```r
# Load community data
load(file = "~/GitHub/DormancyDecay/data/MicrobialCommunity/INPond_Initial.RData")
# Load Environmental and Geographical Data
env <- read.table("~/GitHub/DormancyDecay/data/Environmental/20130801_INPondDataMod.csv", sep = ",", hea
env <- env[complete.cases(env),]
env[which(env$Sample_ID == "HNF133"), ]["SpC"] <- 55
env[which(env$Sample_ID == "YSF46"), ]["lat"] <- 39.1186
```

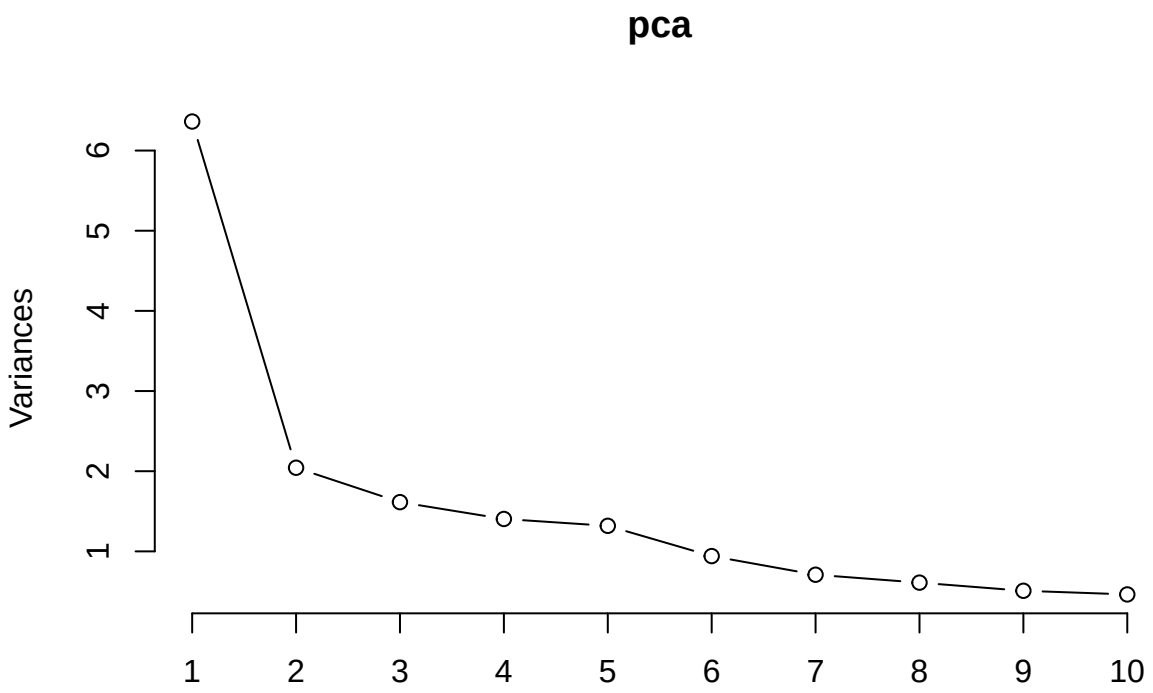
```r
# Geographic Distances (Kilometers) Among Ponds
long.lat <- as.matrix(cbind(env$long, env$lat))
geo.dist <- earth.dist(long.lat, dist = TRUE)
geo.dist <- geo.dist/max(geo.dist)
geo.dist[which(!is.finite(geo.dist))] = NA

# Geographic variables
geo.dat <- as.matrix(subset(env, select = lat:long))
# Pond environmental variables
env.dat <- as.matrix(subset(env, select = Elevation:TP))
```

```r
locs <- env[, "Location"]

# Standardize and center
env.dat <- scale(env.dat, center = TRUE, scale = TRUE)

# Conduct PCA
pca <- prcomp(env.dat, center=TRUE, scale. = TRUE)
print(pca)
```

```
## Standard deviations (1, .., p=17):
##  [1] 2.52235448 1.42937980 1.27043895 1.18496508 1.14825165 0.97001512
##  [7] 0.84168685 0.78094242 0.71287367 0.68021180 0.61793495 0.48155166
## [13] 0.42815076 0.39345057 0.21422036 0.17189812 0.02359114
##
## Rotation (n x k) = (17 x 17):
##                    PC1          PC2         PC3        PC4           PC5
## Elevation   0.03995760  0.060450744 -0.50538204  0.3072993  2.640277e-01
## Diameter    0.28243190 -0.348944177  0.10075797  0.1746602  7.258510e-02
## Depth      -0.15571675 -0.317002320  0.06854498  0.2522998  4.735612e-01
## Cal_Volume  0.28428936 -0.338207158  0.14578554  0.1549885  9.354735e-02
## ORP         0.23387830  0.172737057 -0.21100758 -0.2377546  2.613205e-01
## Temp        0.18788043 -0.419699126  0.08061896 -0.1308108 -3.983106e-01
## SpC        -0.36339075 -0.179613330 -0.01299121 -0.1492372 -1.756813e-03
## DO          0.25565105 -0.235926456 -0.28684222 -0.1196546 -1.098697e-01
## TDS        -0.36365201 -0.179315295 -0.01843911 -0.1473970  6.371817e-05
## Salinity   -0.36309450 -0.101066942 -0.04271124 -0.1567354 -1.487434e-02
## pH         -0.15218567 -0.421903913 -0.36678420 -0.2146364  9.418069e-02
## Color      -0.19201661  0.103633799  0.24148656  0.2770120 -3.921733e-01
## chla       -0.08409581 -0.304713196 -0.12564041  0.4615959 -2.727916e-01
## DOC         0.01217657  0.067954863 -0.53243807 -0.1182272 -3.506715e-01
## DON        -0.25544857 -0.115972552  0.10321264 -0.2927542 -3.331611e-02
## canopy      0.31282552  0.005031988  0.02380827 -0.2072900 -2.287542e-01
## TP         -0.17808329  0.154100948 -0.26364367  0.3903047 -1.981915e-01
##                    PC6         PC7         PC8          PC9         PC10
## Elevation   0.39313129  0.27818678 -0.16177147  0.291907808 -0.29766455
```

```
## Diameter    0.24472298 -0.29926746 -0.19561190 -0.043173148 -0.09277964
## Depth       0.14622601 -0.01175612  0.43369677 -0.153251540  0.36352101
## Cal_Volume  0.23114863 -0.28818936 -0.14810812 -0.101115051 -0.11366577
## ORP        -0.08963676 -0.43713272  0.36740142  0.274271258  0.26612612
## Temp        0.13194330  0.25433011  0.11410540 -0.082014235  0.06799479
## SpC         0.06182365 -0.05276134 -0.17411568  0.016183387  0.11278973
## DO         -0.32086006  0.07401311  0.29041379  0.025476332 -0.36933457
## TDS         0.06598274 -0.04779111 -0.16677329  0.014577951  0.10352088
## Salinity    0.02468321 -0.11911710 -0.22675129  0.032465921  0.03505367
## pH         -0.23599130  0.02140975  0.11529002 -0.274893660 -0.14943177
## Color       0.24818763 -0.01683771  0.52015219 -0.007578861 -0.15545181
## chla       -0.35175099 -0.02337994 -0.05757934  0.580274835  0.30607216
## DOC         0.48133129 -0.03893753  0.10149453 -0.140359053  0.35157603
## DON         0.24998627 -0.33427532  0.18522981  0.456995050 -0.42477239
## canopy      0.03765535 -0.23905810 -0.21950231  0.093203239  0.21147901
## TP         -0.19224458 -0.54558500 -0.06074002 -0.381460662 -0.17961932
##                    PC11        PC12         PC13          PC14
## Elevation   0.2956848262  0.21252317 -0.053470856  0.0596008958
## Diameter   -0.0286981454 -0.13533430  0.140092722  0.1427542103
## Depth      -0.0450962812  0.19209739 -0.325329581 -0.2658640498
## Cal_Volume  0.0249808367 -0.30496754  0.051024864  0.0007085213
## ORP         0.2331497059  0.01396441  0.115658904  0.4413319184
## Temp       -0.0004951823  0.51153908 -0.111031990  0.4600895092
## SpC         0.1724944310 -0.16302727 -0.137926459  0.1807170913
## DO          0.0516439735 -0.35952637 -0.542623172 -0.0685201179
## TDS         0.1747319912 -0.16270236 -0.154298763  0.1903095271
## Salinity    0.2556271084 -0.06559408 -0.201065689  0.0368398819
## pH          0.1685004785  0.10564707  0.597460142 -0.2127382971
## Color       0.4857276448 -0.19070213  0.175592241 -0.0340264932
## chla       -0.1111268144 -0.05684126  0.131448936 -0.0583169021
## DOC        -0.3248729849 -0.25326966  0.025531006 -0.1232464363
## DON        -0.3695527912  0.23225530 -0.006889885 -0.1808609149
## canopy      0.4510000902  0.29166103 -0.156993031 -0.5571919812
## TP         -0.0651652394  0.32282999 -0.187754123  0.1257795036
##                    PC15         PC16          PC17
## Elevation  -0.06390313  0.010529479 -0.0082881927
## Diameter    0.46612160 -0.526856571  0.0191312855
## Depth       0.03903565 -0.020378966 -0.0020235072
## Cal_Volume -0.39977160  0.559374592 -0.0159998122
## ORP        -0.00674622  0.056716122 -0.0021697281
## Temp       -0.01181619  0.118109303 -0.0075168280
## SpC        -0.29121909 -0.264466107 -0.7075108071
## DO          0.04601096 -0.085180716 -0.0073400556
## TDS        -0.31166135 -0.235554082  0.7060520995
## Salinity    0.64070457  0.490816463 -0.0019381012
## pH         -0.01354432  0.006899788  0.0052691409
## Color       0.03476051 -0.037134886 -0.0005810824
## chla       -0.00958507  0.049454299  0.0043541926
## DOC         0.04328405  0.024257415  0.0007151811
## DON        -0.05217534 -0.004018608 -0.0009827477
## canopy     -0.09413658 -0.116679361  0.0062823753
## TP         -0.08728693 -0.012407246 -0.0041536390
```

```r
plot(pca, type = "l")
```




```r
summary(pca)
```

```
## Importance of components:
##                           PC1    PC2     PC3    PC4     PC5     PC6
## Standard deviation     2.5224 1.4294 1.27044 1.1850 1.14825 0.97002
## Proportion of Variance 0.3743 0.1202 0.09494 0.0826 0.07756 0.05535
## Cumulative Proportion  0.3743 0.4944 0.58938 0.6720 0.74953 0.80488
##                           PC7     PC8     PC9    PC10    PC11    PC12
## Standard deviation     0.84169 0.78094 0.71287 0.68021 0.61793 0.48155
## Proportion of Variance 0.04167 0.03587 0.02989 0.02722 0.02246 0.01364
## Cumulative Proportion  0.84655 0.88243 0.91232 0.93954 0.96200 0.97564
##                           PC13    PC14   PC15    PC16    PC17
## Standard deviation     0.42815 0.39345 0.2142 0.17190 0.02359
## Proportion of Variance 0.01078 0.00911 0.0027 0.00174 0.00003
## Cumulative Proportion  0.98642 0.99553 0.9982 0.99997 1.00000
```

```r
predict(pca, newdata=tail(env.dat, 2))
```

```
##           PC1       PC2       PC3       PC4        PC5       PC6
## 49 -2.0515536 0.4773646 -1.659720 -1.228124 -0.8333644  1.034417
## 52 -0.1759856 1.5036756 -1.587934  1.332772  1.5059848 -1.266996
##           PC7        PC8        PC9        PC10       PC11      PC12
## 49 -0.8872107 -0.7337043 -0.2220210  0.08029475 -1.0752456 0.4390526
## 52 -0.6251556 -0.3511739 -0.6939562 -1.43726521  0.1738982 0.1789400
##          PC13        PC14        PC15        PC16        PC17
## 49  0.2264047 -0.09808249 -0.04930136  0.22974104  0.01182956
## 52 -0.2527481 -0.25672274  0.15535029 -0.07508874 -0.02645187
```

```r
file <- paste("~/GitHub/DormancyDecay/figs/PCA.png", sep="")
png(filename=file, width=5, height=5, units="in", res=600, pointsize=10)
```

```
g <- ggbiplot(pca, obs.scale = 1, var.scale = 1,
              groups = locs, ellipse = TRUE,
              circle = TRUE)
g <- g + scale_color_discrete(name = '')
g <- g + theme(legend.direction = 'horizontal',
               legend.position = 'top')
print(g)
#png(filename=file)
dev.off()
```

```
## pdf
##   2
```