

Global Biogeochemical Cycles

Problem Set 4

Due Friday, May 19 by 11:59pm Central time

1. Assuming 100% efficiency in the industrial production of ammonium, compare the CO₂ “cost” in the production of ammonium fertilizer to the potential carbon sink from higher NPP and soil organic matter in land areas that receive the fertilizer. Suggest that you refer to Chapters 12 and 5-6 in the textbook and also make some assumptions -- state them clearly. In addition, explain some reasons why, in the end, fertilizer application yields relatively little real-world carbon storage in land plant biomass. In other words, why can't we just crank up nitrogen availability to solve the problem of CO₂ emissions?

2. The following data are available for two forests:

	<u>Sherwood</u>	<u>Birnam</u>
Total biomass (kcal/m ²)	200,000	1,500,000
Gross photosynthesis (kcal/m ² /yr)	12,200	45,100
Plant respiration (kcal/m ² /yr)	4,700	(ii) _____
Net primary production (kcal/m ² /yr)	(i) _____	13,200
Heterotrophic respiration (kcal/m ² /yr)	4,600	13,180
Net community production (kcal/m ² /yr)	(iii) _____	(iv) _____
C residence time	(v) _____	(vi) _____

(a) Fill in the missing values (i)-(vi).

(b) Which forest do you think is older and why?