

### Primary Productivity and Food Webs

This problem set is designed to get you thinking about what the measurable impact a land use change might have on an ecosystem. As with the calculations you made in *Energy and Trophic Levels*, these require careful analysis of what the question is *asking*. Keep track of your units so that you arrive at an appropriate answer!

**Show all work for the following calculations. Use the following equations to complete the calculations**

- **Net Primary Productivity (NPP) = Gross Primary Productivity (GPP) – Respiration (R)**
- **% Efficiency = ( output / input ) x 100**
- **% Efficiency of Photosynthesis = NPP / insolation energy x 100** (insolation energy = energy from the sun)
- **100<sup>2</sup> cm = 1m<sup>2</sup> = 10,000cm<sup>2</sup>/m<sup>2</sup>**

1. Suppose the fox in a food web ate only on rabbits, squirrels, mice, and birds, all of which feed on plant material. Assuming that a fox's daily caloric requirement is 800 kcal, and that only 10 percent of the energy at one trophic level can be passed to the next trophic level:

- A. How many square meters of plant material are then required to support the fox if the net primary productivity of the plant material is 8,000 kcal/m<sup>2</sup>/yr?
- B. If the fox were to feed only on insect eating birds, how many square meters of plant material would be required?

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2. In a salt marsh in Georgia, the quantity of solar radiation reaching the ground during the summer is 7,000,000 cal/m<sup>2</sup>/ day. The gross productivity of the producers in the salt marsh (microscopic algae) is 0.0040 g/ cm<sup>2</sup>/ day, and 35% of the gross productivity is consumed in aerobic respiration (respiration loss). In the lab, it was found that 1gram of salt marsh producer is equivalent to 2,920 calories.

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