

Four graphs of primary production

Graph 1

Imagine we fill up to two 1 L glass bottles with pond water, cap them, and leave them floating in the pond for 24 h. The only thing is, one bottle is clear, and so allows light to pass into the bottle (light bottle), while the other one is spray painted black, so it prevents light from entering the bottle (dark bottle). We measured the amount of dissolved oxygen in both bottles as 6.24 mg O₂/L right before we set them out, but we came back a day later, the oxygen concentration in the light bottle was 6.39 mg O₂/L and that in the dark bottle was 6.16 mg O₂/L.

- Draw a graph showing the data from this little experiment. Be sure to think about which comparison you want to emphasize.
- What do these numbers tell us? That is, what does the O₂ or change in O₂ represent?
- Draw on the graph the following: (that is, what, on the graph, shows us each thing?)
 - GPP
 - NPP
 - Ra

Graph B

Imagine we have a set of 10 identical plants in bell jars, so that nothing gets in or out of the jar, but we can sample the air and measure the concentration of CO₂ in it. Now imagine that we have each plant in its bell jar under one of a range of intensities of sunlight, from complete darkness to full, bright sunlight. We measure the concentration of CO₂ in the air around the plant right before the study and then after one hour. Draw a graph showing how the *change* in CO₂ concentrations (i.e., gain or loss) over the hour depends on the light conditions.

- Describe what is happening with increasing light intensity. That is, why does your graph have this particular shape?
- What do these numbers tell us? That is, what does the change in CO_2 represent?
- Draw on the graph the following: (that is, what, on the graph, shows us each thing?)
 - GPP
 - NPP
 - R_a

Graph Three

Imagine instead we took a fast-growing plant, like bamboo, planted it in soil, and place the whole thing on a very sensitive balance. Let's pretend we also had a sophisticated watering system so that the total amount of water stays constant (i.e., let's ignore changes in water!). Draw what the data would look like if we weighed the whole plant + pot every hour for three days.

- What does the weight or change in weight tell us? What does it represent?
- Why does your graph have this particular shape?
- Can you find on the graph the following?
 - GPP
 - NPP
 - R_a

Graph IV

Finally, imagine we are studying a nearby wheat field and every month we identify a 1 m-by-1 m square, dig it up, remove all of the soil, dry it out, and weigh the dry biomass. While each month we are using a different square (because we are sampling destructively), the field is very homogeneous, so what you measure in the square is pretty much what is happening in the rest of the field. Draw how biomass changes throughout a year.

- What does the weight or change in weight of biomass tell us? What does it represent?
- Why does your graph have this particular shape?
- Can you find on the graph the following?
 - GPP
 - NPP
 - Ra