Lab 3

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Question 1:

```
download.file(

    "https://raw.githubusercontent.com/USCbiostats/data-science-data/master/02_met/met_al

    destfile = "met_all.gz",

    method   = "libcurl",

    timeout  = 60 )

met <- data.table::fread("met_all.gz")

library(tidyverse)
```

```
── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ──
✔ dplyr     1.1.2     ✔ readr     2.1.4
✔ forcats   1.0.0     ✔ stringr   1.5.0
✔ ggplot2   3.4.3     ✔ tibble    3.2.1
✔ lubridate 1.9.2     ✔ tidyr     1.3.0
✔ purrr     1.0.2
── Conflicts ─────────────────────────────────────────── tidyverse_conflicts() ──
✖ dplyr::filter() masks stats::filter()
✖ dplyr::lag()    masks stats::lag()
ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to
become errors
```

```
library(data.table)
```

```
Attaching package: 'data.table'

The following objects are masked from 'package:lubridate':

    hour, isoweek, mday, minute, month, quarter, second, wday, week,
    yday, year

The following objects are masked from 'package:dplyr':

    between, first, last
```

```
The following object is masked from 'package:purrr':

    transpose
```

Question 2: How many columns, rows are there?

```
dim(met)
```

```
[1] 2377343       30
```

```
head(met)
```

```
   USAFID  WBAN year month day hour min  lat      lon elev wind.dir wind.dir.qc
1: 690150 93121 2019     8   1    0  56 34.3 -116.166  696      220           5
2: 690150 93121 2019     8   1    1  56 34.3 -116.166  696      230           5
3: 690150 93121 2019     8   1    2  56 34.3 -116.166  696      230           5
4: 690150 93121 2019     8   1    3  56 34.3 -116.166  696      210           5
5: 690150 93121 2019     8   1    4  56 34.3 -116.166  696      120           5
6: 690150 93121 2019     8   1    5  56 34.3 -116.166  696       NA           9
   wind.type.code wind.sp wind.sp.qc ceiling.ht ceiling.ht.qc ceiling.ht.method
1:              N     5.7          5      22000             5                 9
2:              N     8.2          5      22000             5                 9
3:              N     6.7          5      22000             5                 9
4:              N     5.1          5      22000             5                 9
5:              N     2.1          5      22000             5                 9
6:              C     0.0          5      22000             5                 9
   sky.cond vis.dist vis.dist.qc vis.var vis.var.qc temp temp.qc dew.point
1:        N    16093           5       N          5 37.2       5      10.6
2:        N    16093           5       N          5 35.6       5      10.6
3:        N    16093           5       N          5 34.4       5       7.2
4:        N    16093           5       N          5 33.3       5       5.0
5:        N    16093           5       N          5 32.8       5       5.0
6:        N    16093           5       N          5 31.1       5       5.6
   dew.point.qc atm.press atm.press.qc       rh
1:            5    1009.9            5 19.88127
2:            5    1010.3            5 21.76098
3:            5    1010.6            5 18.48212
4:            5    1011.6            5 16.88862
5:            5    1012.7            5 17.38410
6:            5    1012.7            5 20.01540
```

```
tail(met)
```

```
   USAFID  WBAN year month day hour min   lat      lon elev wind.dir
1: 726813 94195 2019     8  31   18  56 43.650 -116.633  741       NA
2: 726813 94195 2019     8  31   19  56 43.650 -116.633  741       70
3: 726813 94195 2019     8  31   20  56 43.650 -116.633  741       NA
4: 726813 94195 2019     8  31   21  56 43.650 -116.633  741       10
```

```
5: 726813 94195 2019     8  31   22  56 43.642 -116.636  741        10
6: 726813 94195 2019     8  31   23  56 43.642 -116.636  741        40
   wind.dir.qc wind.type.code wind.sp wind.sp.qc ceiling.ht ceiling.ht.qc
1:          9              C     0.0          5      22000             5
2:          5              N     2.1          5      22000             5
3:          9              C     0.0          5      22000             5
4:          5              N     2.6          5      22000             5
5:          1              N     2.1          1      22000             1
6:          1              N     2.1          1      22000             1
   ceiling.ht.method sky.cond vis.dist vis.dist.qc vis.var vis.var.qc temp
1:                 9        N    16093           5       N          5 30.0
2:                 9        N    16093           5       N          5 32.2
3:                 9        N    16093           5       N          5 33.3
4:                 9        N    14484           5       N          5 35.0
5:                 9        N    16093           1       9          9 34.4
6:                 9        N    16093           1       9          9 34.4
   temp.qc dew.point dew.point.qc atm.press atm.press.qc       rh
1:       5      11.7            5    1013.6            5 32.32509
2:       5      12.2            5    1012.8            5 29.40686
3:       5      12.2            5    1011.6            5 27.60422
4:       5       9.4            5    1010.8            5 20.76325
5:       1       9.4            1    1010.1            1 21.48631
6:       1       9.4            1    1009.6            1 21.48631
```

There are 2,377,343 rows and 30 columns in the met dataset.

Question 3: Looking at the variables

```
str(met)
```

```
Classes 'data.table' and 'data.frame':  2377343 obs. of  30 variables:
 $ USAFID         : int  690150 690150 690150 690150 690150 690150 690150 690150 690150
690150 ...
 $ WBAN           : int  93121 93121 93121 93121 93121 93121 93121 93121 93121 93121
...
 $ year           : int  2019 2019 2019 2019 2019 2019 2019 2019 2019 2019 ...
 $ month          : int  8 8 8 8 8 8 8 8 8 8 ...
 $ day            : int  1 1 1 1 1 1 1 1 1 1 ...
 $ hour           : int  0 1 2 3 4 5 6 7 8 9 ...
 $ min            : int  56 56 56 56 56 56 56 56 56 56 ...
 $ lat            : num  34.3 34.3 34.3 34.3 34.3 34.3 34.3 34.3 34.3 34.3 ...
 $ lon            : num  -116 -116 -116 -116 -116 ...
 $ elev           : int  696 696 696 696 696 696 696 696 696 696 ...
 $ wind.dir       : int  220 230 230 210 120 NA 320 10 320 350 ...
 $ wind.dir.qc    : chr  "5" "5" "5" "5" ...
 $ wind.type.code : chr  "N" "N" "N" "N" ...
 $ wind.sp        : num  5.7 8.2 6.7 5.1 2.1 0 1.5 2.1 2.6 1.5 ...
 $ wind.sp.qc     : chr  "5" "5" "5" "5" ...
 $ ceiling.ht     : int  22000 22000 22000 22000 22000 22000 22000 22000 22000 22000
...
```

```
 $ ceiling.ht.qc    : int  5 5 5 5 5 5 5 5 5 5 ...
 $ ceiling.ht.method: chr  "9" "9" "9" "9" ...
 $ sky.cond         : chr  "N" "N" "N" "N" ...
 $ vis.dist         : int  16093 16093 16093 16093 16093 16093 16093 16093 16093 16093
...
 $ vis.dist.qc      : chr  "5" "5" "5" "5" ...
 $ vis.var          : chr  "N" "N" "N" "N" ...
 $ vis.var.qc       : chr  "5" "5" "5" "5" ...
 $ temp             : num  37.2 35.6 34.4 33.3 32.8 31.1 29.4 28.9 27.2 26.7 ...
 $ temp.qc          : chr  "5" "5" "5" "5" ...
 $ dew.point        : num  10.6 10.6 7.2 5 5 5.6 6.1 6.7 7.8 7.8 ...
 $ dew.point.qc     : chr  "5" "5" "5" "5" ...
 $ atm.press        : num  1010 1010 1011 1012 1013 ...
 $ atm.press.qc     : int  5 5 5 5 5 5 5 5 5 5 ...
 $ rh               : num  19.9 21.8 18.5 16.9 17.4 ...
 - attr(*, ".internal.selfref")=<externalptr>
```

Question 4: Closer look at key variables:

```
table(met$year)
```

```
   2019
2377343
```

```
table(met$day)
```

```
    1     2     3     4     5     6     7     8     9    10    11    12    13
75975 75923 76915 76594 76332 76734 77677 77766 75366 75450 76187 75052 76906
   14    15    16    17    18    19    20    21    22    23    24    25    26
77852 76217 78015 78219 79191 76709 75527 75786 78312 77413 76965 76806 79114
   27    28    29    30    31
79789 77059 71712 74931 74849
```

```
table(met$hour)
```

```
     0      1      2      3      4      5      6      7      8      9     10
 99434  93482  93770  96703 110504 112128 106235 101985 100310 102915 101880
    11     12     13     14     15     16     17     18     19     20     21
100470 103605  97004  96507  97635  94942  94184 100179  94604  94928  96070
    22     23
 94046  93823
```

```
summary(met$temp)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.     NA's
 -40.00   19.60   23.50   23.59   27.80   56.00    60089
```

```
summary(met$elev)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  -13.0   101.0   252.0   415.8   400.0  9999.0
```

```
summary(met$wind.sp)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.     NA's
   0.00    0.00    2.10    2.46    3.60   36.00    79693
```

```
met[met$elev==9999.0] <- NA
summary(met$elev)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.     NA's
    -13     101     252     413     400    4113      710
```

Highest weather station is 4113 meters, after replacing 9999.0 values with NA.

```
met <- met[temp>-40]
met2 <- met[order(temp)]
head(met2)
```

```
   USAFID WBAN year month day hour min     lat     lon elev wind.dir wind.dir.qc
1: 722817 3068 2019     8   1    0  56 38.767 -104.3 1838      190           5
2: 722817 3068 2019     8   1    1  56 38.767 -104.3 1838      180           5
3: 722817 3068 2019     8   3   11  56 38.767 -104.3 1838       NA           9
4: 722817 3068 2019     8   3   12  56 38.767 -104.3 1838       NA           9
5: 722817 3068 2019     8   6   21  56 38.767 -104.3 1838      280           5
6: 722817 3068 2019     8   6   22  56 38.767 -104.3 1838      240           5
   wind.type.code wind.sp wind.sp.qc ceiling.ht ceiling.ht.qc ceiling.ht.method
1:              N     7.2          5         NA             9                 9
2:              N     7.7          5         NA             9                 9
3:              C     0.0          5         NA             9                 9
4:              C     0.0          5         NA             9                 9
5:              N     2.6          5         NA             9                 9
6:              N     7.7          5         NA             9                 9
   sky.cond vis.dist vis.dist.qc vis.var vis.var.qc   temp temp.qc dew.point
1:        N       NA           9       N          5 -17.2       5        NA
2:        N       NA           9       N          5 -17.2       5        NA
3:        N       NA           9       N          5 -17.2       5        NA
4:        N       NA           9       N          5 -17.2       5        NA
5:        N       NA           9       N          5 -17.2       5        NA
6:        N       NA           9       N          5 -17.2       5        NA
   dew.point.qc atm.press atm.press.qc rh
1:            9        NA            9 NA
```

```
2:              9         NA           9 NA
3:              9         NA           9 NA
4:              9         NA           9 NA
5:              9         NA           9 NA
6:              9         NA           9 NA
```

Question 5 - Check data against an external data source

```
met <- met[temp>-15]
met2 <- met[order(temp)]
head(met2)
```

```
   USAFID  WBAN year month day hour min    lat       lon elev wind.dir
1: 726764 94163 2019     8  27   11  50 44.683 -111.116 2025       NA
2: 726764 94163 2019     8  27   12  10 44.683 -111.116 2025       NA
3: 726764 94163 2019     8  27   12  30 44.683 -111.116 2025       NA
4: 726764 94163 2019     8  27   12  50 44.683 -111.116 2025       NA
5: 720411   137 2019     8  18   12  35 36.422 -105.290 2554       NA
6: 726764 94163 2019     8  26   12  30 44.683 -111.116 2025       NA
   wind.dir.qc wind.type.code wind.sp wind.sp.qc ceiling.ht ceiling.ht.qc
1:           9              C       0          5      22000             5
2:           9              C       0          5      22000             5
3:           9              C       0          5      22000             5
4:           9              C       0          5      22000             5
5:           9              C       0          5      22000             5
6:           9              C       0          5      22000             5
   ceiling.ht.method sky.cond vis.dist vis.dist.qc vis.var vis.var.qc temp
1:                 9        N    16093           5       N          5 -3.0
2:                 9        N    16093           5       N          5 -3.0
3:                 9        N    16093           5       N          5 -3.0
4:                 9        N    16093           5       N          5 -3.0
5:                 9        N    16093           5       N          5 -2.4
6:                 9        N    16093           5       N          5 -2.0
   temp.qc dew.point dew.point.qc atm.press atm.press.qc       rh
1:       C      -5.0            C        NA            9 86.26537
2:       5      -4.0            5        NA            9 92.91083
3:       5      -4.0            5        NA            9 92.91083
4:       C      -4.0            C        NA            9 92.91083
5:       5      -3.7            5        NA            9 90.91475
6:       5      -3.0            5        NA            9 92.96690
```

All temperatures colder than -15C were removed. Minimum temp -3C in the new dataset.

```
max(met$elev)
```

```
[1] 4113
```

```
min(met$elev)
```

```
[1] -13
```

6. Summary Statistics

```
elev <- met[elev==max(elev), ]
summary(elev)
```

```
    USAFID              WBAN            year           month          day
 Min.   :720385   Min.   :419   Min.   :2019   Min.   :8   Min.   : 1.0
 1st Qu.:720385   1st Qu.:419   1st Qu.:2019   1st Qu.:8   1st Qu.: 8.0
 Median :720385   Median :419   Median :2019   Median :8   Median :16.0
 Mean   :720385   Mean   :419   Mean   :2019   Mean   :8   Mean   :16.1
 3rd Qu.:720385   3rd Qu.:419   3rd Qu.:2019   3rd Qu.:8   3rd Qu.:24.0
 Max.   :720385   Max.   :419   Max.   :2019   Max.   :8   Max.   :31.0

      hour            min             lat            lon              elev
 Min.   : 0.00   Min.   : 6.00   Min.   :39.8   Min.   :-105.8   Min.   :4113
 1st Qu.: 6.00   1st Qu.:13.00   1st Qu.:39.8   1st Qu.:-105.8   1st Qu.:4113
 Median :12.00   Median :36.00   Median :39.8   Median :-105.8   Median :4113
 Mean   :11.66   Mean   :34.38   Mean   :39.8   Mean   :-105.8   Mean   :4113
 3rd Qu.:18.00   3rd Qu.:53.00   3rd Qu.:39.8   3rd Qu.:-105.8   3rd Qu.:4113
 Max.   :23.00   Max.   :59.00   Max.   :39.8   Max.   :-105.8   Max.   :4113

    wind.dir       wind.dir.qc      wind.type.code        wind.sp
 Min.   : 10.0   Length:2117       Length:2117        Min.   : 0.000
 1st Qu.:250.0   Class :character  Class :character   1st Qu.: 4.100
 Median :300.0   Mode  :character  Mode  :character   Median : 6.700
 Mean   :261.5                                        Mean   : 7.245
 3rd Qu.:310.0                                         3rd Qu.: 9.800
 Max.   :360.0                                        Max.   :21.100
 NA's   :237                                          NA's   :168
  wind.sp.qc         ceiling.ht      ceiling.ht.qc    ceiling.ht.method
 Length:2117       Min.   :   30   Min.   :5.000    Length:2117
 Class :character  1st Qu.: 2591   1st Qu.:5.000    Class :character
 Mode  :character  Median :22000   Median :5.000    Mode  :character
                   Mean   :15145   Mean   :5.008
                   3rd Qu.:22000   3rd Qu.:5.000
                   Max.   :22000   Max.   :9.000
                   NA's   :4
   sky.cond          vis.dist        vis.dist.qc        vis.var
 Length:2117       Min.   :    0   Length:2117       Length:2117
 Class :character  1st Qu.:16093   Class :character  Class :character
 Mode  :character  Median :16093   Mode  :character  Mode  :character
                   Mean   :15913
                   3rd Qu.:16093
                   Max.   :16093
                   NA's   :683
   vis.var.qc          temp          temp.qc          dew.point
 Length:2117       Min.   : 1.00   Length:2117       Min.   :-6.0000
```

```
     Class :character    1st Qu.: 6.00   Class :character    1st Qu.: 0.0000
     Mode  :character    Median : 8.00   Mode  :character    Median : 0.0000
                         Mean   : 8.13                       Mean   : 0.8729
                         3rd Qu.:10.00                       3rd Qu.: 2.0000
                         Max.   :15.00                       Max.   : 7.0000

     dew.point.qc         atm.press       atm.press.qc         rh
     Length:2117       Min.   : NA     Min.    :9       Min.    :53.63
     Class :character  1st Qu.: NA     1st Qu.:9        1st Qu.:58.10
     Mode  :character  Median : NA     Median :9        Median :61.39
                       Mean   :NaN     Mean    :9       Mean    :60.62
                       3rd Qu.: NA     3rd Qu.:9        3rd Qu.:61.85
                       Max.    : NA    Max.    :9       Max.    :70.01
                       NA's    :2117
```

```
cor(elev$temp, elev$wind.sp, use="complete")
```

```
[1] -0.09373843
```

```
cor(elev$temp, elev$hour, use="complete")
```

```
[1] 0.4397261
```

```
cor(elev$wind.sp, elev$day, use="complete")
```

```
[1] 0.3643079
```

```
cor(elev$wind.sp, elev$hour, use="complete")
```

```
[1] 0.08807315
```

```
cor(elev$temp, elev$day, use="complete")
```

```
[1] -0.003857766
```

Question 7: Exploratory Graphs

```
hist(met$elev, breaks=100)
```

Histogram of met$elev
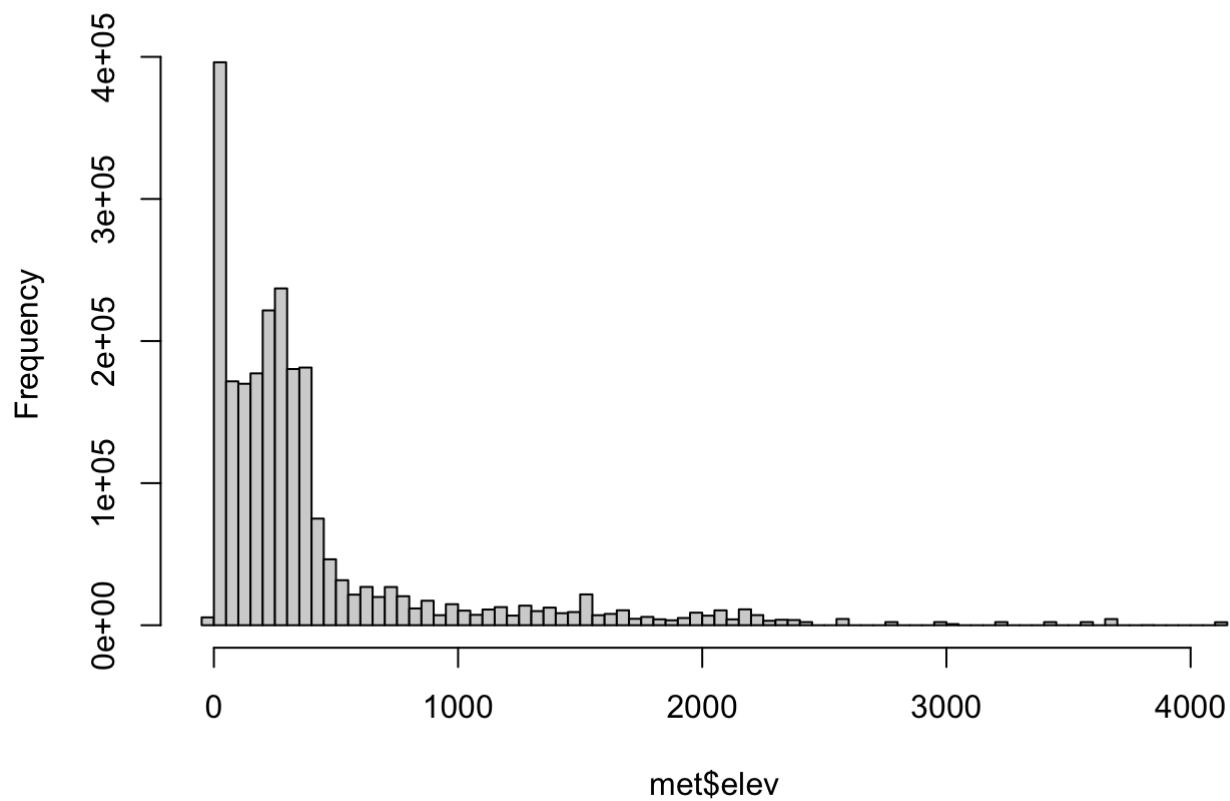

```
hist(met$temp)
```

Histogram of met$temp
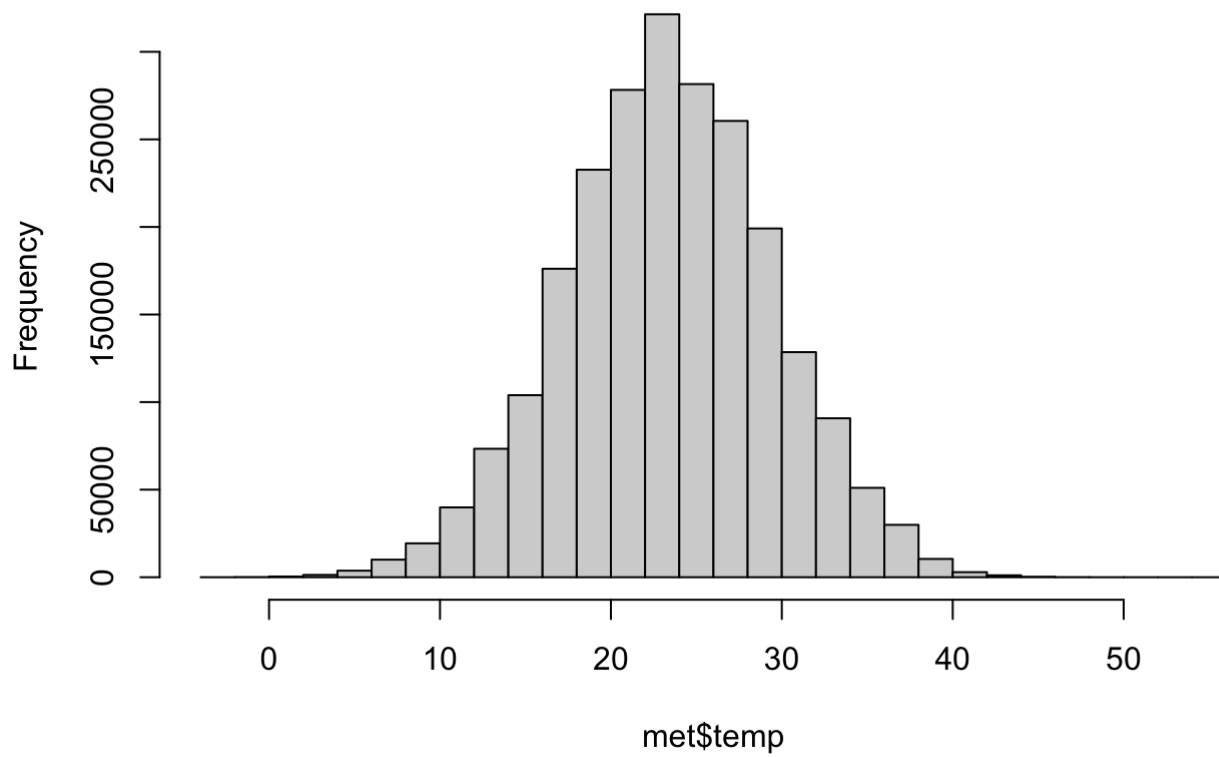

```
hist(met$wind.sp)
```

Histogram of met$wind.sp
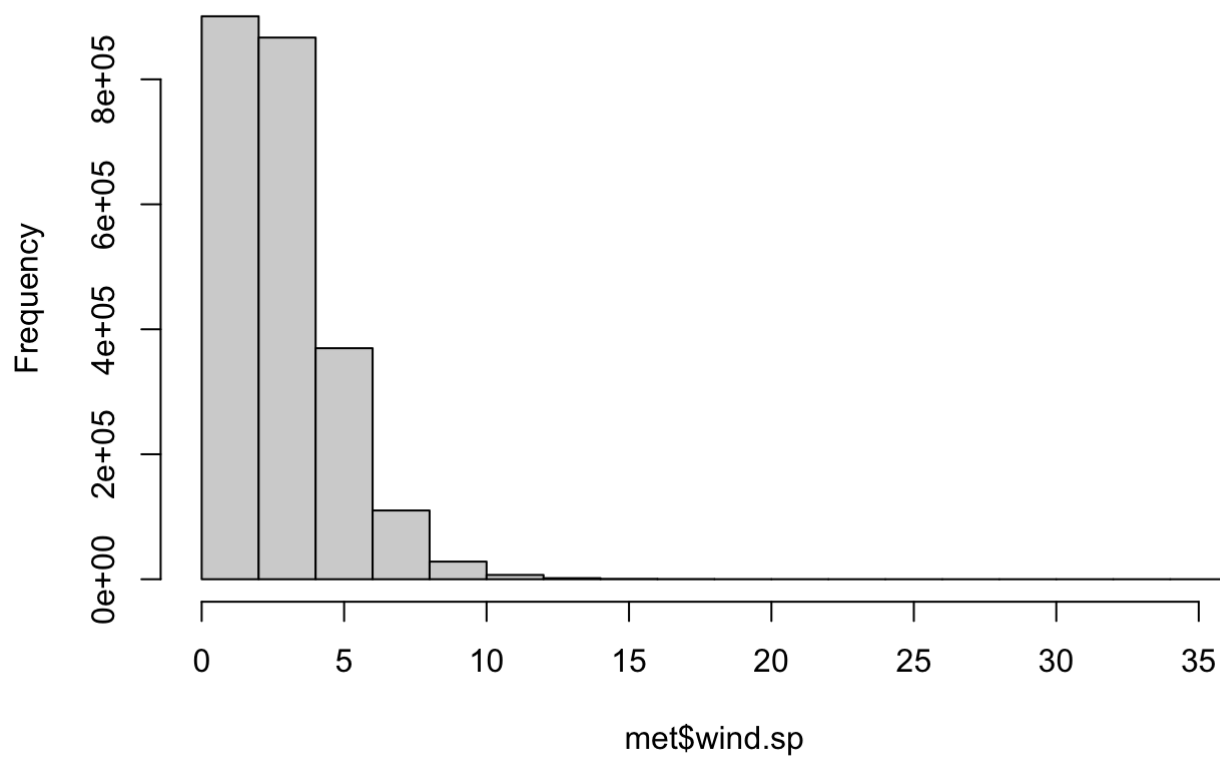

```
library(leaflet)

leaflet(elev) %>%
  addProviderTiles('OpenStreetMap') %>%
  addCircles(lat=~lat,lng=~lon, opacity=1, fillOpacity=1, radius=100)
```

Leaflet | © OpenStreetMap contributors
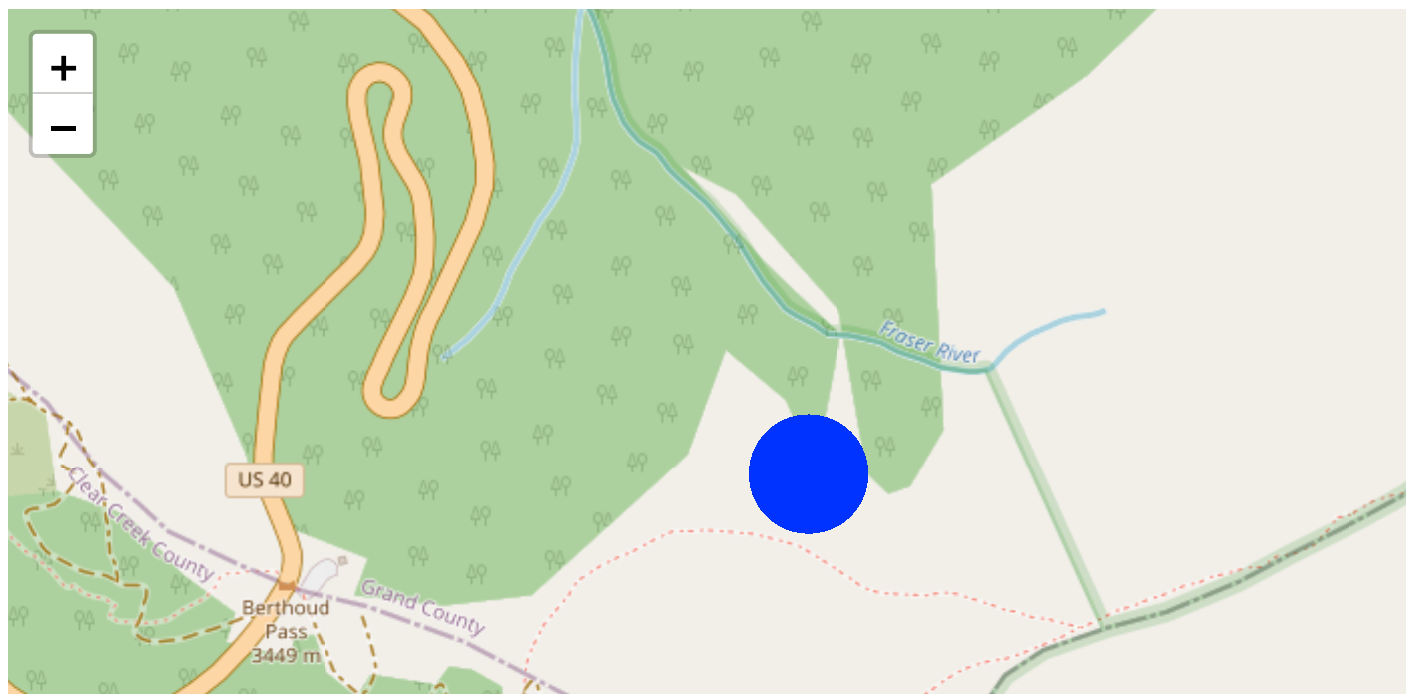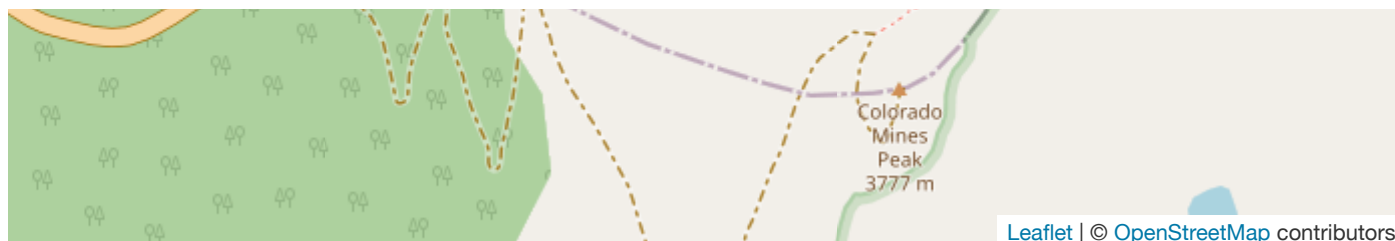
```
library(lubridate)
elev$date <- with(elev, ymd_h(paste(year, month, day, hour, sep= ' ')))
summary(elev$date)
```

```
                          Min.                        1st Qu.
"2019-08-01 00:00:00.0000" "2019-08-08 11:00:00.0000"
                        Median                           Mean
"2019-08-16 22:00:00.0000" "2019-08-16 14:09:56.8823"
                       3rd Qu.                           Max.
"2019-08-24 11:00:00.0000" "2019-08-31 22:00:00.0000"
```

```
elev <- elev[order(date)]
head(elev)
```

```
   USAFID WBAN year month day hour min  lat       lon elev wind.dir wind.dir.qc
1: 720385  419 2019     8   1    0  36 39.8 -105.766 4113      170            5
2: 720385  419 2019     8   1    0  54 39.8 -105.766 4113      100            5
3: 720385  419 2019     8   1    1  12 39.8 -105.766 4113       90            5
4: 720385  419 2019     8   1    1  35 39.8 -105.766 4113      110            5
5: 720385  419 2019     8   1    1  53 39.8 -105.766 4113      120            5
6: 720385  419 2019     8   1    2  12 39.8 -105.766 4113      120            5
   wind.type.code wind.sp wind.sp.qc ceiling.ht ceiling.ht.qc ceiling.ht.method
1:              N     8.8          5       1372             5                 M
2:              N     2.6          5       1372             5                 M
3:              N     3.1          5       1981             5                 M
4:              N     4.1          5       2134             5                 M
5:              N     4.6          5       2134             5                 M
6:              N     6.2          5      22000             5                 9
   sky.cond vis.dist vis.dist.qc vis.var vis.var.qc temp temp.qc dew.point
1:        N       NA           9       N          5    9       5         1
2:        N       NA           9       N          5    9       5         1
3:        N       NA           9       N          5    9       5         2
4:        N       NA           9       N          5    9       5         2
5:        N       NA           9       N          5    9       5         2
6:        N       NA           9       N          5    9       5         2
   dew.point.qc atm.press atm.press.qc       rh                date
1:            5        NA            9 57.61039 2019-08-01 00:00:00
2:            5        NA            9 57.61039 2019-08-01 00:00:00
3:            5        NA            9 61.85243 2019-08-01 01:00:00
4:            5        NA            9 61.85243 2019-08-01 01:00:00
5:            5        NA            9 61.85243 2019-08-01 01:00:00
6:            5        NA            9 61.85243 2019-08-01 02:00:00
```

```r
plot(elev$date, elev$temp, type='l')
```
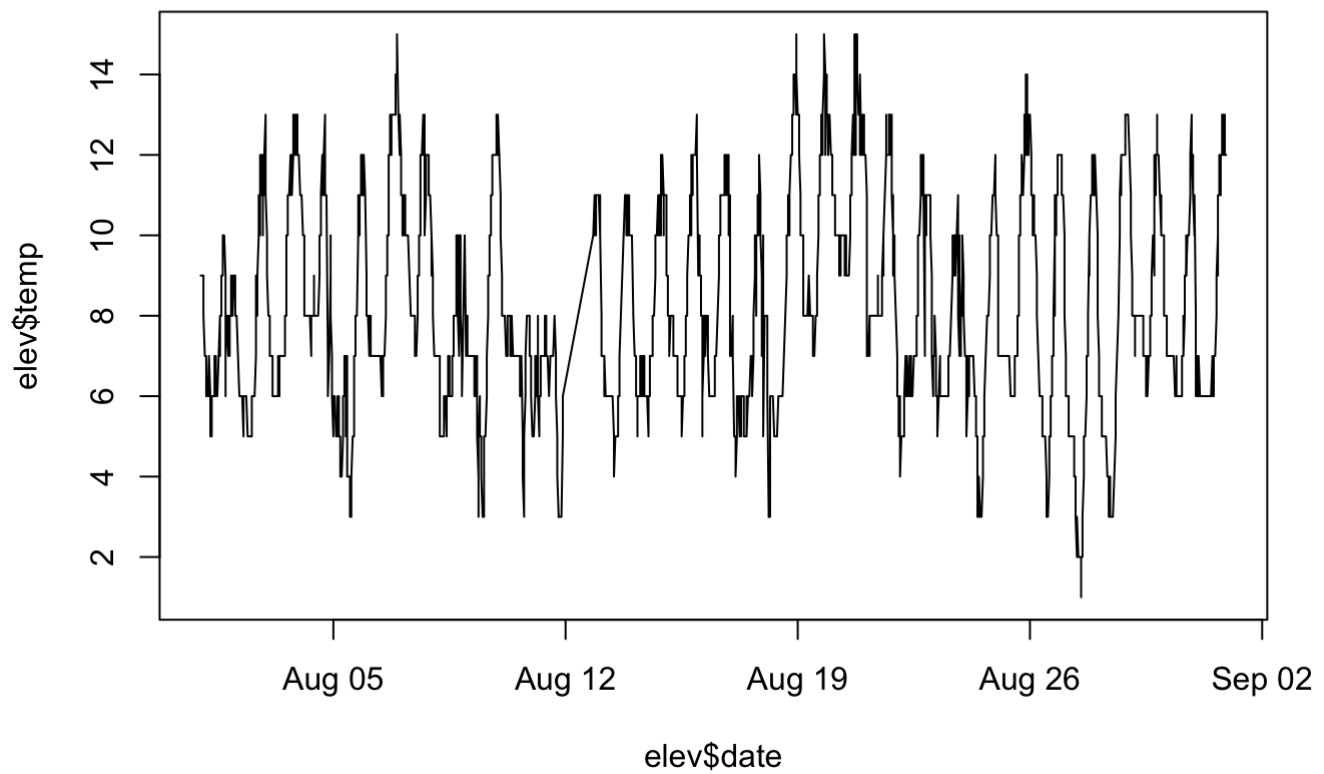


```r
plot(elev$date, elev$wind.sp, type='l')
```
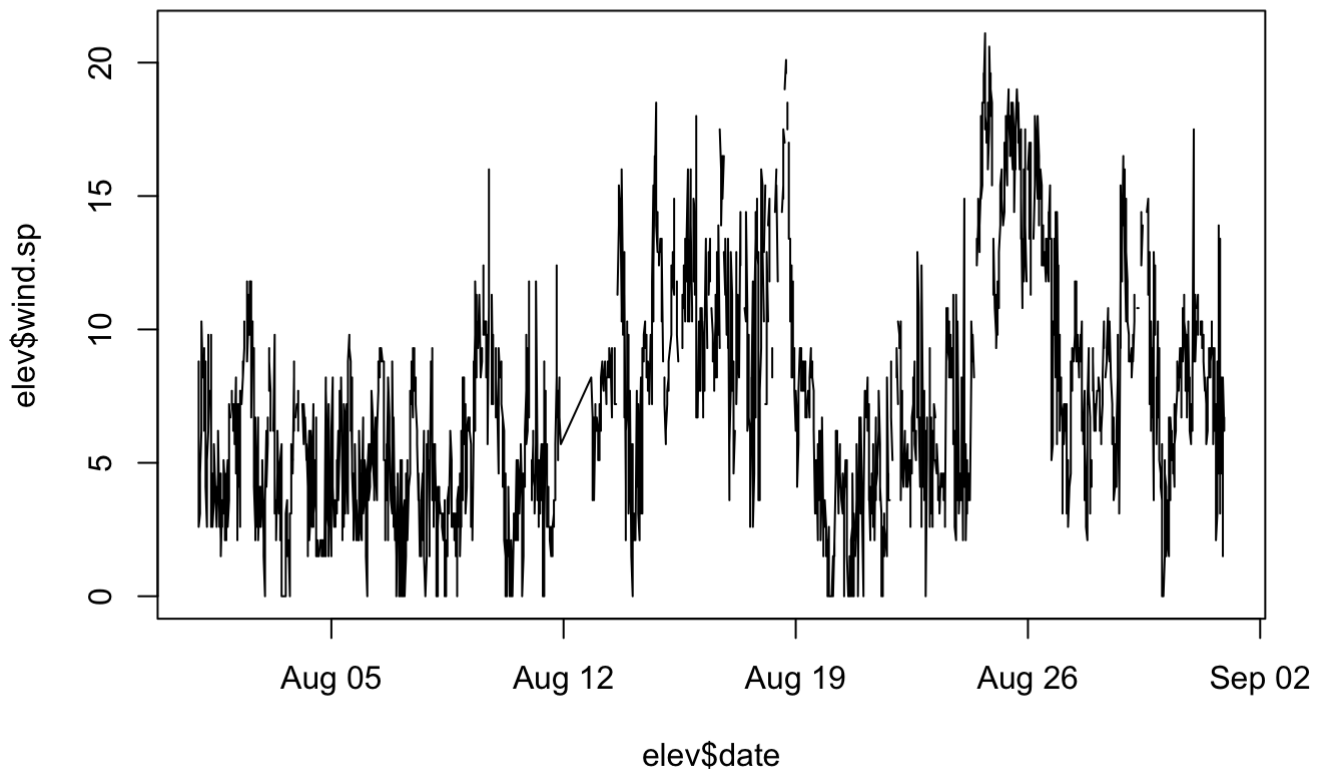
For temp vs date, there appears to be variation within a day, likely reflecting the temperature differences between day and night, and overall temp seems range between 2-14C and remained similar in that trend throughout the month.

For wind vs date, there are two spikes in wind speed around Aug 18 and Aug 26.

Question 8: What questions about the data?

Question: What is the relationship between elevation and wind speed in August?

```
summary(met$wind.sp)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
  0.000   0.000   2.100   2.462   3.600  36.000   31582
```

```
met3 <- met[met$wind.sp < 36, ]
dim(met3)
```

```
[1] 2285437       30
```

```
met4 <- met3[order(met3$wind.sp)]
head(met4)
```

```
    USAFID  WBAN year month day hour  min   lat       lon elev wind.dir wind.dir.qc
1: 690150 93121 2019     8   1    5   56 34.3 -116.166  696       NA           9
2: 690150 93121 2019     8   1   12   56 34.3 -116.166  696       NA           9
3: 690150 93121 2019     8   1   13   56 34.3 -116.166  696       NA           9
4: 690150 93121 2019     8   1   14   56 34.3 -116.166  696       NA           9
5: 690150 93121 2019     8   2   16   56 34.3 -116.166  696       NA           9
6: 690150 93121 2019     8   3   16   56 34.3 -116.166  696       NA           9
    wind.type.code wind.sp wind.sp.qc ceiling.ht ceiling.ht.qc ceiling.ht.method
1:             C       0          5      22000             5                 9
2:             C       0          5      22000             5                 9
3:             C       0          5      22000             5                 9
4:             C       0          5      22000             5                 9
5:             C       0          5      22000             5                 9
6:             C       0          5      22000             5                 9
    sky.cond vis.dist vis.dist.qc vis.var vis.var.qc temp temp.qc dew.point
1:       N    16093           5       N           5 31.1       5       5.6
2:       N    14484           5       N           5 25.6       5       6.7
3:       N    14484           5       N           5 25.6       5       5.6
4:       N    16093           5       N           5 27.8       5       5.6
5:       N    16093           5       N           5 34.4       5      -1.7
6:       N    16093           5       N           5 35.0       5       0.6
    dew.point.qc atm.press atm.press.qc        rh
1:           5    1012.7            5 20.015403
2:           5    1013.6            5 29.933337
3:           5    1014.6            5 27.739048
4:           5    1015.0            5 24.314684
5:           5    1014.2            5  9.745521
6:           5    1012.2            5 11.163048
```

```
tail(met4)
```

```
    USAFID  WBAN year month day hour  min    lat       lon elev wind.dir
1: 726130 14755 2019     8  10   21   48 44.270  -71.300 1909      300
2: 726130 14755 2019     8  11   10   53 44.270  -71.300 1909      300
3: 726130 14755 2019     8  11   14   49 44.270  -71.300 1909      310
4: 724556 13989 2019     8  30    6   29 38.329  -96.195  368      330
5: 725635 24044 2019     8  16    7   32 42.057 -102.801 1198      290
6: 726130 14755 2019     8  10   22   59 44.270  -71.300 1909      310
    wind.dir.qc wind.type.code wind.sp wind.sp.qc ceiling.ht ceiling.ht.qc
1:           1             N     26.8          1          0             1
2:           1             N     26.8          1         NA             9
3:           1             N     27.3          1          0             1
4:           5             N     27.8          6       1341             5
5:           5             N     27.8          5       1494             5
6:           1             N     28.3          1          0             1
    ceiling.ht.method sky.cond vis.dist vis.dist.qc vis.var vis.var.qc temp
1:                 W        N        0           1       9          9  3.0
2:                 9        N      101           5       9          9  4.0
3:                 W        N        0           1       9          9  4.0
4:                 M        N      805           5       N          5 19.4
```

```
5:                M       N     1207          5       N          5 15.0
6:                W       N        0          1       9          9  3.0
   temp.qc dew.point dew.point.qc atm.press atm.press.qc        rh
1:       1       3.0            1        NA            9 100.00000
2:       5       4.0            5        NA            9 100.00000
3:       1       4.0            1        NA            9 100.00000
4:       5      18.9            5        NA            9  96.95169
5:       5      12.8            5        NA            9  86.80701
6:       1       3.0            1        NA            9 100.00000
```

```r
met4_daily <- met4[, .(
  wind.sp = mean(wind.sp),
  lat  = mean(lat),
  lon  = mean(lon),
  elev = mean(elev)
  ), by = c("USAFID", "day")][order(wind.sp)]
head(met4_daily)
```

```
   USAFID day wind.sp      lat       lon elev
1: 720288  27       0 36.36100 -78.52900  161
2: 720297  11       0 37.23900 -76.71600   15
3: 720346   1       0 30.75005 -92.68805   33
4: 720346  13       0 30.75030 -92.68830   33
5: 720592  22       0 30.46000 -87.87700   28
6: 720592  26       0 30.46000 -87.87700   28
```

```r
tail(met4_daily)
```

```
   USAFID day  wind.sp   lat   lon elev
1: 726130  12 16.87500 44.27 -71.3 1909
2: 726130  22 17.03043 44.27 -71.3 1909
3: 726130  23 19.08333 44.27 -71.3 1909
4: 726130  31 20.22174 44.27 -71.3 1909
5: 726130  10 20.32917 44.27 -71.3 1909
6: 726130  11 22.47391 44.27 -71.3 1909
```

```r
met4_daily[, plot(elev, wind.sp, pch = 19, cex =0.5)]
```
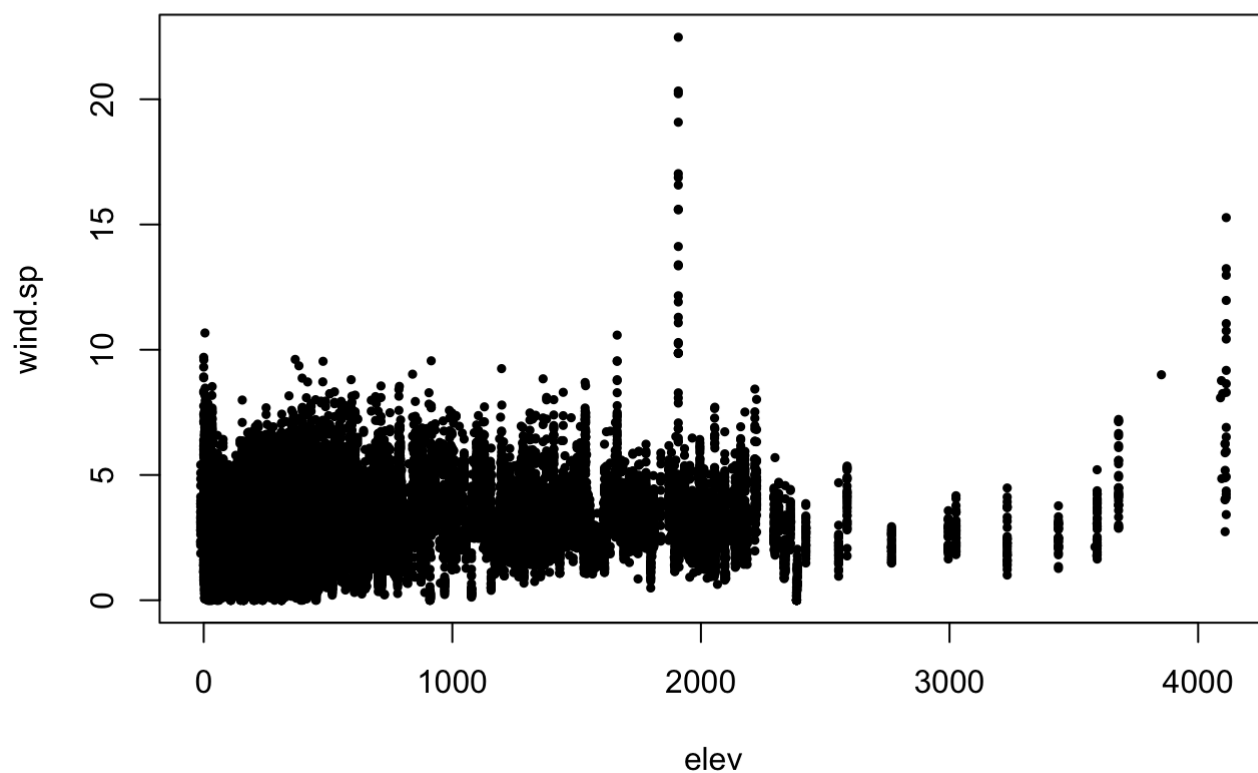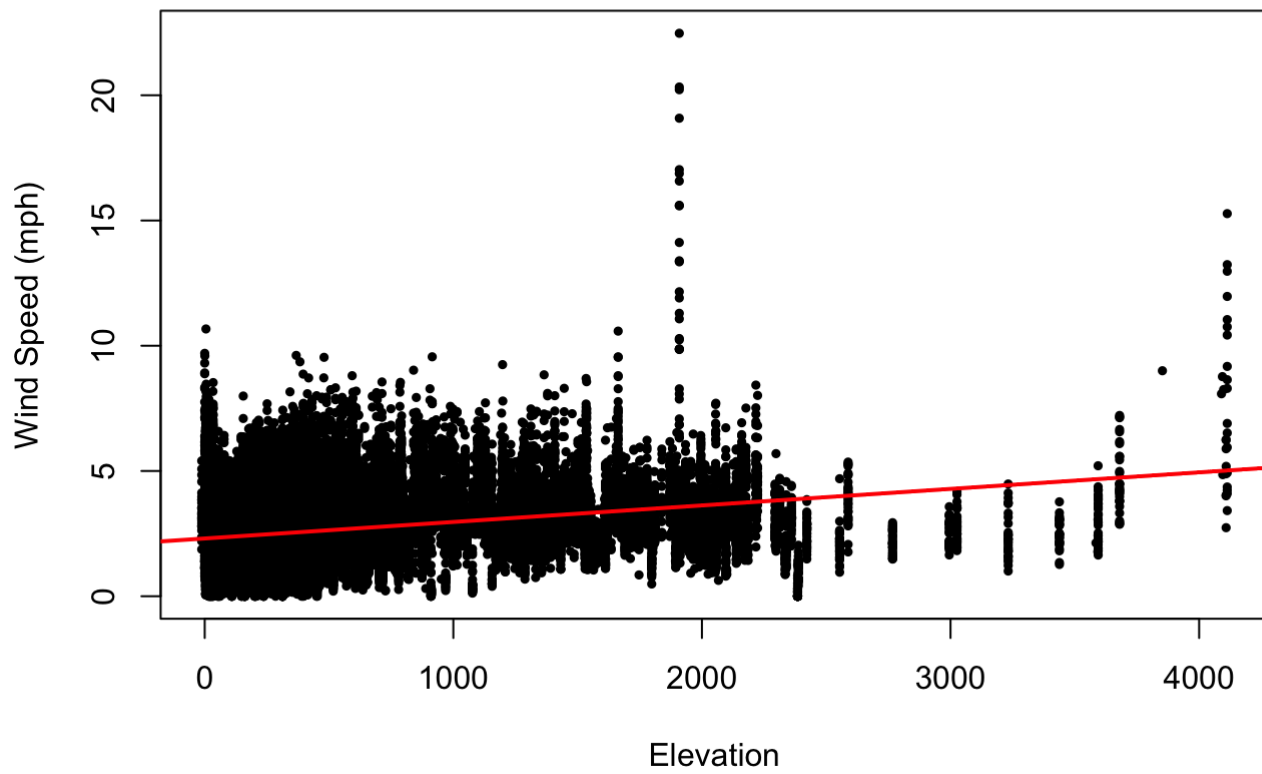
NULL

```r
mod <- lm(wind.sp ~ elev, data = met4_daily)
met4_daily[, plot(
  elev, wind.sp, pch=19, cex=0.5,
  main = "Wind Speed and Elevation",
  xlab = "Elevation", ylab = "Wind Speed (mph)")
  ]
```

NULL

```r
abline(mod, lwd=2, col="red")
```

Wind Speed and Elevation

Average wind speed increases with increasing elevation.