Saddle Grid Permanent Vegetation Plots

Species Composition Methods

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ABSTRACT

Permanent 1 m^2 vegetation plots were established near each of the 88 Saddle grid stakes in 1989 by Marilyn Walker, who led the sampling effort until 1997. To estimate plant canopy cover, point quadrat measurements have been made at irregular intervals from 1989 to the present (1989, 1990, 1995, 1997, 2006, 2008 and yearly from 2010 onward). The point-quadrat technique used for sampling was described in Spasojevich et al. (2013) and Auerbach (1992).

METHODS

*Plot Designation & Naming*

The 88 permanent 1 m^2 Saddle vegetation plots were each located within 2 m of a corresponding Saddle grid stake, in the same type of vegetation community as occurred at the stake. Therefore, the distance and direction of each plot from the grid stake varied from plot to plot. Plots were numbered the same as the grid stakes, except for the "A" row plots, for which an additional set of numbers 101, 201, 301, 401, 501, 601, 701, and 801 was assigned that corresponded to grid stakes 10A, 20A, 30A, 40A, 50A, 60A, 70A, and 80A, respectively. The purpose was to provide an alternative numbering system for all plots that was strictly numeric.

Plots were designated using the methods described in Auerbach 1992:

Plot placement was initially based on the 1 m^2 aluminum point-quadrat frame used to record species composition. Four rebar stakes were positioned outside of each frame corner, and string was tied around the rebar to cordon off each plot. Aluminum tags marked with the plot number and investigator were attached to the southwest corner rebar marker of each plot. In 2017, missing tags were replaced with new tags marked only with the plot number.

So that the quadrat frame could be precisely repositioned in the same location every year, aluminum washers were nailed to the ground beneath each of the four frame legs so that the foot of each leg fit inside a washer. Starting in 2006, exact repositioning of the frame was not possible in some plots due to absence or relocation of washers. Most plots had at least one washer remaining, which could be used to approximate the correct position of the frame. For plots with no washers remaining, the point-quadrat frame was positioned to be as centered as possible within the four rebar stakes marking the plot.

Aluminum disks stamped with an ‘X’ were nailed to the ground inside each of the frame corners so that string crossings within the frame could be aligned over each ‘X’. From 1989 to 1997, 4 points in each plot were recorded as ‘registration marker’ where the frame aligned over the ‘X’. Starting in 2006, the frame no longer lined up with the ‘X’s due to absence or movement of the disks, so ‘registration marker’ hits were not recorded.

*Species Composition*

The aluminum point-quadrat frame used to record species composition was 1 m^2, strung with a grid of double-layer strings whose intersections created a total of 100 equally spaced sampling points. String intersections started 5 cm from the southwest corner of the quadrat and continued at 10 cm intervals up to 95 cm in both northerly and easterly directions. For each year, the 100 sampling points in each of the 88 plots were enumerated as 8800 unique point identification numbers. Point identification numbers began in the southwest corner of plot 1 (in the southwest corner of the saddle grid) and mimicked the numbering pattern of the grid stakes, so that point ID number 11 was directly north of point ID 1 and point ID 8800 was in the northeast corner of plot 80A (801; northeast corner of the saddle grid).

At each sampling grid point, a thin metal stick was placed vertically, and a plant species hit occurred when a plant part touched the metal stick. In 1989 up to three hits were recorded at each sampling grid point: one at the top of the plant canopy (top hit), one at the lowest surface layer (bottom hit), and one in between (middle hit) if the stick intercepted a species different from that of the top and bottom hit.

In accordance with the methods described in Auerbach (1992), in 1990-1997 only top and bottom hits were recorded, and the distance of each hit from the leveled frame was recorded. Additionally: (1) a note was made if a point hit squarely on a large leaf or dense patch of a single species, (2) vegetation was qualified as live, dead or standing dead, and (3) a hit was identified as a shrub species, regardless of whether woody or herbaceous biomass of the shrub was intercepted. Distances and notes (1) to (3) were not included in this data set.

Starting in 2006 and continuing to the present, plant species hits were recorded for top, middle and bottom, including multiple middle hits where more than one unique species was intercepted. If parts of a given species touched the stick at multiple places, only one hit was recorded for that species. The frame was not leveled, hit distances from the frame were not measured, and notes (1) to (3) were not recorded.

All species identifications after 2011 should be considered PRELIMINARY, especially for Carex species. These and earlier data are subject to revision.

*Litter*

Species was identified only for a live biomass hit; any dead biomass hit was included under the single category of ‘litter’. Both litter and live biomass hits could be recorded at a single point, but no more than one litter hit was recorded for that point. If litter intercepted the stick at the uppermost point but live biomass hit farther down, the live biomass species was recorded as the top hit.

Vegetation was not qualified as live, dead or standing dead for data collected starting in 2006, but this status can be inferred since species was identified for live biomass hits, ‘litter’ as a top or middle hit was standing dead litter, and ‘litter’ as a bottom hit was fallen litter lying on the ground.

*Ground Surface*

Where no vegetation was intercepted, only a bottom nonspecies hit was recorded, including ‘litter’ for fallen (not standing) dead plant biomass, ‘bare ground’ for bare soil surface, ‘rock fragments’ for small gravel or a rock of any size, ‘unknown soil crust’, and ‘registration marker’ (1989 to 1997 only)

Whether or not vegetation was hit above, if the ground surface was intercepted by the bottom of the stick, a ground surface code (e.g., bare ground, litter, rock) was recorded as the bottom hit. If the bottom of the stick came down on a leaf near the ground surface, then ground surface below was not recorded.

*Lichen & Mosses*

Lichens and mosses were identified to species from 1989-1997. Starting in 2006, hits were categorized simply as ‘lichen’ or ‘moss’. Species identifications for 1989-1997 were converted to ‘lichen’ or ‘moss’ for consistency with more recent data. ‘Lichen’ was recorded as a bottom hit for lichen growing on soil but not rock; lichen growing on rock was recorded as ‘rock fragments’.

*Disturbances*

Disturbance conditions were not recorded as a separate category, but rather were collapsed into the species codes. All chew and nest disturbances were recorded as ‘litter’, while all runway, mound, and cast disturbances were recorded as ‘bare ground’.

*Data Recoding & Entry*

Data were formatted as one species hit per row (“string of pearls’). The data in this file through 1997 were manually entered from field data sheets by data management personnel using an EasyEntry form. Subsequently, data were entered into Excel spreadsheets formatted to replicate plot sheets. Point records were converted to plant cover using macros. The resulting files were processed and/or archived on the NWT LTER server.

Data for 1989 and 1990 had originally been provided by the Joint Facility for Regional Ecosystem (JFREA) via FTP. More detailed information regarding the original entry of this data into Excel spreadsheets is on file in the JFREA Laboratory. Due to inconsistencies in format and entry of this data, as well as the discovery of several errors, the 1989 and 1990 data were re-entered by data management personnel in the winter of 1995-1996. The format of the data was modified slightly at this time, so the entire data section of this file was replaced, and appropriate modifications were made to the documentation section as well.

Ancillary information relating to plots recorded in 1989-1997 are is as follows:

In 1990 - 1997, only top and bottom hits were recorded.

Species condition codes and canopy heights were recorded for all species

for these years, but not thereafter. Species condition and height data

are available from the NWT LTER data manager.

Distances from the frame to a top canopy plant hit and to a surface

layer plant hit were measured to the nearest 0.5 cm and recorded.

Plant genus and species were also recorded at both hits at each point.

Species condition codes are 1 (live), 2 (standing dead), 3 (dead),

and 5 (other). Species condition code 5 was used for all non-vegetation

hits (e.g., soil, litter, rock, bare). Hit codes are 1 ("bullseye" hit)

and 0 (mediocre hit). Woody (1) or non-woody (0) conditions were also

recorded for each species.

The sampling methodology differed slightly in 1989 from sampling in 1990-1997.

In particular, neither canopy heights nor woodiness conditions were recorded. A

third "middle" layer was also often recorded in 1989, and are

listed as point ID, plot number, numeric species code, hit quality,

and species condition:

105,2,48,0,1

106,2,9,0,1

152,2,48,0,1

197,2,9,0,1

226,3,98,0,1

258,3,9,1,1

287,3,98,0,1

310,4,48,0,1

1244,12,48,0,1

1289,12,78,0,1

2321,22,48,0,1

2322,22,19,0,1

2344,22,2,0,1

2364,22,2,0,1

2525,24,2,0,1

2702,26,2,0,1

2704,26,8,0,1

2763,26,43,0,1

2779,26,8,0,1

3350,31,8,0,1

3368,31,48,0,1

3383,31,48,0,1

3542,33,78,0,1

3577,33,41,0,1

3599,33,51,0,1

3709,35,41,0,1

3727,35,2,0,1

3776,35,41,0,1

4633,43,8,0,1

4847,45,48,0,1

In 2006 and thereafter, species and nonspecies codes were recorded using USDA PLANTS codes. Codes used in earlier years were converted to these codes. Codes that begin with “2” are nonspecies.

REFERENCES

Auerbach, N. 1992. Effects of road and dust disturbance in minerotrophic and acidic tundra ecosystems, Northern Alaska. MS thesis, University of Colorado, Boulder. 253 pp.

Spasojevic, M. J., W. D. Bowman, H. C. Humphries, T. R. Seastedt, and K. N. Suding. 2013. Changes in alpine vegetation over 21 years: Are patterns across a heterogeneous landscape consistent with predictions? Ecosphere 4(9):117. http://dx.doi.org/10.1890/ES13-00133.1