

Biology and the hierarchies of life

Common names are confusing with respect to taxonomy



FIGURE 2.1 White pine trees of the genus and species *Pinus strobus* growing in the Pacific Mountains of Pennsylvania (a) and so-called Norfolk Island pines of the genus and species *Araucaria heterophylla* growing on Norfolk Island in the South Pacific (b). Although both species are called pines, they are unrelated, and only white pine is actually a member of the pine genus.

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What is a "buzzard?"



www.barrywales.co.uk/hawkingcentre/buzzard.htm



www.frc.fi.cmu.edu/projects/buzzard



www.nps.gov/bicy/bvulture.htm



<http://mikami.image.pbse.com/u46/adventuresofstar/small/29443355.HealesvilleBlackBuzzard.jpg>

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Genus: related organisms

Species: consistently distinguishable from other organisms

Two species of genus *Pinus*



FIGURE 2.2 The needles, cones, and shapes of a mature eastern white pine (*Pinus strobus*) and a western lodgepole pine (*Pinus contorta*). Notice that both pine species share a general resemblance but possess clear differences in terms of their needles, cones, and mature form.

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TABLE 2.1 A Systematics (Taxonomic Hierarchy) of Eastern White Pine (*Pinus strobus*) and Humans (*Homo sapiens sapiens*)

	White Pines	Humans
Species	<i>Pinus strobus</i>	<i>Homo sapiens sapiens</i>
Genus	<i>Pinus</i>	<i>Homo</i>
Family	Pinaceae	Hominidae
Order	Coniferales	Primates
Class	Gymnospermae	Mammalia
Phylum	Tracheophyta	Chordata
Kingdom	Plantae	Animalia

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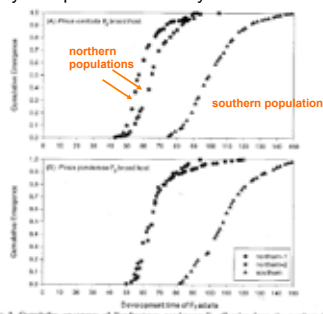
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Populations of mountain pine beetle exhibit variability in important life history traits

Development time



Bentz et al., 2001

FIG. 2. Cumulative emergence of *Diabrotica ponderosa* F₁ offspring from the northern (A), northern (1), and southern source populations raised in their respective (1) and *D. ponderosa* (B).

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Communities

Eucalypt woodland in Australia



www.environment.act.gov.au/nativeplantsandanimals

Alpine meadows in Canada



www.alpine-club.mb.ca

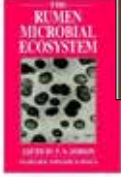

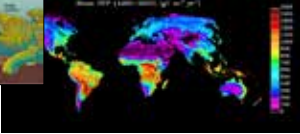
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Ecosystems

www.scienceclarified.com/Di-E/VEcosystem.html

Hicke, Global Biogeochem. Cycles, 2005

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Biomes




FIGURE 6.11 World distribution of major terrestrial biomes. Biomes that are composed of a single species (e.g., grasslands) are shaded in light gray, whereas those composed of multiple species (e.g., tropical rainforests) are shaded in dark gray. The distribution of biomes is determined by the interaction of climate and geography.

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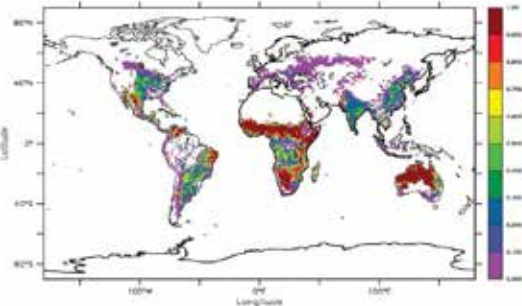


Figure 6. The C₄ biomes of the vegetation. Values below 6000 are annual cm. Still et al., 2003

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Chemosynthesis


Energy source: chemical reactions

Locations: Hydrothermal vents, whale falls 2500 m below ocean surface

Large biomass, numbers of species

Mineral-laden sites

Base of food web: Bacteria oxidize sulfur from H_2S through chemical reactions instead of using sunlight and photosynthesis



ocean-ridge.ldeo.columbia.edu/courses/subgeolhot_springs

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Residence times of energy in food webs

In living plants

grasslands:	3 years
forests:	22-25 years

In plant litter

tropics:	3 months
extratropical forests:	100 years

Typically, some of energy from photosynthesis moves to highest trophic levels in a few weeks

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Efficiencies

Bird/mammals	3% of received energy is assimilated
Insects	39%
Fish	10%

Why are birds and mammals relatively inefficient?

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