Assignment 1: Introduction

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OVERVIEW

This exercise accompanies the lessons in Water Data Analytics on introductory material.

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 (marked with >).
4. When you have completed the assignment, **Knit** the text and code into a single PDF file.
5. After completing your assignment, fill out the assignment completion survey in Sakai.

Having trouble? See the assignment's answer key if you need a hint. Please try to complete the assignment without the key as much as possible - this is where the learning happens!

Target due date: 2022-01-18

Course Setup

1. Post the link to your forked GitHub repository below. Your repo should include one or more commits and an edited README file.

   Link:https://github.com/nvonturkovich/Water_Data_Analytics_2022.git

Data Visualization Exercises

2. Set up your work session. Check your working directory, load packages `tidyverse`, `dataRetrieval`, and `zoo`. Set your ggplot theme as theme_classic (you may need to look up how to set your theme).

```
getwd()
```

```
## [1] "/Users/natalievonturkovich/Documents/DUKE/Courses/Spring 22/ENV_790_WDA/Water_Data_Analytics_20
```

```
library(tidyverse)
library(dataRetrieval)
library(zoo)
```

3. Upload discharge data for the Eno River at site 02096500 for the same dates as we studied in class (2012-01-01 through 2021-12-31). Obtain data for discharge. Rename the columns with informative titles, as we did in class.

```
#  data import
EnoDischarge <- readNWISdv(siteNumbers = "02096500", parameterCd = "00060", # discharge (ft3/s)
                     startDate = "2012-01-01",
                     endDate = "2021-12-31")
# column rename
names(EnoDischarge)[4:5] <- c("Discharge_cfs", "Approval_Code")
```

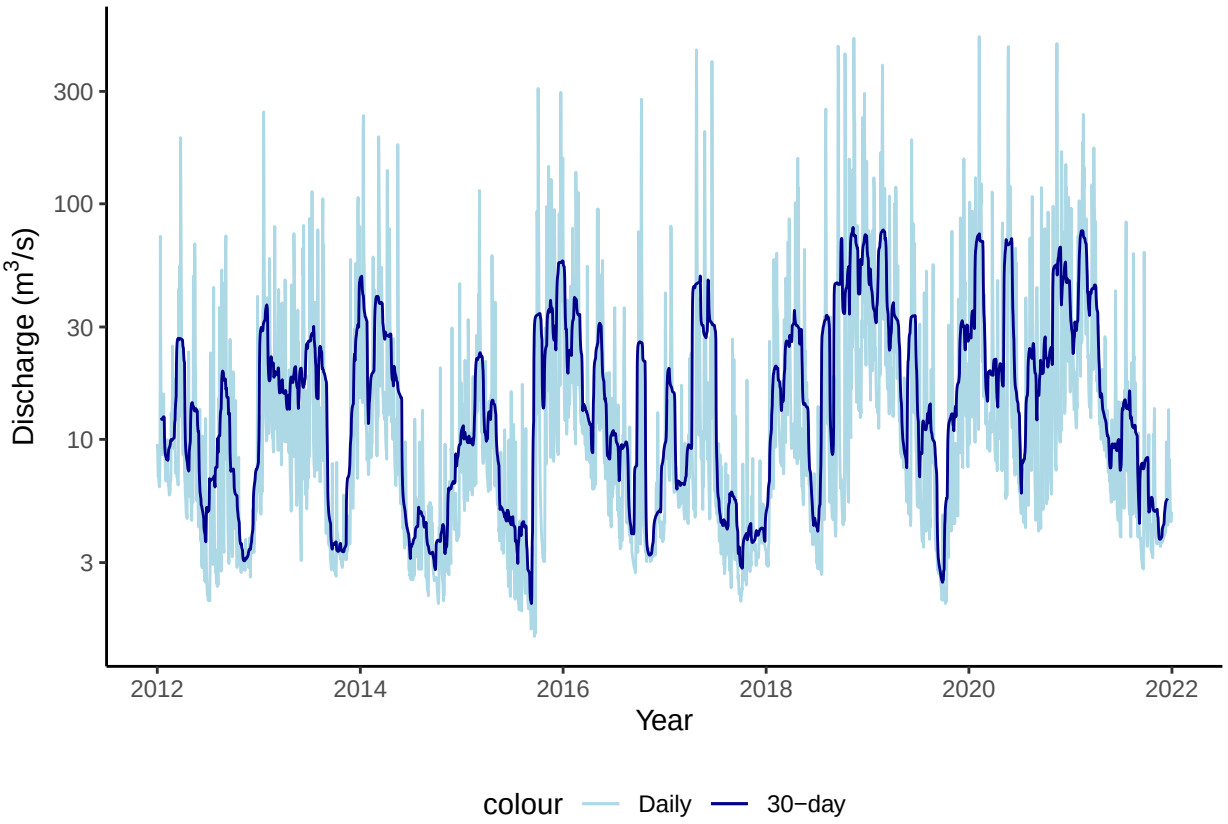
4. Build a plot called EnoPlot2. Use the base plot we made in class and make the following changes:

- Add a column to your data frame for discharge in meters cubed per second. hint: package dplyr in tidyverse includes a `mutate` function
- Add a column in your data frame for a 30-day rolling mean of the metric discharge. (hint: package dplyr in tidyverse includes a `mutate` function. hint: package zoo includes a `rollmean` function)
- Create two geom_line aesthetics, one for daily discharge (meters cubed per second) and one for rolling mean of discharge. Color these differently.
- Update your ggplot theme. I suggest "classic." (hint: https://ggplot2.tidyverse.org/reference/ggtheme.html)
- Update axis names
- Change the y axis from a linear to a log10 axis (hint: google "ggplot logged axis")
- Add a legend. (hint: Google "add legend two geom layers ggplot")

```
EnoDischarge<-EnoDischarge %>%
  mutate(Discharge_m3 = Discharge_cfs/35.3147,
         Discharge_RollMean = rollmean(Discharge_m3, 30, fill=NA))
```

```
#discharge m3+rolling mean
EnoPlot2 <-
  ggplot(EnoDischarge, aes(x=Date))+
  geom_line(aes( y = Discharge_m3, color = "Daily")) +
  geom_line(aes(y=Discharge_RollMean, color = "30-day")) +
  scale_color_manual(values = c("Daily" = "lightblue", "30-day" = "darkblue")) +
  scale_y_log10(name = expression("Discharge (m"^3*"/s)")) +
  theme_classic() +
  theme(legend.position = "bottom") +
  labs(x = "Year")
EnoPlot2
```

```
## Warning: Removed 29 row(s) containing missing values (geom_path).
```



5. In what ways was the second plot a more effective visualization than the first?

   ANSWER: The second plot is a more effective visualization than the first due to having both the (daily?) discharge as well as the rolling mean. Seeing these two lines plotted on the same graph gives a better picture of the discharge. Represnting these two lines in different colors, and adding a legend makes the plot more comprehensible.

6. What portions of the coding were challenging for you?

   ANSWER: I have a hard time remember the coding, I have to look up how to do most things. Some bits are definitely starting to stick though! I tired to add a title but couldn't figure out how to center it so I took it out. I also dont know why is says "colour" before more legend.

7. Interpret the graph you made. What are the things you notice about within- and across-year variability, as well as the differences between daily values and 30-day rolling mean?

   ANSWER: It is interesting to notice how the both the daily and rolling mean discharge volumes are increasing over time. There is a general increasing trend. There is though a lot of variation, with a ~3 year period. Lots of loss and gain over a shorter period of time.