BLE\_Microbio\_16sSalinityRf

Zach Brown

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#housekeeping code and calling things in  
library(readr)  
library(tidyverse)

## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ──  
## ✔ dplyr 1.1.3 ✔ purrr 1.0.2  
## ✔ forcats 1.0.0 ✔ stringr 1.5.0  
## ✔ ggplot2 3.4.4 ✔ tibble 3.2.1  
## ✔ lubridate 1.9.2 ✔ tidyr 1.3.0  
## ── Conflicts ────────────────────────────────────────── tidyverse\_conflicts() ──  
## ✖ dplyr::filter() masks stats::filter()  
## ✖ dplyr::lag() masks stats::lag()  
## ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors

library(ggplot2)  
library(readxl)  
  
library(lubridate)  
library(vegan)

## Loading required package: permute  
## Loading required package: lattice  
## This is vegan 2.6-4

library(plotly) #couldn't load

##   
## Attaching package: 'plotly'  
##   
## The following object is masked from 'package:ggplot2':  
##   
## last\_plot  
##   
## The following object is masked from 'package:stats':  
##   
## filter  
##   
## The following object is masked from 'package:graphics':  
##   
## layout

library(goeveg) #couldn't load

## This is GoeVeg 0.7.2 - build: 2024-02-06

library(patchwork)  
  
#######required libraries#######################  
library(randomForest)

## randomForest 4.7-1.1  
## Type rfNews() to see new features/changes/bug fixes.  
##   
## Attaching package: 'randomForest'  
##   
## The following object is masked from 'package:dplyr':  
##   
## combine  
##   
## The following object is masked from 'package:ggplot2':  
##   
## margin

library(caret)

##   
## Attaching package: 'caret'  
##   
## The following object is masked from 'package:vegan':  
##   
## tolerance  
##   
## The following object is masked from 'package:purrr':  
##   
## lift

library(e1071)  
library(dplyr)  
  
library(tidyverse)  
library(ranger)

##   
## Attaching package: 'ranger'  
##   
## The following object is masked from 'package:randomForest':  
##   
## importance

library(lubridate)  
library(vegan)  
library(ranger)  
library(Boruta)  
  
  
setwd("/Users/zachbrown/Desktop/SIO/Classes/2023-24/Winter2024/SIOB278\_MarineMicrobialSeminar/BLE\_LTER\_Data")

#Attempt 1 RF - regression

#Should we divide up by filter size as well?  
#Start with 16s data, RF\_classification template  
library(randomForest)  
library(caret)  
library(e1071)  
library(dplyr)

Work with MergedData16sSalinity3 for RF. This chunk discusses how I tailored the dataset to meet the RF requirements, starting from confirming numeric data to converting to relative abundance to pulling the ASV and one env data predicted value (salinity) and making sure the data frame was of an okay size.

#import main csv - 15k 16s ASV values and all env data - how to get data ready to go from most optimal CSV  
EnvASVData <- read.csv("EnvASVData2.csv")  
EnvASVData2 <- t(EnvASVData)  
colnames(EnvASVData2) <- EnvASVData2[1, ]  
EnvASVData2 <- EnvASVData2[-1, ]  
EnvASVData2 <- as.data.frame(EnvASVData2)  
  
SalinityASVData <- EnvASVData2[, c(8, 24:15000), drop = FALSE]  
SalinityASVData2 <- SalinityASVData[!is.na(SalinityASVData[, 'Salinity']), ]  
str(SalinityASVData2)

## 'data.frame': 222 obs. of 14978 variables:  
## $ Salinity : chr " 4.5" "30.4" "31.6" "16.8" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGAATGTGAAAGCCCTGGGCTCAACCTAGGAATTGCATCCCAAACTGGCAAACTAGAGTACAAGAGAGGGGTGTGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGACGCCCTGGCTTGATACTGACACTGAGGTGCGAAAGCG : chr "0.0003696946" "0.0882285888" "0.1321956022" "0.0054917554" ...  
## $ CGTTGTCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCTGTGAAATTTCGAGGCTCAACCTCGAACTTGCAGTGGGTACGGGCAGGCTAGAGTGCAGTAGGGGAGATGGGAATTCCTGGTGTAGCGGTGGAATGCGCAGATATCAGGAGGAACACCAATGGCGAAGGCACATCTCTGGGCTGTAACTGACGCTGAGGAGCGAAAGCG : chr "0.0139172123" "0.0062314766" "0.0055136200" "0.0262074910" ...  
## $ CGTTATCCGGATTCATTGGGTTTAAAGGGTCCGTAGGCGGGTCTTTAAGTCAGTGGTGAAAGCCGACAGCTCAACTGTCGAACTGCCATTGATACTGGAGACCTTGAGTACAAATGAAGTAGGCGGAATGAGTCATGTAGCGGTGAAATGCATAGATATGACTCAGAACACCGATTGCGAAGGCAGCTTACTAACATGTAACTGACGCTGAGGGACGAAAGCG : chr "0.0001073307" "0.0090432404" "0.0028224483" "0.0184773239" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGCTTTGTAAGACAGACGTGAAATCCCCGGGCTCAACCTGGGAATTGCGTTTGTGACTGCAAGGCTAGAGTACGGTAGAGGGGGGTAGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAGCCCCCTGGACCTGTACTGACGCTCATGCACGAAAGCG : chr "0.0181985141" "0.0022038149" "0.0017065967" "0.0067013319" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGTTATATAAGACAGTTGTGAAATCCCCGGGCTCAACCTGGGAATTGCATCTGTGACTGTATAGCTAGAGTACGGTAGAGGGGGATGGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAATCCCCTGGACCTGTACTGACGCTCATGCACGAAAGCG : chr "0.0356814902" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGAAAGTTGGGGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTCCAAAACTACTAGTCTAGAGTTCGAGAGAGGTGAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0903485862" "0.0000000000" "0.0019035117" "0.0010566415" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGTAGGCGGTTTATTAAGTCAGATGTGAAAGCCCCGGGCTTAACCTGGGAACTGCATTTGAAACTGGTCAACTAGAGTATGGTAGAGGAAAGTGGAATTTCTGGTGTAGCGGTGAAATGCGTAGATATCAGAAGGAACATCAATGGCGAAGGCAACTTTCTGGACCAATACTGACGCTGAGGTACGAAAGCG : chr "1.192563e-04" "0.000000e+00" "1.706597e-03" "2.725023e-03" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGTAAGTTAGAGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTTAATACTGCTAGTCTTGAGTTCGAGAGAGGTAAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTTACTGGCTCGATACTGACGCTGAGGTGCGAAAGTG : chr "0.0000000000" "0.0085112851" "0.0098457499" "0.0151405611" ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTAAGCAAGTCAACTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAGTCGAAACTGTTTGACTAGAGTATAGTAGGGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAGGCACTTTACTGGGCTATTACTGACACTCAGAGACGAAAGCT : chr "0.1979893385" "0.0088912531" "0.0089924516" "0.0027806357" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCTATTAAGTCAGAGGTGAAATCCCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : chr "0.0012641170" "0.0187704233" "0.0113554316" "0.0102327392" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGGCTATTAAGTCAGAGGTGAAAGTTTGCAGCTCAACTGTAAAATTGCCTTTGAAACTGGTAGTCTTGAATTATTATGAAGTGGTTAGAATAAGTAGTGTAGCGGTGAAATGCATAGATATTACTTAGAATACCAATTGCGAAGGCAGATCACTAATAATATATTGACGCTGAGGGACGAAAGCG : chr "0.0000000000" "0.0137548446" "0.0069576633" "0.0316158274" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTTGTTAAGTGTGATGTGAAAGCCCAGGGCTCAACCTTGGAACTGCATCACATACTGGCAAGCTAGAGTACGGTAGAGGGGGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGAGATGTGGAGGAATACCAGTGGCGAAGGCGGCCCCCTGGATCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0009189367" "0.0053666268" ...  
## $ CGTTATTCGGAATTATTGGGCGTAAAGGGCTCGCAGGCTGCTTGAACAGTTAGACGTGAAATCCCCGGGCTCAACCTGGGAACTGCGTTTAATACTAGCAAGCTAGAGTAATAGAGAGGAAAGTGGAATTCCCAGTGTAGAGGTGAAATTCGTAGATATTGGGAGGAACACCAGTGGCGAAAGCGGCTTTCTGGCTATTTACTGACGCTGAGGAGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0015096817" "0.0122904096" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGTTTTGTAAGACAGGCGTGAAATCCCCGGGCTCAACCTGGGAATTGCGCTTGTGACTGCAAGGCTAGAGTACGGTAGAGGGGGGTAGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAGCCCTCTGGACCTGTACTGACGCTCATGCACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0173233601" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCAATTAAGTCAGAGGTGAAATCCCGTCGCTCAACGACGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGAGATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : chr "2.345772e-02" "0.000000e+00" "0.000000e+00" "6.047883e-03" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCGATTAAGTCAGAGGTGAAATCCCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : chr "0.0007632404" "0.0312333764" "0.0386609780" "0.0064788811" ...  
## $ CGTTATCCGGAATCATTGGGCGTAAAGCGTCTGTAGGTGGCTTTGTAAGTCCGCTGTGAAAGAGTACAGCTTAACTGTAACTAGGCAGTGGAAACTATGAGGCTGGAGTGTGGTAGGGGTAGAGGGAATTCCCGGTGTAGCGGTGAAATGCGTAGATATCGGGAAGAACACCAACGGCGAAAGCACTCTGCTGGGCCAACACTGACACTGAGAGACGAAAGCT : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0068264605" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGAAAGCAAGAGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTTTGAACTACTAGTCTAGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0070957509" "0.0097271829" "0.0034131933" "0.0219809248" ...  
## $ CGTTGTCCGGATTTATTGGGTTTAAAGGGTGCGTAGGCGGCTGATTAAGTCAGTGGTGAAAGTTTTGGGCTCAACCCAGAAATTGCCATTGATACTGGTCGGCTTGAGTATTGGAGGGGTACATGGAATTGATGGTGTAGCGGTGAAATGCATAGATACCATCAGGAACACCGATAGCGAAGGCATTGTACTGGCCAATAACTGACGCTGATGCACGAAAGCA : chr "3.910415e-02" "0.000000e+00" "0.000000e+00" "6.089592e-03" ...  
## $ CGTTATCCGGAATCACTGGGCATAAAGCGTCTGTAGGTTGTTTGGTAAGTCTGCTGTTAAAGACTGGGGCTCAACCCCAGAAAAGCAGTGGAAACTGCCGGACTTGAGTGTGGTAGAGGTAGAGGGAATTCCTAGTGTAGCGGTGAAATGCGTAGATATTAGGAAGAACACCAATGGCGAAGGCACTCTACTGGGCCATAACTGACACTGAGAGACGACAGCT : chr "0.0048895090" "0.0047116042" "0.0070233016" "0.0069098796" ...  
## $ TGTTATTCGAATTAATTGGGCGTAAAGGGCATGTAGGTGGAGAGATGTAGTTGTTTGTGAAAGTCCAAAGGGTTTCTTTGGGTGTGCATTCAAGACGGTTTCTTCTCTTTGAGGGTGTAAGAGGAAAATAGAATTTCCAGAGGAGAGGTTAAATTCTTAGATTTTGGAAGGAATACCTAATGCGAAGGCAATTTTCTGGTGCACTCCTGACACTGAGGTGCGAAAGCG : chr "0.000000e+00" "0.000000e+00" "0.000000e+00" "4.240469e-03" ...  
## $ CGTTATTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGAAAGTCAGAGGTGAAATCCCAGGGCTCAACCTTGGAACTGCCTTTGAAACTTCTAGTCTTGAGTTCGAGAGAGGTGAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0285293218" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTTGGATGTGAAAGCCCTGGGCTCAACCTAGGAACTGCATCCAAAACTAACTCACTAGAGTACGATAGAGGGAGGTAGAATTCATAGTGTAGCGGTGGAATGCGTAGATATTATGAAGAATACCAGTGGCGAAGGCGGCCTCCTGGATCTGTACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0022940244" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGGGCGCGTAGGCGGCCTGATAAGTCAGATGTGAAAGTCCACGGCTCAACCGTGGAAGTGCATTTGAAACTGTCAGGCTTGAGTATCGGAGGGGAGTGTGGAATTCCCGGTGTAGAGGTGAAATTCGTAGAGATCGGGAGGAACACCGGTGGCGAAGGCGACACTCTGGACGAATACTGACGCTGAGGCGCGAAAGCG : chr "0.0003219921" "0.0000000000" "0.0000000000" "0.0012929956" ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAATAAGTCAACTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAGTCGAAACTATTAGACTAGAGTATAGTAGAGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAAGCACTTTACTGGGCTATTACTAACACTCAGAGACGAAAGCT : chr "1.195306e-01" "0.000000e+00" "0.000000e+00" "7.285265e-03" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGGGTGCGCAGGCGGTTTTGTAAGTCAGATGTGAAATCCCCGAGCTCAACTTGGGAACTGCGTTTGAAACTACAAGACTAGAGTGTGTCAGAGGGGGGTAGAATTCCACGTGTAGCAGTGAAATGCGTAGATATGTGGAGGAATACCAATGGCGAAGGCAGCCCCCTGGGATAACACTGACGCTCATGCACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0079804243" ...  
## $ CGTAGTTCGGAATTACTGGGCTTAAAGAGTTCGTAGGTGGTTGAAAAAGTTGGTGGTGAAATCCCAGAGCTTAACTCTGGAACTGCCATCAAAACTTTTCAGCTAGAGTATGATAGAGGAAAGCAGAATTTCTAGTGTAGAGGTGAAATTCGTAGATATTAGAAAGAATACCAATTGCGAAGGCAGCTTTCTGGATCATTACTGACACTGAGGAACGAAAGCA : chr "0.000000e+00" "3.647694e-03" "6.366918e-03" "1.960348e-03" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGTACGTAGGCGGATCAGAAAGTATAGGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTATAAACTCCTGGTCTTGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTACGAAAGTG : chr "0.0012641170" "0.0200623148" "0.0000000000" "0.0021967022" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGATAAGCTAGCTGTGAAAGCCCTGGGCTCAACCTAGGAACTGCAGTTAGAACTGTCTGACTAGAGTACAGTAGAGGGTGGCGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGGCCACCTGGACTGATACTGACACTGAGGTGCGAAAGCG : chr "0.0004173971" "0.0098031765" "0.0076140466" "0.0029474738" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGTCTTTTAAGTCAGAGGTGAAATCCTACAGCTCAACTGTAGAATTGCCTTTGATACTGAAAGACTTGAGTTATTGTGAAGTAGTTAGAATGTGTGGTGTAGCGGTGAAATGCATAGAGATCACACAGAATACCGATTGCGAAGGCAGATTACTAACAATATACTGACGCTGAGGGACGAAAGCG : chr "0.0000000000" "0.0044836234" "0.0063669183" "0.0015571560" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGACGTATAAGTCAGTGGTGAAATCCTGCAGCTTAACTGCAGAACTGCCATTGATACTGTACGTCTTGAATTCGGTCGAAGTGGGCGGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAACACCGATAGCGAAGGCAGCTCACTAGGCCTGGATTGACGCTCAGGGACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0150988516" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGTCTTTTAAGTCAGAGGTGAAATCCTACAGCTCAACTGTAGAATTGCCTTTGATACTGAAGGACTTGAGTTATTGTGAAGTAGTTAGAATGTGTGGTGTAGCGGTGAAATGCATAGAGATCACACAGAATACCGATTGCGAAGGCAGATTACTAACAATATACTGACGCTGAGGGACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0018908322" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCAATTAAGTCAGAGGTGAAATACCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGAGATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : chr "4.173971e-04" "0.000000e+00" "0.000000e+00" "6.256430e-04" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGACAATTAAGTCAGGGGTGAAATTCTGCGGCTCAACCGTAGAACTGCCCTTGATACTGGTTGTCTTGAATCGTTGTGAAGTGGTTAGAATGAGTAGTGTAGCGGTGAAATGCTTAGAGATTACTCAGAATACCGATTGCGAAGGCAGATCACTAACAACGTATTGACGCTGAGGGACGAAAGCG : chr "0.000000e+00" "0.000000e+00" "0.000000e+00" "2.004838e-02" ...  
## $ CGTTGTTCGGAATTATTGGGCGTAAAGAGCATGTAGGCGGTCTGTCAAGTCTGATGTGAAAGCCCGGGGCTCAACCCCGGAAGTGCATTGGAAACTGGCAGACTTGAGTACGGGAGAGGAAAGTGGAATTTCGAGTGTAGGGGTGAAATCCGTAGATATTCGAAGGAACACCAGTGGCGAAGGCGGCTTTCTGGACCGATACTGACGCTGAGATGCGAAAGCG : chr "0.0005008765" "0.0000000000" "0.0000000000" "0.0007229653" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGACATTTAAGTTAGAGGTGAAATCCCACGGCTCAACCGTGGAACTGCCTTTAATACTGGGTGTCTTGAGGTCGAGAGAGGTGAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0053805300" ...  
## $ CGTTACTCGGAATCACTGGGCGTAAAGCGCGCGCAGGCGGCCATTTAAGTTGGATGTGAAAGCCTACGGCTCAACCGTAGAACTGCATCCAAAACTATTTGGCTAGAGTGTGGGAGAGGAAGATGGAATTAGTTGTGTAGGGGTAAAATCCGTAGAGATAACTAGGAATACCAAAAGCGAAGGCAATCTTCTGGAACATTACTGACGCTGAGGCGCGAAAGCG : chr "8.228686e-04" "0.000000e+00" "0.000000e+00" "1.001029e-03" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTGGAAAGTATGGGGTGAAATCCCAGGGCTCAACCCTGGAACGGCCTTGTAAACTCCCAGTCTAGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGTG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0007646748" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGGGCGCGTAGGCGGTCTTTTAAGTTAGGCGTGAAAGCCCCGGGCTCAACCCGGGAACTGCGCTTAAGACTGGAAGACTAGAAAACGGAAGAGGGTAGTGGAATTCCCAGTGTAGAGGTGAAATTCGTAGATATTGGGAAGAACACCAGTGGCGAAAGCGGCTACCTGGTCCGATTTTGACGCTGAGGCGCGAAAGCG : chr "0.000000e+00" "0.000000e+00" "0.000000e+00" "3.058699e-03" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTTGTTAAGTCAGCTGTGAAAGCCCCGGGCTCAACCTGGGAACTGCAGTTGATACTGGCCGACTAGAGTATGAAAGAGGGAGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGATATATGGAGGAATACCAGTGGCGAAGGCGGCCTCCTGGTTCAATACTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0101215138" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTATTAAGTTGGGTGTGAAATCCCCGGGCTCAACCTGGGAACTGCATCCAAAACTGATTCACTAGAGTACGATAGAGGGAGGTAGAATTCACAGTGTAGCGGTGGAATGCGTAGATATTGTGAAGAATACCAATGGCGAAGGCAGCCTCCTGGATCTGTACTGACACTGAGGTGCGAAAGCG : chr "9.540505e-05" "0.000000e+00" "0.000000e+00" "1.348608e-03" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCCGGGCTCAACCTGGGAATTGCATCCCAAACTGGCAAACTAGAGTACAAGAGAGGGGTGTGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGACGCCCTGGCTTGATACTGACACTGAGGTGCGAAAGCG : chr "0.0005366534" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCTAGGCTCAACCTAGGAATTGCATTCCAAACTGACAGACTAGAGTACGATAGAGGGAGGTAGAATTCAGAGTGTAGCGGTGAAATGCGTAGATATTCTGAGGAATACCGGTGGCGAAGGCGGCCTCCTGGATTGATACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0018238468" "0.0014440433" "0.0090509691" ...  
## $ CGTTATCCGGAATTATTGGGTTTAAAGGGTCCGTAGGCGGATGATTAAGTCAGGGGTGAAAGTTTGCAGCTCAACTGTAAAATTGCCTTTGATACTGGTCATCTTGAGTTGTATTGAAGTAGGCGGAATATGTAGTGTAGCGGTGAAATGCATAGATATTACATAGAACACCAATTGCGAAGGCAGCTTACTAAGTACTAACTGACGCTGATGGACGAAAGCG : chr "6.320585e-04" "2.507789e-03" "1.115852e-03" "3.183828e-03" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCGATTAAGTCAGAGGTGAAATCCCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTGGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAATACCGATTGCGAAGGCAGTCCACTACGTATGTACTGACGCTGAGGGACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0018074132" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGTACGTAGGCGGATTAATAAGTTAGAGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTTAAAACTGTTAGTCTTGAGATCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTACGAAAGTG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0023774435" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGTCAGGTAAGTCAGTGGTGAAAGCCCATCGCTCAACGGTGGAACGGCCATTGATACTGTCTGACTTGAATTATTAGGAAGTAACTAGAATATGTAGTGTAGCGGTGAAATGCTTAGAGATTACATGGAATACCAATTGCGAAGGCAGGTTACTACTAATTGATTGACGCTGATGGACGAAAGCG : chr "0.0157060570" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTGTTCGGAATTATTGGGCGTAAAGAGCGTGTAGGCGGCTCGTCAAGTCTGATGTGAAAGCCCTGGGCTCAACCCAGGAAGTGCATTGGAAACTGGCGAACTTGAGTACGGGAGAGGAAAGTGGAATTTCGAGTGTAGGGGTGAAATCCGTAGATATTCGAAGGAACACCAGTGGCGAAGGCGGCTTTCTGGACCGATACTGACGCTGAGACGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0011539638" ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTGAACAAGTCAACTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAGTCGAAACTGTTTGACTAGAGTATAGTAGGGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAGGCACTTTACTGGGCTATTACTGACACTCAGAGACGAAAGCT : chr "0.0004173971" "0.1028953568" "0.1988841483" "0.0003753858" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGATAAGCTAGCTGTGAAAGCCCTGGGCTCAACCTGGGAACTGCAGTTAGAACTGTCTGGCTAGAGTATAGTAGAGGGTGGCGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGGCCACCTGGACTAATACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0098031765" "0.0097144733" "0.0016961877" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGTACGTAGGCGGATTGGAAAGTAGGGGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTCCTAAACTATCAGTCTAGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTACGAAAGTG : chr "6.082072e-04" "1.238696e-02" "1.161798e-02" "2.766732e-03" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGTACGTAGGCGGATCAGAAAGTATGGGGTGAAATCCCAGGGCTTAACCCTGGAACTGCCTCATAAACTCCTGGTCTTGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTACGAAAGTG : chr "0.0000000000" "0.0158066722" "0.0233672465" "0.0011678670" ...  
## $ CGTTATCCGGAATTATTGGGCGTAAAGCGTCCGCAGGCGGTTTTACAAGTCTGTCGTTAAAACGTGGAGCTCAACTCCATTTCGGCGATGGAAACTGTAAGACTAGAGTGTGGTAGGGGCAGAGGGAATTCCCGGTGTAGCGGTGAAATGCGTAGATATCGGGAAGAACACCAGTGGCGAAGGCGCTCTGCTGGGCCATAACTGACGCTCATGGACGAAAGCC : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0021549926" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTTGATAAGCTGGATGTGAAAGCCCCGGGCTCAACCTGGGAACTGCATCCAGAACTGTCTGACTAGAATACAATAGAGGTGAGTGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGACTCACTGGATTGATATTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0008063843" ...  
## $ CGTTGTCCGGATTTATTGGGTTTAAAGGGTACGTAGGCGGGATTTTAAGTCAGTGGTGAAAGCCTCCAGCTCAACTGGAGAACTGCCATTGAAACTGAAATTCTTGAATATGGATGAGGTGGTTGGAATATAACATGTAGCGGTGAAATGCTTAGATATGTTATAGAACACCAATTGCGAAGGCAGATCACTAAACCATTATTGACGCTGAGGTACGAAAGCG : chr "0.0006439841" "0.0000000000" "0.0000000000" "0.0095097739" ...  
## $ TGTTATTCGGATTAATTGGGCGTAAAGGGCATGTAGGTGGAGAAATGTAGTTGTTTGTGAAAGTCCAAAGGTTTTCTTTGGGTGTGCATTCAAAACGGTTTATTCTCTTTGAGGCTGCGAGAGGAAAATAGAATTTCCAGAGGAGAGGTTAAATTCTTAGATTTTGGAAGGAATACCTAATGCGAAGGCAATTTTCTGGTGCAGTCCTGACACTGAGGTGCGAAAGCG : chr "0.000000e+00" "0.000000e+00" "0.000000e+00" "8.898034e-04" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGCTTTGTAAGTCGGATGTGAAAGCCCTGGGCTCAACCTGGGAATTGCATTCGATACTGCAGAGCTAGAGTATGGTAGAGGGAAGTGGAATTTCCGGTGTAGCGGTGAAATGCGTAGATATCGGAAGGAACACCAGTGGCGAAGGCGACTTCCTGGGCCAATACTGACGCTGAGGTGCGAAAGCG : chr "0.0005962816" "0.0000000000" "0.0000000000" "0.0023218308" ...  
## $ TGGTCAGGATGATTATTGGGCCTAAAGCATCCGTAGCCGGCTCTGTAAGTTTTCGGTTAAATCTGTACGCTTAACGTACAGGCTGCCGGGAATACTGCAGAGCTAGGGAGTGGGAGAGGTAGACGGTACTCGGTAGGAAGTGGTAAAATGCTTTGATCTATCGATGACCACCTGTGGCGAAGGCGGTCTACCAGAACACGTCCGACGGTGAGGGATGAAAGCT : chr "0.000000e+00" "0.000000e+00" "1.575320e-03" "0.000000e+00" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCTGGGCTCAACCTAGGAATTGCATCCCAAACTGGCCAACTAGAGTACAAGAGAGGGGTGTGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGACGCCCTGGCTTGATACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTATCCGGAATCATTGGGCGTAAAGCGCCTGTAGGTTGTTTAATAAGTCTGTTGTTAAAGACTAGGGCTTAACCCTAGAAAAGCAATGGAAACTACTAGACTAGAGTATGGCAGGGGTAGAGGGAATTTCTAGTGTAGCGGTGAAATGCGTAGATATTAGAAAGAACACCGGTGGCGAAAGCGCTCTACTGGACCATTACTGACACTCAGAGGCGAAAGCT : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0087311960" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTTGTTAAGTCAGCTGTGAAAGCCCCGGGCTCAACCTGGGAACTGCAGTTGATACTGGCCGACTAGAGTACGAGAGAGGGAGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGATATATGGAGGAATACCAGTGGCGAAGGCGGCCTCCTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0012918915" "0.0015096817" "0.0170591997" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGAGTATGTAGGCGGAACAGAAAGTTAGAAGTGAAATCCCTGGGCTCAACCTAGGAATTGCTTTTAAAACTTCTGTTCTTGAATTCAGGAGAGGATAGTGGAATTTCCAGTGTAGAGGTGAAATTCGTAGATATTGGAAGGAACACCAGTGGCGAAGGCGGCTATCTGGACTGACATTGACGCTGAGATACGAAGGCA : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0021271863" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGCTTGTTAAGTCGGATGTGAAAGCCCCGGGCTCAACCTGGGAACTGCACCCGATACTGGCAAGCTAGAGTACGGGAGAGGGGGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGATATATGGAGGAATACCAGTGGCGAAGGCGGCCCCCTGGCCCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTATCCGGAATCATTGGGCGTAAAGCGTCTGTAGGTGGTTTTGTAAGTCCGCTGTAAAAGAGTACAGCTTAACTGTATATGGGCAGTGGAAACTACAAGACTGGAGTGTGGTAGGGGTAGAGGGAATTCCCGGTGTAGCGGTGAAATGCGTAGATATCGGGAAGAACACCAACGGCGAAAGCACTCTACTGGGCCAACACTGACACTGAGAGACGAAAGCT : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0007785780" ...  
## $ CGTTACTCGGATTCACTGGGCGTAAAGGGTGCGTAGGCGGATAGATGTGTCAGGTGTGAAATCTCGGGGCTCAACCTCGAAACTGCGCCTGAAACTGTCTATCTAGAGTATTGGAGGGGTAAGTGGAATTTCTGGTGTAGCGGTGAAATGCGTAGATATCAGAAGGAACACCAATGGCGAAGGCAGCTTACTGGACAAATACTGACGCTGAGGCACGAAAGCA : chr "7.155379e-05" "1.747853e-03" "1.903512e-03" "4.407308e-03" ...  
## $ CGTTATTCGGAATAACTGGGCGTAAAGCGAGCGTAGGCGGATTTGTAAGTTGGAGGTGAAATCCCAGGGCTTAACCCTGGAACTGCCTTCAAAACTACATTTCTTGAGTTTGGTAGAGGAGAGTGGAATTCCTAGTGTAGAGGTGAAATTCGTAGATATTAGGAGGAACACCAGTGGCGAAGGCGACTCTCTGGGCCAATACTGACGCTGAGGTTCGAAAGCG : chr "0.000000e+00" "0.000000e+00" "3.938300e-04" "7.229653e-04" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGTCAGATAAGTCAGTGGTGAAAGCCCATCGCTCAACGGTGGAACGGCCATTGATACTGTCTGACTTGAATTATTAGGAAGTAACTAGAATATGTAGTGTAGCGGTGAAATGCTTAGAGATTACATGGAATACCAATTGCGAAGGCAGGTTACTACTAATATATTGACGCTGATGGACGAAAGCG : chr "0.0024805314" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCACGCAGGCGGTTTGTTAAGCTAGATGTGAAAGCCCCGGGCTCAACCTGGGAATAGCATTTAGAACTGGCAGACTAGAGTCTTGGAGAGGGGAGTGGAATTTCTGGTGTAGCGGTGAAATGCGTAGATATCAGAAGGAACATCAGTGGCGAAGGCGACTCCCTGGCCAAAGACTGACGCTCATGTGCGAAAGTG : chr "3.339177e-04" "1.544950e-01" "1.178864e-01" "2.419153e-03" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGATTGGAAAGTTGGAGGTGAAATCCCAGGGCTCAACCTTGGAACTGCCTTCAAAACTTCCAGTCTGGAGTTCGAGAGAGGTGAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0014598337" ...  
## $ CGTTACTCGGAATCACTGGGCGTAAAGCGCGCGCAGGCGGCCTTTTAAGTTGGATGTGAAAGCCTACGGCTCAACCGTAGAACTGCATCCAAAACTATCAGGCTAGAGTGTGGGAGAGGAAGATGGAATTAGTTGTGTAGGGGTAAAATCCGTAGAGATAACTAGGAATACCAAAAGCGAAGGCAATCTTCTGGAACATTACTGACGCTGAGGCGCGAAAGCG : chr "0.0004531740" "0.0000000000" "0.0000000000" "0.0007368684" ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAGTAAGTCTGTTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAATCGAAACTACTAGACTTGAGTATGGTAAAGGTAAAAGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAAGCATTTTACTGGGCCATTACTGACACTCAGAGACGAAAGCT : chr "0.0001431076" "0.0023558021" "0.0000000000" "0.0030030865" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCTGGGCTTAACCTAGGAATTGCATTCCAAACTGACAGACTAGAGTACGATAGAGGGGGGTAGAATTCAGAGTGTAGCGGTGAAATGCGTAGATATTCTGAGGAATACCGGTGGCGAAGGCGGCCCCCTGGATTGATACTGACACTGAGGTGCGAAAGCG : chr "0.0005605047" "0.0000000000" "0.0000000000" "0.0029891833" ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGCTTAACAAGTCAACTGTTAAATCTTGAAGCTCAACTTCGAAATCGCAGTCGAAACTGTTAGGCTAGAGTATAGTAGGGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGAGATTGGAAAGAACACCGATGGCGAAGGCACTTTACTGGGCTATTACTGACACTCAGAGACGAAAGCT : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0014598337" ...  
## $ CGTTGTTCGGATTTACTGGGCGTAAAGAGATTGTAGGTGGTTTGTTAAGTCGGATGTGAAATCCCGGGGCTCAACCCCGGAACTGCATCCGATACTGGCAGGCTAGAGTTCGGGAGGGGAAAGCGGAATTCCGTGTGTAGCAGTGAAATGCGTAGATATACGGAGGAACACCTGAGGCGAAGGCGGCTTTCTGGACCGATACTGACACTGAGAATCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTATTAAGTTGGATGTGAAAGCCCCGGGCTCAACCTGGGAACTGCATCCAAAACTGATTCACTAGAGTACGATAGAGGGAGGTAGAATTCACAGTGTAGCGGTGGAATGCGTAGATATTGTGAAGAATACCAATGGCGAAGGCAGCCTCCTGGATCTGTACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCTTTTAAGTCAGAGGTGAAATCCTATCGCTCAACGATAGAACTGCCTTTGATACTGAAAGACTTGAGTTATTGTGAAGTGGTTAGAATATGTAGTGTAGCGGTGAAATGCATAGATATTACATAGAATACCGATTGCGAAGGCAGATCACTAACAATACACTGACGCTGAGGGACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0015571560" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGTTATATAAGACAGATGTGAAATCCCCGGGCTCAACCTGGGACCTGCATTTGTGACTGTATAGCTAGAGTACGGTAGAGGGGGATGGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAATCCCCTGGACCTGTACTGACGCTCATGCACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0026255333" "0.0000000000" ...  
## $ CGTTATCCGGAATCATTGGGCGTAAAGCGTCTGTAGGTGGCTTTGTAAGTCCGCTGTGAAAGAGTACAGCTTAACTGTAACTAGGCAGCGGAAACTACGAGGCTGGAGTGTGGTAGGGGTAGAGGGAATTCCCGGTGTAGCGGTGAAATGCGTAGATATCGGGAAGAACACCAACGGCGAAAGCACTCTGCTGGGCCAACACTGACACTGAGAGACGAAAGCT : chr "2.385126e-04" "0.000000e+00" "3.938300e-04" "6.951589e-04" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTCGGTAAGTTGGATGTGAAAGCCCAGGGCTCAACCTTGGAACTGCATTCAAAACTGCCAGGCTAGAGTACGGTAGAGGGGGGTAGAATTCCACGTGTAGCGGTGAAATGCGTAGAGATGTGGAGGAATACCAGTGGCGAAGGCGGCCCCCTGGATCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0004559617" "0.0000000000" "0.0006395462" ...  
## $ CGTTATCCGGAATCACTGGGCATAAAGCGTCTGTAGGTGGTTTGATAAGTCTGCTGTTAAAGACTAGGGCTTAACCCTAGGAAAGCAGTGGAAACTGTCAGACTTGAGTATGGTAGAGGTACAGGGAATTCCTAGTGTAGCGGTGAAATGCGTAGATATTAGGAAGAACACCAATGGCGAAAGCACTGTACTGGGCCACAACTGACACTGAGAGACGACAGCT : chr "0.0017172910" "0.0000000000" "0.0000000000" "0.0024886689" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTATGTCAGATGTGAAAGTCCACGGCTCAACCGTGGAAGTGCATTTGAAACTGGCAAACTTGAGTACTGGAGGGGGTAGTGGAATTCCCGGTGTAGAGGTGAAATTCGTAGATATCGGGAGGAATACCGGTGGCGAAGGCGACTACCTGGCCAGATACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGATAAGCTAGCTGTGAAAGCCCTGGGCTCAACCTGGGAACTGCAGTTAGAACTGTCTGACTAGAGTACAGTAGAGGGTGGCGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGGCCACCTGGACTGATACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0010149320" ...  
## $ CGTTATCCGGAATCACTGGGCATAAAGCGTCTGTAGGTTGTTCGGTAAGTCTGCTGTTAAAGACTAGGGCCTAACCCTAGAAAAGCAGTGGAAACTGCCAAACTTGAGTGTGGTAGAGGTAGAGGGAATTCCTAGTGTAGCGGTGAAATGCGTAGATATTAGGAAGAACACCAATGGCGAAGGCACTCTACTGGGCCACAACTGACACTGAGAGACGACAGCT : chr "0.0037088715" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCAATTAAGTCAGAGGTGAAATACCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : chr "0.000000e+00" "1.099628e-01" "8.414834e-02" "2.224509e-04" ...  
## $ CGTTATCCGGATTTATTAGGTTTAAAGGGTTCGCAGGCGGAATTTTAAGTCAGTGGTGAAAGCCTACAGCTCAACTGTAGAACTGCCATTGAAACTGATATTCTTGAGTATAGATGAAGTGGGCGGAATATGTCATGTAGCGGTGAAATGCATAGATATGACATGGAACACCAATTGCGAAGGCAGCTCACTAAACTATTACTGACGCTCATGAACGAAAGCG : chr "0.000000e+00" "0.000000e+00" "0.000000e+00" "5.700303e-04" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTTGGATGTGAAAGCCCTGGGCTCAACCTAGGAACTGCATCCAAAACTAACTCACTAGAGTACGATAGAGGGAGGTAGAATTTATAGTGTAGCGGTGGAATGCGTAGATATTATAAAGAATACCAGTGGCGAAGGCGGCCTCCTGGATCTGTACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0030726024" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGGGAGCGTAGGTGGCTCGATAAGTCAGATGTGAAATCCCCGGGCTCAACCTGGGAACTGCATCTGATACTGTTGAGCTAGAGTATGTGAGAGGAAGGTAGAATTCCAGGTGTAGCGGTGAAATGCGTAGAGATCTGGAGGAATACCGATGGCGAAGGCAGCCTTCTGGCATAATACTGACACTGAGGCTCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAATAAGTCAACTGTTAAATCTTGAGGCTCAACCTCAAAATCGCAGTCGAAACTATTAGACTAGAGTATAGTAGAGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAAGCACTTTACTGGGCTATTACTAACACTCAGAGACGAAAGCT : chr "0.0000000000" "0.0249259062" "0.0321627831" "0.0032811501" ...  
## $ CGTTATCCGGATTTATTGGGTTTAAAGGGTACGTAGGCGGAAAATTAAGTCAGTAGTGAAATCCTGCAGCTTAACTGTAGAACTGTTATTGATACTGGTTTTCTTGAATATAGTTGAGGTAGGCGGAATGTGTAATGTAGCGGTGAAATGCTTAGATATTACACAGAACACCGATTGCGAAGGCAGCTTACTAAGCTATGATTGACGCTGAGGTACGAAAGCG : chr "9.540505e-05" "0.000000e+00" "0.000000e+00" "4.866112e-04" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCCGGGCTCAACCTGGGAACTGCATTCCAAACTGACAAACTAGAGTACGATAGAGGGGGGTAGAATTCAGAGTGTAGCGGTGAAATGCGTAGATATTCTGAGGAATACCGGTGGCGAAGGCGGCCCCCTGGATTGATACTGACACTGAGGTGCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0038511804" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGGGTGCGCAGGCGGTTTTGTAAGTCAGATGTGAAATCCCCGAGCTCAACTTGGGAACTGCGTTTGAAACTATAAGACTAGAGTGTGTCAGAGGGGGGTAGAATTCCACGTGTAGCAGTGAAATGCGTAGATATGTGGAGGAATACCAATGGCGAAGGCAGCCCCCTGGGATAACACTGACGCTCATGCACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0035314073" ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGAAAGTTAGAGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTTAAAACTCCTAGTCTTGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGTG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0010288352" ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAATAAGTCTATTGTTAAAGTTTGAGGCTTAACTTCAAATCAGCAATAGAAACTGTTAGGCTTGAGTATGGTAGAGGTAAAAGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAGGCATTTTACTGGACCCTAACTGACACTCAGAGACGAAAGCT : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0005561271" ...  
## $ TGTTATCCGGAATTATTGGGCGTAAAGCGTCTGCAGGTTGATGTAAAAGTCTTTTGTTAAATCTCAGAGCTCAACTCGGAATCTGCAAAGGAAACTATATGTCTAGAGTATGGTAGGGGTAGAGGGAATTTCTAGTGGAGCGGTGAAATGCGTAGATATTAGAAAGAACACCAAGAGCGAAGGCACTCTACTGGGCCAGTACTGACACTCAGAGACGAAAGCT : chr "0.000000e+00" "0.000000e+00" "0.000000e+00" "0.000000e+00" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGCTTGTTAAGTCGAATGTGAAAGCCCCGGGCTTAACCTGGGAACTGCATCCGATACTGGCAAGCTAGAGTACGGGAGAGGGGGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGATATATGGAGGAATACCAGTGGCGAAGGCGGCCCCCTGGTCCGATACTGACGCTGAGGTGCGAAAGCG : chr "0.000000e+00" "0.000000e+00" "0.000000e+00" "1.205406e-02" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGTTATATAAGACAGATGTGAAATCCCCGGGCTCAACCTGGGAACTGCATTTGTGACTGTATAGCTAGAGTACGGTAGAGGGGGATGGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAATCCCCTGGACCTGTACTGACGCTCATGCACGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0005700303" ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAATAAGTCAACTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAGTCGAAACTATTAGACTAGAGTATAGTAGGGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGAGATTGGAAAGAACACCGATGGCGAAGGCACTTTACTGGGCTATTACTGACACTCAGAGACGAAAGCT : chr "3.816202e-04" "0.000000e+00" "0.000000e+00" "2.604065e-01" ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGAGTGTAGGCGGCTATTTAAGTCGGATGTGAAATCCCCGGGCTCAACCTGGGAATTGCATTCGATACTGGATAGCTAGAGTTTGGTAGAGGTAAGTGGAATTCCGGGTGTAGCGGTGAAATGCGTAGATATCCGGAGGAACATCAGTGGCGAAGGCGGCTTACTGGACCAAAACTGACGCTGAGGCTCGAAAGCG : chr "0.0000000000" "0.0000000000" "0.0000000000" "0.0000000000" ...  
## [list output truncated]

SalinityASVData3 <- apply(SalinityASVData2, MARGIN = 2, FUN = as.numeric)  
SalinityASVData3 <- as.data.frame(SalinityASVData3)  
str(SalinityASVData3)

## 'data.frame': 222 obs. of 14978 variables:  
## $ Salinity : num 4.5 30.4 31.6 16.8 26.1 2.5 3.8 1.7 41.8 15.8 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGAATGTGAAAGCCCTGGGCTCAACCTAGGAATTGCATCCCAAACTGGCAAACTAGAGTACAAGAGAGGGGTGTGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGACGCCCTGGCTTGATACTGACACTGAGGTGCGAAAGCG : num 0.00037 0.08823 0.1322 0.00549 0.06148 ...  
## $ CGTTGTCCGGAATTATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTCGCGTCTGCTGTGAAATTTCGAGGCTCAACCTCGAACTTGCAGTGGGTACGGGCAGGCTAGAGTGCAGTAGGGGAGATGGGAATTCCTGGTGTAGCGGTGGAATGCGCAGATATCAGGAGGAACACCAATGGCGAAGGCACATCTCTGGGCTGTAACTGACGCTGAGGAGCGAAAGCG : num 0.01392 0.00623 0.00551 0.02621 0.01014 ...  
## $ CGTTATCCGGATTCATTGGGTTTAAAGGGTCCGTAGGCGGGTCTTTAAGTCAGTGGTGAAAGCCGACAGCTCAACTGTCGAACTGCCATTGATACTGGAGACCTTGAGTACAAATGAAGTAGGCGGAATGAGTCATGTAGCGGTGAAATGCATAGATATGACTCAGAACACCGATTGCGAAGGCAGCTTACTAACATGTAACTGACGCTGAGGGACGAAAGCG : num 0.000107 0.009043 0.002822 0.018477 0.035442 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGCTTTGTAAGACAGACGTGAAATCCCCGGGCTCAACCTGGGAATTGCGTTTGTGACTGCAAGGCTAGAGTACGGTAGAGGGGGGTAGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAGCCCCCTGGACCTGTACTGACGCTCATGCACGAAAGCG : num 0.0182 0.0022 0.00171 0.0067 0.01604 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGTTATATAAGACAGTTGTGAAATCCCCGGGCTCAACCTGGGAATTGCATCTGTGACTGTATAGCTAGAGTACGGTAGAGGGGGATGGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAATCCCCTGGACCTGTACTGACGCTCATGCACGAAAGCG : num 0.0357 0 0 0 0 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGAAAGTTGGGGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTCCAAAACTACTAGTCTAGAGTTCGAGAGAGGTGAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : num 0.09035 0 0.0019 0.00106 0.00691 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGTAGGCGGTTTATTAAGTCAGATGTGAAAGCCCCGGGCTTAACCTGGGAACTGCATTTGAAACTGGTCAACTAGAGTATGGTAGAGGAAAGTGGAATTTCTGGTGTAGCGGTGAAATGCGTAGATATCAGAAGGAACATCAATGGCGAAGGCAACTTTCTGGACCAATACTGACGCTGAGGTACGAAAGCG : num 0.000119 0 0.001707 0.002725 0.001298 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGTAAGTTAGAGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTTAATACTGCTAGTCTTGAGTTCGAGAGAGGTAAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTTACTGGCTCGATACTGACGCTGAGGTGCGAAAGTG : num 0 0.00851 0.00985 0.01514 0.0208 ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTAAGCAAGTCAACTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAGTCGAAACTGTTTGACTAGAGTATAGTAGGGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAGGCACTTTACTGGGCTATTACTGACACTCAGAGACGAAAGCT : num 0.19799 0.00889 0.00899 0.00278 0.00105 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCTATTAAGTCAGAGGTGAAATCCCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : num 0.00126 0.01877 0.01136 0.01023 0.03179 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGGCTATTAAGTCAGAGGTGAAAGTTTGCAGCTCAACTGTAAAATTGCCTTTGAAACTGGTAGTCTTGAATTATTATGAAGTGGTTAGAATAAGTAGTGTAGCGGTGAAATGCATAGATATTACTTAGAATACCAATTGCGAAGGCAGATCACTAATAATATATTGACGCTGAGGGACGAAAGCG : num 0 0.01375 0.00696 0.03162 0.07603 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTTGTTAAGTGTGATGTGAAAGCCCAGGGCTCAACCTTGGAACTGCATCACATACTGGCAAGCTAGAGTACGGTAGAGGGGGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGAGATGTGGAGGAATACCAGTGGCGAAGGCGGCCCCCTGGATCGATACTGACGCTGAGGTGCGAAAGCG : num 0 0 0.000919 0.005367 0.005095 ...  
## $ CGTTATTCGGAATTATTGGGCGTAAAGGGCTCGCAGGCTGCTTGAACAGTTAGACGTGAAATCCCCGGGCTCAACCTGGGAACTGCGTTTAATACTAGCAAGCTAGAGTAATAGAGAGGAAAGTGGAATTCCCAGTGTAGAGGTGAAATTCGTAGATATTGGGAGGAACACCAGTGGCGAAAGCGGCTTTCTGGCTATTTACTGACGCTGAGGAGCGAAAGCG : num 0 0 0.00151 0.01229 0.00527 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGTTTTGTAAGACAGGCGTGAAATCCCCGGGCTCAACCTGGGAATTGCGCTTGTGACTGCAAGGCTAGAGTACGGTAGAGGGGGGTAGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAGCCCTCTGGACCTGTACTGACGCTCATGCACGAAAGCG : num 0 0 0 0.01732 0.00333 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCAATTAAGTCAGAGGTGAAATCCCGTCGCTCAACGACGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGAGATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : num 0.02346 0 0 0.00605 0.0048 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCGATTAAGTCAGAGGTGAAATCCCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : num 0.000763 0.031233 0.038661 0.006479 0.037353 ...  
## $ CGTTATCCGGAATCATTGGGCGTAAAGCGTCTGTAGGTGGCTTTGTAAGTCCGCTGTGAAAGAGTACAGCTTAACTGTAACTAGGCAGTGGAAACTATGAGGCTGGAGTGTGGTAGGGGTAGAGGGAATTCCCGGTGTAGCGGTGAAATGCGTAGATATCGGGAAGAACACCAACGGCGAAAGCACTCTGCTGGGCCAACACTGACACTGAGAGACGAAAGCT : num 0 0 0 0.00683 0 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGAAAGCAAGAGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTTTGAACTACTAGTCTAGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : num 0.0071 0.00973 0.00341 0.02198 0.0231 ...  
## $ CGTTGTCCGGATTTATTGGGTTTAAAGGGTGCGTAGGCGGCTGATTAAGTCAGTGGTGAAAGTTTTGGGCTCAACCCAGAAATTGCCATTGATACTGGTCGGCTTGAGTATTGGAGGGGTACATGGAATTGATGGTGTAGCGGTGAAATGCATAGATACCATCAGGAACACCGATAGCGAAGGCATTGTACTGGCCAATAACTGACGCTGATGCACGAAAGCA : num 0.0391 0 0 0.00609 0.00465 ...  
## $ CGTTATCCGGAATCACTGGGCATAAAGCGTCTGTAGGTTGTTTGGTAAGTCTGCTGTTAAAGACTGGGGCTCAACCCCAGAAAAGCAGTGGAAACTGCCGGACTTGAGTGTGGTAGAGGTAGAGGGAATTCCTAGTGTAGCGGTGAAATGCGTAGATATTAGGAAGAACACCAATGGCGAAGGCACTCTACTGGGCCATAACTGACACTGAGAGACGACAGCT : num 0.00489 0.004712 0.007023 0.00691 0.000612 ...  
## $ TGTTATTCGAATTAATTGGGCGTAAAGGGCATGTAGGTGGAGAGATGTAGTTGTTTGTGAAAGTCCAAAGGGTTTCTTTGGGTGTGCATTCAAGACGGTTTCTTCTCTTTGAGGGTGTAAGAGGAAAATAGAATTTCCAGAGGAGAGGTTAAATTCTTAGATTTTGGAAGGAATACCTAATGCGAAGGCAATTTTCTGGTGCACTCCTGACACTGAGGTGCGAAAGCG : num 0 0 0 0.00424 0.000563 ...  
## $ CGTTATTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGAAAGTCAGAGGTGAAATCCCAGGGCTCAACCTTGGAACTGCCTTTGAAACTTCTAGTCTTGAGTTCGAGAGAGGTGAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : num 0 0 0 0.02853 0.00375 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTTGGATGTGAAAGCCCTGGGCTCAACCTAGGAACTGCATCCAAAACTAACTCACTAGAGTACGATAGAGGGAGGTAGAATTCATAGTGTAGCGGTGGAATGCGTAGATATTATGAAGAATACCAGTGGCGAAGGCGGCCTCCTGGATCTGTACTGACACTGAGGTGCGAAAGCG : num 0 0 0 0.00229 0.00245 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGGGCGCGTAGGCGGCCTGATAAGTCAGATGTGAAAGTCCACGGCTCAACCGTGGAAGTGCATTTGAAACTGTCAGGCTTGAGTATCGGAGGGGAGTGTGGAATTCCCGGTGTAGAGGTGAAATTCGTAGAGATCGGGAGGAACACCGGTGGCGAAGGCGACACTCTGGACGAATACTGACGCTGAGGCGCGAAAGCG : num 0.000322 0 0 0.001293 0.002327 ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAATAAGTCAACTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAGTCGAAACTATTAGACTAGAGTATAGTAGAGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAAGCACTTTACTGGGCTATTACTAACACTCAGAGACGAAAGCT : num 0.11953 0 0 0.00729 0.00681 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGGGTGCGCAGGCGGTTTTGTAAGTCAGATGTGAAATCCCCGAGCTCAACTTGGGAACTGCGTTTGAAACTACAAGACTAGAGTGTGTCAGAGGGGGGTAGAATTCCACGTGTAGCAGTGAAATGCGTAGATATGTGGAGGAATACCAATGGCGAAGGCAGCCCCCTGGGATAACACTGACGCTCATGCACGAAAGCG : num 0 0 0 0.00798 0.00279 ...  
## $ CGTAGTTCGGAATTACTGGGCTTAAAGAGTTCGTAGGTGGTTGAAAAAGTTGGTGGTGAAATCCCAGAGCTTAACTCTGGAACTGCCATCAAAACTTTTCAGCTAGAGTATGATAGAGGAAAGCAGAATTTCTAGTGTAGAGGTGAAATTCGTAGATATTAGAAAGAATACCAATTGCGAAGGCAGCTTTCTGGATCATTACTGACACTGAGGAACGAAAGCA : num 0 0.00365 0.00637 0.00196 0.00245 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGTACGTAGGCGGATCAGAAAGTATAGGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTATAAACTCCTGGTCTTGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTACGAAAGTG : num 0.00126 0.02006 0 0.0022 0.01749 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGATAAGCTAGCTGTGAAAGCCCTGGGCTCAACCTAGGAACTGCAGTTAGAACTGTCTGACTAGAGTACAGTAGAGGGTGGCGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGGCCACCTGGACTGATACTGACACTGAGGTGCGAAAGCG : num 0.000417 0.009803 0.007614 0.002947 0.032062 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGTCTTTTAAGTCAGAGGTGAAATCCTACAGCTCAACTGTAGAATTGCCTTTGATACTGAAAGACTTGAGTTATTGTGAAGTAGTTAGAATGTGTGGTGTAGCGGTGAAATGCATAGAGATCACACAGAATACCGATTGCGAAGGCAGATTACTAACAATATACTGACGCTGAGGGACGAAAGCG : num 0 0.00448 0.00637 0.00156 0.00845 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGACGTATAAGTCAGTGGTGAAATCCTGCAGCTTAACTGCAGAACTGCCATTGATACTGTACGTCTTGAATTCGGTCGAAGTGGGCGGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAACACCGATAGCGAAGGCAGCTCACTAGGCCTGGATTGACGCTCAGGGACGAAAGCG : num 0 0 0 0.0151 0.0142 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGTCTTTTAAGTCAGAGGTGAAATCCTACAGCTCAACTGTAGAATTGCCTTTGATACTGAAGGACTTGAGTTATTGTGAAGTAGTTAGAATGTGTGGTGTAGCGGTGAAATGCATAGAGATCACACAGAATACCGATTGCGAAGGCAGATTACTAACAATATACTGACGCTGAGGGACGAAAGCG : num 0 0 0 0.00189 0 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCAATTAAGTCAGAGGTGAAATACCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGAGATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : num 0.000417 0 0 0.000626 0.000955 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGACAATTAAGTCAGGGGTGAAATTCTGCGGCTCAACCGTAGAACTGCCCTTGATACTGGTTGTCTTGAATCGTTGTGAAGTGGTTAGAATGAGTAGTGTAGCGGTGAAATGCTTAGAGATTACTCAGAATACCGATTGCGAAGGCAGATCACTAACAACGTATTGACGCTGAGGGACGAAAGCG : num 0 0 0 0.02005 0.00446 ...  
## $ CGTTGTTCGGAATTATTGGGCGTAAAGAGCATGTAGGCGGTCTGTCAAGTCTGATGTGAAAGCCCGGGGCTCAACCCCGGAAGTGCATTGGAAACTGGCAGACTTGAGTACGGGAGAGGAAAGTGGAATTTCGAGTGTAGGGGTGAAATCCGTAGATATTCGAAGGAACACCAGTGGCGAAGGCGGCTTTCTGGACCGATACTGACGCTGAGATGCGAAAGCG : num 0.000501 0 0 0.000723 0.002425 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGACATTTAAGTTAGAGGTGAAATCCCACGGCTCAACCGTGGAACTGCCTTTAATACTGGGTGTCTTGAGGTCGAGAGAGGTGAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : num 0 0 0 0.00538 0.00478 ...  
## $ CGTTACTCGGAATCACTGGGCGTAAAGCGCGCGCAGGCGGCCATTTAAGTTGGATGTGAAAGCCTACGGCTCAACCGTAGAACTGCATCCAAAACTATTTGGCTAGAGTGTGGGAGAGGAAGATGGAATTAGTTGTGTAGGGGTAAAATCCGTAGAGATAACTAGGAATACCAAAAGCGAAGGCAATCTTCTGGAACATTACTGACGCTGAGGCGCGAAAGCG : num 0.000823 0 0 0.001001 0.006221 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTGGAAAGTATGGGGTGAAATCCCAGGGCTCAACCCTGGAACGGCCTTGTAAACTCCCAGTCTAGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGTG : num 0 0 0 0.000765 0.002131 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGGGCGCGTAGGCGGTCTTTTAAGTTAGGCGTGAAAGCCCCGGGCTCAACCCGGGAACTGCGCTTAAGACTGGAAGACTAGAAAACGGAAGAGGGTAGTGGAATTCCCAGTGTAGAGGTGAAATTCGTAGATATTGGGAAGAACACCAGTGGCGAAAGCGGCTACCTGGTCCGATTTTGACGCTGAGGCGCGAAAGCG : num 0 0 0 0.003059 0.000416 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTTGTTAAGTCAGCTGTGAAAGCCCCGGGCTCAACCTGGGAACTGCAGTTGATACTGGCCGACTAGAGTATGAAAGAGGGAGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGATATATGGAGGAATACCAGTGGCGAAGGCGGCCTCCTGGTTCAATACTGACGCTGAGGTGCGAAAGCG : num 0 0 0 0.01012 0.00186 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTATTAAGTTGGGTGTGAAATCCCCGGGCTCAACCTGGGAACTGCATCCAAAACTGATTCACTAGAGTACGATAGAGGGAGGTAGAATTCACAGTGTAGCGGTGGAATGCGTAGATATTGTGAAGAATACCAATGGCGAAGGCAGCCTCCTGGATCTGTACTGACACTGAGGTGCGAAAGCG : num 9.54e-05 0.00 0.00 1.35e-03 1.30e-03 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCCGGGCTCAACCTGGGAATTGCATCCCAAACTGGCAAACTAGAGTACAAGAGAGGGGTGTGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGACGCCCTGGCTTGATACTGACACTGAGGTGCGAAAGCG : num 0.000537 0 0 0 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCTAGGCTCAACCTAGGAATTGCATTCCAAACTGACAGACTAGAGTACGATAGAGGGAGGTAGAATTCAGAGTGTAGCGGTGAAATGCGTAGATATTCTGAGGAATACCGGTGGCGAAGGCGGCCTCCTGGATTGATACTGACACTGAGGTGCGAAAGCG : num 0 0.00182 0.00144 0.00905 0.02038 ...  
## $ CGTTATCCGGAATTATTGGGTTTAAAGGGTCCGTAGGCGGATGATTAAGTCAGGGGTGAAAGTTTGCAGCTCAACTGTAAAATTGCCTTTGATACTGGTCATCTTGAGTTGTATTGAAGTAGGCGGAATATGTAGTGTAGCGGTGAAATGCATAGATATTACATAGAACACCAATTGCGAAGGCAGCTTACTAAGTACTAACTGACGCTGATGGACGAAAGCG : num 0.000632 0.002508 0.001116 0.003184 0.0012 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCGATTAAGTCAGAGGTGAAATCCCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTGGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAATACCGATTGCGAAGGCAGTCCACTACGTATGTACTGACGCTGAGGGACGAAAGCG : num 0 0 0 0.00181 0.00551 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGTACGTAGGCGGATTAATAAGTTAGAGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTTAAAACTGTTAGTCTTGAGATCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTACGAAAGTG : num 0 0 0 0.00238 0.00414 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGTCAGGTAAGTCAGTGGTGAAAGCCCATCGCTCAACGGTGGAACGGCCATTGATACTGTCTGACTTGAATTATTAGGAAGTAACTAGAATATGTAGTGTAGCGGTGAAATGCTTAGAGATTACATGGAATACCAATTGCGAAGGCAGGTTACTACTAATTGATTGACGCTGATGGACGAAAGCG : num 0.01571 0 0 0 0.00118 ...  
## $ CGTTGTTCGGAATTATTGGGCGTAAAGAGCGTGTAGGCGGCTCGTCAAGTCTGATGTGAAAGCCCTGGGCTCAACCCAGGAAGTGCATTGGAAACTGGCGAACTTGAGTACGGGAGAGGAAAGTGGAATTTCGAGTGTAGGGGTGAAATCCGTAGATATTCGAAGGAACACCAGTGGCGAAGGCGGCTTTCTGGACCGATACTGACGCTGAGACGCGAAAGCG : num 0 0 0 0.00115 0.00321 ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTGAACAAGTCAACTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAGTCGAAACTGTTTGACTAGAGTATAGTAGGGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAGGCACTTTACTGGGCTATTACTGACACTCAGAGACGAAAGCT : num 0.000417 0.102895 0.198884 0.000375 0.003356 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGATAAGCTAGCTGTGAAAGCCCTGGGCTCAACCTGGGAACTGCAGTTAGAACTGTCTGGCTAGAGTATAGTAGAGGGTGGCGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGGCCACCTGGACTAATACTGACACTGAGGTGCGAAAGCG : num 0 0.0098 0.00971 0.0017 0.00654 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGTACGTAGGCGGATTGGAAAGTAGGGGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTCCTAAACTATCAGTCTAGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTACGAAAGTG : num 0.000608 0.012387 0.011618 0.002767 0.026747 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGTACGTAGGCGGATCAGAAAGTATGGGGTGAAATCCCAGGGCTTAACCCTGGAACTGCCTCATAAACTCCTGGTCTTGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTACGAAAGTG : num 0 0.01581 0.02337 0.00117 0.0205 ...  
## $ CGTTATCCGGAATTATTGGGCGTAAAGCGTCCGCAGGCGGTTTTACAAGTCTGTCGTTAAAACGTGGAGCTCAACTCCATTTCGGCGATGGAAACTGTAAGACTAGAGTGTGGTAGGGGCAGAGGGAATTCCCGGTGTAGCGGTGAAATGCGTAGATATCGGGAAGAACACCAGTGGCGAAGGCGCTCTGCTGGGCCATAACTGACGCTCATGGACGAAAGCC : num 0 0 0 0.00215 0.0046 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTTGATAAGCTGGATGTGAAAGCCCCGGGCTCAACCTGGGAACTGCATCCAGAACTGTCTGACTAGAATACAATAGAGGTGAGTGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGACTCACTGGATTGATATTGACGCTGAGGTGCGAAAGCG : num 0 0 0 0.000806 0.00098 ...  
## $ CGTTGTCCGGATTTATTGGGTTTAAAGGGTACGTAGGCGGGATTTTAAGTCAGTGGTGAAAGCCTCCAGCTCAACTGGAGAACTGCCATTGAAACTGAAATTCTTGAATATGGATGAGGTGGTTGGAATATAACATGTAGCGGTGAAATGCTTAGATATGTTATAGAACACCAATTGCGAAGGCAGATCACTAAACCATTATTGACGCTGAGGTACGAAAGCG : num 0.000644 0 0 0.00951 0.00267 ...  
## $ TGTTATTCGGATTAATTGGGCGTAAAGGGCATGTAGGTGGAGAAATGTAGTTGTTTGTGAAAGTCCAAAGGTTTTCTTTGGGTGTGCATTCAAAACGGTTTATTCTCTTTGAGGCTGCGAGAGGAAAATAGAATTTCCAGAGGAGAGGTTAAATTCTTAGATTTTGGAAGGAATACCTAATGCGAAGGCAATTTTCTGGTGCAGTCCTGACACTGAGGTGCGAAAGCG : num 0 0 0 0.00089 0.000318 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGCTTTGTAAGTCGGATGTGAAAGCCCTGGGCTCAACCTGGGAATTGCATTCGATACTGCAGAGCTAGAGTATGGTAGAGGGAAGTGGAATTTCCGGTGTAGCGGTGAAATGCGTAGATATCGGAAGGAACACCAGTGGCGAAGGCGACTTCCTGGGCCAATACTGACGCTGAGGTGCGAAAGCG : num 0.000596 0 0 0.002322 0.003282 ...  
## $ TGGTCAGGATGATTATTGGGCCTAAAGCATCCGTAGCCGGCTCTGTAAGTTTTCGGTTAAATCTGTACGCTTAACGTACAGGCTGCCGGGAATACTGCAGAGCTAGGGAGTGGGAGAGGTAGACGGTACTCGGTAGGAAGTGGTAAAATGCTTTGATCTATCGATGACCACCTGTGGCGAAGGCGGTCTACCAGAACACGTCCGACGGTGAGGGATGAAAGCT : num 0 0 0.00158 0 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCTGGGCTCAACCTAGGAATTGCATCCCAAACTGGCCAACTAGAGTACAAGAGAGGGGTGTGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGACGCCCTGGCTTGATACTGACACTGAGGTGCGAAAGCG : num 0 0 0 0 0 ...  
## $ CGTTATCCGGAATCATTGGGCGTAAAGCGCCTGTAGGTTGTTTAATAAGTCTGTTGTTAAAGACTAGGGCTTAACCCTAGAAAAGCAATGGAAACTACTAGACTAGAGTATGGCAGGGGTAGAGGGAATTTCTAGTGTAGCGGTGAAATGCGTAGATATTAGAAAGAACACCGGTGGCGAAAGCGCTCTACTGGACCATTACTGACACTCAGAGGCGAAAGCT : num 0 0 0 0.00873 0.00242 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTTGTTAAGTCAGCTGTGAAAGCCCCGGGCTCAACCTGGGAACTGCAGTTGATACTGGCCGACTAGAGTACGAGAGAGGGAGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGATATATGGAGGAATACCAGTGGCGAAGGCGGCCTCCTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : num 0 0.00129 0.00151 0.01706 0.00806 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGAGTATGTAGGCGGAACAGAAAGTTAGAAGTGAAATCCCTGGGCTCAACCTAGGAATTGCTTTTAAAACTTCTGTTCTTGAATTCAGGAGAGGATAGTGGAATTTCCAGTGTAGAGGTGAAATTCGTAGATATTGGAAGGAACACCAGTGGCGAAGGCGGCTATCTGGACTGACATTGACGCTGAGATACGAAGGCA : num 0 0 0 0.002127 0.000612 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGCTTGTTAAGTCGGATGTGAAAGCCCCGGGCTCAACCTGGGAACTGCACCCGATACTGGCAAGCTAGAGTACGGGAGAGGGGGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGATATATGGAGGAATACCAGTGGCGAAGGCGGCCCCCTGGCCCGATACTGACGCTGAGGTGCGAAAGCG : num 0 0 0 0 0.00397 ...  
## $ CGTTATCCGGAATCATTGGGCGTAAAGCGTCTGTAGGTGGTTTTGTAAGTCCGCTGTAAAAGAGTACAGCTTAACTGTATATGGGCAGTGGAAACTACAAGACTGGAGTGTGGTAGGGGTAGAGGGAATTCCCGGTGTAGCGGTGAAATGCGTAGATATCGGGAAGAACACCAACGGCGAAAGCACTCTACTGGGCCAACACTGACACTGAGAGACGAAAGCT : num 0 0 0 0.000779 0.000392 ...  
## $ CGTTACTCGGATTCACTGGGCGTAAAGGGTGCGTAGGCGGATAGATGTGTCAGGTGTGAAATCTCGGGGCTCAACCTCGAAACTGCGCCTGAAACTGTCTATCTAGAGTATTGGAGGGGTAAGTGGAATTTCTGGTGTAGCGGTGAAATGCGTAGATATCAGAAGGAACACCAATGGCGAAGGCAGCTTACTGGACAAATACTGACGCTGAGGCACGAAAGCA : num 7.16e-05 1.75e-03 1.90e-03 4.41e-03 2.20e-03 ...  
## $ CGTTATTCGGAATAACTGGGCGTAAAGCGAGCGTAGGCGGATTTGTAAGTTGGAGGTGAAATCCCAGGGCTTAACCCTGGAACTGCCTTCAAAACTACATTTCTTGAGTTTGGTAGAGGAGAGTGGAATTCCTAGTGTAGAGGTGAAATTCGTAGATATTAGGAGGAACACCAGTGGCGAAGGCGACTCTCTGGGCCAATACTGACGCTGAGGTTCGAAAGCG : num 0 0 0.000394 0.000723 0.000196 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGTAGGCGGTCAGATAAGTCAGTGGTGAAAGCCCATCGCTCAACGGTGGAACGGCCATTGATACTGTCTGACTTGAATTATTAGGAAGTAACTAGAATATGTAGTGTAGCGGTGAAATGCTTAGAGATTACATGGAATACCAATTGCGAAGGCAGGTTACTACTAATATATTGACGCTGATGGACGAAAGCG : num 0.00248 0 0 0 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCACGCAGGCGGTTTGTTAAGCTAGATGTGAAAGCCCCGGGCTCAACCTGGGAATAGCATTTAGAACTGGCAGACTAGAGTCTTGGAGAGGGGAGTGGAATTTCTGGTGTAGCGGTGAAATGCGTAGATATCAGAAGGAACATCAGTGGCGAAGGCGACTCCCTGGCCAAAGACTGACGCTCATGTGCGAAAGTG : num 0.000334 0.154495 0.117886 0.002419 0.028241 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGATTGGAAAGTTGGAGGTGAAATCCCAGGGCTCAACCTTGGAACTGCCTTCAAAACTTCCAGTCTGGAGTTCGAGAGAGGTGAGTGGAATTCCGAGTGTAGAGGTGAAATTCGTAGATATTCGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGCG : num 0 0 0 0.00146 0.00196 ...  
## $ CGTTACTCGGAATCACTGGGCGTAAAGCGCGCGCAGGCGGCCTTTTAAGTTGGATGTGAAAGCCTACGGCTCAACCGTAGAACTGCATCCAAAACTATCAGGCTAGAGTGTGGGAGAGGAAGATGGAATTAGTTGTGTAGGGGTAAAATCCGTAGAGATAACTAGGAATACCAAAAGCGAAGGCAATCTTCTGGAACATTACTGACGCTGAGGCGCGAAAGCG : num 0.000453 0 0 0.000737 0.004801 ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAGTAAGTCTGTTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAATCGAAACTACTAGACTTGAGTATGGTAAAGGTAAAAGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAAGCATTTTACTGGGCCATTACTGACACTCAGAGACGAAAGCT : num 0.000143 0.002356 0 0.003003 0.000343 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCTGGGCTTAACCTAGGAATTGCATTCCAAACTGACAGACTAGAGTACGATAGAGGGGGGTAGAATTCAGAGTGTAGCGGTGAAATGCGTAGATATTCTGAGGAATACCGGTGGCGAAGGCGGCCCCCTGGATTGATACTGACACTGAGGTGCGAAAGCG : num 0.000561 0 0 0.002989 0.00147 ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGCTTAACAAGTCAACTGTTAAATCTTGAAGCTCAACTTCGAAATCGCAGTCGAAACTGTTAGGCTAGAGTATAGTAGGGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGAGATTGGAAAGAACACCGATGGCGAAGGCACTTTACTGGGCTATTACTGACACTCAGAGACGAAAGCT : num 0 0 0 0.00146 0.02591 ...  
## $ CGTTGTTCGGATTTACTGGGCGTAAAGAGATTGTAGGTGGTTTGTTAAGTCGGATGTGAAATCCCGGGGCTCAACCCCGGAACTGCATCCGATACTGGCAGGCTAGAGTTCGGGAGGGGAAAGCGGAATTCCGTGTGTAGCAGTGAAATGCGTAGATATACGGAGGAACACCTGAGGCGAAGGCGGCTTTCTGGACCGATACTGACACTGAGAATCGAAAGCG : num 0 0 0 0 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTATTAAGTTGGATGTGAAAGCCCCGGGCTCAACCTGGGAACTGCATCCAAAACTGATTCACTAGAGTACGATAGAGGGAGGTAGAATTCACAGTGTAGCGGTGGAATGCGTAGATATTGTGAAGAATACCAATGGCGAAGGCAGCCTCCTGGATCTGTACTGACACTGAGGTGCGAAAGCG : num 0 0 0 0 0 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCTTTTAAGTCAGAGGTGAAATCCTATCGCTCAACGATAGAACTGCCTTTGATACTGAAAGACTTGAGTTATTGTGAAGTGGTTAGAATATGTAGTGTAGCGGTGAAATGCATAGATATTACATAGAATACCGATTGCGAAGGCAGATCACTAACAATACACTGACGCTGAGGGACGAAAGCG : num 0 0 0 0.00156 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGTTATATAAGACAGATGTGAAATCCCCGGGCTCAACCTGGGACCTGCATTTGTGACTGTATAGCTAGAGTACGGTAGAGGGGGATGGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAATCCCCTGGACCTGTACTGACGCTCATGCACGAAAGCG : num 0 0 0.00263 0 0.00274 ...  
## $ CGTTATCCGGAATCATTGGGCGTAAAGCGTCTGTAGGTGGCTTTGTAAGTCCGCTGTGAAAGAGTACAGCTTAACTGTAACTAGGCAGCGGAAACTACGAGGCTGGAGTGTGGTAGGGGTAGAGGGAATTCCCGGTGTAGCGGTGAAATGCGTAGATATCGGGAAGAACACCAACGGCGAAAGCACTCTGCTGGGCCAACACTGACACTGAGAGACGAAAGCT : num 0.000239 0 0.000394 0.000695 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGTTCGGTAAGTTGGATGTGAAAGCCCAGGGCTCAACCTTGGAACTGCATTCAAAACTGCCAGGCTAGAGTACGGTAGAGGGGGGTAGAATTCCACGTGTAGCGGTGAAATGCGTAGAGATGTGGAGGAATACCAGTGGCGAAGGCGGCCCCCTGGATCGATACTGACGCTGAGGTGCGAAAGCG : num 0 0.000456 0 0.00064 0.001176 ...  
## $ CGTTATCCGGAATCACTGGGCATAAAGCGTCTGTAGGTGGTTTGATAAGTCTGCTGTTAAAGACTAGGGCTTAACCCTAGGAAAGCAGTGGAAACTGTCAGACTTGAGTATGGTAGAGGTACAGGGAATTCCTAGTGTAGCGGTGAAATGCGTAGATATTAGGAAGAACACCAATGGCGAAAGCACTGTACTGGGCCACAACTGACACTGAGAGACGACAGCT : num 0.00172 0 0 0.00249 0 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTATGTCAGATGTGAAAGTCCACGGCTCAACCGTGGAAGTGCATTTGAAACTGGCAAACTTGAGTACTGGAGGGGGTAGTGGAATTCCCGGTGTAGAGGTGAAATTCGTAGATATCGGGAGGAATACCGGTGGCGAAGGCGACTACCTGGCCAGATACTGACACTGAGGTGCGAAAGCG : num 0 0 0 0 0 0 0 0 0 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGATAAGCTAGCTGTGAAAGCCCTGGGCTCAACCTGGGAACTGCAGTTAGAACTGTCTGACTAGAGTACAGTAGAGGGTGGCGGAATTTCCTGTGTAGCGGTGAAATGCGTAGATATAGGAAGGAACATCAGTGGCGAAGGCGGCCACCTGGACTGATACTGACACTGAGGTGCGAAAGCG : num 0 0 0 0.00101 0.02053 ...  
## $ CGTTATCCGGAATCACTGGGCATAAAGCGTCTGTAGGTTGTTCGGTAAGTCTGCTGTTAAAGACTAGGGCCTAACCCTAGAAAAGCAGTGGAAACTGCCAAACTTGAGTGTGGTAGAGGTAGAGGGAATTCCTAGTGTAGCGGTGAAATGCGTAGATATTAGGAAGAACACCAATGGCGAAGGCACTCTACTGGGCCACAACTGACACTGAGAGACGACAGCT : num 0.00371 0 0 0 0 ...  
## $ CGTTATCCGGAATCATTGGGTTTAAAGGGTCCGCAGGCGGTCAATTAAGTCAGAGGTGAAATACCATAGCTCAACTATGGAACTGCCTTTGATACTGGTTGACTTGAGTCATATGGAAGTAGATAGAATGTGTAGTGTAGCGGTGAAATGCATAGATATTACACAGAATACCGATTGCGAAGGCAGTCTACTACGTATGTACTGACGCTGAGGGACGAAAGCG : num 0 0.109963 0.084148 0.000222 0.003699 ...  
## $ CGTTATCCGGATTTATTAGGTTTAAAGGGTTCGCAGGCGGAATTTTAAGTCAGTGGTGAAAGCCTACAGCTCAACTGTAGAACTGCCATTGAAACTGATATTCTTGAGTATAGATGAAGTGGGCGGAATATGTCATGTAGCGGTGAAATGCATAGATATGACATGGAACACCAATTGCGAAGGCAGCTCACTAAACTATTACTGACGCTCATGAACGAAAGCG : num 0 0 0 0.00057 0.0013 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTTGGATGTGAAAGCCCTGGGCTCAACCTAGGAACTGCATCCAAAACTAACTCACTAGAGTACGATAGAGGGAGGTAGAATTTATAGTGTAGCGGTGGAATGCGTAGATATTATAAAGAATACCAGTGGCGAAGGCGGCCTCCTGGATCTGTACTGACACTGAGGTGCGAAAGCG : num 0 0 0 0.00307 0.00113 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGGGAGCGTAGGTGGCTCGATAAGTCAGATGTGAAATCCCCGGGCTCAACCTGGGAACTGCATCTGATACTGTTGAGCTAGAGTATGTGAGAGGAAGGTAGAATTCCAGGTGTAGCGGTGAAATGCGTAGAGATCTGGAGGAATACCGATGGCGAAGGCAGCCTTCTGGCATAATACTGACACTGAGGCTCGAAAGCG : num 0 0 0 0 0 0 0 0 0 0 ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAATAAGTCAACTGTTAAATCTTGAGGCTCAACCTCAAAATCGCAGTCGAAACTATTAGACTAGAGTATAGTAGAGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAAGCACTTTACTGGGCTATTACTAACACTCAGAGACGAAAGCT : num 0 0.02493 0.03216 0.00328 0 ...  
## $ CGTTATCCGGATTTATTGGGTTTAAAGGGTACGTAGGCGGAAAATTAAGTCAGTAGTGAAATCCTGCAGCTTAACTGTAGAACTGTTATTGATACTGGTTTTCTTGAATATAGTTGAGGTAGGCGGAATGTGTAATGTAGCGGTGAAATGCTTAGATATTACACAGAACACCGATTGCGAAGGCAGCTTACTAAGCTATGATTGACGCTGAGGTACGAAAGCG : num 9.54e-05 0.00 0.00 4.87e-04 7.35e-04 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGTGGTTTGTTAAGTGGGATGTGAAAGCCCCGGGCTCAACCTGGGAACTGCATTCCAAACTGACAAACTAGAGTACGATAGAGGGGGGTAGAATTCAGAGTGTAGCGGTGAAATGCGTAGATATTCTGAGGAATACCGGTGGCGAAGGCGGCCCCCTGGATTGATACTGACACTGAGGTGCGAAAGCG : num 0 0 0 0.00385 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGGGTGCGCAGGCGGTTTTGTAAGTCAGATGTGAAATCCCCGAGCTCAACTTGGGAACTGCGTTTGAAACTATAAGACTAGAGTGTGTCAGAGGGGGGTAGAATTCCACGTGTAGCAGTGAAATGCGTAGATATGTGGAGGAATACCAATGGCGAAGGCAGCCCCCTGGGATAACACTGACGCTCATGCACGAAAGCG : num 0 0 0 0.00353 0 ...  
## $ CGTTGTTCGGAATTACTGGGCGTAAAGCGCACGTAGGCGGATTAGAAAGTTAGAGGTGAAATCCCAGGGCTCAACCCTGGAACTGCCTTTAAAACTCCTAGTCTTGAGTTCGAGAGAGGTGAGTGGAATTCCAAGTGTAGAGGTGAAATTCGTAGATATTTGGAGGAACACCAGTGGCGAAGGCGGCTCACTGGCTCGATACTGACGCTGAGGTGCGAAAGTG : num 0 0 0 0.00103 0.00122 ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAATAAGTCTATTGTTAAAGTTTGAGGCTTAACTTCAAATCAGCAATAGAAACTGTTAGGCTTGAGTATGGTAGAGGTAAAAGGAATTTCCAGTGGAGCGGTGAAATGCGTAGATATTGGAAAGAACACCGATGGCGAAGGCATTTTACTGGACCCTAACTGACACTCAGAGACGAAAGCT : num 0 0 0 0.000556 0.000343 ...  
## $ TGTTATCCGGAATTATTGGGCGTAAAGCGTCTGCAGGTTGATGTAAAAGTCTTTTGTTAAATCTCAGAGCTCAACTCGGAATCTGCAAAGGAAACTATATGTCTAGAGTATGGTAGGGGTAGAGGGAATTTCTAGTGGAGCGGTGAAATGCGTAGATATTAGAAAGAACACCAAGAGCGAAGGCACTCTACTGGGCCAGTACTGACACTCAGAGACGAAAGCT : num 0 0 0 0 0.000147 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGCGCGTAGGCGGCTTGTTAAGTCGAATGTGAAAGCCCCGGGCTTAACCTGGGAACTGCATCCGATACTGGCAAGCTAGAGTACGGGAGAGGGGGGTAGAATTCCATGTGTAGCGGTGAAATGCGTAGATATATGGAGGAATACCAGTGGCGAAGGCGGCCCCCTGGTCCGATACTGACGCTGAGGTGCGAAAGCG : num 0 0 0 0.0121 0.0084 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGTGCGCAGGCGGTTATATAAGACAGATGTGAAATCCCCGGGCTCAACCTGGGAACTGCATTTGTGACTGTATAGCTAGAGTACGGTAGAGGGGGATGGAATTCCGCGTGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAATCCCCTGGACCTGTACTGACGCTCATGCACGAAAGCG : num 0 0 0 0.00057 0 ...  
## $ TGTTATCCGGAATCACTGGGCGTAAAGCGTCTGTAGGTGGTTTAATAAGTCAACTGTTAAATCTTGAGGCTCAACTTCAAAATCGCAGTCGAAACTATTAGACTAGAGTATAGTAGGGGTAAAGGGAATTTCCAGTGGAGCGGTGAAATGCGTAGAGATTGGAAAGAACACCGATGGCGAAGGCACTTTACTGGGCTATTACTGACACTCAGAGACGAAAGCT : num 0.000382 0 0 0.260406 0 ...  
## $ CGTTAATCGGAATTACTGGGCGTAAAGCGAGTGTAGGCGGCTATTTAAGTCGGATGTGAAATCCCCGGGCTCAACCTGGGAATTGCATTCGATACTGGATAGCTAGAGTTTGGTAGAGGTAAGTGGAATTCCGGGTGTAGCGGTGAAATGCGTAGATATCCGGAGGAACATCAGTGGCGAAGGCGGCTTACTGGACCAAAACTGACGCTGAGGCTCGAAAGCG : num 0 0 0 0 0.00105 ...  
## [list output truncated]

#Set a dataframe as the dataframe we want to put through random forest  
Data16sTry2 <- SalinityASVData3  
  
# Data Partition in 70% training dataset and 30% test dataset - directly from code  
#set.seed(123)  
#ind <- sample(2, nrow(Data16sTry2), replace = TRUE, prob = c(0.7, 0.3))  
#train16sSalinity <- Data16sTry2[ind==1,]  
#test16sSalinity <- Data16sTry2[ind==2,]  
  
#running rf - taken directly from code  
#set.seed(4444)  
#rf16sSalinity2 <- randomForest(Salinity~., #looking at phase while compared to all the columns so dot (.) is given after tilda (~)  
 #data=train16sSalinity, #train data is used to train  
 #ntree = 200, #number of trees to run  
 #importance = TRUE, #evaluates importance of a predictor  
 #proximity = TRUE) #calculates the proximity measure among the rows  
  
#plotting error-shows the error with growing number of trees in a forest  
#plot(rf16sSalinity2)  
  
#saving the parameters used in running RF  
#sink(paste0("RF\_parameter2",".txt"))  
#rf16sSalinity2  
#sink()  
  
#predicting the dependent variable in the training set using generated RF model  
#p1 <- predict(rf16sSalinity2, train16sSalinity)  
#write.csv(p1,paste0("trainingSalinity16s2",".csv"))  
  
#predicting the dependent variable in the validation set using generated RF model  
#p2 <- predict(rf16sSalinity2, test16sSalinity)  
#write.csv(p2,paste0("validationSalinity16s2",".csv"))

#read in data  
#data <- SalinityASVData3 #define the dataframe we used for training  
#data2 <- read.csv(paste0("trainingSalinity16s",".csv")) #pull in data from RF  
#colnames(data2) <- c("SampleNumber", "ActualValue") #and rename it  
  
#pull real data for samples that line up with the training dataset  
#df2 <- data %>% select(1, Salinity) #pull all salinity values  
#df2 <- data.frame(blank\_column = NA, df2) #create a blank column aligning with salinity values  
#df2$blank\_column <- 1:222 #label blank column with the number of rows there are   
#colnames(df2) <- c("SampleNumber", "ActualValue") #change the column names  
  
#call in the the trained data with the predicted values  
  
#tr <- read.csv(paste0("trainingSalinity16s",".csv")) #call in the csv saved at the end of the last chunk  
#colnames(tr) <- c("SampleNumber", "PredictedValue") #rename the column names  
#trainingdatapoints <- tr[,1] #make a vector that has the salinity values that were predicted in the above random forest model  
  
#From the training data, pull the associated   
#indices <- match(trainingdatapoints, df2$SampleNumber) #make a list of the row numbers that match with the trained data  
#df2\_2 <- df2[indices, ] #make a new dataframe that pulls the correct rows out of the dataframe that had all of the real data  
#colnames(df2\_2) <- c("SampleNumber", "ActualValue")  
  
#Finally merge the training data and the real values into a new dataframe by the sample number  
#total1 <- merge(tr,df2\_2,by="SampleNumber")  
#write.csv(total1,"predicted\_vs\_actual\_in\_training.csv", row.names = FALSE) #save the dataframe as a CSV  
  
  
#plotting predicted vs actual value  
  
#pdf(paste0("Training\_plot",".pdf"),8,4) - don't need to run this I don't think  
#ggplot(total1, aes(y=ActualValue, x=PredictedValue)) + geom\_point() + geom\_smooth(method=lm)+  
 # ggtitle(paste0("Model RM"," training plot")) +  
 #xlab("Predicted Salinity") + ylab("Actual Salinity")   
#dev.off() - also don't need to run this  
  
#running linear model for training - did not change any of this from the example  
#fit <- lm(ActualValue ~ PredictedValue, data = total1)  
#sink(paste0("training","\_accuracy.txt"))  
#print(summary(fit))  
#sink()

#ggplot(x=train16sSalinity$Salinity, y=p1)  
#train16sSalinity$PredictedSalinity<-p1  
#ggplot(data=train16sSalinity, aes(x=Salinity, y=PredictedSalinity)) +  
 #geom\_point()+  
 #geom\_smooth(method = "lm")+  
 #xlab("Actual Salinity Concentration")+  
 #ylab("Predicted Salinity Concentration")+  
 #ggtitle("Random Forest Training Data Validation")  
  
#Model1<-lm(Salinity~PredictedSalinity,data=train16sSalinity)  
#summary(Model1) #Same as what was put out by the linear model for training

#pr <- read.csv(paste0("validationSalinity16s",".csv"))  
#colnames(pr) <- c("SampleNumber", "PredictedValue")  
#validationdatapoints <- pr[,1] #make a vector that has the salinity values that were predicted in the above random forest model  
#From the training data, pull the associated   
#indices2 <- match(validationdatapoints, df2$SampleNumber) #make a list of the row numbers that match with the trained data  
#df2\_3 <- df2[indices2, ] #make a new dataframe that pulls the correct rows out of the dataframe that had all of the real data  
#colnames(df2\_3) <- c("SampleNumber", "ActualValue")  
  
#total2 <- merge(pr,df2\_3,by="SampleNumber")  
#write.csv(total2,"predicted\_vs\_actual\_in\_validation.csv", row.names = FALSE)  
  
#plotting predicted vs actual value  
  
#pdf(paste0("Validation\_plot",x,y,z,".pdf"),8,4)  
#ggplot(total2, aes(y=ActualValue, x=PredictedValue)) + geom\_point() + geom\_smooth(method=lm)+   
 # ggtitle(paste0("Model RM"," validation plot")) +  
 # xlab("Predicted Salinity") + ylab("Actual Salinity")   
#dev.off()  
  
#running linear model for validation  
#fit2 <- lm(ActualValue ~ PredictedValue, data = total2)  
  
#sink(paste0("validation","\_accuracy.txt"))  
#print(summary(fit2))  
#sink()

#ggplot(x=test16sSalinity$Salinity, y=p2)  
#test16sSalinity$PredictedSalinity<-p2  
#ggplot(data=train16sSalinity, aes(x=Salinity, y=PredictedSalinity)) +  
 #geom\_point()+  
 #geom\_smooth(method = "lm")+  
 #xlab("Actual Salinity Concentration")+  
 #ylab("Predicted Salinity Concentration")+  
 #ggtitle("Random Forest Training Data Validation")  
  
#Model2<-lm(Salinity~PredictedSalinity,data=test16sSalinity)  
#summary(Model2)