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Ecology for Garden Design

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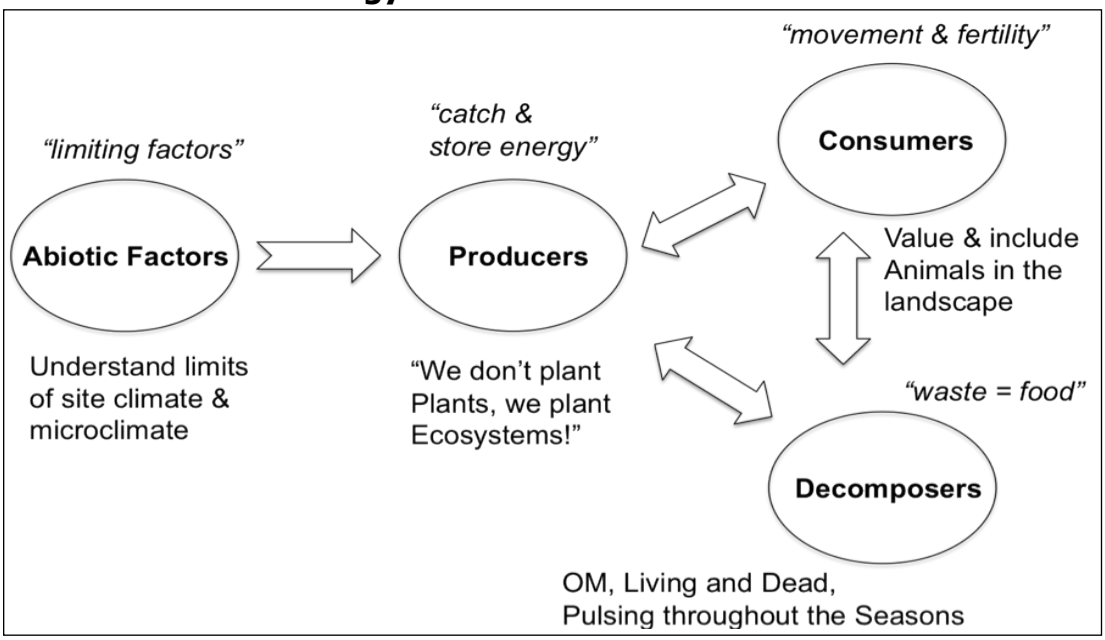
www.gardening.cornell.edu/polycultures

Ecology Defined
Oikos = home
Early ecology: Study of the relationship between organisms and their environment
Later: Study of the relationship between organisms, their environment, *and each other*

Resource: Paradise Lot website (http://paradiselotblog.wordpress.com/). Eric Toensmeier and Jonathan Bates authored *Paradise Lot* book published by Chelsea Green. This **Edible Forest Garden Tasting Workshop** 4-minute video provides a look at the 1/10 of an acre urban backyard garden in Holyoke, Massachusetts they manage with their families (https://vimeo.com/81538941)

A Framework for Ecology:



ABIOTIC FACTORS

Non – living elements of the ecosystem such as *Precipitation, Landform, Sun, Soil, Geology, Climate, Microclimate, Wind, Water,*

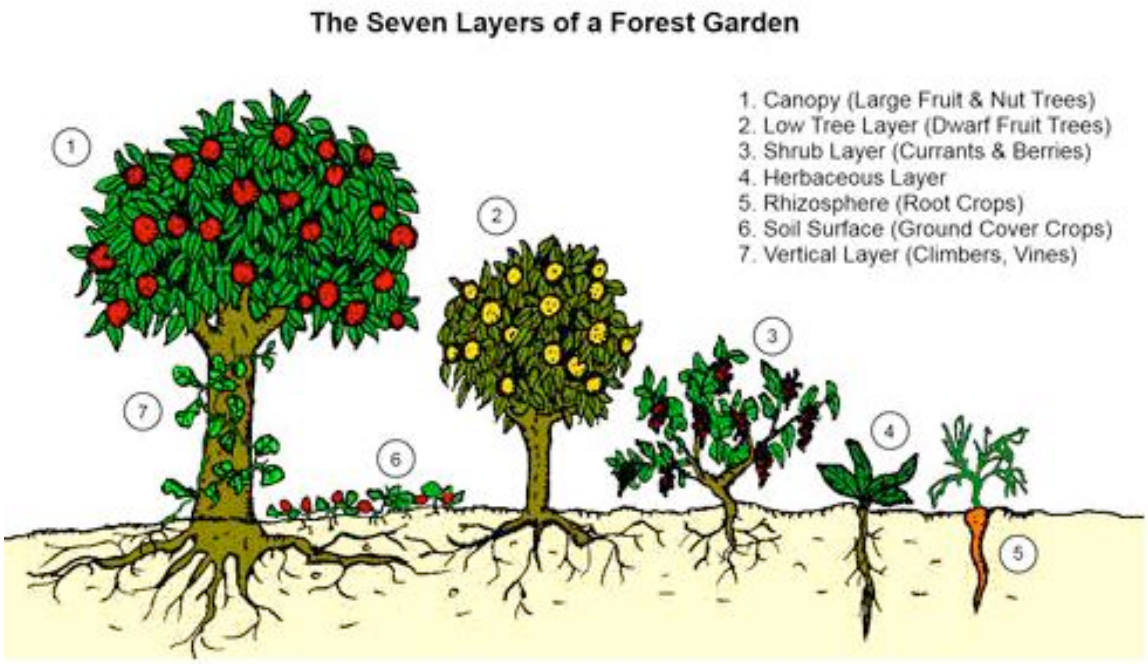
"Limiting Factor": An environmental variable that limits or slows the growth of an organism/system: *Sets limits to what we can do!*

Examples:
a. *Hardiness Zones:* see **www.planthardiness.ars.usda.gov/**
b. *Rain Gauge* and other ways to monitor your site
c. *Sector Analysis* - observations are mapped based on elements affecting the site from the outside. See **gardening.cornell.edu/sectors** video on how to make your own map.
d. *Microclimate;* combinations of sun/shade/hot/cool/dry/wet patterns

PRODUCERS: (plants) "Catch & Store Energy"

- Only organisms that can Photosynthesize sunlight
- Transform this energy source to wood, seeds, fruits, roots, & shoots
- Biomass production – the *root of ecosystem wealth*

Problems: Loss of agrobiodiversity & relationships to animals, fungi
Solutions: POLYCULTURE, STACKING, RELOCALIZING BREEDING



Source: Wikipedia.org

CONSUMERS (animals)

- Move fertility, seed, pollen, materials
- Eat, dig, aerate, haul, control population, make new habitats
- Some upcycle low-quality forage to high quality proteins

Domestic Animals: often raised for a single purpose; better as integrated
Wild Animals: often seen as pests only, have important ecological functions
RESOURCE: *http://www.patternliteracy.com/150-the-watershed-wisdom-of-the-beaver*

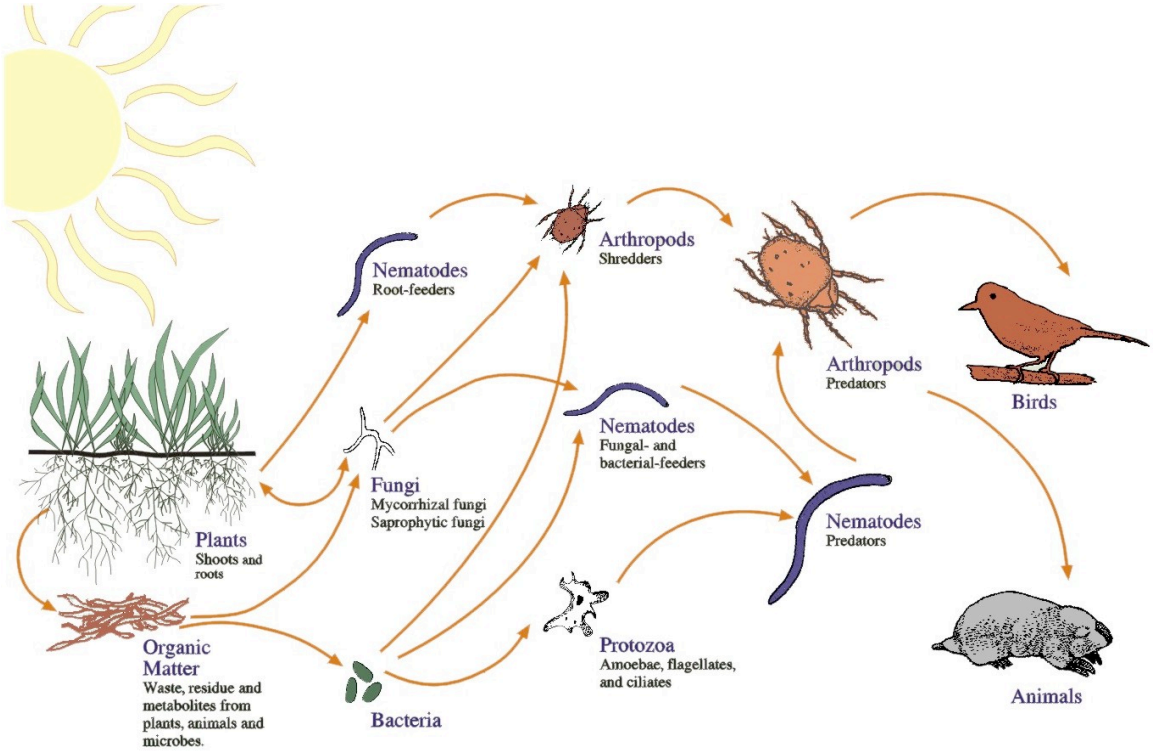
If you don't have animals on site, then you will need to "import fertility!!"

- purchasing/acquiring animal wastes from other sources
- attracting birds = phosphorus AND pest control

DECOMPOSERS

- Animals, fungi, bacteria, etc - "the creepy crawlies"
- Break the wastes of others down into new forms

2/3 of ECOSYSTEM biomass goes directly to decomposers



Source: http://www.soilfoodwebnewyork.com/

How do we value decomposers?

- Eww! Gross! It's going to kill me!
- An afterthought in implementation of plantings
- Add "stuff" to soil, don't cultivate as a living system

ALL ECOSYSTEM DESIGN SHOULD BEGIN WITH SOIL BULDING. THE PRIMARY YIELD IN YEAR ONE AND TWO SHOULD BE HEALTHY, LIVING SOIL

Achieving soil health:
Diverse forms of Organic Matter, Living and Dead,
Pulsing throughout the season

DIVERSE FORMS OF ORGANIC MATTER
Dead: Wood chips, straw, leaves, brush
Living: Cover Crops, living mulch plants

PULSING ACROSS SEASONS
Spring: Compost teas, top dress with compost
Summer: Keep soil covered, cover crop successions
Fall: Mulching crop residues
Winter: add manures to soil

OTHER STRATEGIES:
- Reducing tillage requency/depth
    Bacteria glue together small aggregates (clumps of soil)
    Fungi glue them into larger aggregates.
    Tilling breaks these aggregates apart and they have to start all over!

- Soil organisms live in the rhizopshere "root zone" – plant diverse root structures!
    Decompactors: Daikon/tillage radish
    Nitrogen Fixers: Alder, Indigo, Clover
    Nutrient Accumulators: Comfrey, Sorrell, Yarrow

RESOURCE: BUILDING SOILS FOR BETTER CROPS, a SARE publication available FREE online at : http://tinyurl.com/bettersoilsbettercrops

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Cornell Garden Based Learning