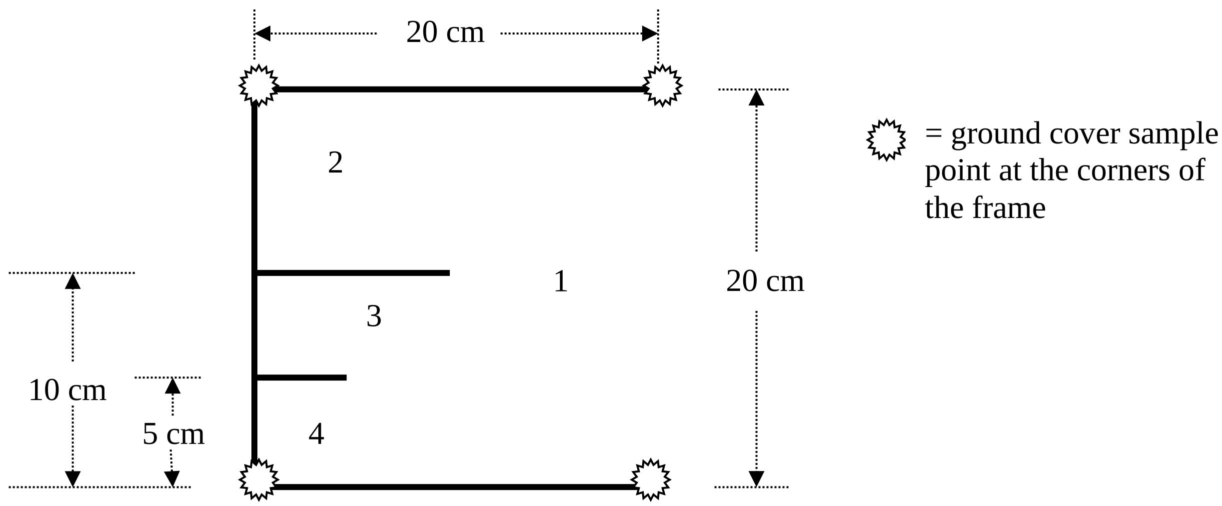
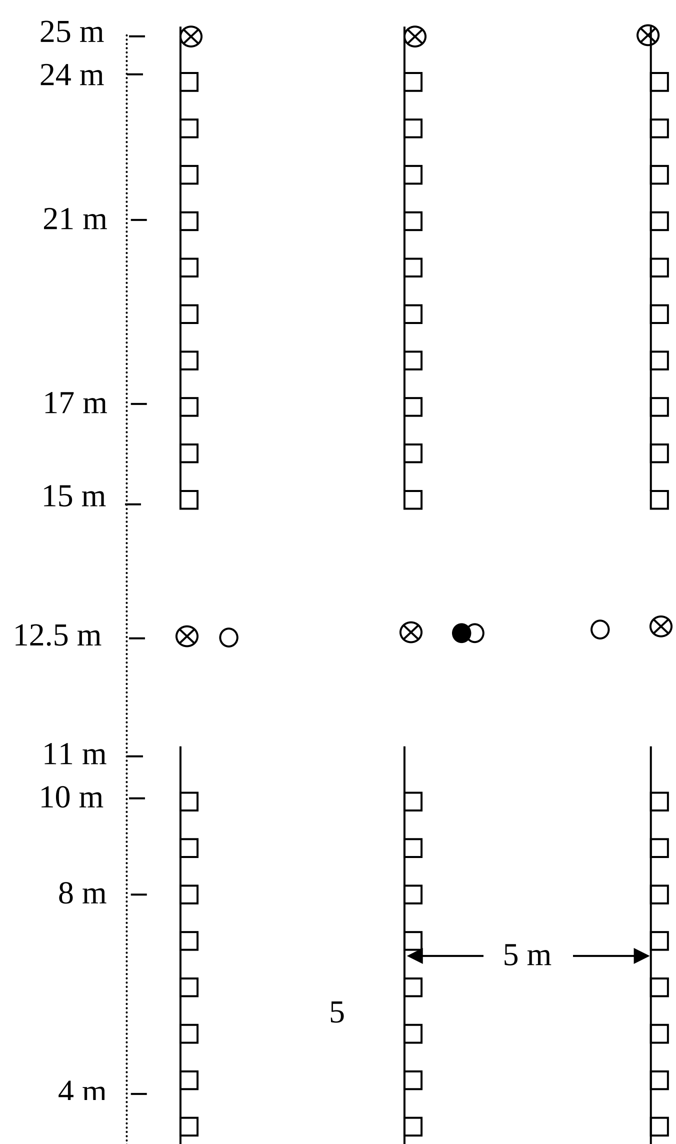


Figure 3. Rooted Frequency Range Monitoring Plot layout 5-3-01



General location field form, rooted frequency plots

Plot code _______________ Plot name ____________________________________
Date ________________ Initials of crew: __________________________________
RMU name ______________________________ RMU number ________________
Forest _________________________ District _______________________________
Elevation ___________ ft. Slope ________% Aspect ____________ degrees T.N.

Study type: annual grassland ____ sagebrush _____ greenline _____ meadow ____
Meadow type: Hydrogeomorphic type ______________________________________

USGS quadrangle ____
Township _______Range __________ Section __________ ¼ _________
Latitude _______deg _______min ____.___sec
Longitude _______deg _______min. _____.___sec

Dominant spp. (% cover): 1. code__________ %_____2. code___________ % _____
Key species: 1. _________________________ 2. ____________________________

Distance and bearing between witness post and the beginning of first transect:
Distance ________ m Bearing ____________ degrees T.N.
Transect length ________ m Transect bearing (T1) ______ deg.T.N.
Sampling interval along transect _______ m
Distance between transects ________ m Frame size _________ cm

Soil data:
Texture at 25 cm _______ Depth mottles ________ cm Depth saturation ________ cm

Root depth (cm) - depth to "many" fine and very fine roots (< 2mm diameter)

	1st transect	2nd transect	3rd transet
Many (> 100/dm^2)			

Hydrogeomorphic type**
1 Basin peatland
2 Mound peatland
3 Discharge slope peatland
4 Depressional seasonal
5. Depressional perennial
6. Lacustrine fringe
7. Dry
8. Discharge slope
9. Riparian low gradient
10. Riparian middle gradient
11. Riparian high gradient
12. Subsurface low gradient
13. Subusrface middle gradient
14. Subsurface high gradient
** from (Weixelman et al. 2011)

Soil texture
1. Sand (s)
2. Loamy sand (ls)
3. Sandy loam (sl)
4. Silt loam (sil)
5. Sandy clay loam (scl)
6. Silty clay loam (sicl)
7. Sandy clay (sc)
8. Silty clay (sic)

Notes: ____

____

Location Map

Plot code ____________________ Plot name ____

The purpose of this map is to make easier the relocation of the macroplot for remeasurement. Make a sketch of the physical features of the site and the location of the macroplot within. Indicate North direction. Use compass bearings and distances to witness post and well-known topographic or cultural features. Show how the transects are arranged.

Frequency

Plot Code:	Date: ___/___/___	Examiners:	Allotment Name
Transect Location:	Number of Quadrats:	Frame Size:	

Plant Code	Species Name	1				5					10					15					20				24	1				5					10					15					20				24	1				5					10					15					20				24	Total

Ground Cover Summary

Vegetation (Basal)	Litter	Bare Ground	Gravel (< 3/4 inch)	Rock (>3/4 inch)	Cryptogams
T1)					
T2)					
T3)					
Hits % Cover	Hits % Cover	Hits % Cover	Hits % Cover	Hits % Cover	Hits % Cover

	Total	%	Remarks:
Species Indicating High Similarity to PNC			
Species Indidating Moderate Similarity to PNC			
Species Indicating Low Similarity to PNC			

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