

Baseflow separation

A guideline for streamflow divorce



Learning Objectives

- Have the audience develop hands-on experience with baseflow separation methods
- Participants can identify key variables of uncertainty
- They can describe the importance of baseflow

Basics of baseflow:

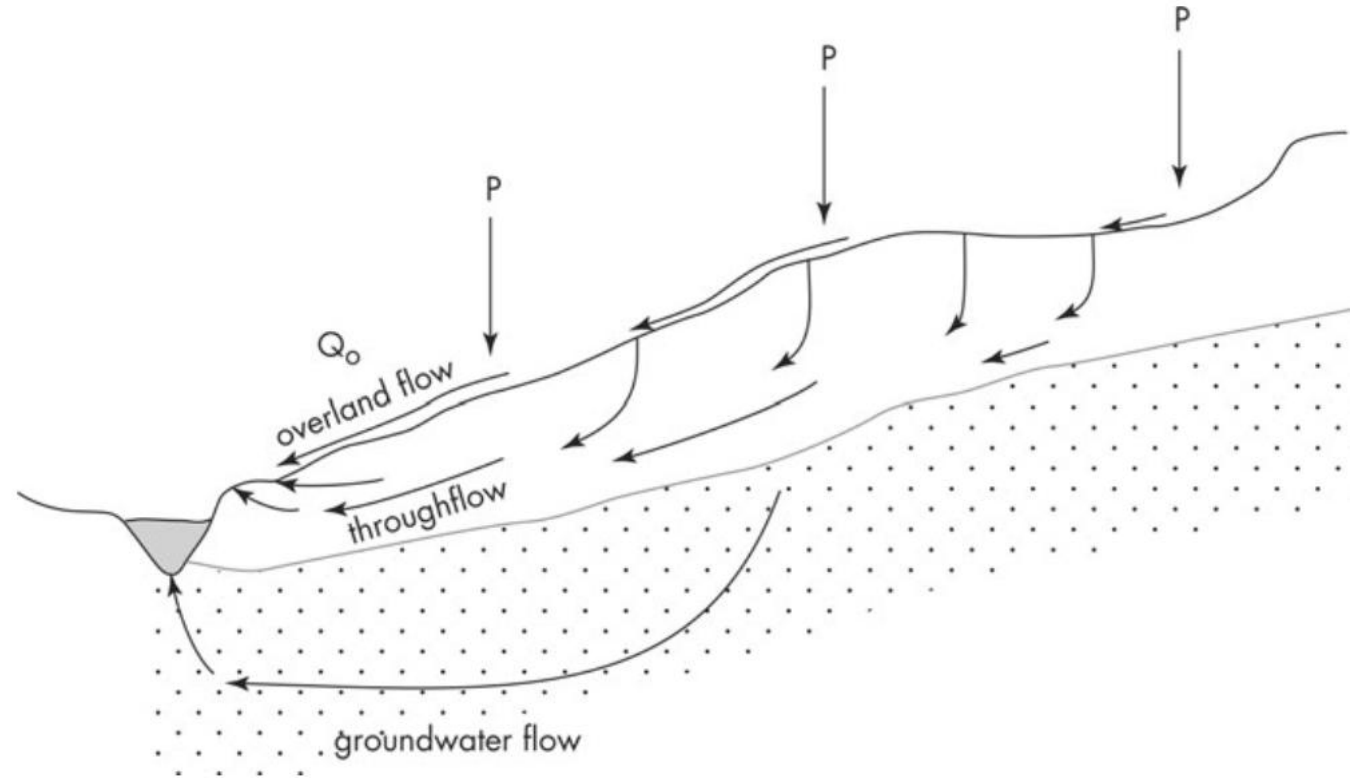
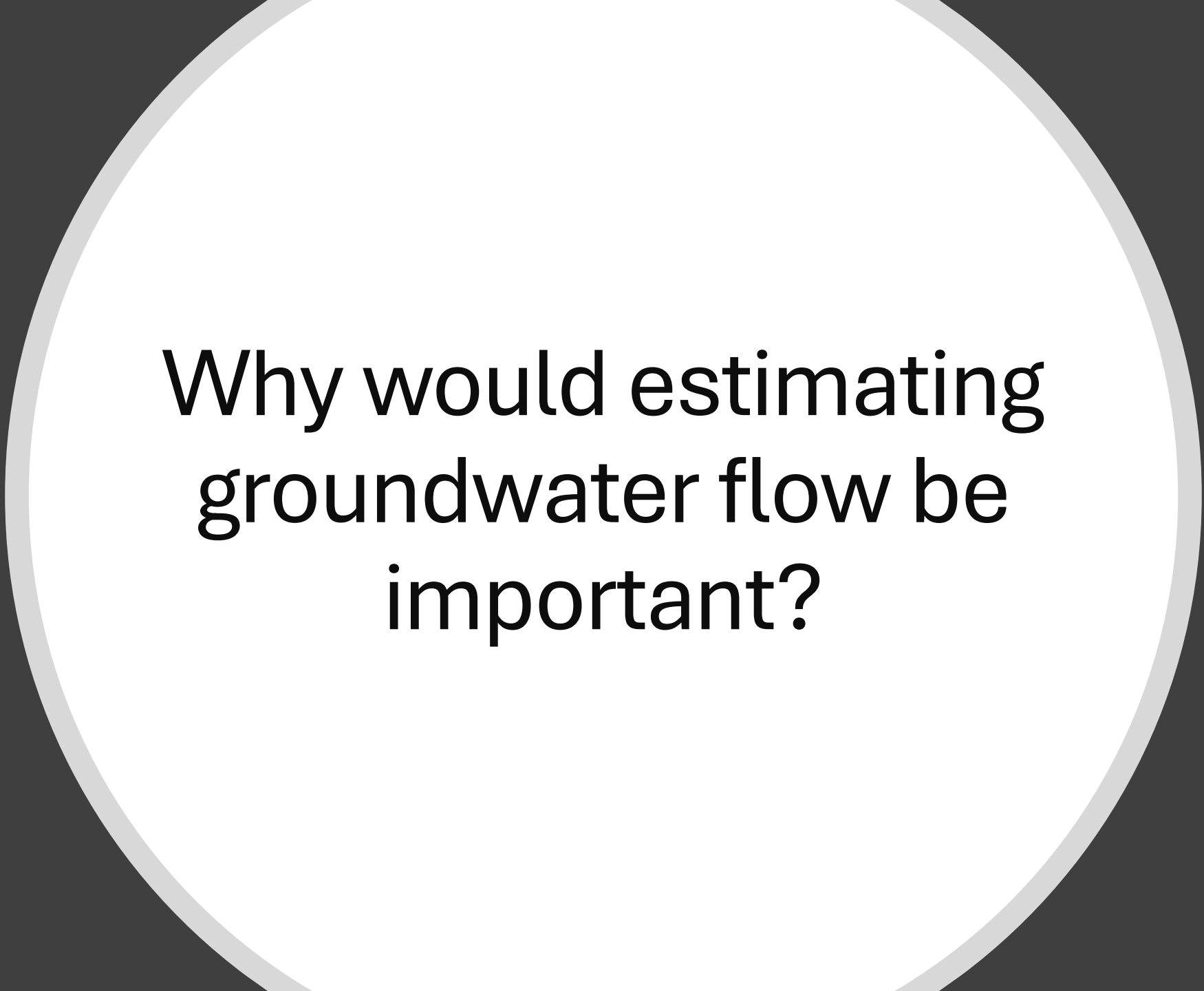


Figure 7.4 Hillslope runoff processes. See text for explanation of terms.



Why would estimating
groundwater flow be
important?

Traditional Estimation Techniques: Tracers



$$b_1 = \frac{(1 - BFI_{\max}) \alpha b_{t-1} + (1 - \alpha) BFI_{\max} Q_t}{1 - \alpha BFI_{\max}}$$

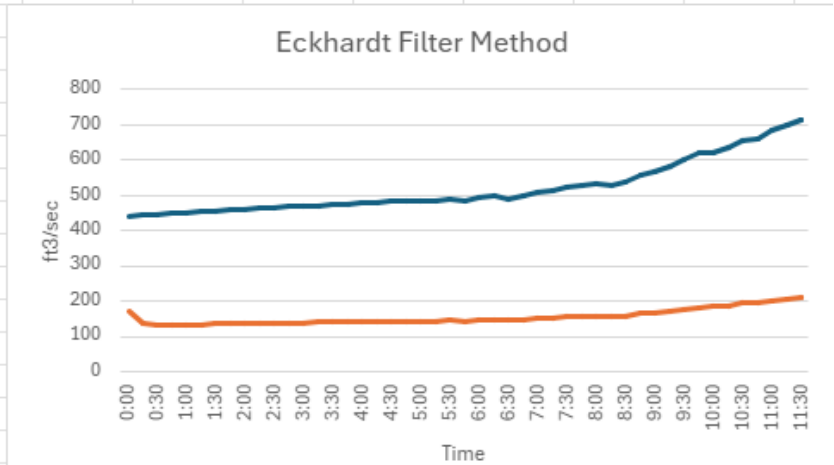
Filter Method: Eckhardt Filter

- BFI_{\max} = Proportion of baseflow to streamflow
- Alpha = Recession coefficient
- Q_t = Streamflow at time t
- B_{t-1} = Baseflow at previous time step
- B_1 = Baseflow at current time step

Example:

Time	Discharge (ft ³ /sec)	b-1	b
0:00	441	352.8	171.8242909
0:15	444	171.8242909	139.2520332
0:30	447	139.2520332	133.9860105
0:45	450	133.9860105	133.744335
1:00	450	133.744335	133.6998667
1:15	453	133.6998667	134.4189573
1:30	456	134.4189573	135.2785427
1:45	459	135.2785427	136.1639791
2:00	462	136.1639791	137.0541722
2:15	465	137.0541722	137.9452404
2:30	465	137.9452404	138.109197
2:45	468	138.109197	138.8666377
3:00	471	138.8666377	139.7332795
3:15	471	139.7332795	139.8927416
3:30	474	139.8927416	140.6493554
3:45	477	140.6493554	141.515845
4:00	480	141.515845	142.4025518
4:15	480	142.4025518	142.5657059
4:30	483	142.5657059	143.322999
4:45	486	143.322999	144.1896136
5:00	486	144.1896136	144.3490707
5:15	486	144.3490707	144.3784108
5:30	490	144.3784108	145.3535064
5:45	486	145.3535064	144.563227
6:00	496	144.563227	146.842058
6:15	499	146.842058	147.9886356
6:30	490	147.9886356	146.0177877
6:45	499	146.0177877	147.8369699
7:00	509	147.8369699	150.5959419
7:15	515	150.5959419	152.5581382
7:30	522	152.5581382	154.616152
7:45	528	154.616152	156.449372
8:00	532	156.449372	157.7563814
8:15	528	157.7563814	157.0271742
8:30	538	157.0271742	159.3172425
8:45	559	159.3172425	164.8295241
9:00	566	164.8295241	167.5407537
9:15	583	167.5407537	172.160832
9:30	601	172.160832	177.3745628
9:45	620	177.3745628	182.9399499

Constants	
BFI _{max}	0.8
alpha	0.92



Overview of steps:

1. Head to the [USGS](#) to download discharge data for 12:00 AM –11:59 PM on 02/12/2025.
2. Pre-process the data to only have hourly time-steps.
3. Create a spreadsheet with the columns "Time", "Streamflow", "Previous baseflow", and "Current Baseflow."
4. Input the Eckhardt equation into the "Current Baseflow" column.
5. Calculate the "Current Baseflow."
6. (Optional) Graph.

*A step by step guide is included in the provided workshop materials if needed

Group Application

Get into groups of three!

A storm hit the watershed HUC 8-031601120 on 2/12/25. Extract the streamflow data from that day and estimate the baseflow across 24 hours using the Eckhardt filter. Afterwards, collectively answer the discussion questions.

Post Activity Check-In and Exit Survey :)

- Had hands-on experience with baseflow separation methods
- Able to identify key variables of uncertainty
- Described the importance of baseflow

• <https://forms.office.com/r/ZLZMSm3F1s?origin=lprLink>

Baseflow Estimation Workshop Feedback Form

