Lecture 2: The Relevé Method of Sampling Plant Communities

- 1. Relevé sampling method.
- 2. Review results of minimal area sampling.
- 3. Lab 2 overview

Sampling methods

- Subjective vs. objective sampling
- Centralized replicate, random, and systematic sampling approaches
- The relevé method
- Cover estimates

Subjective vs. objective sampling

• <u>Subjective sampling</u>

- Sample sites are consciously chosen as representative of predetermined vegetation classes.
- Most flexible sampling scheme
- Allows for experience and decision making ability of the investigator
- Best used in areas where there are clear boundaries between plant communities
- Good approach for vegetation classification

• **Objective sampling**

- Sample sites are chosen according to chance (i.e. random sampling)
- Essential if probability statistics are to be used to back up the conclusions
- Best used in areas where boundaries between communities are indistinct or where the objective is to determine the causes of variation within a single plant community
- Good approach for ordination methods

Centralized replicate, random, and systematic sampling approaches

• Centralized replicate

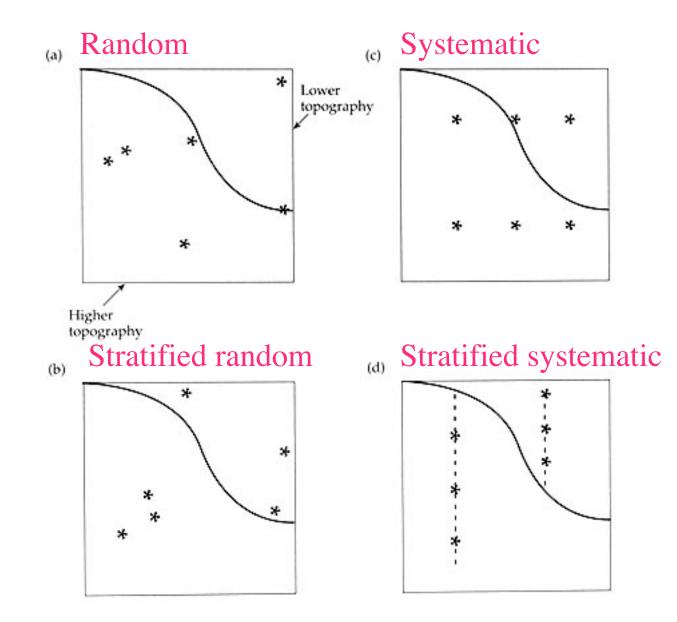
- Sample sites are chosen subjectively and centrally located within representative homogeneous areas of predetermined vegetation types.
- This method is used in the relevé approach (more on this later).

Random

- Sample sites are chosen according some randomizing method (e.g., dice, random numbers). Any point is a possible sample point.
- In a **complete random** method plots are chosen completely randomly.
- In a stratified random approach, the research areas is first divided into relatively similar classes based on some criteria, for example, landscape units (floodplains, hills, mountains) or mapped vegetation units. Sample sites are then randomly chosen in the various classes. This ensures that the most common units are not over-sampled and the uncommon units under sampled. The samples are dispersed throughout the entire survey area.

• Systematic

- Plots are located according to a regular system such as a grid or regular intervals along a line. A **stratified systematic** approach is similar to the stratified random approach except the sample sites are chosen according to a systematic method (grids or linear transects) within each stratified class.



The relevé method

- French term meaning a collection of data. Often used in terms of surveys.
- Developed by Josias Braun-Blanquet as a standard method of sampling for vegetation classification according to the Zurich-Montpellier School of phytosociology.
- Recently has gained popularity in North America (e.g., Nature Conservancy, California Department of Fish and Game, Talbot and Talbot 1994, Walker et al. 1994, Komárková 1978, Rivas-Martinez 1997, Miyawaki et al. 1994, Klinka et al. 1996)
- The quickest way to obtain detailed community information.
- Does not necessarily involve sampling other components of the site such as soils and site factors, although these are often collected if environmental gradient analysis is part of the research.
- Subjective sampling (centralized replicate).
- Qualitative in the sense that species cover is estimated instead of measured.
- Quantitative in the sense that it gives a complete list of species for the plot.

Entitation and requirements of a relevé

Entitation

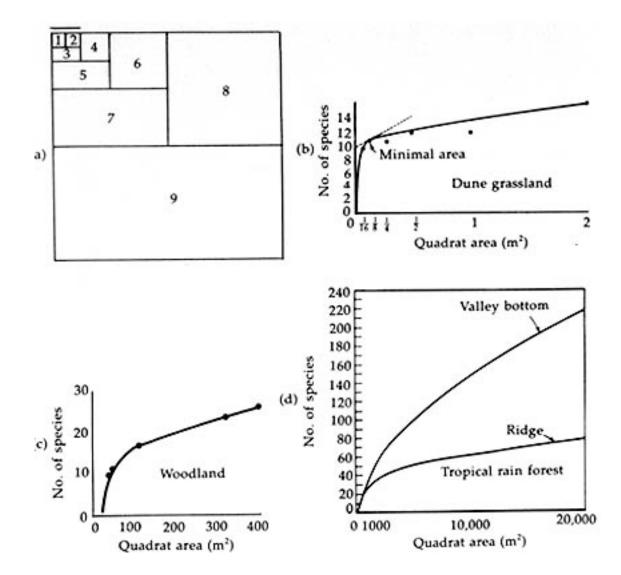
- <u>The process of subdividing the vegetation into recognizable entities or preliminary</u> <u>vegetation types</u>
- Reconnaissance essential (cannot be overemphasized) The better your initial knowledge of an area, the better will be the subsequent sampling.
- Important to avoid sampling ecotones or breaks between distinct communities.
- Iterative process that may take several years to perfect description of the communities.

Requirements of a sample site for a relevé

- Should be recognizable as unit that is repeated in other areas of the landscape, i.e. a repeating assemblage of species.
- <u>HOMOGENEITY</u> of the vegetation canopy
- <u>Homogeneity</u> of the soil and other site factors
- Large enough to contain all the species in the community (where the minimal area sampling scheme comes in)



Size of plots: Minimal Area Method



The advantage of permanent plots

- For long-term studies. It is highly desirable to establish permanent marked plots that can be revisited at later dates.
- Allows the investigator to examine the species composition during different seasons to record plants that may be missed during the first visit. Permits collection of other types of information that were not collected during the first visit, for example, spectral information for remote sensing studies, observations regarding winter snow depth or other more detailed microclimate information, biomass information, or physiological information for individual plant species.
- Examine changes due to successional processes, climate change, or disturbance.
- In our studies, we pound 3/4" rebar in the center of the plot and slip a 60"x1" PVC pipe over the rebar. The pipe is marked with 10-cm stripes that can be used for monitoring snow depth or water depth in aquatic vegetation. The markers are also highly visible for locating the plots, particularly in winter, and provide a scale for photographing the vegetation.

Relevé sites: Homogeneity of vegetation



Minimum area for common vegetation types

Table 9-1 Minimal areas for various vegetation types. From *Aims and Methods of Vegetation Ecology*. Mueller-Dombois and Ellenberg. Copyright © 1974 John Wiley and Sons, Inc. Reprinted by permission.

Туре	Minimal area (m ²)			
Tropical rain forest	1000-50,000			
Temperate forest:				
Overstory	200-500			
Undergrowth	50-200			
Dry temperate grassland	50-100			
Heath	10-25			
Wet meadow	5-10			
Moss and lichen communities	0.1 - 4			

Example Relevé data sheet

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Cover

The area of ground covered by the vertical projection of the aerial parts of plants of one or more species.

- An easily obtained index of plant biomass.
- Estimates of cover can be obtained by using coverabundance scores.
- Measures of cover can be made using point sampling methods, line transect method, or photos and planimeter or other direct measure of cover.

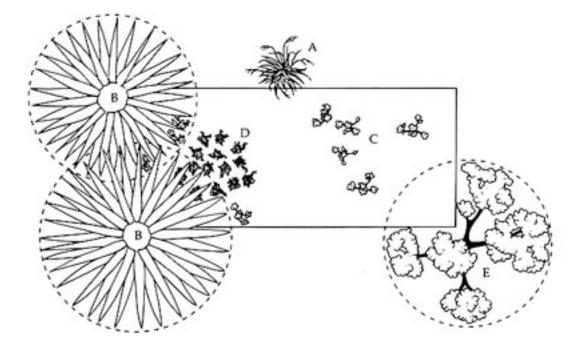
Cover-abundance classes

Table 9-2 Cover classes of Braun-Blanquet, Domin-Krajina, and Daubenmire. From *Aims* and *Methods of Vegetation Ecology*. Mueller-Dombois and Ellenberg. Copyright © 1974 by John Wiley and Sons, Inc. Reprinted by permission.

braun-bianquet			Domin-Krajina			Daubenmire			
Class	Range of cover (%)	Mean	Class	Range of cover (%)	Mean	Class	Range of cover (%)	Mean	
5	75-100	87.5	10	100	100.0	6	95-100	97.5	
4	50-75	62.5	9	75-99	87.0	5	75-95	85.0	
3	25-50	37.5	8	50-75	62.5	4	50-75	62.5	
2	5-25	15.0	7	33-50	41.5	3	25-50	37.5	
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*Individuals occurring seldom or only once; cover ignored and assumed to be insignificant.

Estimating percentage cover



Sociability, vigor, and phenology

- Purists of the Braun-Blanquet often add other information regarding species sociability, vigor, and phenology to provide a more detailed picture regarding the status of individual species.
- **Sociability** is a measure of the degree of clustering (contagion) of individuals of a plant species.
- **Vigor** is a measure of the vitality of the species in the plot.
- **Phenology** provides information regarding the reproductive status of the plant (vegetative, flowering, fruiting, senescing, etc.).
- However, this information is difficult to quantify and has only minimal value for classification or ordination methods.

Example of a European relevé protocol

TABLE III

Protocol of a relevé (translated from MELTZER & WESTHOFF 1942)

Nr. 39462. 1st August 1939. Terschelling, Bessenplak S of beacon near beach mark 6. Gridnr. G5.61.43 in IVON-system (Institute for Vegetation Research in the Netherlands). Stand very uniform, Empetrum heath on slope of 6 m tall parabolic dune, exposition NNE, inclination 30°.

- Habitat: shadowed, moist soil, by day not strongly heated and rarely desiccating. Slight shifting of sand. Little human and animal influence.
- Profile: A₄: 2 cm semi-decayed material.
 - A_i: 5 cm dark humus containing sand.
 - C: bright, white dune sand.

Sample plot 100 sq m.

Herb layer cover 100 %, 20-40 cm			
Polypodium vulgare	2.3	ν.	•
Empetrum nigrum	4.4	fr.	
Hieracium umbellatum	1.1-2	f .	
Festuca rubra subvar, arenaria	+.1	fr.	•
Hypochoeris radicata	+.1	Gr.	
Calamagrostis epigeios	+.1	а.	•
Jasione montana	· · · · ·	А.	•
Carex arenaria	1.1	Υ.	ō o
Ammophila arenaria	2.2	ν.	0
Salix repens	+.2	fr.	•
Viola canina var. dunensis	r	ν.	0
Moss layer cover 100 %, 2-5 cm			
Hypnum cupressiforme var. ericetorum	3.3	Υ.	0
Pleurozium schreberi	3.3	ν.	0
Dicranum scoparium	2.3	ν.	0
Mnium hornum	2.3	ν.	
Lophocolea bidentata	2.2	fr.	•
Eurhynchium stokesii	+.3	٧.	0
Plagiothecium denticulatum	+.2	fr.	
Polytrichum juniperinum	+.3	Υ.	ŏ
Peltigera canina	+.2	Υ.	
Parmelia physodes	+.1	ν.	0
Cladonia alcicornis	+.2	ν.	0

Cover-abundance score

(left column, left of decimal), **sociability** (left column, right of decimal), **phonological state**

(middle column: *v*, vegetative; *fr*. Fruiting; *fl*. Flowering), and **vigor** (right column: *black circle*, well-developed; *circle with dot in center*, vegetative propagation only, not completing life cycle; *open circle*, *no dot*, Feeble, with low vegetative propagation).

Sample site-factor data form

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Soils

- The soil-vegetation relationships are a key to understanding vegetation patterns.
- If you have a background in soils, then it is desirable to obtain as complete soil information from each sample site as possible. Or work in conjuction with a soil scientist.
- The effort should include digging a soil pit, making a quick description of the soil (see relevé soil form), and collecting soil from each soil horizon for later analysis.
- At a minimum, a grab sample (large handful) of soil should be obtained from the rooting zone (generally 10 cm depth). This can later be analyzed for pH, percent soil moisture, soil texture, soil color, percent organic matter, soil nutrients (N, P, K) and other physical and chemical characteristics.
- In our sampling, we will use a simplified soil description that is part of the site factor data sheet, and we will collect soil samples from the rooting zone (about 10 cm) or the top of the first mineral horizon in organic-rich (peaty) soils.

Sample soil description form

due to promise of a sampt member or moters all soil sometity simples

Photo # 945-7-20121

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### Lab 2: Relevé Sampling Method

- Meet here at 2:15 next Wed.
- Walk to bicycle bump area.
- Bring back pack, hand lens, notebook, scotch tape, warm clothing, water, snack. I will provide data sheets.
- Read over lab and data sheets. These will be on the web site next Monday.
- Read Fesler, S. 1999. *North Campus Land: a land-use history*. Paper submitted to Dr. Richard Boone's class; focus on pages 12-15 "Potato Field". This is on 2-hr loan in the Biosiences Library.