Univariate Modeling

```
TreeData<- read.csv("https://raw.githubusercontent.com/dmcglinn/quant_methods/gh-pages/data/tree
data.csv", header = T)
```

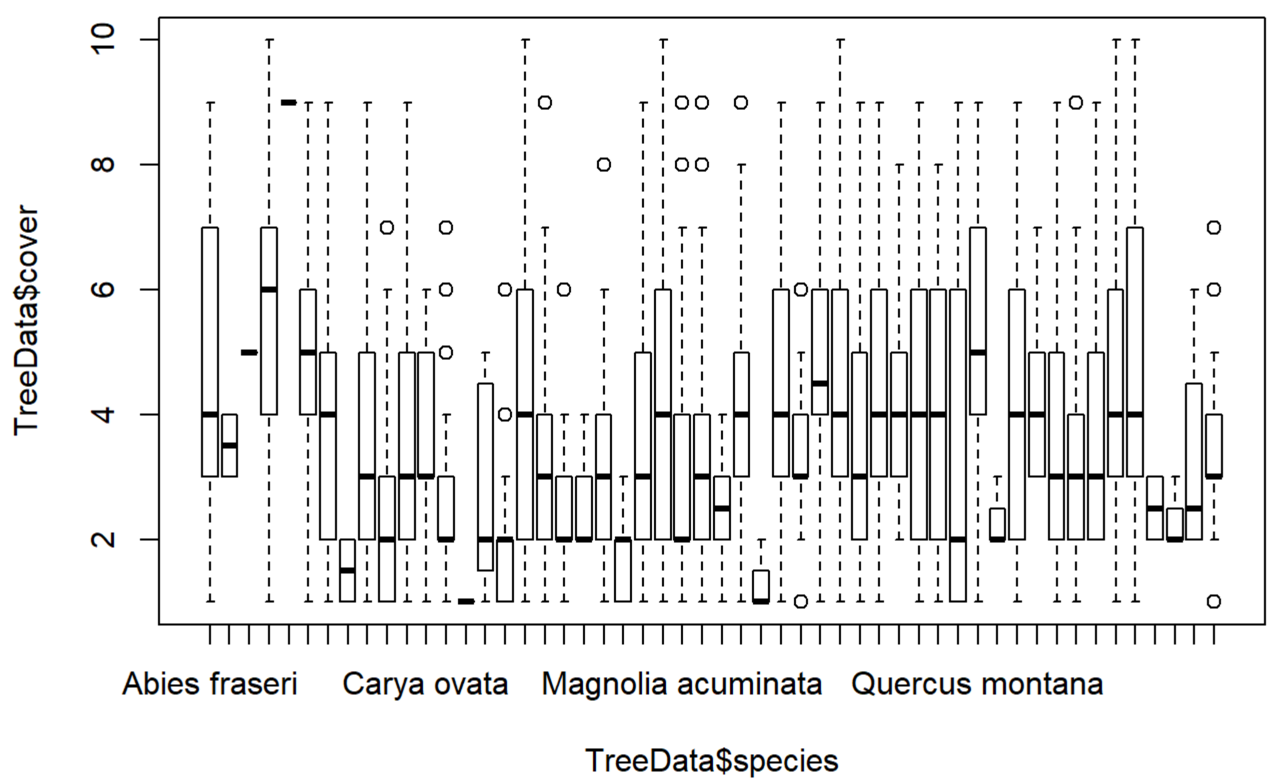
```
library("car")
```

```
## Warning: package 'car' was built under R version 3.5.2
```

```
## Loading required package: carData
```

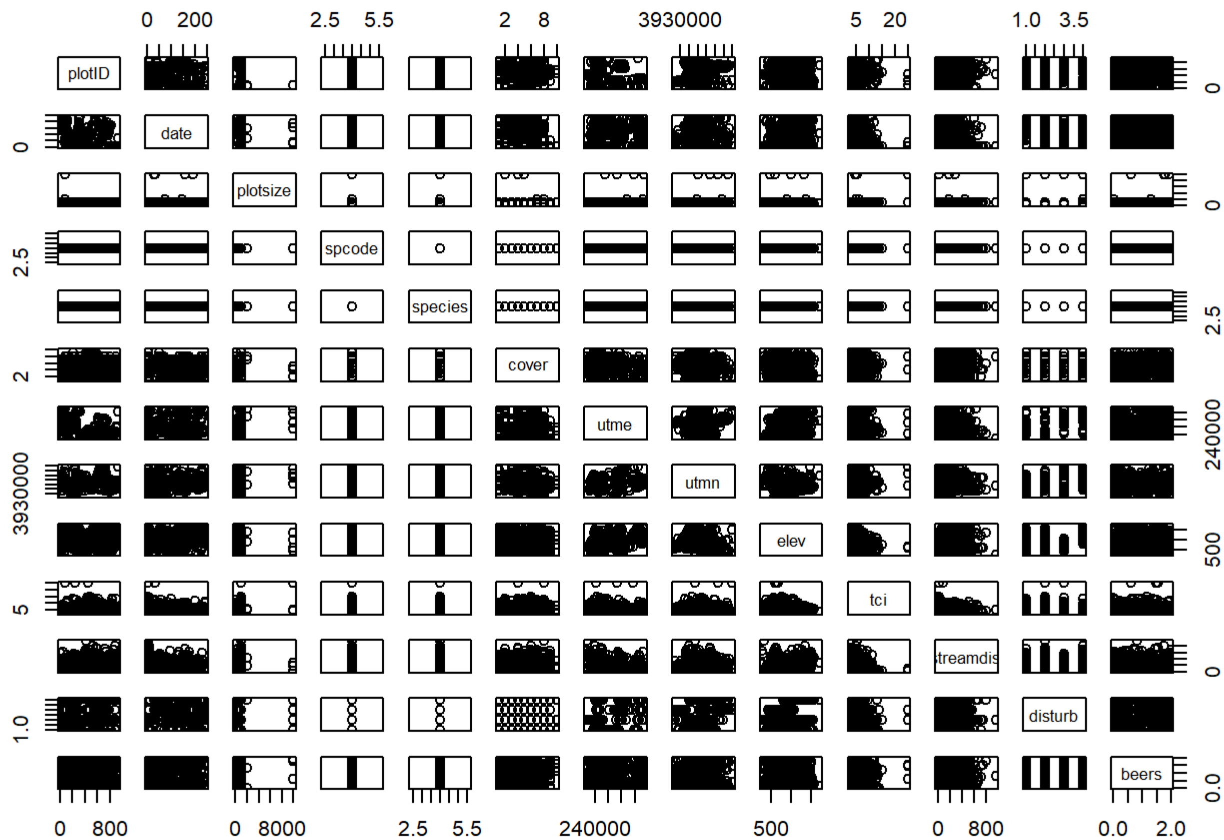
```
## Warning: package 'carData' was built under R version 3.5.2
```

```
plot(TreeData$cover~TreeData$species)
```

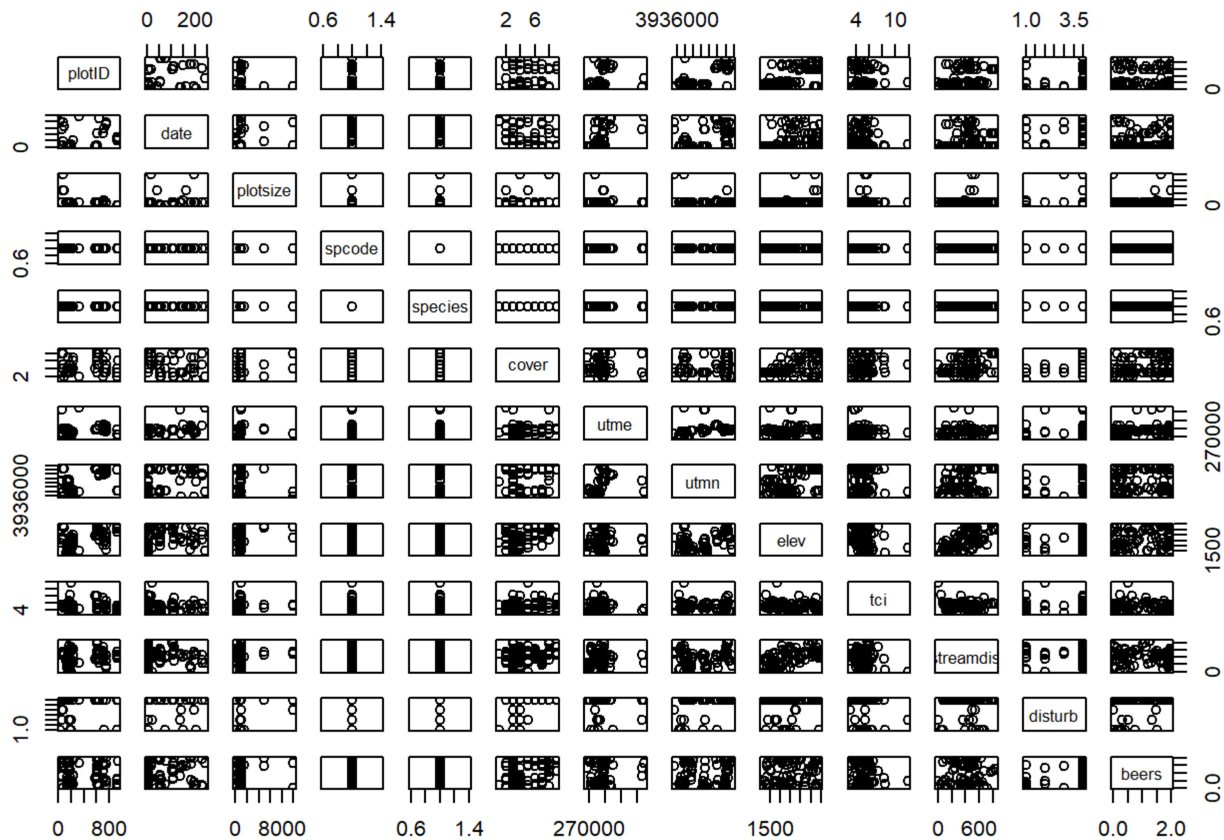



```
Acer<-TreeData[TreeData$spcode=="ACERRUB",]
Abies<-TreeData[TreeData$spcode=="ABIEFRA",]
```

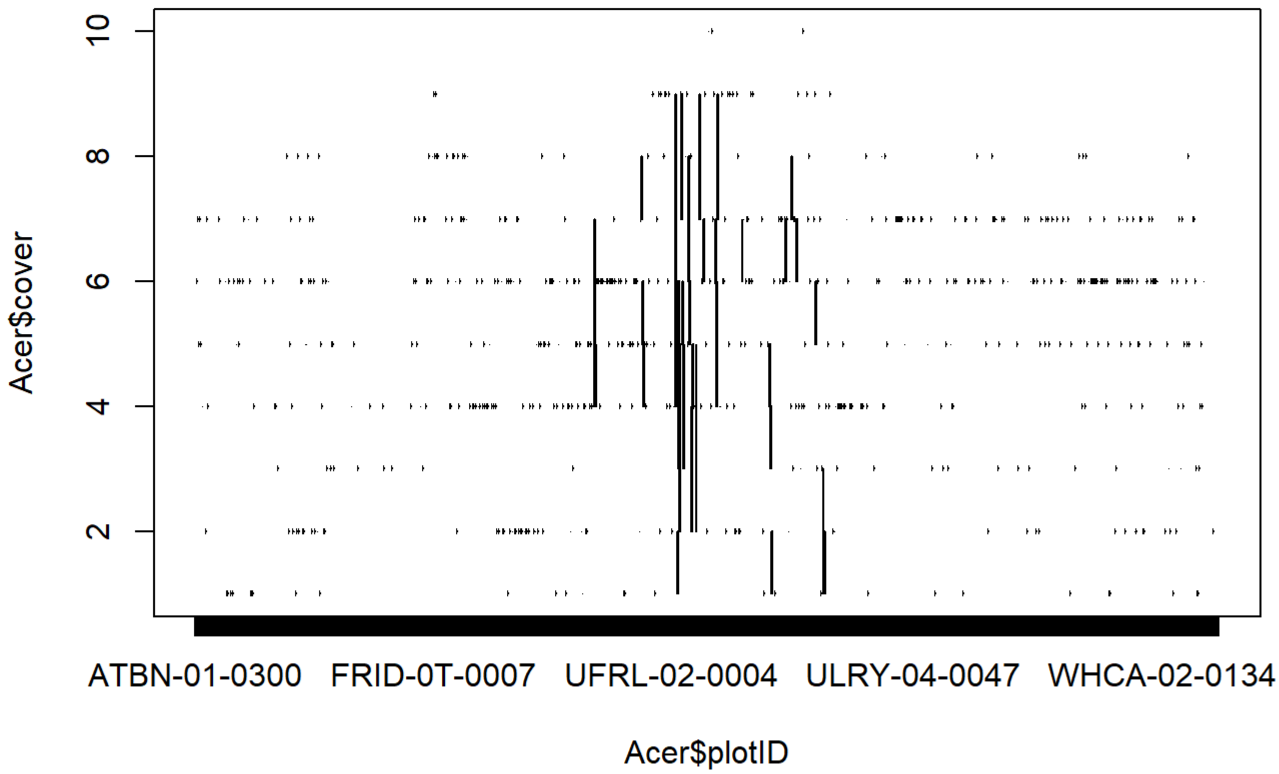
```
pairs(Acer)
```


plotID
date
plotsize
spcode
species
cover
utme
utmn
elev
tci
streamdis
disturb
beers
0
200
2.5
5.5
2
8
3930000
5
20
1.0
3.5
800
8000
240000
500
0.0
2.0

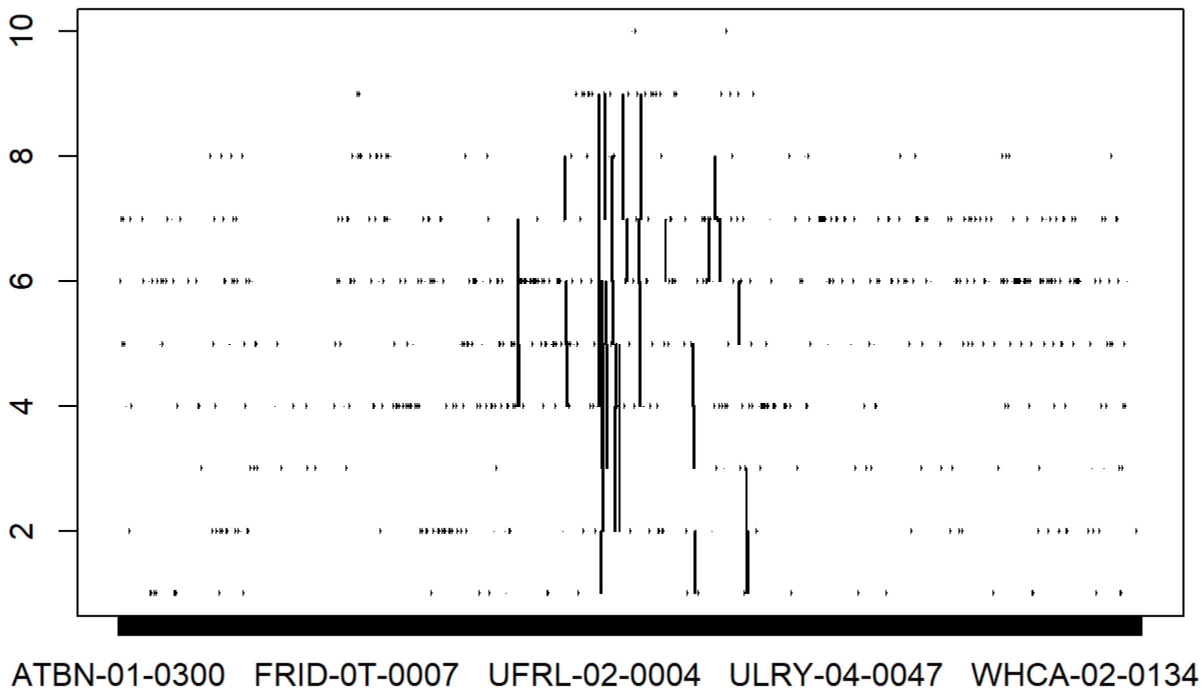
```
pairs(Abies)
```



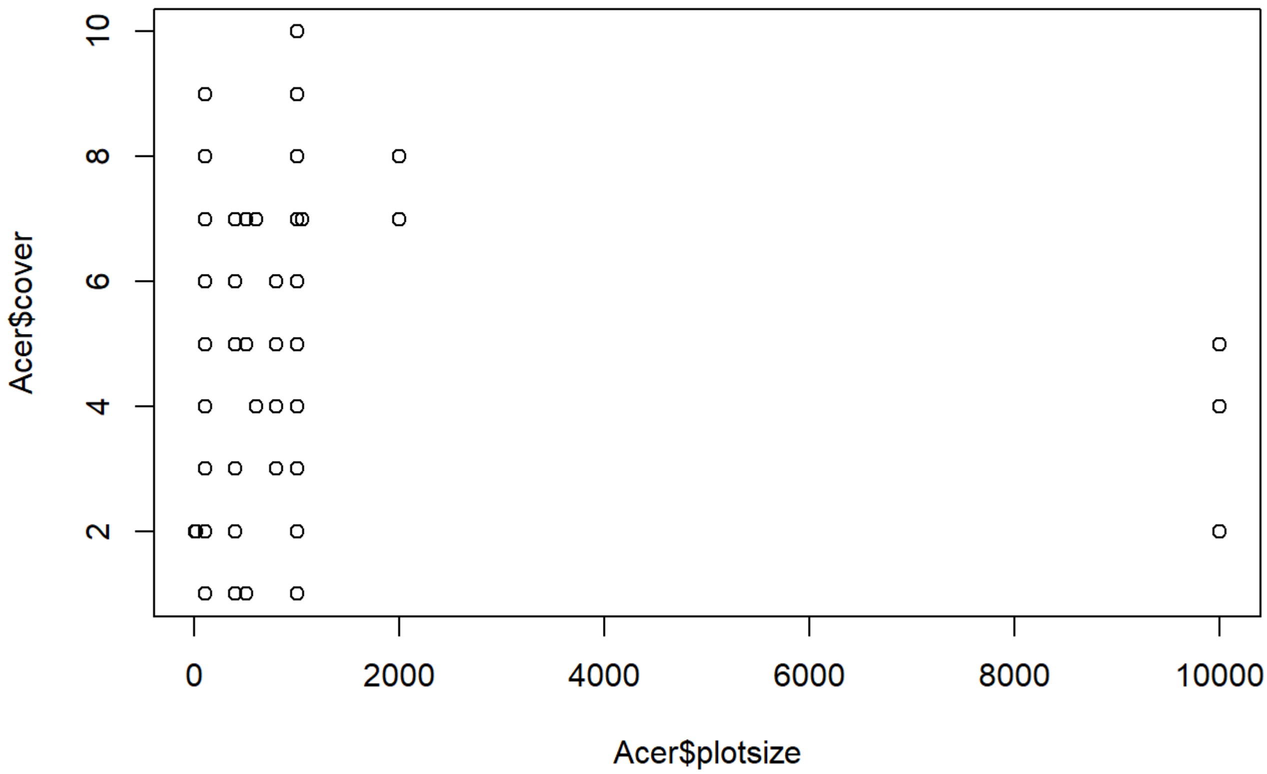

```
plot(Acer$cover~Acer$plotID)
```



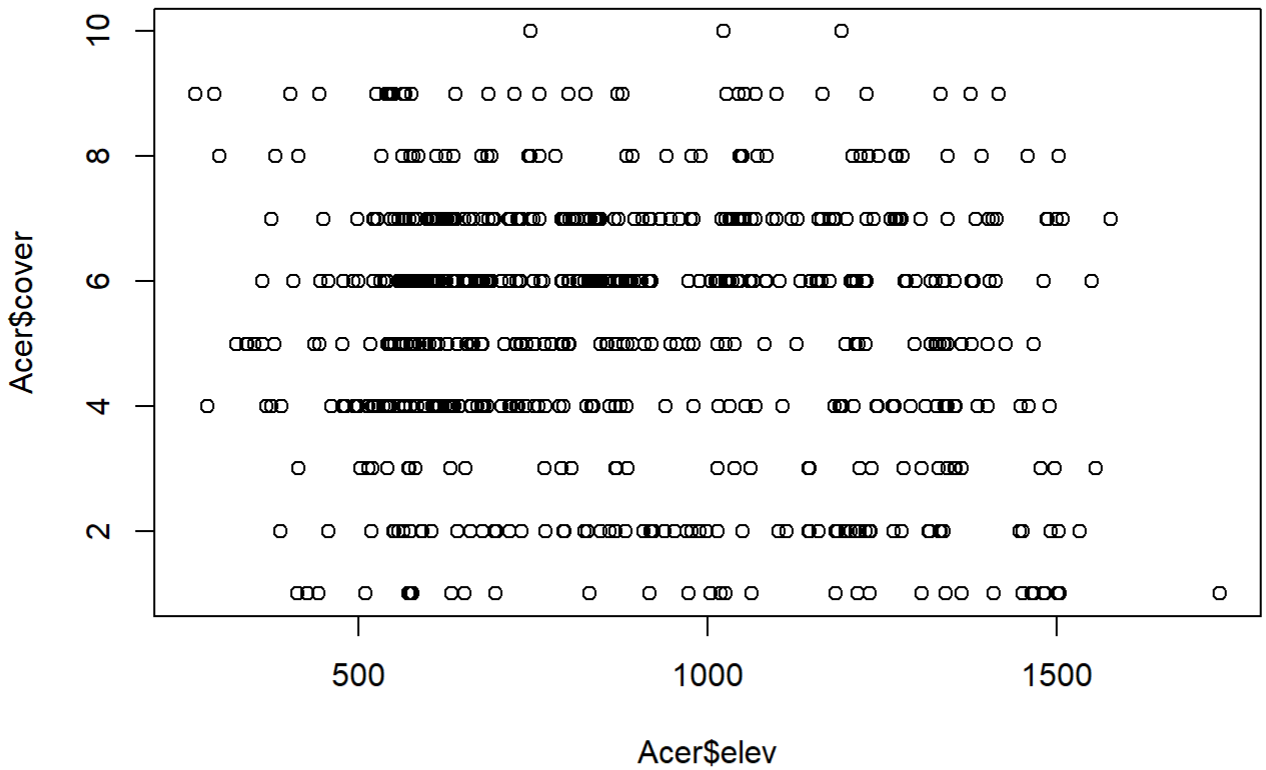

```
boxplot(Acer$cover~Acer$plotID)
```



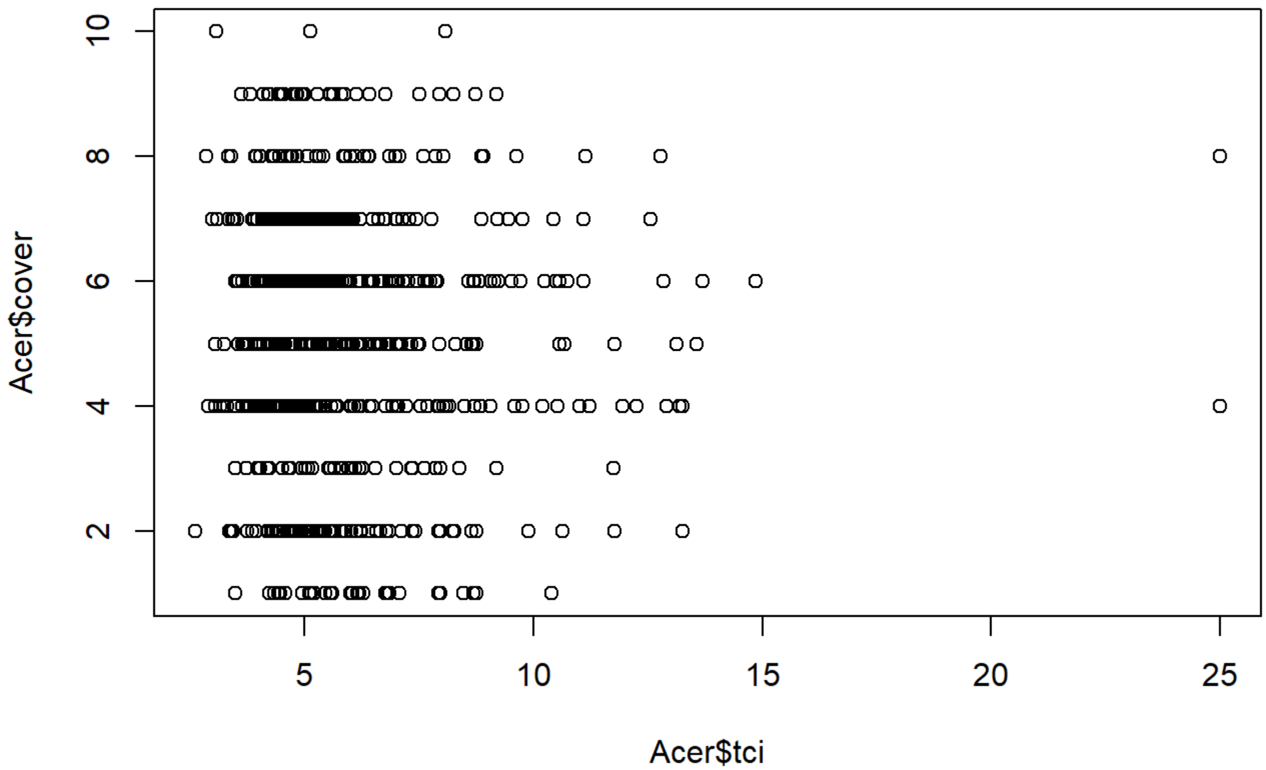

```
plot(Acer$cover~Acer$plotsize)
```



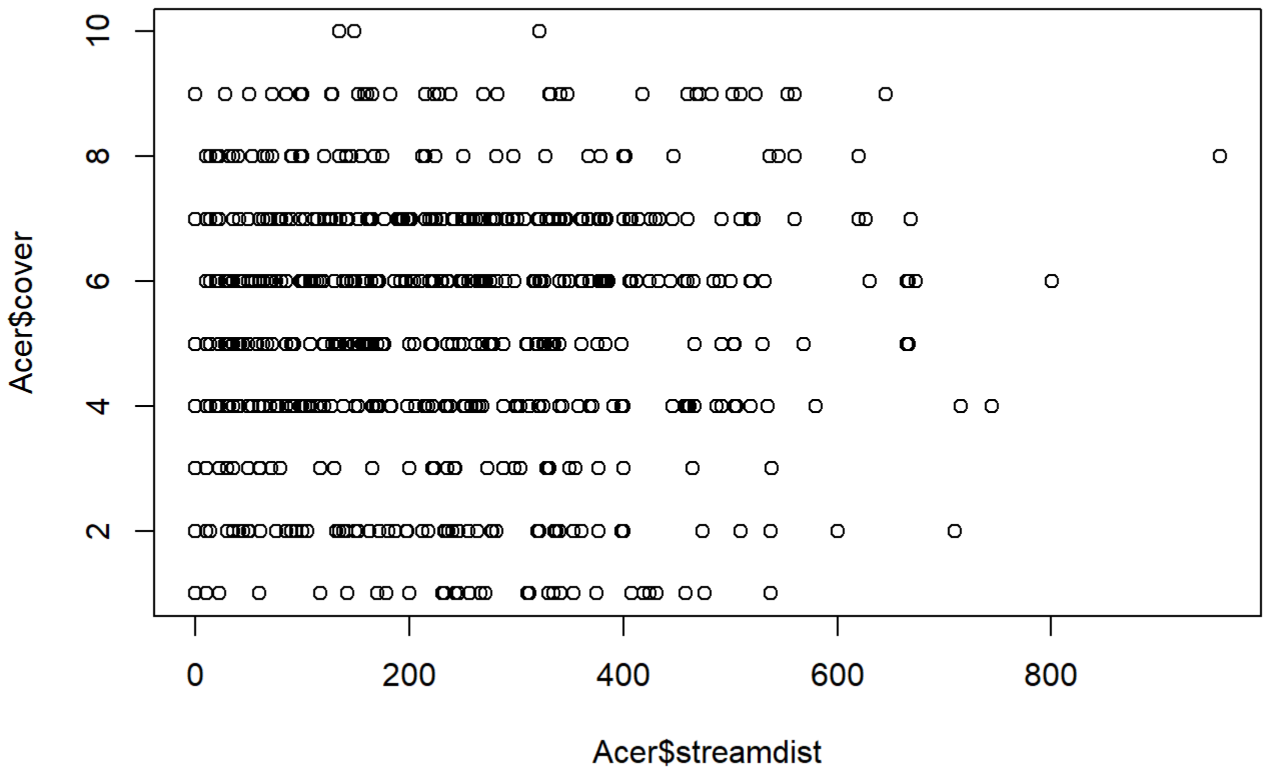

```
plot(Acer$cover~Acer$elev)
```



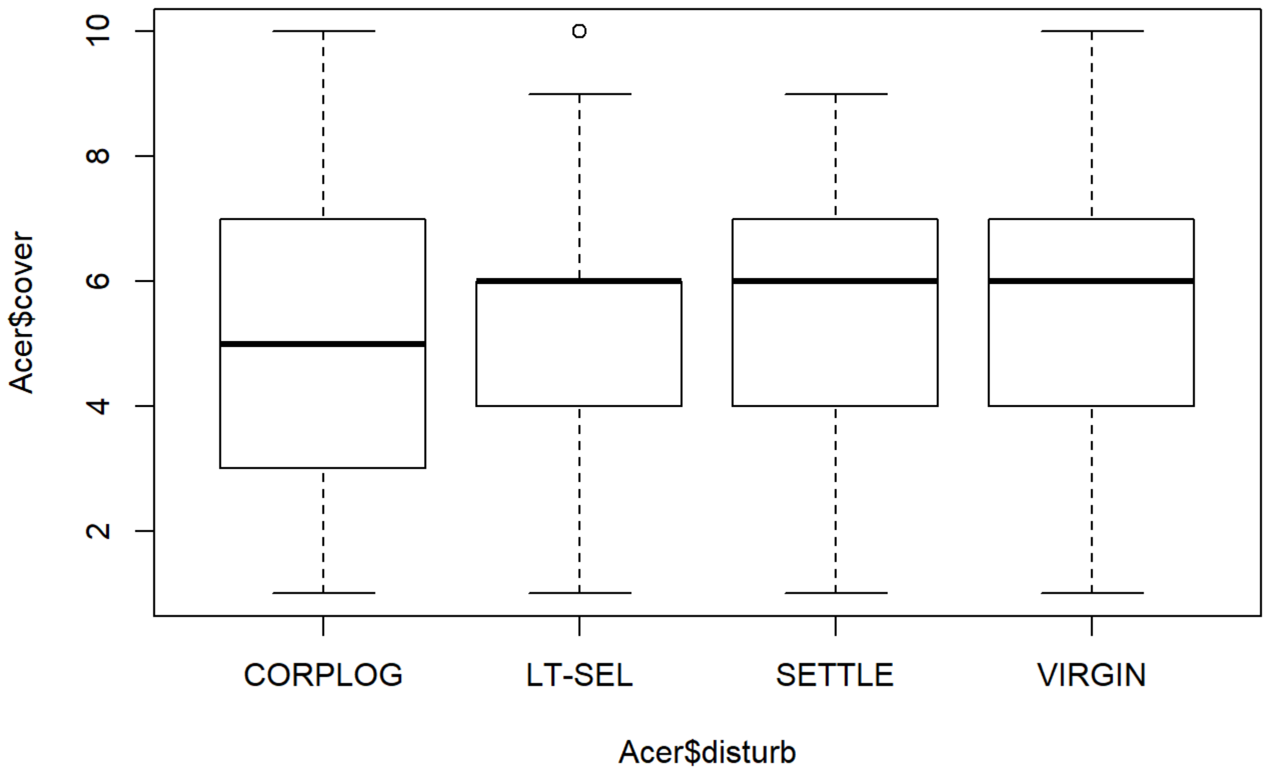

```
plot(Acer$cover~Acer$tci)
```



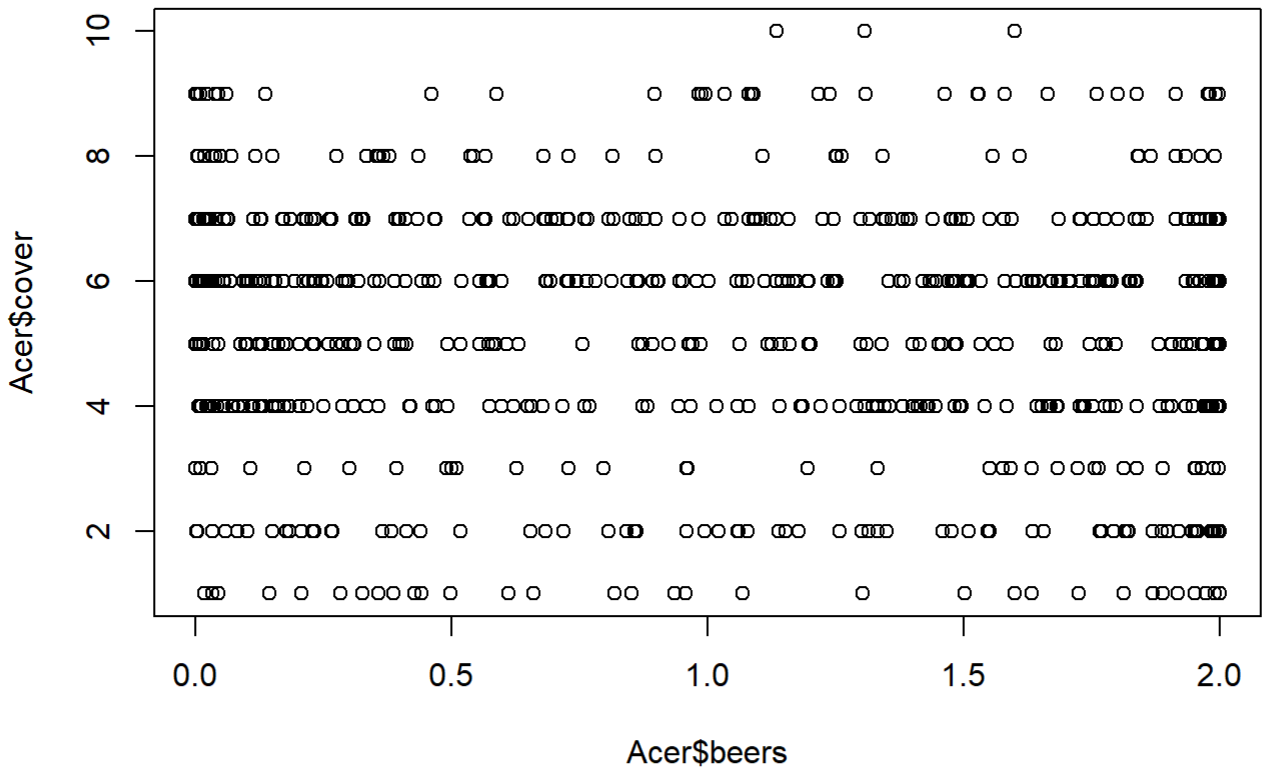

```
plot(Acer$cover~Acer$streamdist)
```




```
plot(Acer$cover~Acer$disturb)
```




```
plot(Acer$cover~Acer$beers)
```




```
# take a look at plotID, elevation, tci, streamdist -- lesser important beers, disturb, plotsize
```

After looking at the plots of each variable as it relates to cover I thought the most important variables to consider were plotID, elevation, tci, and streamdist.

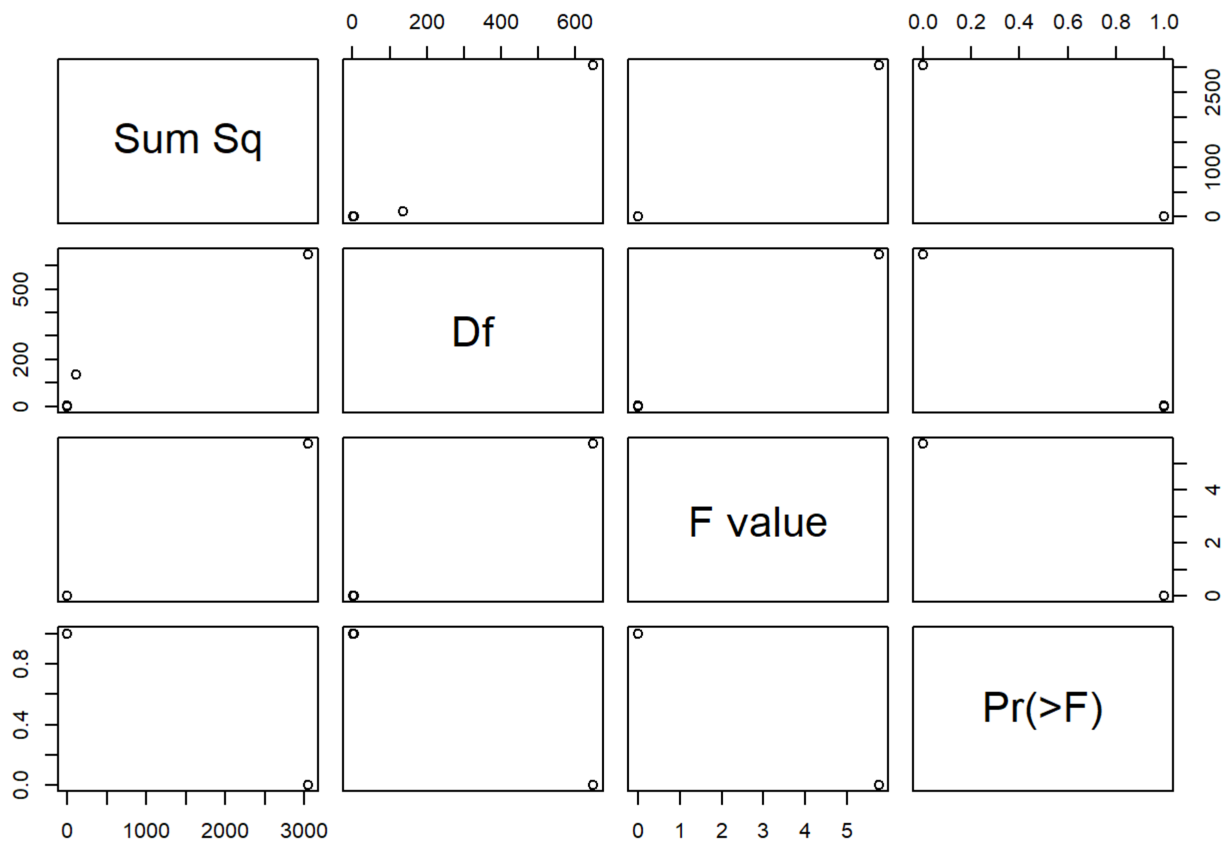
```
AcerFull<-Anova(aov(cover~as.factor(plotID)+elev+tci+streamdist+beers+disturb+plotsize, data = A
cer))
```

```
## Note: model has aliased coefficients
##       sums of squares computed by model comparison
```

```
summary(AcerFull)
```

```
##      Sum Sq            Df            F value           Pr(>F)
##  Min.   :   0.0   Min.   :  0.0   Min.   :0.0000   Min.   :0.0000
##  1st Qu.:   0.0   1st Qu.:  1.0   1st Qu.:0.0000   1st Qu.:1.0000
##  Median :   0.0   Median :  1.0   Median :0.0000   Median :1.0000
##  Mean   : 450.8   Mean   : 99.0   Mean   :0.9576   Mean   :0.8333
##  3rd Qu.:  56.0   3rd Qu.: 36.5   3rd Qu.:0.0000   3rd Qu.:1.0000
##  Max.   :3043.8   Max.   :648.0   Max.   :5.7458   Max.   :1.0000
##  NA's   :1                        NA's   :2        NA's   :2
```

```
plot(AcerFull)
```




```
AcerAOV<- aov(cover~as.factor(plotID)+elev+tci+streamdist+beers+disturb+plotsize, data = Acer)
AcerLM<- lm(cover~plotID+elev+tci+streamdist+beers+disturb+plotsize, data = Acer)
summary(AcerAOV)
```

```
##                    Df Sum Sq Mean Sq F value Pr(>F)
## as.factor(plotID) 649   3197   4.927   6.026 <2e-16 ***
## elev                1      0   0.000   0.000      1
## tci                 1      0   0.000   0.000      1
## streamdist          1      0   0.000   0.000      1
## beers               1      0   0.000   0.000      1
## disturb             3      0   0.000   0.000      1
## Residuals         137    112   0.818
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1 observation deleted due to missingness
```

```
summary(AcerLM)$adj.r.squared
```

```
## [1] 0.804105
```

```
Acer1<-aov(cover~tci+elev+streamdist+beers+disturb+plotsize, data = Acer)
AcerLM1<-lm(cover~tci+elev+streamdist+beers+disturb+plotsize, data = Acer)
summary(Acer1)
```

```
##              Df Sum Sq Mean Sq F value  Pr(>F)
## tci           1   12.1   12.05   2.997 0.08379 .
## elev          1   34.3   34.32   8.538 0.00358 **
## streamdist    1   30.2   30.17   7.504 0.00629 **
## beers         1   40.8   40.84  10.159 0.00149 **
## disturb       3    8.4    2.82   0.700 0.55206
## plotsize      1   27.7   27.73   6.898 0.00880 **
## Residuals   785 3155.8    4.02
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1 observation deleted due to missingness
```

```
summary(AcerLM1)
```

```
##
## Call:
## lm(formula = cover ~ tci + elev + streamdist + beers + disturb +
##     plotsize, data = Acer)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.7731 -1.2704  0.3525  1.4185  5.2049
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)    6.3754823  0.4477404  14.239  < 2e-16 ***
## tci           -0.0438862  0.0334663  -1.311  0.19012
## elev          -0.0008589  0.0002970  -2.892  0.00394 **
## streamdist     0.0012370  0.0004590   2.695  0.00720 **
## beers         -0.2988236  0.1044015  -2.862  0.00432 **
## disturbLT-SEL  0.1457197  0.2094514   0.696  0.48681
## disturbSETTLE  0.1222650  0.2610710   0.468  0.63969
## disturbVIRGIN  0.3550208  0.2410740   1.473  0.14124
## plotsize      -0.0003217  0.0001225  -2.626  0.00880 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.005 on 785 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.0464, Adjusted R-squared:  0.03668
## F-statistic: 4.775 on 8 and 785 DF,  p-value: 9.557e-06
```

```
Acer2<-aov(cover~tci+elev+streamdist+beers+plotsize, data = Acer)
AcerLM2<-lm(cover~tci+elev+streamdist+beers+plotsize, data = Acer)
summary(Acer2)
```

```
##              Df Sum Sq Mean Sq F value  Pr(>F)
## tci           1     12   12.05   3.001 0.08363 .
## elev          1     34   34.32   8.547 0.00356 **
## streamdist    1     30   30.17   7.512 0.00627 **
## beers         1     41   40.84  10.169 0.00148 **
## plotsize      1     27   27.43   6.829 0.00914 **
## Residuals   788   3165    4.02
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1 observation deleted due to missingness
```

```
summary(AcerLM2)
```

```
##
## Call:
## lm(formula = cover ~ tci + elev + streamdist + beers + plotsize,
##     data = Acer)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.7987 -1.3037  0.3438  1.4254  5.1959
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  6.5024516  0.3529416  18.424  < 2e-16 ***
## tci         -0.0467835  0.0333089  -1.405 0.160554
## elev        -0.0008253  0.0002443  -3.379 0.000764 ***
## streamdist   0.0012763  0.0004522   2.822 0.004887 **
## beers       -0.3056302  0.1027921  -2.973 0.003036 **
## plotsize    -0.0003173  0.0001214  -2.613 0.009138 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.004 on 788 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.04376,    Adjusted R-squared:  0.03769
## F-statistic: 7.212 on 5 and 788 DF,  p-value: 1.296e-06
```

```
Acer3<-aov(cover~elev+streamdist+beers+plotsize, data = Acer)
AcerLM3<-lm(cover~elev+streamdist+beers+plotsize, data = Acer)
summary(Acer3)
```

```
##              Df Sum Sq Mean Sq F value  Pr(>F)
## elev          1     25   25.09   6.241 0.01269 *
## streamdist    1     42   41.50  10.321 0.00137 **
## beers         1     37   36.79   9.150 0.00257 **
## plotsize      1     33   33.50   8.331 0.00400 **
## Residuals   789   3172    4.02
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1 observation deleted due to missingness
```

```
summary(AcerLM3)
```

```
##
## Call:
## lm(formula = cover ~ elev + streamdist + beers + plotsize, data = Acer)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.9265 -1.3419  0.3182  1.4210  5.2248
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  6.1725065  0.2635689  23.419  < 2e-16 ***
## elev        -0.0007846  0.0002427  -3.233  0.00128 **
## streamdist   0.0014348  0.0004382   3.275  0.00110 **
## beers       -0.2903855  0.1022804  -2.839  0.00464 **
## plotsize    -0.0003458  0.0001198  -2.886  0.00400 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.005 on 789 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.04136,    Adjusted R-squared:  0.0365
## F-statistic: 8.511 on 4 and 789 DF,  p-value: 1.002e-06
```

```
Acer4<-aov(cover~elev*streamdist*beers*plotsize, data = Acer)
AcerLM4<-lm(cover~elev+streamdist+beers+plotsize, data = Acer)
summary(Acer4)
```

```
##                               Df Sum Sq Mean Sq F value   Pr(>F)    
## elev                           1   25.1   25.09   6.347  0.01196 *  
## streamdist                     1   41.5   41.50  10.497  0.00125 ** 
## beers                          1   36.8   36.79   9.306  0.00236 ** 
## plotsize                       1   33.5   33.50   8.474  0.00371 ** 
## elev:streamdist                1    0.8    0.81   0.204  0.65187    
## elev:beers                     1   77.3   77.28  19.548 1.12e-05 ***
## streamdist:beers               1    3.3    3.31   0.837  0.36041    
## elev:plotsize                  1    0.4    0.37   0.092  0.76115    
## streamdist:plotsize            1    2.5    2.46   0.623  0.43008    
## beers:plotsize                 1    1.4    1.45   0.366  0.54537    
## elev:streamdist:beers          1    3.1    3.13   0.793  0.37356    
## elev:streamdist:plotsize       1    1.8    1.79   0.453  0.50119    
## elev:beers:plotsize            1    3.0    3.02   0.765  0.38205    
## streamdist:beers:plotsize      1    0.6    0.62   0.157  0.69158    
## elev:streamdist:beers:plotsize   1    2.5    2.48   0.626  0.42905    
## Residuals                    778 3075.8    3.95                     
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1 observation deleted due to missingness
```

```
summary(AcerLM4)
```

```
## 
## Call:
## lm(formula = cover ~ elev + streamdist + beers + plotsize, data = Acer)
## 
## Residuals:
##     Min      1Q  Median      3Q     Max 
## -4.9265 -1.3419  0.3182  1.4210  5.2248 
## 
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)    
## (Intercept)  6.1725065  0.2635689  23.419  < 2e-16 ***
## elev        -0.0007846  0.0002427  -3.233  0.00128 ** 
## streamdist   0.0014348  0.0004382   3.275  0.00110 ** 
## beers       -0.2903855  0.1022804  -2.839  0.00464 ** 
## plotsize    -0.0003458  0.0001198  -2.886  0.00400 ** 
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 2.005 on 789 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.04136,    Adjusted R-squared:  0.0365 
## F-statistic: 8.511 on 4 and 789 DF,  p-value: 1.002e-06
```

```
Acer5<-aov(cover~elev+streamdist+plotsize, data = Acer)
AcerLM5<-lm(cover~elev+streamdist+plotsize, data = Acer)
summary(Acer5)
```

```
##              Df Sum Sq Mean Sq F value  Pr(>F)
## elev          1     25   25.09   6.186 0.01309 *
## streamdist    1     42   41.50  10.230 0.00144 **
## plotsize      1     38   37.88   9.337 0.00232 **
## Residuals   790   3205    4.06
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 1 observation deleted due to missingness
```

```
summary(AcerLM5)
```

```
##
## Call:
## lm(formula = cover ~ elev + streamdist + plotsize, data = Acer)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.7572 -1.3318  0.3265  1.4854  5.2108
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  5.9553499  0.2533512  23.506  < 2e-16 ***
## elev        -0.0008504  0.0002427  -3.505 0.000483 ***
## streamdist   0.0014425  0.0004401   3.278 0.001093 **
## plotsize    -0.0003669  0.0001201  -3.056 0.002321 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.014 on 790 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.03157,    Adjusted R-squared:  0.02789
## F-statistic: 8.584 on 3 and 790 DF,  p-value: 1.3e-05
```

Plot ID is dominating the explanation of the varience. However, when each variable is ran on its own they show significance. This is most likely due to plotID being a composite of the other variables. In other words, the values of the other variables are highly dependent on the plotID marker or visa versa because it is a marker of location. For this reason, I removed plot ID. In this case elevation and distance from stream are the most important variables to consider when trying to predict cover for Acer rubrum.

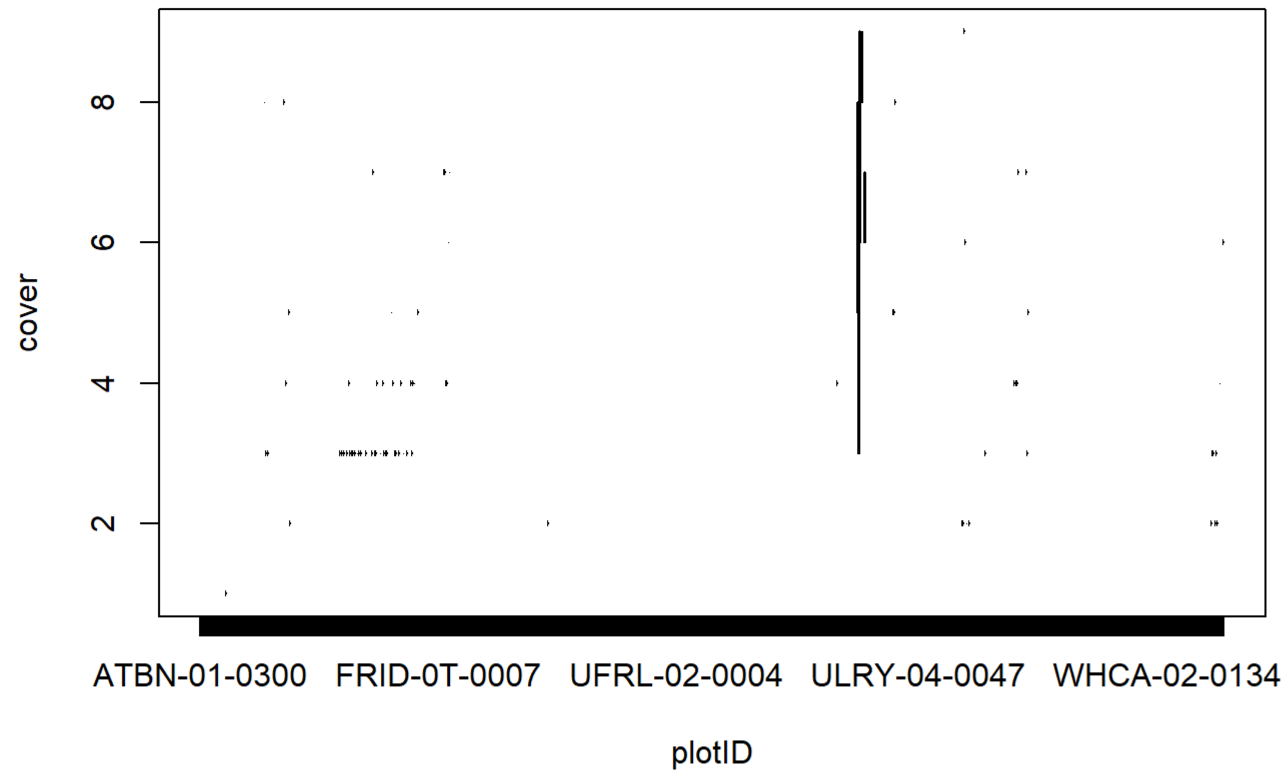
```
AcerGLM<-glm(cover~streamdist+elev+plotsize, data = Acer, family = 'poisson')
summary(AcerGLM)
```

```
## 
## Call:
## glm(formula = cover ~ streamdist + elev + plotsize, family = "poisson", 
##     data = Acer)
## 
## Deviance Residuals: 
##     Min       1Q   Median       3Q      Max  
## -2.4562  -0.5994   0.1375   0.6138   2.0766  
## 
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)    
## (Intercept)  1.821e+00  6.079e-02  29.958  < 2e-16 ***
## streamdist   2.758e-04  9.386e-05   2.938  0.00330 ** 
## elev        -1.659e-04  5.309e-05  -3.124  0.00178 ** 
## plotsize    -9.907e-05  3.715e-05  -2.667  0.00765 ** 
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## (Dispersion parameter for poisson family taken to be 1)
## 
##     Null deviance: 721.46  on 793  degrees of freedom
## Residual deviance: 699.69  on 790  degrees of freedom
##   (1 observation deleted due to missingness)
## AIC: 3416.8
## 
## Number of Fisher Scoring iterations: 4
```

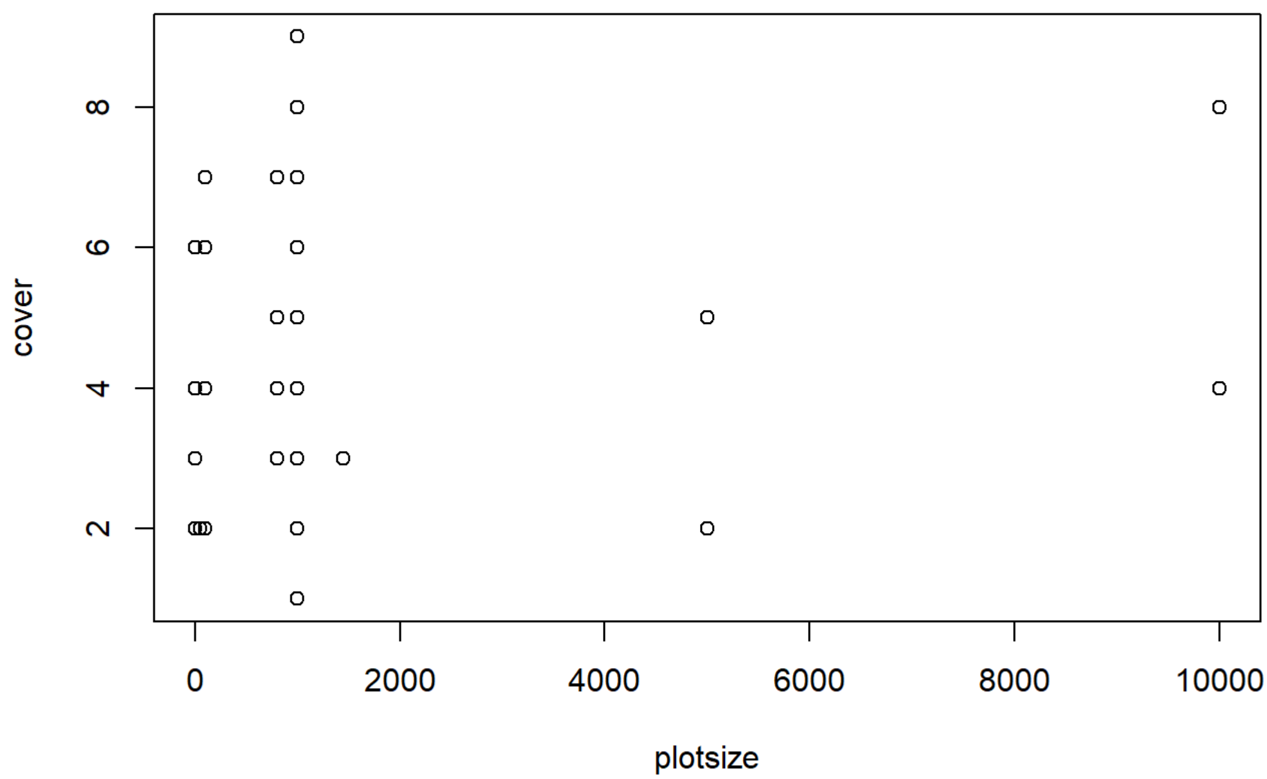
```
pseudo_r2<-1 -  AcerGLM$deviance / AcerGLM$null.deviance
pseudo_r2
```

```
## [1] 0.03017477
```

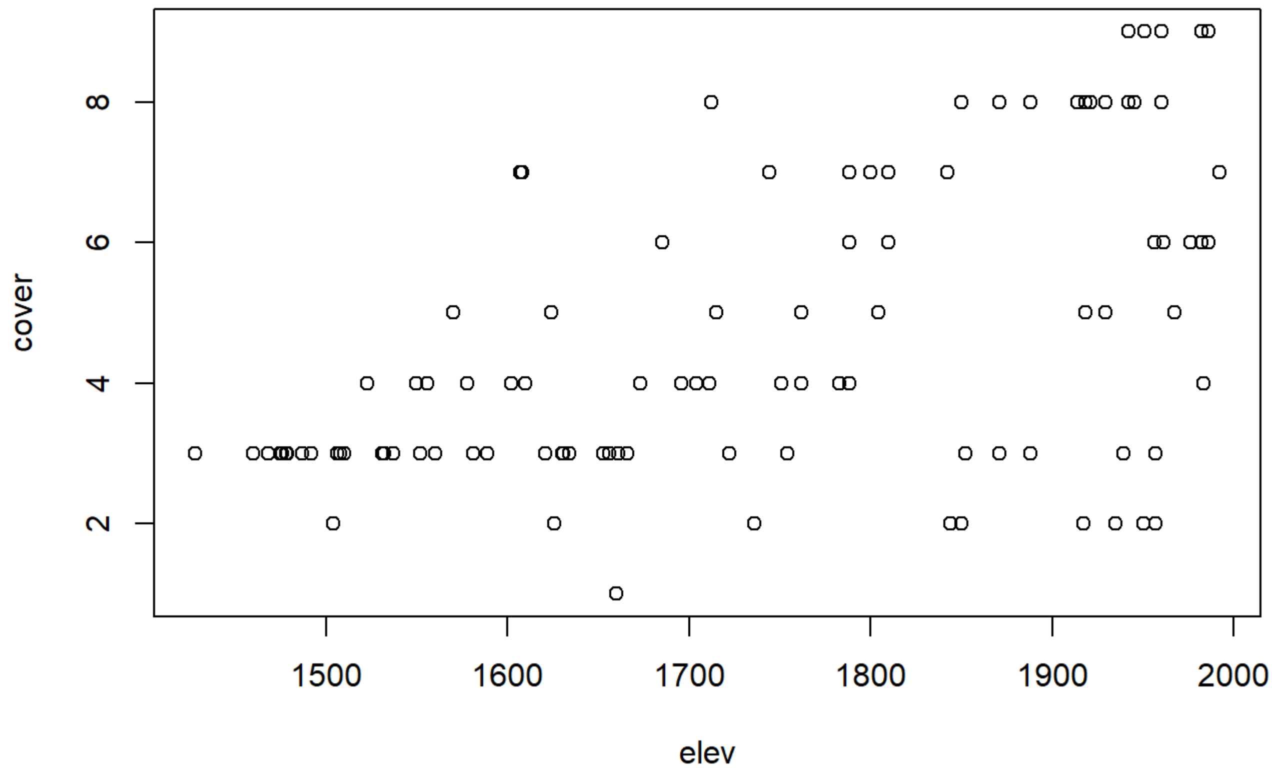
```
plot(cover~plotID, data = Abies)
```



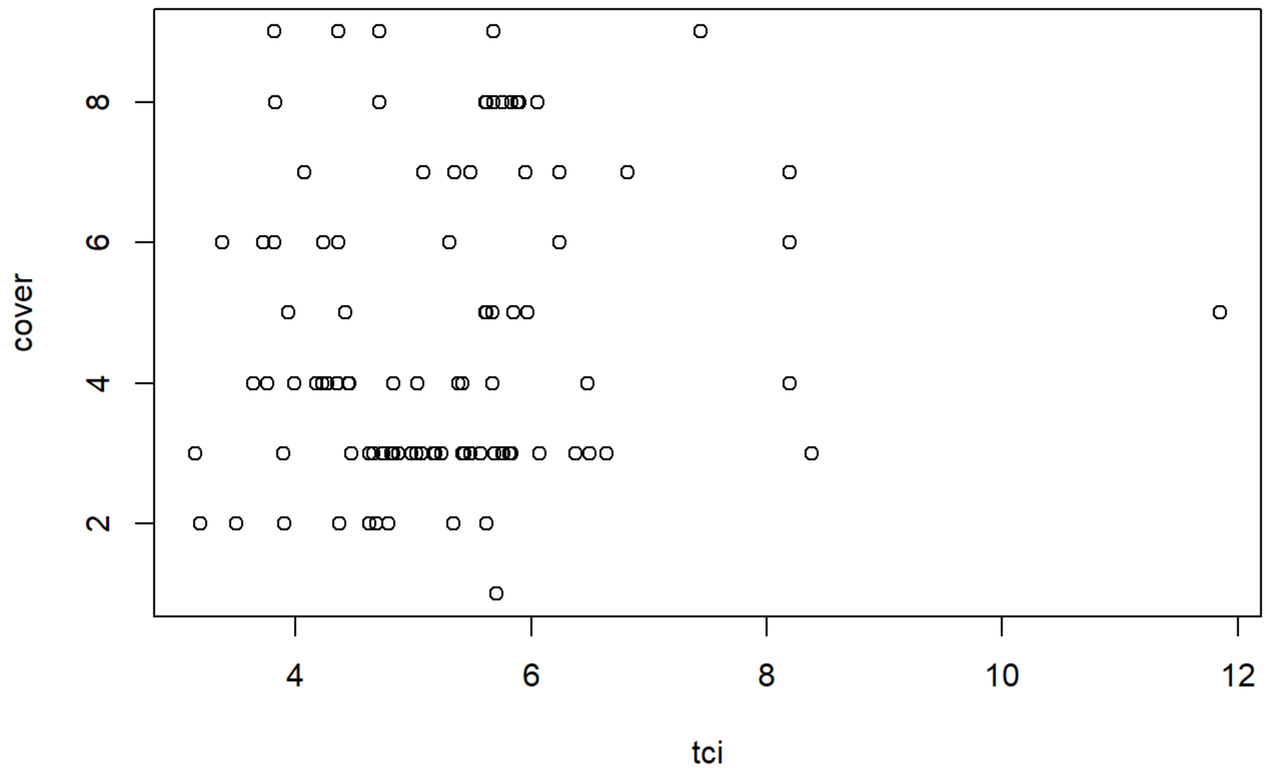

```
plot(cover~plotsize, data = Abies)
```



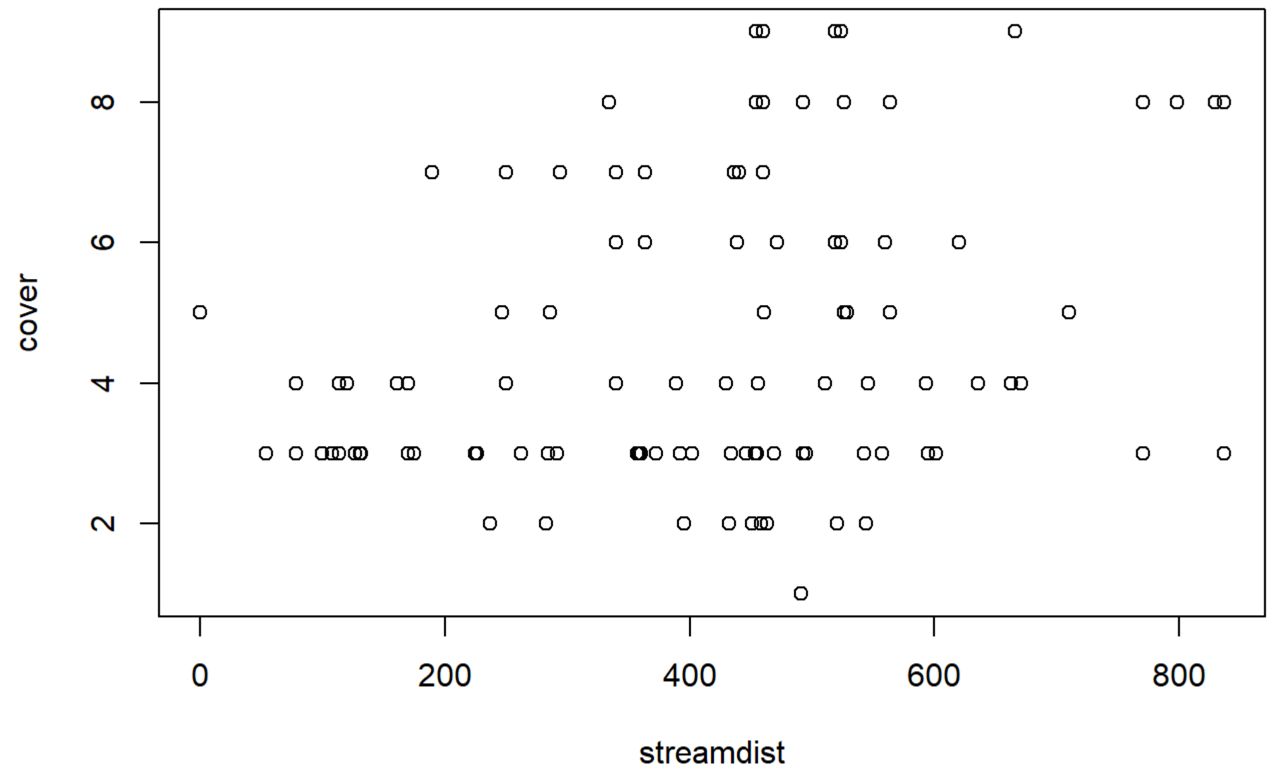

```
plot(cover~elev, data = Abies)
```



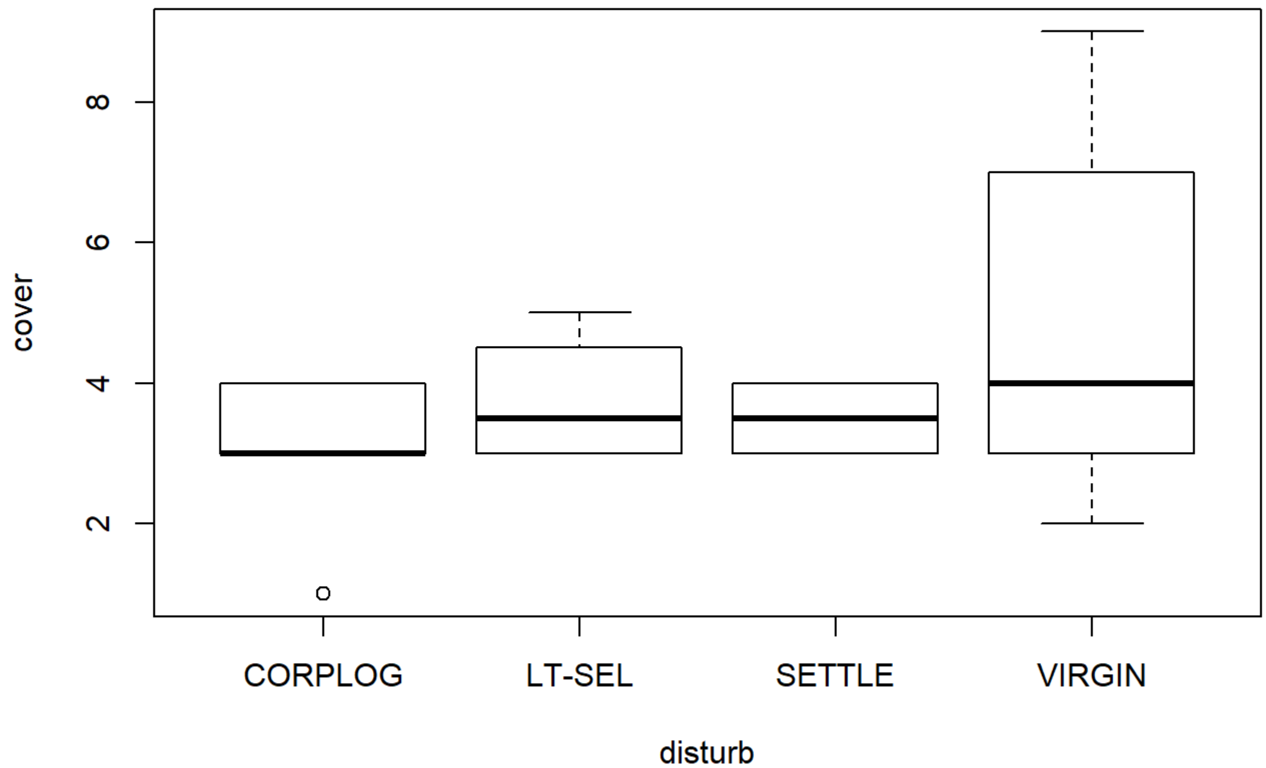

```
plot(cover~tci, data = Abies)
```



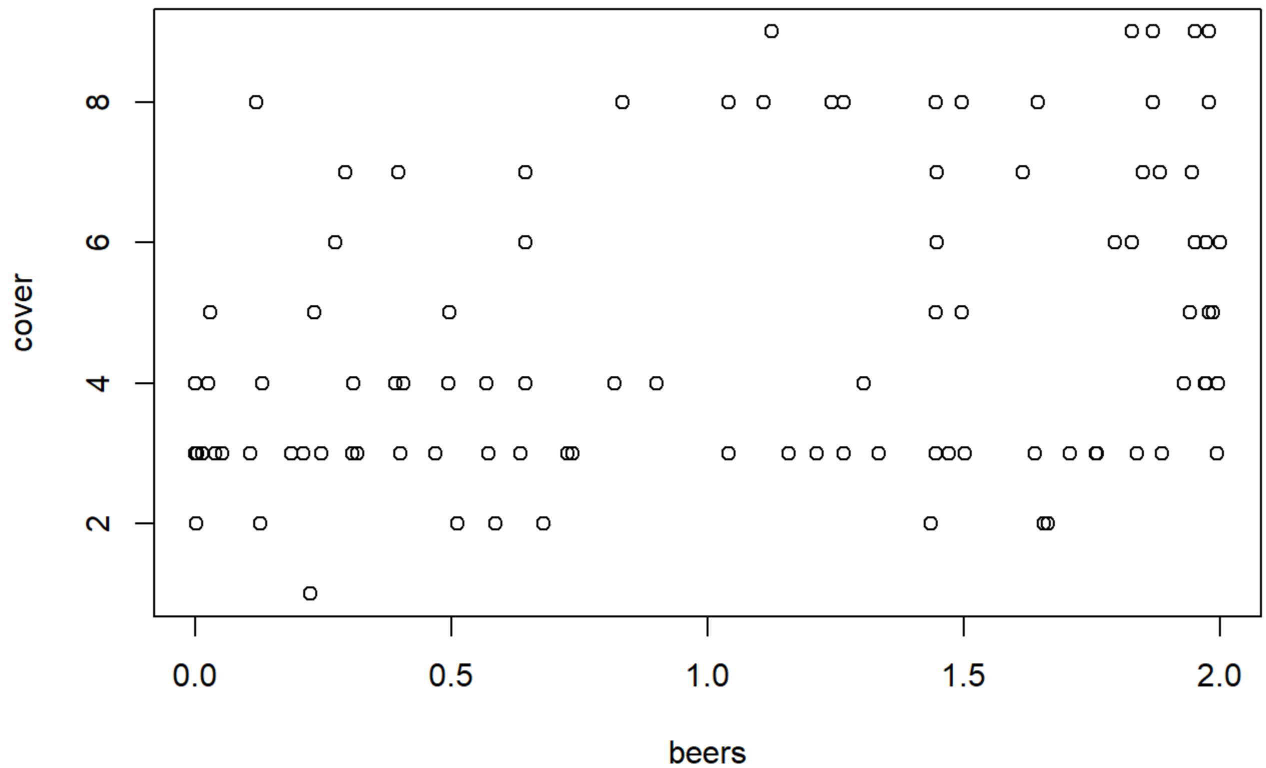

```
plot(cover~streamdist, data = Abies)
```




```
plot(cover~disturb, data=Abies)
```




```
plot(cover~beers, data = Abies)
```




```
#take a look at plot ID, elev, tci, streamdist-- lesser important disturb, beers, plotsize
```

Again, after looking at each relationship individually the variables of the most interest were plotID, elev, tci and streamdist.

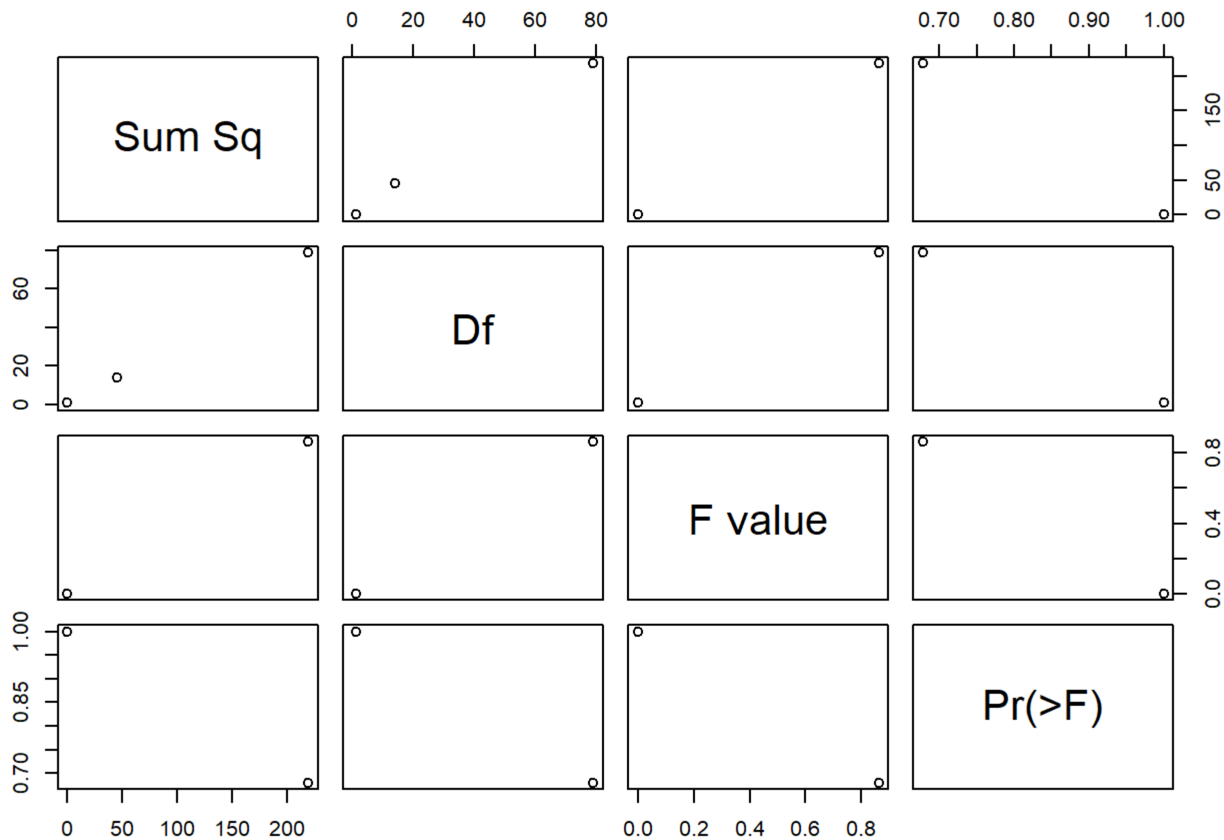
```
AbiesFull<-Anova(lm(cover~plotID+elev+tci+streamdist+beers+disturb+plotsize, data = Abies))
```

```
## Note: model has aliased coefficients
##       sums of squares computed by model comparison
```

```
summary(AbiesFull)
```

```
##      Sum Sq             Df            F value          Pr(>F)
##  Min.   :  0.00   Min.   : 0.00   Min.   :0.0000   Min.   :0.6786
##  1st Qu.:  0.00   1st Qu.: 0.75   1st Qu.:0.0000   1st Qu.:1.0000
##  Median :  0.00   Median : 1.00   Median :0.0000   Median :1.0000
##  Mean   : 43.95   Mean   :12.12   Mean   :0.1723   Mean   :0.9357
##  3rd Qu.: 33.75   3rd Qu.: 4.25   3rd Qu.:0.0000   3rd Qu.:1.0000
##  Max.   :218.70   Max.   :79.00   Max.   :0.8613   Max.   :1.0000
##  NA's   :2                        NA's   :3        NA's   :3
```

```
plot(AbiesFull)
```




```
AbiesAOV<- aov(cover~as.factor(plotID)+elev+tci+streamdist+beers+disturb+plotsize, data = Abies)
AbiesLM<- lm(cover~plotID+elev+tci+streamdist+beers+disturb+plotsize, data = Abies)
summary(AbiesAOV)
```

```
##                   Df Sum Sq Mean Sq F value Pr(>F)
## as.factor(plotID) 83    431   5.192   1.615  0.158
## elev               1      0   0.000   0.000  1.000
## tci                1      0   0.000   0.000  1.000
## streamdist         1      0   0.000   0.000  1.000
## beers              1      0   0.000   0.000  1.000
## Residuals         14     45   3.214
```

```
summary(AbiesLM)$adj.r.squared
```

```
## [1] 0.317921
```

```
Abies1<-aov(cover~tci+elev+streamdist+beers+disturb+plotsize, data = Abies)
AbiesLM1<-lm(cover~tci+elev+streamdist+beers+disturb+plotsize, data = Abies)
summary(Abies1)
```

```
##              Df Sum Sq Mean Sq F value   Pr(>F)    
## tci           1  10.88   10.88   3.837 0.053134 .  
## elev          1 158.50  158.50  55.897 4.14e-11 ***
## streamdist    1   1.11    1.11   0.392 0.532542    
## beers         1  35.83   35.83  12.635 0.000597 ***
## disturb       3   5.73    1.91   0.673 0.570504    
## plotsize      1   0.21    0.21   0.075 0.784530    
## Residuals    93 263.70    2.84                     
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
summary(AbiesLM1)$adj.r.squared
```

```
## [1] 0.3982977
```

```
Abies2<-aov(cover~tci+elev+beers, data = Abies)
AbiesLM2<-lm(cover~tci+elev+beers, data = Abies)
summary(Abies2)
```

```
##              Df Sum Sq Mean Sq F value   Pr(>F)    
## tci           1  10.88   10.88    3.90 0.051091 .  
## elev          1 158.50  158.50   56.82 2.42e-11 ***
## beers         1  33.22   33.22   11.91 0.000825 ***
## Residuals    98 273.36    2.79                     
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
summary(AbiesLM2)
```

```
##
## Call:
## lm(formula = cover ~ tci + elev + beers, data = Abies)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.9474 -1.2389  0.0673  1.1258  4.4466
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -10.426571   1.965465  -5.305 7.00e-07 ***
## tci           0.505556   0.137752   3.670 0.000395 ***
## elev          0.006623   0.001005   6.587 2.25e-09 ***
## beers         0.848679   0.245905   3.451 0.000825 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.67 on 98 degrees of freedom
## Multiple R-squared:  0.4257, Adjusted R-squared:  0.4081
## F-statistic: 24.21 on 3 and 98 DF,  p-value: 8.319e-12
```

```
Abies3<-aov(cover~elev*tci*beers, data = Abies)
AbiesLM3<-lm(cover~elev+beers+tci, data = Abies)
summary(Abies3)
```

```
##                Df Sum Sq Mean Sq F value   Pr(>F)
## elev            1 141.49  141.49  58.452 1.76e-11 ***
## tci             1  27.89   27.89  11.523 0.001008 **
## beers           1  33.22   33.22  13.726 0.000357 ***
## elev:tci        1  10.64   10.64   4.397 0.038685 *
## elev:beers      1  33.00   33.00  13.632 0.000373 ***
## tci:beers       1   0.54    0.54   0.223 0.637704
## elev:tci:beers  1   1.65    1.65   0.681 0.411502
## Residuals      94 227.53    2.42
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
summary(AbiesLM3)
```

```
##
## Call:
## lm(formula = cover ~ elev + beers + tci, data = Abies)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.9474 -1.2389  0.0673  1.1258  4.4466
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -10.426571   1.965465  -5.305 7.00e-07 ***
## elev          0.006623   0.001005   6.587 2.25e-09 ***
## beers         0.848679   0.245905   3.451 0.000825 ***
## tci           0.505556   0.137752   3.670 0.000395 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.67 on 98 degrees of freedom
## Multiple R-squared:  0.4257, Adjusted R-squared:  0.4081
## F-statistic: 24.21 on 3 and 98 DF,  p-value: 8.319e-12
```

```
Abies5<-aov(cover~elev+tci, data = Abies)
AbiesLM5<-lm(cover~elev+tci, data = Abies)
summary(Abies5)
```

```
##             Df Sum Sq Mean Sq F value   Pr(>F)
## elev         1 141.49  141.49  45.688 9.71e-10 ***
## tci          1  27.89   27.89   9.007   0.0034 **
## Residuals   99 306.58    3.10
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
summary(AbiesLM5)
```

```
##
## Call:
## lm(formula = cover ~ elev + tci, data = Abies)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.9957 -0.8333  0.1053  0.9229  4.1766
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -10.475197   2.070892  -5.058 1.95e-06 ***
## elev          0.007391   0.001033   7.154 1.48e-10 ***
## tci           0.430070   0.143303   3.001   0.0034 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.76 on 99 degrees of freedom
## Multiple R-squared:  0.3559, Adjusted R-squared:  0.3429
## F-statistic: 27.35 on 2 and 99 DF,  p-value: 3.503e-10
```

Unlike Acer rubrum, plotID was not significantly important in predicting cover in Acer fraseri. Instead, the three most important parameters were elevation, tci and beers. However, beers and elevation are not independent and have a significant interaction. Another consideration is the highest adjusted R squared is much lower then Acer rubrum at about 0.4.

```
AbiesGLM<-glm(cover~elev+tci+beers, data = Abies, family = 'poisson')
summary(AbiesGLM)
```

```
##
## Call:
## glm(formula = cover ~ elev + tci + beers, family = "poisson",
##     data = Abies)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -1.87039  -0.56446   0.04234   0.47595   2.04892
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept) -1.7933522  0.5710240  -3.141  0.00169 **
## elev         0.0014528  0.0002897   5.015  5.3e-07 ***
## tci          0.1060297  0.0361364   2.934  0.00334 **
## beers        0.1879386  0.0711588   2.641  0.00826 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for poisson family taken to be 1)
##
##     Null deviance: 98.822  on 101  degrees of freedom
## Residual deviance: 54.988  on  98  degrees of freedom
## AIC: 401.51
##
## Number of Fisher Scoring iterations: 4
```

```
pseudo_r2Abies<-1 -  AbiesGLM$deviance / AbiesGLM$null.deviance
pseudo_r2Abies
```

```
## [1] 0.4435648
```

The GLM did asist in the pseudo R squared which was about 0.44. Overall the GLM did not greatly change the outcomes of the models.

3. Take away messages Acer rubrum cover is best explained by the plotID which is very dependent on the other parameters being measured. Acer fraseri cover was less well explained by parameters measured, but the best choices were elevation, beers, and tci. This makes sense when accounting for the haitat flexibility for each of these species. Acer rubrum, a habitat generalists most important determinant is the plotID. This alludes to clumping of individuals because the greatest indicator of cover is the location where similar cover values are. Additionally, when plotID was removed the adjusted R squared descreased dramatically meaning that the cover of Acer rubrum was hard to predict without knowing which plot it is. Adversely, a habitat specialist in Abies fraseri is more concerned with specific values of elevation, tci, and beers because they require a narrower range of ideal habitat characteristics.