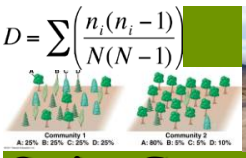
$$D = \sum \left(\frac{n_i(n_i - 1)}{N(N-1)} \right)$$



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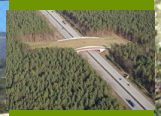
Option C
Ecology and Conservation
C.4- Conservation of Biodiversity



Essential idea:

- Entire communities need to be conserved in order to preserve biodiversity.

Nature of science:

- Scientists collaborate with other agencies
  - the preservation of species involves international cooperation through intergovernmental and non-governmental organizations. (4.3)

WWF 50 YEARS OF CONSERVATION THANK YOU FOR YOUR SUPPORT

WDCS Whale and Dolphin Conservation Society

International Animal Rescue internationalanimalrescue.org

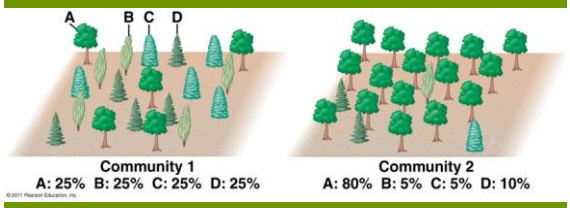
IFAW International Fund for Animal Welfare

Understandings

- An indicator species is an organism used to assess a specific environmental condition.
  - Occur when certain environmental conditions exist.
    - Fruticose lichens indicate clean air
    - Black greasewood indicate alkaline soil.
    - Mojave Indigobush (*Psorothamnus arborescens*)

Understandings

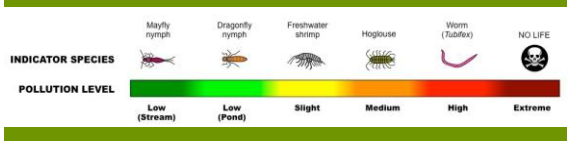
- Richness and evenness are components of biodiversity.
  - Number of species(richness)
  - How close abundance of each species is to each other(evenness)



Understandings

- Relative numbers of indicator species can be used to calculate the value of a biotic index.
  - Biotic Index is the relative frequency of an indicator species.
  - Benthic macroinvertebrates are a good measure of stream health.

Taxa	Relative abundance		Relative frequency		Indicator value	
	Água Boa	Perobão	Água Boa	Perobão	Água Boa	Perobão
Miathyria	100	0	36	0	**36**	0
Zenithoptera	100	0	36	0	**36**	0
Erythrodiplax	6	94	18	50	1	**47**
Libellula	0	100	0	58	0	**58**
Macrothemis	3	97	9	58	0	**57**
Progomphus	4	96	27	83	1	**80**
Tramea	6	94	27	58	2	**55**



Simpson's Reciprocal Index of Diversity

- The formula for Simpson's reciprocal index of diversity is:

$$D = \frac{N(N-1)}{\sum n(n-1)}$$

- *D* = diversity index
- *N* = total number of organisms of all species found
- *n* = number of individuals of a particular species.

Using the Simpson Diversity Index

Remember!!!
This calculates Simpson Index
1/D is the reciprocal

$$D = \sum_{i=1}^{S} \frac{n_i(n_i-1)}{N(N-1)}$$

Species	Sample 1	Sample 2	Sample 3
1	10	20	100
2	10	20	1
3	10	10	1
4	10	10	1
5	10	2	1

$$D_1 = \frac{\sum n_i(n_i-1)}{N(N-1)}$$

$$D_1 = \frac{10(9)+10(9)+10(9)+10(9)+10(9)}{50(49)}$$

$$D_1 = \frac{90+90+90+90+90}{2450} = \frac{450}{2450} = 0.2$$

$$D_1 = \frac{\sum n_i(n_i-1)}{N(N-1)}$$

$$D_1 = \frac{20(19)+20(19)+10(9)+10(9)+2(1)}{62(61)}$$

$$D_1 = \frac{380+380+90+90+2}{3782} = \frac{942}{3782} = 0.3$$

$$D_1 = \frac{\sum n_i(n_i-1)}{N(N-1)}$$

$$D_1 = \frac{100(99)+1(0)+1(0)+1(0)+1(0)}{104(103)}$$

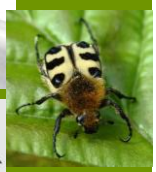
$$D_1 = \frac{9900+0+0+0+0}{10712} = \frac{9900}{10712} = 0.9$$

$$D = \sum \left(\frac{n_i(n_i-1)}{N(N-1)} \right)$$

- **Sample 1:** Simpson's Index: 0.2
  Simpson's Reciprocal Index: 5
- **Sample 2:** Simpson's Index: 0.3
  Simpson's Reciprocal Index: 3.3
- **Sample 3:** Simpson's Index: 0.9
  Simpson's Reciprocal Index: 1.1

Applications

- Skill: Analysis of the biodiversity of two local communities using Simpson's reciprocal index of diversity. (Activity 639)
  - *Trichius fasciatus*
  - *Aphodius lapponum*
  - *Cicindela campestris*
  - *Stenus geniculatis*

Understandings

- *In situ* conservation may require active management of nature reserves or national parks.
  - Area preserves the habitat and communities that the organisms are adapted to.
    - Control grazing
    - Remove alien and invasive species
    - Limit predation
    - Control poaching
    - Feed organisms
    - Control access


Understandings

- *Ex situ* conservation is the preservation of species outside their natural habitats.
  - Removal of organism from natural habitat
  - Botanical gardens
  - Breeding programs




Applications

- Application: Case study of the captive breeding and reintroduction of an endangered animal species. (read 637-638)
  - Peregrine falcon (*Falco peregrinus*)
  - 1973: Gone in Southern Alberta, with few in Northern Alberta
  - DDT in 60's-70's create weak shells.
    - Replaced thin-eggs with porcelain eggs and incubated the real eggs.
    - Returned hatchlings to wild peregrines or foster prairie chickens.

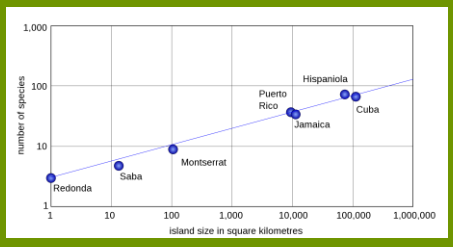


Understandings

- Biogeographic factors affect species diversity.
  - Large reserves are more effective (Island Biogeography)
  - Connecting with reserves wildlife corridors are more effective than isolated
  - Circular more effective than extended

Applications

- Application: Analysis of the impact of biogeographic factors on diversity limited to island size and edge effects. (DBQ 640-641)
  - Estimate how many species are on an island of 10,000 km^2.



Applications

- Application: Analysis of the impact of biogeographic factors on diversity limited to island size and edge effects. (DBQ 640-641)
  - What is the relationship between number of species and island area?