Community ecology:

community - groups of organisms living close enough together for interactions to occur.

Some features of communities include:

Biodiversity - the variety of organisms that make up a community. This is composed of:

a) species richness - how many different species are there?

b) relative abundance of each species.

measures of diversity usually include both features (there are many different ways to measure diversity **[Fig., similar to 37.10 A & B, p. 748]**.

For example:

	# of individuals of each species				
	species A	species B	species C	species D	species E
community 1:	25	25	25	25	0
community 2:	97	1	1	1	0
community 3:	20	20	20	20	20

Community 1 is obviously more diverse than community 2 (right out of the text), but community 3 is more diverse than community 1.

Competition

- this is when organisms compete for the same resources. There are two types of competition:

- interspecific (between different species)

- An example **[Fig., not in book (in 5th ed. on p. 717)]:**

- two species of barnacle. One is found further up on rocks than the other (it can survive drying out at low tide better than the other).

- if the species that lives lower down in the water is removed, the upper species moves down and takes over - it CAN live lower down if the other one isn't there.

- if the species from lower down is put back, then it quickly drives the species from the upper zone to

extinction in the lower area - it outcompetes the species form the upper area in it's preferred habitat (the lower area).

- this gave rise to the "Competitive exclusion" principle.

- two species in the same place cannot coexist if they are competing for the same resources.

- one will do better than the other.

- intraspecific competition (within the same species)

- example: plants all need water & nutrients from the soil. If there are too many individuals in the area, the plants will be stunted and not grow well. This is very important in agriculture.

- competition has given rise to the concept of "niche"

- niche is the overall biotic and nonbiotic factors that an organisms needs to survive.

- biotic - biological factors such as food availability

- abiotic - non biological factors such as temperature or rainfall.

Predation

- often leads to the evolution of characteristics that help animals catch prey, or help animals avoid becoming prey.

- camouflage (blending into the surroundings)

- mimicry (looking like something deadly so you don't get bothered)

- predation can actually increase diversity:

- example **[Fig., not in book (on p. 720 in 5th ed.)]**:

- kelp forests of the West Coast.

- sea otters feed on sea urchins.

- sea urchins feed on kelp

- kelp supports a large diverse community of other organisms.

- when sea otters were seriously endangered, sea urchins had a field day, and kelp forests disappeared in many areas.

- as sea otter populations recovered (they had been decimated by the fur trade), kelp forest started coming back.

- in some areas, though, killer whales are now eating sea otters, and kelp forests are disappearing in those areas.

- (killer whales are eating more otters because seals and sea lion populations have declined.)

Symbiotic relationships:

- interactions between two or more species. Three kinds (actually, competition and predation could be lumped here as well) **[Fig., similar to p. 742 (some examples in the table are a bit silly)]**:

- parasitism - one species is hurt, one comes out ahead.

- tape worms, ticks, round worms, pinworm, etc.

- true parasites rarely kill their host (or they're dead, too).

- commensalism - one species gets a benefit, the other is unhurt (rare)

- few real examples, but they might include:

- algae on turtle shells, barnacles on whales, birds following large ungulates (they get insects scared up by the ungulates).

- mutualism - both species come out ahead

- Sea anemone & clown fish:

- sea anemone gets food from the fish, fish gets protection

- Acacia & ants:

- ants get shelter & food from plant, ants in turn fiercely protect the tree (if ants are removed, tree often dies).

Disturbance:

- things like fire, hurricanes, overgrazing, human activities, etc., can all disrupt a community **[Fig., not in book]**

- not all disturbances are bad

    - some communities rely on these to perpetuate themselves

        - some pine trees will only release their seeds after fire has caused their cones to open.

    - after a disturbance, a community goes through what is called "succession"

    - succession - starting with a life-less area, and "succeeding" through various stages until we get our community back **[Fig., 37.12, p. 750]**.

        - e.g., grasses --> shrubs --> pine trees --> deciduous trees

Trophic levels:

- the energy that is available to a certain grouping of organisms (see below).

- this explains why there are more herbivores than carnivores.

- essentially, all life is supported by autotrophs (= producers). These are mostly plants and algae.

    - they provide energy for other organisms (obviously, this is usually not voluntary)

- herbivores eat producers, carnivores eat herbivores, other carnivores eat the first carnivores, and so on **[Fig. 37.8, p. 746]**.

    - animals are classified as "primary consumers" (herbivores), secondary consumers (carnivores that eat herbivores), tertiary consumers (they eat the previous carnivores), and so on.

- there are also detritivores, which eat dead stuff (vultures, many fungi, dung beetles, etc.)

- put all this together, and we get food webs **[Fig., not in book and 37.9, p. 747]**.

- but, this can't go on forever. Energy is limited.

    - only about 10% (on average) of the energy at one level (say, producers, makes it to the next level (say, primary consumers).

    - **[OVERHEAD, fig. 37.16, p. 753]**

    - incidentally, only about 1% of sunlight is captured by photosynthesis

- this makes it difficult to support too many trophic levels (e.g., too many quaternary consumers)

- note that this also explains why meat (incl. fish) is not the most efficient way to feed humans:

- **[Fig. 37.17, p. 754]**

- cows only provide 10% of the energy to humans that plants can.

Finally, just a quick word on chemical cycles.

The book only lists four of the most important ones, but there are many more:

Water, Carbon, Nitrogen & Phosphorus

- in all of these, the elements (or compounds) are recycled through the ecosystem.

- we don't have the time to look at these in detail, but just be aware they exist.