

Net Primary Productivity

Purpose:

- Measure net primary productivity (NPP) of grass
- Apply the NPP concept to problems of crop growth and higher trophic level support

Introduction:

Net primary productivity (NPP) is defined as the amount of carbon from the atmosphere that gets added to green plants per unit of time. It is a rate, the quantity of new vegetable matter added per day, per week or per year. Net primary productivity is calculated as the total gain of biomass from photosynthesis minus the losses due to plant respiration. It is this net gain that is available to other organisms as food. The higher the NPP is in a region, the higher the overall biomass and diversity.

You will measure NPP by comparing the changes in dry mass of grass growth of the course of one week. The procedure will measure the net primary productivity as in increase in dry weight over a one week period.

Materials:

- Grass
- Aluminum foil
- Straws for marking test area

Procedure:

1. Harvest 15 plants, all from the same area, by cutting the plants 0.5 cm above the soil.
2. In the section (which you will mark with straws) which you took your samples, count the number of plants in a 10cm by 10cm area. Record this count in your data table.
3. Place the clippings on an open container made from aluminum foil, and put in the drying oven for 72 hrs at a temperature above 60°C.
4. After the plants are dry, weigh and record the mass. This is the starting dry mass.
5. Allow the grass to grow for one week.
6. Harvest an additional 15 grass plants by clipping the plants 0.5 cm above the soil. Repeat the drying and weighing procedure. This is the final dry mass.
7. Find the difference in dry mass. This number is in grams of carbon per 15 plants. Scale this value up by using the number of plants growing 25 cm² (multiply by 2.5). Then convert units of cm² to m² and also the number of days between samples into years.
8. Calculate and report the net primary productivity in units of grams of carbon per square meter per year.

Data:

- Make a data table to collect the number of blades of grass, the starting weight and the final weight of the grass.
- Show calculations of your net primary productivity.

Analysis Questions:

1. What is the definition of net primary productivity? Why is this rate such an important piece of information ecologists?
2. Why are the results expressed as “net productivity” instead of “gross productivity”?
3. Suppose the grass plants continued to grow at the same rate over a six-month growing season. What would be the net productivity for a field that is 1 km²?
4. Comment on the availability of energy from the plant, if it is consumed by the herbivores after the six-month growing season. Explain how energy availability affects the timing of farmers’ harvest of their grain crops.

Conclusions:

- Compare your results with several other groups.
 - Do they have similar calculations?
 - What could account for any possible differences?
- Discuss some of the shortcomings of this experiment. What could be changed to make it more accurate?