Name _____ Date _____

How much water?

In this activity, you will first calculate the volume of water flowing past a certain point every second in a stream, and then figure out how that compares to volume of your classroom and the volume of water in the Hudson River. Finally, you will look at historic data from the Hudson and think about the future implications of changing flow with a changing climate.

Part 1: Your best guess

Calculate the volume of your classroom in cubic feet:

_____

Estimate the volume of water moving past a point each second in the stream you will visit in cubic feet per second (cfs):

_____

Estimate the volume of water moving in the Hudson River in cfs:

_____

Part 2: Measuring your stream's flow

Step 1: Stream segment length

Measure out a specific length of your stream (if it is a small stream that is moving very slowly, you will probably want to use a shorter length).

Stream segment length: _____ ft

Step 2: Stream segment width

Find the average width of your stream segment at the top, middle, and bottom end of your segment.

Width top: _____
Width middle: _____
Width bottom: _____
Average: _____ ft

Step 3: Stream segment velocity

Using your segment, drop a ping pong ball or a tennis ball (depending on the perceived velocity of your stream-a ping pong ball works better in slower moving water) and record the speed at which the object travels the length of the segment. You should do this at the left, middle, and right side of the stream, and then average your measurements.

Left side (sec)	Middle (sec)	Right side (sec)	Average
Average of all three segments (time in seconds)			

Step 4: Stream depth. Stretch a tape measure across the stream at the mid-point of your stream segment. At 1 foot intervals across the stream, measure the depth (in feet) and record it in the table below.

Distance (ft)	Depth		Distance (ft)	Depth
0	0		6	
1			7	
2			8	
3			9	
4			10	
5			11	

Sum of depths: _____ / number of samples taken = _____ average depth of stream

Step 5: Flow calculation
Now that you have all your measurements, simply plug in the numbers in the equation:

[____ ft (length) x _____ ft (width) x _____ ft (depth)] ÷ _____ (time secs) = _____ cubic feet per sec (cfs)

Part 3: How good were your estimates?

How does your calculated flow compare with your original guess of flow in your stream?

_____
_____

Download the historical flow data (cubic feet per second) in the Hudson River at Poughkeepsie, using this website: http://ny.water.usgs.gov/projects/dialer_plots/saltfront.html#HDR1
How does your stream's flow compare with the Hudson's?

_____
_____

How does the actual flow at Poughkeepsie compare with your estimate?

_____
_____

Part 4: Historical Flow Rate

Using the historical flow data from the website above, plot a graph of the flow over time. Add a trend line.

What does this data set show?

_____
_____
_____

Which year had the highest annual discharge? _____ the lowest? _____
What is the average annual discharge from 1947 to 2005? _____

Part 5: Climate Change and Flow

Read the following and answer the question below:

> Under climate change scenarios from the IPCC report (A2 and B2, which estimate an increase between 2°C and 4°C), estimates are that the Hudson River will experience a 20% increase in flow rate by 2050, from 20,400 cfs to 24,500 cfs. The average historic freshwater flow rate of the Hudson over the last sixty years is 20,350 cfs.

What types of impact would this increased flow rate have on the Hudson River? How might this affect a river like the Mississippi? What impact will an increase in flow together with rising sea level have on the Hudson?

_____
_____
_____
_____
_____
_____