

Primary Productivity Case Study Teaching Notes

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General course information:

Department: Biology

Level: Introductory Undergraduate

Course Type: Lecture

Students: Majors

Number of Students: 100-150

I teach Introduction to Ecology & Evolution every semester. It typically has 100-150 students, and is required of all bio majors. It also satisfies a core requirement so it always attracts non-bio majors as well. I break the course into 3 units: Evolution, Tree of Life, and Ecology. This would happen towards the end of the Ecology unit. I designed this case study to go along with the SimUText Ecosystem Ecology chapter (specifically, section 2: Primary Productivity and Repiration). SimUText ecology resources can be found [here \(http://simbio.com/products-college/simutextecology\)](http://simbio.com/products-college/simutextecology).

Learning Outcomes/Objectives:

- Understand broad global patterns primary productivity in different biomes/habitats
- Convert global annual NPP estimates into relative values of NPP per area
- Describe why primary productivity varies so much over time, space, and among ecosystems
- Compare the local and global scale of chemosynthetic primary productivity with photosynthetic NPP, and discuss why global estimates of annual chemosynthetic NPP are so difficult to make

Background knowledge: This is designed to happen in class after students have completed section 2 of the Ecosystem Ecology SimUText chapter. At this point near the end of our semester, students are part way through a unit on Ecology (1/3 of the semester long course), and this roughly marks the transition between overviewing the different scales of ecology (behavior, population, community, ecosystem), to ending the semester with climate change and conservation biology.

Adapting the case-study: There are a few different parts of this case that could be completed individually (see below). To complete the whole thing would probably take one 75-minute class period.

Classroom management: I did this in an interrupted lecture format, where I went through a series of slides and pauses for students to work in pairs or small groups to discuss questions. I solicit responses using PollEverywhere to gauge comprehension, participation, and engagement along the way.

Case Overview: Each of these investigations could stand alone. They could be done all together, or individually across different class meetings. You can find more detailed explanations in the presenter notes of each slide in the PowerPoint file.

1. How does primary productivity vary seasonally on land and in the ocean?
2. Where does most terrestrial primary productivity occur?
3. How is photosynthetic primary productivity in the ocean different from photosynthetic primary productivity on land?

Possible Chemosynthesis Extension: I take this one step farther with a 4th section that asks students to think about the importance (both globally and on local scales) of chemosynthetic primary productivity relative to photosynthetic NPP. I used both published and unpublished data for this (which is why I haven't included it here), but feel free to be in touch if you are interested in this extension. I also use this extension in an upper level elective class called Deep Sea Biology.