

1. Introduction to Niche Theory

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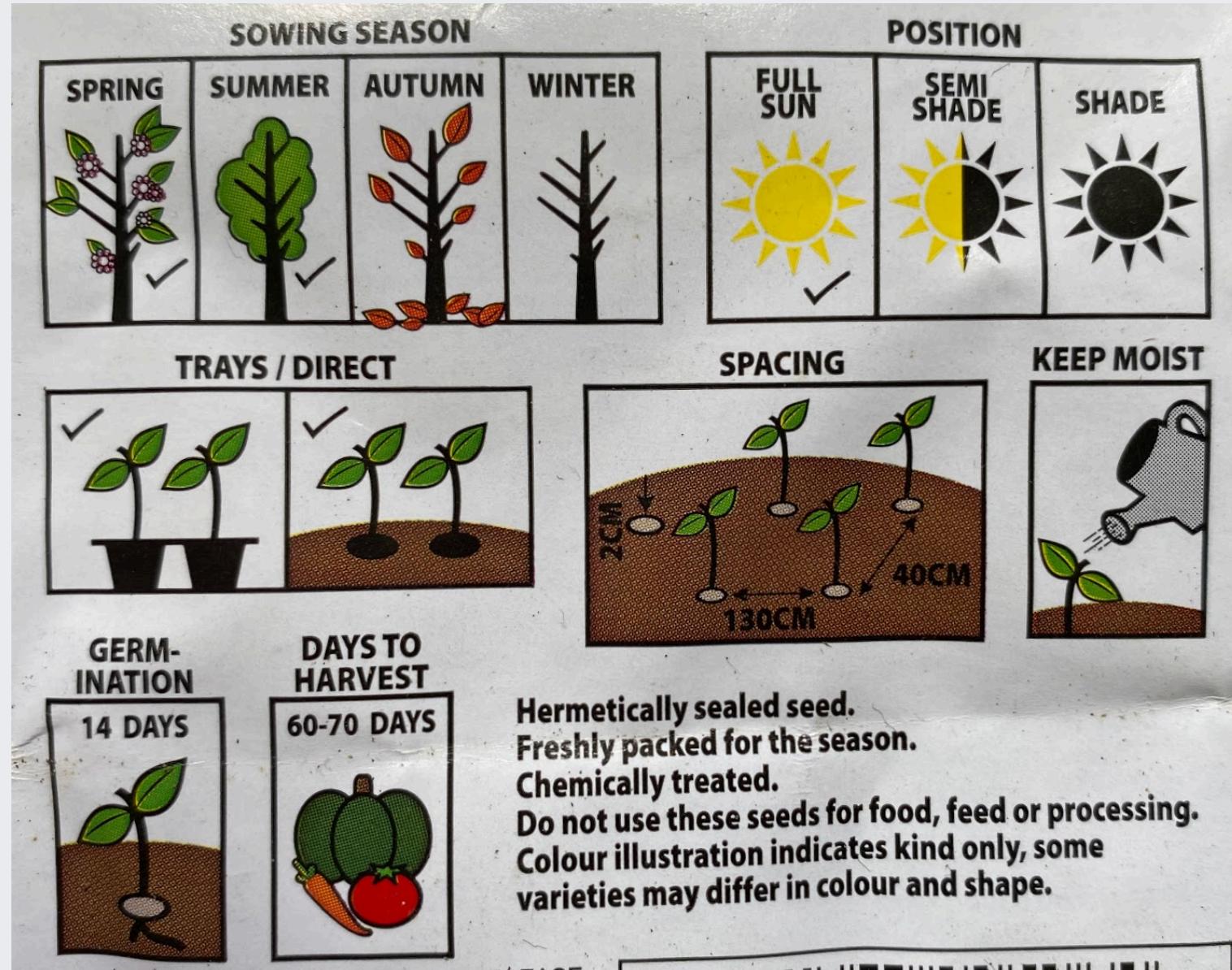




image: Mauricio Antón, CC BY 3.0

This module is about **formalising scientific definitions for the niche** and exploring how **this allows us to develop theory** to help understand and predict various aspects of biodiversity.

Early observations of the Niche



Carl Ludwig Willdenow, 1765-1812

image: Wikipedia

Perhaps the first to recognize the role of climate in determining the geography of plants, with vegetation organised in latitudinal and elevation zones.



***Willdenowia sulcata*, The "Groovy Sunreed" or Sonkwasriet, Restionaceae**

image: Tony Rebelo CC BY-SA 4.0

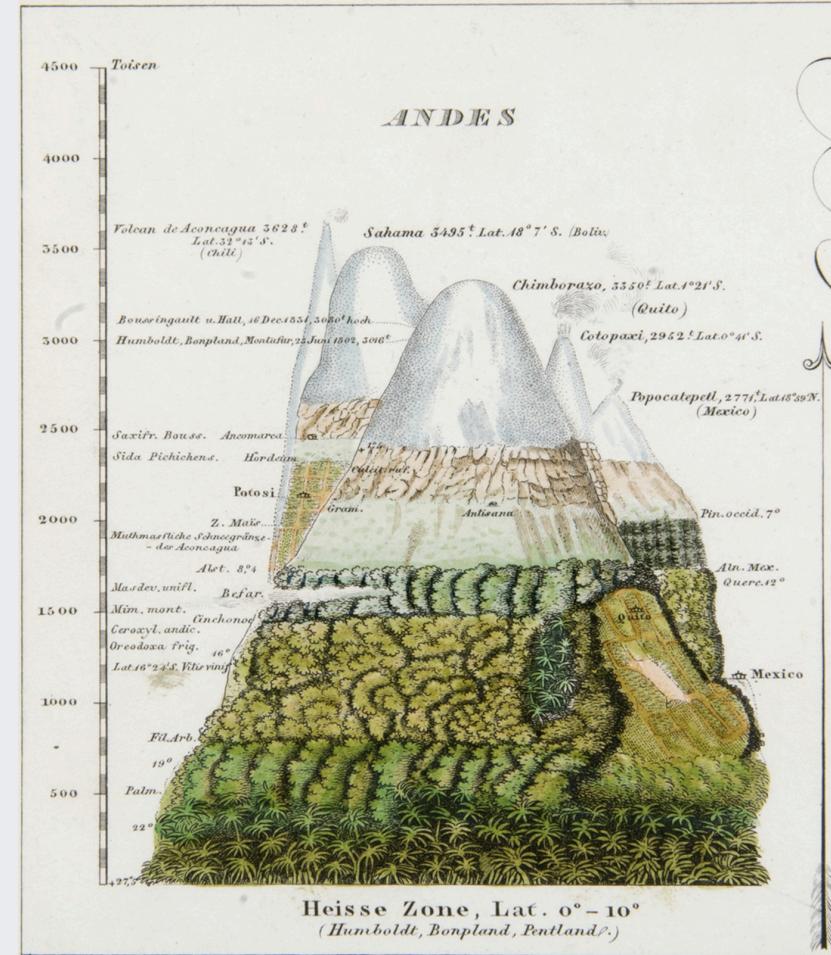
Early observations of the Niche



Alexander von Humboldt, 1769-1859

A friend of Willdenow, and first to test his ideas.

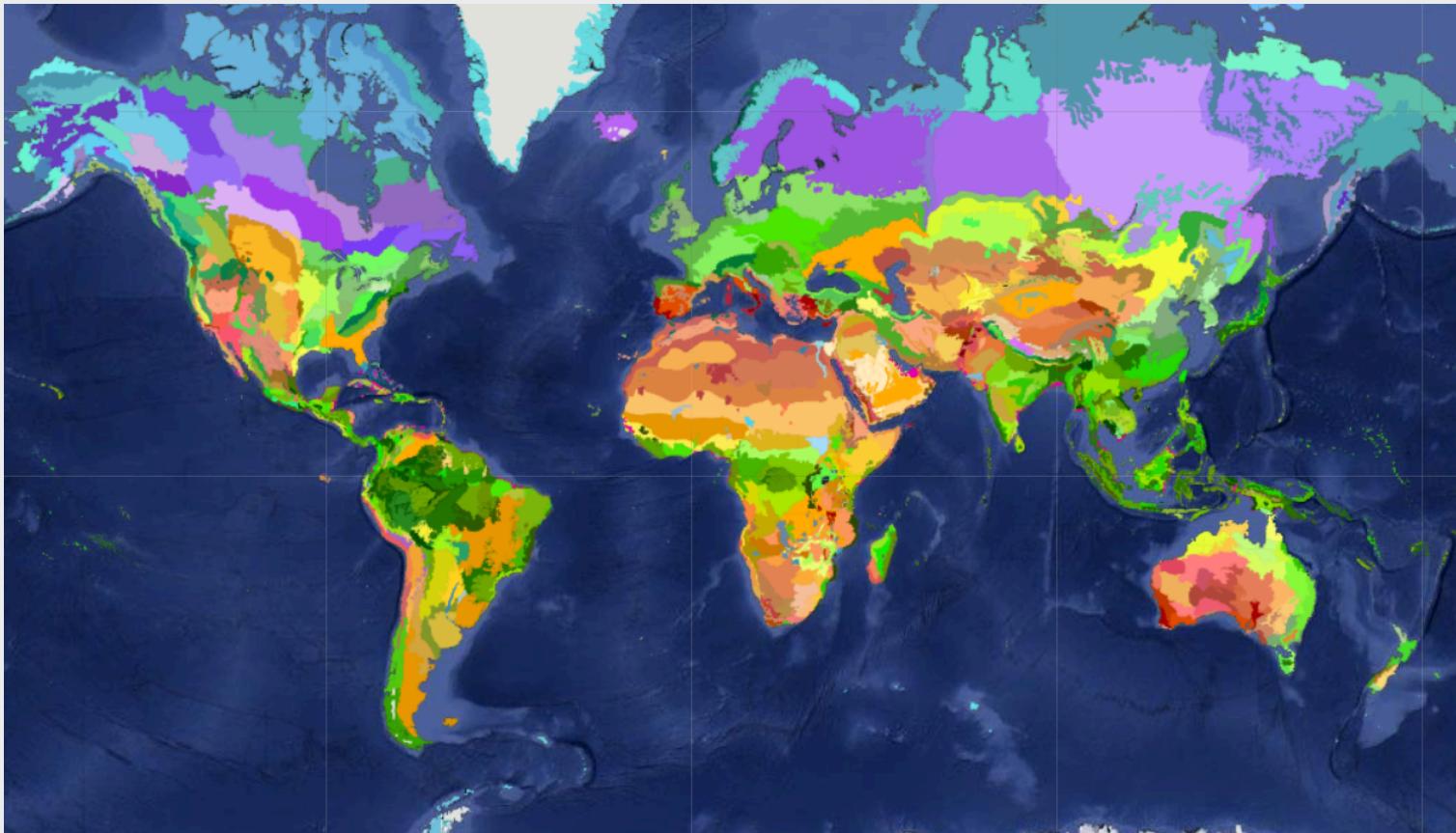
painting by: Joseph Karl Stieler, 1843



Essay on the Geography of Plants, von Humboldt and Bonpland (1805) documents repeated vegetation zones with elevation in the Andes.



Climate zones and biomes



<https://ecoregions.appspot.com/>

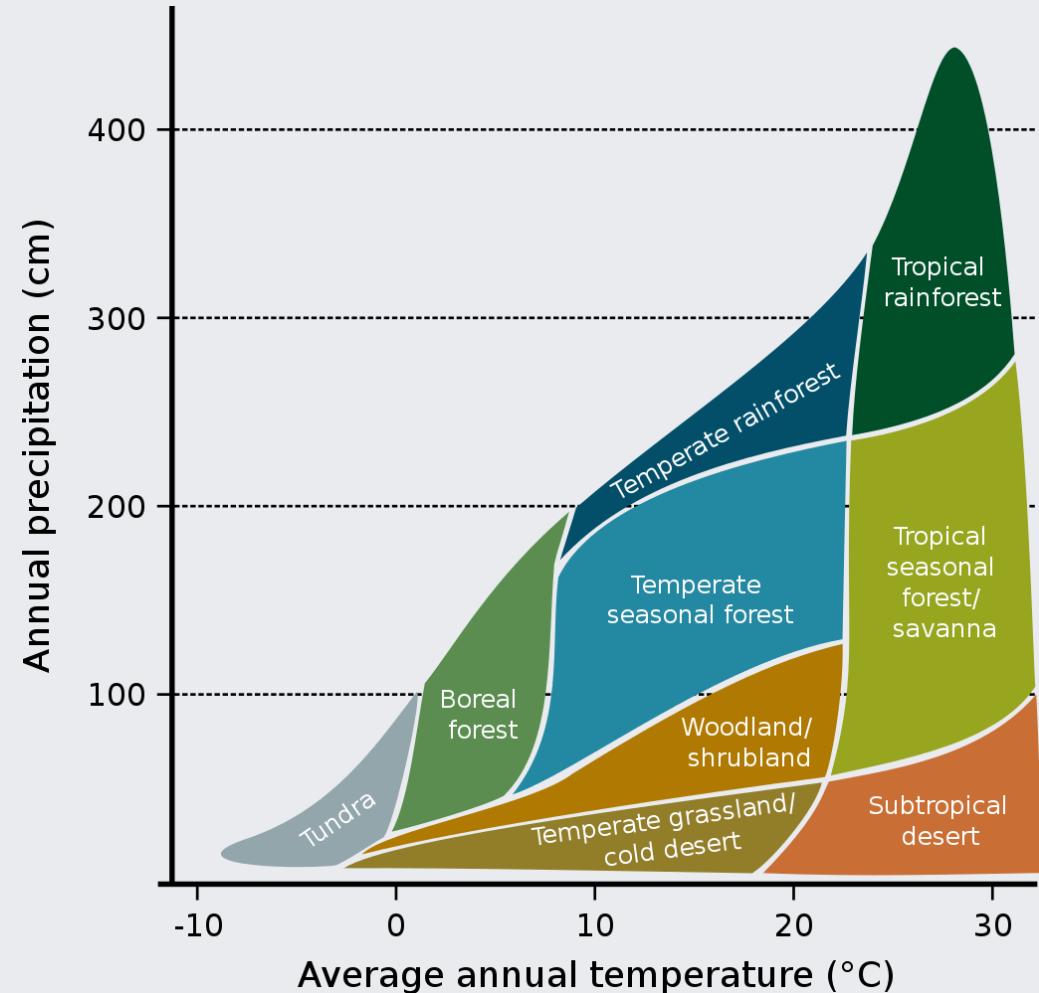
Climate zones and biomes

Here is RH Whittaker's mapping of biomes against two major axes of climate variation.

He wasn't the first to do this, but the "Whittaker plot" is one of the best known.

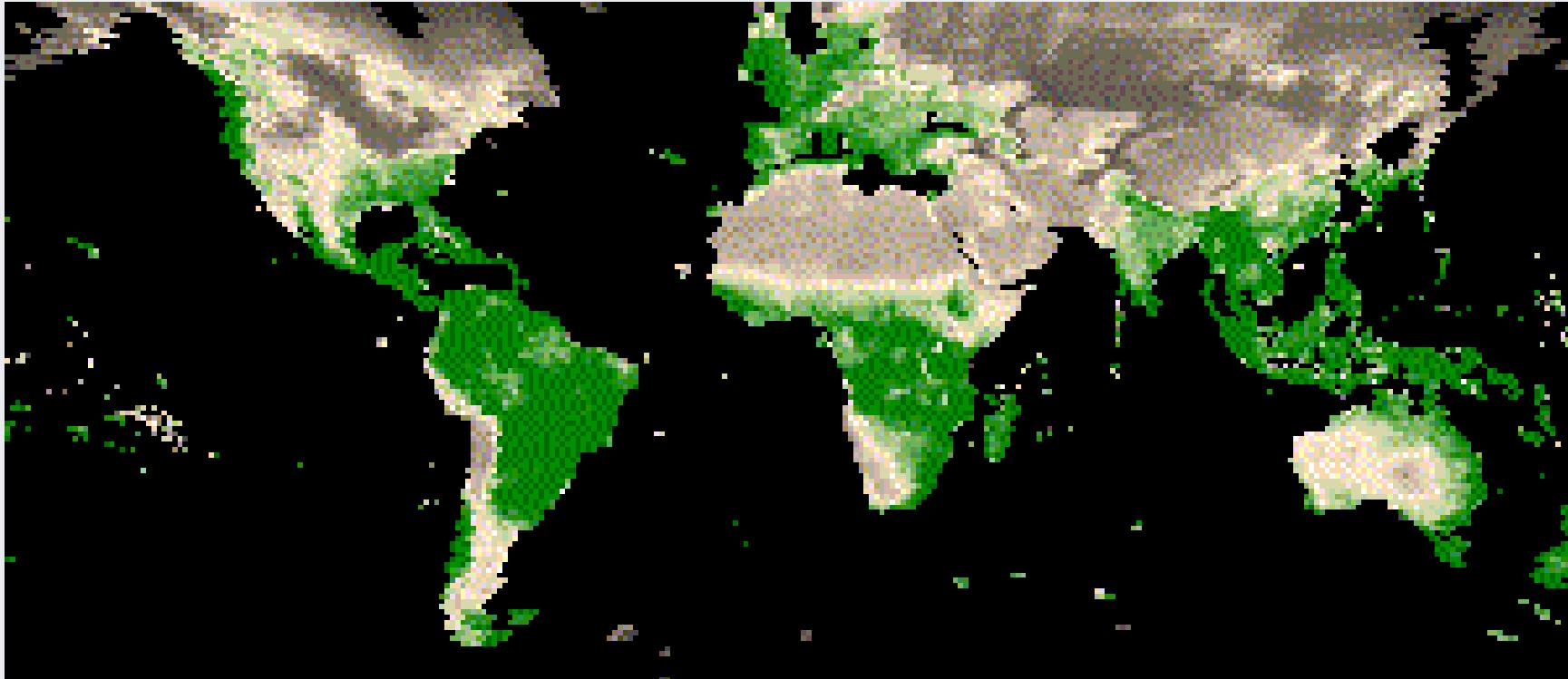
The biomes align reasonably well with temperature and precipitation.

The biomes are largely defined by the dominant plant functional types.



Whittaker 1975

Hang on?



We started by talking about growing vegetables and now we're looking at the whole world?

The Hierarchy of Ecology

Individual organism

Populations are groups of interacting individuals of the same species.

Communities are groups of interacting individuals or populations of different species.

Ecosystems are the combination of biotic communities and their physical environment.

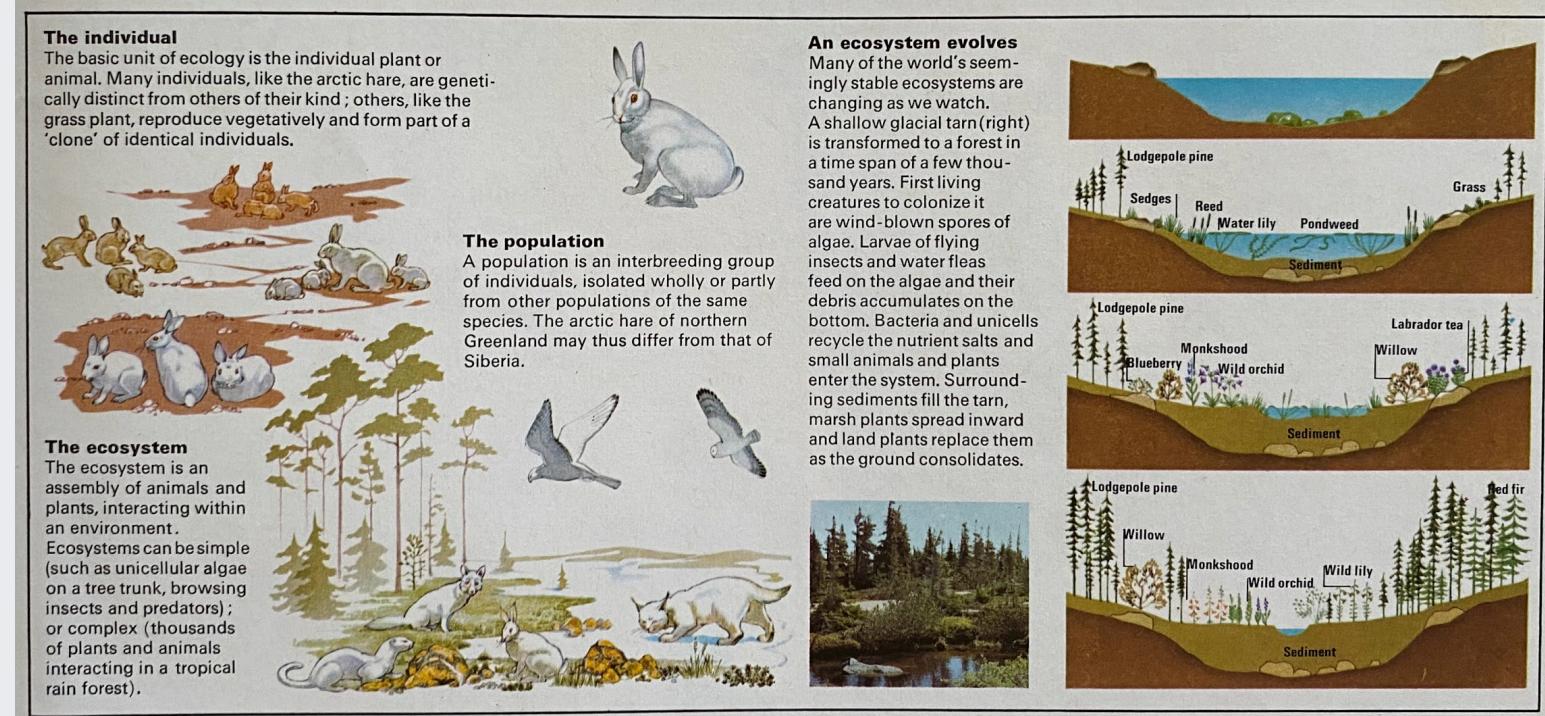


image: *The Atlas of World Wildlife* 1973

The Niche Concept and the Hierarchy of Ecology

The Niche Concept is **typically applied at the level of species**, but has implications for higher order levels of the hierarchy - i.e. populations, communities, ecosystems (including biomes or the whole biosphere).

"The niche concept is not always used explicitly in theories at all these levels of organization, but it provides an important, if sometimes implicit connection between these disparate fields of ecology that justifies its status as a fundamental ecological concept." - **Leibold 1995**

Take-home

While the idea that species have particular environmental preferences/requirements and that they play specific roles in ecosystems is as old as life itself, the formal recognition and development of definitions of the niche allows us to develop more sophisticated theory in ecology and evolution.

Niche theory has its roots in early biogeographic observations about the geography of plants by Willdenow, von Humboldt and others.

While the niche concept has implications for other levels of the ecological hierarchy (populations, communities, ecosystems, biomes), it is typically applied at the level of species.

Thanks!

Slides created via the R packages:

xaringan
gadenbuie/xaringanthemer

The chakra comes from remark.js, **knitr**, and R Markdown.