

Comments on Chapter 20

Information in this chapter is focused on energy flow through ecosystems and its importance for the structure and function of ecosystems.

When you finish reading the assigned material in this chapter you should have a clear understanding of: the first & second law of thermodynamics; the difference between gross & net primary productivity; major controls over NPP on land and in water; the relationship between primary and secondary productivity (including inefficiencies in energy transfer from plants to herbivores); features of the two major types of food chains; why energy flow decreases in each successive trophic level; the 10% rule-of-thumb (also covered in lecture); and biomass pyramids.

Section 20.1 –

You probably have had the terms in this section before, so use this as a review.
Know the 1st & 2nd laws of thermodynamics and the terms open & closed systems.

Section 20.2 –

Know the definitions of NPP, GPP, and standing crop biomass.
Pay attention to the equations in this section and be able to use them.
Be aware that productivity is a flux and as such is a change over time.
Standing biomass is a static value representing the amount of biomass at a given point in time.
Study Figure 20.1 and understand how light & dark bottles are used to estimate GPP in aquatic ecosystems. Note that oxygen production in the light bottle would only measure NPP if there are no heterotrophs in the water (non-photosynthetic organisms that respire).

Section 20.3 –

Use figures 20.2, 20.3, and 20.4 along with the text to understand the relationships between NPP and temperature, precipitation, length of growing season, and evapotranspiration.
See how the influence of these climatic factors are reflected in the map of terrestrial NPP shown in figure 20.5.
Study figures 20.6 & 20.7 to see the influence that nutrient availability can have on terrestrial NPP.

Section 20.4 –

In contrast to terrestrial NPP, aquatic NPP is not limited by water.
It is, however, strongly affected by light and nutrients.
Study the text and figures in this section to understand the relationship between these factors (light & nutrients) to aquatic NPP.
Know the term PAR and compensation depth (which is the same as the light compensation depth).
Note the influence of phosphorus availability on productivity in freshwater lakes and make the link to material covered in lecture about eutrophication.
Know why the coastal and near-shore regions of the ocean have the highest productivity in figure 20.10.

Skip sections 20.5, 20.6, and 20.7

Section 20.8 –

Pay close attention to the information contained in the 2nd paragraph, understand secondary production, and know what happens to energy as it is transferred from plants to plant eating animals (some is not consumed, some ends up in waste products, some goes to metabolic heat, & some accumulates as new tissue).

Use the text and figures 20.20 & 20.21 to understand the relationship between primary (NPP) and secondary production.

Note that NPP is quantitatively greater than secondary production by comparing the units on the X and Y axes in figure 20.20a and 20.21.

Skip section 20.9

Section 20.10 –

Know what a food chain is and the terms used to label the different trophic levels.

Know the difference between a grazing and detrital (AKA decomposer) food chain.

Study figure 20.23

Skip material on pages 454-455, and skip sections 20.11, and 20.12

Section 20.13 –

Understand and know the 10% ecological rule of thumb about energy transfer between trophic levels.

Note that in lecture we note the 10% transfer is for the comparison of energy ingested at one trophic level compared to energy ingested at the next trophic level. The textbook uses energy stored in biomass instead of energy ingested. For this class the rule of thumb will be applied to the differences in ingested energy.

Don't worry about the calculation of trophic efficiency.

Study figure 20.27 and know what is meant by a biomass pyramid.

Skip the sections on Ecological Issues & Applications and Quantifying Ecology found on pages 458-461.

Finally, at the end of the chapter you should be able to answer the following study: #s 2, 3, and 11.