Analyzing Rainfall-Runoff Relationships

By looking at the amount of times it takes for a watershed to respond and the relative sizes of peak stream stage and rainfall, hydrologists can see how stream behavior changes throughout the year. This can lead us to conclusions about what happens in the channel.   A few measurements are useful and easily calculated from paired rain and runoff records.

Definitions:

Storm: Period of rain. Researchers should figure out the definition of a storm. Usually one storm can be separated from another based on the space between rain tips (1 hour, 2 hours, 3 hours). There simply has to be a consistent definition to define a storm.

Beginning of a storm (tw$_0$): Time of the first tip

End of a storm (tw$_e$): Time of the last tip

Total rainfall (R): The amount of rain in a storm. Can be calculated from a tipping bucket rain record by counting the number of tips during a storm and multiplying this by the amount of rain per tips (0.2 mm/tip)

Storm Duration (tw$_e$-tw$_0$): The storm length from the first tip to the last tip.

Average rain intensity (i_{avg}): The total rainfall divided by the storm duration

Peak rain intensity i_{pk}: the amount per tip (0.2 mm/tip) divided by the time from the last tip to the current one
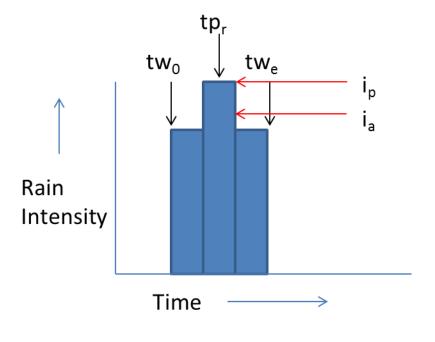
Beginning of rise (t_{q0}): The time when the stream stage starts to increase.
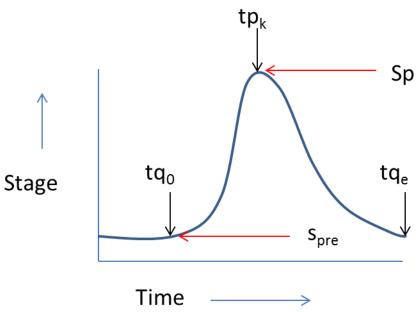
Time of peak (t_{pk}): The time that the peak rain intensity occurred

Peak stage (s_p): Greatest height of water in the channel

Time of peak stage(t_{pk}): Time that the peak stage occurred.

Calculated Times:

Lag to peak (T_{Lp}) = $t_{pk} - t_{w0}$

Response lag (T_{Lr}) = $t_{q0} - t_{w0}$

Time to concentration (T_c) = $t_{qe} - t_{we}$

	Date and time something occurs						Depths in centimeters above gage		Rain intensity in millimeters per hour		Total rain in millimeters	Peak lag $t_{pk}-t_{w0}$	Response lag $t_{q0}-t_{w0}$	Time to concentration $t_{qe}-t_{we}$
Symbols	t_{w0}	t_{wpk}	t_{we}	t_{q0}	t_{qpk}	t_{qe}	s_{pre}	s_p	I_p	I_{avg}	R	T_{Lp}	T_{Lr}	T_c
Storm Number														

Storm Description Table