

Estimating Biodiversity

Introduction: You will learn two techniques scientists use to estimate the biodiversity of an area. You will look at biodiversity patterns and try to determine how various factors influence species distributions.

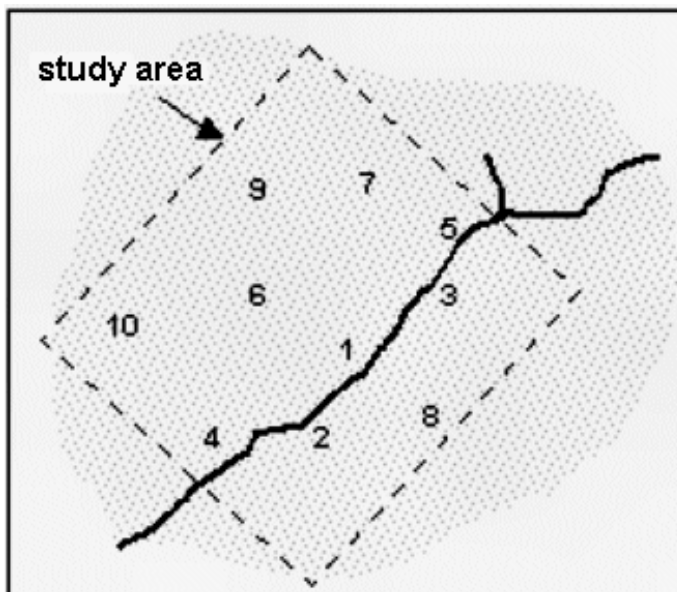
Key concepts:

- How may we estimate biodiversity?
- Most species are rare (see definition of abundance, p. 3).
- What kinds of species are likely to be missed in censuses of diversity (definition p. 3)?

Answer the questions below, then use these answers to answer 10 multiple-choice questions in **D2L Wk 5** (10 pts)

ESTIMATING PLANT DIVERSITY WITH QUADRATS

1. The figure (above) shows a map of your study area with 10 vegetation-sampling quadrats marked. A river runs through it, represented by a black line. "5" is next to the line, so plot 5 is near the river; "8" is not next to the line, so plot 8 is not near the river. **(1) List the locations that were sampled near the river. (2) How might the quadrats near the river differ from the other quadrats in terms of diversity and species-composition?**



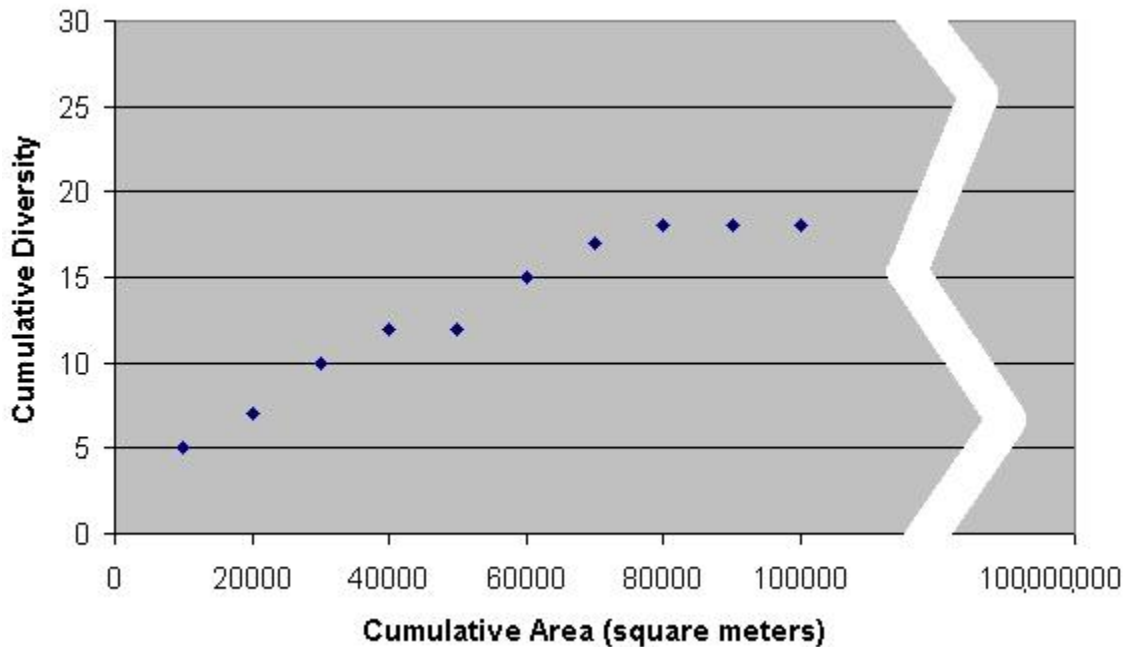
2. The side of each square quadrat is 100 m (0.1 km) long. **What is the area of each quadrat?** The study area you sampled (above) is 10 square kilometers. **What percentage of the entire study area did you actually sample, with 10 quadrats?** (1 pt. You can use the space below for calculations.)

3. Complete the data sheet below by summing up the number of individuals of each species, the number of species in each quadrat, and the cumulative number of species in all quadrats.

Then count the number of species in each individual quadrat, the number of species in the first five quadrats have been counted for you: 5, 6, 7 and 7 species. **What is the correct sequence of total species per quadrat in the remaining six quadrats?**

species name		ocotillo	creosote bush	triangle-leaf bursage	golden aster	velvet ash	desert broom	desert hackberry	spurge	saguaro	staghorn cholla	prickly pear	Fremont cottonwood	canyon ragweed	jumping cholla	blue paloverde	mesquite	barrell cactus	ironwood	turpentine bush	total species	cumulative species	
	1					15	3		1				8								1	5	5
	2	1				15	4						9				7	1				6	8
	3				1	15	5						10	2		1	9					7	11
	4		1			17	6				1		13			1	11					7	13
	5					18	5		2		2		9			1	6						
quadrat	6	1	7	1			5			1				1						1	2		
	7		7				1		1			1			1	6					1		
	8	1	3				3	1			9					6		1					
	9		2		2		5				3					1		1					
	10	1	7		1		3				1						1				1		
total individuals		4	27	1																			
total # quadrats		4	6	1																			

4. **Next** count the cumulative number of species in the ten quadrats in the graph in question 3, from 1 to 10. The cumulative number of species has been entered in the first four quadrats: 5, 8, 11, 13 species. There are 5 species in the first quadrat. In addition, there are three more species in the second quadrat, not in the first: ocotillo, mesquite and barrel cactus. In the third quadrat there are three species not in the first two ($5 + 3 + 3 = 11$). **What is the correct sequence of cumulative number of species in the remaining six quadrats?**



5. Species-Area Curve: Estimating Total Diversity

Each of the 10 quadrats has an area of 10,000 m². The first quadrat had 5 species in 10,000 m². The first two quadrats had 8 species, cumulatively, in 20,000 m². In the first three (30,000 m²) there were 11 species, in total. This relationship for all 10 quadrats is plotted above. With each increase in area, the cumulative number of species increases. However, the increase from quadrat to quadrat decreases asymptotically -- the curve "flattens out." Using the graph above, extrapolate from the end of the curve (100,000 m²) to the diversity of the entire study area (100,000,000 m²).

6. Return to the table in question 3. How many of the species occurred in only one quadrat? _____. What percent of the quadrats is that? _____

7. Again, using the table in question 3. Note the abundance (total number of individuals) for riparian species (see question 1; example, velvet ash), and the ubiquity of weeds such as desert broom (in 10/10 quadrats). Compare them with the number of species occurring in just one quadrat (question 6), which of these three kinds of plants (riparian, weedy vs. single-quadrat species) is most likely to be missed using this plant quadrat method for estimating plant abundance?