NEON TOS Coding Lab Solution

K Duffy

8/19/2020

Loading the libraries that we need:

```
library(neonUtilities)
library(geoNEON)
library(sp)
library(dplyr)
library(ggplot2)
```

Pulling in the code referenced in the textbook:

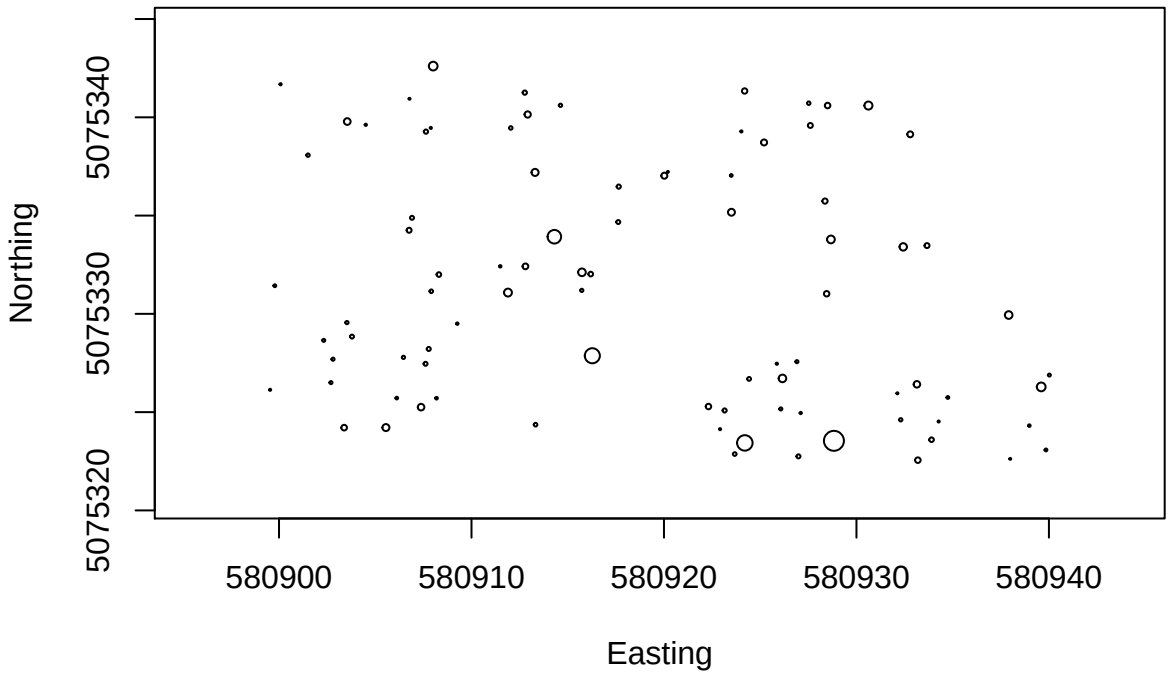
```
vegmap <- getLocTOS(veglist$vst_mappingandtagging,
                            "vst_mappingandtagging")
```

```
##   |                                                                      |
```

```
veg <- merge(veglist$vst_apparentindividual, vegmap,
             by=c("individualID","namedLocation",
                  "domainID","siteID","plotID"))
```

Here's our original plot from the textbook:

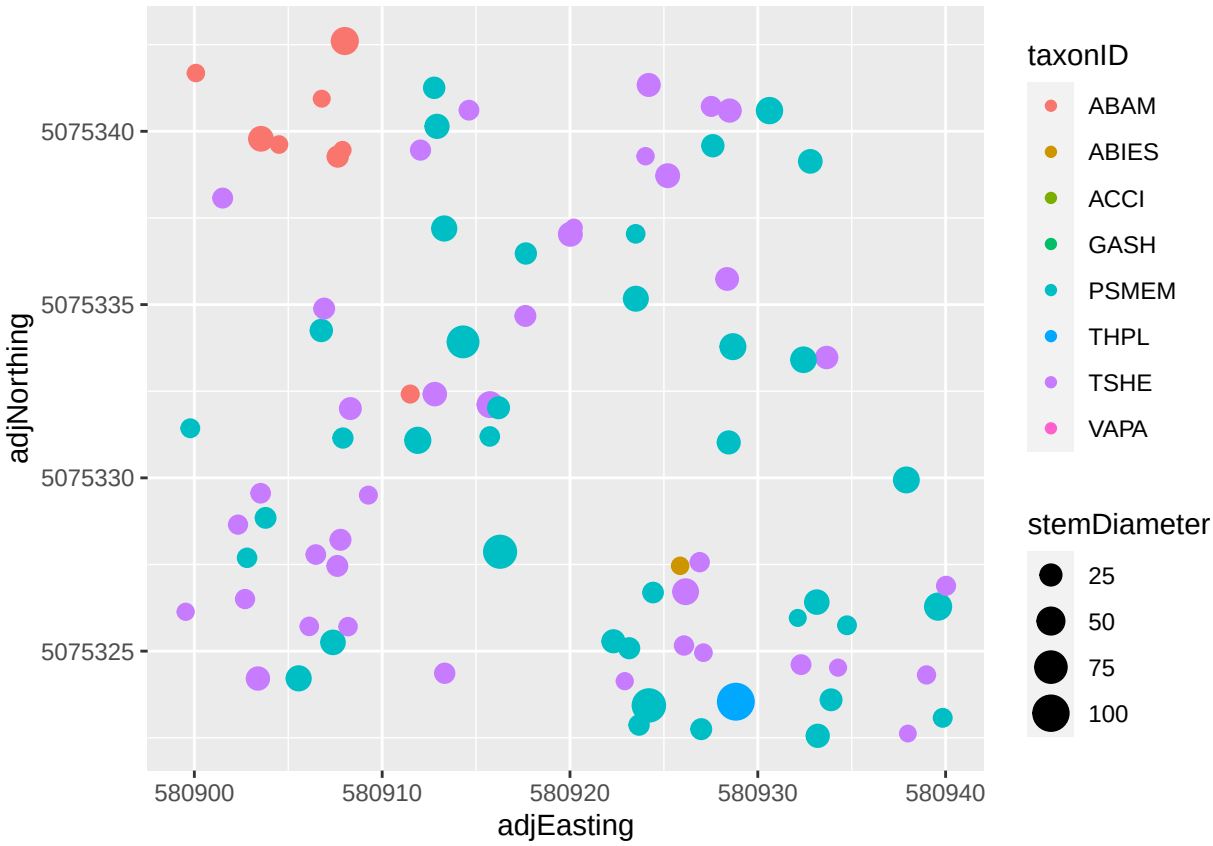
```
symbols(veg$adjEasting[which(veg$plotID=="WREF_075")],
        veg$adjNorthing[which(veg$plotID=="WREF_075")],
        circles=veg$stemDiameter[which(veg$plotID=="WREF_075")]/100/2,
        inches=F, xlab="Easting", ylab="Northing")
```



SOLUTIONS: NEON Part 1

1. Convert the above diameter plot into a ggplot:
2. Set the color of your circles to be a function of each species:

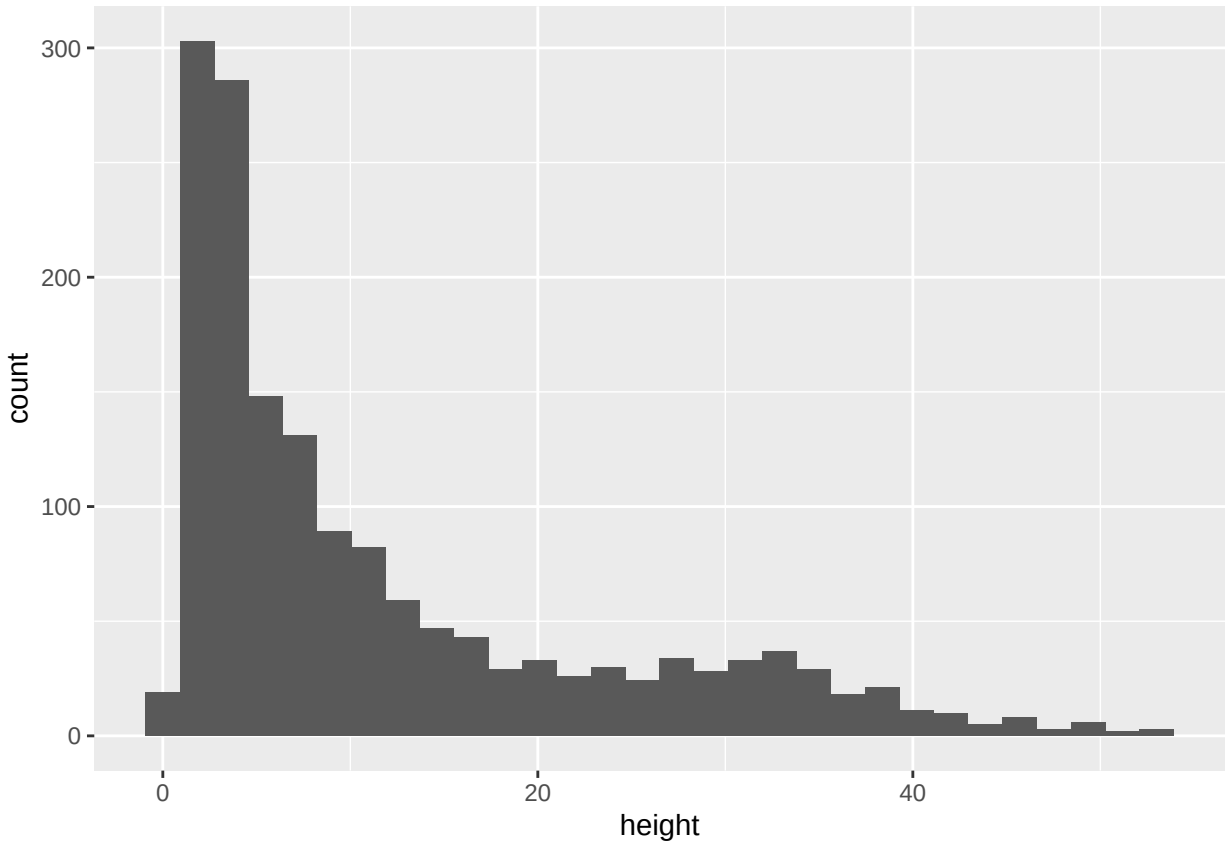
```
ggplot(veg[which(veg$plotID=="WREF_075"),], aes(x=adjEasting, y=adjNorthing, color=taxonID, size=stemDia
  geom_point()
```



3. Generate a histogram of tree heights for each plot. Color your stacked bar as a function of each species:

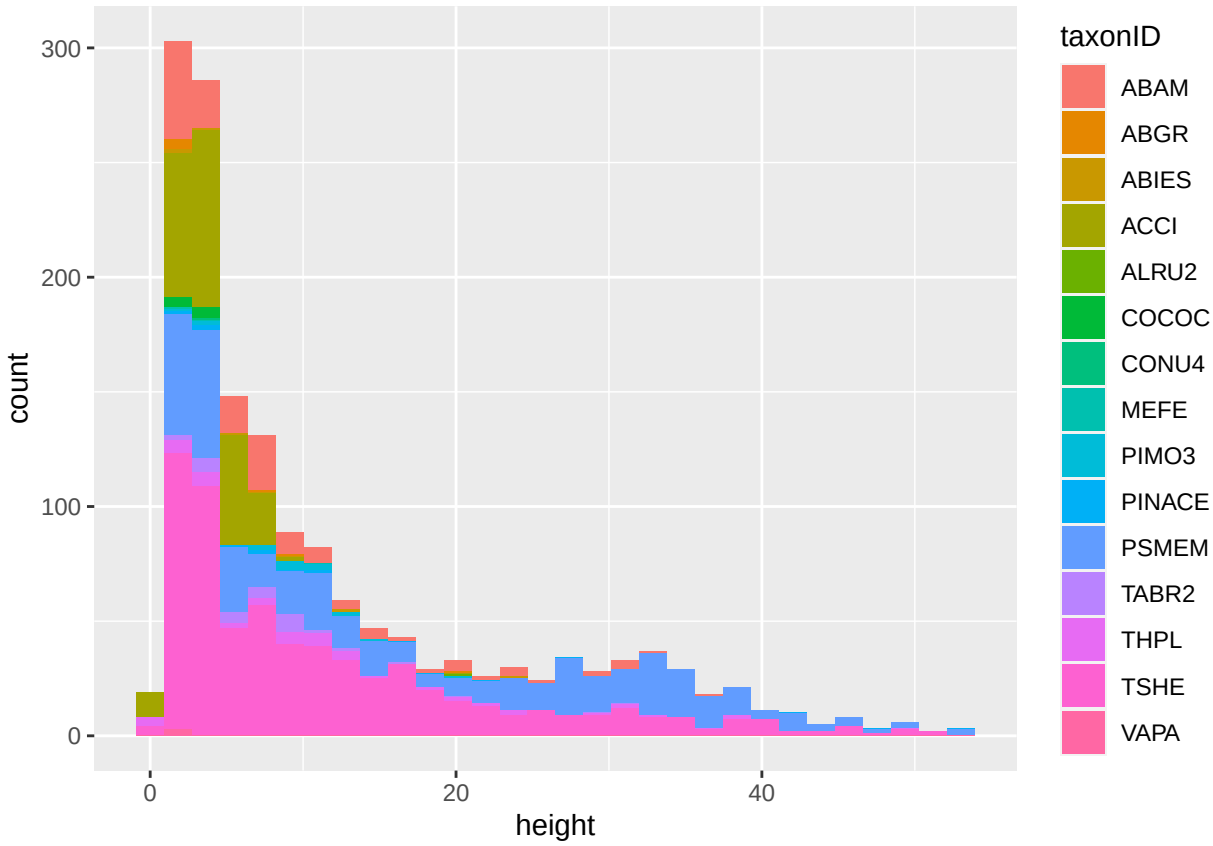
First, I'll just make a general histogram:

```
#I'll remove NA values because they will mess up my model later in this code and give me a bunch of war

veg=veg%>%
  filter(!is.na(stemDiameter))%>%
  filter(!is.na(height))

ggplot(veg, aes(x=height)) +
  geom_histogram()
```



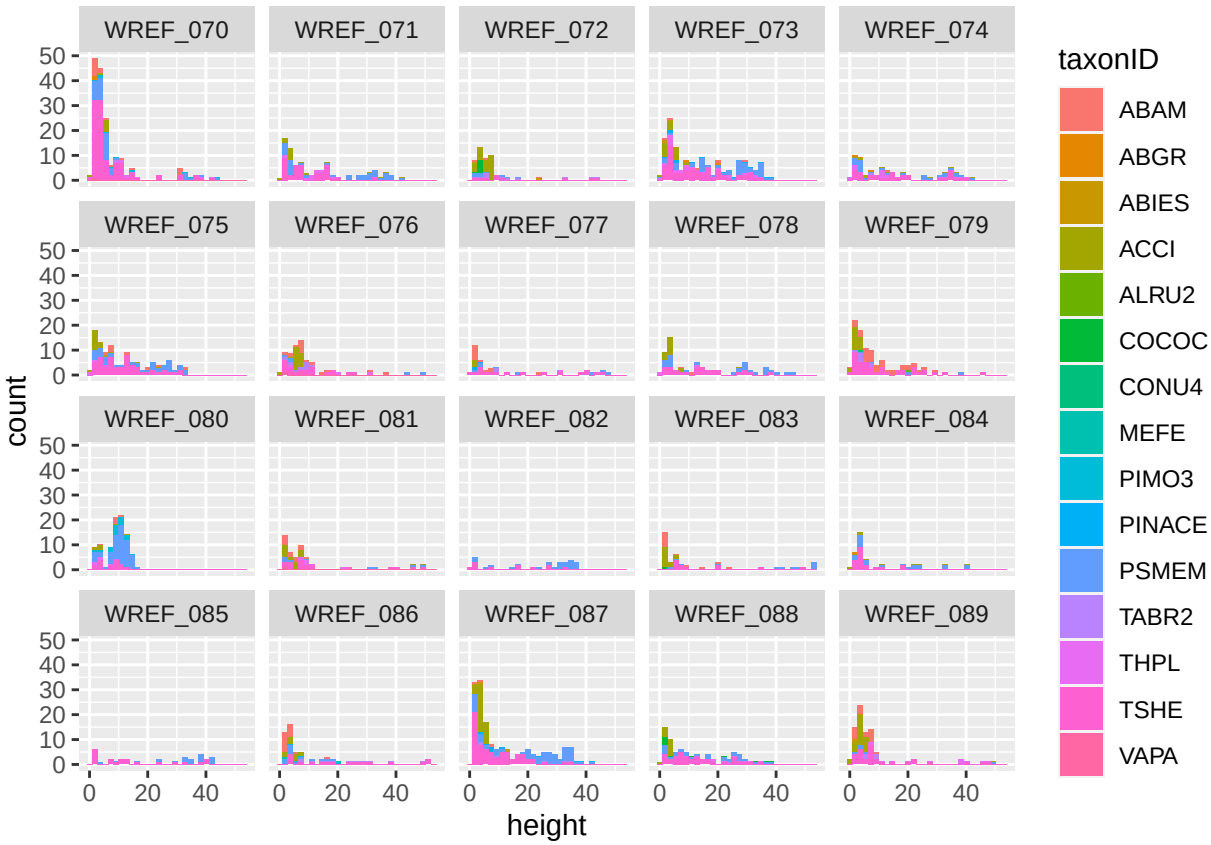
Now I'll add color as a function of species:

```
ggplot(veg, aes(x=height, fill=taxonID)) +
  geom_histogram()
```



And now I will facet_wrap as a function of plotID:

```
ggplot(veg, aes(x=height, fill=taxonID)) +
  geom_histogram()+
  facet_wrap(~ plotID)
```



4. Use `dplyr` to remove dead trees:

First I've looked at the data and metadata. I'm going to figure out all the `unique` values of `plantStatus` at this site:

```
unique(veg$plantStatus)
```

```
## [1] "Dead, broken bole"        "Live"
## [3] "Live, physically damaged" "Standing dead"
## [5] "Live, broken bole"        "Live, disease damaged"
## [7] "Live,  other damage"      "Live, insect damaged"
```

Given that check, it looks like I need to filter for "Dead, broken bole" and "Standing dead":

```
vegLIVE=veg%>%
filter(plantStatus != c("Standing dead","Dead, broken bole"))
```

```
## Warning in plantStatus != c("Standing dead", "Dead, broken bole"): longer object
## length is not a multiple of shorter object length
```

Now a couple of important and quick 'common sense' checks to make sure I really did filter out the dead trees:

First I'll just check how many rows I removed using the base function `nrow` (number of rows)

```
nrow(veg)-nrow(vegLIVE)
```

```
## [1] 145
```

Okay! I removed >100 observations, but I'm getting an error message. Let's just check what all the `plantStatus` values look like now:

```
unique(vegLIVE$plantStatus)
```

```
## [1] "Dead, broken bole"        "Live"
## [3] "Live, physically damaged" "Live, broken bole"
## [5] "Standing dead"            "Live, disease damaged"
## [7] "Live,  other damage"      "Live, insect damaged"
```

Oh no! I still have dead trees! This is *exactly* why we always check.

From here we have a couple of options for filtering. I'll use a `string compare` function from `tidyverse`. Also, I find `dplyr::filter` to be problematic when searching for multiple things at the same time, so I've broken those filters up for readability/ease:

```
library(tidyverse)
vegLIVE=vegLIVE %>%
  filter(!str_detect(plantStatus, 'Standing dead'))%>%
  filter(!str_detect(plantStatus, 'Dead, broken bole'))
```

Let's do another common sense check:

```
unique(vegLIVE$plantStatus)
```

```
## [1] "Live"                     "Live, physically damaged"
## [3] "Live, broken bole"        "Live, disease damaged"
## [5] "Live,  other damage"      "Live, insect damaged"
```

No dead trees, success!

To make things a little easier from here on out I'll just plot the top 3 species

```
vegTop3=vegLIVE%>%
  count(vegLIVE$taxonID) %>%
  top_n(3)
```

```
## Selecting by n
```

```
summary(vegTop3)
```

```
##  vegLIVE$taxonID          n
##  Length:3           Min.   :202.0
##  Class :character   1st Qu.:244.0
##  Mode  :character   Median :286.0
##                     Mean   :356.7
##                     3rd Qu.:434.0
##                     Max.   :582.0
```

Now I'll filter my main data.frame based on this top 3 data.frame:

```
vegLIVEtop3=vegLIVE%>%
  filter(is.element(vegLIVE$taxonID, vegTop3$`vegLIVE$taxonID`))
```

5. Create a simple linear model that uses DBH and height to predict allometries. Print the summary information of your model:

```
mdl=lm(height ~ stemDiameter * taxonID, data=vegLIVEtop3)
print(mdl)
```

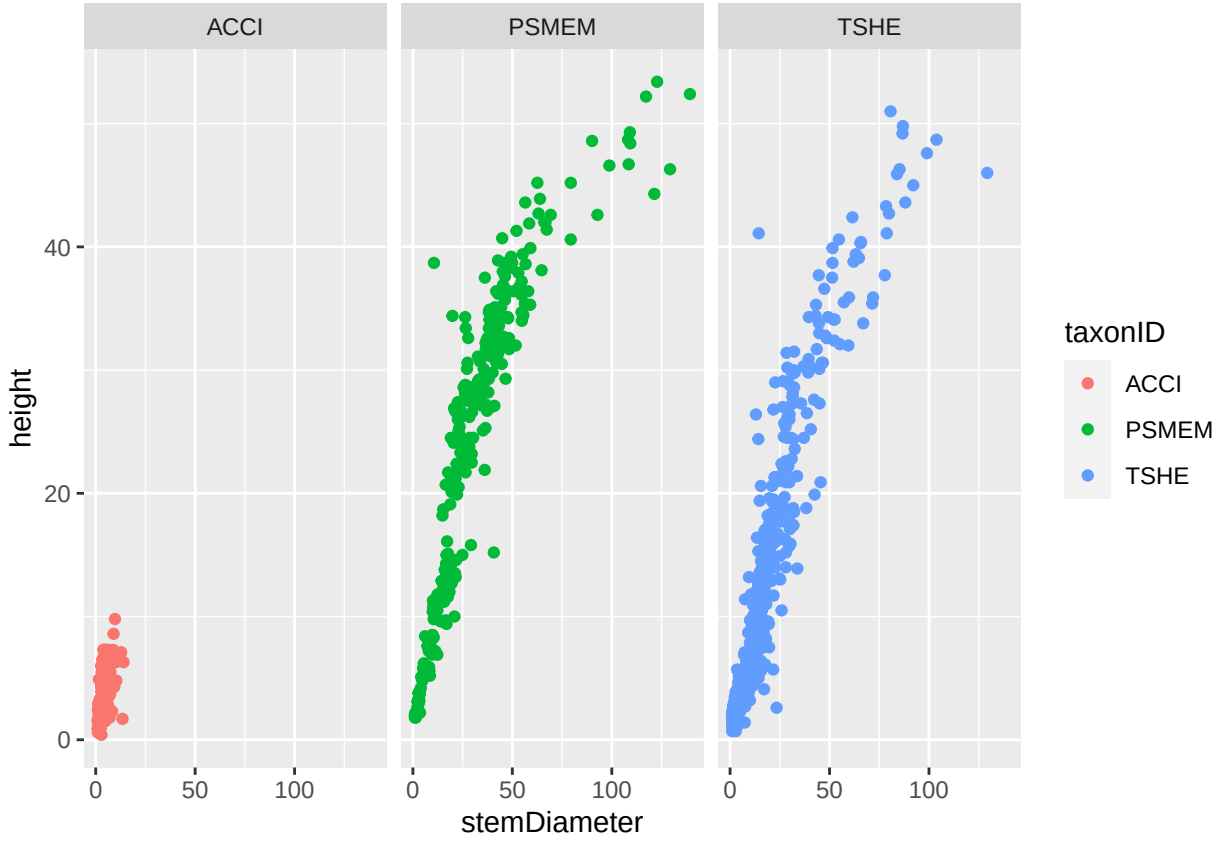
```
##
## Call:
## lm(formula = height ~ stemDiameter * taxonID, data = vegLIVEtop3)
##
```

```
## Coefficients:
##                (Intercept)               stemDiameter
##                    1.91986                    0.44364
##              taxonIDPSMEM                taxonIDTSHE
##                    7.68473                    0.32365
## stemDiameter:taxonIDPSMEM   stemDiameter:taxonIDTSHE
##                    0.01772                    0.12846
```

Now I'll tack on my model predictions to my data.frame:

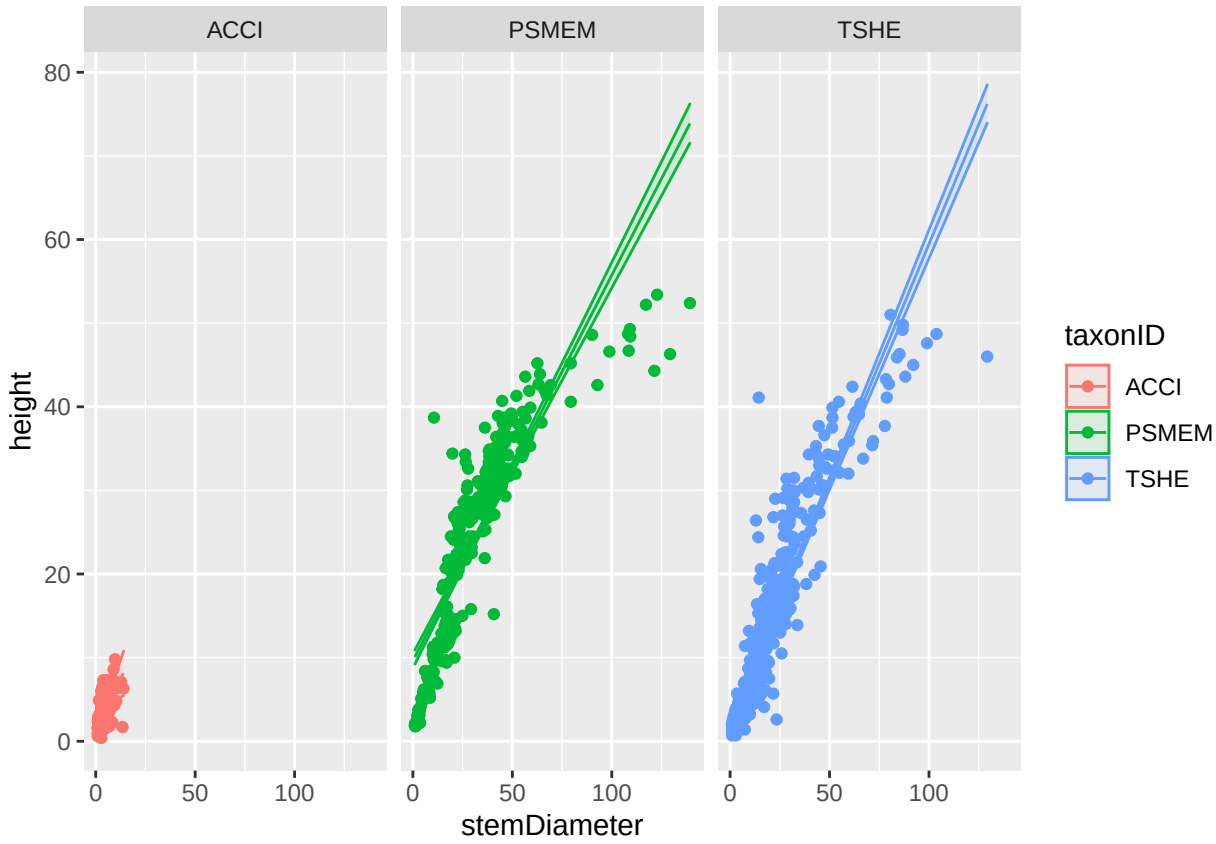
Let's take a look. First let's plot our NEON data:

```
ggplot(data=vegLIVEtop3, aes(x=stemDiameter, y=height, color=taxonID)) +
  geom_point()+
  facet_wrap(~ taxonID)
```



Now let's plot our model:

```
ggplot(data=vegLIVEtop3, aes(x=stemDiameter, y=height, color=taxonID)) +
  geom_point() +
  geom_line( aes(y=fit) ) +
  geom_ribbon( aes( ymin=lwr, ymax=upr, fill=taxonID), alpha=.1 )+
  facet_wrap(~ taxonID)# alpha is the ribbon transparency
```



What do you think about our simple linear model? To me it looks like we're failing to constrain the fact that trees have a height limit. I guess gravity isn't just a 'theory'. In this case I would certainy look at non-linear methods such as splines or a GAM, but we'll apply those methods later in this course.

7. Answer the following questions:

- How many `unique` species are present at `WREF`?

```
print(length(unique(veg$taxonID)))
```

```
## [1] 15
```

- What are the `top_5` trees based on height?

```
vegTop5_height=veg%>%
  slice_max(height, n=5)
head(vegTop5_height)
```

```
##              individualID         namedLocation domainID siteID   plotID
## 1 NEON.PLA.D16.WREF.04807 WREF_083.basePlot.vst      D16   WREF WREF_083
## 2 NEON.PLA.D16.WREF.04803 WREF_083.basePlot.vst      D16   WREF WREF_083
## 3 NEON.PLA.D16.WREF.04934 WREF_083.basePlot.vst      D16   WREF WREF_083
## 4 NEON.PLA.D16.WREF.04159 WREF_086.basePlot.vst      D16   WREF WREF_086
## 5 NEON.PLA.D16.WREF.04148 WREF_086.basePlot.vst      D16   WREF WREF_086
##                                 uid.x     date.x      eventID.x subplotID.x
## 1 04151931-5979-4e33-8c10-d1b6b6ddb745 2017-10-18 vst_WREF_2017        <NA>
## 2 3da7c3bc-aead-4c2a-9838-7eb1c83ddbd4 2017-10-18 vst_WREF_2017        <NA>
## 3 b79e1d0d-4eea-43c3-8a2a-3f5cf12e3601 2017-10-18 vst_WREF_2017        <NA>
## 4 fa7f9079-5489-4453-9ad3-be96aea28c30 2017-10-20 vst_WREF_2017        <NA>
## 5 cb48c34a-c4bd-4bb8-8a41-f4a04b240f32 2017-10-20 vst_WREF_2017        <NA>
```

```
##   tempStemID tagStatus       growthForm   plantStatus stemDiameter
## 1       <NA>        ok single bole tree          Live        122.8
## 2       <NA>        ok single bole tree          Live        139.3
## 3       <NA>        ok single bole tree          Live        117.2
## 4       <NA>        ok single bole tree          Live         80.7
## 5       <NA>        ok single bole tree Standing dead         83.0
##   measurementHeight height baseCrownHeight breakHeight breakDiameter
## 1               130   53.4              NA          NA            NA
## 2               130   52.4              NA          NA            NA
## 3               130   52.2              NA          NA            NA
## 4               130   51.0              NA          NA            NA
## 5               180   50.8              NA          NA            NA
##   maxCrownDiameter ninetyCrownDiameter canopyPosition shape basalStemDiameter
## 1               NA                  NA           <NA>  <NA>                NA
## 2               NA                  NA           <NA>  <NA>                NA
## 3               NA                  NA           <NA>  <NA>                NA
## 4               NA                  NA           <NA>  <NA>                NA
## 5               NA                  NA           <NA>  <NA>                NA
##   basalStemDiameterMsrmntHeight maxBaseCrownDiameter ninetyBaseCrownDiameter
## 1                            NA                   NA                      NA
## 2                            NA                   NA                      NA
## 3                            NA                   NA                      NA
## 4                            NA                   NA                      NA
## 5                            NA                   NA                      NA
##   dendrometerInstallationDate initialGapMeasurementDate initialBandStemDiameter
## 1                          NA                        NA                     NA
## 2                          NA                        NA                     NA
## 3                          NA                        NA                     NA
## 4                          NA                        NA                     NA
## 5                          NA                        NA                     NA
##   initialDendrometerGap dendrometerHeight dendrometerGap dendrometerCondition
## 1                    NA                NA             NA                 <NA>
## 2                    NA                NA             NA                 <NA>
## 3                    NA                NA             NA                 <NA>
## 4                    NA                NA             NA                 <NA>
## 5                    NA                NA             NA                 <NA>
##   bandStemDiameter                 remarks.x                    recordedBy.x
## 1               NA                      <NA>     dweller@battelleecology.org
## 2               NA                      <NA>     dweller@battelleecology.org
## 3               NA                      <NA> jhausknecht@battelleecology.org
## 4               NA           Dwarf mistletoe    ccordell@battelleecology.org
## 5               NA Dbh blocked byfallen tree    ccordell@battelleecology.org
##                    measuredBy.x   dataQF.x publicationDate.x
## 1  vschmitt@battelleecology.org legacyData  20200817T130556Z
## 2  vschmitt@battelleecology.org legacyData  20200817T130556Z
## 3 Kchilders@battelleecology.org legacyData  20200817T130556Z
## 4    Eolsen@battelleecology.org legacyData  20200817T130556Z
## 5    Eolsen@battelleecology.org legacyData  20200817T130556Z
##                                  uid.y     date.y     eventID.y subplotID.y
## 1 4529d5b1-6a8b-4e94-b471-4cc8ba72c067 2017-10-18 vst_WREF_2017          21
## 2 8e9eb50f-44bf-4b99-833a-09cf9c4022ff 2017-10-18 vst_WREF_2017          21
## 3 f6db7136-9b6e-49d6-8271-93961979574f 2017-10-18 vst_WREF_2017          23
## 4 86ea41d6-b74e-43fe-a675-11d269235956 2017-10-23 vst_WREF_2017          21
## 5 efc3dbad-9f54-4052-8b79-abd5f0dec396 2017-10-23 vst_WREF_2017          21
```

```
##   nestedSubplotID pointID stemDistance stemAzimuth recordType
## 1               4      41          4.0       248.5       <NA>
## 2            <NA>      39          2.3       102.0       <NA>
## 3               2      25          7.3       313.3       <NA>
## 4               1      23         11.5       299.6       <NA>
## 5               4      41         10.5       223.1       <NA>
##   supportingStemIndividualID previouslyTaggedAs samplingProtocolVersion taxonID
## 1                       <NA>              <NA>       NEON.DOC.000987vG   PSMEM
## 2                       <NA>              <NA>       NEON.DOC.000987vG   PSMEM
## 3                       <NA>              <NA>       NEON.DOC.000987vG   PSMEM
## 4                       <NA>              <NA>       NEON.DOC.000987vG    TSHE
## 5                       <NA>              <NA>       NEON.DOC.000987vG    TSHE
##                                    scientificName taxonRank
## 1 Pseudotsuga menziesii (Mirb.) Franco var. menziesii   variety
## 2 Pseudotsuga menziesii (Mirb.) Franco var. menziesii   variety
## 3 Pseudotsuga menziesii (Mirb.) Franco var. menziesii   variety
## 4                     Tsuga heterophylla (Raf.) Sarg.   species
## 5                     Tsuga heterophylla (Raf.) Sarg.   species
##   identificationReferences morphospeciesID morphospeciesIDRemarks
## 1                     <NA>            <NA>                   <NA>
## 2                     <NA>            <NA>                   <NA>
## 3                     <NA>            <NA>                   <NA>
## 4                     <NA>            <NA>                   <NA>
## 5                     <NA>            <NA>                   <NA>
##   identificationQualifier remarks.y                  measuredBy.y
## 1                    <NA>      <NA>    Eolsen@battelleecology.org
## 2                    <NA>      <NA>    Eolsen@battelleecology.org
## 3                    <NA>      <NA> Kchilders@battelleecology.org
## 4                    <NA>      <NA>    Eolsen@battelleecology.org
## 5                    <NA>      <NA>    Eolsen@battelleecology.org
##                      recordedBy.y dataQF.y publicationDate.y utmZone
## 1    vschmitt@battelleecology.org     <NA>  20200817T124831Z     10N
## 2    vschmitt@battelleecology.org     <NA>  20200817T124831Z     10N
## 3 jhausknecht@battelleecology.org     <NA>  20200817T124831Z     10N
## 4   Kchilders@battelleecology.org     <NA>  20200817T124831Z     10N
## 5   Kchilders@battelleecology.org     <NA>  20200817T124831Z     10N
##   adjNorthing adjEasting adjCoordinateUncertainty adjDecimalLatitude
## 1     5074889   580560.2                     0.83           45.82286
## 2     5074888   580545.8                     0.82           45.82285
## 3     5074876   580579.4                     0.82           45.82274
## 4     5074818   581000.5                     0.83           45.82217
## 5     5074823   581003.9                     0.83           45.82221
##   adjDecimalLongitude adjElevation adjElevationUncertainty
## 1           -121.9629       396.87                    1.35
## 2           -121.9631       399.79                    1.26
## 3           -121.9627       401.64                    1.32
## 4           -121.9573       378.39                    1.35
## 5           -121.9572       374.47                    1.26
```

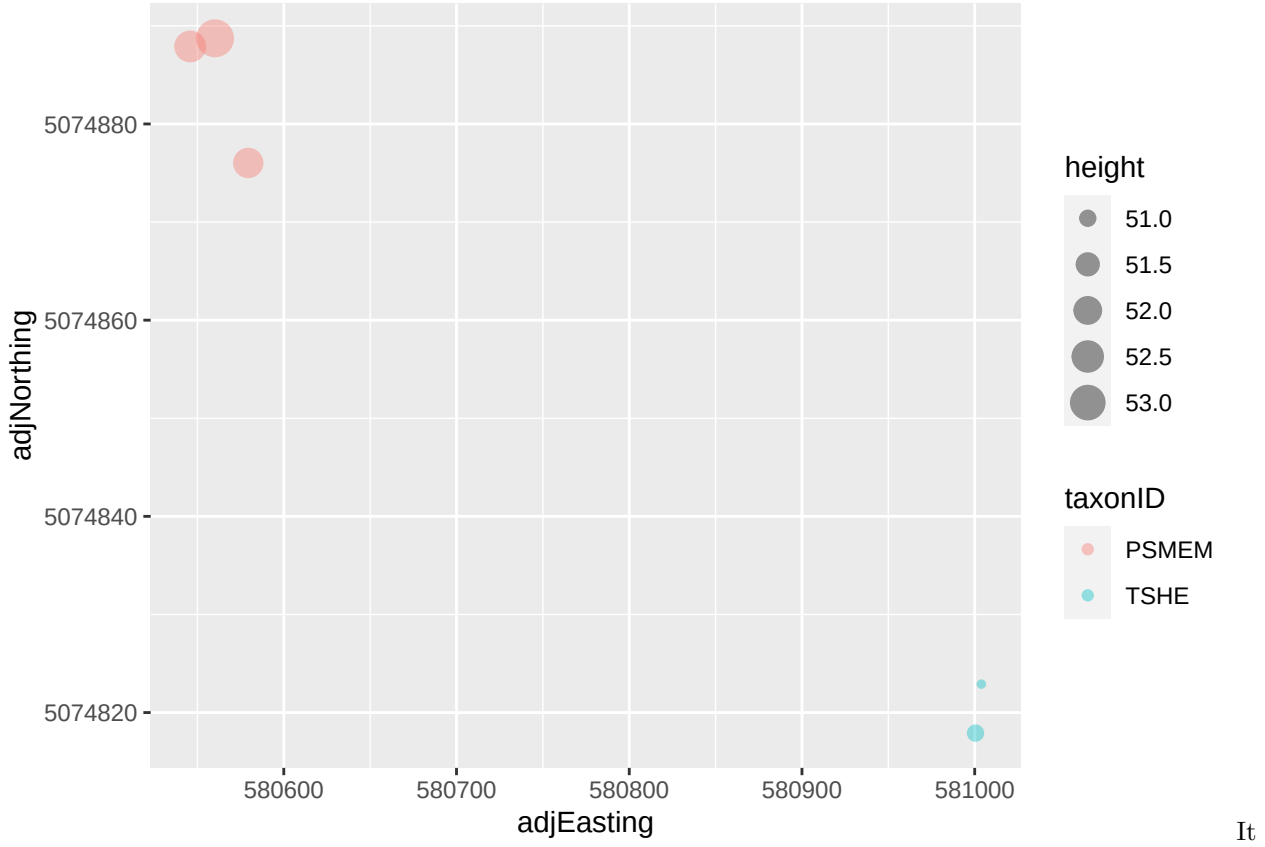
```
vegTop5_height%>%
  select(plotID, plantStatus, taxonID, scientificName, adjNorthing, adjEasting, height)
```

```
##     plotID   plantStatus taxonID
## 1 WREF_083          Live   PSMEM
## 2 WREF_083          Live   PSMEM
```

```
## 3 WREF_083          Live   PSMEM
## 4 WREF_086          Live    TSHE
## 5 WREF_086 Standing dead    TSHE
##                                       scientificName adjNorthing adjEasting
## 1 Pseudotsuga menziesii (Mirb.) Franco var. menziesii     5074889   580560.2
## 2 Pseudotsuga menziesii (Mirb.) Franco var. menziesii     5074888   580545.8
## 3 Pseudotsuga menziesii (Mirb.) Franco var. menziesii     5074876   580579.4
## 4                     Tsuga heterophylla (Raf.) Sarg.     5074818   581000.5
## 5                     Tsuga heterophylla (Raf.) Sarg.     5074823   581003.9
##   height
## 1   53.4
## 2   52.4
## 3   52.2
## 4   51.0
## 5   50.8
```

Cool. My native state tree, the Douglas Fir, dominates the height record (Go Oregon!). I wonder if these trees are all together in an old growth stand, or if they're distributed throughout the area?

```
ggplot(vegTop5_height, aes(x=adjEasting, y=adjNorthing, color=taxonID, size=height)) +
  geom_point(alpha=.4 )
```



It looks to me like we have a small old growth patch of Douglas Fir. That would be super fun to study.

- Diameter?

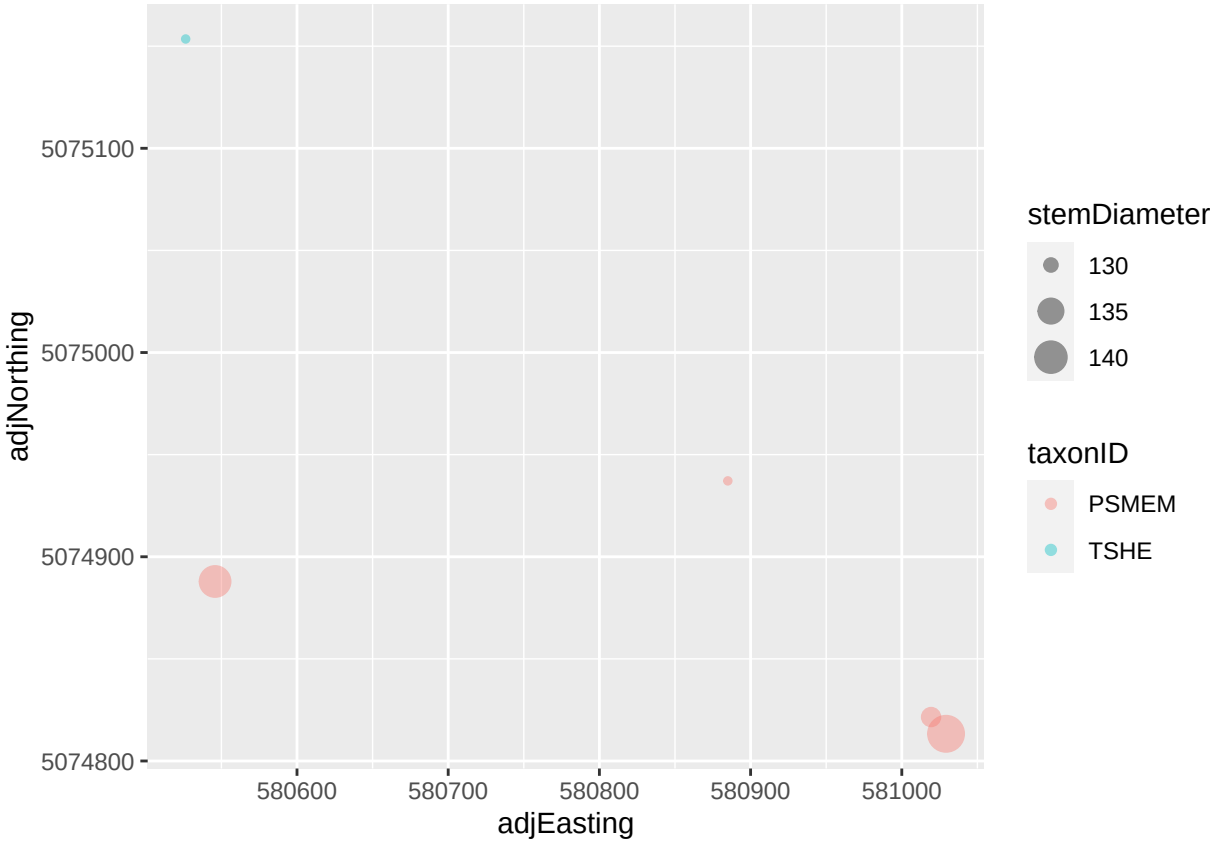
```
vegTop5_diameter=veg%>%
  slice_max(stemDiameter, n=5)
head(vegTop5_diameter)
```

```
##              individualID         namedLocation domainID siteID   plotID
## 1 NEON.PLA.D16.WREF.04360 WREF_086.basePlot.vst      D16   WREF WREF_086
## 2 NEON.PLA.D16.WREF.04803 WREF_083.basePlot.vst      D16   WREF WREF_083
## 3 NEON.PLA.D16.WREF.04747 WREF_086.basePlot.vst      D16   WREF WREF_086
## 4 NEON.PLA.D16.WREF.02139 WREF_079.basePlot.vst      D16   WREF WREF_079
## 5 NEON.PLA.D16.WREF.04509 WREF_077.basePlot.vst      D16   WREF WREF_077
##                                uid.x     date.x     eventID.x subplotID.x
## 1 5bc4101d-24c8-491e-8e97-4aa456b235ee 2017-10-20 vst_WREF_2017        <NA>
## 2 3da7c3bc-aead-4c2a-9838-7eb1c83ddbd4 2017-10-18 vst_WREF_2017        <NA>
## 3 da1661cf-d9b8-41b6-a887-8afb76be159e 2017-10-20 vst_WREF_2017        <NA>
## 4 fcf2924f-94c3-446f-8b0d-07b45fb52d55 2017-10-26 vst_WREF_2017        <NA>
## 5 72704d5e-e0cd-4fab-b683-d6eb26a52cc6 2017-10-18 vst_WREF_2017        <NA>
##   tempStemID tagStatus       growthForm           plantStatus stemDiameter
## 1       <NA>        ok single bole tree     Dead, broken bole        144.2
## 2       <NA>        ok single bole tree                  Live        139.3
## 3       <NA>        ok single bole tree     Dead, broken bole        131.5
## 4       <NA>        ok single bole tree Live, disease damaged        129.3
## 5       <NA>        ok single bole tree                  Live        129.3
##   measurementHeight height baseCrownHeight breakHeight breakDiameter
## 1               130   19.1              NA          NA            NA
## 2               130   52.4              NA          NA            NA
## 3               130    3.9              NA          NA            NA
## 4               130   46.0              NA          NA            NA
## 5               130   46.3              NA          NA            NA
##   maxCrownDiameter ninetyCrownDiameter canopyPosition shape basalStemDiameter
## 1               NA                  NA           <NA>  <NA>               NA
## 2               NA                  NA           <NA>  <NA>               NA
## 3               NA                  NA           <NA>  <NA>               NA
## 4               NA                  NA           <NA>  <NA>               NA
## 5               NA                  NA           <NA>  <NA>               NA
##   basalStemDiameterMsrmntHeight maxBaseCrownDiameter ninetyBaseCrownDiameter
## 1                            NA                   NA                      NA
## 2                            NA                   NA                      NA
## 3                            NA                   NA                      NA
## 4                            NA                   NA                      NA
## 5                            NA                   NA                      NA
##   dendrometerInstallationDate initialGapMeasurementDate initialBandStemDiameter
## 1                          NA                         NA                     NA
## 2                          NA                         NA                     NA
## 3                          NA                         NA                     NA
## 4                          NA                         NA                     NA
## 5                          NA                         NA                     NA
##   initialDendrometerGap dendrometerHeight dendrometerGap dendrometerCondition
## 1                    NA                NA              NA                 <NA>
## 2                    NA                NA              NA                 <NA>
## 3                    NA                NA              NA                 <NA>
## 4                    NA                NA              NA                 <NA>
## 5                    NA                NA              NA                 <NA>
##   bandStemDiameter                          remarks.x
## 1               NA                Broken main bole
## 2               NA                            <NA>
## 3               NA                            <NA>
## 4               NA Heavily infested with Dwarf mistletoe
## 5               NA                            <NA>
```

```
##                       recordedBy.x                 measuredBy.x   dataQF.x
## 1 jhausknecht@battelleecology.org   Eolsen@battelleecology.org legacyData
## 2     dweller@battelleecology.org vschmitt@battelleecology.org legacyData
## 3 jhausknecht@battelleecology.org   Eolsen@battelleecology.org legacyData
## 4   Kchilders@battelleecology.org   kwells@battelleecology.org legacyData
## 5     dweller@battelleecology.org   Eolsen@battelleecology.org legacyData
##   publicationDate.x                                uid.y     date.y
## 1  20200817T130556Z 68f2c91b-0bfc-4497-8270-ebb6e8d7db26 2017-10-20
## 2  20200817T130556Z 8e9eb50f-44bf-4b99-833a-09cf9c4022ff 2017-10-18
## 3  20200817T130556Z ea25b600-0492-4237-908b-c32d2f9c05c8 2017-10-23
## 4  20200817T130556Z 460a43cf-3ddb-449a-b540-bb98cff80fd1 2017-10-26
## 5  20200817T130556Z 41992938-8784-4d23-8b7d-ac701db9a358 2017-10-19
##       eventID.y subplotID.y nestedSubplotID pointID stemDistance stemAzimuth
## 1 vst_WREF_2017          23               2      41         25.1       133.4
## 2 vst_WREF_2017          21            <NA>      39          2.3       102.0
## 3 vst_WREF_2017          23            <NA>      41         12.3       137.3
## 4 vst_WREF_2017          21               4      41          7.7       197.5
## 5 vst_WREF_2017          39            <NA>      41         14.7       343.0
##   recordType supportingStemIndividualID previouslyTaggedAs
## 1       <NA>                       <NA>               <NA>
## 2       <NA>                       <NA>               <NA>
## 3       <NA>                       <NA>               <NA>
## 4       <NA>                       <NA>               <NA>
## 5       <NA>                       <NA>               <NA>
##   samplingProtocolVersion taxonID
## 1       NEON.DOC.000987vG   PSMEM
## 2       NEON.DOC.000987vG   PSMEM
## 3       NEON.DOC.000987vG   PSMEM
## 4       NEON.DOC.000987vG    TSHE
## 5       NEON.DOC.000987vG   PSMEM
##                                     scientificName taxonRank
## 1 Pseudotsuga menziesii (Mirb.) Franco var. menziesii   variety
## 2 Pseudotsuga menziesii (Mirb.) Franco var. menziesii   variety
## 3 Pseudotsuga menziesii (Mirb.) Franco var. menziesii   variety
## 4                    Tsuga heterophylla (Raf.) Sarg.   species
## 5 Pseudotsuga menziesii (Mirb.) Franco var. menziesii   variety
##   identificationReferences morphospeciesID morphospeciesIDRemarks
## 1                     <NA>            <NA>                   <NA>
## 2                     <NA>            <NA>                   <NA>
## 3                     <NA>            <NA>                   <NA>
## 4                     <NA>            <NA>                   <NA>
## 5                     <NA>            <NA>                   <NA>
##   identificationQualifier remarks.y                measuredBy.y
## 1                    <NA>      <NA>   Eolsen@battelleecology.org
## 2                    <NA>      <NA>   Eolsen@battelleecology.org
## 3                    <NA>      <NA> ccordell@battelleecology.org
## 4                    <NA>      <NA>   kwells@battelleecology.org
## 5                    <NA>      <NA>   Eolsen@battelleecology.org
##                       recordedBy.y dataQF.y publicationDate.y utmZone
## 1 jhausknecht@battelleecology.org     <NA>  20200817T124831Z     10N
## 2    vschmitt@battelleecology.org     <NA>  20200817T124831Z     10N
## 3     dweller@battelleecology.org     <NA>  20200817T124831Z     10N
## 4   Kchilders@battelleecology.org     <NA>  20200817T124831Z     10N
## 5     dweller@battelleecology.org     <NA>  20200817T124831Z     10N
```

```
##   adjNorthing adjEasting adjCoordinateUncertainty adjDecimalLatitude
## 1     5074813   581029.3                     0.83           45.82212
## 2     5074888   580545.8                     0.82           45.82285
## 3     5074822   581019.4                     0.83           45.82220
## 4     5075154   580526.4                     0.77           45.82524
## 5     5074937   580884.9                     0.80           45.82325
##   adjDecimalLongitude adjElevation adjElevationUncertainty
## 1           -121.9569       374.47                    1.26
## 2           -121.9631       399.79                    1.26
## 3           -121.9570       374.47                    1.26
## 4           -121.9633        390.5                    1.16
## 5           -121.9587       379.83                    1.28
```

```
ggplot(vegTop5_diameter, aes(x=adjEasting, y=adjNorthing, color=taxonID, size=stemDiameter)) +
  geom_point(alpha=.4 )
```



Interesting. Also mostly Douglas Firs, but (mostly) not the ones who are the tallest. I bet that's *part* why our linear model failed (but we had removed the dead trees).

- What proportion of sampled trees are dead?

```
1-nrow(vegLIVE)/nrow(veg)
```

```
## [1] 0.183469
```

Or ~18%

We can also make a table to see what percentage of each plantStatus class are shown in our data

```
veg %>% group_by(plantStatus) %>% count() %>% mutate(pct=round(100*n/nrow(veg), 2))
```

```
## # A tibble: 8 x 3
## # Groups:   plantStatus [8]
##   plantStatus                 n   pct
##   <chr>                   <int> <dbl>
## 1 Dead, broken bole         179 11.2
## 2 Live                     1089 68.2
## 3 Live,  other damage         6  0.38
## 4 Live, broken bole          64  4.01
## 5 Live, disease damaged      37  2.32
## 6 Live, insect damaged        5  0.31
## 7 Live, physically damaged  103  6.45
## 8 Standing dead             114  7.14
```