

MODELING LAND USE AND STREAMFLOW WORKSHEET

Name _____ Date _____

1. Open the streamflow STELLA model. You should see a control panel that includes a graph and several smaller boxes.

2. The graph at the top of the screen will generate a “hydrograph” showing how streamflow responds to rainfall and land use in your model watershed over a 14-day period. The model is set up so that a 3" rain event will occur on Day 4 (you will change this later). Four “slider” controls set the land use in the watershed.

3. What initial conditions have been set for land use practices? In other words, what percent of the landscape in the model is farmland, forest, suburbs, and urban? Record your answer in the space below.

4. This initial setup—100% forest—reflects conditions found in much of North America at the time of European settlement. Without changing the settings on the slider controls, record your prediction for how streamflow will respond to a 3" rainfall event on Day 4:
 - a. Double click on the Streamflow Prediction graph.
 - b. Using your mouse, drag a graph line on the grid to show your prediction for streamflow. Remember, 3" of rain will fall on Day 4.
 - c. Click OK to close the window.

5. Now select *Run* from the “Run” menu to run the model. Record your findings in Table 2.18. How did the prediction you made in Step 3 compare to the model run? Explain.

6. Use the slider controls to change the land use so that *Percent Urban* equals 100 and *Percent Forest* equals 0. To change land use in the model, click on the slider control bar and drag it to the appropriate position, or click on the number window, type in a new value, and press “Enter”. As you did in Step 3, record your predictions on the Streamflow Prediction graph first, and then run the model. Record your findings in Table 2.18. How did your predictions compare to the model? Explain.

7. Click on the bottom left corner of the hydrograph to look at Page 2 of the graph. This page compares all the model runs you have performed so far. You can use it to compare the first model run with the second. How did the streamflow change when the land use was changed from 100% forest to 100% urban? What’s different about the graphs? Explain below.

8. Clear Page 2 of the graph by clicking on the dynamite icon at the bottom of the graph.

SECTION 2. PROTOCOLS

9. Change the rainfall event by double-clicking on the “Rainfall” graph. To increase the amount of rain on Day 4 from 3 inches to 6 inches, click on the “Rainfall” column for Day 4 and type “6” in the “Edit Output” box.

10. Run the model three times using the 6" rainfall event and the land use percentages in the table below. This table contains the land use percentages for an upstate New York watershed. Alternatively, you may use your own local watershed land use data. Record your findings in Table 2.18.

Year	% Farm	% Forest	% Urban	% Suburban
1600	0	100	0	0
1910	75	21	4	0
1992	23	65	7	5

11. Look at Page 2 of the graph and compare the findings from the three simulations. How did streamflow change as land use changed over time? Explain.

12. As a member of the Watershed Advisory Working Group, what would you tell the mayor about the impact of different land uses on streamflow?

13. Now that you have experience with the streamflow model, you can begin to consider questions that might arise as you serve on the mayor's committee. Experiment with different combinations of land usage. Each time, before you run the model, enter a prediction for the streamflow and compare your predictions to your findings. Remember that you can clear a graph by selecting the dynamite tool and clicking on the graph.

14. Now consider a developer who wants to create a subdivision with many new houses in your town. Your town currently has land use percentages of: 23% farm, 65% forest, 7% urban, and 5% suburban. How would you change these percentages to model the impact the developer might have on streamflow? How do you think the streamflow will respond to these changes? Explain.

15. The city is buying some old buildings located next to a stream, bulldozing the buildings, and planting trees to create a forest. How do you predict streamflow will respond to these changes? Why? Explain.

16. Why do you think streamflow patterns matter in terms of water quality and quantity? Why would it matter to town residents if all the rainwater washed out of the watershed in streamflow very quickly or more slowly?

