**Productivity Practice Problems**

1. The gross primary productivity of a meadow in southeastern Kansas is found to be 38,000 kcal/m2. Respiration which is measured by the amount of CO2 released is 13,500 kcal/m2, what is the net primary productivity for this ecosystem, in kcal/m2 per year?
2. A researcher has measured the gross primary productivity of a forest in northern Arkansas to be 24,000 kcal/m2. She also has measured the amount of CO2 given off into the atmosphere as 8.6000 kcal/m2. What is the net primary productivity for the forest ecosystem?
3. Biomass is measured by dry weight or by the amount of Carbon in the biomass. To calculate the net primary productivity we use the same equation of GPP – R = NPP, but the units of measure change. Instead of measuring the amount of energy we are measuring the amount of Carbon (biomass). The gross primary productivity of a forest ecosystem in southwestern Kentucky is measured to be 18 kg C/ m2 -year, the respiration for the system is measured as 7.8 kg C/ m2 –year. What is the NPP of the forest as calculated by measuring the carbon in the biomass?
4. The *net* annual primary productivity of a particular wetland ecosystem is found to be 6,000 kcal/m2 per year. If respiration by the aquatic producers is 12,000 kcal/m2 per year, what is the *gross* annual primary productivity for this ecosystem, in kcal/m2 per year?

5. If you measure the available biomass for a patch of forest as 10 kg C/ m2 –year, and the amount of CO2 given off into the atmosphere as 5 kg C/ m2 –year, what is the GPP?

6. In a patch of forest in problem #5, how much energy is *available* in the primary producer level for herbivore consumption? Assume 1 kg of carbon produces 10,000 kJ.

7. Imagine we run an experiment on a simulated grassland ecosystem. We measure their starting weight (using an identical third sample, dried) and place equal amounts of a grass species in light and dark locations. After one week, we end up with the following data. Each sample is in a 10 cm2 container.

What is the NPP, respiration, and GPP of the “grassland”? Express your answers in grams/cm2/day. (Hint: the measurements were for 7 days).

|  |  |
| --- | --- |
| Week | Dry weight (g) |
| Start | 10 |
| One week later | 17 (light bottle) |
| One week later | 7.2 (dark bottle |

8. Imagine we run an experiment on a marine diatom (a type of algae). We place equal amounts of the diatom species in light and dark settings, and measure their starting weight (using an identical third sample) and dry it out. After one week, we end up with the following data.

What is the percent moisture of the samples, and the NPP, respiration, and GPP of the species of diatom? Express your answer in grams per bottle.

|  |  |  |
| --- | --- | --- |
| Week | Wet weight (g) | Dry weight (g) |
| Start | 14 | 9 |
| One week later | 19 | 11 (light bottle) |
| One week later | 12 | 8 (dark bottle) |

9. Which will produce more apples, Orchard A with 1037 J/m2/day of NPP, Orchard B with 773 J/m2/day, or Orchard C with 2,000 J/m2/day?

10. Which will give you more crops (by weight), a cornfield with a GPP of 5 kg/m2/harvest or a wheat-field with a GPP of 10 kg/m2/harvest?

11. Assuming GPP Forest A = GPP Forest B = GPP Forest C, which has the highest rate of respiration in it’s trees: Forest A, NPP = 1254 J/m2/day; Forest B, NPP =2157 J/m2/day; or Forest C, NPP = 779 J/m2/day?

12. Which has a higher rate of respiration, Bog A with NPP = 300 g/m2/day or Bog B with NPP = 100 g/m2/day? (Assume GPP of Bog A = GPP of Bog B)

14. If a dark bottle loses 1 g biomass/mL and a light bottle gains 5 g biomass/mL, what is the NPP? What is the GPP? Can it be calculated?