VUStats Data Exploration

```
#Load the data

library(readr)
Visitation_by_Month <- read_csv("./Visitation_by_Month.csv")
```

```
## Rows: 43 Columns: 13

## -- Column specification ------------------------------------------------
## Delimiter: ","
## dbl (1): Year

##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
getwd()
```

```
## [1] "C:/Users/gabri/OneDrive/Desktop/MPP Coursework/Spring 2022/ENVIRO 872/AntonovaLiu_ENV872_EDA_Fin
```

```
View(Visitation_by_Month)
```

```
#Pivot Longer to create a tidy dataset
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.5      v dplyr   1.0.7
## v tibble  3.1.6      v stringr 1.4.0
## v tidyr   1.1.4      v forcats 0.5.1
## v purrr   0.3.4
```

```
## -- Conflicts ---------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
# Gather nutrient data into one column using pivot_longer
Visitation_by_month_gathered <- Visitation_by_Month %>%
  pivot_longer(JAN:DEC, names_to = "Month", values_to = "Recreational_Visits")

#Create a date column

library(lubridate)
```

```
##
## Attaching package: 'lubridate'

## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union
```

```
paste(Visitation_by_month_gathered$Year,Visitation_by_month_gathered$Month, sep="-")
```

```
##   [1] "2021-JAN" "2021-FEB" "2021-MAR" "2021-APR" "2021-MAY" "2021-JUN"
##   [7] "2021-JUL" "2021-AUG" "2021-SEP" "2021-OCT" "2021-NOV" "2021-DEC"
##  [13] "2020-JAN" "2020-FEB" "2020-MAR" "2020-APR" "2020-MAY" "2020-JUN"
##  [19] "2020-JUL" "2020-AUG" "2020-SEP" "2020-OCT" "2020-NOV" "2020-DEC"
##  [25] "2019-JAN" "2019-FEB" "2019-MAR" "2019-APR" "2019-MAY" "2019-JUN"
##  [31] "2019-JUL" "2019-AUG" "2019-SEP" "2019-OCT" "2019-NOV" "2019-DEC"
##  [37] "2018-JAN" "2018-FEB" "2018-MAR" "2018-APR" "2018-MAY" "2018-JUN"
##  [43] "2018-JUL" "2018-AUG" "2018-SEP" "2018-OCT" "2018-NOV" "2018-DEC"
##  [49] "2017-JAN" "2017-FEB" "2017-MAR" "2017-APR" "2017-MAY" "2017-JUN"
##  [55] "2017-JUL" "2017-AUG" "2017-SEP" "2017-OCT" "2017-NOV" "2017-DEC"
##  [61] "2016-JAN" "2016-FEB" "2016-MAR" "2016-APR" "2016-MAY" "2016-JUN"
##  [67] "2016-JUL" "2016-AUG" "2016-SEP" "2016-OCT" "2016-NOV" "2016-DEC"
##  [73] "2015-JAN" "2015-FEB" "2015-MAR" "2015-APR" "2015-MAY" "2015-JUN"
##  [79] "2015-JUL" "2015-AUG" "2015-SEP" "2015-OCT" "2015-NOV" "2015-DEC"
##  [85] "2014-JAN" "2014-FEB" "2014-MAR" "2014-APR" "2014-MAY" "2014-JUN"
##  [91] "2014-JUL" "2014-AUG" "2014-SEP" "2014-OCT" "2014-NOV" "2014-DEC"
##  [97] "2013-JAN" "2013-FEB" "2013-MAR" "2013-APR" "2013-MAY" "2013-JUN"
## [103] "2013-JUL" "2013-AUG" "2013-SEP" "2013-OCT" "2013-NOV" "2013-DEC"
## [109] "2012-JAN" "2012-FEB" "2012-MAR" "2012-APR" "2012-MAY" "2012-JUN"
## [115] "2012-JUL" "2012-AUG" "2012-SEP" "2012-OCT" "2012-NOV" "2012-DEC"
## [121] "2011-JAN" "2011-FEB" "2011-MAR" "2011-APR" "2011-MAY" "2011-JUN"
## [127] "2011-JUL" "2011-AUG" "2011-SEP" "2011-OCT" "2011-NOV" "2011-DEC"
## [133] "2010-JAN" "2010-FEB" "2010-MAR" "2010-APR" "2010-MAY" "2010-JUN"
## [139] "2010-JUL" "2010-AUG" "2010-SEP" "2010-OCT" "2010-NOV" "2010-DEC"
## [145] "2009-JAN" "2009-FEB" "2009-MAR" "2009-APR" "2009-MAY" "2009-JUN"
## [151] "2009-JUL" "2009-AUG" "2009-SEP" "2009-OCT" "2009-NOV" "2009-DEC"
## [157] "2008-JAN" "2008-FEB" "2008-MAR" "2008-APR" "2008-MAY" "2008-JUN"
## [163] "2008-JUL" "2008-AUG" "2008-SEP" "2008-OCT" "2008-NOV" "2008-DEC"
## [169] "2007-JAN" "2007-FEB" "2007-MAR" "2007-APR" "2007-MAY" "2007-JUN"
## [175] "2007-JUL" "2007-AUG" "2007-SEP" "2007-OCT" "2007-NOV" "2007-DEC"
## [181] "2006-JAN" "2006-FEB" "2006-MAR" "2006-APR" "2006-MAY" "2006-JUN"
## [187] "2006-JUL" "2006-AUG" "2006-SEP" "2006-OCT" "2006-NOV" "2006-DEC"
## [193] "2005-JAN" "2005-FEB" "2005-MAR" "2005-APR" "2005-MAY" "2005-JUN"
## [199] "2005-JUL" "2005-AUG" "2005-SEP" "2005-OCT" "2005-NOV" "2005-DEC"
## [205] "2004-JAN" "2004-FEB" "2004-MAR" "2004-APR" "2004-MAY" "2004-JUN"
## [211] "2004-JUL" "2004-AUG" "2004-SEP" "2004-OCT" "2004-NOV" "2004-DEC"
## [217] "2003-JAN" "2003-FEB" "2003-MAR" "2003-APR" "2003-MAY" "2003-JUN"
## [223] "2003-JUL" "2003-AUG" "2003-SEP" "2003-OCT" "2003-NOV" "2003-DEC"
## [229] "2002-JAN" "2002-FEB" "2002-MAR" "2002-APR" "2002-MAY" "2002-JUN"
## [235] "2002-JUL" "2002-AUG" "2002-SEP" "2002-OCT" "2002-NOV" "2002-DEC"
## [241] "2001-JAN" "2001-FEB" "2001-MAR" "2001-APR" "2001-MAY" "2001-JUN"
## [247] "2001-JUL" "2001-AUG" "2001-SEP" "2001-OCT" "2001-NOV" "2001-DEC"
## [253] "2000-JAN" "2000-FEB" "2000-MAR" "2000-APR" "2000-MAY" "2000-JUN"
## [259] "2000-JUL" "2000-AUG" "2000-SEP" "2000-OCT" "2000-NOV" "2000-DEC"
```

```
## [265] "1999-JAN" "1999-FEB" "1999-MAR" "1999-APR" "1999-MAY" "1999-JUN"
## [271] "1999-JUL" "1999-AUG" "1999-SEP" "1999-OCT" "1999-NOV" "1999-DEC"
## [277] "1998-JAN" "1998-FEB" "1998-MAR" "1998-APR" "1998-MAY" "1998-JUN"
## [283] "1998-JUL" "1998-AUG" "1998-SEP" "1998-OCT" "1998-NOV" "1998-DEC"
## [289] "1997-JAN" "1997-FEB" "1997-MAR" "1997-APR" "1997-MAY" "1997-JUN"
## [295] "1997-JUL" "1997-AUG" "1997-SEP" "1997-OCT" "1997-NOV" "1997-DEC"
## [301] "1996-JAN" "1996-FEB" "1996-MAR" "1996-APR" "1996-MAY" "1996-JUN"
## [307] "1996-JUL" "1996-AUG" "1996-SEP" "1996-OCT" "1996-NOV" "1996-DEC"
## [313] "1995-JAN" "1995-FEB" "1995-MAR" "1995-APR" "1995-MAY" "1995-JUN"
## [319] "1995-JUL" "1995-AUG" "1995-SEP" "1995-OCT" "1995-NOV" "1995-DEC"
## [325] "1994-JAN" "1994-FEB" "1994-MAR" "1994-APR" "1994-MAY" "1994-JUN"
## [331] "1994-JUL" "1994-AUG" "1994-SEP" "1994-OCT" "1994-NOV" "1994-DEC"
## [337] "1993-JAN" "1993-FEB" "1993-MAR" "1993-APR" "1993-MAY" "1993-JUN"
## [343] "1993-JUL" "1993-AUG" "1993-SEP" "1993-OCT" "1993-NOV" "1993-DEC"
## [349] "1992-JAN" "1992-FEB" "1992-MAR" "1992-APR" "1992-MAY" "1992-JUN"
## [355] "1992-JUL" "1992-AUG" "1992-SEP" "1992-OCT" "1992-NOV" "1992-DEC"
## [361] "1991-JAN" "1991-FEB" "1991-MAR" "1991-APR" "1991-MAY" "1991-JUN"
## [367] "1991-JUL" "1991-AUG" "1991-SEP" "1991-OCT" "1991-NOV" "1991-DEC"
## [373] "1990-JAN" "1990-FEB" "1990-MAR" "1990-APR" "1990-MAY" "1990-JUN"
## [379] "1990-JUL" "1990-AUG" "1990-SEP" "1990-OCT" "1990-NOV" "1990-DEC"
## [385] "1989-JAN" "1989-FEB" "1989-MAR" "1989-APR" "1989-MAY" "1989-JUN"
## [391] "1989-JUL" "1989-AUG" "1989-SEP" "1989-OCT" "1989-NOV" "1989-DEC"
## [397] "1988-JAN" "1988-FEB" "1988-MAR" "1988-APR" "1988-MAY" "1988-JUN"
## [403] "1988-JUL" "1988-AUG" "1988-SEP" "1988-OCT" "1988-NOV" "1988-DEC"
## [409] "1987-JAN" "1987-FEB" "1987-MAR" "1987-APR" "1987-MAY" "1987-JUN"
## [415] "1987-JUL" "1987-AUG" "1987-SEP" "1987-OCT" "1987-NOV" "1987-DEC"
## [421] "1986-JAN" "1986-FEB" "1986-MAR" "1986-APR" "1986-MAY" "1986-JUN"
## [427] "1986-JUL" "1986-AUG" "1986-SEP" "1986-OCT" "1986-NOV" "1986-DEC"
## [433] "1985-JAN" "1985-FEB" "1985-MAR" "1985-APR" "1985-MAY" "1985-JUN"
## [439] "1985-JUL" "1985-AUG" "1985-SEP" "1985-OCT" "1985-NOV" "1985-DEC"
## [445] "1984-JAN" "1984-FEB" "1984-MAR" "1984-APR" "1984-MAY" "1984-JUN"
## [451] "1984-JUL" "1984-AUG" "1984-SEP" "1984-OCT" "1984-NOV" "1984-DEC"
## [457] "1983-JAN" "1983-FEB" "1983-MAR" "1983-APR" "1983-MAY" "1983-JUN"
## [463] "1983-JUL" "1983-AUG" "1983-SEP" "1983-OCT" "1983-NOV" "1983-DEC"
## [469] "1982-JAN" "1982-FEB" "1982-MAR" "1982-APR" "1982-MAY" "1982-JUN"
## [475] "1982-JUL" "1982-AUG" "1982-SEP" "1982-OCT" "1982-NOV" "1982-DEC"
## [481] "1981-JAN" "1981-FEB" "1981-MAR" "1981-APR" "1981-MAY" "1981-JUN"
## [487] "1981-JUL" "1981-AUG" "1981-SEP" "1981-OCT" "1981-NOV" "1981-DEC"
## [493] "1980-JAN" "1980-FEB" "1980-MAR" "1980-APR" "1980-MAY" "1980-JUN"
## [499] "1980-JUL" "1980-AUG" "1980-SEP" "1980-OCT" "1980-NOV" "1980-DEC"
## [505] "1979-JAN" "1979-FEB" "1979-MAR" "1979-APR" "1979-MAY" "1979-JUN"
## [511] "1979-JUL" "1979-AUG" "1979-SEP" "1979-OCT" "1979-NOV" "1979-DEC"
```

```r
paste(Visitation_by_month_gathered$Year, Visitation_by_month_gathered$Month, "1", sep="-")
```

```
##  [1] "2021-JAN-1" "2021-FEB-1" "2021-MAR-1" "2021-APR-1" "2021-MAY-1"
##  [6] "2021-JUN-1" "2021-JUL-1" "2021-AUG-1" "2021-SEP-1" "2021-OCT-1"
## [11] "2021-NOV-1" "2021-DEC-1" "2020-JAN-1" "2020-FEB-1" "2020-MAR-1"
## [16] "2020-APR-1" "2020-MAY-1" "2020-JUN-1" "2020-JUL-1" "2020-AUG-1"
## [21] "2020-SEP-1" "2020-OCT-1" "2020-NOV-1" "2020-DEC-1" "2019-JAN-1"
## [26] "2019-FEB-1" "2019-MAR-1" "2019-APR-1" "2019-MAY-1" "2019-JUN-1"
## [31] "2019-JUL-1" "2019-AUG-1" "2019-SEP-1" "2019-OCT-1" "2019-NOV-1"
## [36] "2019-DEC-1" "2018-JAN-1" "2018-FEB-1" "2018-MAR-1" "2018-APR-1"
## [41] "2018-MAY-1" "2018-JUN-1" "2018-JUL-1" "2018-AUG-1" "2018-SEP-1"
```

```
##  [46] "2018-OCT-1" "2018-NOV-1" "2018-DEC-1" "2017-JAN-1" "2017-FEB-1"
##  [51] "2017-MAR-1" "2017-APR-1" "2017-MAY-1" "2017-JUN-1" "2017-JUL-1"
##  [56] "2017-AUG-1" "2017-SEP-1" "2017-OCT-1" "2017-NOV-1" "2017-DEC-1"
##  [61] "2016-JAN-1" "2016-FEB-1" "2016-MAR-1" "2016-APR-1" "2016-MAY-1"
##  [66] "2016-JUN-1" "2016-JUL-1" "2016-AUG-1" "2016-SEP-1" "2016-OCT-1"
##  [71] "2016-NOV-1" "2016-DEC-1" "2015-JAN-1" "2015-FEB-1" "2015-MAR-1"
##  [76] "2015-APR-1" "2015-MAY-1" "2015-JUN-1" "2015-JUL-1" "2015-AUG-1"
##  [81] "2015-SEP-1" "2015-OCT-1" "2015-NOV-1" "2015-DEC-1" "2014-JAN-1"
##  [86] "2014-FEB-1" "2014-MAR-1" "2014-APR-1" "2014-MAY-1" "2014-JUN-1"
##  [91] "2014-JUL-1" "2014-AUG-1" "2014-SEP-1" "2014-OCT-1" "2014-NOV-1"
##  [96] "2014-DEC-1" "2013-JAN-1" "2013-FEB-1" "2013-MAR-1" "2013-APR-1"
## [101] "2013-MAY-1" "2013-JUN-1" "2013-JUL-1" "2013-AUG-1" "2013-SEP-1"
## [106] "2013-OCT-1" "2013-NOV-1" "2013-DEC-1" "2012-JAN-1" "2012-FEB-1"
## [111] "2012-MAR-1" "2012-APR-1" "2012-MAY-1" "2012-JUN-1" "2012-JUL-1"
## [116] "2012-AUG-1" "2012-SEP-1" "2012-OCT-1" "2012-NOV-1" "2012-DEC-1"
## [121] "2011-JAN-1" "2011-FEB-1" "2011-MAR-1" "2011-APR-1" "2011-MAY-1"
## [126] "2011-JUN-1" "2011-JUL-1" "2011-AUG-1" "2011-SEP-1" "2011-OCT-1"
## [131] "2011-NOV-1" "2011-DEC-1" "2010-JAN-1" "2010-FEB-1" "2010-MAR-1"
## [136] "2010-APR-1" "2010-MAY-1" "2010-JUN-1" "2010-JUL-1" "2010-AUG-1"
## [141] "2010-SEP-1" "2010-OCT-1" "2010-NOV-1" "2010-DEC-1" "2009-JAN-1"
## [146] "2009-FEB-1" "2009-MAR-1" "2009-APR-1" "2009-MAY-1" "2009-JUN-1"
## [151] "2009-JUL-1" "2009-AUG-1" "2009-SEP-1" "2009-OCT-1" "2009-NOV-1"
## [156] "2009-DEC-1" "2008-JAN-1" "2008-FEB-1" "2008-MAR-1" "2008-APR-1"
## [161] "2008-MAY-1" "2008-JUN-1" "2008-JUL-1" "2008-AUG-1" "2008-SEP-1"
## [166] "2008-OCT-1" "2008-NOV-1" "2008-DEC-1" "2007-JAN-1" "2007-FEB-1"
## [171] "2007-MAR-1" "2007-APR-1" "2007-MAY-1" "2007-JUN-1" "2007-JUL-1"
## [176] "2007-AUG-1" "2007-SEP-1" "2007-OCT-1" "2007-NOV-1" "2007-DEC-1"
## [181] "2006-JAN-1" "2006-FEB-1" "2006-MAR-1" "2006-APR-1" "2006-MAY-1"
## [186] "2006-JUN-1" "2006-JUL-1" "2006-AUG-1" "2006-SEP-1" "2006-OCT-1"
## [191] "2006-NOV-1" "2006-DEC-1" "2005-JAN-1" "2005-FEB-1" "2005-MAR-1"
## [196] "2005-APR-1" "2005-MAY-1" "2005-JUN-1" "2005-JUL-1" "2005-AUG-1"
## [201] "2005-SEP-1" "2005-OCT-1" "2005-NOV-1" "2005-DEC-1" "2004-JAN-1"
## [206] "2004-FEB-1" "2004-MAR-1" "2004-APR-1" "2004-MAY-1" "2004-JUN-1"
## [211] "2004-JUL-1" "2004-AUG-1" "2004-SEP-1" "2004-OCT-1" "2004-NOV-1"
## [216] "2004-DEC-1" "2003-JAN-1" "2003-FEB-1" "2003-MAR-1" "2003-APR-1"
## [221] "2003-MAY-1" "2003-JUN-1" "2003-JUL-1" "2003-AUG-1" "2003-SEP-1"
## [226] "2003-OCT-1" "2003-NOV-1" "2003-DEC-1" "2002-JAN-1" "2002-FEB-1"
## [231] "2002-MAR-1" "2002-APR-1" "2002-MAY-1" "2002-JUN-1" "2002-JUL-1"
## [236] "2002-AUG-1" "2002-SEP-1" "2002-OCT-1" "2002-NOV-1" "2002-DEC-1"
## [241] "2001-JAN-1" "2001-FEB-1" "2001-MAR-1" "2001-APR-1" "2001-MAY-1"
## [246] "2001-JUN-1" "2001-JUL-1" "2001-AUG-1" "2001-SEP-1" "2001-OCT-1"
## [251] "2001-NOV-1" "2001-DEC-1" "2000-JAN-1" "2000-FEB-1" "2000-MAR-1"
## [256] "2000-APR-1" "2000-MAY-1" "2000-JUN-1" "2000-JUL-1" "2000-AUG-1"
## [261] "2000-SEP-1" "2000-OCT-1" "2000-NOV-1" "2000-DEC-1" "1999-JAN-1"
## [266] "1999-FEB-1" "1999-MAR-1" "1999-APR-1" "1999-MAY-1" "1999-JUN-1"
## [271] "1999-JUL-1" "1999-AUG-1" "1999-SEP-1" "1999-OCT-1" "1999-NOV-1"
## [276] "1999-DEC-1" "1998-JAN-1" "1998-FEB-1" "1998-MAR-1" "1998-APR-1"
## [281] "1998-MAY-1" "1998-JUN-1" "1998-JUL-1" "1998-AUG-1" "1998-SEP-1"
## [286] "1998-OCT-1" "1998-NOV-1" "1998-DEC-1" "1997-JAN-1" "1997-FEB-1"
## [291] "1997-MAR-1" "1997-APR-1" "1997-MAY-1" "1997-JUN-1" "1997-JUL-1"
## [296] "1997-AUG-1" "1997-SEP-1" "1997-OCT-1" "1997-NOV-1" "1997-DEC-1"
## [301] "1996-JAN-1" "1996-FEB-1" "1996-MAR-1" "1996-APR-1" "1996-MAY-1"
## [306] "1996-JUN-1" "1996-JUL-1" "1996-AUG-1" "1996-SEP-1" "1996-OCT-1"
## [311] "1996-NOV-1" "1996-DEC-1" "1995-JAN-1" "1995-FEB-1" "1995-MAR-1"
```

```
## [316] "1995-APR-1" "1995-MAY-1" "1995-JUN-1" "1995-JUL-1" "1995-AUG-1"
## [321] "1995-SEP-1" "1995-OCT-1" "1995-NOV-1" "1995-DEC-1" "1994-JAN-1"
## [326] "1994-FEB-1" "1994-MAR-1" "1994-APR-1" "1994-MAY-1" "1994-JUN-1"
## [331] "1994-JUL-1" "1994-AUG-1" "1994-SEP-1" "1994-OCT-1" "1994-NOV-1"
## [336] "1994-DEC-1" "1993-JAN-1" "1993-FEB-1" "1993-MAR-1" "1993-APR-1"
## [341] "1993-MAY-1" "1993-JUN-1" "1993-JUL-1" "1993-AUG-1" "1993-SEP-1"
## [346] "1993-OCT-1" "1993-NOV-1" "1993-DEC-1" "1992-JAN-1" "1992-FEB-1"
## [351] "1992-MAR-1" "1992-APR-1" "1992-MAY-1" "1992-JUN-1" "1992-JUL-1"
## [356] "1992-AUG-1" "1992-SEP-1" "1992-OCT-1" "1992-NOV-1" "1992-DEC-1"
## [361] "1991-JAN-1" "1991-FEB-1" "1991-MAR-1" "1991-APR-1" "1991-MAY-1"
## [366] "1991-JUN-1" "1991-JUL-1" "1991-AUG-1" "1991-SEP-1" "1991-OCT-1"
## [371] "1991-NOV-1" "1991-DEC-1" "1990-JAN-1" "1990-FEB-1" "1990-MAR-1"
## [376] "1990-APR-1" "1990-MAY-1" "1990-JUN-1" "1990-JUL-1" "1990-AUG-1"
## [381] "1990-SEP-1" "1990-OCT-1" "1990-NOV-1" "1990-DEC-1" "1989-JAN-1"
## [386] "1989-FEB-1" "1989-MAR-1" "1989-APR-1" "1989-MAY-1" "1989-JUN-1"
## [391] "1989-JUL-1" "1989-AUG-1" "1989-SEP-1" "1989-OCT-1" "1989-NOV-1"
## [396] "1989-DEC-1" "1988-JAN-1" "1988-FEB-1" "1988-MAR-1" "1988-APR-1"
## [401] "1988-MAY-1" "1988-JUN-1" "1988-JUL-1" "1988-AUG-1" "1988-SEP-1"
## [406] "1988-OCT-1" "1988-NOV-1" "1988-DEC-1" "1987-JAN-1" "1987-FEB-1"
## [411] "1987-MAR-1" "1987-APR-1" "1987-MAY-1" "1987-JUN-1" "1987-JUL-1"
## [416] "1987-AUG-1" "1987-SEP-1" "1987-OCT-1" "1987-NOV-1" "1987-DEC-1"
## [421] "1986-JAN-1" "1986-FEB-1" "1986-MAR-1" "1986-APR-1" "1986-MAY-1"
## [426] "1986-JUN-1" "1986-JUL-1" "1986-AUG-1" "1986-SEP-1" "1986-OCT-1"
## [431] "1986-NOV-1" "1986-DEC-1" "1985-JAN-1" "1985-FEB-1" "1985-MAR-1"
## [436] "1985-APR-1" "1985-MAY-1" "1985-JUN-1" "1985-JUL-1" "1985-AUG-1"
## [441] "1985-SEP-1" "1985-OCT-1" "1985-NOV-1" "1985-DEC-1" "1984-JAN-1"
## [446] "1984-FEB-1" "1984-MAR-1" "1984-APR-1" "1984-MAY-1" "1984-JUN-1"
## [451] "1984-JUL-1" "1984-AUG-1" "1984-SEP-1" "1984-OCT-1" "1984-NOV-1"
## [456] "1984-DEC-1" "1983-JAN-1" "1983-FEB-1" "1983-MAR-1" "1983-APR-1"
## [461] "1983-MAY-1" "1983-JUN-1" "1983-JUL-1" "1983-AUG-1" "1983-SEP-1"
## [466] "1983-OCT-1" "1983-NOV-1" "1983-DEC-1" "1982-JAN-1" "1982-FEB-1"
## [471] "1982-MAR-1" "1982-APR-1" "1982-MAY-1" "1982-JUN-1" "1982-JUL-1"
## [476] "1982-AUG-1" "1982-SEP-1" "1982-OCT-1" "1982-NOV-1" "1982-DEC-1"
## [481] "1981-JAN-1" "1981-FEB-1" "1981-MAR-1" "1981-APR-1" "1981-MAY-1"
## [486] "1981-JUN-1" "1981-JUL-1" "1981-AUG-1" "1981-SEP-1" "1981-OCT-1"
## [491] "1981-NOV-1" "1981-DEC-1" "1980-JAN-1" "1980-FEB-1" "1980-MAR-1"
## [496] "1980-APR-1" "1980-MAY-1" "1980-JUN-1" "1980-JUL-1" "1980-AUG-1"
## [501] "1980-SEP-1" "1980-OCT-1" "1980-NOV-1" "1980-DEC-1" "1979-JAN-1"
## [506] "1979-FEB-1" "1979-MAR-1" "1979-APR-1" "1979-MAY-1" "1979-JUN-1"
## [511] "1979-JUL-1" "1979-AUG-1" "1979-SEP-1" "1979-OCT-1" "1979-NOV-1"
## [516] "1979-DEC-1"
```

```
Visitation_by_month_gathered$Date <- ymd( paste(Visitation_by_month_gathered$Year, Visitation_by_month_g
head(Visitation_by_month_gathered)
```

```
## # A tibble: 6 x 4
##    Year Month Recreational_Visits Date
##   <dbl> <chr>               <dbl> <date>
## 1  2021 JAN                 67284 2021-01-01
## 2  2021 FEB                128222 2021-02-01
## 3  2021 MAR                159906 2021-03-01
## 4  2021 APR                257158 2021-04-01
## 5  2021 MAY                348006 2021-05-01
## 6  2021 JUN                429980 2021-06-01
```

```
Visitation_by_month_gathered <- filter(Visitation_by_month_gathered, Year > 1998 & Year < 2020 )

library(ggplot2)
head(Visitation_by_month_gathered)
```

```
## # A tibble: 6 x 4
##    Year Month Recreational_Visits Date
##   <dbl> <chr>              <dbl> <date>
## 1  2019 JAN               116746 2019-01-01
## 2  2019 FEB               111665 2019-02-01
## 3  2019 MAR               173610 2019-03-01
## 4  2019 APR               297207 2019-04-01
## 5  2019 MAY               393004 2019-05-01
## 6  2019 JUN               496625 2019-06-01
```
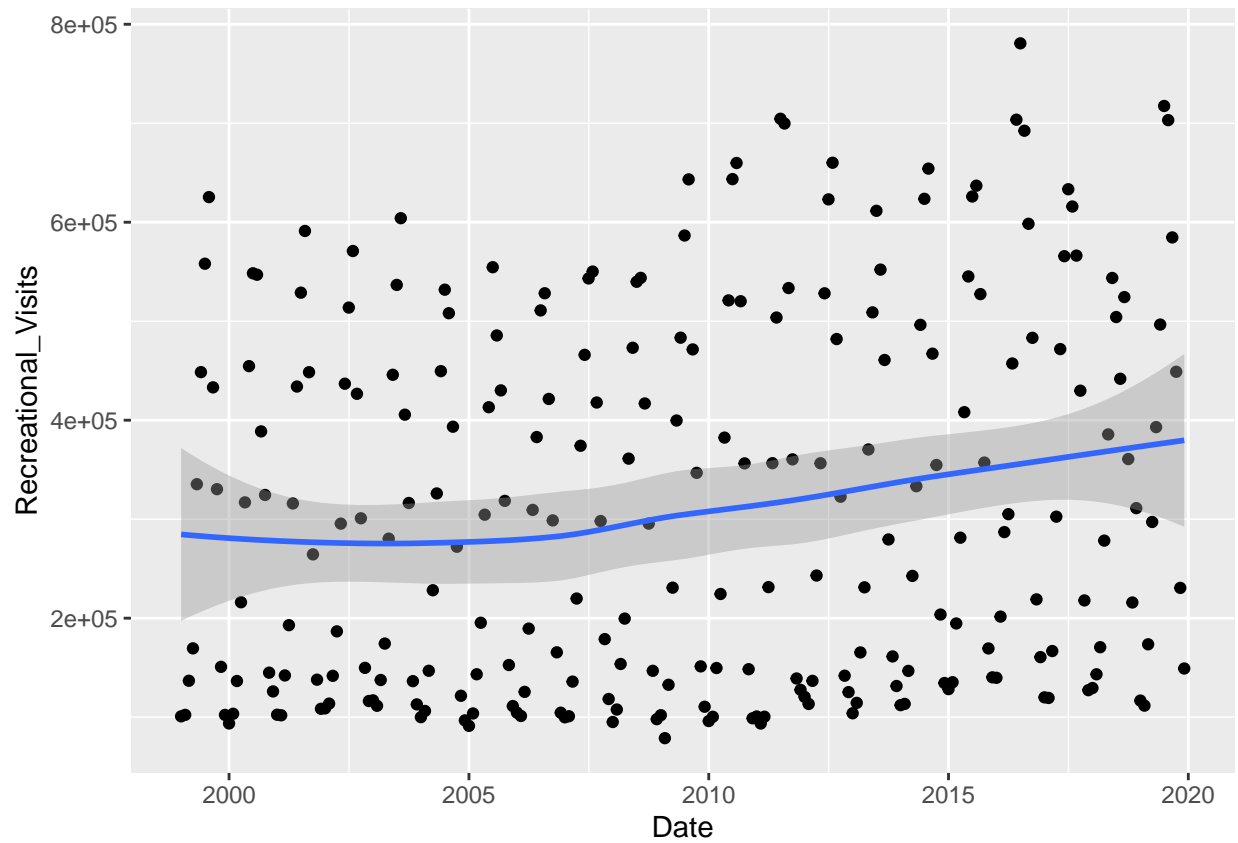
```
summary(Visitation_by_month_gathered$Recreational_Visits)
```
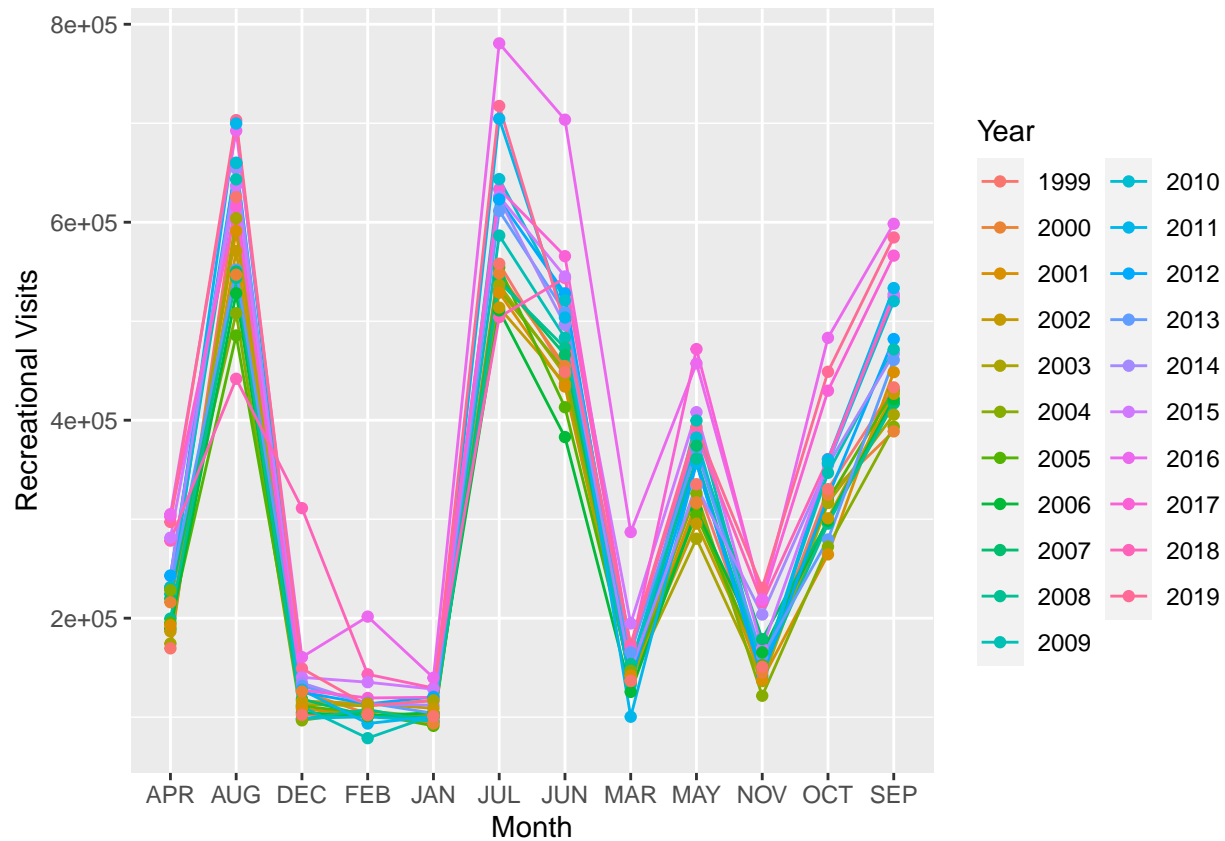
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   78795  136646  291251  312429  471609  780728
```

```
Visitation_by_month_plot <- ggplot(Visitation_by_month_gathered, aes(x = Date, y = Recreational_Visits)
  geom_point()+
  geom_smooth()
print(Visitation_by_month_plot)
```

```
## 'geom_smooth()' using method = 'loess' and formula 'y ~ x'
```
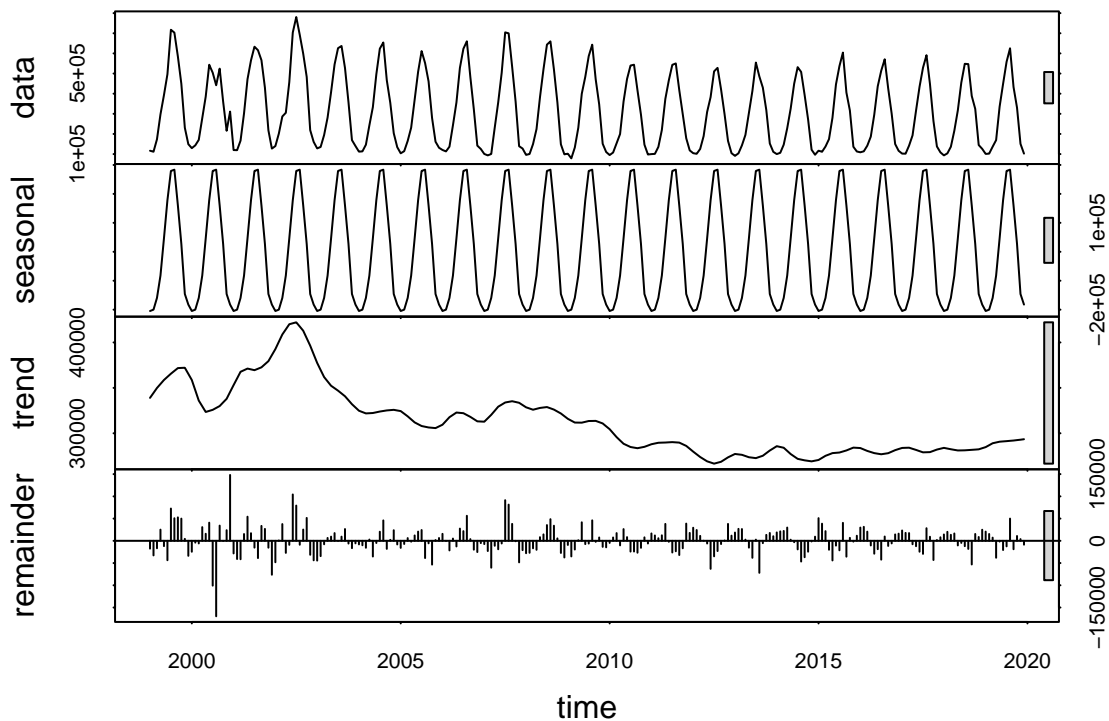
```
visitation_by_month_plot2 <- ggplot(Visitation_by_month_gathered, aes(x = Month, y = Recreational_Visit
  geom_line() +
  geom_point() +
  labs(x="Month", colour="Year", y = "Recreational Visits")
print(visitation_by_month_plot2)
```

```
#Question: Has there been an increasing or decreasing visitation trend for Yosemite National Park betwe

Visitation_by_month_gathered_ts <- ts(Visitation_by_month_gathered$Recreational_Visits, start = c(1999,

# Generate the decomposition
Visitation_by_month_Decomposed <- stl(Visitation_by_month_gathered_ts, s.window = "periodic")

# Visualize the decomposed series.
plot(Visitation_by_month_Decomposed)
```

```
#mostly monotonic trend - visitation appears to be decreasing overall

# Run SMK test
library(Kendall)
Visitation_by_month_trend1 <- Kendall::SeasonalMannKendall(Visitation_by_month_gathered_ts)

#Answer: The seasonal Mann-Kendall test is the most appropriate because this ozone data has seasonality

# Inspect results
Visitation_by_month_trend1
```

```
## tau = -0.494, 2-sided pvalue =< 2.22e-16
```

```
summary(Visitation_by_month_trend1)
```

```
## Score =  -1244 , Var(Score) = 13160
## denominator =  2520
## tau = -0.494, 2-sided pvalue =< 2.22e-16
```

```
#The p-value us less than 0.05, so we reject the null hypothesis that the data is stationary, therefore

Visitation_by_month_trend2 <- trend::smk.test(Visitation_by_month_gathered_ts)
# Inspect results
Visitation_by_month_trend2
```

```
##
##  Seasonal Mann-Kendall trend test (Hirsch-Slack test)
##
## data:  Visitation_by_month_gathered_ts
## z = -10.835, p-value < 2.2e-16
## alternative hypothesis: true S is not equal to 0
## sample estimates:
##      S  varS
## -1244 13160
```

summary(Visitation_by_month_trend2)

```
##
##  Seasonal Mann-Kendall trend test (Hirsch-Slack test)
##
## data: Visitation_by_month_gathered_ts
## alternative hypothesis: two.sided
##
## Statistics for individual seasons
##
## H0
##                        S   varS    tau      z   Pr(>|z|)
## Season 1:   S = 0    -90 1096.7 -0.429 -2.688 0.00719835  **
## Season 2:   S = 0    -70 1096.7 -0.333 -2.084 0.03719769   *
## Season 3:   S = 0    -92 1096.7 -0.438 -2.748 0.00599747  **
## Season 4:   S = 0   -156 1096.7 -0.743 -4.681 2.8614e-06 ***
## Season 5:   S = 0   -112 1096.7 -0.533 -3.352 0.00080271 ***
## Season 6:   S = 0   -132 1096.7 -0.629 -3.956 7.6280e-05 ***
## Season 7:   S = 0    -94 1096.7 -0.448 -2.808 0.00498017  **
## Season 8:   S = 0    -58 1096.7 -0.276 -1.721 0.08521008   .
## Season 9:   S = 0   -122 1096.7 -0.581 -3.654 0.00025836 ***
## Season 10:  S = 0   -100 1096.7 -0.476 -2.989 0.00279439  **
## Season 11:  S = 0   -106 1096.7 -0.505 -3.171 0.00152084  **
## Season 12:  S = 0   -112 1096.7 -0.533 -3.352 0.00080271 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```