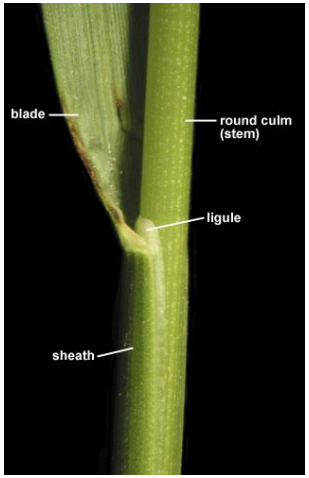
Figure 8-17b
Biology of Plants, Seventh Edition

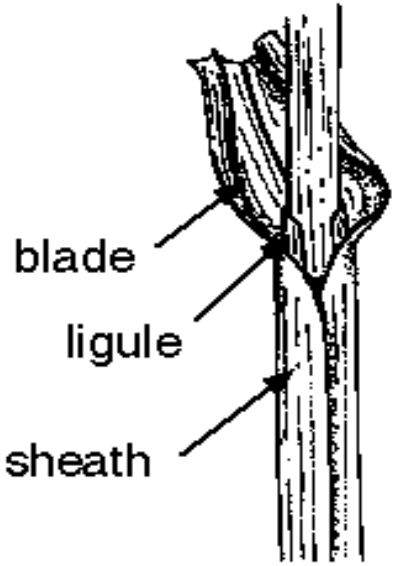
GRASSES

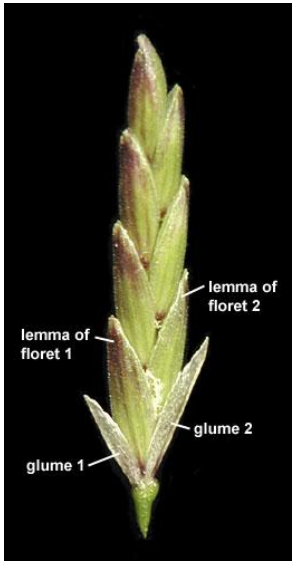
"…the most important single family of organisms in the world of life, rivaled only by the human family itself." (G. L. Stebbins)

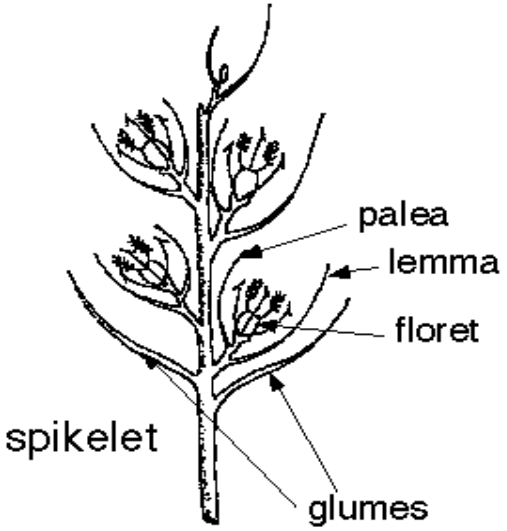
WHAT'S A GRASS?

- Monocots (parallel-veined leaves; flower parts in multiples of 3) generally adapted to wind pollination and dispersal.
- Perennial or annual herbs with round culms (stems): hollow or (rarely) solid at internodes, solid at nodes.
- Leaves alternate, composed of an open (sometimes closed) sheath, ligule, and blade.
- Each flower (floret) subtended by two specialized bracts (lemma and palea)
- Florets grouped into spikelets (primary inflorescence) subtended by two specialized bracts (glume #1 and glume #2)
- Spikelets grouped into spikes, panicles, or "racemes" (secondary inflorescence).
- Fruit a grain (caryopsis)

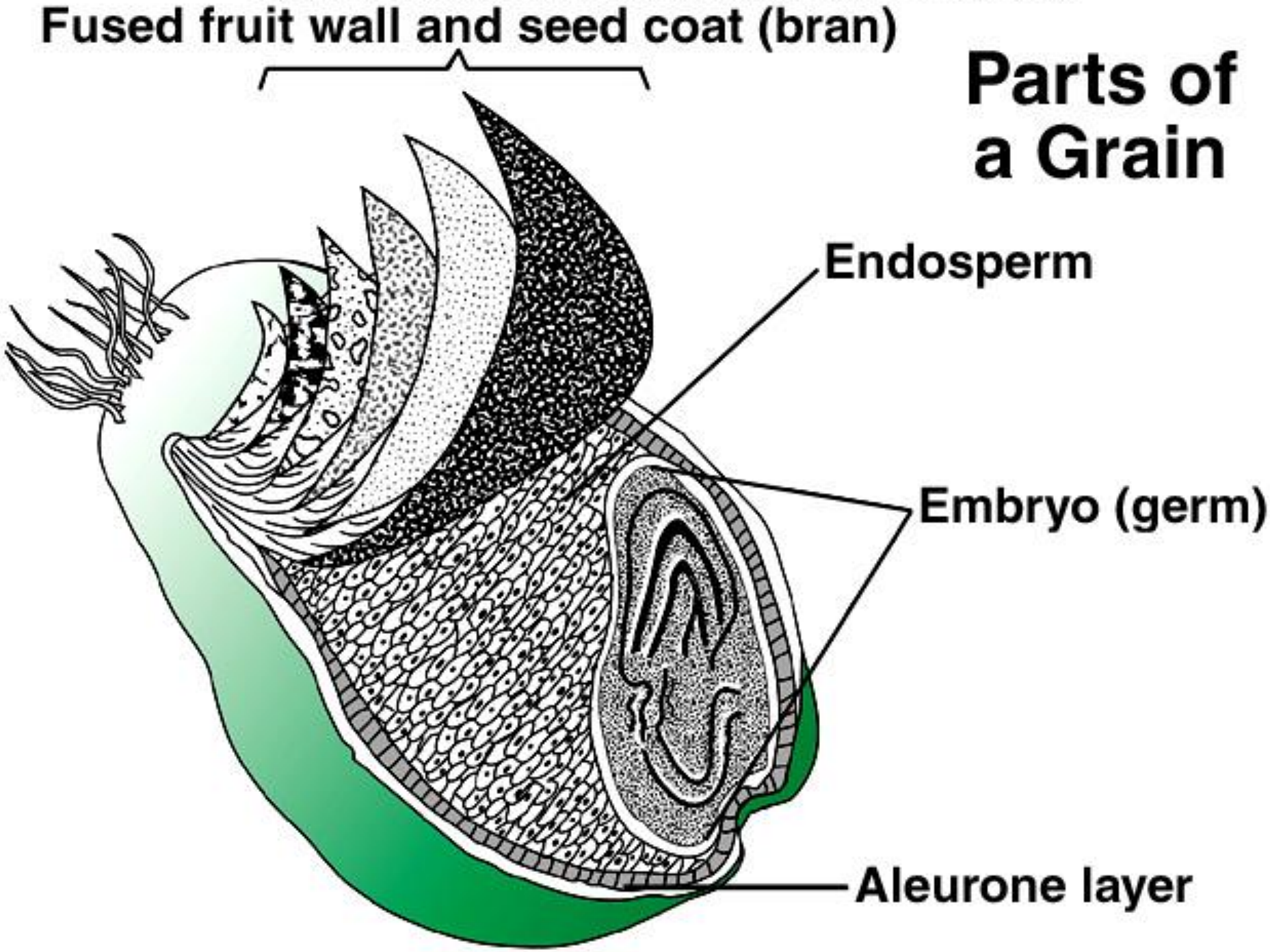








Parts of a Grain



Taxonomic classification

Category	**Name**	**Characteristics**
Kingdom	Plantae	Organisms with rigid cellulose cell walls, chlorophyll a & b, …
Division	Anthophyta	Flowering seed plants
Class	Monocotyledones	Embryo with one seed leaf
Order	Commelinales	
Family	Poaceae	Flowers subtend. by 2 bracts, etc.
Subfamily	Pooideae	Multi-flowered spikelets; sterile florets on top
Tribe	Poeae	Uncertain
Genus	*Poa*	Panic.; multi-flowered spikelets…
Species	*Poa annua*	Annual; no to few cobwebby hairs

Why Study Grasses??

- Important economically, socially, ecologically
- Critically informative to “reading the landscape” (disturbance, site quality, soils, hydroperiod….)
- Some are invasive
- Some are rare
- Some are fundamental to restoration and land management
- Beautiful
- Beautifully Diverse
- Challenging and fascinating
- Few folks know them well

THE GRASS FAMILY (Poaceae)

- Genera : 700 – 800
- Species: 7500 - 11,000 (4th largest)
- First appeared in pollen record 65 mya (Paleocene)
- cereal crops (food, sugar, **beer**...)
- grazing/pasture/forage crops
- fuel
- ornamentals, turf, soil stabilization, wildlife
- building materials (thatch, scaffolding)
- matting, paper, clothing
- All major civilizations developed around cultivated grasses (Middle East to New World)

GRASSES AND HUMAN CIVILIZATION

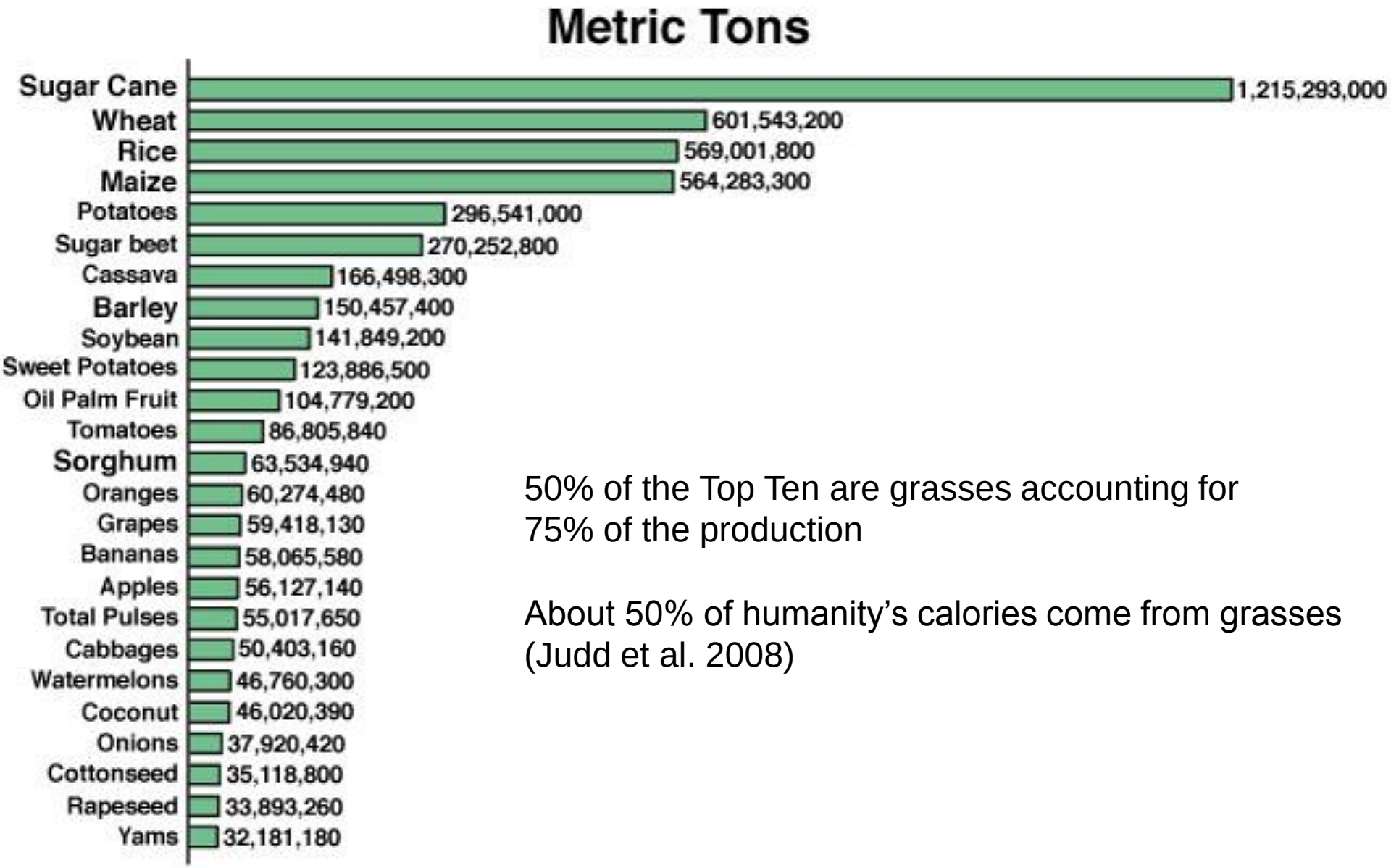
- Planting cereal grains may have been the most important catalyst in the advent of human civilization.
- 10,000 – 12,000 years ago, some genius had the idea of planting seeds, caring for the plants, and harvesting them months later.
- Thusly, hunting/gathering societies became agrarian (maize = 48 days of labor in Mayan culture).
- And human population increased; wars and weaponry became more sophisticated; increased interaction with domesticated animals and more humans increased human disease; natural environments became increasingly altered to suit human purposes; increased social inequity….

Major Grass Grain Crops

(photosynthetic apparatus)

- Sugarcane (C4)
- Wheat (C3)
- Corn (Maize) (C4)
- Rice (C3)
- Barley (C3)
- Sorghum (C4)
- Oats (C3)
- Millet (C3 & C4; different species)
- Rye (C3)
- Triticale (wheat and rye hybrid; C3)

World Crop Production, 1997



50% of the Top Ten are grasses accounting for 75% of the production

About 50% of humanity's calories come from grasses (Judd et al. 2008)

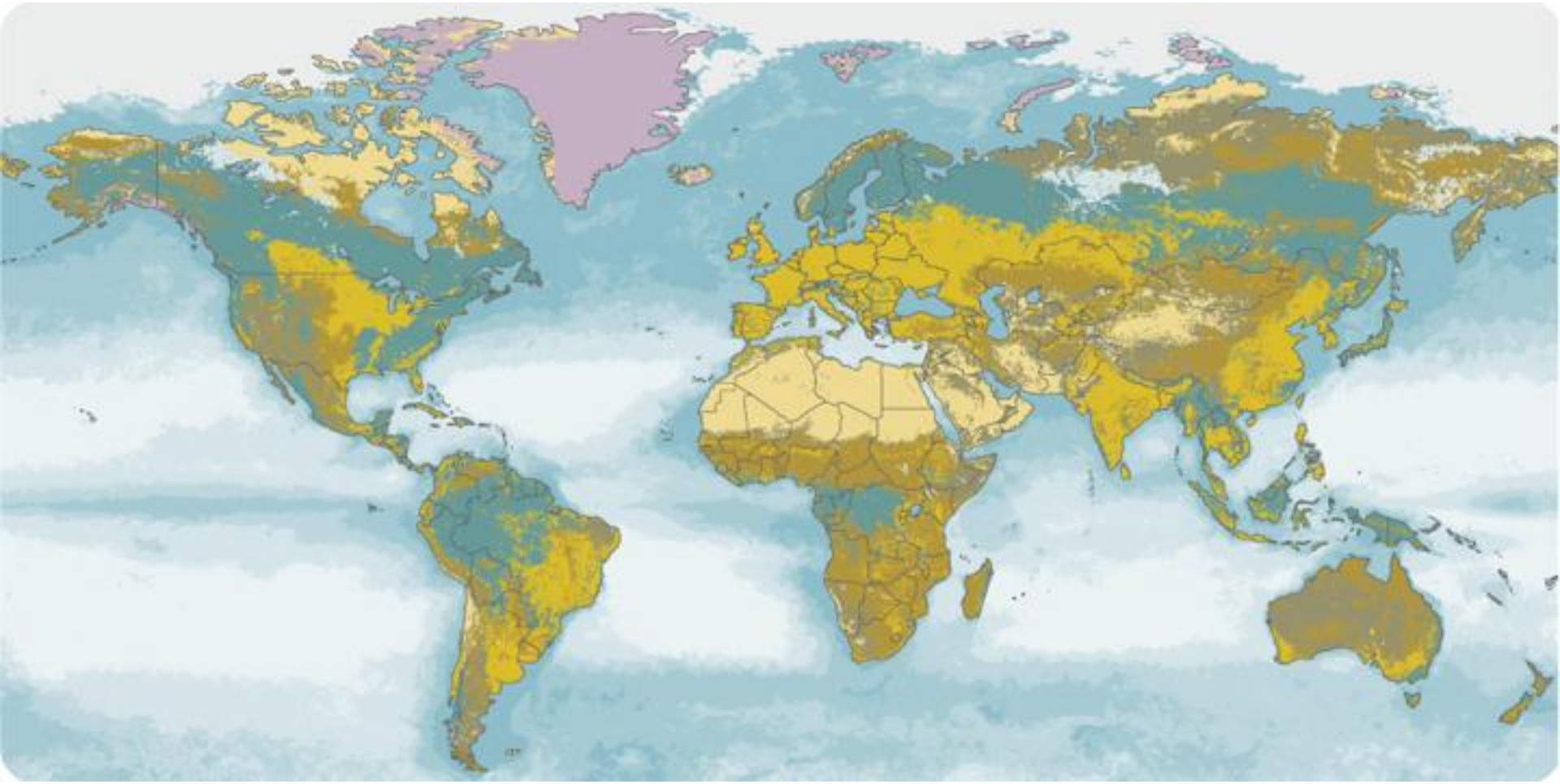
Some of the World's Worst Invasive Plant Species are Grasses

- **cogon grass (*Imperata cylindrica*)**
- **common reed (*Phragmites australis*)**
- **reed canarygrass (*Phalaris arundinacea*)**
- **Johnson grass (*Sorghum halapense*)**
- **spartina (*Spartina* species and hybrids)**
- **pampas grass *(Cortaderia* species and hybrids)**
- **giant reed (*Arundo donax*)**
- **Japanese stilt grass (*Microstegium vimineum*)**
- **cheat (*Bromus tectorum*)**
- **medusahead (*Taeniatherum caput-medusa*)**
- **Bermuda grass (*Cynodon dactylon*)**

Some of the World's Worst Invasive Plant Species are Grasses

There's evidence the decline of the Mayan civilization was linked to the incidence of grass weeds affecting the productivity and required labor in Mayan agriculture (Pohl IN Soderstom et al. 1986)

Grass Ecology

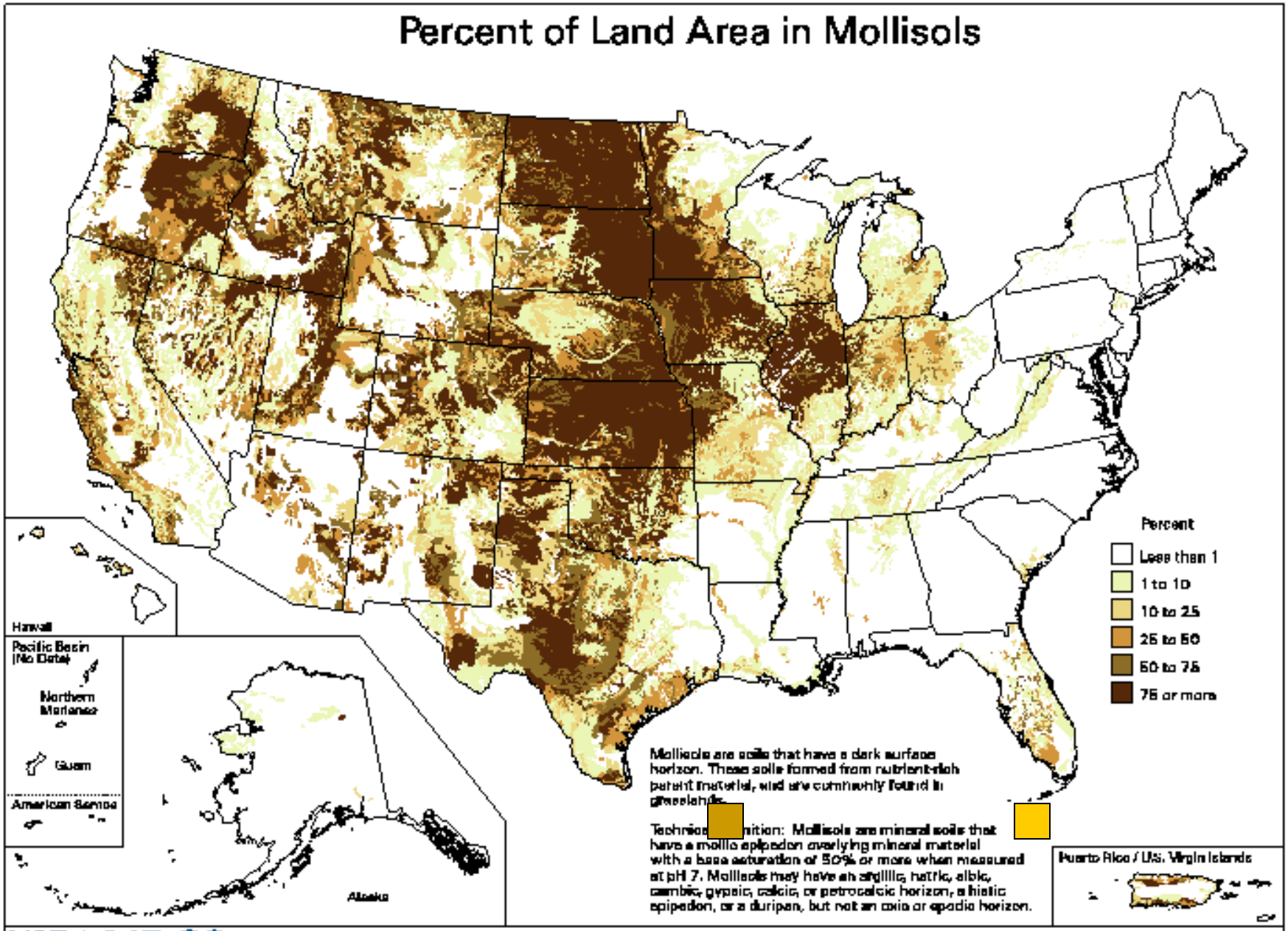


Note dominance of grasslands/savannahs ( ) and croplands ( ), which are planted mainly in grasses. Grasses dominate the Earth's land surface.

About 70 percent of the world's farmland is planted to grass crops.

Chernozems and mollisols.

Percent of Land Area in Mollisols



Mollisols are soils that have a dark surface horizon. These soils formed from nutrient-rich parent material, and are commonly found in grasslands.

Technical definition: Mollisols are mineral soils that have a mollic epipedon overlying mineral material with a base saturation of 50% or more when measured at pH 7. Mollisols may have an argillic, natric, albic, cambic, gypsic, calcic, or petrocalcic horizon, a histic epipedon, or a duripan, but not an oxic or spodic horizon.

USDA NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service
Resource Assessment Division
Washington DC June 1999

Map ID: m4034
For proper interpretation, see Explanation of Analysis for this map at our web site. Search for "USDASOTL" to locate our map index.

Data Source: Soil Survey Staff. 1998 Dominant Soil Orders and Suborders-Soil Taxonomy 1998. United States of America. Maps and Soil Photographs, USDA NRCS. National Soil Survey Center, Lincoln, NE. NSSC 5502-696-01

Annual means for temperature and rainfall are reasonably well correlated with the biomes we find in different regions).

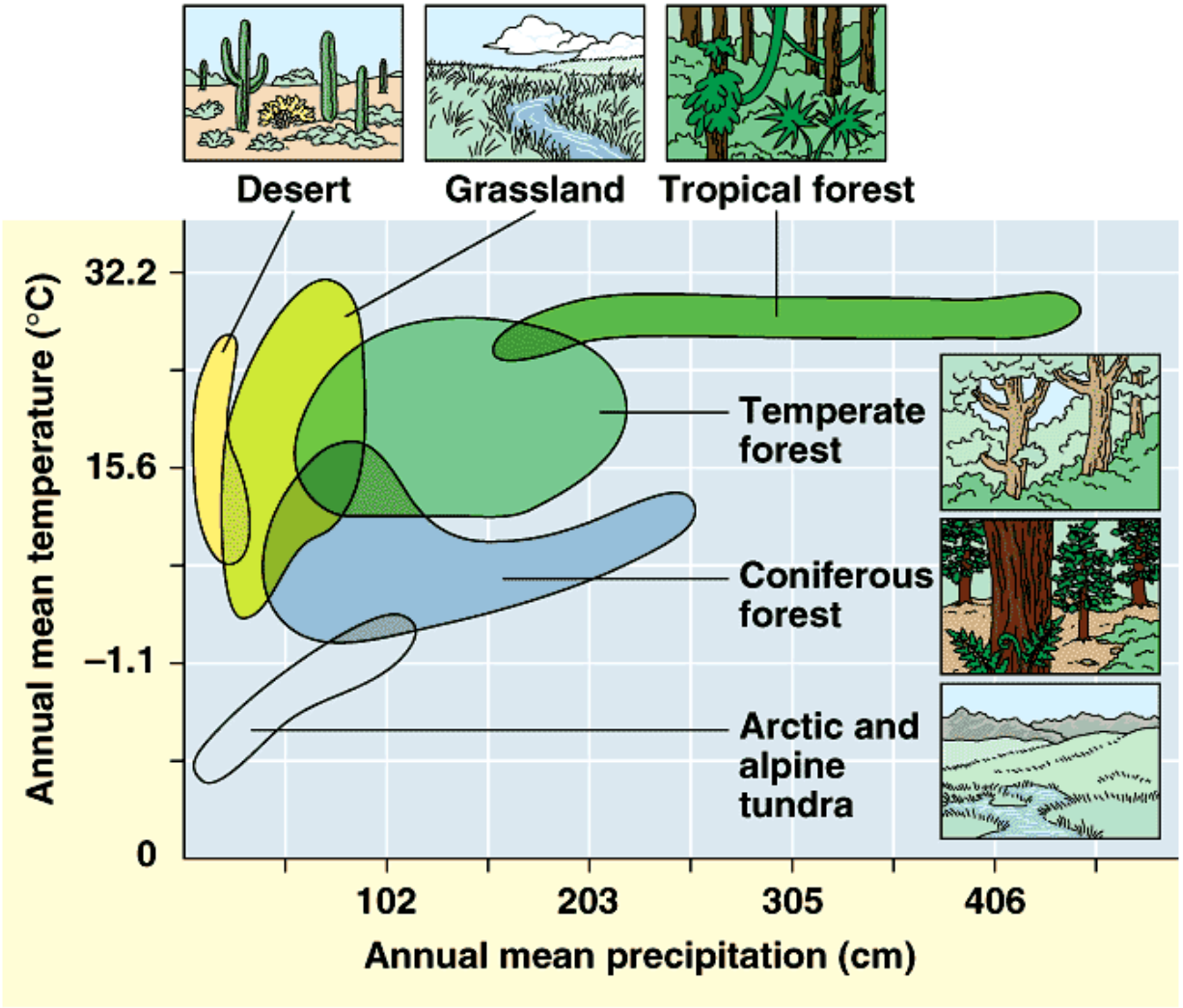
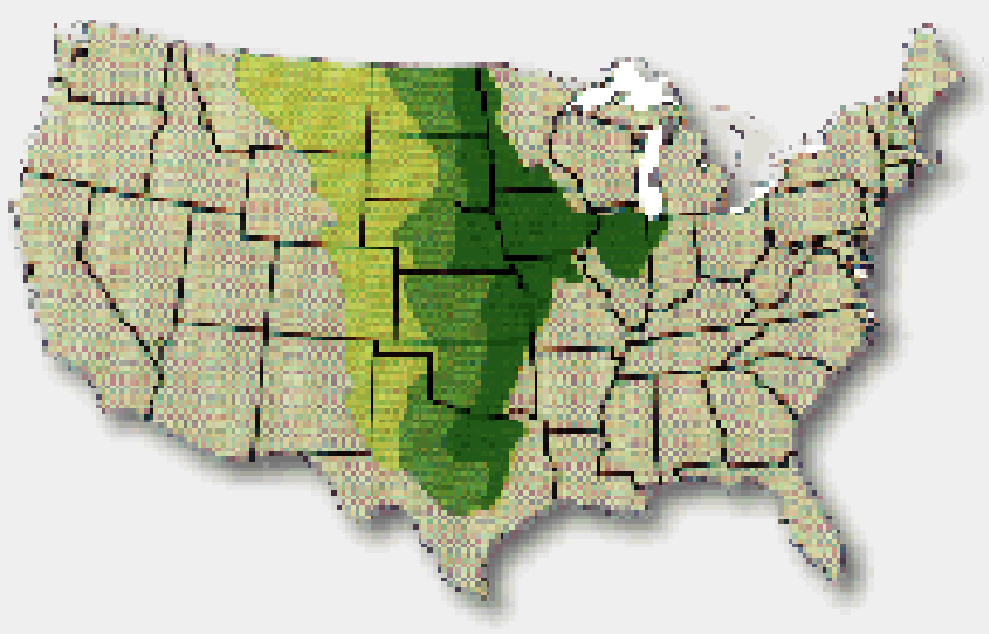


Fig. 50.10

Temperate grasslands exhibit seasonal drought, occasional fires, and are usually used for grazing and agriculture.

Fig. 50.25e

Short, Mixed, and Tall Grass Prairie



Over 90% of the tall grass prairie in USA has been converted to crop land.

Mixed grass prairie- mixture of crop and range land.

Short grass prairie- limited amount of crop land, majority is still considered rangeland.

Pacific Northwest Grassland Ecosystems

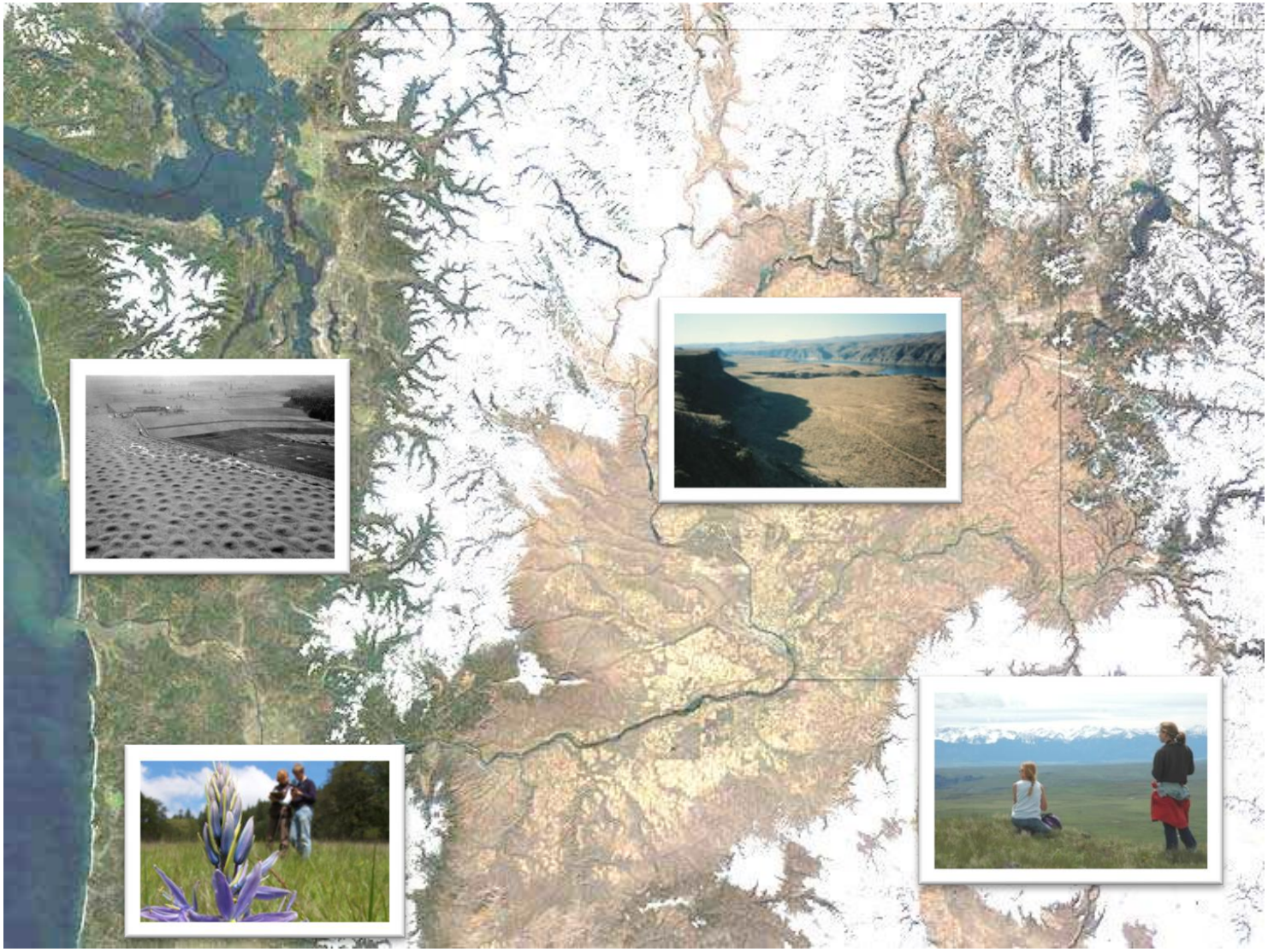
Unique grasslands comprised of bunch- grasses.

Majority of PNW bunchgrass prairie ecosystems has been converted to cropland and rangeland.

PNW grassland ecosystems are not adapted to heavy grazing pressure.**

**Meristems of cespitose grasses are easily removed by grazing.

Pacific Northwest Grassland Ecosystems



Desert Steppe (Great Basin and Columbia Basin)

Puget Sound Gravelly Outwash Prairies

Palouse Prairie Complex (but see Zumwalt Prairie in NE OR; Kamiak Butte in SE WA, and National Bison Range in W MT).

Willamette Valley Prairies and Oak Woodland