

Getting started with Phyloseq

```
library(knitr)
opts_chunk$set(tidy.opts=list(width.cutoff=60),tidy=TRUE)
```

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What is phyloseq?

phyloseq is a R package for exploring microbiome profiles. The phyloseq package is a tool to import, store, analyze, and graph sequencing data that has already been clustered into OTUs or ASVs. This package uses many of the tools already available in R for ecology and phylogenetic analysis (packages like `vegan`) and supports `ggplot2` to easily make publication-ready figures.

A lot of great tutorials out there for Phyloseq, e.g. <https://joey711.github.io/phyloseq/index.html>

Link to R documentation and function list: <https://www.rdocumentation.org/packages/phyloseq/versions/1.16.2>

Packages you will need for doing basic microbial analyses:

```
#set your working directory OR the nice thing about R notebooks is that your wd is automatically the folder you are in
#setwd("~/Mote_Coral_Fall2020/microbes_pipeline")
library(phyloseq)
library(ggplot2)
library(vegan)
```

```
## Loading required package: permute
```

```
## Loading required package: lattice
```

```
## This is vegan 2.5-7
```

```
#... add any other standard packages.
```

Microbial Data

File structures

- All of the data being loaded into R for this notebook, should be csv files.
- Your sample names should be the same across all files
- Your ASV/OTU names must also be consistent across files

Explanation of practice dataset we will use and getting it into R

This dataset is from a study of *Acropora cervicornis* microbiomes from fragments located in the same nursery but collected from (and previously located in nurseries) reefs across the Upper, Middle, and Lower Keys. This dataset contains an abundance, or OTU table, a taxonomy table, and a table of the sample data, AKA the meta data.

```
otudf <- read.csv("acer_otu_table.csv",row.names = 1) #loads csv file into R as a dataframe
#row.names = 1 is important for when this data is used later, because it sets the table's row names to
taxdf <- read.csv("acer_tax_table.csv", row.names = 1) #loads csv file into R as a dataframe
#row.names = 1 is important for when this data is used later, because it sets the table's row names to
samdf <- read.csv("acer_sample_data.csv",row.names = 1) #loads csv file into R as a dataframe
#row.names = 1 is important for when this data is used later, because without it, r will not be able to
```

What are the components of a phyloseq object?

- `otu_table`: Table of the abundance data, where sample IDs are rows and taxa (ASVs or OTUs) are columns or vice versa. Whether or not the taxa are rows depends on the analysis being done on the object. Be sure to set `taxa_are_rows` equal to `TRUE` if your taxa are rows.
- `tax_table`: Table of the taxonomy data, so the rows are ASVs or OTUs, and the columns are taxonomic rank (i.e. Kingdom, phylum, etc.)
- `sample_data`: Table of the metadata, explaining more information about your samples. This data MUST include sample IDs as the first row, and it MUST contain more than 2 columns or it will not compile.

```
#####OTU_Table#####
otumat<- as.matrix(otudf) #otu_table() doesn't like dataframes so you need to convert to a matrix
otu <- otu_table(otudf, taxa_are_rows = FALSE) #makes data into an otu table object
#be sure to confirm whether or not your taxa are rows or columns, in this case they are rows
#easy way to check this:
otumat[1:2,1:2] # the columns are ASVs
```

```
##          ASV_1 ASV_2
## AC1.4    25842    18
## AC10.4   26080     9
```

```
#####Tax_Table#####
taxmat <- as.matrix(taxdf) #tax_table needs matrices not dataframes
tax <- tax_table(taxmat) #makes data into a taxonomy table object
```

```
#####Sample_Data#####
sample.data <- sample_data(samdf) #makes a sample data table
#note: sample data does NOT need to be a matrix to compile
```

Making a Phyloseq object

what goes in: When making a phyloseq object, there are 2 components necessary to getting the phyloseq object to compile. These are your taxonomy table and your otu table (see the last chunk for how to create these components). However, in order to really do anything with your phyloseq object, you want to include a sample data table (see the last chunk for how to create this).

IMPORTANT NOTE: In order for these to compile, be sure your sample IDs and OTUs or ASVs match between tables

what comes out: When the phyloseq object is made, you get one object containing all of your abundance, sample, and taxonomy data. Those data are all linked so the abundance data and sample data overlap by sampleID, and the abundance data and taxonomy data overlap by OTUs or ASVs. This means that with the sampleID you can get data from 2 tables, and with the OTUs or ASVs you can get data from 2 tables. Phyloseq objects allow you to organize your data into 1 object containing all of your data, so if you make edits to your data, you only have to load it in the beginning.

```
ps <- phyloseq(otu, tax, sample.data) #make the phyloseq object from the components made in the last chunk
ps #view the phyloseq object
```

```
## phyloseq-class experiment-level object
## otu_table() OTU Table: [ 1195 taxa and 64 samples ]
## sample_data() Sample Data: [ 64 samples by 13 sample variables ]
## tax_table() Taxonomy Table: [ 1195 taxa by 7 taxonomic ranks ]
```

```
#this object should have 1195 taxa and 64 samples
```

Exploring your Phyloseq object

There are ways to view each component of your phyloseq object. In the below chunk, we use head() as a way to just look at the first 6 rows. Remove head() from the line to see the entire object.

```
#to view the sample data
head(sample_data(ps))
```

```
##      Sample.ID Orig_geno_ID X2020_Mote_ID Genotype Outlier sampling_date
## AC1.4         AC1.4         1           M-L-1      1.4      No      11/12/19
## AC10.4        AC10.4        10          M-L-10     10.4     No      11/12/19
## AC13.22       AC13.22       13          M-L-13     13.22    No      11/12/19
## AC20          AC20          20          M-L-20     20       No      12/13/19
## AC29          AC29          29          M-L-29     29       No      12/13/19
## AC31.15       AC31.15       31          M-L-31     31.15    No      11/12/19
##      Species      Lat      Long      Region collection_date
## AC1.4 cervicornis 24.56937 -81.33028 Lower Keys 2/23/08
## AC10.4 cervicornis 24.61515 -81.37917 Lower Keys 2/23/08
## AC13.22 cervicornis 24.59592 -81.37162 Lower Keys 12/1/09
## AC20 cervicornis 24.62167 -81.36313 Lower Keys 12/15/09
## AC29 cervicornis 24.52172 -81.57675 Lower Keys 5/28/10
## AC31.15 cervicornis 24.54770 -81.45696 Lower Keys 3/18/10
##      Baums_MSAT_clonal_ID Proposed_pheno
## AC1.4 C1153 (AF) Susceptible
## AC10.4 C1083 (DG) Susceptible
## AC13.22 C1365 Susceptible
## AC20 C1191 Susceptible
## AC29 C1377 <NA>
## AC31.15 C1369 Susceptible
```

```
#to view the taxonomy table
head(data.frame(tax_table(ps)))
```

```
##      Kingdom      Phylum      Class      Order
```

```
## ASV_1 Bacteria Proteobacteria Alphaproteobacteria Rickettsiales
## ASV_2 Bacteria Spirochaetes Spirochaetia Spirochaetales
## ASV_3 Bacteria Proteobacteria
## ASV_4 Bacteria Spirochaetes Spirochaetia Spirochaetales
## ASV_5 Bacteria Proteobacteria Alphaproteobacteria Rickettsiales
## ASV_6 Bacteria Proteobacteria Alphaproteobacteria
##
## Family Genus Species
## ASV_1 Midichloriaceae Aquarickettsia Aquarickettsia
## ASV_2 Spirochaetaceae Spirochaeta_2 Genus_Spirochaeta_2
## ASV_3 Unclassified_ASV_3 Unclassified_ASV_3 Unclassified_ASV_3
## ASV_4 Spirochaetaceae Spirochaeta_2 Genus_Spirochaeta_2
## ASV_5 Midichloriaceae Aquarickettsia Aquarickettsia
## ASV_6 Unclassified_ASV_6 Unclassified_ASV_6 Unclassified_ASV_6
```

#to view the otu table

`head(data.frame(otu_table(ps)))` *#this is how you actually view the otu table data*

```
## ASV_1 ASV_2 ASV_3 ASV_4 ASV_5 ASV_6 ASV_7 ASV_8 ASV_9 ASV_10 ASV_11
## AC1.4 25842 18 143 44 107 14 3 14 2 6 48
## AC10.4 26080 9 60 3 114 0 2 15 1 8 0
## AC13.22 24992 14 622 0 96 2 421 10 0 12 37
## AC20 24895 12 1185 5 124 17 1 14 0 40 34
## AC29 25782 22 276 7 119 1 0 14 0 65 0
## AC31.15 25977 19 90 0 122 3 3 16 0 8 0
## ASV_12 ASV_13 ASV_14 ASV_15 ASV_16 ASV_17 ASV_18 ASV_19 ASV_20 ASV_21
## AC1.4 27 0 18 3 0 5 50 2 0 0
## AC10.4 13 7 27 3 0 0 44 0 0 0
## AC13.22 61 0 19 0 0 0 57 3 0 0
## AC20 87 0 23 0 0 0 0 0 0 0
## AC29 36 1 12 3 28 1 0 0 0 0
## AC31.15 17 0 20 1 0 0 54 1 0 18
## ASV_22 ASV_23 ASV_24 ASV_25 ASV_26 ASV_27 ASV_28 ASV_29 ASV_30 ASV_31
## AC1.4 24 0 35 0 14 18 7 0 10 0
## AC10.4 0 0 0 0 14 8 11 0 4 0
## AC13.22 16 1 36 0 4 0 10 0 4 1
## AC20 10 0 0 0 14 0 6 0 0 0
## AC29 21 0 0 1 8 9 9 0 4 2
## AC31.15 21 0 0 0 15 11 10 0 2 1
## ASV_32 ASV_33 ASV_34 ASV_35 ASV_36 ASV_37 ASV_38 ASV_39 ASV_40 ASV_41
## AC1.4 0 0 0 0 1 5 7 0 0 0
## AC10.4 0 0 0 0 0 6 7 2 0 0
## AC13.22 0 0 0 0 0 6 3 0 0 2
## AC20 0 0 0 0 0 8 10 0 0 0
## AC29 0 0 0 0 0 6 6 0 0 0
## AC31.15 0 0 0 0 0 3 8 0 0 2
## ASV_42 ASV_43 ASV_44 ASV_45 ASV_46 ASV_47 ASV_48 ASV_49 ASV_50 ASV_51
## AC1.4 0 8 0 0 0 0 0 0 0 1
## AC10.4 0 6 0 0 0 18 0 0 0 0
## AC13.22 0 3 0 0 0 0 0 0 0 0
## AC20 0 10 0 0 0 0 0 0 0 0
## AC29 0 6 0 0 0 0 0 0 46 0
## AC31.15 0 0 0 0 0 0 0 0 0 0
## ASV_52 ASV_53 ASV_54 ASV_55 ASV_56 ASV_57 ASV_58 ASV_59 ASV_60 ASV_61
## AC1.4 0 7 0 2 0 0 0 0 0 0
```

## AC10.4	0	12	0	6	0	0	0	0	1	0
## AC13.22	0	0	0	7	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0	0
## AC29	0	10	0	5	0	0	0	0	0	0
## AC31.15	0	8	0	3	0	0	0	0	0	0
##	ASV_62	ASV_63	ASV_64	ASV_65	ASV_66	ASV_67	ASV_68	ASV_69	ASV_70	ASV_71
## AC1.4	0	0	0	0	0	0	0	5	0	0
## AC10.4	0	0	0	1	1	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	2	0	0
## AC29	0	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0	0
##	ASV_72	ASV_73	ASV_74	ASV_75	ASV_76	ASV_77	ASV_78	ASV_79	ASV_80	ASV_81
## AC1.4	3	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0	1
## AC13.22	0	0	0	0	0	0	0	0	0	0
## AC20	4	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0	0
## AC31.15	8	0	0	0	0	0	0	0	0	0
##	ASV_82	ASV_83	ASV_84	ASV_85	ASV_86	ASV_87	ASV_88	ASV_89	ASV_90	ASV_91
## AC1.4	0	0	0	0	0	8	0	0	2	0
## AC10.4	0	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	2	0	0
## AC31.15	0	5	0	0	0	0	0	0	0	0
##	ASV_92	ASV_93	ASV_94	ASV_95	ASV_96	ASV_97	ASV_98	ASV_99	ASV_100	ASV_101
## AC1.4	0	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	3	0	0	2
## AC13.22	0	0	0	0	1	0	6	0	0	1
## AC20	0	0	0	0	0	4	0	0	0	0
## AC29	0	0	0	0	0	13	0	0	0	0
## AC31.15	0	0	0	0	4	0	8	0	0	0
##	ASV_102	ASV_103	ASV_104	ASV_105	ASV_106	ASV_107	ASV_108	ASV_109	ASV_110	
## AC1.4	0	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0	0
## AC13.22	0	7	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0	0
##	ASV_111	ASV_112	ASV_113	ASV_114	ASV_115	ASV_116	ASV_117	ASV_118	ASV_119	
## AC1.4	0	1	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0	0
## AC13.22	4	0	0	0	0	0	0	3	0	0
## AC20	1	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0	0
## AC31.15	1	0	0	0	2	0	0	1	0	0
##	ASV_120	ASV_121	ASV_122	ASV_123	ASV_124	ASV_125	ASV_126	ASV_127	ASV_128	
## AC1.4	0	0	0	0	0	0	0	0	1	0
## AC10.4	0	0	0	0	0	7	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	7	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	1	0
## AC31.15	0	0	0	0	0	0	0	0	0	0

##	ASV_129	ASV_130	ASV_131	ASV_132	ASV_133	ASV_134	ASV_135	ASV_136	ASV_137
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_138	ASV_139	ASV_140	ASV_141	ASV_142	ASV_143	ASV_144	ASV_145	ASV_146
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	1	0	0	0	0	0	0
## AC13.22	0	0	5	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	1	0	0	0	0	0	0
##	ASV_147	ASV_148	ASV_149	ASV_150	ASV_151	ASV_152	ASV_153	ASV_154	ASV_155
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	2
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_156	ASV_157	ASV_158	ASV_159	ASV_160	ASV_161	ASV_162	ASV_163	ASV_164
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_165	ASV_166	ASV_167	ASV_168	ASV_169	ASV_170	ASV_171	ASV_172	ASV_173
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	2	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_174	ASV_175	ASV_176	ASV_177	ASV_178	ASV_179	ASV_180	ASV_181	ASV_182
## AC1.4	0	0	0	0	0	0	4	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	5	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_183	ASV_184	ASV_185	ASV_186	ASV_187	ASV_188	ASV_189	ASV_190	ASV_191
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_192	ASV_193	ASV_194	ASV_195	ASV_196	ASV_197	ASV_198	ASV_199	ASV_200
## AC1.4	0	0	0	0	0	2	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0

## AC29	0	0	0	0	0	2	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	1
##	ASV_201	ASV_202	ASV_203	ASV_204	ASV_205	ASV_206	ASV_207	ASV_208	ASV_209
## AC1.4	0	0	0	0	0	0	0	3	0
## AC10.4	0	0	0	0	0	0	0	0	1
## AC13.22	0	0	0	0	0	0	0	2	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_210	ASV_211	ASV_212	ASV_213	ASV_214	ASV_215	ASV_216	ASV_217	ASV_218
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_219	ASV_220	ASV_221	ASV_222	ASV_223	ASV_224	ASV_225	ASV_226	ASV_227
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	8	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_228	ASV_229	ASV_230	ASV_231	ASV_232	ASV_233	ASV_234	ASV_235	ASV_236
## AC1.4	0	3	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	3	0	0	0	0	0	0	0
## AC29	0	4	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_237	ASV_238	ASV_239	ASV_240	ASV_241	ASV_242	ASV_243	ASV_244	ASV_245
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	4	0	0	0	0	0	0
##	ASV_246	ASV_247	ASV_248	ASV_249	ASV_250	ASV_251	ASV_252	ASV_253	ASV_254
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	2	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_255	ASV_256	ASV_257	ASV_258	ASV_259	ASV_260	ASV_261	ASV_262	ASV_263
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	1	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_264	ASV_265	ASV_266	ASV_267	ASV_268	ASV_269	ASV_270	ASV_271	ASV_272
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	1	0	0	0

## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	4	0	0	0
##	ASV_273	ASV_274	ASV_275	ASV_276	ASV_277	ASV_278	ASV_279	ASV_280	ASV_281
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	1	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_282	ASV_283	ASV_284	ASV_285	ASV_286	ASV_287	ASV_288	ASV_289	ASV_290
## AC1.4	0	0	0	0	0	0	0	3	0
## AC10.4	0	0	0	0	0	0	0	1	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	1	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	3	0
##	ASV_291	ASV_292	ASV_293	ASV_294	ASV_295	ASV_296	ASV_297	ASV_298	ASV_299
## AC1.4	0	0	0	0	0	0	0	3	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	1	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_300	ASV_301	ASV_302	ASV_303	ASV_304	ASV_305	ASV_306	ASV_307	ASV_308
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	2	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	4	0
##	ASV_309	ASV_310	ASV_311	ASV_312	ASV_313	ASV_314	ASV_315	ASV_316	ASV_317
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_318	ASV_319	ASV_320	ASV_321	ASV_322	ASV_323	ASV_324	ASV_325	ASV_326
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	4	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_327	ASV_328	ASV_329	ASV_330	ASV_331	ASV_332	ASV_333	ASV_334	ASV_335
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_336	ASV_337	ASV_338	ASV_339	ASV_340	ASV_341	ASV_342	ASV_343	ASV_344

## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_345	ASV_346	ASV_347	ASV_348	ASV_349	ASV_350	ASV_351	ASV_352	ASV_353
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_354	ASV_355	ASV_356	ASV_357	ASV_358	ASV_359	ASV_360	ASV_361	ASV_362
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_363	ASV_364	ASV_365	ASV_366	ASV_367	ASV_368	ASV_369	ASV_370	ASV_371
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_372	ASV_373	ASV_374	ASV_375	ASV_376	ASV_377	ASV_378	ASV_379	ASV_380
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	9	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_381	ASV_382	ASV_383	ASV_384	ASV_385	ASV_386	ASV_387	ASV_388	ASV_389
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_390	ASV_391	ASV_392	ASV_393	ASV_394	ASV_395	ASV_396	ASV_397	ASV_398
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	10	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	1	0	0	0	0
##	ASV_399	ASV_400	ASV_401	ASV_402	ASV_403	ASV_404	ASV_405	ASV_406	ASV_407
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0

##	AC31.15	0	0	0	0	0	0	0	0	0
##		ASV_408	ASV_409	ASV_410	ASV_411	ASV_412	ASV_413	ASV_414	ASV_415	ASV_416
##	AC1.4	0	0	0	0	0	0	0	0	0
##	AC10.4	0	0	0	0	0	0	0	0	0
##	AC13.22	0	0	0	0	0	0	0	0	0
##	AC20	0	0	0	0	0	0	0	0	0
##	AC29	0	0	0	0	0	0	0	0	0
##	AC31.15	0	0	1	0	0	0	0	0	0
##		ASV_417	ASV_418	ASV_419	ASV_420	ASV_421	ASV_422	ASV_423	ASV_424	ASV_425
##	AC1.4	0	0	0	0	0	0	0	0	0
##	AC10.4	0	0	0	0	0	0	0	0	0
##	AC13.22	0	0	0	0	0	0	0	0	0
##	AC20	0	0	0	0	0	0	0	0	0
##	AC29	0	0	0	0	0	0	0	0	0
##	AC31.15	1	0	0	0	0	0	0	0	0
##		ASV_426	ASV_427	ASV_428	ASV_429	ASV_430	ASV_431	ASV_432	ASV_433	ASV_434
##	AC1.4	0	0	4	0	0	0	0	0	0
##	AC10.4	0	0	0	0	0	0	0	0	0
##	AC13.22	0	0	1	0	0	0	0	0	0
##	AC20	0	0	0	0	0	0	0	0	0
##	AC29	0	0	0	0	0	0	0	0	0
##	AC31.15	0	0	0	0	0	0	0	0	0
##		ASV_435	ASV_436	ASV_437	ASV_438	ASV_439	ASV_440	ASV_441	ASV_442	ASV_443
##	AC1.4	0	0	0	0	0	0	0	0	0
##	AC10.4	0	0	0	0	0	0	0	0	0
##	AC13.22	0	0	2	0	0	0	0	0	0
##	AC20	0	0	0	0	0	0	0	0	0
##	AC29	0	0	0	0	0	0	0	0	0
##	AC31.15	0	0	3	0	0	0	0	0	0
##		ASV_444	ASV_445	ASV_446	ASV_447	ASV_448	ASV_449	ASV_450	ASV_451	ASV_452
##	AC1.4	0	0	0	0	0	0	0	0	0
##	AC10.4	0	0	0	0	0	0	0	0	0
##	AC13.22	0	0	0	0	0	0	0	0	0
##	AC20	0	0	0	0	0	0	0	0	0
##	AC29	0	0	0	0	0	0	0	0	0
##	AC31.15	0	0	0	0	0	0	0	0	0
##		ASV_453	ASV_454	ASV_455	ASV_456	ASV_457	ASV_458	ASV_459	ASV_460	ASV_461
##	AC1.4	0	0	0	0	0	0	0	0	0
##	AC10.4	0	0	0	0	0	0	0	0	0
##	AC13.22	0	0	0	0	0	0	0	0	0
##	AC20	0	0	0	0	0	0	0	0	0
##	AC29	0	0	0	0	0	0	0	0	0
##	AC31.15	0	0	0	0	0	0	0	0	0
##		ASV_462	ASV_463	ASV_464	ASV_465	ASV_466	ASV_467	ASV_468	ASV_469	ASV_470
##	AC1.4	0	0	0	0	0	0	0	0	0
##	AC10.4	0	0	0	0	0	0	0	0	0
##	AC13.22	0	0	0	0	0	0	0	0	0
##	AC20	0	0	0	0	0	0	0	0	0
##	AC29	0	0	0	0	0	0	0	0	0
##	AC31.15	0	0	0	0	0	0	0	0	0
##		ASV_471	ASV_472	ASV_473	ASV_474	ASV_475	ASV_476	ASV_477	ASV_478	ASV_479
##	AC1.4	0	0	0	0	0	0	0	0	0
##	AC10.4	0	0	0	0	0	0	0	0	0
##	AC13.22	0	0	0	0	0	0	0	0	0

## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_480	ASV_481	ASV_482	ASV_483	ASV_484	ASV_485	ASV_486	ASV_487	ASV_488
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_489	ASV_490	ASV_491	ASV_492	ASV_493	ASV_494	ASV_495	ASV_496	ASV_497
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_498	ASV_499	ASV_500	ASV_501	ASV_502	ASV_503	ASV_504	ASV_505	ASV_506
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	2	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	1	0	0	0	0	0	0
##	ASV_507	ASV_508	ASV_509	ASV_510	ASV_511	ASV_512	ASV_513	ASV_514	ASV_515
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	2	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_516	ASV_517	ASV_518	ASV_519	ASV_520	ASV_521	ASV_522	ASV_523	ASV_524
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_525	ASV_526	ASV_527	ASV_528	ASV_529	ASV_530	ASV_531	ASV_532	ASV_533
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_534	ASV_535	ASV_536	ASV_537	ASV_538	ASV_539	ASV_540	ASV_541	ASV_542
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_543	ASV_544	ASV_545	ASV_546	ASV_547	ASV_548	ASV_549	ASV_550	ASV_551
## AC1.4	0	0	0	0	0	0	0	0	0

## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	9	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	1	0	0	0	0	0
##	ASV_552	ASV_553	ASV_554	ASV_555	ASV_556	ASV_557	ASV_558	ASV_559	ASV_560
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	8	0	0	0
## AC13.22	0	0	2	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	2	0	0	0	0	0	0
##	ASV_561	ASV_562	ASV_563	ASV_564	ASV_565	ASV_566	ASV_567	ASV_568	ASV_569
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	3	0	0	0	0	0	4	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_570	ASV_571	ASV_572	ASV_573	ASV_574	ASV_575	ASV_576	ASV_577	ASV_578
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	1	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_579	ASV_580	ASV_581	ASV_582	ASV_583	ASV_584	ASV_585	ASV_586	ASV_587
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	2	0
## AC13.22	0	0	0	0	0	0	0	0	1
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_588	ASV_589	ASV_590	ASV_591	ASV_592	ASV_593	ASV_594	ASV_595	ASV_596
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	2	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_597	ASV_598	ASV_599	ASV_600	ASV_601	ASV_602	ASV_603	ASV_604	ASV_605
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_606	ASV_607	ASV_608	ASV_609	ASV_610	ASV_611	ASV_612	ASV_613	ASV_614
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	1	0	0	0	0	0	0	0	0

##	ASV_615	ASV_616	ASV_617	ASV_618	ASV_619	ASV_620	ASV_621	ASV_622	ASV_623
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_624	ASV_625	ASV_626	ASV_627	ASV_628	ASV_629	ASV_630	ASV_631	ASV_632
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	3	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_633	ASV_634	ASV_635	ASV_636	ASV_637	ASV_638	ASV_639	ASV_640	ASV_641
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	1	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	4	0	0	0	0	0
##	ASV_642	ASV_643	ASV_644	ASV_645	ASV_646	ASV_647	ASV_648	ASV_649	ASV_650
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	3	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	3
##	ASV_651	ASV_652	ASV_653	ASV_654	ASV_655	ASV_656	ASV_657	ASV_658	ASV_659
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_660	ASV_661	ASV_662	ASV_663	ASV_664	ASV_665	ASV_666	ASV_667	ASV_668
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	5	0	0	0	0	0	0
##	ASV_669	ASV_670	ASV_671	ASV_672	ASV_673	ASV_674	ASV_675	ASV_676	ASV_677
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_678	ASV_680	ASV_681	ASV_682	ASV_683	ASV_684	ASV_685	ASV_686	ASV_687
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0

## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_688	ASV_689	ASV_690	ASV_691	ASV_692	ASV_693	ASV_694	ASV_695	ASV_696
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	2
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_697	ASV_698	ASV_699	ASV_700	ASV_701	ASV_702	ASV_703	ASV_704	ASV_705
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_706	ASV_707	ASV_708	ASV_709	ASV_710	ASV_711	ASV_712	ASV_713	ASV_714
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_715	ASV_716	ASV_717	ASV_718	ASV_719	ASV_720	ASV_721	ASV_722	ASV_723
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	1	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_724	ASV_725	ASV_726	ASV_727	ASV_728	ASV_729	ASV_730	ASV_731	ASV_732
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_733	ASV_734	ASV_735	ASV_736	ASV_737	ASV_738	ASV_739	ASV_741	ASV_742
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_743	ASV_744	ASV_745	ASV_746	ASV_747	ASV_748	ASV_749	ASV_750	ASV_751
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_752	ASV_753	ASV_754	ASV_755	ASV_756	ASV_757	ASV_758	ASV_759	ASV_760
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0

## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_761	ASV_762	ASV_763	ASV_764	ASV_765	ASV_766	ASV_767	ASV_768	ASV_769
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	1	0	0	0
##	ASV_770	ASV_771	ASV_772	ASV_773	ASV_774	ASV_776	ASV_777	ASV_778	ASV_779
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_780	ASV_781	ASV_782	ASV_783	ASV_784	ASV_785	ASV_786	ASV_787	ASV_788
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_789	ASV_790	ASV_791	ASV_792	ASV_793	ASV_794	ASV_795	ASV_796	ASV_797
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	5	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_798	ASV_799	ASV_800	ASV_801	ASV_802	ASV_803	ASV_804	ASV_805	ASV_806
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_807	ASV_808	ASV_809	ASV_810	ASV_811	ASV_812	ASV_813	ASV_814	ASV_815
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	2	0	0	0	4	0	0	0
##	ASV_816	ASV_817	ASV_818	ASV_819	ASV_820	ASV_821	ASV_822	ASV_823	ASV_824
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_825	ASV_826	ASV_827	ASV_828	ASV_829	ASV_830	ASV_831	ASV_832	ASV_833

## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	2	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_834	ASV_835	ASV_836	ASV_837	ASV_838	ASV_839	ASV_840	ASV_841	ASV_842
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	1
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_844	ASV_845	ASV_846	ASV_847	ASV_848	ASV_849	ASV_850	ASV_851	ASV_852
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	1	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_853	ASV_854	ASV_855	ASV_856	ASV_857	ASV_858	ASV_859	ASV_860	ASV_861
## AC1.4	0	0	0	0	0	2	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	3	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_862	ASV_863	ASV_864	ASV_865	ASV_866	ASV_867	ASV_868	ASV_869	ASV_870
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	3	0	0
##	ASV_871	ASV_872	ASV_873	ASV_874	ASV_875	ASV_876	ASV_877	ASV_878	ASV_879
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_880	ASV_881	ASV_882	ASV_883	ASV_884	ASV_886	ASV_887	ASV_888	ASV_889
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	2	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_890	ASV_891	ASV_892	ASV_893	ASV_894	ASV_895	ASV_896	ASV_897	ASV_898
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	1	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0

## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_899	ASV_900	ASV_901	ASV_902	ASV_903	ASV_904	ASV_905	ASV_906	ASV_907
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_909	ASV_910	ASV_911	ASV_914	ASV_915	ASV_916	ASV_917	ASV_919	ASV_920
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_921	ASV_922	ASV_924	ASV_925	ASV_926	ASV_927	ASV_928	ASV_929	ASV_930
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	1	0	0	0	0	0	0	0
##	ASV_931	ASV_932	ASV_933	ASV_934	ASV_935	ASV_936	ASV_937	ASV_938	ASV_939
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_941	ASV_942	ASV_943	ASV_945	ASV_946	ASV_947	ASV_948	ASV_949	ASV_950
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	1	0	0	0	0	0
##	ASV_951	ASV_952	ASV_953	ASV_954	ASV_955	ASV_956	ASV_957	ASV_958	ASV_959
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	2
##	ASV_960	ASV_961	ASV_962	ASV_963	ASV_964	ASV_965	ASV_966	ASV_967	ASV_968
## AC1.4	0	0	0	0	0	0	0	3	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	7
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_969	ASV_970	ASV_971	ASV_972	ASV_973	ASV_974	ASV_975	ASV_976	ASV_977
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0

## AC20	2	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_978	ASV_979	ASV_980	ASV_981	ASV_982	ASV_983	ASV_984	ASV_985	ASV_986
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_987	ASV_988	ASV_989	ASV_990	ASV_991	ASV_992	ASV_993	ASV_995	ASV_996
## AC1.4	0	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0	0
##	ASV_997	ASV_998	ASV_999	ASV_1000	ASV_1001	ASV_1002	ASV_1003	ASV_1005	
## AC1.4	0	0	0	0	0	0	0	0	
## AC10.4	2	0	0	0	0	0	0	0	
## AC13.22	0	0	0	0	0	0	0	0	
## AC20	0	0	0	0	0	0	0	0	
## AC29	0	0	0	0	0	0	0	0	
## AC31.15	0	1	0	0	0	0	0	0	
##	ASV_1006	ASV_1007	ASV_1008	ASV_1009	ASV_1010	ASV_1011	ASV_1012	ASV_1013	
## AC1.4	0	0	0	0	0	0	0	0	
## AC10.4	0	0	0	0	0	0	0	0	
## AC13.22	0	0	0	0	0	0	0	0	
## AC20	0	0	0	0	0	0	0	0	
## AC29	0	0	0	0	0	0	0	0	
## AC31.15	0	0	0	0	0	0	0	0	
##	ASV_1014	ASV_1015	ASV_1016	ASV_1017	ASV_1019	ASV_1020	ASV_1021	ASV_1022	
## AC1.4	0	0	0	0	0	0	0	0	
## AC10.4	0	0	0	0	0	0	0	0	
## AC13.22	0	0	0	0	0	0	0	0	
## AC20	0	0	0	0	0	0	0	0	
## AC29	0	0	0	0	0	0	0	0	
## AC31.15	1	0	0	0	0	0	0	0	
##	ASV_1023	ASV_1025	ASV_1026	ASV_1027	ASV_1028	ASV_1029	ASV_1030	ASV_1032	
## AC1.4	0	0	2	0	0	0	0	0	
## AC10.4	0	0	0	0	0	0	0	0	
## AC13.22	0	0	0	0	0	0	0	0	
## AC20	0	0	0	0	0	0	0	0	
## AC29	0	0	0	0	0	0	0	0	
## AC31.15	0	0	0	0	0	0	0	0	
##	ASV_1033	ASV_1034	ASV_1035	ASV_1036	ASV_1037	ASV_1039	ASV_1040	ASV_1041	
## AC1.4	0	0	0	0	0	0	0	0	
## AC10.4	0	0	0	0	0	0	0	0	
## AC13.22	0	0	0	0	0	0	0	0	
## AC20	0	0	0	0	0	0	0	0	
## AC29	0	0	0	0	0	0	0	0	
## AC31.15	0	0	0	0	0	0	2	0	
##	ASV_1042	ASV_1043	ASV_1044	ASV_1045	ASV_1046	ASV_1047	ASV_1050	ASV_1051	
## AC1.4	0	0	0	0	0	0	0	0	

## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1052	ASV_1053	ASV_1054	ASV_1055	ASV_1056	ASV_1058	ASV_1059	ASV_1060
## AC1.4	0	0	0	0	1	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	1	1	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1061	ASV_1062	ASV_1063	ASV_1064	ASV_1065	ASV_1067	ASV_1069	ASV_1070
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	2	0
##	ASV_1072	ASV_1074	ASV_1075	ASV_1076	ASV_1077	ASV_1078	ASV_1079	ASV_1080
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	1	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	2
##	ASV_1081	ASV_1082	ASV_1084	ASV_1085	ASV_1086	ASV_1088	ASV_1089	ASV_1091
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1092	ASV_1094	ASV_1095	ASV_1096	ASV_1097	ASV_1098	ASV_1099	ASV_1100
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	2	1	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	1	3	0
##	ASV_1102	ASV_1103	ASV_1104	ASV_1106	ASV_1107	ASV_1108	ASV_1109	ASV_1111
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1112	ASV_1114	ASV_1116	ASV_1120	ASV_1123	ASV_1124	ASV_1127	ASV_1128
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0

##	ASV_1131	ASV_1132	ASV_1133	ASV_1134	ASV_1136	ASV_1137	ASV_1138	ASV_1139
## AC1.4	0	0	0	0	0	0	0	2
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1140	ASV_1142	ASV_1144	ASV_1145	ASV_1146	ASV_1147	ASV_1148	ASV_1149
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	2	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	2	0	0	0	0	0	0
##	ASV_1150	ASV_1151	ASV_1153	ASV_1154	ASV_1155	ASV_1156	ASV_1157	ASV_1159
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1163	ASV_1164	ASV_1165	ASV_1166	ASV_1167	ASV_1168	ASV_1169	ASV_1170
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	2	0	0	0
## AC13.22	0	0	0	0	0	1	0	0
## AC20	0	0	0	0	0	0	3	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1171	ASV_1173	ASV_1174	ASV_1176	ASV_1177	ASV_1178	ASV_1179	ASV_1180
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1182	ASV_1183	ASV_1184	ASV_1185	ASV_1189	ASV_1191	ASV_1193	ASV_1194
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	2	2	0	0
##	ASV_1197	ASV_1198	ASV_1199	ASV_1200	ASV_1202	ASV_1204	ASV_1205	ASV_1206
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1207	ASV_1208	ASV_1210	ASV_1211	ASV_1212	ASV_1215	ASV_1217	ASV_1218
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	1	2
## AC20	0	0	0	0	0	0	0	0

## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1219	ASV_1221	ASV_1224	ASV_1225	ASV_1226	ASV_1229	ASV_1230	ASV_1232
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	1	0	0	0	0	0	0	0
## AC31.15	0	2	0	0	0	0	0	0
##	ASV_1236	ASV_1237	ASV_1239	ASV_1241	ASV_1243	ASV_1244	ASV_1245	ASV_1246
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1247	ASV_1248	ASV_1249	ASV_1250	ASV_1251	ASV_1252	ASV_1253	ASV_1255
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	1
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1256	ASV_1258	ASV_1260	ASV_1262	ASV_1264	ASV_1265	ASV_1266	ASV_1268
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	1	0	0	0	0	0	0	0
##	ASV_1269	ASV_1274	ASV_1276	ASV_1277	ASV_1279	ASV_1280	ASV_1281	ASV_1282
## AC1.4	0	0	0	0	0	0	0	0
## AC10.4	0	0	0	0	0	0	0	0
## AC13.22	0	0	0	0	0	0	0	0
## AC20	0	0	0	0	0	0	0	0
## AC29	0	0	0	0	0	0	0	0
## AC31.15	0	0	0	0	0	0	0	0
##	ASV_1285	ASV_1287	ASV_1288	ASV_1290				
## AC1.4	0	0	0	0				
## AC10.4	0	0	0	0				
## AC13.22	0	0	0	0				
## AC20	0	0	0	0				
## AC29	0	0	0	0				
## AC31.15	0	0	0	0				

Filtering, subsetting, and pruning your phyloseq object

Filtering and pruning Sometimes, your phyloseq object is messy, from having a lot of taxa with little to no abundance at all included, for example from using raw abundances, or from having too many samples for what the tests or graphs you are running need, etc. There are many things you can do to clean your phyloseq object. This includes filtering it to exclude super small abundances, converting your raw abundance data to relative abundance data, or by merging samples.

```
#get rid of 0 taxa
ps_clean <- prune_taxa(taxa_sums(ps) > 0, ps)
any(sample_sums(ps_clean) == 0) #reports FALSE if no zero taxa
```

```
## [1] FALSE
```

```
#Remove Samples with less than 100 reads
ps_clean = prune_samples(sample_sums(ps_clean) > 100, ps_clean)
```

```
#You can filter taxa to remove taxa with small abundances, i.e. get rid of taxa that have less than 10
ps_clean = filter_taxa(ps_clean, function(x) sum(x > 10) > (0.01*length(x)), TRUE)
```

```
#Or alternatively, get rid of taxa in less than 4 samples
ps_clean<- prune_taxa(taxa_sums(ps_clean) > 4, ps_clean)
```

```
#get rid of common contaminants
ps.filt<-subset_taxa(ps_clean, (Order!="Chloroplast") | is.na(Order))
ps.filt<-subset_taxa(ps_clean, (Family!="Mitochondria") | is.na(Family))
```

```
#You can also convert your data from raw abundance data to relative abundance data
physeq.f.ra <- transform_sample_counts(ps.filt, function(x) x*100/sum(x)) #transform to relative abundance
```

```
rowSums(data.frame(otu_table(physeq.f.ra)))#if the line above worked right, all of the row sums should
```

```
## AC1.4 AC10.4 AC13.22 AC20 AC29 AC31.15 AC34 AC38 AC4.13 AC41.24
## 100 100 100 100 100 100 100 100 100 100
## AC44.3 AC46.21 AC47.21 AC48 AC5.5 AC50.18 AC51 AC54 AC55 AC56
## 100 100 100 100 100 100 100 100 100 100
## AC57.9 AC58.3 AC6 AC62.13 AC63 AC70 AC75 AC76 AC77 AC78
## 100 100 100 100 100 100 100 100 100 100
## AC79 AC8 AC80 AC84 AC88 AC89 CU.K2 CU.K3 CU12.19 CU19.8
## 100 100 100 100 100 100 100 100 100 100
## CU24 CU25.13 CU27.4 CU28 CU30 CU43 CU44 CU69.17 CU76 CM2
## 100 100 100 100 100 100 100 100 100 100
## CM5 CM6 FM.12 FM.13 FM.14 FM.18 FM.19 FM.20 FM.21 FM.4
## 100 100 100 100 100 100 100 100 100 100
## FM.5 FM.6 FM.7 FM.9
## 100 100 100 100
```

```
#You can also merge samples by a variable in the sample data, i.e. Region
ps.reg.merge <- merge_samples(ps,"Region")#the second part is the variable name be sure to spell it cor
```

```
## Warning in asMethod(object): NAs introduced by coercion
```

```
## Warning in asMethod(object): NAs introduced by coercion
```

```
## Warning in asMethod(object): NAs introduced by coercion
```

```
## Warning in asMethod(object): NAs introduced by coercion
```

```
## Warning in asMethod(object): NAs introduced by coercion
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```
## Warning in asMethod(object): NAs introduced by coercion
## Warning in asMethod(object): NAs introduced by coercion
## Warning in asMethod(object): NAs introduced by coercion
## Warning in asMethod(object): NAs introduced by coercion
## Warning in asMethod(object): NAs introduced by coercion
## Warning in asMethod(object): NAs introduced by coercion
```

```
#Do not let the warning message from merge_samples() alarm you, it is not harmful
head(data.frame(otu_table(ps.reg.merge))) #if done right, this data is now combined so there is 1 abund
```

```
##          ASV_1 ASV_2 ASV_3 ASV_4 ASV_5 ASV_6 ASV_7 ASV_8 ASV_9 ASV_10
## Lower Keys  912423 4261  9468  9192  3746   457   587   693    37   761
## Middle Keys 364188 24623 1709  2035  1545   110    0  1001    6   42
## Upper Keys  305380 31868 2147   45  1177   105   143   945    4   43
##          ASV_11 ASV_12 ASV_13 ASV_14 ASV_15 ASV_16 ASV_17 ASV_18 ASV_19
## Lower Keys    882   1002    33   689   184   865   481   701   12
## Middle Keys   271    148    57   286    1   109    4    34    0
## Upper Keys    351    193    76   247    6   104    1    89    2
##          ASV_20 ASV_21 ASV_22 ASV_23 ASV_24 ASV_25 ASV_26 ASV_27 ASV_28
## Lower Keys    707    22   452   590   347    3   318   287   317
## Middle Keys     0     0   160    0   120    8   123   138   115
## Upper Keys     6    17   127    2   123    0   109   105   117
##          ASV_29 ASV_30 ASV_31 ASV_32 ASV_33 ASV_34 ASV_35 ASV_36 ASV_37
## Lower Keys    102   440   157    21    8    0    4    99   206
## Middle Keys     4    81    38    5    1    0    0    0   103
## Upper Keys     6     0     6    1    5    1    0    3    78
##          ASV_38 ASV_39 ASV_40 ASV_41 ASV_42 ASV_43 ASV_44 ASV_45 ASV_46
## Lower Keys    248    29    8    24    4   209   172    0    5
## Middle Keys    82     0    0    0    0   85   152    0    0
## Upper Keys    107    0    0    1    0   53   74    0    0
##          ASV_47 ASV_48 ASV_49 ASV_50 ASV_51 ASV_52 ASV_53 ASV_54 ASV_55
## Lower Keys    23     0    0   224    1   88   179   225   135
## Middle Keys     0    78    0   92    2    0   43    0   38
## Upper Keys     0   290    0   73    0    0   33    0   40
##          ASV_56 ASV_57 ASV_58 ASV_59 ASV_60 ASV_61 ASV_62 ASV_63 ASV_64
## Lower Keys    32     0    1    0   35    6    0    1    6
## Middle Keys     0     0    0    0    0    0   18    0    0
## Upper Keys     1    16    2    0    5    0   35    1    0
##          ASV_65 ASV_66 ASV_67 ASV_68 ASV_69 ASV_70 ASV_71 ASV_72 ASV_73
## Lower Keys    15     9    0   10   85    0    3   86    0
## Middle Keys     2     1    0    0   36    0    0   37    0
## Upper Keys     3     0    0    2   41    0   28   42    0
##          ASV_74 ASV_75 ASV_76 ASV_77 ASV_78 ASV_79 ASV_80 ASV_81 ASV_82
## Lower Keys     0     0   12    0    0    0    0   72    0
## Middle Keys     0     0    0    0    0    0    0    2    0
## Upper Keys     7     0    0    1    0    0    0    8    0
##          ASV_83 ASV_84 ASV_85 ASV_86 ASV_87 ASV_88 ASV_89 ASV_90 ASV_91
## Lower Keys    19     3   55    3   70    4   16   21    0
## Middle Keys     0     0    0    0   19    1    0    0    2
```

## Upper Keys	0	0	0	2	14	3	2	0	0
##	ASV_92	ASV_93	ASV_94	ASV_95	ASV_96	ASV_97	ASV_98	ASV_99	ASV_100
## Lower Keys	0	31	1	0	30	117	70	1	0
## Middle Keys	0	37	0	0	0	7	23	0	0
## Upper Keys	0	47	0	21	1	1	20	1	0
##	ASV_101	ASV_102	ASV_103	ASV_104	ASV_105	ASV_106	ASV_107	ASV_108	
## Lower Keys	32	7	15	2	1	5	13	0	
## Middle Keys	0	3	0	0	0	0	1	0	
## Upper Keys	2	1	0	0	0	0	2	0	
##	ASV_109	ASV_110	ASV_111	ASV_112	ASV_113	ASV_114	ASV_115	ASV_116	
## Lower Keys	0	11	28	14	0	0	17	0	
## Middle Keys	1	0	0	0	0	0	1	0	
## Upper Keys	0	0	5	0	0	0	0	0	
##	ASV_117	ASV_118	ASV_119	ASV_120	ASV_121	ASV_122	ASV_123	ASV_124	
## Lower Keys	3	4	0	0	1	0	0	6	
## Middle Keys	0	0	0	0	0	0	0	1	
## Upper Keys	0	3	0	0	2	0	0	2	
##	ASV_125	ASV_126	ASV_127	ASV_128	ASV_129	ASV_130	ASV_131	ASV_132	
## Lower Keys	78	0	0	20	0	4	62	2	
## Middle Keys	6	0	0	0	0	0	0	0	
## Upper Keys	0	0	0	0	0	1	0	0	
##	ASV_133	ASV_134	ASV_135	ASV_136	ASV_137	ASV_138	ASV_139	ASV_140	
## Lower Keys	0	6	3	0	0	19	9	15	
## Middle Keys	0	0	0	0	0	0	1	0	
## Upper Keys	0	0	2	0	0	0	1	3	
##	ASV_141	ASV_142	ASV_143	ASV_144	ASV_145	ASV_146	ASV_147	ASV_148	
## Lower Keys	0	0	49	0	0	9	0	35	
## Middle Keys	0	0	16	0	0	0	0	0	
## Upper Keys	0	0	0	0	0	0	0	12	
##	ASV_149	ASV_150	ASV_151	ASV_152	ASV_153	ASV_154	ASV_155	ASV_156	
## Lower Keys	1	4	8	0	2	2	2	3	
## Middle Keys	0	0	0	0	0	0	0	0	
## Upper Keys	0	0	0	80	0	0	0	0	
##	ASV_157	ASV_158	ASV_159	ASV_160	ASV_161	ASV_162	ASV_163	ASV_164	
## Lower Keys	23	40	0	2	1	0	0	8	
## Middle Keys	0	0	0	0	0	0	0	5	
## Upper Keys	0	0	0	0	0	0	0	1	
##	ASV_165	ASV_166	ASV_167	ASV_168	ASV_169	ASV_170	ASV_171	ASV_172	
## Lower Keys	0	38	5	62	0	0	0	0	
## Middle Keys	0	1	0	3	0	0	0	0	
## Upper Keys	0	1	0	0	0	0	0	0	
##	ASV_173	ASV_174	ASV_175	ASV_176	ASV_177	ASV_178	ASV_179	ASV_180	
## Lower Keys	0	0	0	1	0	0	0	25	
## Middle Keys	0	0	0	0	0	0	0	6	
## Upper Keys	0	0	0	0	0	0	0	7	
##	ASV_181	ASV_182	ASV_183	ASV_184	ASV_185	ASV_186	ASV_187	ASV_188	
## Lower Keys	0	9	0	0	0	2	0	0	
## Middle Keys	0	0	0	0	0	0	0	0	
## Upper Keys	0	1	0	0	0	0	0	0	
##	ASV_189	ASV_190	ASV_191	ASV_192	ASV_193	ASV_194	ASV_195	ASV_196	
## Lower Keys	0	0	1	2	0	0	4	1	
## Middle Keys	0	0	0	0	0	0	0	3	
## Upper Keys	0	0	0	1	0	0	0	0	
##	ASV_197	ASV_198	ASV_199	ASV_200	ASV_201	ASV_202	ASV_203	ASV_204	

## Lower Keys	34	2	17	3	0	7	1	0
## Middle Keys	11	0	2	3	0	0	0	0
## Upper Keys	4	0	2	0	0	0	0	0
##	ASV_205	ASV_206	ASV_207	ASV_208	ASV_209	ASV_210	ASV_211	ASV_212
## Lower Keys	0	0	0	15	10	0	0	2
## Middle Keys	0	0	0	7	0	0	0	0
## Upper Keys	0	0	6	10	0	0	0	0
##	ASV_213	ASV_214	ASV_215	ASV_216	ASV_217	ASV_218	ASV_219	ASV_220
## Lower Keys	1	0	0	2	0	17	1	0
## Middle Keys	0	0	0	1	0	1	0	0
## Upper Keys	1	0	0	0	0	3	0	4
##	ASV_221	ASV_222	ASV_223	ASV_224	ASV_225	ASV_226	ASV_227	ASV_228
## Lower Keys	1	3	0	0	0	19	0	0
## Middle Keys	0	0	0	0	0	7	0	0
## Upper Keys	0	0	0	2	0	6	0	0
##	ASV_229	ASV_230	ASV_231	ASV_232	ASV_233	ASV_234	ASV_235	ASV_236
## Lower Keys	23	0	0	0	0	0	0	0
## Middle Keys	12	0	0	0	0	0	0	0
## Upper Keys	7	0	0	0	0	0	0	0
##	ASV_237	ASV_238	ASV_239	ASV_240	ASV_241	ASV_242	ASV_243	ASV_244
## Lower Keys	11	7	17	0	0	0	0	0
## Middle Keys	1	0	0	0	0	0	0	0
## Upper Keys	5	0	7	0	0	0	0	0
##	ASV_245	ASV_246	ASV_247	ASV_248	ASV_249	ASV_250	ASV_251	ASV_252
## Lower Keys	0	0	5	42	0	5	0	11
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	2	0	0	1
##	ASV_253	ASV_254	ASV_255	ASV_256	ASV_257	ASV_258	ASV_259	ASV_260
## Lower Keys	31	0	0	0	1	0	1	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_261	ASV_262	ASV_263	ASV_264	ASV_265	ASV_266	ASV_267	ASV_268
## Lower Keys	0	1	5	5	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_269	ASV_270	ASV_271	ASV_272	ASV_273	ASV_274	ASV_275	ASV_276
## Lower Keys	18	0	16	0	3	0	0	15
## Middle Keys	1	0	0	0	0	0	0	0
## Upper Keys	3	0	0	0	0	0	0	1
##	ASV_277	ASV_278	ASV_279	ASV_280	ASV_281	ASV_282	ASV_283	ASV_284
## Lower Keys	0	0	0	7	0	14	1	0
## Middle Keys	0	0	0	0	0	2	0	0
## Upper Keys	0	0	0	0	0	6	0	0
##	ASV_285	ASV_286	ASV_287	ASV_288	ASV_289	ASV_290	ASV_291	ASV_292
## Lower Keys	22	0	0	0	15	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	10	0	0	0
##	ASV_293	ASV_294	ASV_295	ASV_296	ASV_297	ASV_298	ASV_299	ASV_300
## Lower Keys	0	0	0	4	0	14	0	0
## Middle Keys	0	0	0	0	0	3	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_301	ASV_302	ASV_303	ASV_304	ASV_305	ASV_306	ASV_307	ASV_308
## Lower Keys	0	0	2	0	0	0	26	0
## Middle Keys	0	0	0	0	0	0	0	0

## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_309	ASV_310	ASV_311	ASV_312	ASV_313	ASV_314	ASV_315	ASV_316
## Lower Keys	0	0	0	5	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_317	ASV_318	ASV_319	ASV_320	ASV_321	ASV_322	ASV_323	ASV_324
## Lower Keys	0	0	4	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_325	ASV_326	ASV_327	ASV_328	ASV_329	ASV_330	ASV_331	ASV_332
## Lower Keys	11	0	1	0	0	0	0	0
## Middle Keys	1	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	1	0	0
##	ASV_333	ASV_334	ASV_335	ASV_336	ASV_337	ASV_338	ASV_339	ASV_340
## Lower Keys	0	14	8	0	0	0	0	0
## Middle Keys	0	4	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_341	ASV_342	ASV_343	ASV_344	ASV_345	ASV_346	ASV_347	ASV_348
## Lower Keys	0	0	0	0	0	5	8	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_349	ASV_350	ASV_351	ASV_352	ASV_353	ASV_354	ASV_355	ASV_356
## Lower Keys	0	20	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	2	0	0	0
##	ASV_357	ASV_358	ASV_359	ASV_360	ASV_361	ASV_362	ASV_363	ASV_364
## Lower Keys	0	0	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_365	ASV_366	ASV_367	ASV_368	ASV_369	ASV_370	ASV_371	ASV_372
## Lower Keys	0	5	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_373	ASV_374	ASV_375	ASV_376	ASV_377	ASV_378	ASV_379	ASV_380
## Lower Keys	0	0	21	0	23	0	0	2
## Middle Keys	0	0	2	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_381	ASV_382	ASV_383	ASV_384	ASV_385	ASV_386	ASV_387	ASV_388
## Lower Keys	2	1	0	0	0	0	12	1
## Middle Keys	0	1	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_389	ASV_390	ASV_391	ASV_392	ASV_393	ASV_394	ASV_395	ASV_396
## Lower Keys	0	0	0	0	0	14	0	9
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_397	ASV_398	ASV_399	ASV_400	ASV_401	ASV_402	ASV_403	ASV_404
## Lower Keys	0	0	1	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_405	ASV_406	ASV_407	ASV_408	ASV_409	ASV_410	ASV_411	ASV_412
## Lower Keys	0	0	0	0	0	13	12	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	1
##	ASV_413	ASV_414	ASV_415	ASV_416	ASV_417	ASV_418	ASV_419	ASV_420

## Lower Keys	0	0	0	0	2	0	0	0
## Middle Keys	0	0	0	0	0	6	0	0
## Upper Keys	0	0	0	0	0	3	0	0
##	ASV_421	ASV_422	ASV_423	ASV_424	ASV_425	ASV_426	ASV_427	ASV_428
## Lower Keys	1	0	0	0	0	0	0	13
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	3
##	ASV_429	ASV_430	ASV_431	ASV_432	ASV_433	ASV_434	ASV_435	ASV_436
## Lower Keys	0	3	0	0	0	1	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_437	ASV_438	ASV_439	ASV_440	ASV_441	ASV_442	ASV_443	ASV_444
## Lower Keys	6	0	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	3	0	0	0	0	0	0	0
##	ASV_445	ASV_446	ASV_447	ASV_448	ASV_449	ASV_450	ASV_451	ASV_452
## Lower Keys	0	0	0	2	14	17	0	5
## Middle Keys	0	0	0	2	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_453	ASV_454	ASV_455	ASV_456	ASV_457	ASV_458	ASV_459	ASV_460
## Lower Keys	0	2	0	0	0	0	2	0
## Middle Keys	0	2	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_461	ASV_462	ASV_463	ASV_464	ASV_465	ASV_466	ASV_467	ASV_468
## Lower Keys	0	0	0	0	0	0	12	0
## Middle Keys	0	0	22	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_469	ASV_470	ASV_471	ASV_472	ASV_473	ASV_474	ASV_475	ASV_476
## Lower Keys	0	0	3	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_477	ASV_478	ASV_479	ASV_480	ASV_481	ASV_482	ASV_483	ASV_484
## Lower Keys	0	0	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_485	ASV_486	ASV_487	ASV_488	ASV_489	ASV_490	ASV_491	ASV_492
## Lower Keys	0	0	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_493	ASV_494	ASV_495	ASV_496	ASV_497	ASV_498	ASV_499	ASV_500
## Lower Keys	0	0	0	0	0	15	0	6
## Middle Keys	0	0	0	0	0	1	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_501	ASV_502	ASV_503	ASV_504	ASV_505	ASV_506	ASV_507	ASV_508
## Lower Keys	0	2	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	4	0	0	0	0	0	0
##	ASV_509	ASV_510	ASV_511	ASV_512	ASV_513	ASV_514	ASV_515	ASV_516
## Lower Keys	2	0	1	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	2	0	0	0	0	0
##	ASV_517	ASV_518	ASV_519	ASV_520	ASV_521	ASV_522	ASV_523	ASV_524
## Lower Keys	0	0	0	0	0	0	0	0
## Middle Keys	0	0	0	11	0	0	0	0

## Upper Keys	0	11	0	0	0	0	0	0
##	ASV_525	ASV_526	ASV_527	ASV_528	ASV_529	ASV_530	ASV_531	ASV_532
## Lower Keys	0	0	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_533	ASV_534	ASV_535	ASV_536	ASV_537	ASV_538	ASV_539	ASV_540
## Lower Keys	0	0	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_541	ASV_542	ASV_543	ASV_544	ASV_545	ASV_546	ASV_547	ASV_548
## Lower Keys	0	4	0	0	0	1	1	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_549	ASV_550	ASV_551	ASV_552	ASV_553	ASV_554	ASV_555	ASV_556
## Lower Keys	0	9	0	0	0	11	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_557	ASV_558	ASV_559	ASV_560	ASV_561	ASV_562	ASV_563	ASV_564
## Lower Keys	8	1	0	0	5	4	0	10
## Middle Keys	0	0	0	0	1	0	0	2
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_565	ASV_566	ASV_567	ASV_568	ASV_569	ASV_570	ASV_571	ASV_572
## Lower Keys	1	0	0	15	2	0	0	2
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	3
##	ASV_573	ASV_574	ASV_575	ASV_576	ASV_577	ASV_578	ASV_579	ASV_580
## Lower Keys	1	0	0	0	0	0	2	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	4	0	0	0	0	0	1	0
##	ASV_581	ASV_582	ASV_583	ASV_584	ASV_585	ASV_586	ASV_587	ASV_588
## Lower Keys	0	0	0	7	0	6	1	6
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	1	3	0	0	0
##	ASV_589	ASV_590	ASV_591	ASV_592	ASV_593	ASV_594	ASV_595	ASV_596
## Lower Keys	1	1	0	0	4	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_597	ASV_598	ASV_599	ASV_600	ASV_601	ASV_602	ASV_603	ASV_604
## Lower Keys	0	0	4	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_605	ASV_606	ASV_607	ASV_608	ASV_609	ASV_610	ASV_611	ASV_612
## Lower Keys	0	2	8	10	0	0	0	0
## Middle Keys	0	1	0	0	0	0	0	0
## Upper Keys	0	0	0	0	10	0	0	0
##	ASV_613	ASV_614	ASV_615	ASV_616	ASV_617	ASV_618	ASV_619	ASV_620
## Lower Keys	0	6	9	0	0	0	2	6
## Middle Keys	0	0	0	0	0	0	0	2
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_621	ASV_622	ASV_623	ASV_624	ASV_625	ASV_626	ASV_627	ASV_628
## Lower Keys	0	10	5	0	5	0	3	7
## Middle Keys	0	0	0	0	2	0	0	0
## Upper Keys	0	0	0	0	2	0	3	0
##	ASV_629	ASV_630	ASV_631	ASV_632	ASV_633	ASV_634	ASV_635	ASV_636

## Lower Keys	5	0	0	0	2	8	0	8
## Middle Keys	1	0	0	0	0	0	0	0
## Upper Keys	1	0	0	0	0	0	0	0
##	ASV_637	ASV_638	ASV_639	ASV_640	ASV_641	ASV_642	ASV_643	ASV_644
## Lower Keys	0	0	0	0	0	9	5	6
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_645	ASV_646	ASV_647	ASV_648	ASV_649	ASV_650	ASV_651	ASV_652
## Lower Keys	0	0	0	3	0	3	3	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	1	0	0
##	ASV_653	ASV_654	ASV_655	ASV_656	ASV_657	ASV_658	ASV_659	ASV_660
## Lower Keys	0	0	4	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_661	ASV_662	ASV_663	ASV_664	ASV_665	ASV_666	ASV_667	ASV_668
## Lower Keys	0	5	1	5	2	1	0	0
## Middle Keys	0	0	0	0	0	4	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_669	ASV_670	ASV_671	ASV_672	ASV_673	ASV_674	ASV_675	ASV_676
## Lower Keys	0	8	0	2	0	0	0	0
## Middle Keys	0	4	0	0	0	0	0	0
## Upper Keys	0	0	0	1	0	0	0	0
##	ASV_677	ASV_678	ASV_680	ASV_681	ASV_682	ASV_683	ASV_684	ASV_685
## Lower Keys	0	0	9	0	0	0	0	5
## Middle Keys	0	0	0	0	0	0	0	2
## Upper Keys	0	0	0	0	0	0	10	3
##	ASV_686	ASV_687	ASV_688	ASV_689	ASV_690	ASV_691	ASV_692	ASV_693
## Lower Keys	0	0	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_694	ASV_695	ASV_696	ASV_697	ASV_698	ASV_699	ASV_700	ASV_701
## Lower Keys	0	0	3	3	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_702	ASV_703	ASV_704	ASV_705	ASV_706	ASV_707	ASV_708	ASV_709
## Lower Keys	4	0	0	0	4	0	0	0
## Middle Keys	0	0	0	0	2	0	0	0
## Upper Keys	0	0	0	0	2	0	0	0
##	ASV_710	ASV_711	ASV_712	ASV_713	ASV_714	ASV_715	ASV_716	ASV_717
## Lower Keys	0	4	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_718	ASV_719	ASV_720	ASV_721	ASV_722	ASV_723	ASV_724	ASV_725
## Lower Keys	0	0	0	0	1	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_726	ASV_727	ASV_728	ASV_729	ASV_730	ASV_731	ASV_732	ASV_733
## Lower Keys	0	0	0	8	0	0	0	8
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_734	ASV_735	ASV_736	ASV_737	ASV_738	ASV_739	ASV_741	ASV_742
## Lower Keys	4	0	0	2	0	2	0	0
## Middle Keys	0	0	0	2	0	0	0	0

## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_743	ASV_744	ASV_745	ASV_746	ASV_747	ASV_748	ASV_749	ASV_750
## Lower Keys	0	0	0	0	5	7	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_751	ASV_752	ASV_753	ASV_754	ASV_755	ASV_756	ASV_757	ASV_758
## Lower Keys	0	0	0	7	2	7	0	0
## Middle Keys	0	0	0	1	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_759	ASV_760	ASV_761	ASV_762	ASV_763	ASV_764	ASV_765	ASV_766
## Lower Keys	0	0	0	0	0	0	0	2
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_767	ASV_768	ASV_769	ASV_770	ASV_771	ASV_772	ASV_773	ASV_774
## Lower Keys	5	4	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	1	0	0	0	0	0	0
##	ASV_776	ASV_777	ASV_778	ASV_779	ASV_780	ASV_781	ASV_782	ASV_783
## Lower Keys	0	0	8	0	4	1	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	7	0	0
##	ASV_784	ASV_785	ASV_786	ASV_787	ASV_788	ASV_789	ASV_790	ASV_791
## Lower Keys	0	1	1	2	0	0	0	5
## Middle Keys	0	0	2	0	0	0	0	0
## Upper Keys	0	0	3	6	0	0	0	0
##	ASV_792	ASV_793	ASV_794	ASV_795	ASV_796	ASV_797	ASV_798	ASV_799
## Lower Keys	3	3	8	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	3	0	0	0	0
##	ASV_800	ASV_801	ASV_802	ASV_803	ASV_804	ASV_805	ASV_806	ASV_807
## Lower Keys	0	3	0	2	2	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	2	0	0	0	0
##	ASV_808	ASV_809	ASV_810	ASV_811	ASV_812	ASV_813	ASV_814	ASV_815
## Lower Keys	2	0	0	0	4	3	2	2
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	5	0	0	0	0	0	1
##	ASV_816	ASV_817	ASV_818	ASV_819	ASV_820	ASV_821	ASV_822	ASV_823
## Lower Keys	0	0	6	3	5	0	0	4
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	1	0	0	0	0
##	ASV_824	ASV_825	ASV_826	ASV_827	ASV_828	ASV_829	ASV_830	ASV_831
## Lower Keys	0	0	0	0	0	2	0	0
## Middle Keys	1	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_832	ASV_833	ASV_834	ASV_835	ASV_836	ASV_837	ASV_838	ASV_839
## Lower Keys	6	3	3	2	1	3	0	1
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	2	0	0	0
##	ASV_840	ASV_841	ASV_842	ASV_844	ASV_845	ASV_846	ASV_847	ASV_848
## Lower Keys	0	0	1	0	3	4	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_849	ASV_850	ASV_851	ASV_852	ASV_853	ASV_854	ASV_855	ASV_856

## Lower Keys	4	5	6	3	4	2	4	0
## Middle Keys	0	1	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	1
##	ASV_857	ASV_858	ASV_859	ASV_860	ASV_861	ASV_862	ASV_863	ASV_864
## Lower Keys	0	8	3	2	3	3	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_865	ASV_866	ASV_867	ASV_868	ASV_869	ASV_870	ASV_871	ASV_872
## Lower Keys	0	6	0	3	1	0	3	4
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_873	ASV_874	ASV_875	ASV_876	ASV_877	ASV_878	ASV_879	ASV_880
## Lower Keys	0	0	0	0	0	6	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_881	ASV_882	ASV_883	ASV_884	ASV_886	ASV_887	ASV_888	ASV_889
## Lower Keys	0	3	0	3	4	8	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_890	ASV_891	ASV_892	ASV_893	ASV_894	ASV_895	ASV_896	ASV_897
## Lower Keys	0	1	2	2	4	2	1	5
## Middle Keys	0	1	0	0	0	0	0	0
## Upper Keys	0	2	0	0	0	0	0	1
##	ASV_898	ASV_899	ASV_900	ASV_901	ASV_902	ASV_903	ASV_904	ASV_905
## Lower Keys	2	1	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	3	0	0	0	0	0
##	ASV_906	ASV_907	ASV_909	ASV_910	ASV_911	ASV_914	ASV_915	ASV_916
## Lower Keys	0	3	1	0	2	2	6	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	1
##	ASV_917	ASV_919	ASV_920	ASV_921	ASV_922	ASV_924	ASV_925	ASV_926
## Lower Keys	0	0	0	0	3	1	2	2
## Middle Keys	0	0	0	8	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_927	ASV_928	ASV_929	ASV_930	ASV_931	ASV_932	ASV_933	ASV_934
## Lower Keys	2	0	0	0	0	0	2	2
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	2	2	0	0	2	0	0
##	ASV_935	ASV_936	ASV_937	ASV_938	ASV_939	ASV_941	ASV_942	ASV_943
## Lower Keys	3	4	3	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_945	ASV_946	ASV_947	ASV_948	ASV_949	ASV_950	ASV_951	ASV_952
## Lower Keys	2	4	4	3	4	0	0	0
## Middle Keys	1	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	1	0	0
##	ASV_953	ASV_954	ASV_955	ASV_956	ASV_957	ASV_958	ASV_959	ASV_960
## Lower Keys	0	0	0	0	2	0	2	2
## Middle Keys	0	0	0	0	0	1	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_961	ASV_962	ASV_963	ASV_964	ASV_965	ASV_966	ASV_967	ASV_968
## Lower Keys	1	2	0	0	0	0	3	7
## Middle Keys	0	0	0	0	0	0	0	0

## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_969	ASV_970	ASV_971	ASV_972	ASV_973	ASV_974	ASV_975	ASV_976
## Lower Keys	2	0	1	1	1	1	0	0
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_977	ASV_978	ASV_979	ASV_980	ASV_981	ASV_982	ASV_983	ASV_984
## Lower Keys	1	2	1	3	1	1	0	0
## Middle Keys	0	0	0	0	0	5	0	0
## Upper Keys	0	0	0	0	0	0	0	2
##	ASV_985	ASV_986	ASV_987	ASV_988	ASV_989	ASV_990	ASV_991	ASV_992
## Lower Keys	0	0	0	2	4	1	0	4
## Middle Keys	0	0	0	0	0	0	0	0
## Upper Keys	0	3	0	0	0	0	0	0
##	ASV_993	ASV_995	ASV_996	ASV_997	ASV_998	ASV_999	ASV_1000	ASV_1001
## Lower Keys	0	0	0	2	1	1	1	3
## Middle Keys	2	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0	0
##	ASV_1002	ASV_1003	ASV_1005	ASV_1006	ASV_1007	ASV_1008	ASV_1009	
## Lower Keys	3	3	7	0	0	0	0	
## Middle Keys	0	0	0	2	0	0	0	
## Upper Keys	0	0	0	0	1	0	0	
##	ASV_1010	ASV_1011	ASV_1012	ASV_1013	ASV_1014	ASV_1015	ASV_1016	
## Lower Keys	0	0	0	1	1	2	1	
## Middle Keys	0	5	4	0	0	0	0	
## Upper Keys	0	0	0	0	0	0	0	
##	ASV_1017	ASV_1019	ASV_1020	ASV_1021	ASV_1022	ASV_1023	ASV_1025	
## Lower Keys	3	2	3	2	1	0	0	
## Middle Keys	0	0	0	0	0	0	0	
## Upper Keys	0	0	0	0	0	2	1	
##	ASV_1026	ASV_1027	ASV_1028	ASV_1029	ASV_1030	ASV_1032	ASV_1033	
## Lower Keys	2	0	1	1	1	2	0	
## Middle Keys	0	0	0	0	0	0	0	
## Upper Keys	0	0	0	0	0	0	2	
##	ASV_1034	ASV_1035	ASV_1036	ASV_1037	ASV_1039	ASV_1040	ASV_1041	
## Lower Keys	0	0	0	0	0	2	0	
## Middle Keys	0	0	0	0	0	1	0	
## Upper Keys	0	0	2	0	0	0	0	
##	ASV_1042	ASV_1043	ASV_1044	ASV_1045	ASV_1046	ASV_1047	ASV_1050	
## Lower Keys	2	1	3	2	3	0	1	
## Middle Keys	0	0	0	0	0	0	0	
## Upper Keys	0	0	0	0	0	1	0	
##	ASV_1051	ASV_1052	ASV_1053	ASV_1054	ASV_1055	ASV_1056	ASV_1058	
## Lower Keys	0	0	0	0	0	1	1	
## Middle Keys	0	0	0	0	1	0	0	
## Upper Keys	1	0	2	2	0	0	0	
##	ASV_1059	ASV_1060	ASV_1061	ASV_1062	ASV_1063	ASV_1064	ASV_1065	
## Lower Keys	1	1	1	4	2	0	0	
## Middle Keys	0	0	0	0	0	0	0	
## Upper Keys	0	0	0	0	0	0	7	
##	ASV_1067	ASV_1069	ASV_1070	ASV_1072	ASV_1074	ASV_1075	ASV_1076	
## Lower Keys	0	2	2	1	0	0	0	
## Middle Keys	0	0	0	0	0	0	0	
## Upper Keys	0	0	0	0	0	4	1	
##	ASV_1077	ASV_1078	ASV_1079	ASV_1080	ASV_1081	ASV_1082	ASV_1084	

## Lower Keys	0	1	0	2	1	2	4
## Middle Keys	3	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1085	ASV_1086	ASV_1088	ASV_1089	ASV_1091	ASV_1092	ASV_1094
## Lower Keys	2	2	2	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	3	0
##	ASV_1095	ASV_1096	ASV_1097	ASV_1098	ASV_1099	ASV_1100	ASV_1102
## Lower Keys	0	2	1	1	3	0	1
## Middle Keys	2	0	0	0	0	1	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1103	ASV_1104	ASV_1106	ASV_1107	ASV_1108	ASV_1109	ASV_1111
## Lower Keys	3	2	1	0	4	2	1
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	1	0	0	0
##	ASV_1112	ASV_1114	ASV_1116	ASV_1120	ASV_1123	ASV_1124	ASV_1127
## Lower Keys	1	0	0	0	2	1	1
## Middle Keys	0	1	0	0	2	0	0
## Upper Keys	0	0	2	0	0	0	0
##	ASV_1128	ASV_1131	ASV_1132	ASV_1133	ASV_1134	ASV_1136	ASV_1137
## Lower Keys	4	1	4	1	2	0	0
## Middle Keys	0	0	0	0	0	2	0
## Upper Keys	0	0	0	0	0	0	1
##	ASV_1138	ASV_1139	ASV_1140	ASV_1142	ASV_1144	ASV_1145	ASV_1146
## Lower Keys	0	2	2	2	1	1	2
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1147	ASV_1148	ASV_1149	ASV_1150	ASV_1151	ASV_1153	ASV_1154
## Lower Keys	2	3	1	1	1	1	1
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1155	ASV_1156	ASV_1157	ASV_1159	ASV_1163	ASV_1164	ASV_1165
## Lower Keys	2	1	1	4	0	0	0
## Middle Keys	0	0	0	0	0	0	1
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1166	ASV_1167	ASV_1168	ASV_1169	ASV_1170	ASV_1171	ASV_1173
## Lower Keys	0	2	1	3	1	1	1
## Middle Keys	1	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1174	ASV_1176	ASV_1177	ASV_1178	ASV_1179	ASV_1180	ASV_1182
## Lower Keys	1	1	1	2	2	3	1
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1183	ASV_1184	ASV_1185	ASV_1189	ASV_1191	ASV_1193	ASV_1194
## Lower Keys	0	0	0	2	2	1	1
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	1	0	2	0	0	0	0
##	ASV_1197	ASV_1198	ASV_1199	ASV_1200	ASV_1202	ASV_1204	ASV_1205
## Lower Keys	3	1	2	2	3	2	2
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1206	ASV_1207	ASV_1208	ASV_1210	ASV_1211	ASV_1212	ASV_1215
## Lower Keys	2	1	2	0	0	0	0
## Middle Keys	0	0	0	0	0	0	0

## Upper Keys	0	0	0	0	0	0	2
##	ASV_1217	ASV_1218	ASV_1219	ASV_1221	ASV_1224	ASV_1225	ASV_1226
## Lower Keys	1	2	1	2	1	1	2
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1229	ASV_1230	ASV_1232	ASV_1236	ASV_1237	ASV_1239	ASV_1241
## Lower Keys	1	1	2	1	1	2	2
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1243	ASV_1244	ASV_1245	ASV_1246	ASV_1247	ASV_1248	ASV_1249
## Lower Keys	2	0	0	0	0	0	0
## Middle Keys	0	0	0	0	0	0	1
## Upper Keys	0	0	0	0	2	1	0
##	ASV_1250	ASV_1251	ASV_1252	ASV_1253	ASV_1255	ASV_1256	ASV_1258
## Lower Keys	0	0	0	0	1	1	1
## Middle Keys	3	1	1	1	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1260	ASV_1262	ASV_1264	ASV_1265	ASV_1266	ASV_1268	ASV_1269
## Lower Keys	2	2	3	1	1	1	2
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1274	ASV_1276	ASV_1277	ASV_1279	ASV_1280	ASV_1281	ASV_1282
## Lower Keys	2	1	1	2	1	1	2
## Middle Keys	0	0	0	0	0	0	0
## Upper Keys	0	0	0	0	0	0	0
##	ASV_1285	ASV_1287	ASV_1288	ASV_1290			
## Lower Keys	0	0	0	0			
## Middle Keys	0	1	1	1			
## Upper Keys	0	0	0	0			

subsetting Using the `subset_samples()` or `subset_taxa()` functions, you can subset your phyloseq object into a smaller part of the data, i.e. only the data from the upper keys. In order to do this, you need to know the different boolean operators in R.

Complete list of R operators here: <https://www.statmethods.net/management/operators.html>

```
#subsetting your data by info from the sample data, using ==
ps.up <- subset_samples(ps, Region=="Upper Keys")
#this subsets your data by region equals Upper Keys, so you only get Upper Keys
ps.up #this object should have 1195 taxa and 13 samples
```

```
## phyloseq-class experiment-level object
## otu_table() OTU Table: [ 1195 taxa and 13 samples ]
## sample_data() Sample Data: [ 13 samples by 13 sample variables ]
## tax_table() Taxonomy Table: [ 1195 taxa by 7 taxonomic ranks ]
```

```
####subsetting you data by info from the sample data, using other boolean operators#####
ps.nolow <- subset_samples(ps, Region!="Lower Keys")
#this uses the != operator (AKA not equal to) to subset for everything except the lower keys
ps.nolow
```

```
## phyloseq-class experiment-level object
## otu_table() OTU Table: [ 1195 taxa and 28 samples ]
```

```
## sample_data() Sample Data:      [ 28 samples by 13 sample variables ]
## tax_table()   Taxonomy Table:   [ 1195 taxa by 7 taxonomic ranks ]
```

```
#you can subset by more than just equal to or not equal to
ps.latlong <- subset_samples(ps, Lat>=24.5 && Long<=81.5)
#this uses the && operator (AKA and) to subset by Lat and Long, this also uses the >= (AKA greater than
ps.latlong
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:        [ 1195 taxa and 64 samples ]
## sample_data() Sample Data:      [ 64 samples by 13 sample variables ]
## tax_table()   Taxonomy Table:   [ 1195 taxa by 7 taxonomic ranks ]
```

```
#you can also subset by or not just and
ps.uplow <- subset_samples(ps, Region=="Upper Keys"|Region=="Lower Keys")
#this uses the | operator (AKA or) to subset, choosing any samples that are upper keys OR lower keys
#this is different than && because && requires both halves to be true, but for | one half or the other
ps.uplow
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:        [ 1195 taxa and 49 samples ]
## sample_data() Sample Data:      [ 49 samples by 13 sample variables ]
## tax_table()   Taxonomy Table:   [ 1195 taxa by 7 taxonomic ranks ]
```

```
#subsetting your data by taxonomy
ps.rick <- subset_taxa(ps, Order=="Rickettsiales")
ps.rick
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:        [ 65 taxa and 64 samples ]
## sample_data() Sample Data:      [ 64 samples by 13 sample variables ]
## tax_table()   Taxonomy Table:   [ 65 taxa by 7 taxonomic ranks ]
```

Some standard filter/prune steps before you start the rest of your analyses:

```
#get rid of 0 taxa
ps
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:        [ 1195 taxa and 64 samples ]
## sample_data() Sample Data:      [ 64 samples by 13 sample variables ]
## tax_table()   Taxonomy Table:   [ 1195 taxa by 7 taxonomic ranks ]
```

```
ps_clean <- prune_taxa(taxa_sums(ps) > 0, ps)
any(sample_sums(ps_clean) == 0) #reports FALSE if no zero taxa
```

```
## [1] FALSE
```

```
ps_clean
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:         [ 617 taxa and 64 samples ]
## sample_data() Sample Data:      [ 64 samples by 13 sample variables ]
## tax_table()   Taxonomy Table:    [ 617 taxa by 7 taxonomic ranks ]
```

```
#get rid of taxa in less than 4 samples
```

```
ps_clean<- prune_taxa(taxa_sums(ps_clean) > 4, ps_clean)
ps_clean
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:         [ 234 taxa and 64 samples ]
## sample_data() Sample Data:      [ 64 samples by 13 sample variables ]
## tax_table()   Taxonomy Table:    [ 234 taxa by 7 taxonomic ranks ]
```

```
#get rid of common contaminants
```

```
ps.filt<-subset_taxa(ps_clean, (Order!="Chloroplast") | is.na(Order))
ps.filt<-subset_taxa(ps_clean, (Family!="Mitochondria") | is.na(Family))
ps.filt
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:         [ 234 taxa and 64 samples ]
## sample_data() Sample Data:      [ 64 samples by 13 sample variables ]
## tax_table()   Taxonomy Table:    [ 234 taxa by 7 taxonomic ranks ]
```

Save your phyloseq object as a R data structure

This function allows you to save your phyloseq object to your working directory. This means that, in the future, you will only have to load your phyloseq object into R rather than 3 csv files. This saves a lot of time, keeps your folder cleaner, and makes working with others MUCH easier.

.rds files are r data structures. It saves one object in a way that it can then be loaded with readRDS() later and R knows what it should look like.

```
saveRDS(ps.filt, "examplePhyloseq.rds")
```