

Density



Outline

- Definition & uses of density
- Methods to measure density
- Advantages & disadvantages of density
- Considerations for density
- Calculating & analyzing density

Definition and Uses of Density

- Definitions: **Be consistent!!!**
 - # counting units per unit area
 - Counting units = # individuals (genets)
 - Counting units = # groups of individuals (ramets)
- Uses:
 - To detect change in recruitment and mortality



Methods for Density

- Plot-based
 - Daubenmire or other quadrat
 - Belt transects
- Things to consider:
 - Various plot sizes and shapes
 - Must consider boundary error
 - Boundary error higher when perimeter:area is large (ex. small or long, narrow quadrats)
 - May consider including age classes (seedling, non-reproductive, reproductive)

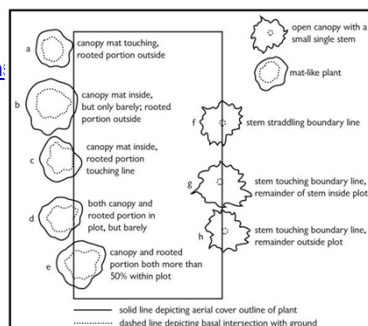


Quadrats/Daubenmire

Boundary Decision:

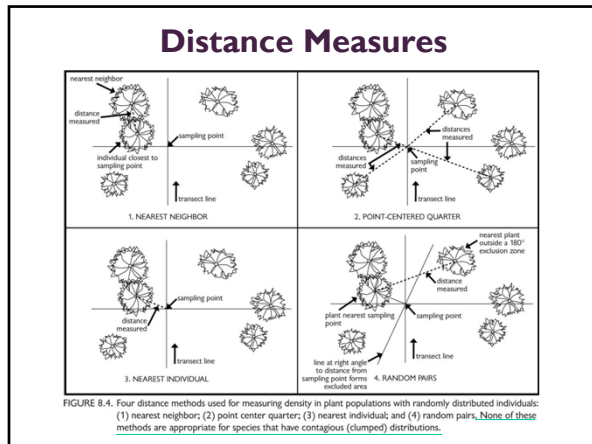
1. Two adjacent sides
2. Alternate plants
3. >50% of plant in

Apply decisions consistently!!!



Methods for Density

- Distance measures
 - Distance from one individual to another
 - Usually for large or scattered individuals
 - Calculate *average distance* and *mean area/plant* = density per unit area
 - Only for species with random distributions
 - Clumped distributions resolved by (sort of):
 - Wandering quarter method
 - T-square method



- ### Advantages of Density
- Not heavily influenced by plot size since expressed on area basis
 - Sensitive to changes in recruitment and mortality
 - Not sensitive to changes in phenology
 - Easy to measure

- ### Disadvantages of Density
- Time consuming
 - Difficult to define what is an individual
 - Comparisons only with similar life forms and size
 - Poor for long-lived species
 - Sometimes poor for annuals due to high interannual variability
 - Observer bias large if plants are cryptic or at high densities

- ### Disadvantages of Density
- Does not address plant vigor
 - Cover may be changing
 - Lacks information on reproductive output of population
 - Poor for species that respond to stress by reducing biomass or reproduction rather than mortality

Disadvantages of Density

<p>1995 <u>39 individuals</u> 14 reproducing 14 non-reproducing 11 seedlings</p>	1995	
<p>1996 <u>37 individuals</u> 4 reproducing 26 non-reproducing 7 seedlings</p>	1996	

Elzinga Fig. 8.2 p. 169

- ### Considerations for Density
- Quadrat design
 - Not too large to count accurately
 - Size and shape should consider plant distribution
 - Most efficient to use rectangle
 - Minimize variability in # of individuals/quadrat

Considerations for Density

- **Boundary rules**
 - Usually determined by what is rooted in plot
 - Addresses problem of changing plant vigor
 - Numerous rules to adopt – be consistent!
 - Count only plants touching two sides of quadrat or
 - Count every other plant touching all sides of quadrat or
 - Count individuals with >50% boundary in quadrat

Calculating Density

$$\frac{\# \text{ individuals}}{\text{area}}$$

Ex. *Pleuraphis rigida* $\frac{40}{100\text{m}^2} = 0.40/\text{m}^2$

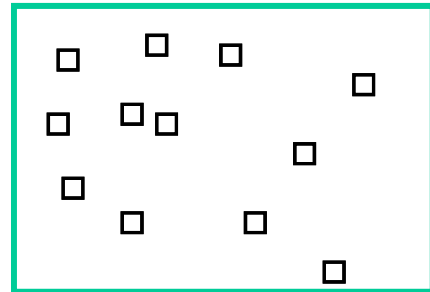
Ex. *Larrea tridentata* $\frac{7}{100\text{m}^2} = 0.07/\text{m}^2$

Ex. *Schismus arabicus* $\frac{2000}{100\text{m}^2} = 20/\text{m}^2$

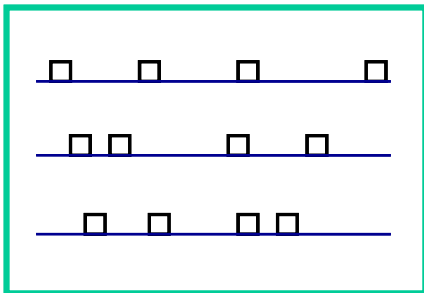
Analyzing Density

		Sampling Unit	
		Plots	Transects
Sample Independence	Independent	Independent sample t-test	Independent sample t-test
	Paired	Paired sample t-test	Paired sample t-test

What is the Sampling Unit?



What is the Sampling Unit?



What is the Sampling Unit?

