SEGMENT FOUR, LECTURE SIX: DEMOGRAPHIC TRANSITIONS/COMMUNITY ECOLOGY

Human population has been steadily increasing and currently shows exponential growth (Fig. 53.22). Today's human population is over 6.6 billion individuals. Human population growth is largely due to declines in death rate, because of improved nutrition, sanitation, and better medical care.

Global fertility rates have not declined uniformly although in some areas (Sweden, Japan) populations are stable and in others (e.g., Italy) birth rates are so low that population size is in decline. A **demographic transition** (Fig. 53.24) has been repeatedly observed when regional populations shift from:

1) Relatively high birth and death rates (zero population growth);
2) Decreasing death rates, but continuing high birth rates;
3) Relatively low birth and death rates (zero population growth).

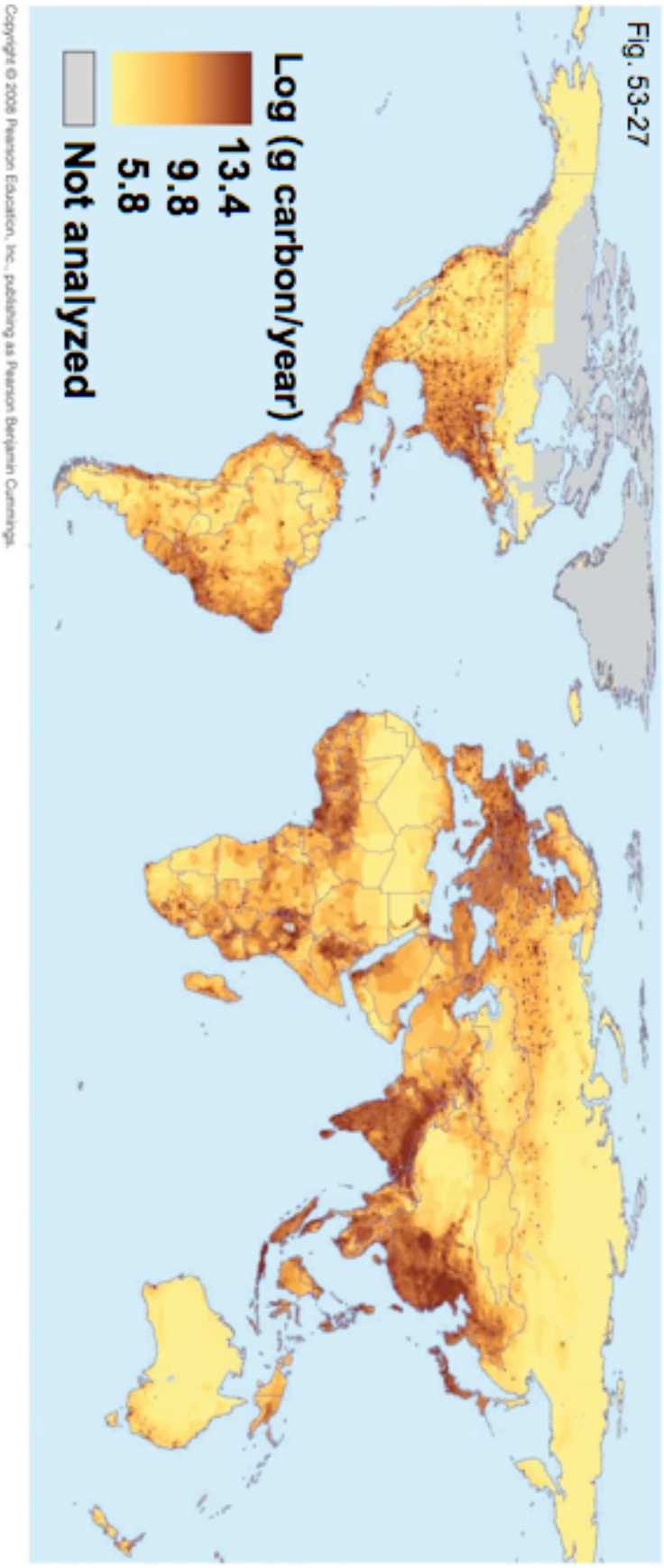
Social and cultural changes are responsible for demographic transitions.

The **ecological footprint** is a measure for assessing population needs.
The ecological footprint is the total of water and land areas required by each person, city, or nation to produce all the resources it consumes and to absorb all the wastes that it generates. Types of ecologically productive areas:

1) Crop land, pastures, and gardens
2) Developed lands (roads and cities)
3) "Fossil energy land" needed to absorb carbon produced by burning fossil fuels
4) Landfill sites; sites for storage of nuclear wastes;
5) Streams, lakes, and oceans

Different countries vary greatly in the sizes of their ecological footprints (see Fig. 53.27).

The amount of photosynthetic products that humans use around the world. The unit of measurement is the logarithm of the number of grams of photosynthetic products consumed each year.



COMMUNITY ECOLOGY

A community consists of all of the organisms in a particular area. Each species occupies an ecological role or **niche** in the community, which is the sum of the biotic and abiotic resources for a given species. Interspecific interactions are defined in terms of the affect that the interaction has on the survival and reproduction of the interacting species.

+ indicates an increase in fitness;
0 indicates no affect on fitness;
— indicates a decrease in fitness.

Types of interactions:
Interspecific Competition (— / —) occurs when similar resources are utilized by two different species. Two species with identical niches cannot coexist in a community because of **competitive exclusion**, a situation in which the species that uses resources even slightly more efficiently will eventually eliminate the second species. Thus, interspecific competition may be difficult to document when it is rapidly eliminated by selection. There is, however, circumstantial evidence for interspecific competition.

The **realized niche** may be smaller than the **fundamental niche** of a species (Fig. 54.3) because of interspecific competition.

Outcomes of interspecific competition

- **Resource partitioning** may occur between sympatric species that use resources in slightly different ways, thus dividing the environment into different microhabitats (Fig. 54.2 as in Anolis lizards, which differ by heterochronic shifts).
- **Character Displacement** (Fig 54.4) is a change in body structure to permit resource partitioning. Populations of two species will resemble each other more when they are allopatric (and therefore noncompeting) than when they are sympatric.

Predation (+ / —) is an interaction in which one organism eats another. Herbivory, the eating of plants by animals, is a type of predation. Parasitism is a special case in which there is a long-term, intimate physical association between the parasite and its host. A pathogen is a microbial parasite.