Name _____ Teacher _____ Date _____

4.3: Grading the Computer Model for Changing Fluxes Worksheet

*This worksheet has "grading" in the title because at this point, students can be held accountable for correct answers. Level 4 (correct) responses to the questions are in **blue bold italics** below. There are also comments about common Level 2 and Level 3 responses to help you with grading and making decisions about what to emphasize in future lessons.*

Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers. There are 67 points total on this worksheet.

A. Collect and record results for Model 2

1. See what happens with different settings. Start with the settings suggested for runs 1, 2, and 3, then try your own settings! Click on the graph to see a sliding line that you can use to get the exact pool and flux sizes for a specific time.

Run #1: Settings in the middle

Initial settings (0 years)			Results of Run				
CO_2 pool	Organic pool	Carrying capacity	Time	CO_2 pool	Org. pool	Phs. flux	CR flux
500 kg	500 kg	50 kg/yr	1 year	***523*** kg	***476*** kg	***73*** kg/yr	***95*** kg/yr
			5 years	***590*** kg	***409*** kg	***69*** kg/yr	***81*** kg/yr
			20 years	***672*** kg	***327*** kg	***63*** kg/yr	***65*** kg/yr

1 point for each correct cell. 12 points total.

Run #2: Change the pool settings

Initial settings (0 years)			Results of Run				
CO_2 pool	Organic pool	Carrying capacity	Time	CO_2 pool	Org. pool	Phs. flux	CR flux
800 kg	200 kg	50 kg/yr	1 year	***791*** kg	***208*** kg	***50*** kg/yr	***41*** kg/yr
			5 years	***761*** kg	***238*** kg	***54*** kg/yr	***47*** kg/yr
			20 years	***706*** kg	***293*** kg	***60*** kg/yr	***58*** kg/yr

1 point for each correct cell. 12 points total.

Run #3: Change the photosynthesis limit

Initial settings (0 years)			Results of Run				
CO_2 pool	Organic pool	Carrying capacity	Time	CO_2 pool	Org. pool	Phs. flux	CR flux
500 kg	500 kg	90 kg/yr	1 year	***466*** kg	***533*** kg	***137*** kg/yr	***106*** kg/yr
			5 years	***367*** kg	***632*** kg	***144*** kg/yr	***126*** kg/yr
			20 years	***254*** kg	***745*** kg	***150*** kg/yr	***149*** kg/yr

1 point for each correct cell. 12 points total.

Run #4: Your own settings

Initial settings (0 years)			Results of Run				
CO_2 pool	Organic pool	Photosynthesis limit	Time	CO_2 pool	Org. pool	Phs. flux	CR flux
kg	kg	kg/yr	1 year	kg	kg	kg/yr	kg/yr
			5 years	kg	kg	kg/yr	kg/yr
			20 years	kg	kg	kg/yr	kg/yr

Answers will vary.
1 point for each cell. 12 points total.

Run #5: Your own settings

Initial settings (0 years)			Results of Run				
CO_2 pool	Organic pool	Photosynthesis limit	Time	CO_2 pool	Org. pool	Phs. flux	CR flux
kg	kg	kg/yr	1 year	kg	kg	kg/yr	kg/yr
			5 years	kg	kg	kg/yr	kg/yr
			20 years	kg	kg	kg/yr	kg/yr

Answers will vary.
1 point for each cell. 12 points total.

B. Questions about Patterns

3. What is the main setting that determines pool size after 20 years? Why do you think this happens?

The pool size after 20 years is determined by the photosynthesis limit. The photosynthesis limit determines the maximum amount of organic carbon an ecosystem can support.

1 point for correct answer.

4. What is the main setting that determines fluxes after 20 years? Why do you think this happens?

The fluxes after 20 years are determined by the photosynthesis limit. The photosynthesis limit determines the maximum amount of photosynthesis an ecosystem can support.

1 point for correct answer.

5. What happens to the fluxes over the 20-year period? What would happen in 50 years?

The fluxes begin to converge and will continue to converge in 50 years.

1 point for correct answer.

6. In Lesson 2 you discussed ecosystems with different total organic matter pools. For each ecosystem, what are your ideas about the *limiting resource*—the thing that plants are most likely to run out of so that they can't increase the photosynthesis flux?

Desert: ***Water***
Forest: ***Sunlight or Water***
Cornfield: ***Nutrients or Water***
Prairie: ***Nutrients or Water***
1 point for each correct answer. 4 points total.