

Communities in landscapes

TABLE 15.1 The use of presence/absence data to analyze relationships among sites (Part 1)

(A) Typical presence/absence data^a

Species	Sites				
	A	B	C	D	E
1	1	1	0	0	1
2	1	1	1	0	0
3	0	0	1	1	1
4	0	0	1	1	0
5	1	0	1	1	0
6	0	1	0	0	1
7	0	0	1	1	1
8	1	1	0	0	0
9	1	1	1	0	0
10	0	1	1	0	0

^a The presence of a species in a site is indicated by a 1.

TABLE 15.1 The use of presence/absence data to analyze relationships among sites (Part 2)

(B) Reordered matrix^b

Species	Sites				
	A	B	E	D	C
8	1	1	0	0	0
1	1	1	1	0	0
9	1	1	0	0	1
2	1	1	0	0	1
6	0	1	1	0	0
10	0	1	0	0	1
5	1	0	0	1	1
3	0	0	1	1	1
7	0	0	1	1	1
4	0	0	0	1	1

^b A reordered matrix attempts to group sites that share species and species that share sites.

TABLE 15.1 The use of presence/absence data to analyze relationships among sites (Part 3)

(C) Matrix of Jaccard similarity values for the data in (A) or (B)

Site	Sites				
	A	B	C	D	E
A	1.00	0.57	0.33	0.13	0.13
B	0.57	1.00	0.30	0.00	0.25
C	0.33	0.30	1.00	0.57	0.22
D	0.13	0.00	0.57	1.00	0.33
E	0.13	0.25	0.22	0.33	1.00

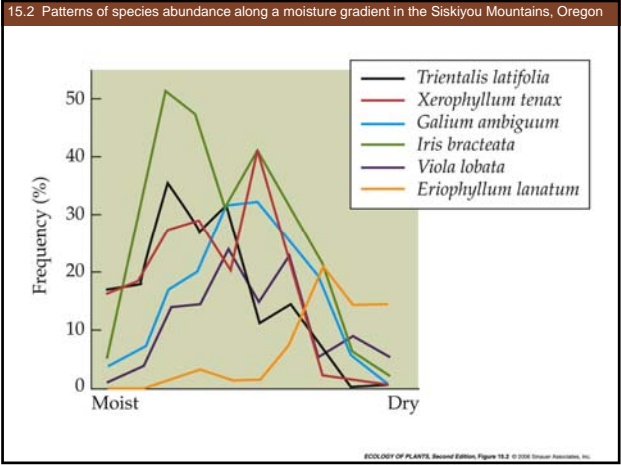
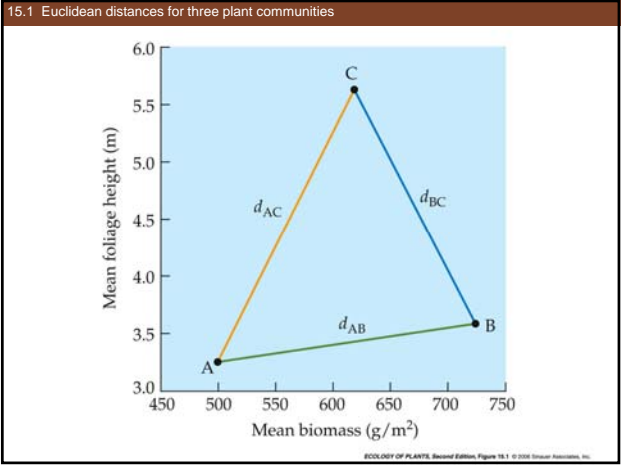


TABLE 15.2 Some similarity measures used by plant ecologists

Index	Formula	Index	Formula
Presence/absence indices			
Jaccard index	$S_J = \frac{a}{a+b+c}$	Abundance indices	
Sørensen-Dice index	$S_{SD} = \frac{2a}{2a+b+c}$	Percentage of similarity	$S_{PS} = \sum (p_{ij} - p_{ij}^2)$
Simple matching	$S_{SM} = \frac{a+d}{a+b+c+d}$	Asymmetrical percentage of similarity	$S_{AS} = \frac{\sum (n_{ij} - n_{ij}^2)}{\sum n_{ij} + \sum n_{ji}}$, for $n_{ij} \neq 0$
Ochilov index	$S_O = \frac{a}{\sqrt{(a+b) + \sqrt{(a+c)}}$	Minimum similarity	$S_{MI} = \sum \min(p_{ij}, p_{ji})$
Asymmetrical similarity	$S_{AS} = \frac{a}{2a+b}$	Bray-Curtis index	$S_{BC} = \frac{\sum \min(n_{ij}, n_{ji})}{\sum n_{ij} + \sum n_{ji}}$
		Morista's index	$S_M = \frac{\sum (n_{ij} p_{ij}^2 - p_{ij}^3)}{(\sum n_{ij} + \sum n_{ji})^2 - \frac{(\sum n_{ij} + \sum n_{ji})^2}{N_1(N_1 - 1)}}$

Definitions of symbols:
 a = number of species in both sites
 b = number of species in second site only
 c = number of species in first site only
 d = number of species in neither site

p_{ij} = the proportion of individuals in the *i*th species in sample *j* ($p_{ij} = n_{ij}/N_j$)
 n_{ij} = the number of individuals of species *i* in sample *j*
 N_j = the total number of individuals sampled
 $\min(x,y)$ = the smaller of the two values

Note: These indices differ in the factors they emphasize (e.g., common versus rare species) and their robustness to deviations in assumptions (Whittaker 1972; Janson and Vigilant 1981; Wolda 1981; Austin and Bellon 1982; McCulloch 1985).

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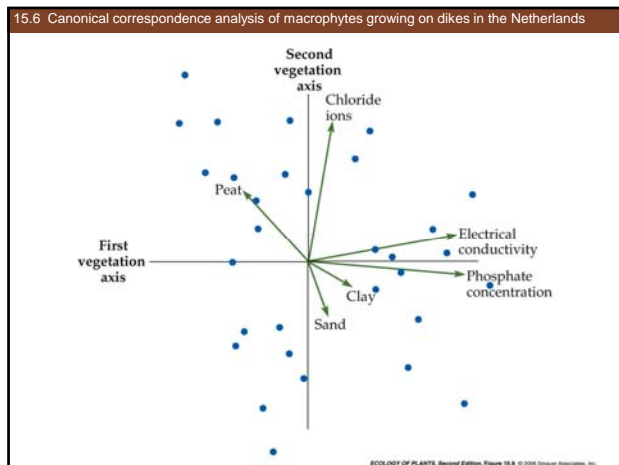
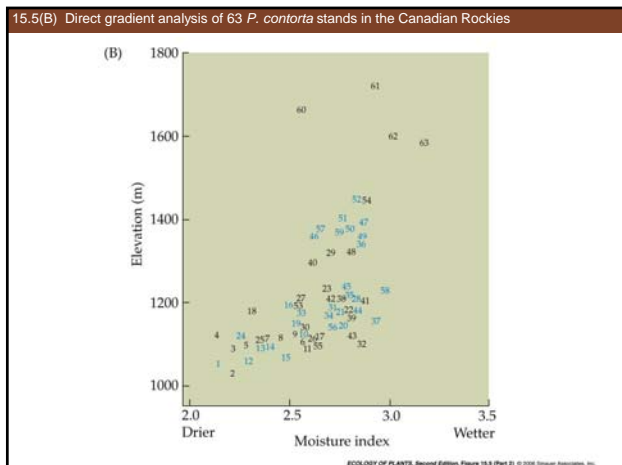
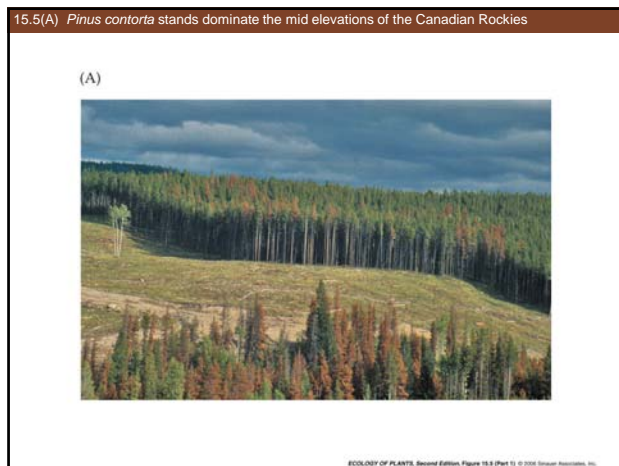
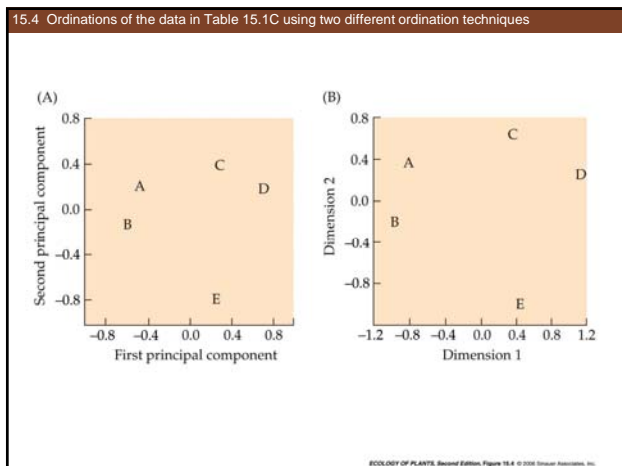
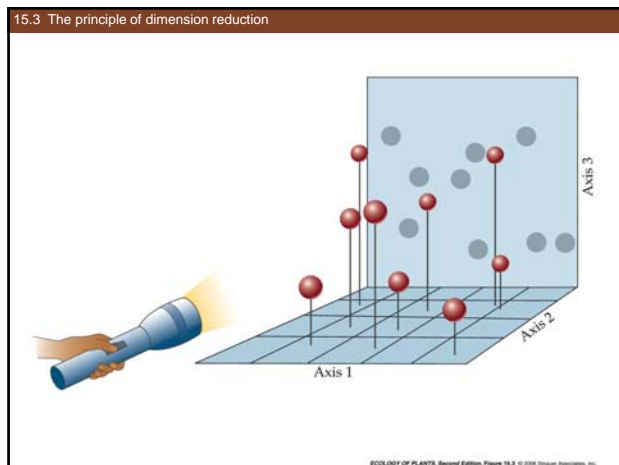


TABLE 15.3 An example of the classification of a North American plant community

Physiognomic categories
 Class Woodlands
 Subclass Mainly evergreen woodlands
 Group Evergreen needle-leaved woodlands
 Subgroup Natural/seminatural
 Formation Evergreen coniferous woodlands with rounded crowns

Floristic categories
 Alliance *Juniperus occidentalis*
 Association *Juniperus occidentalis/Artemisia tridentata*

Note: This classification follows the National Vegetation Classification system proposed by the Ecological Society of America. The classification uses a dual system in which higher categories are based on physiognomic criteria and finer-level categories are based on floristic criteria.

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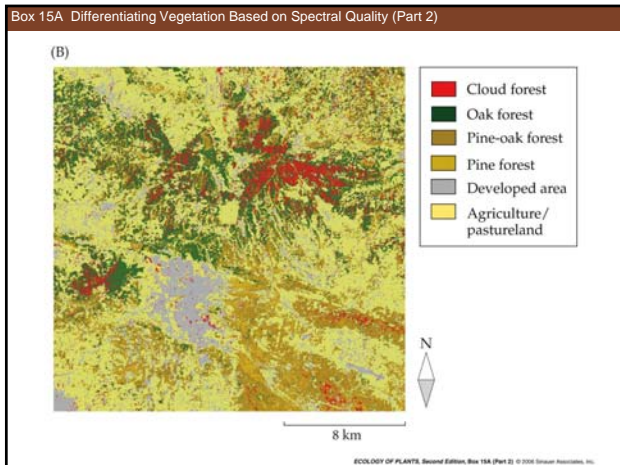
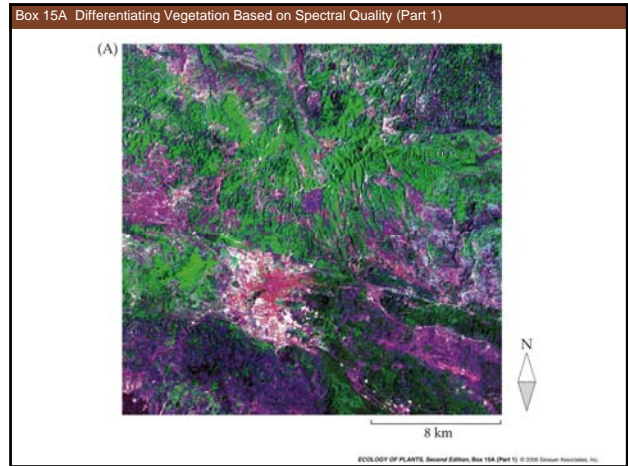
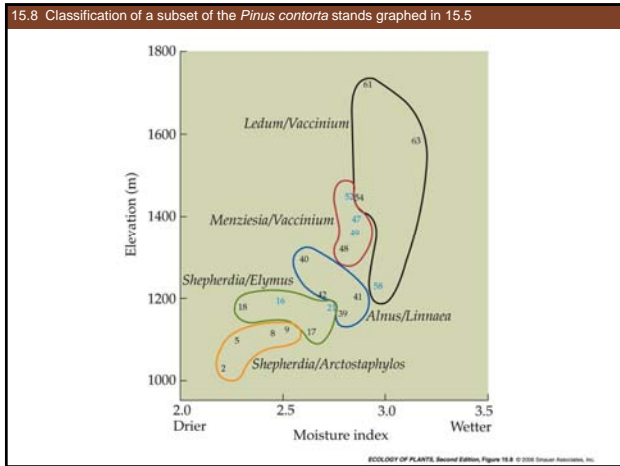
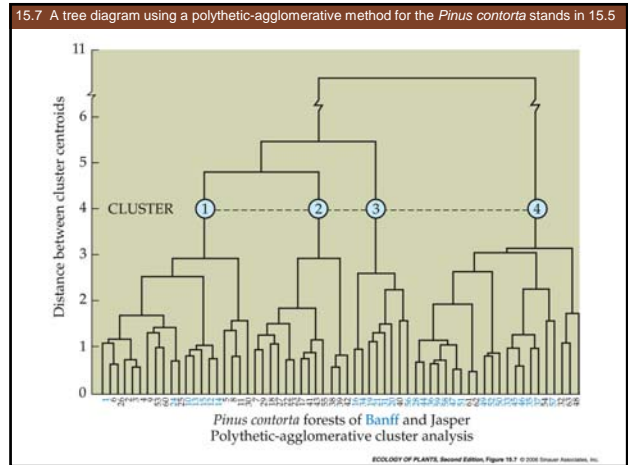


TABLE 15.4 Definitions of some diversity concepts

Inventory diversity
Measures: Species density; Shannon-Weiner index; Simpson's index
Spatial scale:
 1. Point diversity: The diversity of a single small or microhabitat sample within a community that is regarded as homogeneous
 2. Alpha (α) diversity: The diversity of a sample representing a single community
 3. Gamma (γ) diversity: The diversity of a landscape or a set of samples that includes more than one community
 4. Epsilon (ϵ) diversity: The diversity of a broader geographic area including different landscapes

Differentiation diversity
Measures: Mean similarity; percentage of species richness; turnover
Spatial scale:
 1. Beta (β) diversity: The difference in community composition between communities along an environmental gradient or among communities in a landscape
 2. Delta (δ) diversity: The difference in community composition between communities between geographic regions

Pattern diversity
Measures: Mosaic diversity; nestedness
Spatial scale: No explicit terminology

Sources: Whittaker 1977 and Scheiner 1992.

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TABLE 15.5 Two examples of nested landscapes

(1)									(2)									
Site									Site									
Species	A	B	C	D	E	F	G	H	Species	A	B	C	D	E	F	G	H	I
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0
2	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0
3	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0
4	1	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0
5	1	1	1	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1
6	1	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	0
7	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0
8	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

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