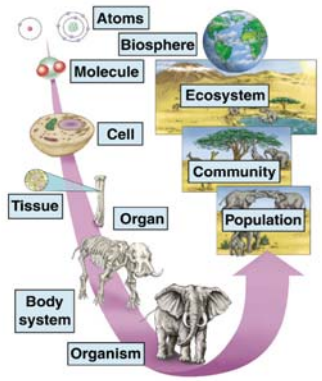
BES 316 2010

Describing Biological Communities

What IS a biological community ?

Spatial Scales of Organization in Biological Systems



from Raven & Berg (2004)

How do we describe a biological community ?

Physical characteristics of the biota: “Physical Structure”

Taxonomic characteristic of the biota: “Biological Structure”

Overall dominant physical structure of the vegetation

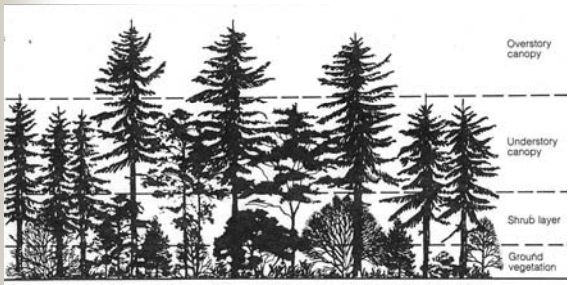
Prairie / meadow

Bunchgrass steppe

Shrubland

Forest

Complexity of vertical structure within the vegetation



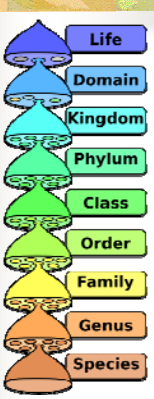
Kruckeberg (1991)

Complexity of horizontal structure within the vegetation

Biological Structure

I. Who is there?

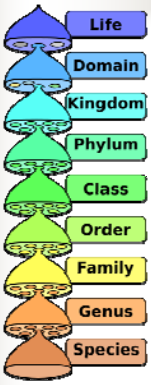
Descriptions by taxa



Biological Classification by taxa (taxonomic groups)

A simple description of the biological structure of a community in the campus wetlands

Growth Form	Species	Common Name
Tree	*Acer macrophyllum*	Big leaf maple
	Alnus rubra	Red alder
	Psuedotsuga menzeisii	Douglas-fir
	Populus trichocarpa	Black cottonwood
	Thuja plicata	Western red cedar
	Tsuga heterophylla	Western hemlock
Shrub	*Acer circinatum*	Vine maple
	Cornus sericea	Red-osier dogwood
	*Cytisus scoparius **	Scotch broom
	Lonicera involucrata	Twinberry
	Oemleria cerasiformis	Indian plum
	Physocarpus capitatus	Pacific ninebark
	Ribes sanguineum	Red-flowering currant
	Rubus spectabilis	Salmonberry
	Salix sitchensis	Sitka willow
	Spirea douglasii	Hardhack spirea
Herb	*Arctium minus **	Common burdock
	Athyerium felix-femina	Lady fern
	Blechnum spicant	Deer fern



Biological Classification by taxa (taxonomic groups)

Are we / should we

always be focused on describing the SPECIES in a community?

A simple description of the biological structure of a community in the campus wetlands

Growth Form	Species	Common Name
Tree	*Acer macrophyllum*	Big leaf maple
	Alnus rubra	Red alder
	Psuedotsuga menzeisii	Douglas-fir
	Populus trichocarpa	Black cottonwood
	Thuja plicata	Western red cedar
	Tsuga heterophylla	Western hemlock
Shrub	*Acer circinatum*	Vine maple
	Cornus sericea	Red-osier dogwood
	*Cytisus scoparius **	Scotch broom
	Lonicera involucrata	Twinberry
	Oemleria cerasiformis	Indian plum
	Physocarpus capitatus	Pacific ninebark
	Ribes sanguineum	Red-flowering currant
	Rubus spectabilis	Salmonberry
	Salix sitchensis	Sitka willow
	Spirea douglasii	Hardhack spirea
Herb	*Arctium minus **	Common burdock
	Athyerium felix-femina	Lady fern
	Blechnum spicant	Deer fern

What does this list

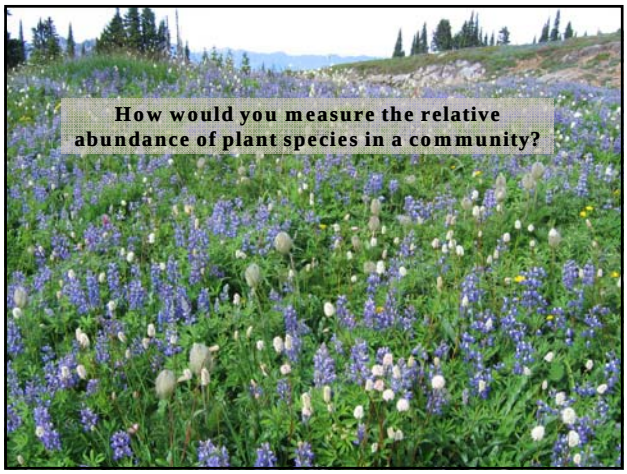
NOT

tell you about the community?

Biological Structure

I. Who is there?
- Descriptions by taxa
- Using "species"

II. Relative abundance of taxa



How do we measure the relative abundance of species in a community?

Some common measures of relative abundance

- **Number** *or* **Density** (# / area)
- **Frequency** (% of samples it is found in)
- **Cover** (space it occupies)
- **Mass** (weight or weight/area)
- **Productivity** (mass produced / time)

Comparing measures of species' relative abundance

COMMUNITY ATTRIBUTE	EASE OF MEASURE
Density	Easy (?)
Frequency	Easy
Cover	Moderate
Mass	Difficult
Productivity	Very difficult

Which measures might best reflect the relative "ecological importance" of species in a community?

Comparing measures of species' relative abundance

COMMUNITY ATTRIBUTE	EASE OF MEASURE
Density	Easy
Frequency	Easy
Cover	Moderate
Mass	Difficult
Productivity	Very difficult

Often selected as a middle ground solution

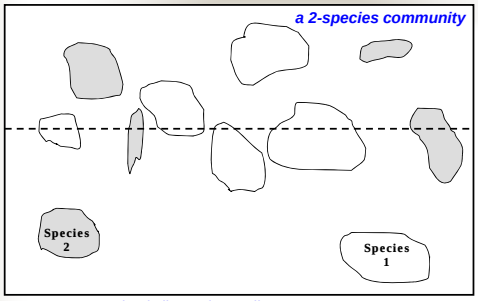
However, are more abundant species always more "important"?

How do we measure plant species' cover ?

1. Photographic / digitization techniques
2. Light attenuation
3. Transect intersection
4. Quadrat visual estimation

We will use these approaches

Transects: line intercept measures of cover



Transects are simply lines of sampling

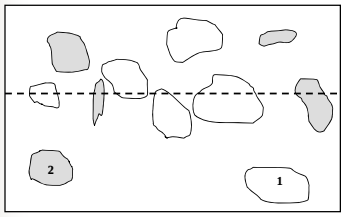
In this class we will use them to:

(1) sample plant cover with the line intercept approach

(2) locate quadrats for sampling

Transects: line intercept measures of cover

Calculating cover of Species 1



COVER

= (38 cm / 100 cm) x 100

= 38%

Interception distances: 12 cm; 8 cm; 5 cm; 13 cm

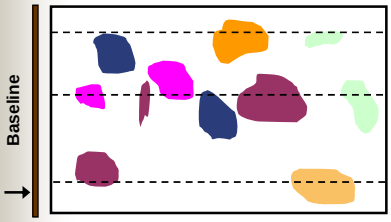
Total interception distance: 12 + 8 + 5 + 13 = 38 cm

Total transect distance: 100 cm

Transects: line intercept measures of cover

What you will do TODAY with transects

You will get two artificial communities



Different colors represent different species' canopies

- **Identify a baseline side**
- **Lay a meterstick along the baseline**
- **Choose a random # between 0 and 100 (cm) – locate it on meterstick**
- **Lay out your first transect at that point**
- **Sample cover along that transect**
- **Choose 2 more random numbers and lay out 2 more transects**

Quadrats: visual estimates of cover

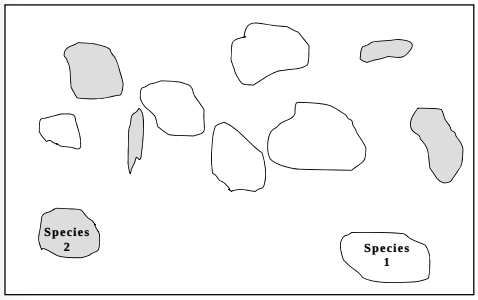
A quadrat is an enclosed area used for sampling

In vegetation measurements, quadrats are often used to assess the relative abundance of species based upon their canopy cover

The canopy cover of each species is visually estimated

Quadrats: visual estimates of cover

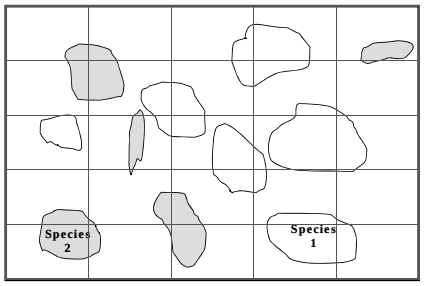
A 2-species community



It is challenging to estimate cover in a large area

Quadrats: visual estimates of cover

Quadrats are often sectioned off to make estimation easier – sampling grids

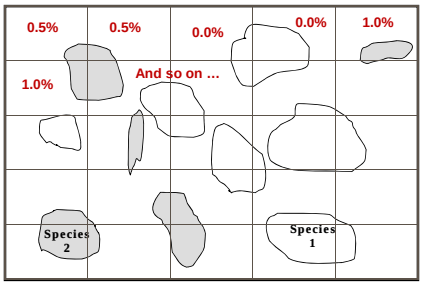


Each of the 25 grid units is 4% of the total area

Quadrats: visual estimates of cover

You go through each small square, adding up the % cover to get a total at the end.

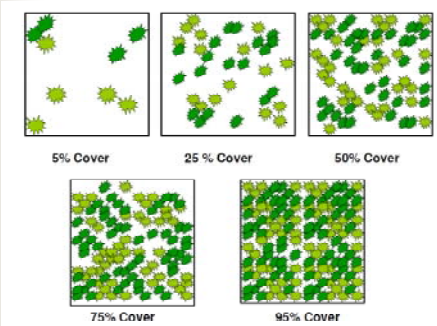
Partial example for species 2



Each of the 25 grid units is 4% of the total area

Quadrats: visual estimates of cover

A challenging method that requires trained observers

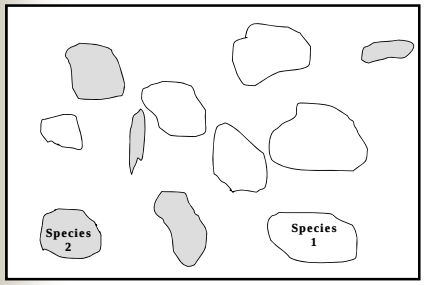


Quadrats: visual estimates of cover

Consensus estimates increase the accuracy greatly

Quadrats: visual estimates of cover

But sometimes when time is too short cover CLASSES are employed

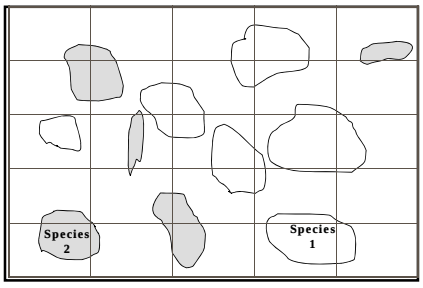


Daubenmire Cover Classes

1: 0 - 5 %
2: 5 – 25%
3: 25 – 50%
4: 50 - 75%
5: 75 - 95%
6: 95 - 100%

Quadrats: visual estimates of cover

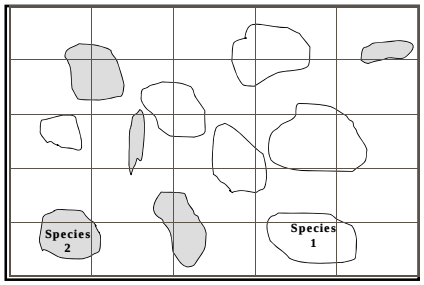
In the field on Thursday, we will use visual estimates by assessing small squares



BUT

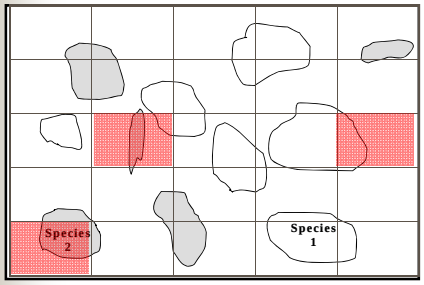
TODAY WE WILL USE THE SMALL SQUARES DIFFERENTLY.

PAY ATTENTION!



Using Quadrats TODAY

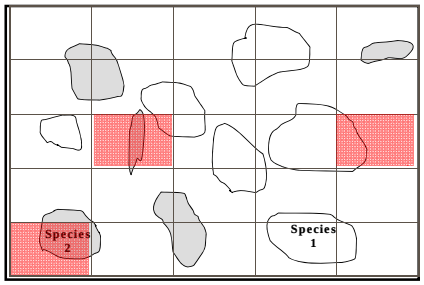
Today our sampling grid is used only to locate 3 sample quadrats



Each pink square is its own quadrat

Using Quadrats TODAY

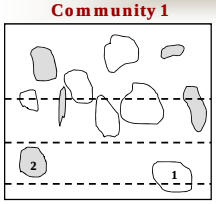
You will estimate cover of all species that occur within each of those 3 replicate quadrats



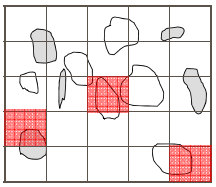
Each team will sample 1 community with transects & quadrats

Community 1

3 Transects



3 Quadrats



After you are done sampling come get the actual numbers & we will briefly discuss your results