---

title: "Assignment 3: Data Exploration"

author: "Student Name"

output: pdf\_document

geometry: margin=2.54cm

---

## OVERVIEW

This exercise accompanies the lessons in Environmental Data Analytics on Data Exploration.

## Directions

1. Change "Student Name" on line 3 (above) with your name.

3. Work through the steps, \*\*creating code and output\*\* that fulfill each instruction.

4. Be sure to \*\*answer the questions\*\* in this assignment document.

6. When you have completed the assignment, \*\*Knit\*\* the text and code into a single PDF file.

8. After Knitting, submit the completed exercise (PDF file) to the dropbox in Sakai. Add your last name into the file name (e.g., "Salk\_A03\_DataExploration.Rmd") prior to submission.

The completed exercise is due on Tuesday, January 28 at 1:00 pm.

## Set up your R session

1. Check your working directory, load necessary packages (tidyverse), and upload two datasets: the ECOTOX neonicotinoid dataset (ECOTOX\_Neonicotinoids\_Insects\_raw.csv) and the Niwot Ridge NEON dataset for litter and woody debris (NEON\_NIWO\_Litter\_massdata\_2018-08\_raw.csv). Name these datasets "Neonics" and "Litter", respectively.

```{r, message = FALSE}

#Set up your working directory

getwd()

#Load packges

library(tidyverse)

#Import datasets

Neonics.data <- read.csv("../Data/Raw/ECOTOX\_Neonicotinoids\_Insects\_raw.csv")

Litter.data <- read.csv("../Data/Raw/NEON\_NIWO\_Litter\_massdata\_2018-08\_raw.csv")

```

## Learn about your system

2. The neonicotinoid dataset was collected from the Environmental Protection Agency's ECOTOX Knowledgebase, a database for ecotoxicology research. Neonicotinoids are a class of insecticides used widely in agriculture. The dataset that has been pulled includes all studies published on insects. Why might we be interested in the ecotoxicologoy of neonicotinoids on insects? Feel free to do a brief internet search if you feel you need more background information.

> Answer:

3. The Niwot Ridge litter and woody debris dataset was collected from the National Ecological Observatory Network, which collectively includes 81 aquatic and terrestrial sites across 20 ecoclimatic domains. 32 of these sites sample forest litter and woody debris, and we will focus on the Niwot Ridge long-term ecological research (LTER) station in Colorado. Why might we be interested in studying litter and woody debris that falls to the ground in forests? Feel free to do a brief internet search if you feel you need more background information.

> Answer:

4. How is litter and woody debris sampled as part of the NEON network? Read the NEON\_Litterfall\_UserGuide.pdf document to learn more. List three pieces of salient information about the sampling methods here:

> Answer:

\*

\*

\*

## Obtain basic summaries of your data (Neonics)

5. What are the dimensions of the dataset?

```{r}

dim(Neonics.data) # rows: 4623 columns: 30

```

6. Using the `summary` function, determine the most common effects that are studied. Why might these effects specifically be of interest?

```{r}

summary(Neonics.data)

summary(Neonics.data$Effect)

summary(Neonics.data$Effect.Measurement)

```

> Answer: Abundance has 1699 and Mortality 1294

7. Using the `summary` function, determine the six most commonly studied species in the dataset (common name). What do these species have in common, and why might they be of interest over other insects? Feel free to do a brief internet search for more information if needed.

```{r}

summary(Neonics.data$Species.Common.Name)

```

> Answer: Honey Bee Parasitic Wasp

667 285

Buff Tailed Bumblebee Carniolan Honey Bee

183 152

Bumble Bee Italian Honeybee

140 113

8. Concentrations are always a numeric value. What is the class of Conc.1..Author. in the dataset, and why is it not numeric?

```{r}

class(Neonics.data$Conc.1..Author.)

```

> Answer: factor. It is not numerica because it is missing some numerical values in the columns

## Explore your data graphically (Neonics)

9. Using `geom\_freqpoly`, generate a plot of the number of studies conducted by publication year.

```{r}

ggplot(Neonics.data)+

geom\_freqpoly(aes(x = Publication.Year))

```

10. Reproduce the same graph but now add a color aesthetic so that different Test.Location are displayed as different colors.

```{r}

ggplot(Neonics.data)+

geom\_freqpoly(aes(x = Publication.Year, color=Test.Location))

```

Interpret this graph. What are the most common test locations, and do they differ over time?

> Answer: The Lab is the most common test location

11. Create a bar graph of Endpoint counts. What are the two most common end points, and how are they defined? Consult the ECOTOX\_CodeAppendix for more information.

```{r}

ggplot(Neonics.data, aes(x = Endpoint)) +

geom\_bar()

summary(Neonics.data$Endpoint)

```

> Answer: NOEL endpoint has 1816, LOEL 1664

>

## Explore your data (Litter)

12. Determine the class of collectDate. Is it a date? If not, change to a date and confirm the new class of the variable. Using the `unique` function, determine which dates litter was sampled in August 2018.

```{r}

class(Litter.data$collectDate) #factor

Litter.data$collectDate <- as.Date(Litter.data$collectDate, format = "%Y-%m-%d")

class(Litter.data$collectDate)

```

13. Using the `unique` function, determine how many plots were sampled at Niwot Ridge. How is the information obtained from `unique` different from that obtained from `summary`?

```{r}

unique(Litter.data$plotID)

```

> Answer: 12 different plots

14. Create a bar graph of functionalGroup counts. This shows you what type of litter is collected at the Niwot Ridge sites. Notice that litter types are fairly equally distributed across the Niwot Ridge sites.

```{r}

ggplot(Litter.data, aes(x = functionalGroup)) +

geom\_bar()

summary(Litter.data$functionalGroup)

```

15. Using `geom\_boxplot` and `geom\_violin`, create a boxplot and a violin plot of dryMass by functionalGroup.

```{r}

ggplot(Litter.data) +

geom\_boxplot(aes(x = functionalGroup, y = dryMass))

ggplot(Litter.data) +

geom\_violin(aes(x = functionalGroup, y = dryMass))

```

Why is the boxplot a more effective visualization option than the violin plot in this case?

> Answer:

What type(s) of litter tend to have the highest biomass at these sites?

> Answer: