# Assignment 6: Time Series Analysis

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## OVERVIEW

This exercise accompanies the lessons in Hydrologic Data Analysis on time series analysis

## Directions

1. Change "Student Name" on line 3 (above) with your name.
2. Work through the steps, **creating code and output** that fulfill each instruction.
3. Be sure to **answer the questions** in this assignment document.
4. When you have completed the assignment, **Knit** the text and code into a single pdf file.
5. After Knitting, submit the completed exercise (pdf file) to the dropbox in Sakai. Add your last name into the file name (e.g., "A06_Salk.html") prior to submission.

The completed exercise is due on 11 October 2019 at 9:00 am.

## Setup

1. Verify your working directory is set to the R project file,
2. Load the tidyverse, lubridate, trend, and dataRetrieval packages.
3. Set your ggplot theme (can be theme_classic or something else)
4. Load the ClearCreekDischarge.Monthly.csv file from the processed data folder. Call this data frame ClearCreekDischarge.Monthly.

## Time Series Decomposition

5. Create a new data frame that includes daily mean discharge at the Eno River for all available dates (`siteNumbers = "02085070"`). Rename the columns accordingly.

6. Plot discharge over time with geom_line. Make sure axis labels are formatted appropriately.

7. Create a time series of discharge

8. Decompose the time series using the `stl` function.

9. Visualize the decomposed time series.

10. How do the seasonal and trend components of the decomposition compare to the Clear Creek discharge dataset? Are they similar in magnitude?

    Seasonal:

    Trend:

## Trend Analysis

Research question: Has there been a monotonic trend in discharge in Clear Creek over the period of study?

11. Generate a time series of monthly discharge in Clear Creek from the ClearCreekDischarge.Monthly data frame. This time series should include just one column (discharge).

12. Run a Seasonal Mann-Kendall test on the monthly discharge data. Inspect the overall trend and the monthly trends.

13. Is there an overall monotonic trend in discharge over time? If so, is it positive or negative?

14. Are there any monthly monotonic trends in discharge over time? If so, during which months do they occur and are they positive or negative?

## Reflection

15. What are 2-3 conclusions or summary points about time series you learned through your analysis?

16. What data, visualizations, and/or models supported your conclusions from 12?

17. Did hands-on data analysis impact your learning about time series relative to a theory-based lesson? If so, how?

18. How did the real-world data compare with your expectations from theory?