Ecological Problem Solving

FW 364

Practice Problem 1

**Learning objectives**: In this lab, we will learn how to create a conceptual model of an ecological system (the global hydrologic cycle), apply mass balance concepts (most notably, the idea and implications of *steady-state*), recognize and document hidden assumptions, and practice the simple algebra needed to solve mass-balance problems. Effective problem solving starts from the creation of a simple conceptual model of the real-world system. An effective model should be minimally complex - only as complex as required to solve the problem, and will always be a gross simplification of the real system of interest.

Based on the information below and a mass-balance model of the global hydrologic cycle, determine the residence time of water in the world's oceans. To do this problem, you must first delineate the relevant stocks and flows of water (a diagram is useful for this purpose). You may need to make assumptions in order to calculate certain quantities. Be sure to state these assumptions in your answer. Be careful of the units! Show all your work.

Total surface area of the Earth: 5.10 x 108 km2

Total surface area of oceans: 3.61 x 108 km2

Total volume of oceans: 1.35 x 1018 m3

Average global precipitation: 1 m/year

Total evapotranspiration from land: 6.2 x 1013 m3/year