This is wrong:

soil-ph/2020-03-12-hatch-final-data-merged/output-rmd/rsq-permanova-plot-ph-wisc-spoon-1.png

The adonis function has ordered input (for some reason), even when adding factors to the model.

```
## Biom + Metadata

# Intall:
# BiocManager::install("phyloseq")
# Load libraries
library(phyloseq)
#library(dada2)
library(ggplot2)
library(RColorBrewer)
library(vegan)

# Here we'll load in the microbial data.

# Import sequence processing table and check it out
# How many sequences were retained at each step?
track = readRDS("../2020-03-12-hatch-final-data-merged/reads/track.rds")
track
```

```
##                          input filtered denoised tabled nonchim
## 001-K1-0-17_S1_         182876   113727    95159  95159   89297
## 002-K1-17-45_S2_         81260    51682    42307  42307   41748
## 003-K1-45-60_S3_         55300    27171    20888  20888   20171
## 004-K2-Muck_S4_         108860    71520    57380  57380   53443
## 005-K3-0-15_S5_         135686    71730    54482  54482   51936
## 006-K3-15-35_S6_        107464    37348    23576  23576   23486
## 007-K3-35-50_S7_        115786    78875    65044  65044   62650
## 008-K4-0-15_S8_         100152    19285     8619   8619    8556
## 009-K4-15-30_S9_         57577    35582    29993  29993   29051
## 010-K4-30-50_S10_        93763    46765    38406  38406   37402
## 011-R1-0-27_S11_        128413    40030    21838  21838   21737
## 012-R1-27-50_S12_       108524    67801    57776  57776   56713
## 013-R1-50-70_S13_       101327    44743    37288  37288   36691
## 014-R2-0-30_S14_         98020    50303    34370  34370   33980
## 015-R2-30-45_S15_       144651    83427    67939  67939   66910
## 016-R2-45-60_S16_       130070    34111    25167  25167   25018
## 017-R2-60-100_S17_      107756    58066    49565  49565   47991
## 018-R3-0-20_S18_         79325    34393    20386  20386   20326
## 019-R3-20-30_S19_       101494    43254    33039  33039   32370
## 020-M1-0-31_S20_         81090    44031    28164  28164   28059
## 021-M1-31-50_S21_       123202    32323    19729  19729   19466
## 022-M1-50-70_S22_       115300    58825    50270  50270   48700
## 023-M2-0-24_S23_         69786    37765    25211  25211   25211
## 024-M2-24-38_S24_        66500     4392     1360   1360    1360
## 025-M2-38-55_S25_        72317    11461     6401   6401    6401
## 026-M3-0-15_S26_         93907    58097    44706  44706   43995
## 027-M3-15-30_S27_       113189    69066    58961  58961   55617
## 028-S-0-30_S28_          84651    45676    33139  33139   32957
## 029-S-30-60_S29_         93210    60904    51755  51755   49984
## 030-H1-0-30_S30_         90750    46239    27822  27822   27668
## 031-H1-30-40_S31_        86567    30139    17938  17938   17938
```

```
## 032-H1-40-60_S32_         105640    67558    59240  59240   57478
## 033-H2-0-30_S33_           87099    16339     6348   6348    6348
## 034-H2-30-60_S34_          83980    49334    41732  41732   40567
## 035-A249-0-35_S35_        171995    99802    78097  78097   76177
## 036-A249-35-60_S36_       150886    31831    20121  20121   19889
## 037-A341-0-33_S37_         85427    58108    43652  43652   42498
## 038-A341-33-55_S38_       152238    37509    22947  22947   22729
## 039-A341-55-75_S39_       136405    86536    70615  70615   66543
## 040-A341-75-85_S40_       136079    73684    61036  61036   57498
## 041-L2-0-23_S41_          159454    43258    23094  23094   23094
## 042-L2-23-45_S42_         122710    65865    49028  49028   47069
## 043-L3-0-12_S43_           86274    17177     8855   8855    8855
## 044-L3-12-20_S44_         132616    73576    55701  55701   55220
## 045-L3-20-40_S45_          80337    50489    40351  40351   39803
## 046-L4-0-10_S46_           99581    22005     9226   9226    9171
## 047-L4-10-20_S47_          91215    50684    32790  32790   31661
## 048-L4-20-40_S48_         119412    50107    33518  33518   32534
## 049-W3-Compost_S49_       180030    78201    58381  58381   52148
## 050-W4-0-28_S50_          104694    18856     9956   9956    9956
## 051-W4-28-45_S51_         247394   151323   128651 128651  119735
## 052-W4-45-55_S52_         115897    75634    62731  62731   61321
## 053-W5-0-35_S53_          103001    54100    37307  37307   36937
## 054-W5-35-65_S54_         105301    69483    54655  54655   51766
## 055-W7-0-15_S55_           89996    48631    33299  33299   32938
## 056-W7-15-30_S56_          66065    21643    13343  13343   13343
## 057-P1-0-30_S57_           89999    57426    41822  41822   41207
## 058-P1-30-45_S58_         109185    15843     8812   8812    8812
## 059-P1-45-55_S59_          92847    61590    51573  51573   50559
## 060-P2-0-20_S60_          107565    53905    36050  36050   35670
## 061-P2-20-45_S61_         176157    42505    23826  23826   23486
## 062-P2-45-55_S62_         136875    73794    57793  57793   55732
## 063-P4-0-25_S63_          146085    56463    34722  34722   34268
## 064-P4-25-35_S64_         153343    95555    73081  73081   68963
## 065-P4-35-50_S65_         120945    69145    50362  50362   48655
## 181-Sp11-Cr31-0-20_S66_   107462    27633    10675  10675   10675
## 182-Sp11-Cr32-0-16_S67_    88842    21116     7352   7352    7352
## 183-Sp11-Cr33-0-20_S68_    48207    17300     6739   6739    6739
## 184-Sp12-Cr34-0-16_S69_    91437    57258    37259  37259   37078
## 185-Sp12-Cr35-0-18_S70_   102991    61552    39530  39530   38480
## 186-Sp12-Cr36-0-20_S71_    74281    17619     6050   6050    6050
## 187-Sp13-Cr37-0-20_S72_    87916    35459    16580  16580   16570
## 188-Sp13-Cr38-0-20_S73_    92749    48058    30511  30511   30290
## 189-Sp13-Cr39-0-19_S74_   120274    64100    43911  43911   43536
## 190-Sp14-Cr40-0-17_S75_   147563    19324     7700   7700    7700
## 191-Sp14-Cr41-0-18_S76_   123615    76067    58444  58444   57514
## 192-Sp14-Cr42-0-20_S77_    95005    57765    40490  40490   40337
## 193-Sp15-Cr43-0-18_S78_   117756    55650    40950  40950   40238
## 194-Sp15-Cr44-0-17_S79_   144523    84487    71381  71381   68362
## 195-Sp15-Cr45-0-20_S80_   108008    49459    32985  32985   32567
## 196-Sp16-Cr46-0-20_S81_    82746    25675     8942   8942    8942
## 197-Sp16-Cr47-0-17_S82_   107765    64753    42508  42508   42356
## 198-Sp16-Cr48-0-20_S83_   115552    33125    14483  14483   14483
## 199-Sp17-Cr49-0-20_S84_   120659    64605    52183  52183   50940
## 200-Sp17-Cr50-0-18_S85_   161957    82546    62933  62933   59863
```

```
## 201-Sp17-Cr51-0-18_S86_  109479    10752     4159   4159    4159
## 202-Sp18-Cr52-0-18_S87_  113065    72492    49565  49565   49262
## 203-Sp18-Cr53-0-19_S88_   92639    33398    15743  15743   15715
## 204-Sp18-Cr54-0-20_S89_   95422    59781    38645  38645   38431
## 205-Sp19-Cr55-0-20_S90_  204505   101955    73534  73534   71731
## 206-Sp19-Cr56-0-18_S91_   98520     7220     2276   2276    2276
## 207-Sp19-Cr57-0-18_S92_   97994    36745    19184  19184   19184
## 208-Sp20-Cr58-0-20_S93_   81724    36655    17796  17796   17796
## 209-Sp20-Cr59-0-19_S94_  148052    84565    54466  54466   53727
## 210-Sp20-Cr60-0-20_S95_   66841    40391    25375  25375   25288
## 211-Sp1-Cr1-0-20_S96_    134100    15037     6086   6086    6086
## 212-Sp1-Cr2-0-20_S97_     66264    14952     7640   7640    7537
## 213-Sp1-Cr3-0-20_S98_     71197    33638    23553  23553   19873
## 214-Sp2-Cr4-0-20_S99_     64668    32062    19681  19681   19681
## 215-Sp2-Cr5-0-20_S100_    59680     9677     3727   3727    3727
## 216-Sp2-Cr6-0-20_S101_    83270    51845    41388  41388   41287
## 217-Sp3-Cr7-0-20_S102_    73671    46034    29507  29507   29332
## 218-Sp3-Cr8-0-20_S103_    97858    53712    31869  31869   31707
## 219-Sp3-Cr9-0-20_S104_    97545    61866    40989  40989   40599
## 220-Sp4-Cr10-0-20_S105_   71516    34617    18555  18555   18555
## 221-Sp4-Cr11-0-20_S106_   63790    17585     6625   6625    6625
## 222-Sp4-Cr12-0-20_S107_  117411    78366    57338  57338   56779
## 223-Sp5-Cr13-0-20_S108_  108733    20176     6204   6204    6204
## 224-Sp5-Cr14-0-20_S109_   90829    58242    40371  40371   40169
## 225-Sp5-Cr15-0-20_S110_   64613    28212    13220  13220   13143
## 226-Sp6-Cr16-0-15_S111_   82006    19304     7464   7464    7464
## 227-Sp6-Cr17-0-20_S112_   76389    49052    30022  30022   29835
## 228-Sp6-Cr18-0-20_S113_   90349    34880    16346  16346   16247
## 229-Sp7-Cr19-0-20_S114_  115919    64710    51544  51544   50690
## 230-Sp7-Cr20-0-20_S115_   74230    18776    11523  11523   11499
## 231-Sp7-Cr21-0-13_S116_   75045    12521     5294   5294    5294
## 232-Sp8-Cr22-0-20_S117_  141073    69721    45560  45560   45482
## 233-Sp8-Cr23-0-20_S118_  110558    45709    26455  26455   26417
## 234-Sp8-Cr24-0-20_S119_   61465    37231    24321  24321   24273
## 235-Sp9-Cr25-0-15_S120_   83784    41544    22254  22254   22165
## 236-Sp9-Cr26-0-20_S121_   80446    48274    32007  32007   31862
## 237-Sp9-Cr27-0-15_S122_   80498    21827     8729   8729    8729
## 238-Sp10-Cr28-0-20_S123_  75603    36729    24170  24170   24160
## 239-Sp10-Cr29-0-15_S124_  84146    43982    30468  30468   30468
## 240-Sp10-Cr30-0-20_S125_  85612    12867     4856   4856    4856
## 241-S-0-30-Dry_S126_      81180    46857    39598  39598   39224
```

```
# Import final otu table
OTUs = readRDS("../2020-03-12-hatch-final-data-merged/reads/otutab.nochim.rds")
# Change rows and columns so taxa are rows
OTUs = t(OTUs)
# Import as phyloseq object table
otutab = otu_table(OTUs, taxa_are_rows=TRUE)
head(otutab)
```

```
## OTU Table:          [6 taxa and 126 samples]
##                      taxa are rows
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
```

```
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
```

```
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
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## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
```

```
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
```

```
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCA
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCA
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCAT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCC
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCA
```

```
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCAT
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCGG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCAT
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCATT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCCT
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCAG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCAT
##
## CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATCTGCGG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGAGCTTAACTCCGAAACTGCAT
## GTAGGGGGCAAGCGTTATCCAGATTTACTGGGCGTAAAGCGCGTGTAGGCGGCTGGTTAGGTGTGATGTGAAATCTTCCGGCTCAACCGGAAAACTGCATT
## CGAAGGGGGCTAGCGTTGCTCGGAATCACTGGGCGTAAAGGGTGCGTAGGCGGGTCTTTAAGTCAGGGGTGAAATCCTGGAGCTCAACTCCAGAACTGCCT
## CGTAGGTGGCAAGCGTTGTCCGGATTTACTGGGCGTAAAGAGCGCGCAGGCGGTCGTTCAAGTCGCGTGTGAAAGCCCCCGGCTCAACTGGGGAGGGTCAG
## CAGAGGTCTCAAGCGTTGTTCGGATTCATTGGGCGTAAAGGGTGCGTAGGCGGCGCGGTAAGTCGGGTGTGAAATCTCGGGGCTTAACTCCGAAACTGCAT
```

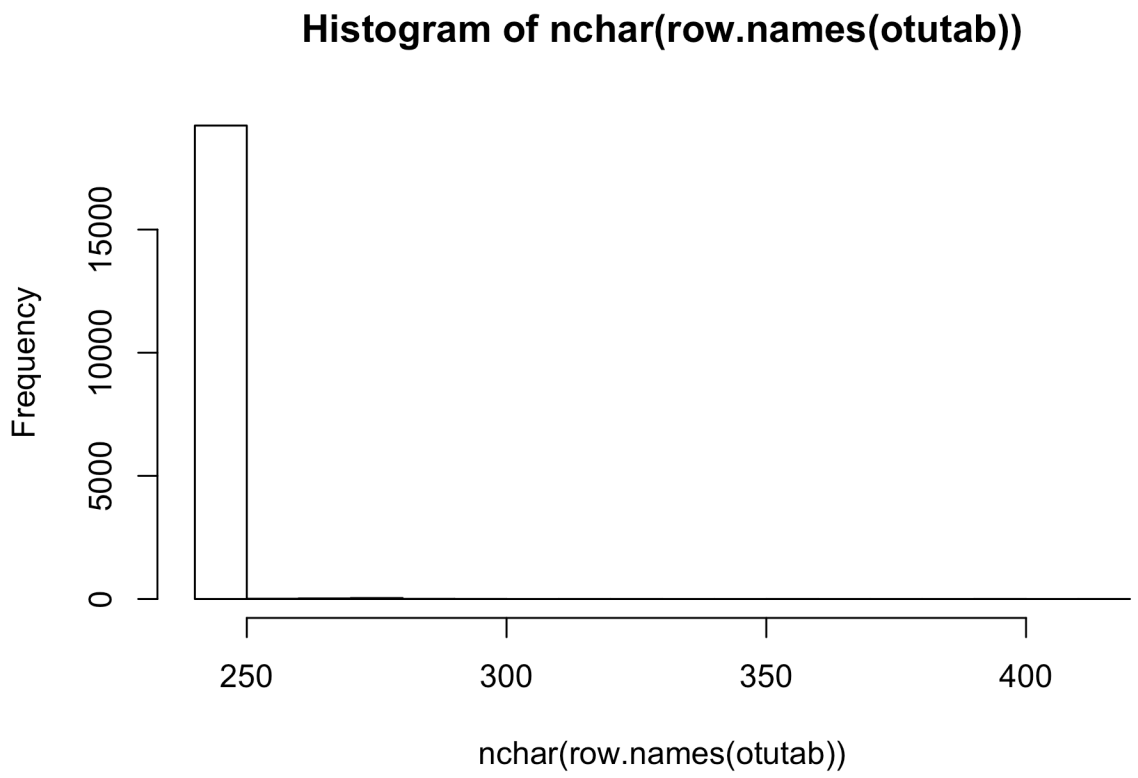
```
# Look at lowest-abundance samples
head(sort(sample_sums(otutab)))
```

```
##        024-M2-24-38_S24__F_filt.fastq.gz
##                                     1360
##  206-Sp19-Cr56-0-18_S91__F_filt.fastq.gz
##                                     2276
##   215-Sp2-Cr5-0-20_S100__F_filt.fastq.gz
##                                     3727
##  201-Sp17-Cr51-0-18_S86__F_filt.fastq.gz
##                                     4159
## 240-Sp10-Cr30-0-20_S125__F_filt.fastq.gz
##                                     4856
##  231-Sp7-Cr21-0-13_S116__F_filt.fastq.gz
##                                     5294
```

```
name = row.names(otutab)[1]
name
```

```
## [1] "CGTAGGGCGCAAGCGTTATCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCCGTGAAAGTCCGGGGCTCAACTCCGGATC
```

```
hist(nchar(row.names(otutab)))
```




```
colnames(otutab)
```

```
##   [1] "001-K1-0-17_S1__F_filt.fastq.gz"
##   [2] "002-K1-17-45_S2__F_filt.fastq.gz"
##   [3] "003-K1-45-60_S3__F_filt.fastq.gz"
##   [4] "004-K2-Muck_S4__F_filt.fastq.gz"
##   [5] "005-K3-0-15_S5__F_filt.fastq.gz"
##   [6] "006-K3-15-35_S6__F_filt.fastq.gz"
##   [7] "007-K3-35-50_S7__F_filt.fastq.gz"
##   [8] "008-K4-0-15_S8__F_filt.fastq.gz"
##   [9] "009-K4-15-30_S9__F_filt.fastq.gz"
##  [10] "010-K4-30-50_S10__F_filt.fastq.gz"
##  [11] "011-R1-0-27_S11__F_filt.fastq.gz"
##  [12] "012-R1-27-50_S12__F_filt.fastq.gz"
##  [13] "013-R1-50-70_S13__F_filt.fastq.gz"
##  [14] "014-R2-0-30_S14__F_filt.fastq.gz"
##  [15] "015-R2-30-45_S15__F_filt.fastq.gz"
##  [16] "016-R2-45-60_S16__F_filt.fastq.gz"
##  [17] "017-R2-60-100_S17__F_filt.fastq.gz"
##  [18] "018-R3-0-20_S18__F_filt.fastq.gz"
##  [19] "019-R3-20-30_S19__F_filt.fastq.gz"
##  [20] "020-M1-0-31_S20__F_filt.fastq.gz"
##  [21] "021-M1-31-50_S21__F_filt.fastq.gz"
##  [22] "022-M1-50-70_S22__F_filt.fastq.gz"
##  [23] "023-M2-0-24_S23__F_filt.fastq.gz"
##  [24] "024-M2-24-38_S24__F_filt.fastq.gz"
```

```
##  [25] "025-M2-38-55_S25__F_filt.fastq.gz"
##  [26] "026-M3-0-15_S26__F_filt.fastq.gz"
##  [27] "027-M3-15-30_S27__F_filt.fastq.gz"
##  [28] "028-S-0-30_S28__F_filt.fastq.gz"
##  [29] "029-S-30-60_S29__F_filt.fastq.gz"
##  [30] "030-H1-0-30_S30__F_filt.fastq.gz"
##  [31] "031-H1-30-40_S31__F_filt.fastq.gz"
##  [32] "032-H1-40-60_S32__F_filt.fastq.gz"
##  [33] "033-H2-0-30_S33__F_filt.fastq.gz"
##  [34] "034-H2-30-60_S34__F_filt.fastq.gz"
##  [35] "035-A249-0-35_S35__F_filt.fastq.gz"
##  [36] "036-A249-35-60_S36__F_filt.fastq.gz"
##  [37] "037-A341-0-33_S37__F_filt.fastq.gz"
##  [38] "038-A341-33-55_S38__F_filt.fastq.gz"
##  [39] "039-A341-55-75_S39__F_filt.fastq.gz"
##  [40] "040-A341-75-85_S40__F_filt.fastq.gz"
##  [41] "041-L2-0-23_S41__F_filt.fastq.gz"
##  [42] "042-L2-23-45_S42__F_filt.fastq.gz"
##  [43] "043-L3-0-12_S43__F_filt.fastq.gz"
##  [44] "044-L3-12-20_S44__F_filt.fastq.gz"
##  [45] "045-L3-20-40_S45__F_filt.fastq.gz"
##  [46] "046-L4-0-10_S46__F_filt.fastq.gz"
##  [47] "047-L4-10-20_S47__F_filt.fastq.gz"
##  [48] "048-L4-20-40_S48__F_filt.fastq.gz"
##  [49] "049-W3-Compost_S49__F_filt.fastq.gz"
##  [50] "050-W4-0-28_S50__F_filt.fastq.gz"
##  [51] "051-W4-28-45_S51__F_filt.fastq.gz"
##  [52] "052-W4-45-55_S52__F_filt.fastq.gz"
##  [53] "053-W5-0-35_S53__F_filt.fastq.gz"
##  [54] "054-W5-35-65_S54__F_filt.fastq.gz"
##  [55] "055-W7-0-15_S55__F_filt.fastq.gz"
##  [56] "056-W7-15-30_S56__F_filt.fastq.gz"
##  [57] "057-P1-0-30_S57__F_filt.fastq.gz"
##  [58] "058-P1-30-45_S58__F_filt.fastq.gz"
##  [59] "059-P1-45-55_S59__F_filt.fastq.gz"
##  [60] "060-P2-0-20_S60__F_filt.fastq.gz"
##  [61] "061-P2-20-45_S61__F_filt.fastq.gz"
##  [62] "062-P2-45-55_S62__F_filt.fastq.gz"
##  [63] "063-P4-0-25_S63__F_filt.fastq.gz"
##  [64] "064-P4-25-35_S64__F_filt.fastq.gz"
##  [65] "065-P4-35-50_S65__F_filt.fastq.gz"
##  [66] "181-Sp11-Cr31-0-20_S66__F_filt.fastq.gz"
##  [67] "182-Sp11-Cr32-0-16_S67__F_filt.fastq.gz"
##  [68] "183-Sp11-Cr33-0-20_S68__F_filt.fastq.gz"
##  [69] "184-Sp12-Cr34-0-16_S69__F_filt.fastq.gz"
##  [70] "185-Sp12-Cr35-0-18_S70__F_filt.fastq.gz"
##  [71] "186-Sp12-Cr36-0-20_S71__F_filt.fastq.gz"
##  [72] "187-Sp13-Cr37-0-20_S72__F_filt.fastq.gz"
##  [73] "188-Sp13-Cr38-0-20_S73__F_filt.fastq.gz"
##  [74] "189-Sp13-Cr39-0-19_S74__F_filt.fastq.gz"
##  [75] "190-Sp14-Cr40-0-17_S75__F_filt.fastq.gz"
##  [76] "191-Sp14-Cr41-0-18_S76__F_filt.fastq.gz"
##  [77] "192-Sp14-Cr42-0-20_S77__F_filt.fastq.gz"
##  [78] "193-Sp15-Cr43-0-18_S78__F_filt.fastq.gz"
```

```
##  [79] "194-Sp15-Cr44-0-17_S79__F_filt.fastq.gz"
##  [80] "195-Sp15-Cr45-0-20_S80__F_filt.fastq.gz"
##  [81] "196-Sp16-Cr46-0-20_S81__F_filt.fastq.gz"
##  [82] "197-Sp16-Cr47-0-17_S82__F_filt.fastq.gz"
##  [83] "198-Sp16-Cr48-0-20_S83__F_filt.fastq.gz"
##  [84] "199-Sp17-Cr49-0-20_S84__F_filt.fastq.gz"
##  [85] "200-Sp17-Cr50-0-18_S85__F_filt.fastq.gz"
##  [86] "201-Sp17-Cr51-0-18_S86__F_filt.fastq.gz"
##  [87] "202-Sp18-Cr52-0-18_S87__F_filt.fastq.gz"
##  [88] "203-Sp18-Cr53-0-19_S88__F_filt.fastq.gz"
##  [89] "204-Sp18-Cr54-0-20_S89__F_filt.fastq.gz"
##  [90] "205-Sp19-Cr55-0-20_S90__F_filt.fastq.gz"
##  [91] "206-Sp19-Cr56-0-18_S91__F_filt.fastq.gz"
##  [92] "207-Sp19-Cr57-0-18_S92__F_filt.fastq.gz"
##  [93] "208-Sp20-Cr58-0-20_S93__F_filt.fastq.gz"
##  [94] "209-Sp20-Cr59-0-19_S94__F_filt.fastq.gz"
##  [95] "210-Sp20-Cr60-0-20_S95__F_filt.fastq.gz"
##  [96] "211-Sp1-Cr1-0-20_S96__F_filt.fastq.gz"
##  [97] "212-Sp1-Cr2-0-20_S97__F_filt.fastq.gz"
##  [98] "213-Sp1-Cr3-0-20_S98__F_filt.fastq.gz"
##  [99] "214-Sp2-Cr4-0-20_S99__F_filt.fastq.gz"
## [100] "215-Sp2-Cr5-0-20_S100__F_filt.fastq.gz"
## [101] "216-Sp2-Cr6-0-20_S101__F_filt.fastq.gz"
## [102] "217-Sp3-Cr7-0-20_S102__F_filt.fastq.gz"
## [103] "218-Sp3-Cr8-0-20_S103__F_filt.fastq.gz"
## [104] "219-Sp3-Cr9-0-20_S104__F_filt.fastq.gz"
## [105] "220-Sp4-Cr10-0-20_S105__F_filt.fastq.gz"
## [106] "221-Sp4-Cr11-0-20_S106__F_filt.fastq.gz"
## [107] "222-Sp4-Cr12-0-20_S107__F_filt.fastq.gz"
## [108] "223-Sp5-Cr13-0-20_S108__F_filt.fastq.gz"
## [109] "224-Sp5-Cr14-0-20_S109__F_filt.fastq.gz"
## [110] "225-Sp5-Cr15-0-20_S110__F_filt.fastq.gz"
## [111] "226-Sp6-Cr16-0-15_S111__F_filt.fastq.gz"
## [112] "227-Sp6-Cr17-0-20_S112__F_filt.fastq.gz"
## [113] "228-Sp6-Cr18-0-20_S113__F_filt.fastq.gz"
## [114] "229-Sp7-Cr19-0-20_S114__F_filt.fastq.gz"
## [115] "230-Sp7-Cr20-0-20_S115__F_filt.fastq.gz"
## [116] "231-Sp7-Cr21-0-13_S116__F_filt.fastq.gz"
## [117] "232-Sp8-Cr22-0-20_S117__F_filt.fastq.gz"
## [118] "233-Sp8-Cr23-0-20_S118__F_filt.fastq.gz"
## [119] "234-Sp8-Cr24-0-20_S119__F_filt.fastq.gz"
## [120] "235-Sp9-Cr25-0-15_S120__F_filt.fastq.gz"
## [121] "236-Sp9-Cr26-0-20_S121__F_filt.fastq.gz"
## [122] "237-Sp9-Cr27-0-15_S122__F_filt.fastq.gz"
## [123] "238-Sp10-Cr28-0-20_S123__F_filt.fastq.gz"
## [124] "239-Sp10-Cr29-0-15_S124__F_filt.fastq.gz"
## [125] "240-Sp10-Cr30-0-20_S125__F_filt.fastq.gz"
## [126] "241-S-0-30-Dry_S126__F_filt.fastq.gz"
```

```
# The sample names have suffixes appended to them - we just want sample IDs
# Get names
names = colnames(otutab)
# Remove last 17 characters
newnames = gsub('.{17}$', '', names)
```

```
# Check out names
newnames
```

```
##   [1] "001-K1-0-17_S1"          "002-K1-17-45_S2"
##   [3] "003-K1-45-60_S3"         "004-K2-Muck_S4"
##   [5] "005-K3-0-15_S5"          "006-K3-15-35_S6"
##   [7] "007-K3-35-50_S7"         "008-K4-0-15_S8"
##   [9] "009-K4-15-30_S9"         "010-K4-30-50_S10"
##  [11] "011-R1-0-27_S11"         "012-R1-27-50_S12"
##  [13] "013-R1-50-70_S13"        "014-R2-0-30_S14"
##  [15] "015-R2-30-45_S15"        "016-R2-45-60_S16"
##  [17] "017-R2-60-100_S17"       "018-R3-0-20_S18"
##  [19] "019-R3-20-30_S19"        "020-M1-0-31_S20"
##  [21] "021-M1-31-50_S21"        "022-M1-50-70_S22"
##  [23] "023-M2-0-24_S23"         "024-M2-24-38_S24"
##  [25] "025-M2-38-55_S25"        "026-M3-0-15_S26"
##  [27] "027-M3-15-30_S27"        "028-S-0-30_S28"
##  [29] "029-S-30-60_S29"         "030-H1-0-30_S30"
##  [31] "031-H1-30-40_S31"        "032-H1-40-60_S32"
##  [33] "033-H2-0-30_S33"         "034-H2-30-60_S34"
##  [35] "035-A249-0-35_S35"       "036-A249-35-60_S36"
##  [37] "037-A341-0-33_S37"       "038-A341-33-55_S38"
##  [39] "039-A341-55-75_S39"      "040-A341-75-85_S40"
##  [41] "041-L2-0-23_S41"         "042-L2-23-45_S42"
##  [43] "043-L3-0-12_S43"         "044-L3-12-20_S44"
##  [45] "045-L3-20-40_S45"        "046-L4-0-10_S46"
##  [47] "047-L4-10-20_S47"        "048-L4-20-40_S48"
##  [49] "049-W3-Compost_S49"      "050-W4-0-28_S50"
##  [51] "051-W4-28-45_S51"        "052-W4-45-55_S52"
##  [53] "053-W5-0-35_S53"         "054-W5-35-65_S54"
##  [55] "055-W7-0-15_S55"         "056-W7-15-30_S56"
##  [57] "057-P1-0-30_S57"         "058-P1-30-45_S58"
##  [59] "059-P1-45-55_S59"        "060-P2-0-20_S60"
##  [61] "061-P2-20-45_S61"        "062-P2-45-55_S62"
##  [63] "063-P4-0-25_S63"         "064-P4-25-35_S64"
##  [65] "065-P4-35-50_S65"        "181-Sp11-Cr31-0-20_S66"
##  [67] "182-Sp11-Cr32-0-16_S67"  "183-Sp11-Cr33-0-20_S68"
##  [69] "184-Sp12-Cr34-0-16_S69"  "185-Sp12-Cr35-0-18_S70"
##  [71] "186-Sp12-Cr36-0-20_S71"  "187-Sp13-Cr37-0-20_S72"
##  [73] "188-Sp13-Cr38-0-20_S73"  "189-Sp13-Cr39-0-19_S74"
##  [75] "190-Sp14-Cr40-0-17_S75"  "191-Sp14-Cr41-0-18_S76"
##  [77] "192-Sp14-Cr42-0-20_S77"  "193-Sp15-Cr43-0-18_S78"
##  [79] "194-Sp15-Cr44-0-17_S79"  "195-Sp15-Cr45-0-20_S80"
##  [81] "196-Sp16-Cr46-0-20_S81"  "197-Sp16-Cr47-0-17_S82"
##  [83] "198-Sp16-Cr48-0-20_S83"  "199-Sp17-Cr49-0-20_S84"
##  [85] "200-Sp17-Cr50-0-18_S85"  "201-Sp17-Cr51-0-18_S86"
##  [87] "202-Sp18-Cr52-0-18_S87"  "203-Sp18-Cr53-0-19_S88"
##  [89] "204-Sp18-Cr54-0-20_S89"  "205-Sp19-Cr55-0-20_S90"
##  [91] "206-Sp19-Cr56-0-18_S91"  "207-Sp19-Cr57-0-18_S92"
##  [93] "208-Sp20-Cr58-0-20_S93"  "209-Sp20-Cr59-0-19_S94"
##  [95] "210-Sp20-Cr60-0-20_S95"  "211-Sp1-Cr1-0-20_S96"
##  [97] "212-Sp1-Cr2-0-20_S97"    "213-Sp1-Cr3-0-20_S98"
##  [99] "214-Sp2-Cr4-0-20_S99"    "215-Sp2-Cr5-0-20_S100"
## [101] "216-Sp2-Cr6-0-20_S101"   "217-Sp3-Cr7-0-20_S102"
```

```
## [103] "218-Sp3-Cr8-0-20_S103"   "219-Sp3-Cr9-0-20_S104"
## [105] "220-Sp4-Cr10-0-20_S105"  "221-Sp4-Cr11-0-20_S106"
## [107] "222-Sp4-Cr12-0-20_S107"  "223-Sp5-Cr13-0-20_S108"
## [109] "224-Sp5-Cr14-0-20_S109"  "225-Sp5-Cr15-0-20_S110"
## [111] "226-Sp6-Cr16-0-15_S111"  "227-Sp6-Cr17-0-20_S112"
## [113] "228-Sp6-Cr18-0-20_S113"  "229-Sp7-Cr19-0-20_S114"
## [115] "230-Sp7-Cr20-0-20_S115"  "231-Sp7-Cr21-0-13_S116"
## [117] "232-Sp8-Cr22-0-20_S117"  "233-Sp8-Cr23-0-20_S118"
## [119] "234-Sp8-Cr24-0-20_S119"  "235-Sp9-Cr25-0-15_S120"
## [121] "236-Sp9-Cr26-0-20_S121"  "237-Sp9-Cr27-0-15_S122"
## [123] "238-Sp10-Cr28-0-20_S123" "239-Sp10-Cr29-0-15_S124"
## [125] "240-Sp10-Cr30-0-20_S125" "241-S-0-30-Dry_S126"
```

```
# Assign new names to samples
colnames(otutab) = newnames

# Same thing if we wanted to simplify OTU names to IDs
# Instead of sequences (although that's useful)
otunames=row.names(otutab)
length(otunames)
```

```
## [1] 19313
```

```
newotunames = paste("OTU",rep(1:length(otunames)),sep="")
head(newotunames)
```

```
## [1] "OTU1" "OTU2" "OTU3" "OTU4" "OTU5" "OTU6"
```

```
row.names(otutab) = newotunames
head(otutab)
```

```
## OTU Table:          [6 taxa and 126 samples]
##                      taxa are rows
##      001-K1-0-17_S1 002-K1-17-45_S2 003-K1-45-60_S3 004-K2-Muck_S4
## OTU1              0               0              49              0
## OTU2            461             369               0              0
## OTU3            157             522             429              0
## OTU4            482             159               0              0
## OTU5              0               0               0              0
## OTU6            181             247             271              0
##      005-K3-0-15_S5 006-K3-15-35_S6 007-K3-35-50_S7 008-K4-0-15_S8
## OTU1            115               0              25              0
## OTU2            546             509             983              0
## OTU3             64             343             452              0
## OTU4            452             227             313              0
## OTU5              0               0              24              0
## OTU6            269             429            1184              0
##      009-K4-15-30_S9 010-K4-30-50_S10 011-R1-0-27_S11 012-R1-27-50_S12
## OTU1               0                0            1096              635
## OTU2               0              156             205               84
## OTU3             635             1162             184             1659
## OTU4               0               75             262                0
## OTU5               0                0               0                0
## OTU6               0                0               0              198
##      013-R1-50-70_S13 014-R2-0-30_S14 015-R2-30-45_S15 016-R2-45-60_S16
## OTU1              225             1303              730              349
```

```
## OTU2                0                0              233                0
## OTU3             1094                0              984              332
## OTU4                0              167               71                0
## OTU5                0              333              193                0
## OTU6                0                0             1665              456
##      017-R2-60-100_S17 018-R3-0-20_S18 019-R3-20-30_S19 020-M1-0-31_S20
## OTU1              1483              426                0              216
## OTU2                 0              211               64              246
## OTU3               838               45             1711                6
## OTU4                 0               87                0              112
## OTU5                 0               72                0              536
## OTU6               555                0               57                0
##      021-M1-31-50_S21 022-M1-50-70_S22 023-M2-0-24_S23 024-M2-24-38_S24
## OTU1               89              128              149                0
## OTU2              298              258              105                0
## OTU3             1691             5550                5               72
## OTU4              108              183               81                0
## OTU5              279               53              329               98
## OTU6                0              248                0                0
##      025-M2-38-55_S25 026-M3-0-15_S26 027-M3-15-30_S27 028-S-0-30_S28
## OTU1               39              115              656             51
## OTU2                0              424              644            436
## OTU3              904               15             1119             80
## OTU4                0              201              119            240
## OTU5               52              547              457              0
## OTU6                0                0              671            144
##      029-S-30-60_S29 030-H1-0-30_S30 031-H1-30-40_S31 032-H1-40-60_S32
## OTU1              71              354              158              129
## OTU2            1128                0              140              902
## OTU3            1042                0                0                0
## OTU4             181               87               17              105
## OTU5               0              999              163               31
## OTU6             574                0              106              704
##      033-H2-0-30_S33 034-H2-30-60_S34 035-A249-0-35_S35 036-A249-35-60_S36
## OTU1              96              287              462                95
## OTU2             119              497              322               315
## OTU3               0               15                0               311
## OTU4              60               82              195               149
## OTU5             138               71             1203               173
## OTU6               0              296              405               479
##      037-A341-0-33_S37 038-A341-33-55_S38 039-A341-55-75_S39 040-A341-75-85_S40
## OTU1               305               119               232                64
## OTU2               157               695               389               220
## OTU3                 0               126              1302              2972
## OTU4                88                 0               133                43
## OTU5               682               312               443               129
## OTU6                 0               573               681               256
##      041-L2-0-23_S41 042-L2-23-45_S42 043-L3-0-12_S43 044-L3-12-20_S44
## OTU1              77              174                0              130
## OTU2             788             2370              317              830
## OTU3               0              240                0               14
## OTU4             133              269              121              216
## OTU5             272              166              180              561
## OTU6             263              788                0              483
```

```
##      045-L3-20-40_S45 046-L4-0-10_S46 047-L4-10-20_S47 048-L4-20-40_S48
## OTU1               71              27                0               56
## OTU2              674            1202             2267              864
## OTU3              614               0               16              343
## OTU4              265             235              314              367
## OTU5              397             186              303              196
## OTU6              606              32              720              522
##      049-W3-Compost_S49 050-W4-0-28_S50 051-W4-28-45_S51 052-W4-45-55_S52
## OTU1                  0               0              970              257
## OTU2                  0             324             1291             1013
## OTU3                  0               0             2177             1017
## OTU4                  0               0              388              222
## OTU5                  0               0              324              477
## OTU6                  0               0             1538              600
##      053-W5-0-35_S53 054-W5-35-65_S54 055-W7-0-15_S55 056-W7-15-30_S56
## OTU1             367              31             180                0
## OTU2             547            1871             978              459
## OTU3              32             117              94              917
## OTU4             212             210             152               66
## OTU5             430              49             198                0
## OTU6             293            1051             795              542
##      057-P1-0-30_S57 058-P1-30-45_S58 059-P1-45-55_S59 060-P2-0-20_S60
## OTU1             665             135              875              486
## OTU2             548               0               71               77
## OTU3               0              28              130                0
## OTU4              91             105               60              157
## OTU5             588               0               80              447
## OTU6               0               0              390                0
##      061-P2-20-45_S61 062-P2-45-55_S62 063-P4-0-25_S63 064-P4-25-35_S64
## OTU1              192              462              160              335
## OTU2              136                0              395              273
## OTU3                0                0                0                0
## OTU4              124              129              154              244
## OTU5                0              159              497              319
## OTU6                0                0                0                0
##      065-P4-35-50_S65 181-Sp11-Cr31-0-20_S66 182-Sp11-Cr32-0-16_S67
## OTU1              211                    307                    195
## OTU2               79                    231                    242
## OTU3                0                      0                      0
## OTU4              158                    124                    157
## OTU5              256                    204                    170
## OTU6                0                      0                      0
##      183-Sp11-Cr33-0-20_S68 184-Sp12-Cr34-0-16_S69 185-Sp12-Cr35-0-18_S70
## OTU1                    785                    975                    685
## OTU2                    151                    267                    240
## OTU3                      0                      0                      0
## OTU4                    204                    275                   2352
## OTU5                     81                    461                    380
## OTU6                      0                      0                      0
##      186-Sp12-Cr36-0-20_S71 187-Sp13-Cr37-0-20_S72 188-Sp13-Cr38-0-20_S73
## OTU1                    744                    423                   1472
## OTU2                    171                    279                    395
## OTU3                      0                      0                     62
## OTU4                    318                    324                    363
```

```
##      189-Sp13-Cr39-0-19_S74 190-Sp14-Cr40-0-17_S75 191-Sp14-Cr41-0-18_S76
## OTU1                   1393                    121                    730
## OTU2                    467                      0                    120
## OTU3                     72                     43                    115
## OTU4                    361                    181                    228
## OTU5                    173                      0                      0
## OTU6                    129                      0                      0
##      192-Sp14-Cr42-0-20_S77 193-Sp15-Cr43-0-18_S78 194-Sp15-Cr44-0-17_S79
## OTU1                    635                   1568                   1439
## OTU2                    179                      0                      0
## OTU3                    140                      0                    479
## OTU4                    359                    376                    235
## OTU5                     47                      0                      0
## OTU6                      0                      0                      0
##      195-Sp15-Cr45-0-20_S80 196-Sp16-Cr46-0-20_S81 197-Sp16-Cr47-0-17_S82
## OTU1                   1037                    321                   1055
## OTU2                      0                      0                    348
## OTU3                      0                      0                      0
## OTU4                    688                    175                    348
## OTU5                     50                    138                    323
## OTU6                      0                      0                    141
##      198-Sp16-Cr48-0-20_S83 199-Sp17-Cr49-0-20_S84 200-Sp17-Cr50-0-18_S85
## OTU1                    397                    492                   1223
## OTU2                    192                      0                      0
## OTU3                      0                    281                    101
## OTU4                    516                    166                   1959
## OTU5                    130                      0                     90
## OTU6                      0                      0                      0
##      201-Sp17-Cr51-0-18_S86 202-Sp18-Cr52-0-18_S87 203-Sp18-Cr53-0-19_S88
## OTU1                    482                   1306                    857
## OTU2                      0                    236                    271
## OTU3                     83                      0                      0
## OTU4                    164                    278                    279
## OTU5                      0                    553                    300
## OTU6                      0                    107                      0
##      204-Sp18-Cr54-0-20_S89 205-Sp19-Cr55-0-20_S90 206-Sp19-Cr56-0-18_S91
## OTU1                   1367                   1716                    113
## OTU2                    227                    162                      0
## OTU3                      0                    242                     51
## OTU4                    347                    446                      0
## OTU5                    384                      0                      0
## OTU6                     83                      0                      0
##      207-Sp19-Cr57-0-18_S92 208-Sp20-Cr58-0-20_S93 209-Sp20-Cr59-0-19_S94
## OTU1                   1179                    997                   1546
## OTU2                      0                    314                    323
## OTU3                     41                      0                     70
## OTU4                      0                    341                    711
## OTU5                      0                    315                    408
## OTU6                      0                      0                    256
##      210-Sp20-Cr60-0-20_S95 211-Sp1-Cr1-0-20_S96 212-Sp1-Cr2-0-20_S97
## OTU1                    878                   99                    96
## OTU2                    225                    0                     0
```

```
## OTU3                    0                   0                   0
## OTU4                  181                 127                2578
## OTU5                  204                   0                   0
## OTU6                  194                   0                   0
##      213-Sp1-Cr3-0-20_S98 214-Sp2-Cr4-0-20_S99 215-Sp2-Cr5-0-20_S100
## OTU1                  253                1054                   0
## OTU2                    0                 228                   0
## OTU3                   50                   0                   0
## OTU4                    0                 153                   0
## OTU5                    0                   0                   0
## OTU6                    0                   0                   0
##      216-Sp2-Cr6-0-20_S101 217-Sp3-Cr7-0-20_S102 218-Sp3-Cr8-0-20_S103
## OTU1                  356                1342                1200
## OTU2                  344                 240                 257
## OTU3                  150                   0                   0
## OTU4                  154                 465                 164
## OTU5                    0                 405                 375
## OTU6                  131                  99                 111
##      219-Sp3-Cr9-0-20_S104 220-Sp4-Cr10-0-20_S105 221-Sp4-Cr11-0-20_S106
## OTU1                 1786                  962                   676
## OTU2                  286                  176                   102
## OTU3                    0                    0                     0
## OTU4                  245                  303                   107
## OTU5                  425                  191                    84
## OTU6                  130                  176                     0
##      222-Sp4-Cr12-0-20_S107 223-Sp5-Cr13-0-20_S108 224-Sp5-Cr14-0-20_S109
## OTU1                  1114                  204                  1062
## OTU2                   363                  132                   313
## OTU3                    33                    0                     0
## OTU4                   336                  202                   417
## OTU5                   547                  224                   505
## OTU6                   388                    0                   228
##      225-Sp5-Cr15-0-20_S110 226-Sp6-Cr16-0-15_S111 227-Sp6-Cr17-0-20_S112
## OTU1                  908                  160                   754
## OTU2                  136                    0                   131
## OTU3                    0                    0                     0
## OTU4                  227                  196                   316
## OTU5                  204                  143                   329
## OTU6                    0                    0                    70
##      228-Sp6-Cr18-0-20_S113 229-Sp7-Cr19-0-20_S114 230-Sp7-Cr20-0-20_S115
## OTU1                  377                  296                   300
## OTU2                  233                    0                     0
## OTU3                    0                  250                     0
## OTU4                  172                  235                   250
## OTU5                  330                    0                     0
## OTU6                    0                    0                     0
##      231-Sp7-Cr21-0-13_S116 232-Sp8-Cr22-0-20_S117 233-Sp8-Cr23-0-20_S118
## OTU1                  525                 1144                   831
## OTU2                    0                  469                   484
## OTU3                   44                   93                    97
## OTU4                    0                  415                   280
## OTU5                    0                  183                    84
## OTU6                    0                  129                     0
##      234-Sp8-Cr24-0-20_S119 235-Sp9-Cr25-0-15_S120 236-Sp9-Cr26-0-20_S121
```

```
## OTU1                    312                    753                    405
## OTU2                    776                    160                    204
## OTU3                     71                      0                      0
## OTU4                    287                    190                    196
## OTU5                    169                    412                    484
## OTU6                      0                      0                      0
##      237-Sp9-Cr27-0-15_S122 238-Sp10-Cr28-0-20_S123 239-Sp10-Cr29-0-15_S124
## OTU1                    611                    353                    271
## OTU2                    126                      0                      0
## OTU3                      0                    144                     43
## OTU4                     61                    169                    319
## OTU5                    224                     35                     55
## OTU6                      0                      0                      0
##      240-Sp10-Cr30-0-20_S125 241-S-0-30-Dry_S126
## OTU1                    130                   0
## OTU2                      0                 204
## OTU3                     58                 312
## OTU4                    114                 160
## OTU5                      0                   0
## OTU6                      0                   0
```

```
# Cut off the sampling ID to match metadata
for (i in 1:length(colnames(otutab))){
  newname = strsplit(colnames(otutab[i]),"_")[[i]][1]
  colnames(otutab)[i]=newname
}

# Import sample data
samdat = read.csv("../2020-03-12-hatch-final-data-merged/source/metrology-compiled/2020-03-12-hatch-data
# samdat$Sample.ID = as.character(samdat$Sample.ID)
# samdat$Sample.ID[1:9] = paste("00",samdat$Sample.ID[1:9],sep="")
# samdat$Sample.ID[10:length(samdat$Sample.ID)] = paste("0",samdat$Sample.ID[10:length(samdat$Sample.ID

# Check we have all the same sample names now
samdat$Sample.ID[1:65] == colnames(otutab)[1:65]
```

```
##  [1] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [16] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [31] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [46] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [61] TRUE TRUE TRUE TRUE TRUE
```

```
samdat$Sample.ID[66:125] == colnames(otutab)[66:125]
```

```
##  [1] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [16] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [31] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
## [46] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
```

```
samdat = sample_data(samdat)

# Exponentiate all pH values
samdat$DNA.Extr.Hplus.After.C1 <- 10^-samdat$DNA.Extr.pH.After.C1
samdat$DNA.Extr.Hplus.After.C2 <- 10^-samdat$DNA.Extr.pH.After.C2
samdat$Lab.CO2.Hplus.one2one <- 10^-samdat$Lab.CO2.pH.one2one
samdat$Lab.CO2.Hplus.one2two <- 10^-samdat$Lab.CO2.pH.one2two
```

```
samdat$Lab.CO2.Hplus.one2three <- 10^-samdat$Lab.CO2.pH.one2three
samdat$Lab.CO2.Hplus.one2four <- 10^-samdat$Lab.CO2.pH.one2four
samdat$High.CO2.Hplus.one2one <- 10^-samdat$High.CO2.pH.one2one
samdat$High.CO2.Hplus.one2two <- 10^-samdat$High.CO2.pH.one2two
samdat$High.CO2.Hplus.one2three <- 10^-samdat$High.CO2.pH.one2three
samdat$High.CO2.Hplus.one2four <- 10^-samdat$High.CO2.pH.one2four

row.names(samdat) = samdat$Sample.ID

# Create phyloseq object
ps = phyloseq(otu_table=otutab,sample_data=samdat)

library(dplyr)

# Checking total read depth
Depth = data.frame(sample_sums(ps))
Depth$Sample.ID = row.names(Depth)
colnames(Depth)[1] = "SampleSums"
Depth = Depth %>%
  arrange(SampleSums)
head(Depth)
```

```
##   SampleSums          Sample.ID
## 1       1360       024-M2-24-38
## 2       2276 206-Sp19-Cr56-0-18
## 3       3727   215-Sp2-Cr5-0-20
## 4       4159 201-Sp17-Cr51-0-18
## 5       4856 240-Sp10-Cr30-0-20
## 6       5294  231-Sp7-Cr21-0-13
```

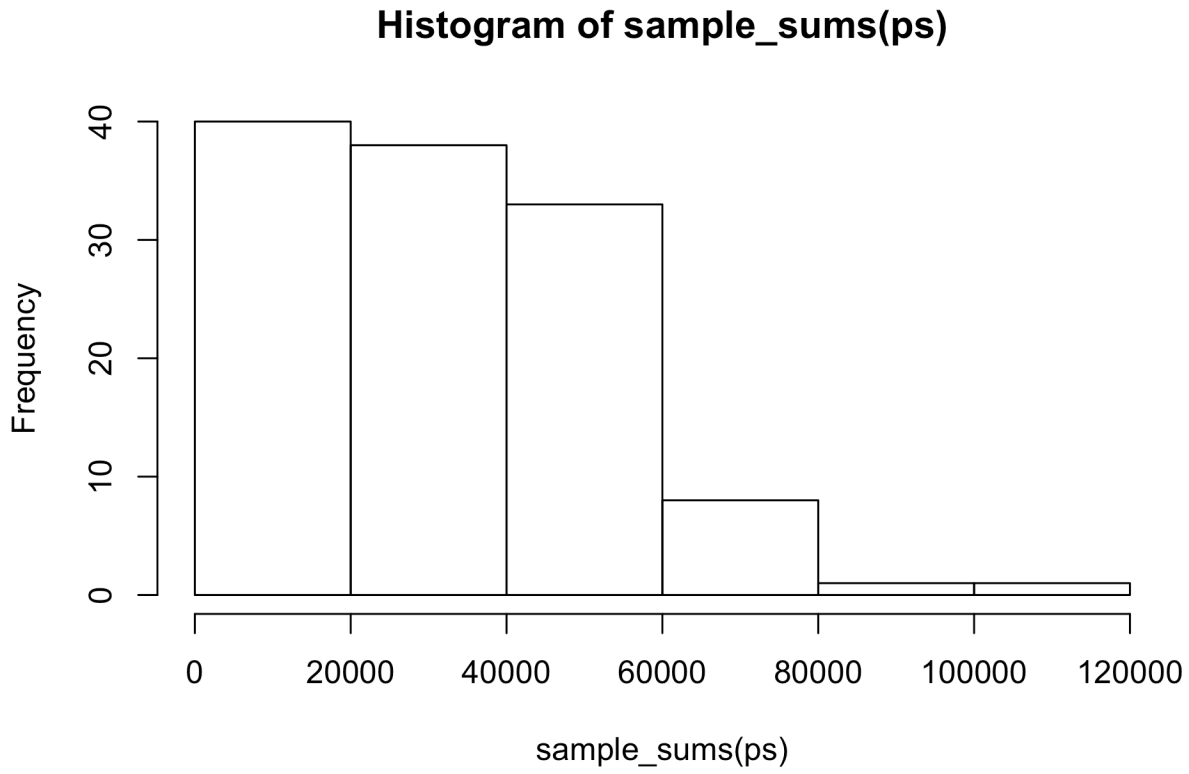
```
# It looked to me like this has already been done (no Compost or Muck)
# We don't want the Spooner samples removed anyway, I think
ps = subset_samples(ps, Sample.ID != "049-W3-Compost" & Sample.ID!="004-K2-Muck" & Sample.ID!="028-S-0-3

# Melt
ps.melt = psmelt(ps)
head(ps.melt)
```

```
##                    Sample   OTU Abundance Water.Soil.Ratio        Sample.ID
## 1796119 213-Sp1-Cr3-0-20 OTU10      6555           1-to-1 213-Sp1-Cr3-0-20
## 1139493     064-P4-25-35 OTU26      5830           1-to-1     064-P4-25-35
## 386263      022-M1-50-70  OTU3      5550           1-to-1     022-M1-50-70
## 212482      013-R1-50-70 OTU39      5320           1-to-1     013-R1-50-70
## 1139487     064-P4-25-35 OTU20      4707           1-to-1     064-P4-25-35
## 598715     035-A249-0-35 OTU12      3998           1-to-1    035-A249-0-35
##         Sample.Num Random.Num.1.to.65     Study Sample.Number
## 1796119        213          29.065274   Spooner           213
## 1139493         64           9.498628 Wisconsin            64
## 386263          22          55.041233 Wisconsin            22
## 212482          13          32.647708 Wisconsin            13
## 1139487         64           9.498628 Wisconsin            64
## 598715          35          36.643249 Wisconsin            35
##         DNA.Extr.pH.After.C1 DNA.Extr.pH.After.C2 Lab.CO2.pH.one2one
## 1796119                9.174                8.090               5.39
```

```
## 1139493               9.071               7.880              6.83
## 386263                8.737               7.635              5.36
## 212482                9.530               7.973              5.69
## 1139487               9.071               7.880              6.83
## 598715                8.925               7.795              6.75
##         Lab.CO2.pH.one2two Lab.CO2.pH.one2three Lab.CO2.pH.one2four
## 1796119               5.45                7.08               5.24
## 1139493               7.65                7.24               7.22
## 386263                5.21                5.15               5.10
## 212482                5.61                5.38               5.48
## 1139487               7.65                7.24               7.22
## 598715                7.07                6.86               7.38
##         High.CO2.pH.one2one High.CO2.pH.one2two High.CO2.pH.one2three
## 1796119                5.44                5.57                 6.93
## 1139493                6.79                7.56                 7.50
## 386263                 5.18                5.36                 5.33
## 212482                 5.52                5.61                 5.70
## 1139487                6.79                7.56                 7.50
## 598715                 6.70                7.28                 7.17
##         High.CO2.pH.one2four Perc.Sand Perc.Silt Perc.Clay Texture.Name OM.perc
## 1796119                 5.44        NA        NA        NA                   NA
## 1139493                 7.38      50.8      28.8      20.4         Loam     1.9
## 386263                  5.36      29.6      37.6      32.8    Clay Loam     1.0
## 212482                  5.65      97.6      -0.4       2.8         Sand     0.2
## 1139487                 7.38      50.8      28.8      20.4         Loam     1.9
## 598715                  7.12      11.2      65.2      23.6    Silt Loam     3.6
##         Scoop.Density.g.4.24.cc Soil.pH Sikora.pH Total.N.perc Total.Org.C.perc
## 1796119                      NA      NA        NA           NA               NA
## 1139493                    4.63     7.5       7.4         0.12             1.56
## 386263                     4.60     4.8       6.1         0.10             0.12
## 212482                     6.48     5.9       7.4         0.07             0.01
## 1139487                    4.63     7.5       7.4         0.12             1.56
## 598715                     4.07     7.2       7.3         0.21             2.23
##         Bray.1.P.ppm K.ppm K.perc.CEC Ca.ppm Ca.perc.CEC Mg.ppm Mg.perc.CEC
## 1796119           NA    NA         NA     NA          NA     NA          NA
## 1139493           12    45          2   1378          98    360          42
## 386263             8    67          1   1281          37    633          30
## 212482            25    35         28     47          72      3           8
## 1139487           12    45          2   1378          98    360          42
## 598715            28    78          2   1785          98    505          45
##         Na.ppm Na.perc.CEC Est.Ac.Hplus Hplus.perc.CEC CEC.sum
## 1796119     NA          NA           NA             NA      NA
## 1139493     NA           0          0.0              0       6
## 386263      NA           0         10.7             62      16
## 212482      NA           0          0.0              0       0
## 1139487     NA           0          0.0              0       6
## 598715      NA           0          0.0              0      10
##         Date.of.Collection Station.Name St.pH.WSS Site.Number Upper.Depth.cm
## 1796119                      Spooner        NA          NA             NA
## 1139493         9/10/2018   Peninsular      7.20           4             25
## 386263           9/7/2018   Marshfield      5.65           1             50
## 212482          8/24/2018  Rhinelander      5.50           1             50
## 1139487         9/10/2018   Peninsular      7.20           4             25
## 598715          8/31/2018    Arlington      6.50         249              0
```

```
##         Lower.Depth.cm DNA.Extr.Hplus.After.C1 DNA.Extr.Hplus.After.C2
## 1796119             NA            6.698846e-10            8.128305e-09
## 1139493             35            8.491805e-10            1.318257e-08
## 386263              70            1.832314e-09            2.317395e-08
## 212482              70            2.951209e-10            1.064143e-08
## 1139487             35            8.491805e-10            1.318257e-08
## 598715              35            1.188502e-09            1.603245e-08
##         Lab.CO2.Hplus.one2one Lab.CO2.Hplus.one2two Lab.CO2.Hplus.one2three
## 1796119          4.073803e-06          3.548134e-06            8.317638e-08
## 1139493          1.479108e-07          2.238721e-08            5.754399e-08
## 386263           4.365158e-06          6.165950e-06            7.079458e-06
## 212482           2.041738e-06          2.454709e-06            4.168694e-06
## 1139487          1.479108e-07          2.238721e-08            5.754399e-08
## 598715           1.778279e-07          8.511380e-08            1.380384e-07
##         Lab.CO2.Hplus.one2four High.CO2.Hplus.one2one High.CO2.Hplus.one2two
## 1796119           5.754399e-06           3.630781e-06           2.691535e-06
## 1139493           6.025596e-08           1.621810e-07           2.754229e-08
## 386263            7.943282e-06           6.606934e-06           4.365158e-06
## 212482            3.311311e-06           3.019952e-06           2.454709e-06
## 1139487           6.025596e-08           1.621810e-07           2.754229e-08
## 598715            4.168694e-08           1.995262e-07           5.248075e-08
##         High.CO2.Hplus.one2three High.CO2.Hplus.one2four
## 1796119             1.174898e-07            3.630781e-06
## 1139493             3.162278e-08            4.168694e-08
## 386263              4.677351e-06            4.365158e-06
## 212482              1.995262e-06            2.238721e-06
## 1139487             3.162278e-08            4.168694e-08
## 598715              6.760830e-08            7.585776e-08
```

```
hist(sample_sums(ps))
```




```
# Relative abundances
ps.norm = transform_sample_counts(ps,function(x) x/sum(x))
head(otu_table(ps.norm))
```

```
## OTU Table:          [6 taxa and 121 samples]
##                      taxa are rows
##      001-K1-0-17 002-K1-17-45 003-K1-45-60 005-K3-0-15 006-K3-15-35
## OTU1 0.000000000  0.000000000   0.00242923 0.002214264  0.000000000
## OTU2 0.005162547  0.008838747   0.00000000 0.010512939  0.021672486
## OTU3 0.001758178  0.012503593   0.02126816 0.001232286  0.014604445
## OTU4 0.005397718  0.003808566   0.00000000 0.008703019  0.009665333
## OTU5 0.000000000  0.000000000   0.00000000 0.000000000  0.000000000
## OTU6 0.002026944  0.005916451   0.01343513 0.005179452  0.018266201
##      007-K3-35-50 008-K4-0-15 009-K4-15-30 010-K4-30-50 011-R1-0-27
## OTU1 0.0003990423           0   0.00000000   0.00000000 0.050420941
## OTU2 0.0156903432           0   0.00000000   0.00417090 0.009430924
## OTU3 0.0072146848           0   0.02185811   0.03106786 0.008464830
## OTU4 0.0049960096           0   0.00000000   0.00200524 0.012053181
## OTU5 0.0003830806           0   0.00000000   0.00000000 0.000000000
## OTU6 0.0188986433           0   0.00000000   0.00000000 0.000000000
##      012-R1-27-50 013-R1-50-70 014-R2-0-30 015-R2-30-45 016-R2-45-60
## OTU1  0.011196727  0.006132294 0.038346086  0.010910178   0.01394996
## OTU2  0.001481142  0.000000000 0.000000000  0.003482290   0.00000000
## OTU3  0.029252552  0.029816576 0.000000000  0.014706322   0.01327045
## OTU4  0.000000000  0.000000000 0.004914656  0.001061127   0.00000000
## OTU5  0.000000000  0.000000000 0.009799882  0.002884472   0.00000000
```

```
## OTU6  0.003491263  0.000000000 0.000000000  0.024884173   0.01822688
##      017-R2-60-100 018-R3-0-20 019-R3-20-30  020-M1-0-31 021-M1-31-50
## OTU1    0.03090163 0.020958378  0.000000000 0.0076980648  0.004572074
## OTU2    0.00000000 0.010380793  0.001977139 0.0087672405  0.015308743
## OTU3    0.01746161 0.002213913  0.052857584 0.0002138351  0.086869413
## OTU4    0.00000000 0.004280232  0.000000000 0.0039915892  0.005548135
## OTU5    0.00000000 0.003542261  0.000000000 0.0191026052  0.014332683
## OTU6    0.01156467 0.000000000  0.001760890 0.0000000000  0.000000000
##      022-M1-50-70  023-M2-0-24 024-M2-24-38 025-M2-38-55  026-M3-0-15
## OTU1  0.002628337 0.0059101186   0.00000000  0.006092798 0.0026139334
## OTU2  0.005297741 0.0041648487   0.00000000  0.000000000 0.0096374588
## OTU3  0.113963039 0.0001983261   0.05294118  0.141227933 0.0003409478
## OTU4  0.003757700 0.0032128833   0.00000000  0.000000000 0.0045687010
## OTU5  0.001088296 0.0130498592   0.07205882  0.008123731 0.0124332310
## OTU6  0.005092402 0.0000000000   0.00000000  0.000000000 0.0000000000
##      027-M3-15-30 030-H1-0-30 031-H1-30-40 032-H1-40-60 033-H2-0-30
## OTU1  0.011794955 0.012794564 0.0088081168 0.0022443370 0.015122873
## OTU2  0.011579193 0.000000000 0.0078046605 0.0156929608 0.018746062
## OTU3  0.020119748 0.000000000 0.0000000000 0.0000000000 0.000000000
## OTU4  0.002139634 0.003144427 0.0009477088 0.0018267859 0.009451796
## OTU5  0.008216912 0.036106694 0.0090868547 0.0005393368 0.021739130
## OTU6  0.012064656 0.000000000 0.0059092429 0.0122481645 0.000000000
##      034-H2-30-60 035-A249-0-35 036-A249-35-60 037-A341-0-33 038-A341-33-55
## OTU1 0.0070747159   0.006064823    0.004776510   0.007176808    0.005235602
## OTU2 0.0122513373   0.004226998    0.015837900   0.003694291    0.030577676
## OTU3 0.0003697587   0.000000000    0.015636784   0.000000000    0.005543579
## OTU4 0.0020213474   0.002559828    0.007491578   0.002070686    0.000000000
## OTU5 0.0017501910   0.015792168    0.008698275   0.016047814    0.013726957
## OTU6 0.0072965711   0.005316565    0.024083664   0.000000000    0.025210084
##      039-A341-55-75 040-A341-75-85 041-L2-0-23 042-L2-23-45 043-L3-0-12
## OTU1    0.003486467   0.0011130822 0.003334199  0.003696701  0.00000000
## OTU2    0.005845844   0.0038262200 0.034121417  0.050351611  0.03579898
## OTU3    0.019566295   0.0516887544 0.000000000  0.005098897  0.00000000
## OTU4    0.001998708   0.0007478521 0.005759072  0.005715014  0.01366460
## OTU5    0.006657349   0.0022435563 0.011777951  0.003526737  0.02032750
## OTU6    0.010233984   0.0044523288 0.011388239  0.016741380  0.00000000
##      044-L3-12-20 045-L3-20-40 046-L4-0-10 047-L4-10-20 048-L4-20-40
## OTU1 0.0023542195  0.001783785 0.002944063 0.0000000000  0.001721276
## OTU2 0.0150307859  0.016933397 0.131065315 0.0716022867  0.026556833
## OTU3 0.0002535313  0.015425973 0.000000000 0.0005053536  0.010542817
## OTU4 0.0039116262  0.006657790 0.025624250 0.0099175642  0.011280507
## OTU5 0.0101593625  0.009974123 0.020281322 0.0095701336  0.006024467
## OTU6 0.0087468309  0.015224983 0.003489260 0.0227409115  0.016044753
##      050-W4-0-28 051-W4-28-45 052-W4-45-55 053-W5-0-35 054-W5-35-65 055-W7-0-15
## OTU1  0.00000000  0.008101224  0.004191060 0.009935837 0.0005988487 0.005464813
## OTU2  0.03254319  0.010782144  0.016519626 0.014808999 0.0361434146 0.029692149
## OTU3  0.00000000  0.018181818  0.016584857 0.000866340 0.0022601708 0.002853847
## OTU4  0.00000000  0.003240489  0.003620293 0.005739502 0.0040567168 0.004614731
## OTU5  0.00000000  0.002705976  0.007778738 0.011641444 0.0009465672 0.006011294
## OTU6  0.00000000  0.012845033  0.009784576 0.007932425 0.0203029015 0.024136256
##      056-W7-15-30 057-P1-0-30 058-P1-30-45 059-P1-45-55 060-P2-0-20
## OTU1  0.000000000 0.016138035  0.015320018  0.017306513 0.013624895
## OTU2  0.034400060 0.013298711  0.000000000  0.001404300 0.002158677
## OTU3  0.068725174 0.000000000  0.003177485  0.002571253 0.000000000
```

```
## OTU4  0.004946414 0.002208363  0.011915570  0.001186732 0.004401458
## OTU5  0.000000000 0.014269420  0.000000000  0.001582310 0.012531539
## OTU6  0.040620550 0.000000000  0.000000000  0.007713760 0.000000000
##      061-P2-20-45 062-P2-45-55 063-P4-0-25 064-P4-25-35 065-P4-35-50
## OTU1  0.008175083  0.008289672 0.004669079  0.004857677  0.004336656
## OTU2  0.005790684  0.000000000 0.011526789  0.003958644  0.001623677
## OTU3  0.000000000  0.000000000 0.000000000  0.000000000  0.000000000
## OTU4  0.005279741  0.002314649 0.004493989  0.003538129  0.003247354
## OTU5  0.000000000  0.002852939 0.014503327  0.004625669  0.005261535
## OTU6  0.000000000  0.000000000 0.000000000  0.000000000  0.000000000
##      181-Sp11-Cr31-0-20 182-Sp11-Cr32-0-16 183-Sp11-Cr33-0-20
## OTU1         0.02875878         0.02652339         0.11648613
## OTU2         0.02163934         0.03291621         0.02240689
## OTU3         0.00000000         0.00000000         0.00000000
## OTU4         0.01161593         0.02135473         0.03027155
## OTU5         0.01911007         0.02312296         0.01201959
## OTU6         0.00000000         0.00000000         0.00000000
##      184-Sp12-Cr34-0-16 185-Sp12-Cr35-0-18 186-Sp12-Cr36-0-20
## OTU1        0.026295917        0.017801455         0.12297521
## OTU2        0.007201036        0.006237006         0.02826446
## OTU3        0.000000000        0.000000000         0.00000000
## OTU4        0.007416797        0.061122661         0.05256198
## OTU5        0.012433249        0.009875260         0.02082645
## OTU6        0.000000000        0.000000000         0.00000000
##      187-Sp13-Cr37-0-20 188-Sp13-Cr38-0-20 189-Sp13-Cr39-0-19
## OTU1         0.02552806        0.048596897        0.031996509
## OTU2         0.01683766        0.013040607        0.010726755
## OTU3         0.00000000        0.002046880        0.001653804
## OTU4         0.01955341        0.011984153        0.008291988
## OTU5         0.01587206        0.003037306        0.003973723
## OTU6         0.00000000        0.004754044        0.002963065
##      190-Sp14-Cr40-0-17 191-Sp14-Cr41-0-18 192-Sp14-Cr42-0-20
## OTU1        0.015714286        0.012692562        0.015742371
## OTU2        0.000000000        0.002086449        0.004437613
## OTU3        0.005584416        0.001999513        0.003470759
## OTU4        0.023506494        0.003964252        0.008900017
## OTU5        0.000000000        0.000000000        0.001165183
## OTU6        0.000000000        0.000000000        0.000000000
##      193-Sp15-Cr43-0-18 194-Sp15-Cr44-0-17 195-Sp15-Cr45-0-20
## OTU1        0.038968140        0.021049706        0.031842049
## OTU2        0.000000000        0.000000000        0.000000000
## OTU3        0.000000000        0.007006817        0.000000000
## OTU4        0.009344401        0.003437582        0.021125679
## OTU5        0.000000000        0.000000000        0.001535296
## OTU6        0.000000000        0.000000000        0.000000000
##      196-Sp16-Cr46-0-20 197-Sp16-Cr47-0-17 198-Sp16-Cr48-0-20
## OTU1         0.03589801        0.024907923        0.027411448
## OTU2         0.00000000        0.008216073        0.013256922
## OTU3         0.00000000        0.000000000        0.000000000
## OTU4         0.01957057        0.008216073        0.035627978
## OTU5         0.01543279        0.007625838        0.008976041
## OTU6         0.00000000        0.003328926        0.000000000
##      199-Sp17-Cr49-0-20 200-Sp17-Cr50-0-18 201-Sp17-Cr51-0-18
## OTU1        0.009658422        0.020429982         0.11589324
```

```
## OTU2        0.000000000        0.000000000         0.00000000
## OTU3        0.005516294        0.001687186         0.01995672
## OTU4        0.003258736        0.032724721         0.03943256
## OTU5        0.000000000        0.001503433         0.00000000
## OTU6        0.000000000        0.000000000         0.00000000
##      202-Sp18-Cr52-0-18 203-Sp18-Cr53-0-19 204-Sp18-Cr54-0-20
## OTU1        0.026511307         0.05453388        0.035570243
## OTU2        0.004790711         0.01724467        0.005906690
## OTU3        0.000000000         0.00000000        0.000000000
## OTU4        0.005643295         0.01775374        0.009029169
## OTU5        0.011225691         0.01909004        0.009991934
## OTU6        0.002172060         0.00000000        0.002159715
##      205-Sp19-Cr55-0-20 206-Sp19-Cr56-0-18 207-Sp19-Cr57-0-18
## OTU1        0.023922711         0.04964851        0.061457465
## OTU2        0.002258438         0.00000000        0.000000000
## OTU3        0.003373716         0.02240773        0.002137198
## OTU4        0.006217674         0.00000000        0.000000000
## OTU5        0.000000000         0.00000000        0.000000000
## OTU6        0.000000000         0.00000000        0.000000000
##      208-Sp20-Cr58-0-20 209-Sp20-Cr59-0-19 210-Sp20-Cr60-0-20 211-Sp1-Cr1-0-20
## OTU1         0.05602383        0.028775104        0.034720025       0.01626684
## OTU2         0.01764441        0.006011875        0.008897501       0.00000000
## OTU3         0.00000000        0.001302883        0.000000000       0.00000000
## OTU4         0.01916161        0.013233570        0.007157545       0.02086756
## OTU5         0.01770061        0.007593947        0.008067067       0.00000000
## OTU6         0.00000000        0.004764830        0.007671623       0.00000000
##      212-Sp1-Cr2-0-20 213-Sp1-Cr3-0-20 214-Sp2-Cr4-0-20 215-Sp2-Cr5-0-20
## OTU1       0.01273716      0.012730841      0.053554189                0
## OTU2       0.00000000      0.000000000      0.011584777                0
## OTU3       0.00000000      0.002515976      0.000000000                0
## OTU4       0.34204591      0.000000000      0.007773995                0
## OTU5       0.00000000      0.000000000      0.000000000                0
## OTU6       0.00000000      0.000000000      0.000000000                0
##      216-Sp2-Cr6-0-20 217-Sp3-Cr7-0-20 218-Sp3-Cr8-0-20 219-Sp3-Cr9-0-20
## OTU1      0.008622569      0.045752080      0.037846532      0.043991231
## OTU2      0.008331920      0.008182190      0.008105466      0.007044508
## OTU3      0.003633105      0.000000000      0.000000000      0.000000000
## OTU4      0.003729988      0.015852993      0.005172359      0.006034631
## OTU5      0.000000000      0.013807446      0.011827041      0.010468238
## OTU6      0.003172912      0.003375153      0.003500804      0.003202049
##      220-Sp4-Cr10-0-20 221-Sp4-Cr11-0-20 222-Sp4-Cr12-0-20 223-Sp5-Cr13-0-20
## OTU1       0.051845864        0.10203774      0.0196199299        0.03288201
## OTU2       0.009485314        0.01539623      0.0063932088        0.02127660
## OTU3       0.000000000        0.00000000      0.0005812008        0.00000000
## OTU4       0.016329830        0.01615094      0.0059176808        0.03255964
## OTU5       0.010293721        0.01267925      0.0096338435        0.03610574
## OTU6       0.009485314        0.00000000      0.0068335124        0.00000000
##      224-Sp5-Cr14-0-20 225-Sp5-Cr15-0-20 226-Sp6-Cr16-0-15 227-Sp6-Cr17-0-20
## OTU1       0.026438298        0.06908621        0.02143623       0.025272331
## OTU2       0.007792078        0.01034771        0.00000000       0.004390816
## OTU3       0.000000000        0.00000000        0.00000000       0.000000000
## OTU4       0.010381140        0.01727155        0.02625938       0.010591587
## OTU5       0.012571884        0.01552157        0.01915863       0.011027317
## OTU6       0.005676019        0.00000000        0.00000000       0.002346238
```

```
##      228-Sp6-Cr18-0-20 229-Sp7-Cr19-0-20 230-Sp7-Cr20-0-20 231-Sp7-Cr21-0-13
## OTU1        0.02320428       0.005839416        0.02608923       0.099168870
## OTU2        0.01434111       0.000000000        0.00000000       0.000000000
## OTU3        0.00000000       0.004931939        0.00000000       0.008311296
## OTU4        0.01058657       0.004636023        0.02174102       0.000000000
## OTU5        0.02031144       0.000000000        0.00000000       0.000000000
## OTU6        0.00000000       0.000000000        0.00000000       0.000000000
##      232-Sp8-Cr22-0-20 233-Sp8-Cr23-0-20 234-Sp8-Cr24-0-20 235-Sp9-Cr25-0-15
## OTU1       0.025152808       0.031457016       0.012853788       0.033972479
## OTU2       0.010311772       0.018321535       0.031969678       0.007218588
## OTU3       0.002044765       0.003671878       0.002925061       0.000000000
## OTU4       0.009124489       0.010599235       0.011823837       0.008572073
## OTU5       0.004023570       0.003179771       0.006962469       0.018587864
## OTU6       0.002836287       0.000000000       0.000000000       0.000000000
##      236-Sp9-Cr26-0-20 237-Sp9-Cr27-0-15 238-Sp10-Cr28-0-20 239-Sp10-Cr29-0-15
## OTU1       0.012711066        0.06999656        0.014610927        0.008894578
## OTU2       0.006402611        0.01443464        0.000000000        0.000000000
## OTU3       0.000000000        0.00000000        0.005960265        0.001411317
## OTU4       0.006151528        0.00698820        0.006995033        0.010470001
## OTU5       0.015190509        0.02566159        0.001448675        0.001805173
## OTU6       0.000000000        0.00000000        0.000000000        0.000000000
##      240-Sp10-Cr30-0-20
## OTU1         0.02677100
## OTU2         0.00000000
## OTU3         0.01194399
## OTU4         0.02347611
## OTU5         0.00000000
## OTU6         0.00000000
```

```
sample_sums(ps.norm)
```

```
##        001-K1-0-17       002-K1-17-45       003-K1-45-60        005-K3-0-15
##                  1                  1                  1                  1
##       006-K3-15-35       007-K3-35-50        008-K4-0-15       009-K4-15-30
##                  1                  1                  1                  1
##       010-K4-30-50        011-R1-0-27       012-R1-27-50       013-R1-50-70
##                  1                  1                  1                  1
##        014-R2-0-30       015-R2-30-45       016-R2-45-60      017-R2-60-100
##                  1                  1                  1                  1
##        018-R3-0-20       019-R3-20-30        020-M1-0-31       021-M1-31-50
##                  1                  1                  1                  1
##       022-M1-50-70        023-M2-0-24       024-M2-24-38       025-M2-38-55
##                  1                  1                  1                  1
##        026-M3-0-15       027-M3-15-30        030-H1-0-30       031-H1-30-40
##                  1                  1                  1                  1
##       032-H1-40-60        033-H2-0-30       034-H2-30-60       035-A249-0-35
##                  1                  1                  1                  1
##     036-A249-35-60      037-A341-0-33     038-A341-33-55     039-A341-55-75
##                  1                  1                  1                  1
##     040-A341-75-85        041-L2-0-23       042-L2-23-45        043-L3-0-12
##                  1                  1                  1                  1
##       044-L3-12-20       045-L3-20-40        046-L4-0-10       047-L4-10-20
##                  1                  1                  1                  1
##       048-L4-20-40        050-W4-0-28       051-W4-28-45       052-W4-45-55
##                  1                  1                  1                  1
```

```
##        053-W5-0-35       054-W5-35-65        055-W7-0-15       056-W7-15-30
##                  1                  1                  1                  1
##        057-P1-0-30       058-P1-30-45       059-P1-45-55        060-P2-0-20
##                  1                  1                  1                  1
##       061-P2-20-45       062-P2-45-55        063-P4-0-25       064-P4-25-35
##                  1                  1                  1                  1
##       065-P4-35-50 181-Sp11-Cr31-0-20 182-Sp11-Cr32-0-16 183-Sp11-Cr33-0-20
##                  1                  1                  1                  1
## 184-Sp12-Cr34-0-16 185-Sp12-Cr35-0-18 186-Sp12-Cr36-0-20 187-Sp13-Cr37-0-20
##                  1                  1                  1                  1
## 188-Sp13-Cr38-0-20 189-Sp13-Cr39-0-19 190-Sp14-Cr40-0-17 191-Sp14-Cr41-0-18
##                  1                  1                  1                  1
## 192-Sp14-Cr42-0-20 193-Sp15-Cr43-0-18 194-Sp15-Cr44-0-17 195-Sp15-Cr45-0-20
##                  1                  1                  1                  1
## 196-Sp16-Cr46-0-20 197-Sp16-Cr47-0-17 198-Sp16-Cr48-0-20 199-Sp17-Cr49-0-20
##                  1                  1                  1                  1
## 200-Sp17-Cr50-0-18 201-Sp17-Cr51-0-18 202-Sp18-Cr52-0-18 203-Sp18-Cr53-0-19
##                  1                  1                  1                  1
## 204-Sp18-Cr54-0-20 205-Sp19-Cr55-0-20 206-Sp19-Cr56-0-18 207-Sp19-Cr57-0-18
##                  1                  1                  1                  1
## 208-Sp20-Cr58-0-20 209-Sp20-Cr59-0-19 210-Sp20-Cr60-0-20   211-Sp1-Cr1-0-20
##                  1                  1                  1                  1
##   212-Sp1-Cr2-0-20   213-Sp1-Cr3-0-20   214-Sp2-Cr4-0-20   215-Sp2-Cr5-0-20
##                  1                  1                  1                  1
##   216-Sp2-Cr6-0-20   217-Sp3-Cr7-0-20   218-Sp3-Cr8-0-20   219-Sp3-Cr9-0-20
##                  1                  1                  1                  1
##  220-Sp4-Cr10-0-20  221-Sp4-Cr11-0-20  222-Sp4-Cr12-0-20  223-Sp5-Cr13-0-20
##                  1                  1                  1                  1
##  224-Sp5-Cr14-0-20  225-Sp5-Cr15-0-20  226-Sp6-Cr16-0-15  227-Sp6-Cr17-0-20
##                  1                  1                  1                  1
##  228-Sp6-Cr18-0-20  229-Sp7-Cr19-0-20  230-Sp7-Cr20-0-20  231-Sp7-Cr21-0-13
##                  1                  1                  1                  1
##  232-Sp8-Cr22-0-20  233-Sp8-Cr23-0-20  234-Sp8-Cr24-0-20  235-Sp9-Cr25-0-15
##                  1                  1                  1                  1
##  236-Sp9-Cr26-0-20  237-Sp9-Cr27-0-15 238-Sp10-Cr28-0-20 239-Sp10-Cr29-0-15
##                  1                  1                  1                  1
## 240-Sp10-Cr30-0-20
##                  1
```

```
# Looks good

# Spooner Vs. Wisconsin
ps.wisc <- subset_samples(ps, Study=="Wisconsin")
ps.spoon <- subset_samples(ps, Study=="Spooner")

ps.norm.wisc <- subset_samples(ps.norm, Study=="Wisconsin")
ps.norm.spoon <- subset_samples(ps.norm, Study=="Spooner")
```

MJB: Let's try this again, correctly this time.

```
df.wisc = as(sample_data(ps.norm.wisc), "data.frame")
d.wisc = distance(ps.norm.wisc, method = "bray")
Lab.CO2.pH.one2one.wisc <- adonis(d.wisc ~ Lab.CO2.pH.one2one, data=df.wisc)
Lab.CO2.pH.one2one.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Lab.CO2.pH.one2one, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                    Df SumsOfSqs MeanSqs F.Model     R2 Pr(>F)
## Lab.CO2.pH.one2one  1    2.0581 2.05808  5.5794 0.0864  0.001 ***
## Residuals          59   21.7633 0.36887         0.9136
## Total              60   23.8213                 1.0000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.pH.one2two.wisc <- adonis(d.wisc ~ Lab.CO2.pH.one2two, data=df.wisc)
Lab.CO2.pH.one2two.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Lab.CO2.pH.one2two, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                    Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.pH.one2two  1     2.145 2.14505  5.8385 0.09005  0.001 ***
## Residuals          59    21.676 0.36739         0.90995
## Total              60    23.821                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.pH.one2three.wisc <- adonis(d.wisc ~ Lab.CO2.pH.one2three, data=df.wisc)
Lab.CO2.pH.one2three.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Lab.CO2.pH.one2three, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                      Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.pH.one2three  1    2.1335 2.13351  5.8041 0.08956  0.001 ***
## Residuals            59   21.6878 0.36759         0.91044
## Total                60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.pH.one2four.wisc <- adonis(d.wisc ~ Lab.CO2.pH.one2four, data=df.wisc)
Lab.CO2.pH.one2four.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Lab.CO2.pH.one2four, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                     Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.pH.one2four  1    2.0417 2.04169  5.5308 0.08571  0.001 ***
## Residuals           59   21.7797 0.36915         0.91429
## Total               60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# Just running the sample numbers to see what the R2 is for an arbitrary factor.
sample.num.wisc <- adonis(d.wisc ~ Sample.Num, data=df.wisc)
sample.num.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Sample.Num, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##            Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Sample.Num  1    1.7926 1.79260  4.8012 0.07525  0.001 ***
## Residuals  59   22.0287 0.37337         0.92475
## Total      60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
sample.random.wisc <- adonis(d.wisc ~ Random.Num.1.to.65, data=df.wisc)
sample.random.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Random.Num.1.to.65, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                    Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Random.Num.1.to.65  1    0.2756 0.27555 0.69046 0.01157  0.953
## Residuals          59   23.5458 0.39908         0.98843
## Total              60   23.8213                 1.00000
```

```
Lab.CO2.Hplus.one2one.wisc <- adonis(d.wisc ~ Lab.CO2.Hplus.one2one, data=df.wisc)
Lab.CO2.Hplus.one2one.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Lab.CO2.Hplus.one2one, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.Hplus.one2one  1    1.6946 1.69458  4.5185 0.07114  0.001 ***
## Residuals             59   22.1268 0.37503         0.92886
## Total                 60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.Hplus.one2two.wisc <- adonis(d.wisc ~ Lab.CO2.Hplus.one2two, data=df.wisc)
Lab.CO2.Hplus.one2two.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Lab.CO2.Hplus.one2two, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.Hplus.one2two  1    1.6752 1.67524   4.463 0.07033  0.001 ***
## Residuals             59   22.1461 0.37536         0.92967
## Total                 60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.Hplus.one2three.wisc <- adonis(d.wisc ~ Lab.CO2.Hplus.one2three, data=df.wisc)
Lab.CO2.Hplus.one2three.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Lab.CO2.Hplus.one2three, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                         Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.Hplus.one2three  1    1.6909 1.69091   4.508 0.07098  0.001 ***
## Residuals               59   22.1304 0.37509         0.92902
## Total                   60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.Hplus.one2four.wisc <- adonis(d.wisc ~ Lab.CO2.Hplus.one2four, data=df.wisc)
Lab.CO2.Hplus.one2four.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ Lab.CO2.Hplus.one2four, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                         Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.Hplus.one2four  1    1.4641 1.46413  3.8638 0.06146  0.001 ***
## Residuals              59   22.3572 0.37894         0.93854
## Total                  60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.pH.one2one.wisc <- adonis(d.wisc ~ High.CO2.pH.one2one, data=df.wisc)
High.CO2.pH.one2one.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ High.CO2.pH.one2one, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                     Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.pH.one2one  1    2.0519 2.05186   5.561 0.08614  0.001 ***
## Residuals           59   21.7695 0.36897         0.91386
## Total               60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.pH.one2two.wisc <- adonis(d.wisc ~ High.CO2.pH.one2two, data=df.wisc)
High.CO2.pH.one2two.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ High.CO2.pH.one2two, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                     Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.pH.one2two  1    2.0674 2.06744  5.6072 0.08679  0.001 ***
## Residuals           59   21.7539 0.36871         0.91321
## Total               60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.pH.one2three.wisc <- adonis(d.wisc ~ High.CO2.pH.one2three, data=df.wisc)
High.CO2.pH.one2three.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ High.CO2.pH.one2three, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.pH.one2three  1    2.1523 2.15225  5.8601 0.09035  0.001 ***
## Residuals             59   21.6691 0.36727         0.90965
## Total                 60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.pH.one2four.wisc <- adonis(d.wisc ~ High.CO2.pH.one2four, data=df.wisc)
High.CO2.pH.one2four.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ High.CO2.pH.one2four, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.pH.one2four  1    2.1467 2.14669  5.8434 0.09012  0.001 ***
## Residuals             59   21.6747 0.36737         0.90988
## Total                 60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.Hplus.one2one.wisc <- adonis(d.wisc ~ High.CO2.Hplus.one2one, data=df.wisc)
High.CO2.Hplus.one2one.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ High.CO2.Hplus.one2one, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                        Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.Hplus.one2one  1    1.5384 1.53839  4.0733 0.06458  0.001 ***
## Residuals              59   22.2830 0.37768         0.93542
## Total                  60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.Hplus.one2two.wisc <- adonis(d.wisc ~ High.CO2.Hplus.one2two, data=df.wisc)
High.CO2.Hplus.one2two.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ High.CO2.Hplus.one2two, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                         Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.Hplus.one2two   1    1.5833 1.58330  4.2007 0.06647  0.001 ***
## Residuals               59   22.2380 0.37692         0.93353
## Total                   60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.Hplus.one2three.wisc <- adonis(d.wisc ~ High.CO2.Hplus.one2three, data=df.wisc)
High.CO2.Hplus.one2three.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ High.CO2.Hplus.one2three, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                           Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.Hplus.one2three   1    1.6325 1.63254  4.3409 0.06853  0.001 ***
## Residuals                 59   22.1888 0.37608         0.93147
## Total                     60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.Hplus.one2four.wisc <- adonis(d.wisc ~ High.CO2.Hplus.one2four, data=df.wisc)
High.CO2.Hplus.one2four.wisc
```

```
##
## Call:
## adonis(formula = d.wisc ~ High.CO2.Hplus.one2four, data = df.wisc)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                          Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.Hplus.one2four   1    1.6225 1.62250  4.3123 0.06811  0.001 ***
## Residuals                59   22.1988 0.37625         0.93189
## Total                    60   23.8213                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
df.spoon = as(sample_data(ps.norm.spoon), "data.frame")
d.spoon = distance(ps.norm.spoon, method = "bray")
```

```
Lab.CO2.pH.one2one.spoon <- adonis(d.spoon ~ Lab.CO2.pH.one2one, data=df.spoon)
Lab.CO2.pH.one2one.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ Lab.CO2.pH.one2one, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                    Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.pH.one2one  1    2.4938 2.49377  8.9838 0.13412  0.001 ***
## Residuals          58   16.0999 0.27758         0.86588
## Total              59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.pH.one2two.spoon <- adonis(d.spoon ~ Lab.CO2.pH.one2two, data=df.spoon)
Lab.CO2.pH.one2two.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ Lab.CO2.pH.one2two, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                    Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.pH.one2two  1    2.6055 2.60546  9.4518 0.14013  0.001 ***
## Residuals          58   15.9882 0.27566         0.85987
## Total              59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.pH.one2three.spoon <- adonis(d.spoon ~ Lab.CO2.pH.one2three, data=df.spoon)
Lab.CO2.pH.one2three.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ Lab.CO2.pH.one2three, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                      Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.pH.one2three  1    2.9809 2.98088  11.074 0.16032  0.001 ***
## Residuals            58   15.6128 0.26919         0.83968
## Total                59   18.5936                 1.00000
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.pH.one2four.spoon <- adonis(d.spoon ~ Lab.CO2.pH.one2four, data=df.spoon)
Lab.CO2.pH.one2four.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ Lab.CO2.pH.one2four, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                      Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.pH.one2four  1    2.8842 2.88418  10.649 0.15512  0.001 ***
## Residuals           58   15.7095 0.27085         0.84488
## Total               59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.Hplus.one2one.spoon <- adonis(d.spoon ~ Lab.CO2.Hplus.one2one, data=df.spoon)
Lab.CO2.Hplus.one2one.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ Lab.CO2.Hplus.one2one, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.Hplus.one2one  1    1.8268 1.82683  6.3194 0.09825  0.001 ***
## Residuals             58   16.7668 0.28908         0.90175
## Total                 59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.Hplus.one2two.spoon <- adonis(d.spoon ~ Lab.CO2.Hplus.one2two, data=df.spoon)
Lab.CO2.Hplus.one2two.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ Lab.CO2.Hplus.one2two, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.Hplus.one2two  1    1.9567 1.95670  6.8215 0.10523  0.001 ***
## Residuals             58   16.6369 0.28684         0.89477
## Total                 59   18.5936                 1.00000
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.Hplus.one2three.spoon <- adonis(d.spoon ~ Lab.CO2.Hplus.one2three, data=df.spoon)
Lab.CO2.Hplus.one2three.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ Lab.CO2.Hplus.one2three, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                          Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.Hplus.one2three  1    2.2953 2.29530  8.1682 0.12345  0.001 ***
## Residuals               58   16.2983 0.28101         0.87655
## Total                   59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Lab.CO2.Hplus.one2four.spoon <- adonis(d.spoon ~ Lab.CO2.Hplus.one2four, data=df.spoon)
Lab.CO2.Hplus.one2four.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ Lab.CO2.Hplus.one2four, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                         Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## Lab.CO2.Hplus.one2four  1    1.9794 1.97942  6.9101 0.10646  0.001 ***
## Residuals              58   16.6142 0.28645         0.89354
## Total                  59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.pH.one2one.spoon <- adonis(d.spoon ~ High.CO2.pH.one2one, data=df.spoon)
High.CO2.pH.one2one.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ High.CO2.pH.one2one, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.pH.one2one  1    2.3846 2.38458  8.5326 0.12825  0.001 ***
## Residuals           58   16.2091 0.27947         0.87175
```

```
## Total               59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.pH.one2two.spoon <- adonis(d.spoon ~ High.CO2.pH.one2two, data=df.spoon)
High.CO2.pH.one2two.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ High.CO2.pH.one2two, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                     Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.pH.one2two  1    2.6985 2.69849  9.8466 0.14513  0.001 ***
## Residuals           58   15.8951 0.27405         0.85487
## Total               59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.pH.one2three.spoon <- adonis(d.spoon ~ High.CO2.pH.one2three, data=df.spoon)
High.CO2.pH.one2three.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ High.CO2.pH.one2three, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.pH.one2three  1    3.1036 3.10359  11.621 0.16692  0.001 ***
## Residuals             58   15.4900 0.26707         0.83308
## Total                 59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.pH.one2four.spoon <- adonis(d.spoon ~ High.CO2.pH.one2four, data=df.spoon)
High.CO2.pH.one2four.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ High.CO2.pH.one2four, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                       Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.pH.one2four  1    2.7714  2.7714  10.159 0.14905  0.001 ***
```

```
## Residuals            58   15.8222  0.2728         0.85095
## Total                59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.Hplus.one2one.spoon <- adonis(d.spoon ~ High.CO2.Hplus.one2one, data=df.spoon)
High.CO2.Hplus.one2one.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ High.CO2.Hplus.one2one, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                         Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.Hplus.one2one   1    1.8045 1.80445  6.2337 0.09705  0.001 ***
## Residuals               58   16.7892 0.28947         0.90295
## Total                   59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.Hplus.one2two.spoon <- adonis(d.spoon ~ High.CO2.Hplus.one2two, data=df.spoon)
High.CO2.Hplus.one2two.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ High.CO2.Hplus.one2two, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                         Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.Hplus.one2two   1    2.0702 2.07018  7.2667 0.11134  0.001 ***
## Residuals               58   16.5235 0.28489         0.88866
## Total                   59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.Hplus.one2three.spoon <- adonis(d.spoon ~ High.CO2.Hplus.one2three, data=df.spoon)
High.CO2.Hplus.one2three.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ High.CO2.Hplus.one2three, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                           Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
```

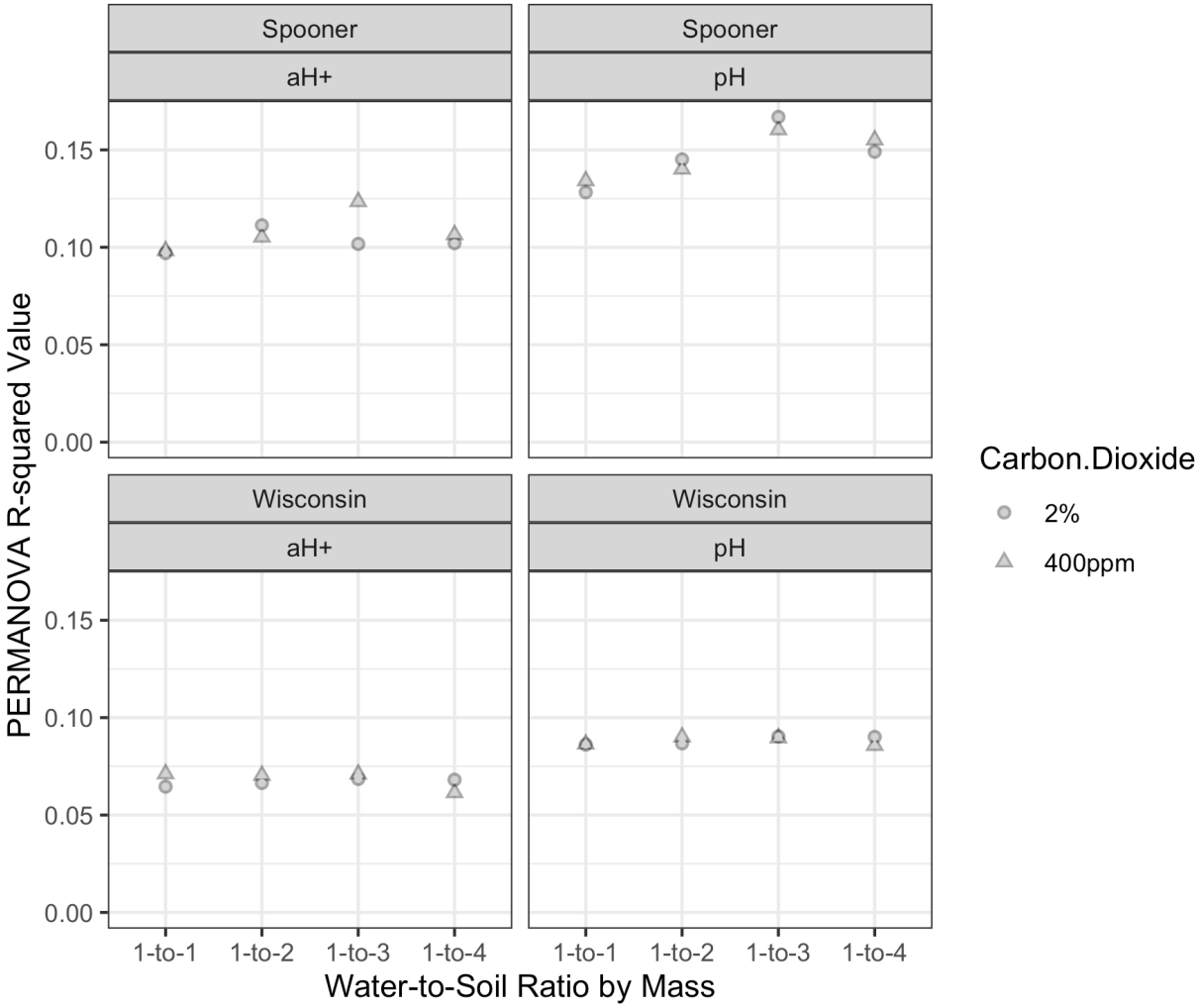
```
## High.CO2.Hplus.one2three  1    1.8918 1.89179  6.5696 0.10174  0.001 ***
## Residuals                58   16.7018 0.28796         0.89826
## Total                    59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
High.CO2.Hplus.one2four.spoon <- adonis(d.spoon ~ High.CO2.Hplus.one2four, data=df.spoon)
High.CO2.Hplus.one2four.spoon
```

```
##
## Call:
## adonis(formula = d.spoon ~ High.CO2.Hplus.one2four, data = df.spoon)
##
## Permutation: free
## Number of permutations: 999
##
## Terms added sequentially (first to last)
##
##                          Df SumsOfSqs MeanSqs F.Model      R2 Pr(>F)
## High.CO2.Hplus.one2four  1    1.8994 1.89935  6.5988 0.10215  0.001 ***
## Residuals                58   16.6943 0.28783         0.89785
## Total                    59   18.5936                 1.00000
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
R.squared <- c(Lab.CO2.pH.one2one.wisc$aov.tab[1,5],
               Lab.CO2.Hplus.one2one.wisc$aov.tab[1,5],
               Lab.CO2.pH.one2two.wisc$aov.tab[1,5],
               Lab.CO2.Hplus.one2two.wisc$aov.tab[1,5],
               Lab.CO2.pH.one2three.wisc$aov.tab[1,5],
               Lab.CO2.Hplus.one2three.wisc$aov.tab[1,5],
               Lab.CO2.pH.one2four.wisc$aov.tab[1,5],
               Lab.CO2.Hplus.one2four.wisc$aov.tab[1,5],
               High.CO2.pH.one2one.wisc$aov.tab[1,5],
               High.CO2.Hplus.one2one.wisc$aov.tab[1,5],
               High.CO2.pH.one2two.wisc$aov.tab[1,5],
               High.CO2.Hplus.one2two.wisc$aov.tab[1,5],
               High.CO2.pH.one2three.wisc$aov.tab[1,5],
               High.CO2.Hplus.one2three.wisc$aov.tab[1,5],
               High.CO2.pH.one2four.wisc$aov.tab[1,5],
               High.CO2.Hplus.one2four.wisc$aov.tab[1,5],
               Lab.CO2.pH.one2one.spoon$aov.tab[1,5],
               Lab.CO2.Hplus.one2one.spoon$aov.tab[1,5],
               Lab.CO2.pH.one2two.spoon$aov.tab[1,5],
               Lab.CO2.Hplus.one2two.spoon$aov.tab[1,5],
               Lab.CO2.pH.one2three.spoon$aov.tab[1,5],
               Lab.CO2.Hplus.one2three.spoon$aov.tab[1,5],
               Lab.CO2.pH.one2four.spoon$aov.tab[1,5],
               Lab.CO2.Hplus.one2four.spoon$aov.tab[1,5],
               High.CO2.pH.one2one.spoon$aov.tab[1,5],
               High.CO2.Hplus.one2one.spoon$aov.tab[1,5],
               High.CO2.pH.one2two.spoon$aov.tab[1,5],
               High.CO2.Hplus.one2two.spoon$aov.tab[1,5],
               High.CO2.pH.one2three.spoon$aov.tab[1,5],
               High.CO2.Hplus.one2three.spoon$aov.tab[1,5],
```

```
                High.CO2.pH.one2four.spoon$aov.tab[1,5],
                High.CO2.Hplus.one2four.spoon$aov.tab[1,5]
                )
dat.rsq <- read.csv("rsq-data.csv", header=T)
dat.rsq$R.squared <- R.squared
# str(dat.rsq)
ggplot(dat.rsq, aes(Water.Soil.Ratio, R.squared, shape = Carbon.Dioxide)) + geom_point(color="black", s
```



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