

```

# Load community data
load(file = "~/GitHub/DistDecay/data/MicrobialCommunity/INPond_Initial.RData")
# Load Environmental and Geographical Data
env <- read.table("~/GitHub/DistDecay/data/Environmental/20130801_PondDataMod.csv", sep = ",", header =
env <- env[complete.cases(env),]
env[which(env$Sample_ID == "HNF133"), ]["SpC"] <- 55
env[which(env$Sample_ID == "YSF46"), ]["lat"] <- 39.1186
env[c("DON")] <- list(NULL)

```

```

# 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 = Depth:TP))

```

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locs <- env[, "Location"]

```

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

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

```

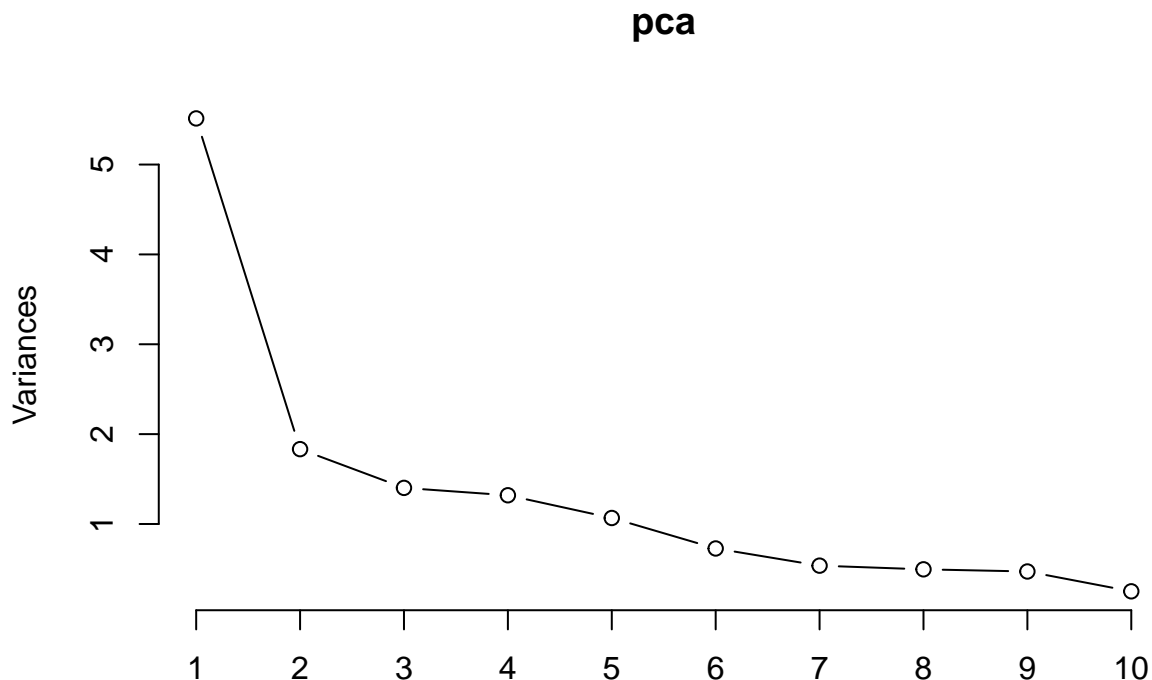
```

## Standard deviations:
## [1] 2.34802740 1.35383775 1.18403995 1.14875483 1.03289382 0.85305409
## [7] 0.73236940 0.70387151 0.68673421 0.50083261 0.42660679 0.40068625
## [13] 0.20083628 0.02482466
##
## Rotation:
##          PC1      PC2      PC3      PC4      PC5
## Depth      0.19103361 -0.23965529 -0.41772196 -0.18115600 -0.29993931
## Cal_Volume -0.27922918 -0.26375347 -0.30798204  0.08667011 -0.04109322
## ORP        -0.26663019  0.09367804  0.22547869 -0.37009997 -0.26227626
## Temp       -0.19489102 -0.45659828 -0.05696277  0.29436235  0.41118474
## SpC         0.39221812 -0.15497581  0.04802627 -0.11368452  0.19475543
## DO         -0.27472356 -0.37892494  0.20749117  0.01988956 -0.17846550
## TDS         0.39246455 -0.15588146  0.05015370 -0.11394652  0.19278480
## Salinity    0.38856824 -0.08266127  0.11136855 -0.11890807  0.16591799
## pH          0.17268266 -0.53577951  0.22811508 -0.24046041 -0.12242209
## Color       0.20457948  0.20205901 -0.11106686  0.50505748  0.18795091
## chl_a       0.11331148 -0.31658289 -0.03796354  0.50538900 -0.40194412
## DOC         -0.01944284 -0.05539656  0.66114940  0.14121579  0.15572921
## canopy      -0.34179288 -0.03697722  0.12882818  0.06551916  0.22885667
## TP          0.20107042  0.15639697  0.31106877  0.32101082 -0.49750669
##          PC6      PC7      PC8      PC9     PC10
## Depth      -0.59746832  0.004105753 -0.02188774 -0.10455486  0.23597277
## Cal_Volume -0.24130250  0.462849982 -0.03814430  0.36612546 -0.49768148
## ORP        -0.15859284  0.163781522 -0.47551456 -0.43739472  0.06857073

```

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## Temp      -0.06793235 -0.078787262 -0.03820440  0.02501225  0.50538060
## SpC       0.05293565  0.202804061 -0.08449925 -0.05632378 -0.13829648
## DO        0.16692206 -0.392814409 -0.22823986  0.06553614 -0.41587895
## TDS       0.04652433  0.193273191 -0.08619321 -0.05234529 -0.14461869
## Salinity  0.13295091  0.237552185 -0.15162856 -0.01109644 -0.09540489
## pH        0.04815385 -0.205255030 -0.18981537  0.21520807  0.15847255
## Color     -0.27232989 -0.268238921 -0.61896622 -0.09749157 -0.17792819
## chl_a     0.24872981  0.202622984  0.18054171 -0.55806510 -0.05351158
## DOC       -0.59142469  0.045770115  0.34192328 -0.11395760 -0.15838011
## canopy    0.12756310  0.509370305 -0.29379604 -0.04271456  0.22712027
## TP        -0.01132313  0.216361210 -0.16082981  0.52027253  0.27949466
##           PC11      PC12      PC13      PC14
## Depth     -0.1966757  0.38208388 -0.0063274856  0.0031857840
## Cal_Volume 0.1343229 -0.26273948 -0.0754352362 -0.0001201743
## ORP       -0.0841831 -0.42570855 -0.0332867156  0.0006928970
## Temp      -0.3014206 -0.35828290 -0.0838244466  0.0020343610
## SpC       -0.1710442 -0.08339929  0.3988178161  0.7073540723
## DO        -0.4590806  0.28692461  0.0309915096  0.0096778039
## TDS       -0.1865674 -0.08470580  0.3962274982 -0.7067006096
## Salinity  -0.1687100  0.10191008 -0.8018329003  0.0016788035
## pH        0.6368416 -0.02753782  0.0046573982 -0.0047531411
## Color     0.2089815  0.02239199  0.0006984624  0.0013729133
## chl_a     0.1312435 -0.02802733 -0.0258103845 -0.0047762956
## DOC       0.0477593  0.07196516 -0.0302372937  0.0025991057
## canopy    0.1336945  0.59570844  0.1424621901 -0.0072474342
## TP        -0.2354417 -0.08031667  0.0654863779  0.0025754971
```

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



```
summary(pca)
```

```
## Importance of components:
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##           PC1      PC2      PC3      PC4      PC5      PC6      PC7
```

```
## Standard deviation      2.3480 1.3538 1.1840 1.14875 1.0329 0.85305 0.73237
## Proportion of Variance 0.3938 0.1309 0.1001 0.09426 0.0762 0.05198 0.03831
## Cumulative Proportion  0.3938 0.5247 0.6249 0.71912 0.7953 0.84730 0.88562
##                          PC8      PC9      PC10      PC11      PC12      PC13
## Standard deviation      0.70387 0.68673 0.50083 0.4266 0.40069 0.20084
## Proportion of Variance  0.03539 0.03369 0.01792 0.0130 0.01147 0.00288
## Cumulative Proportion  0.92100 0.95469 0.97261 0.9856 0.99707 0.99996
##                          PC14
## Standard deviation      0.02482
## Proportion of Variance  0.00004
## Cumulative Proportion  1.00000
```

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

```
##          PC1          PC2          PC3          PC4          PC5          PC6
## 49 1.5646250 0.1352154 2.3750476 -0.2417625 0.504076 -0.5055796
## 52 0.3203732 1.1833058 0.5917331 -0.6870034 -2.467406 0.7692960
##          PC7          PC8          PC9          PC10          PC11          PC12
## 49 0.7948709 0.9076965 0.5360746 0.29595933 0.13230057 -0.2772835
## 52 -0.3898491 -0.2495656 1.4226269 -0.08469607 -0.06174719 0.3829231
##          PC13          PC14
## 49 -0.1510521 -0.01417658
## 52 -0.1010334 0.02420366
```

```
file <- paste("~/GitHub/DistDecay/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
```