Assignment 09: Data Scraping

Andrew Brantley

Total points:

OVERVIEW

This exercise accompanies the lessons in Environmental Data Analytics on data scraping.

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., "Fay_09_Data_Scraping.Rmd") prior to submission.

Set up

1. Set up your session:

- Check your working directory
- Load the packages `tidyverse`, `rvest`, and any others you end up using.
- Set your ggplot theme

```
#1

# checking working directory
getwd()
```

```
## [1] "/Users/AndrewBrantley/Library/CloudStorage/Box-Box/Environmental Data Analytics/GithubRepos/Envi
```

```
# loading packages
library(tidyverse)
library(rvest)
library(lubridate)
library(zoo)

# building personal theme
Andrew.Theme <- theme_gray() +
  theme(axis.text = element_text(color = "black"),
        legend.position = "top")

theme_set(Andrew.Theme)
```

2. We will be scraping data from the NC DEQs Local Water Supply Planning website, specifically the Durham's 2019 Municipal Local Water Supply Plan (LWSP):

- Navigate to https://www.ncwater.org/WUDC/app/LWSP/search.php

- Change the date from 2020 to 2019 in the upper right corner.
- Scroll down and select the LWSP link next to Durham Municipality.
- Note the web address: https://www.ncwater.org/WUDC/app/LWSP/report.php?pwsid=03-32-010&year=2020

Indicate this website as the as the URL to be scraped. (In other words, read the contents into an `rvest` webpage object.)

```
#2
# creating webpage object
WaterSupply_Website <-
  read_html('https://www.ncwater.org/WUDC/app/LWSP/report.php?pwsid=03-32-010&year=2020')
```

3. The data we want to collect are listed below:

- From the "1. System Information" section:
- Water system name
- PSWID
- Ownership
- From the "3. Water Supply Sources" section:
- Average Daily Use (MGD) - for each month

In the code chunk below scrape these values, assigning them to three separate variables.

> HINT: The first value should be "Durham", the second "03-32-010", the third "Municipality", and the last should be a vector of 12 numeric values, with the first value being 36.0100.

```
#3
water.system.name <-   WaterSupply_Website %>%
                        html_nodes('div+ table tr:nth-child(1) td:nth-child(2)') %>% html_text()
pswid <-               WaterSupply_Website %>%
                        html_nodes('td tr:nth-child(1) td:nth-child(5)') %>% html_text()
ownership <-           WaterSupply_Website %>%
                        html_nodes('div+ table tr:nth-child(2) td:nth-child(4)') %>% html_text()
max.withdrawals.mgd <- WaterSupply_Website %>%
                        html_nodes('th~ td+ td') %>% html_text()
```

4. Convert your scraped data into a dataframe. This dataframe should have a column for each of the 4 variables scraped and a row for the month corresponding to the withdrawal data. Also add a Date column that includes your month and year in data format. (Feel free to add a Year column too, if you wish.)

   > TIP: Use `rep()` to repeat a value when creating a dataframe.
   >
   > NOTE: It's likely you won't be able to scrape the monthly widthrawal data in order. You can overcome this by creating a month column in the same order the data are scraped: Jan, May, Sept, Feb, etc...

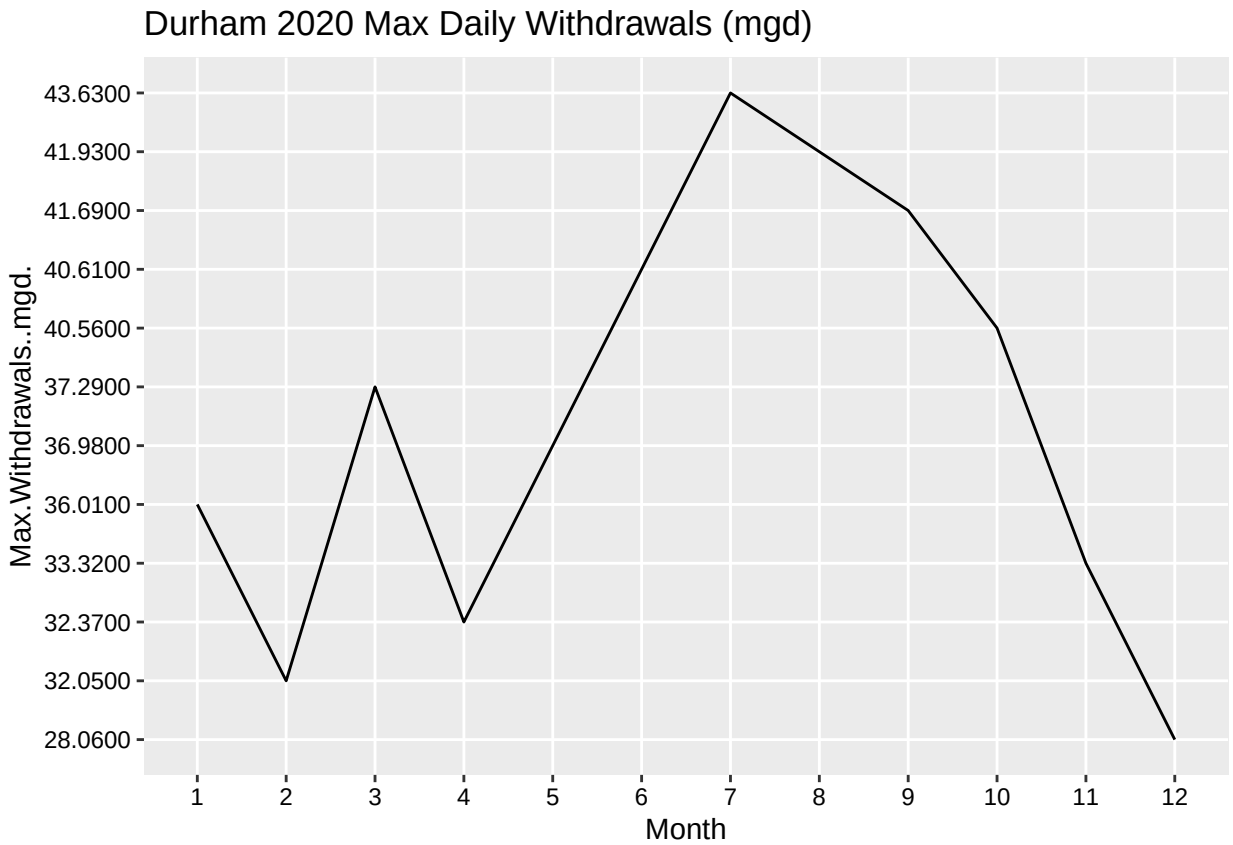
5. Plot the max daily withdrawals across the months for 2020

```
#4

# creating dataframe from vectors
Durham2020_Water <- data.frame(
               "Water System Name" = water.system.name,
               "PSWID" = pswid,
               "Ownership" = ownership,
```

```
              "Max Withdrawals (mgd)" = max.withdrawals.mgd,
              "Month" = as.factor(c(01, 05, 09, 02, 06, 10, 03, 07, 11, 04, 08, 12)))
Durham2020_Water
```

```
##    Water.System.Name     PSWID    Ownership Max.Withdrawals..mgd. Month
## 1             Durham 03-32-010 Municipality               36.0100     1
## 2             Durham 03-32-010 Municipality               36.9800     5
## 3             Durham 03-32-010 Municipality               41.6900     9
## 4             Durham 03-32-010 Municipality               32.0500     2
## 5             Durham 03-32-010 Municipality               40.6100     6
## 6             Durham 03-32-010 Municipality               40.5600    10
## 7             Durham 03-32-010 Municipality               37.2900     3
## 8             Durham 03-32-010 Municipality               43.6300     7
## 9             Durham 03-32-010 Municipality               33.3200    11
## 10            Durham 03-32-010 Municipality               32.3700     4
## 11            Durham 03-32-010 Municipality               41.9300     8
## 12            Durham 03-32-010 Municipality               28.0600    12
```

```
#5

# plotting max withdrawals
MaxWithdrawals.Plot <- ggplot(Durham2020_Water, aes(x = Month, y = Max.Withdrawals..mgd.)) +
                        geom_line(group = 1) +
                        labs(title = "Durham 2020 Max Daily Withdrawals (mgd)")
MaxWithdrawals.Plot
```



6. Note that the PSWID and the year appear in the web address for the page we scraped. Construct a function using your code above that can scrape data for any PSWID and year for which the NC DEQ

has data. **Be sure to modify the code to reflect the year and site scraped.**

```
#6.

# creating function to scrape website
WaterUsage_Scraper <- function(the_pswid, the_year){

  #Get the proper url
  the_url <- paste0('https://www.ncwater.org/WUDC/app/LWSP/report.php?pwsid=',
                    the_pswid, '&year=',the_year)

#Scrape the data
water.system.name <-   read_html(the_url) %>%
                        html_nodes('div+ table tr:nth-child(1) td:nth-child(2)') %>% html_text()
pswid <-               read_html(the_url) %>%
                        html_nodes('td tr:nth-child(1) td:nth-child(5)') %>% html_text()
ownership <-           read_html(the_url) %>%
                        html_nodes('div+ table tr:nth-child(2) td:nth-child(4)') %>% html_text()
max.withdrawals.mgd <- read_html(the_url) %>%
                        html_nodes('th~ td+ td') %>% html_text()

#Convert to dataframe
WaterUsage_DF <- data.frame(
              "Water System Name" = as.character(water.system.name),
              "PSWID" = as.character(pswid),
              "Ownership" = as.character(ownership),
              "Max Withdrawals (mgd)" = as.character(max.withdrawals.mgd),
              "Month" = as.factor(c(01, 05, 09, 02, 06, 10, 03, 07, 11, 04, 08, 12)),
              "Year" = the_year)

#Return the dataframe
return(WaterUsage_DF)
}
```

7. Use the function above to extract and plot max daily withdrawals for Durham (PWSID='03-32-010') for each month in 2015

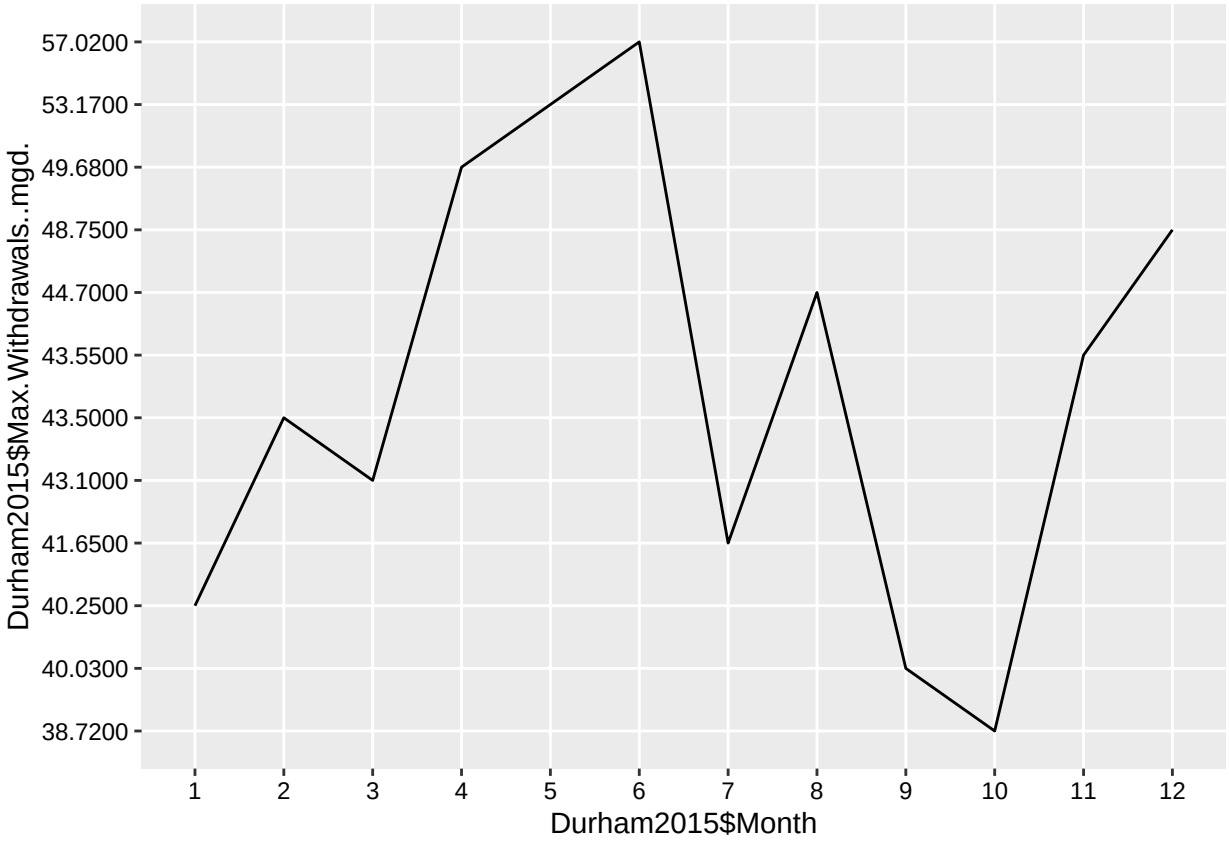
```
#7

# pulling 2015 max withdrawals for Durham
Durham2015 <- WaterUsage_Scraper("03-32-010", 2015)
Durham2015
```

```
##    Water.System.Name     PSWID    Ownership Max.Withdrawals..mgd. Month Year
## 1             Durham 03-32-010 Municipality               40.2500     1 2015
## 2             Durham 03-32-010 Municipality               53.1700     5 2015
## 3             Durham 03-32-010 Municipality               40.0300     9 2015
## 4             Durham 03-32-010 Municipality               43.5000     2 2015
## 5             Durham 03-32-010 Municipality               57.0200     6 2015
## 6             Durham 03-32-010 Municipality               38.7200    10 2015
## 7             Durham 03-32-010 Municipality               43.1000     3 2015
## 8             Durham 03-32-010 Municipality               41.6500     7 2015
## 9             Durham 03-32-010 Municipality               43.5500    11 2015
## 10            Durham 03-32-010 Municipality               49.6800     4 2015
## 11            Durham 03-32-010 Municipality               44.7000     8 2015
## 12            Durham 03-32-010 Municipality               48.7500    12 2015
```

```
# plotting Durham 2015 max withdrawals
Durham2015.Plot <- ggplot(data = Durham2015) +
                          geom_line(aes(Durham2015$Month,
                                        Durham2015$Max.Withdrawals..mgd.), group = 1)
Durham2015.Plot
```

```
## Warning: Use of `Durham2015$Month` is discouraged. Use `Month` instead.
```

```
## Warning: Use of `Durham2015$Max.Withdrawals..mgd.` is discouraged. Use
## `Max.Withdrawals..mgd.` instead.
```



8. Use the function above to extract data for Asheville (PWSID = 01-11-010) in 2015. Combine this data with the Durham data collected above and create a plot that compares the Asheville to Durham's water withdrawals.

```
#8

Asheville2015 <- WaterUsage_Scraper("01-11-010", 2015)
Asheville2015
```

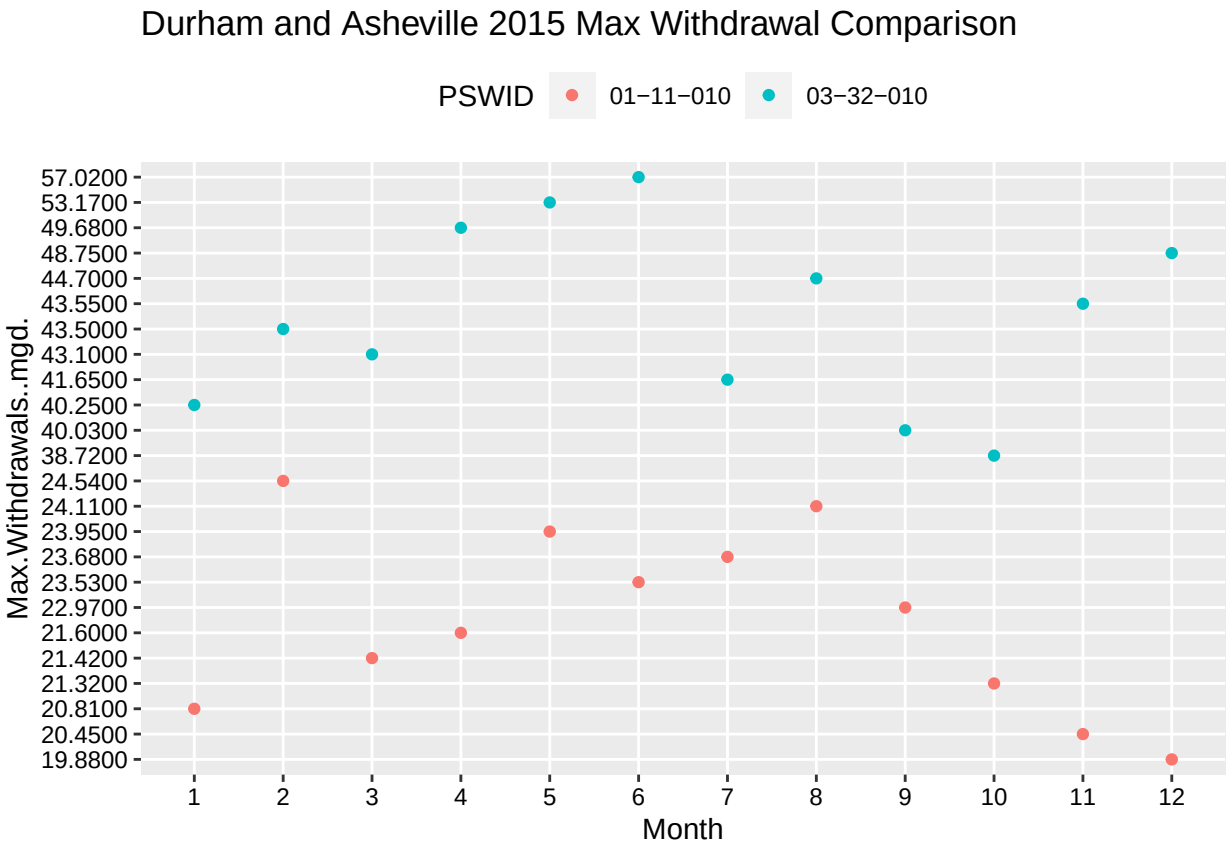
```
##    Water.System.Name     PSWID    Ownership Max.Withdrawals..mgd. Month Year
## 1          Asheville 01-11-010 Municipality               20.8100     1 2015
## 2          Asheville 01-11-010 Municipality               23.9500     5 2015
## 3          Asheville 01-11-010 Municipality               22.9700     9 2015
## 4          Asheville 01-11-010 Municipality               24.5400     2 2015
## 5          Asheville 01-11-010 Municipality               23.5300     6 2015
## 6          Asheville 01-11-010 Municipality               21.3200    10 2015
## 7          Asheville 01-11-010 Municipality               21.4200     3 2015
## 8          Asheville 01-11-010 Municipality               23.6800     7 2015
```

```
## 9          Asheville 01-11-010 Municipality               20.4500    11 2015
## 10         Asheville 01-11-010 Municipality               21.6000     4 2015
## 11         Asheville 01-11-010 Municipality               24.1100     8 2015
## 12         Asheville 01-11-010 Municipality               19.8800    12 2015
```

```
# combining datasets
avl_dur_2015 <- bind_rows(Durham2015, Asheville2015)
avl_dur_2015
```

```
##    Water.System.Name     PSWID    Ownership Max.Withdrawals..mgd. Month Year
## 1             Durham 03-32-010 Municipality               40.2500     1 2015
## 2             Durham 03-32-010 Municipality               53.1700     5 2015
## 3             Durham 03-32-010 Municipality               40.0300     9 2015
## 4             Durham 03-32-010 Municipality               43.5000     2 2015
## 5             Durham 03-32-010 Municipality               57.0200     6 2015
## 6             Durham 03-32-010 Municipality               38.7200    10 2015
## 7             Durham 03-32-010 Municipality               43.1000     3 2015
## 8             Durham 03-32-010 Municipality               41.6500     7 2015
## 9             Durham 03-32-010 Municipality               43.5500    11 2015
## 10            Durham 03-32-010 Municipality               49.6800     4 2015
## 11            Durham 03-32-010 Municipality               44.7000     8 2015
## 12            Durham 03-32-010 Municipality               48.7500    12 2015
## 13         Asheville 01-11-010 Municipality               20.8100     1 2015
## 14         Asheville 01-11-010 Municipality               23.9500     5 2015
## 15         Asheville 01-11-010 Municipality               22.9700     9 2015
## 16         Asheville 01-11-010 Municipality               24.5400     2 2015
## 17         Asheville 01-11-010 Municipality               23.5300     6 2015
## 18         Asheville 01-11-010 Municipality               21.3200    10 2015
## 19         Asheville 01-11-010 Municipality               21.4200     3 2015
## 20         Asheville 01-11-010 Municipality               23.6800     7 2015
## 21         Asheville 01-11-010 Municipality               20.4500    11 2015
## 22         Asheville 01-11-010 Municipality               21.6000     4 2015
## 23         Asheville 01-11-010 Municipality               24.1100     8 2015
## 24         Asheville 01-11-010 Municipality               19.8800    12 2015
```

```
avl.dur.plot <- ggplot(avl_dur_2015) +
                    geom_point(aes(x = Month, y = Max.Withdrawals..mgd., color = PSWID)) +
                    labs( title = "Durham and Asheville 2015 Max Withdrawal Comparison")
avl.dur.plot
```



9. Use the code & function you created above to plot Asheville's max daily withdrawal by months for the years 2010 thru 2019.Add a smoothed line to the plot.

```
#9

# gathering and plotting Asheville withdrawal 2010-2019
years <- seq(2010,2019)
Avl <-   "01-11-010"
Avl_2010_2019 <- map2(Avl, years, WaterUsage_Scraper) %>%  bind_rows() %>%
                      mutate("MonthYear" = make_date(year = Year, month = Month),
                             "Max.Withdrawals..mgd." = as.numeric(Max.Withdrawals..mgd.))
Avl_2010_2019
```

```
##     Water.System.Name     PSWID    Ownership Max.Withdrawals..mgd. Month Year
## 1           Asheville 01-11-010 Municipality                 21.89     1 2010
## 2           Asheville 01-11-010 Municipality                 20.99     5 2010
## 3           Asheville 01-11-010 Municipality                 22.45     9 2010
## 4           Asheville 01-11-010 Municipality                 19.95     2 2010
## 5           Asheville 01-11-010 Municipality                 22.53     6 2010
## 6           Asheville 01-11-010 Municipality                 21.49    10 2010
## 7           Asheville 01-11-010 Municipality                 19.74     3 2010
## 8           Asheville 01-11-010 Municipality                 24.01     7 2010
## 9           Asheville 01-11-010 Municipality                 21.23    11 2010
## 10          Asheville 01-11-010 Municipality                 21.25     4 2010
## 11          Asheville 01-11-010 Municipality                 22.50     8 2010
## 12          Asheville 01-11-010 Municipality                 24.43    12 2010
## 13          Asheville 01-11-010 Municipality                 21.44     1 2011
## 14          Asheville 01-11-010 Municipality                 23.33     5 2011
```

```
## 15          Asheville 01-11-010 Municipality              23.54     9 2011
## 16          Asheville 01-11-010 Municipality              23.87     2 2011
## 17          Asheville 01-11-010 Municipality              23.73     6 2011
## 18          Asheville 01-11-010 Municipality              22.55    10 2011
## 19          Asheville 01-11-010 Municipality              20.20     3 2011
## 20          Asheville 01-11-010 Municipality              24.04     7 2011
## 21          Asheville 01-11-010 Municipality              21.53    11 2011
## 22          Asheville 01-11-010 Municipality              20.58     4 2011
## 23          Asheville 01-11-010 Municipality              24.18     8 2011
## 24          Asheville 01-11-010 Municipality              21.51    12 2011
## 25          Asheville 01-11-010 Municipality              22.17     1 2012
## 26          Asheville 01-11-010 Municipality              22.63     5 2012
## 27          Asheville 01-11-010 Municipality              21.69     9 2012
## 28          Asheville 01-11-010 Municipality              21.90     2 2012
## 29          Asheville 01-11-010 Municipality              24.82     6 2012
## 30          Asheville 01-11-010 Municipality              21.67    10 2012
## 31          Asheville 01-11-010 Municipality              21.06     3 2012
## 32          Asheville 01-11-010 Municipality              23.82     7 2012
## 33          Asheville 01-11-010 Municipality              20.85    11 2012
## 34          Asheville 01-11-010 Municipality              21.57     4 2012
## 35          Asheville 01-11-010 Municipality              23.00     8 2012
## 36          Asheville 01-11-010 Municipality              20.43    12 2012
## 37          Asheville 01-11-010 Municipality              20.84     1 2013
## 38          Asheville 01-11-010 Municipality              21.95     5 2013
## 39          Asheville 01-11-010 Municipality              21.04     9 2013
## 40          Asheville 01-11-010 Municipality              20.53     2 2013
## 41          Asheville 01-11-010 Municipality              21.46     6 2013
## 42          Asheville 01-11-010 Municipality              20.34    10 2013
## 43          Asheville 01-11-010 Municipality              20.28     3 2013
## 44          Asheville 01-11-010 Municipality              21.42     7 2013
## 45          Asheville 01-11-010 Municipality              19.81    11 2013
## 46          Asheville 01-11-010 Municipality              20.93     4 2013
## 47          Asheville 01-11-010 Municipality              21.25     8 2013
## 48          Asheville 01-11-010 Municipality              19.66    12 2013
## 49          Asheville 01-11-010 Municipality              22.64     1 2014
## 50          Asheville 01-11-010 Municipality              21.39     5 2014
## 51          Asheville 01-11-010 Municipality              20.98     9 2014
## 52          Asheville 01-11-010 Municipality              21.22     2 2014
## 53          Asheville 01-11-010 Municipality              21.83     6 2014
## 54          Asheville 01-11-010 Municipality              20.73    10 2014
## 55          Asheville 01-11-010 Municipality              19.81     3 2014
## 56          Asheville 01-11-010 Municipality              22.20     7 2014
## 57          Asheville 01-11-010 Municipality              20.33    11 2014
## 58          Asheville 01-11-010 Municipality              20.08     4 2014
## 59          Asheville 01-11-010 Municipality              21.66     8 2014
## 60          Asheville 01-11-010 Municipality              20.78    12 2014
## 61          Asheville 01-11-010 Municipality              20.81     1 2015
## 62          Asheville 01-11-010 Municipality              23.95     5 2015
## 63          Asheville 01-11-010 Municipality              22.97     9 2015
## 64          Asheville 01-11-010 Municipality              24.54     2 2015
## 65          Asheville 01-11-010 Municipality              23.53     6 2015
## 66          Asheville 01-11-010 Municipality              21.32    10 2015
## 67          Asheville 01-11-010 Municipality              21.42     3 2015
## 68          Asheville 01-11-010 Municipality              23.68     7 2015
```

```
## 69          Asheville 01-11-010 Municipality              20.45    11 2015
## 70          Asheville 01-11-010 Municipality              21.60     4 2015
## 71          Asheville 01-11-010 Municipality              24.11     8 2015
## 72          Asheville 01-11-010 Municipality              19.88    12 2015
## 73          Asheville 01-11-010 Municipality              20.43     1 2016
## 74          Asheville 01-11-010 Municipality              21.99     5 2016
## 75          Asheville 01-11-010 Municipality              22.95     9 2016
## 76          Asheville 01-11-010 Municipality              20.87     2 2016
## 77          Asheville 01-11-010 Municipality              24.08     6 2016
## 78          Asheville 01-11-010 Municipality              22.62    10 2016
## 79          Asheville 01-11-010 Municipality              19.35     3 2016
## 80          Asheville 01-11-010 Municipality              22.85     7 2016
## 81          Asheville 01-11-010 Municipality              22.43    11 2016
## 82          Asheville 01-11-010 Municipality              21.07     4 2016
## 83          Asheville 01-11-010 Municipality              22.34     8 2016
## 84          Asheville 01-11-010 Municipality              21.97    12 2016
## 85          Asheville 01-11-010 Municipality              21.31     1 2017
## 86          Asheville 01-11-010 Municipality              21.62     5 2017
## 87          Asheville 01-11-010 Municipality              21.87     9 2017
## 88          Asheville 01-11-010 Municipality              20.28     2 2017
## 89          Asheville 01-11-010 Municipality              21.85     6 2017
## 90          Asheville 01-11-010 Municipality              21.57    10 2017
## 91          Asheville 01-11-010 Municipality              19.80     3 2017
## 92          Asheville 01-11-010 Municipality              22.50     7 2017
## 93          Asheville 01-11-010 Municipality              20.00    11 2017
## 94          Asheville 01-11-010 Municipality              20.43     4 2017
## 95          Asheville 01-11-010 Municipality              22.89     8 2017
## 96          Asheville 01-11-010 Municipality              20.55    12 2017
## 97          Asheville 01-11-010 Municipality              23.89     1 2018
## 98          Asheville 01-11-010 Municipality              21.97     5 2018
## 99          Asheville 01-11-010 Municipality              23.87     9 2018
## 100         Asheville 01-11-010 Municipality              20.07     2 2018
## 101         Asheville 01-11-010 Municipality              22.47     6 2018
## 102         Asheville 01-11-010 Municipality              21.61    10 2018
## 103         Asheville 01-11-010 Municipality              19.78     3 2018
## 104         Asheville 01-11-010 Municipality              22.54     7 2018
## 105         Asheville 01-11-010 Municipality              21.05    11 2018
## 106         Asheville 01-11-010 Municipality              20.31     4 2018
## 107         Asheville 01-11-010 Municipality              22.47     8 2018
## 108         Asheville 01-11-010 Municipality              21.62    12 2018
## 109         Asheville 01-11-010 Municipality              24.51     1 2019
## 110         Asheville 01-11-010 Municipality              27.09     5 2019
## 111         Asheville 01-11-010 Municipality              28.45     9 2019
## 112         Asheville 01-11-010 Municipality              22.46     2 2019
## 113         Asheville 01-11-010 Municipality              26.10     6 2019
## 114         Asheville 01-11-010 Municipality              24.99    10 2019
## 115         Asheville 01-11-010 Municipality              24.25     3 2019
## 116         Asheville 01-11-010 Municipality              26.10     7 2019
## 117         Asheville 01-11-010 Municipality              25.06    11 2019
## 118         Asheville 01-11-010 Municipality              25.26     4 2019
## 119         Asheville 01-11-010 Municipality              26.21     8 2019
## 120         Asheville 01-11-010 Municipality              24.16    12 2019
##      MonthYear
## 1   2010-01-01
```

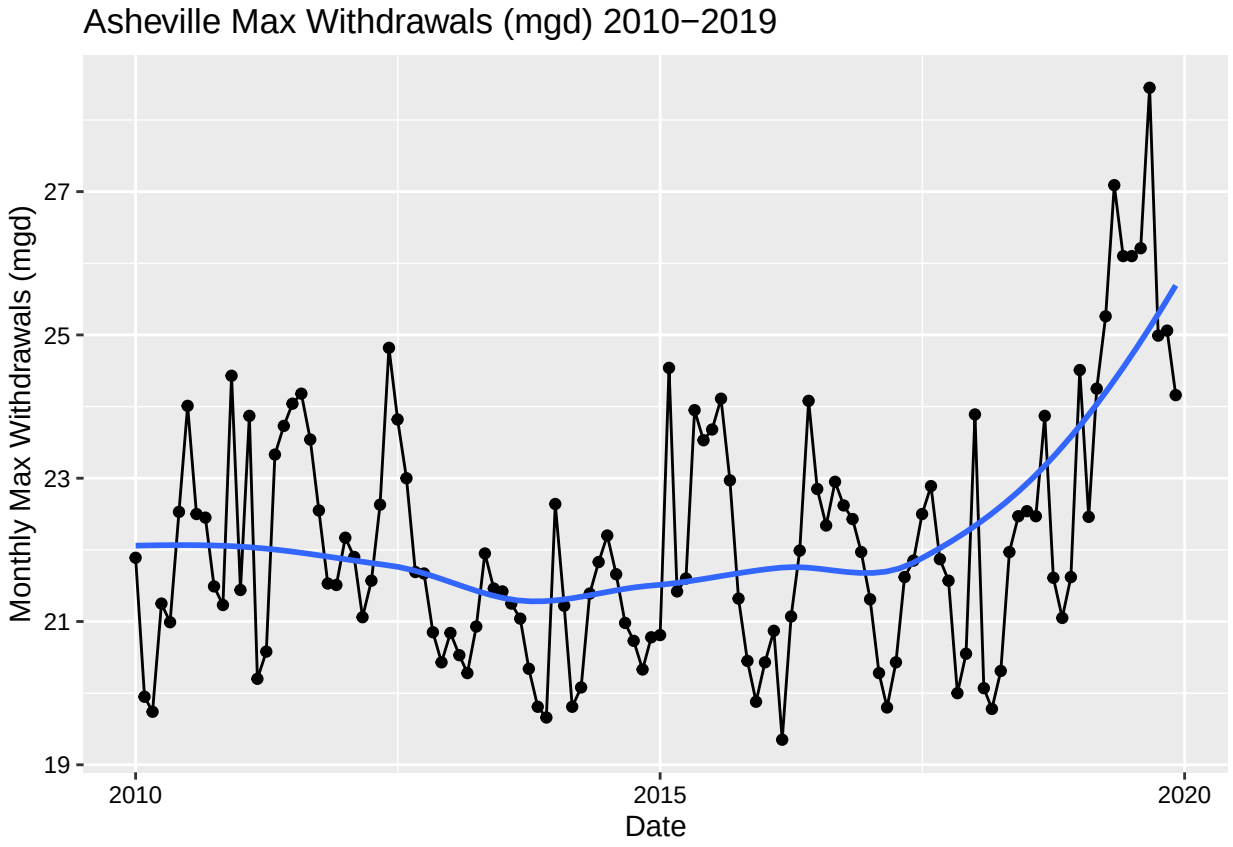
```
## 2   2010-05-01
## 3   2010-09-01
## 4   2010-02-01
## 5   2010-06-01
## 6   2010-10-01
## 7   2010-03-01
## 8   2010-07-01
## 9   2010-11-01
## 10  2010-04-01
## 11  2010-08-01
## 12  2010-12-01
## 13  2011-01-01
## 14  2011-05-01
## 15  2011-09-01
## 16  2011-02-01
## 17  2011-06-01
## 18  2011-10-01
## 19  2011-03-01
## 20  2011-07-01
## 21  2011-11-01
## 22  2011-04-01
## 23  2011-08-01
## 24  2011-12-01
## 25  2012-01-01
## 26  2012-05-01
## 27  2012-09-01
## 28  2012-02-01
## 29  2012-06-01
## 30  2012-10-01
## 31  2012-03-01
## 32  2012-07-01
## 33  2012-11-01
## 34  2012-04-01
## 35  2012-08-01
## 36  2012-12-01
## 37  2013-01-01
## 38  2013-05-01
## 39  2013-09-01
## 40  2013-02-01
## 41  2013-06-01
## 42  2013-10-01
## 43  2013-03-01
## 44  2013-07-01
## 45  2013-11-01
## 46  2013-04-01
## 47  2013-08-01
## 48  2013-12-01
## 49  2014-01-01
## 50  2014-05-01
## 51  2014-09-01
## 52  2014-02-01
## 53  2014-06-01
## 54  2014-10-01
## 55  2014-03-01
```

```
## 56  2014-07-01
## 57  2014-11-01
## 58  2014-04-01
## 59  2014-08-01
## 60  2014-12-01
## 61  2015-01-01
## 62  2015-05-01
## 63  2015-09-01
## 64  2015-02-01
## 65  2015-06-01
## 66  2015-10-01
## 67  2015-03-01
## 68  2015-07-01
## 69  2015-11-01
## 70  2015-04-01
## 71  2015-08-01
## 72  2015-12-01
## 73  2016-01-01
## 74  2016-05-01
## 75  2016-09-01
## 76  2016-02-01
## 77  2016-06-01
## 78  2016-10-01
## 79  2016-03-01
## 80  2016-07-01
## 81  2016-11-01
## 82  2016-04-01
## 83  2016-08-01
## 84  2016-12-01
## 85  2017-01-01
## 86  2017-05-01
## 87  2017-09-01
## 88  2017-02-01
## 89  2017-06-01
## 90  2017-10-01
## 91  2017-03-01
## 92  2017-07-01
## 93  2017-11-01
## 94  2017-04-01
## 95  2017-08-01
## 96  2017-12-01
## 97  2018-01-01
## 98  2018-05-01
## 99  2018-09-01
## 100 2018-02-01
## 101 2018-06-01
## 102 2018-10-01
## 103 2018-03-01
## 104 2018-07-01
## 105 2018-11-01
## 106 2018-04-01
## 107 2018-08-01
## 108 2018-12-01
## 109 2019-01-01
```

```
## 110 2019-05-01
## 111 2019-09-01
## 112 2019-02-01
## 113 2019-06-01
## 114 2019-10-01
## 115 2019-03-01
## 116 2019-07-01
## 117 2019-11-01
## 118 2019-04-01
## 119 2019-08-01
## 120 2019-12-01
```

```
Avl_2010_2019.Plot <-  ggplot(Avl_2010_2019, aes(x = MonthYear, y = Max.Withdrawals..mgd.)) +
                          geom_point() +
                          geom_line() +
                          geom_smooth(method='loess', se = FALSE) +
                          labs(title = "Asheville Max Withdrawals (mgd) 2010-2019",
                               y = "Monthly Max Withdrawals (mgd)", x = "Date")
Avl_2010_2019.Plot
```

```
## `geom_smooth()` using formula 'y ~ x'
```



Question: Just by looking at the plot (i.e. not running statistics), does Asheville have a trend in water usage over time? It seems that there has been an increase in water usage over time, especially in the last two years.