Additional exercises Chapters 1 and 2

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Chapter 1

1. With the water flows of Figure 1.6 in mind (note what is labeled "interception loss" should be "interception evaporation"), consider these three scenarios at the same forested location:

   A. At the very beginning of a rain storm
   B. Near the end of a long rain storm (gross precipitation rate as 1)
   C. After the storm ends and the sun comes out

   Compare the following items for scenarios A-C and explain why they compare the way that they do.

   a) Interception evaporation
   b) Interception storage
   c) Stemflow
   d) Throughfall
   e) Infiltration
   f) Soil evaporation

2. Write a water balance equation for Sebago Lake (Portland's water supply). The equation does not need numbers, just symbols representing the different terms. Explain what each term is. Explain how the balance is different in a late summer dry spell compared to a wet springtime.

3. The estimated volume of the Greenland ice sheet is 684,000 cubic miles. The area of ice in Greenland is about 1,710,000 km^2. The estimated average precipitation rate over Greenland's ice is about 350 mm/year (liquid water equivalent).

   a) Convert the volume of ice to the equivalent volume of water in km^3 and m^3.
   b) Estimate the total average volume of precipitation that falls on Greenland's ice in in km^3/yr and m^3/yr.
   c) Estimate the average residence time for ice in the ice sheet.

4. The USGS gaging stations report their flow data in cfs (cubic feet per second). The discharge of the Kennebec River Gorge during rafting runs is typically about 5200 cfs. Convert this discharge to m^3/s units.

5. A small drainage basin has an area of 6.0 km^2 and received 475 mm of precipitation in a given year. In the same year, the stream draining this basin had an average discharge of 1.1 x 10^6 m^3/yr. Assuming that the basin has no inlet streams and that there has been no change in water stored within the basin, compute the annual evaporation from the basin in m^3/yr and convert this to the average evaporation rate in the basin in mm/yr.

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