Biology and the hierarchies of life

Common names are confusing with respect to taxonomy

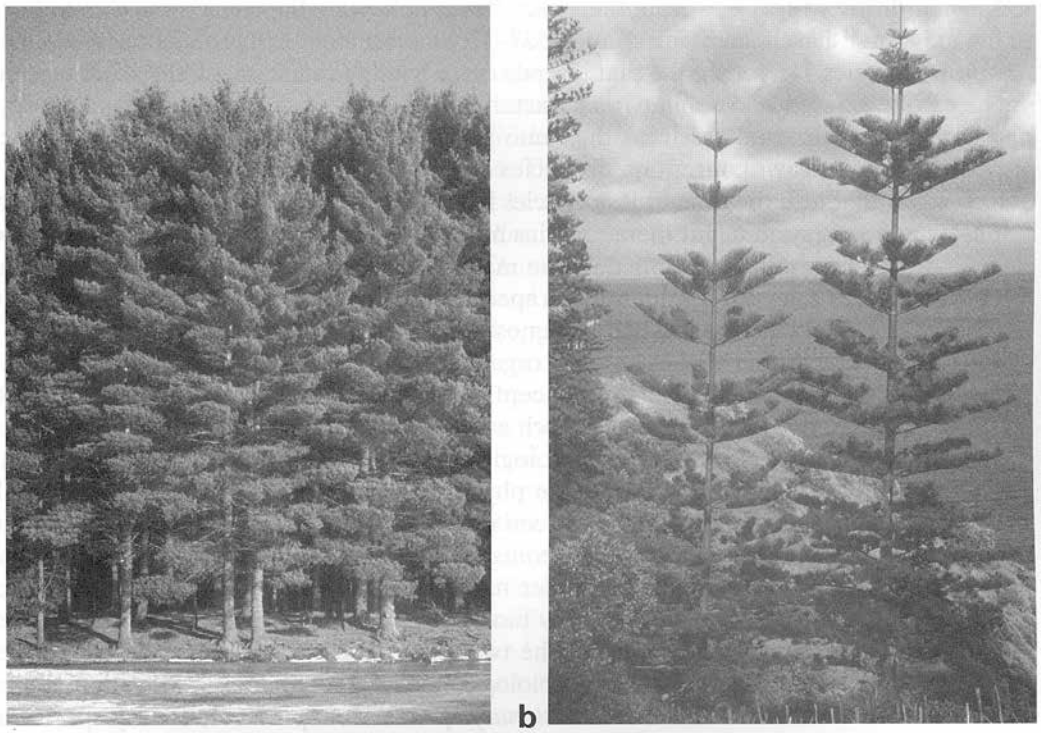


FIGURE 2.1 White pine trees of the genus and species *Pinus strobus* growing in the Pocono Mountains of Pennsylvania (*a*) and so-called Norfolk Island pines of the genus and species *Araucaria heterophylla* growing on Norfolk Island in the South Pacific (*b*). Although both species are called pines,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

Biology and the hierarchies of life

What is a "buzzard?"

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

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

www.nps.gov/bicy/bvulture.htm

http://mikami.image.pbase.com/u46/adventuresofstar/small/29443355.HealesvilleBlackBuzzard.jpg

Biology and the hierarchies of life

Genus: related organisms

Species: consistently distinguishable from other organisms

Two species of genus *Pinus*

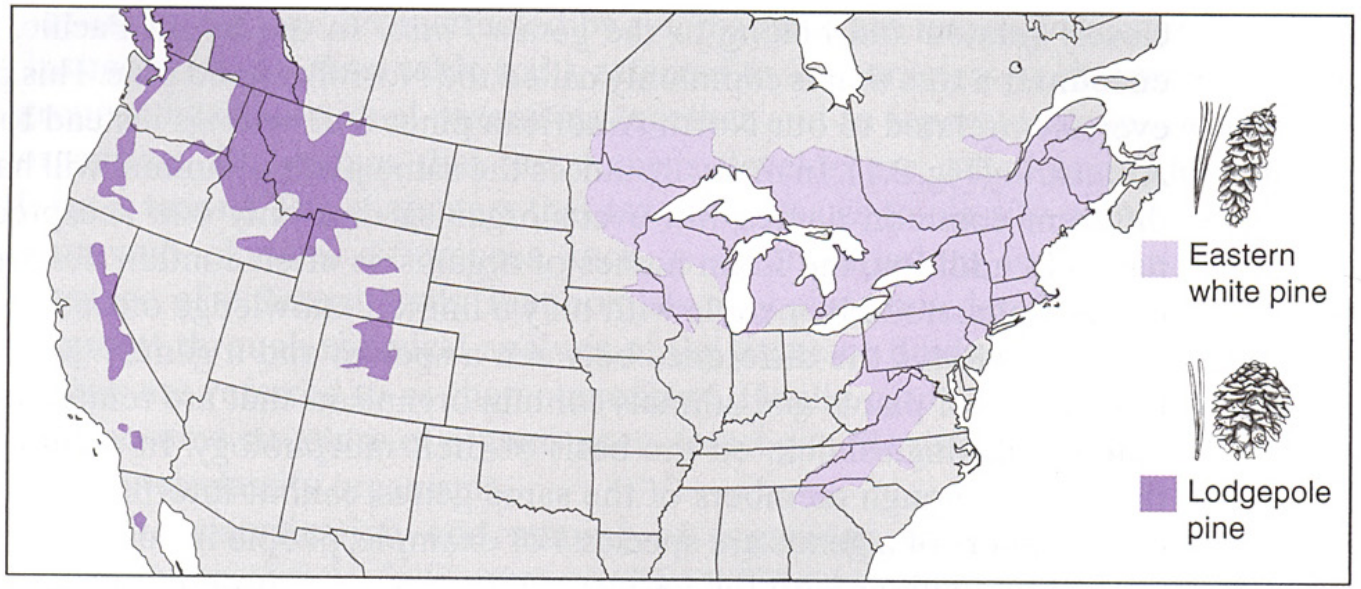


FIGURE 2.2 The needles, cones, and shapes of a mature eastern white pine *(Pinus strobus)* and a western lodgepole pine *(Pinus contorta).* Notice that both pine species share a general resemblance but possess clear differences in terms of their needles, cones, and mature form.

Biology and the hierarchies of life

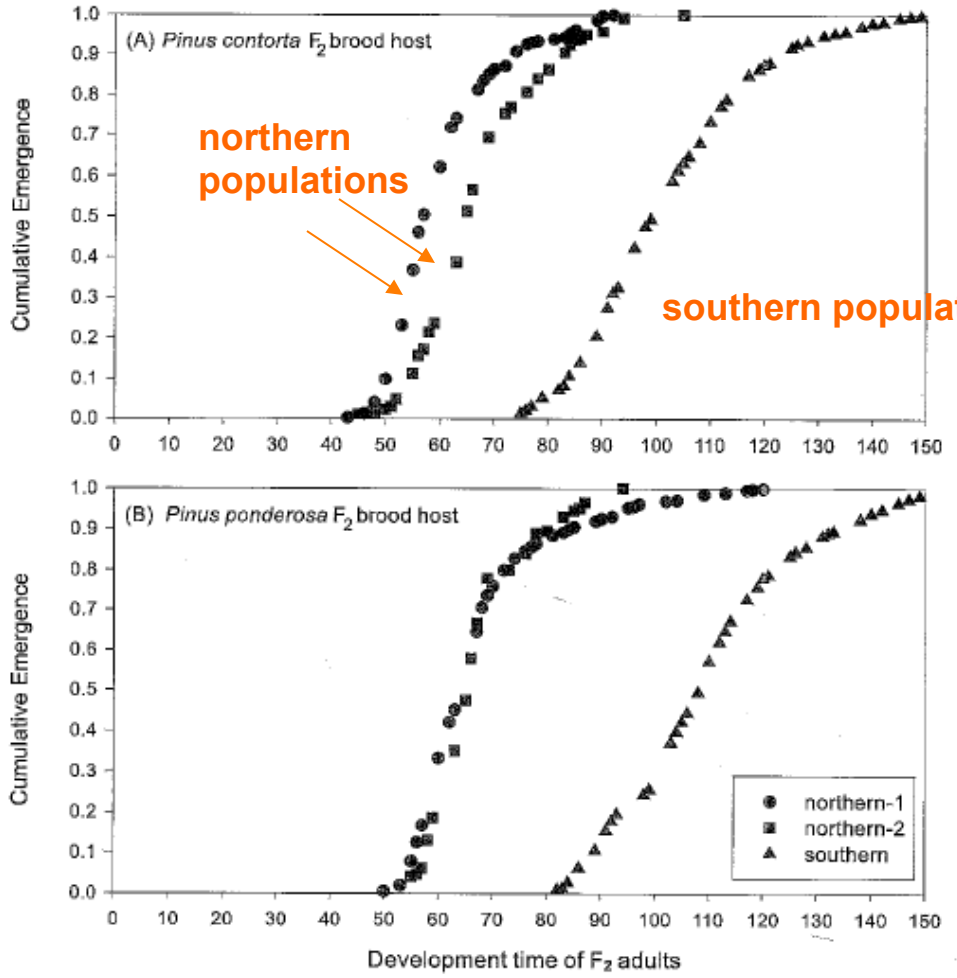
TABLE 2.1 **A Systematics (Taxonomic Hierarchy) of Eastern White Pine *(Pinus strobus)* and Humans *(Homo sapiens sapiens)***

	White Pines	Humans
Species	*Pinus strobus*	*Homo sapiens sapiens*
Genus	*Pinus*	*Homo*
Family	Pinaceae	Homonidae
Order	Coniferales	Primates
Class	Gymnospermae	Mammalia
Phylum	Trachaeophyta	Chordata
Kingdom	Plantae	Animalia

Biology and the hierarchies of life

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

Development time



Bentz et al., 2001

FIGURE 2. Cumulative emergence of *Dendroctonus ponderosae* F_2 offspring from the northern-1, northern-2, and southern source parents raised in *Pinus contorta* (A) and *P. ponderosa* (B).

Biology and the hierarchies of life

Communities

Eucalypt woodland in Australia

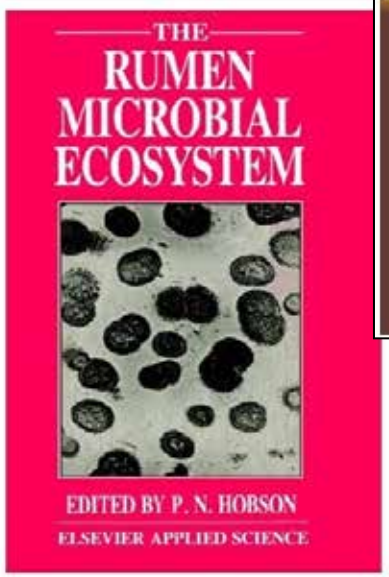
www.environment.act.gov.au/nativeplantsandanimals

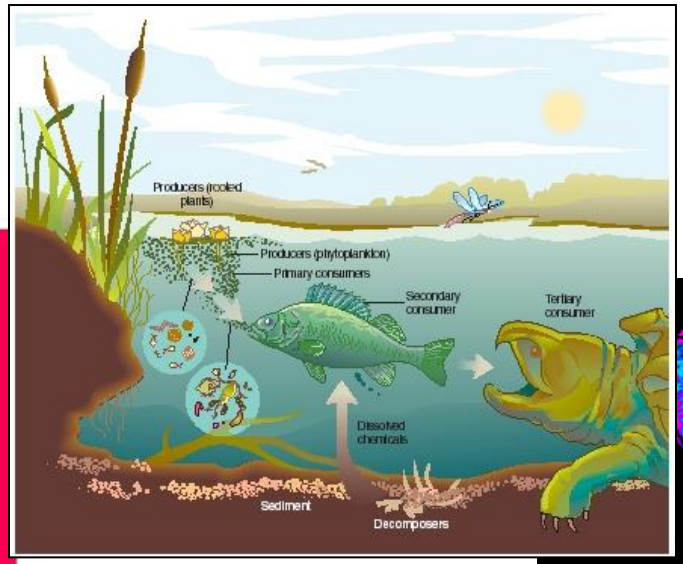
Alpine meadows in Canada

www.alpine-club.mb.ca

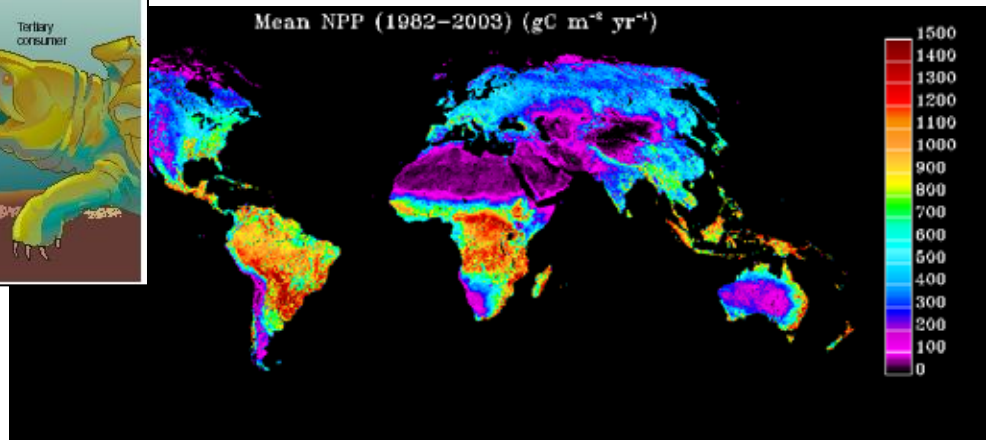
Biology and the hierarchies of life

Ecosystems





www.scienceclarified.com/Di-El/Ecosystem.html



Hicke, Global Biogeochem. Cycles, 2005

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Biomes

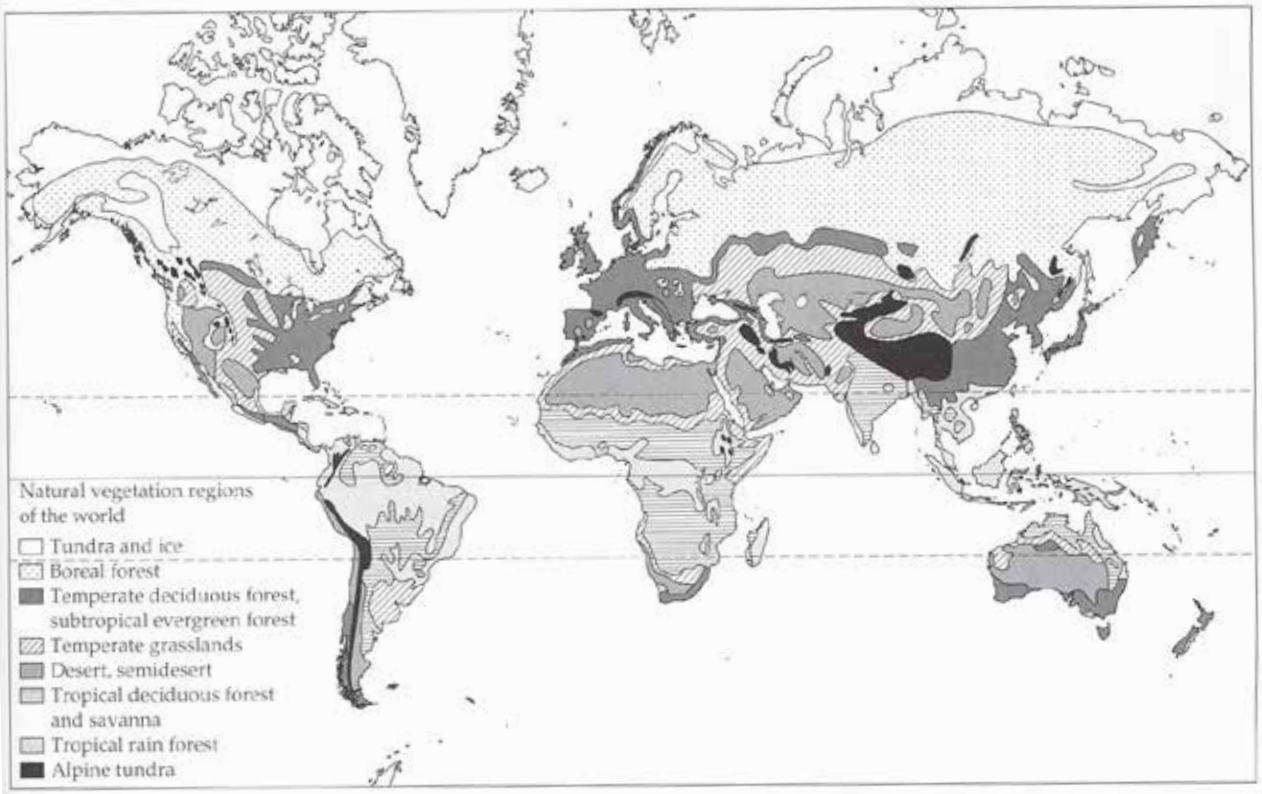


FIGURE 5.11 World distribution of major terrestrial biomes. Note that the locations of these vegetation types correspond closely to the distribution of climatic regimes and soil types (see Figures 3.6 and 3.11). In some cases, several different vegetation types (e.g., tropical deciduous forest and savanna) have been grouped together so that the general zonal pattern of biomes can be observed.

Biology and the hierarchies of life

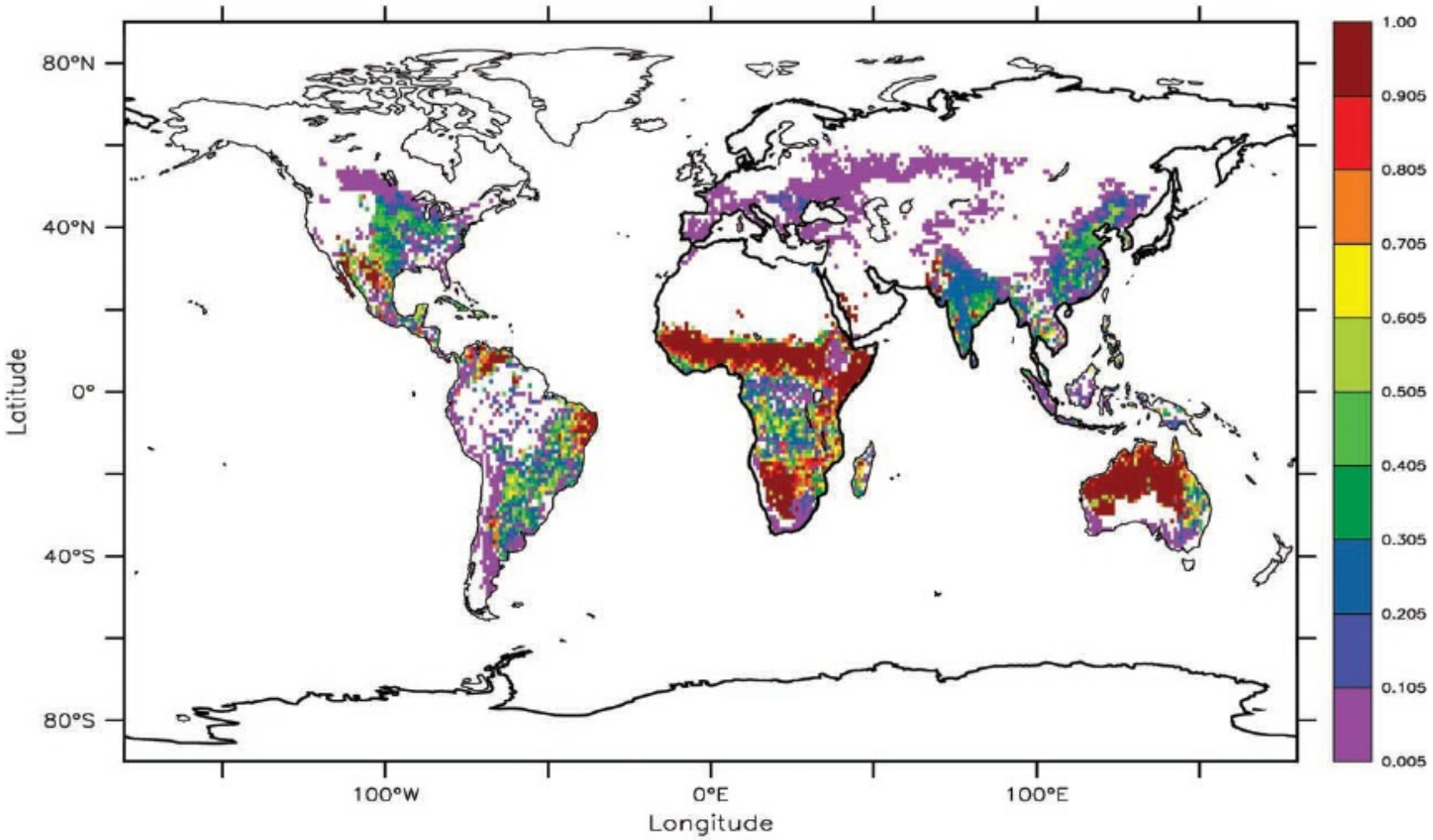


Figure 4. The C_4 fraction of the vegetation. Values below 0.005 are screened out.

Still et al., 2003

Biology and the hierarchies of life

Chemosynthesis

Energy source: chemical reactions

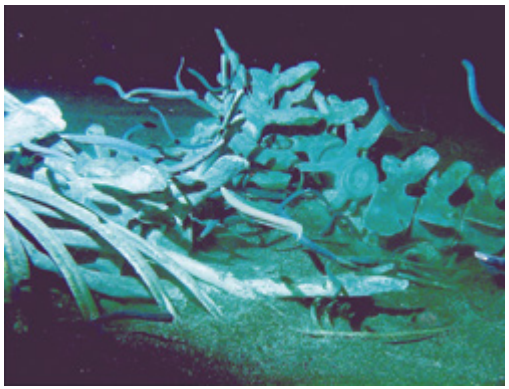
Locations: Hydrothermal vents, whale falls 2500 m below ocean surface

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/subgeol/hot_springs



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Biology and the hierarchies of life

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

Biology and the hierarchies of life

Efficiencies

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

Why are birds and mammals relatively inefficient?