Puget Sound Food Chain

Data and information

The resident orcas of Southern Puget Sound are the top predators of the Puget Sound food chain. Their preferred food is salmon, whose numbers have been seriously declining over the last decade. The salmon feed mostly on zooplankton, called euphausiid krill, which in turn feed on phytoplankton, the primary producers of the marine ecosystem.

Roughly 1,700,000 kcal/m^2/yr of sunlight is used by 809 g/ m^2 of primary producers, roughly 17,597 individuals per square meter. The primary producers can convert 8,863 kcal/m^2/yr of the solar energy into chemical energy. The 912 primary consumers per square meter (37 g/ m^2 of biomass) can utilize 1,478 kcal/m^2/yr of that energy. However, only 67 kcal/m^2/yr is passed on to the 11 g/ m^2 of secondary consumers. The 0.5 secondary consumers per square meter are eaten by the 0.03 third level consumers per square meter. These tertiary consumers can acquire 4.9 kcal/m^2/yr by eating the second level consumers, which provided energy for them to maintain their 2 g/ m^2 of biomass.

Your Task

Consider the trophic transfer efficiency for the Puget Sound orca food chain described above. Each of the species described above is the dominant species in their trophic level so understanding energy transfers among these four species goes a long way toward understanding energy transfers in the whole ecosystem. Based on the information provided below, your job is to:

1. Draw the food chain described.
2. Calculate the % of energy lost between each trophic level.
3. Explain why this food chain does or does not follow the 10% rule.