

# Physical Hydrology for Ecosystems

## BEE 3710

### Assignment #1: Hydrology Warm-up - Snow & Watersheds<sup>1</sup>

In lab we will go out to the Cornell Arboretum and measure the snow depth,  $D_s$  (cm), and density,  $\rho_s$  ( $\text{g cm}^{-3}$ ). The amount of water in the snow is called the snow water equivalent, or  $SWE$  (cm), and is determined with the following equation.

$$SWE = D_s \frac{\rho_s}{\rho_w} \quad (1)$$

where  $\rho_w$  is the density of water ( $\sim 1 \text{ g cm}^{-3}$ ).

We will make measurements at several locations and note the locations on the map.

Your assignment is to:

- 1) Calculate the  $SWE$  for each measurement
- 2) Find the average  $SWE$  over the watershed
- 3) Determine the area of the watershed (see the Cornell Arboretum map)
- 4) Estimate the volumes ( $\text{m}^3$ ) of snow and water in the watershed
- 5) If this water melted and left the watershed in one day (24 hrs), what would be the average discharge ( $\text{m}^3/\text{s}$ )?
- 6) What's the average  $SWE$  if you use Thiessen Polygons (see handout on the course website)?
- 7) In the early Spring, Ithaca gets roughly  $10,000 \text{ kJ m}^{-2} \text{ day}^{-1}$  of environmental energy (sunshine, longwave radiation, etc.). The latent heat of freezing/melting is  $0.333 \text{ kJ g}^{-1}$ . Estimate how long it would take to melt all the snow in the watershed.

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<sup>1</sup> Assignments also posted on the web: <http://www.hydrology.bee.cornell.edu/BEE371Index.htm>

SNOW SURVEY WORK SHEET

Site	Depth $D_s$ (cm)	Tube Dia. $d$ (cm):	X-sec. area $A = \pi d^2/4$ (cm <sup>2</sup> )	Snow Volume $V_s = D_s \times A$ (cm <sup>3</sup> )	Snow Mass $M_s$ (g)	Snow Density $\rho_s = M_s / V_s$ (g cm <sup>-3</sup> )	<i>SWE</i> (cm)
1							
2							
3							
4							
5							
6							
7							
8							