Additional File 12

Bennett et al. Nutrients Team

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Table of Contents

```
## Printing code
knitr::opts_chunk$set(echo = TRUE)
```

```
## Loading libraries
library(dplyr)

## Warning: package 'dplyr' was built under R version 4.0.5

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

library(formatR)

## Warning: package 'formatR' was built under R version 4.0.5

library(metafor)

## Warning: package 'metafor' was built under R version 4.0.5

## Loading required package: Matrix

## Warning: package 'Matrix' was built under R version 4.0.5

##
## Loading the 'metafor' package (version 3.0-2). For an
## introduction to the package please type: help(metafor)

library(metaviz)
library(ggplot2)
library(tidyverse)

## Warning: package 'tidyverse' was built under R version 4.0.5

## -- Attaching packages --------------------------------------- tidyverse
1.3.1 --

## v tibble  3.1.2     v purrr   0.3.4
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1

## Warning: package 'tibble' was built under R version 4.0.5

## Warning: package 'tidyr' was built under R version 4.0.5

## Warning: package 'readr' was built under R version 4.0.5

## Warning: package 'forcats' was built under R version 4.0.5
```

```
## -- Conflicts ---------------------------------------
tidyverse_conflicts() --
## x tidyr::expand() masks Matrix::expand()
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## x tidyr::pack()   masks Matrix::pack()
## x tidyr::unpack() masks Matrix::unpack()

library(DT)

## Warning: package 'DT' was built under R version 4.0.5

library(usmap)

## Warning: package 'usmap' was built under R version 4.0.5

library(rworldmap)

## Loading required package: sp

## Warning: package 'sp' was built under R version 4.0.5

## ### Welcome to rworldmap ###

## For a short introduction type :   vignette('rworldmap')

library(RColorBrewer)
library(classInt)
library(ggpubr)
library(gridExtra)

##
## Attaching package: 'gridExtra'

## The following object is masked from 'package:dplyr':
##
##     combine

library(multipanelfigure)
library(tiff)

## Warning: package 'tiff' was built under R version 4.0.4

library(scales)

##
## Attaching package: 'scales'

## The following object is masked from 'package:purrr':
##
##     discard
```

```
## The following object is masked from 'package:readr':
##
##     col_factor

library(sjPlot)

## Warning: package 'sjPlot' was built under R version 4.0.5

## Registered S3 methods overwritten by 'lme4':
##   method                          from
##   cooks.distance.influence.merMod car
##   influence.merMod                car
##   dfbeta.influence.merMod         car
##   dfbetas.influence.merMod        car

## Learn more about sjPlot with 'browseVignettes("sjPlot")'.

## Reading in functions from another R script
source("Called_Functions.R")
```

1. CHL-A SUBSET

```
## This section removes rows without sufficient data for meta-analysis
## Then we calculate effect sizes and variances. These 2 new columns are
## added to the dataframe. Next, we subset the data to Chlorophyll a and
## Total Nutrients. Finally, we detect and remove outliers from the
## Chlorophyll data subset.


## Reading in the data (db4 has 6923 observations)
db4 = read.csv("db4_20201216.csv",header=T,stringsAsFactors=F)


## Additional file 10. Studies with chlorophyll effect sizes, before
filtering for sample size.
db4.chl <- filter(db4, EFFECT.TERM == "Chlorophyll a")
write.csv(db4.chl, "db4.chl_20201216.csv")

# Remove rows without CAUSE.TERM or EFFECT.TERM.
db4.n = db4[!is.na(db4$CAUSE.TERM),]
db4.n = db4.n[!is.na(db4.n$EFFECT.TERM),]

## Remove rows without a converted Pearson correlation effect size.
db4.n = db4.n[!is.na(db4.n$RESPONSE.MEASURE.VALUE2),]

## Remove rows with low sample size (escalc cannot estimate sampling variance
if n<=4)
samplesize.min = 9
db4.n = subset(db4.n, IMPACT.SAMPLES > samplesize.min)
```

```r
## Calculate yi and vi with measure=COR (NOT Z transformed for Forest Plots)
## escalc adds yi and vi as last 2 columns
db4.yv = escalc(measure="COR",ri=RESPONSE.MEASURE.VALUE2,
                ni=IMPACT.SAMPLES,data=db4.n)


## Extracting column numbers
yi = which(colnames(db4.yv)=="yi")
vi = which(colnames(db4.yv)=="vi")


## Put yi and vi as first and second columns
db4.yv = db4.yv[,c(yi, vi, 1:(ncol(db4.yv)-2))]


## Check the first 2 columns are yi and vi
colnames(db4.yv[,1:10])


## Check rows with NA in yi or vi
sum(is.na(db4.yv$yi))
sum(is.na(db4.yv$vi))


## Sort the df from low to high effect size
## This improves ordering of studies in the forest plots
db4.yv.sort = db4.yv[order(db4.yv$yi),]


############################
## Make a small example forest plot of individual effect sizes
#db4.example <- db4.yv.sort[200:210,]
#write.csv(db4.example, "db4.example.csv", row.names=F)
#db4.example[,(1:8)]

#Before running viz_forest, check method="DL". If using rma.mv, need to
replace db4.example with the rma.mv model output object and delete
method="DL".
#viz_forest(db4.example,
#           group=NULL,
#           type="standard",
#           study_labels=db4.example$paper,summary_label=NULL,
#           xlab="Pearson correlation (r)",
#           summary_table=NULL,variant="thick",method="DL",
#           text_size=3,x_limit=c(-0.7,-0.5),annotate_CI=T)
```

```r
# Get 95% confidence intervals
#-0.5981 - stats::qnorm(1-(1-0.95)/2)*0.0458
#-0.5981 + stats::qnorm(1-(1-0.95)/2)*0.0458

# File for EMVL: add column with 95% confidence intervals
# db4.yv.sort$conf_interval <- stats::qnorm(1-(1-0.95)/2)*db4.yv.sort$vi

# write.csv(db4.yv.sort, "db4_withCI_20201216.csv", row.names=F)

#db4.yv.sort["StressorResponse"] <- paste(db4.yv.sort$CAUSE.TERM,
db4.yv.sort$EFFECT.MEASURE, sep = " and ")

#db4.CI <- db4.yv.sort %>% filter(CAUSE.TERM == "Total N" |
#                                 CAUSE.TERM == "Total P" |
#                                 CAUSE.TERM == "Total N: total P") %>%
#  filter(EFFECT.MEASURE == "Sestonic chl-a" |
#           EFFECT.MEASURE == "Benthic chl-a" |
#           EFFECT.MEASURE == "Other chl-a")

#count.CI <- db4.CI %>% group_by(StressorResponse) %>% tally()


#See above comment about method="DL"
#viz_forest(db4.CI,
#           group=db4.CI$StressorResponse,
#           type="summary_only",
#           study_labels=NULL,summary_label=NULL,
#           xlab="Pearson correlation (r)",
#           summary_table=(count.CI),variant="thick",method="DL",
#           text_size=3,x_limit=c(-1,1),annotate_CI=T)

############################

# Get counts of country
print("Full Dataset - Countries")
summary(as.factor(db4.yv.sort$COUNTRY))
db4.benthic <- dplyr::filter(db4.yv.sort, EFFECT.MEASURE=="Benthic chl-a")
print("Benthic Chlorophyll - Countries")
summary(as.factor(db4.benthic$COUNTRY))
db4.sestonic <- dplyr::filter(db4.yv.sort, EFFECT.MEASURE=="Sestonic chl-a")
print("Sestonic Chlorophyll - Countries")
summary(as.factor(db4.sestonic$COUNTRY))

# Get counts for a state
db4.NM <- dplyr::filter(db4.yv.sort, STATE=="New Mexico" & CAUSE.TERM=="Total
N")
print("New Mexico - TN")
summary(as.factor(db4.NM$EFFECT.TERM))
```

```r
db4.NM <- dplyr::filter(db4.yv.sort, STATE=="New Mexico" & CAUSE.TERM=="Total
P")
print("New Mexico - TP")
summary(as.factor(db4.NM$EFFECT.TERM))

# Get counts of chl, diatoms, and macros
summary(as.factor(db4.yv.sort$EFFECT.TERM))
# Get counts of all nutrient endpoints
summary(as.factor(db4.yv.sort$CAUSE.TERM))
# Get counts of nutrient enpoints for diatoms
db4.diatoms <- dplyr::filter(db4.yv.sort, EFFECT.TERM=="Diatoms")
print("Diatoms")
summary(as.factor(db4.diatoms$CAUSE.TERM))
# Get counts of nutrient enpoints for macros
db4.macros <- dplyr::filter(db4.yv.sort, EFFECT.TERM=="Macroinvertebrates")
print("Macroinvertebrates")
summary(as.factor(db4.macros$CAUSE.TERM))
# Get counts of nutrient enpoints for chl
db4.chloro <- dplyr::filter(db4.yv.sort, EFFECT.TERM=="Chlorophyll a")
print("Chlorophyll a")
summary(as.factor(db4.chloro$CAUSE.TERM))


## Subset to Chlorophyll a and Total nutrients only
db4.total = db4.yv.sort %>%
  filter (EFFECT.TERM=="Chlorophyll a") %>%
  filter(CAUSE.TERM=="Total N" |
           CAUSE.TERM=="Total P" |
           CAUSE.TERM=="Total N: total P")
nrow(db4.total) #441


## Check Total Nutrients and Chlorophyll a only
unique(db4.total$CAUSE.TERM)
unique(db4.total$EFFECT.TERM)
```

1.1 Detect outliers

```r
## WARNING: TAKES A LONG TIME. To run, set eval=TRUE.


## Fitting a random-effects model with r-to-z transformed correlations
res.db4.total.zcor = rma(ri=db4.total$RESPONSE.MEASURE.VALUE2,
                         ni=db4.total$IMPACT.SAMPLES, measure="ZCOR",
                         data=db4.total)


## Calculate influence diagnostics
inf.db4.total.zcor = influence(res.db4.total.zcor)
```

```
## Plot the influence diagnostics
tiff("outliers_chl.tiff", width = 10, height = 12, units = 'in', res = 150)
plot(inf.db4.total.zcor,layout=c(8,1))
dev.off()


## There are two red points in the plot.
## These have significant influence on the models.

inf.db4.total.zcor$inf[1:10,]
inf.db4.total.zcor$inf[430:441,]
db4.total[5,1:10]
db4.total[440,1:10]


## The two red points correspond to Askey et al. 2007
## (uniqueID=27903, benthic chla & TP) and Heiskary
## et al. 2013 (uniqueID=3210101, sestonic chl a & TP)
## However, the effect sizes and sample sizes do not
## seem like obvious outliers.
## Result: no more potential outliers detected.
```

1.2 Remove outliers

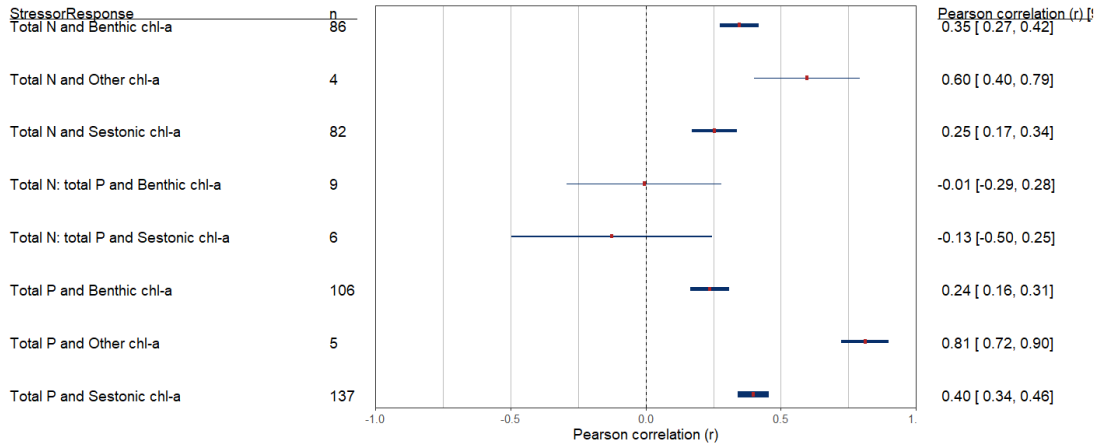
```
## The two outliers identified above are
## Askey et al. 2007 (uniqueID=27903, benthic chla & TP) and
## Heiskary et al. 2013 (uniqueID=3210101, sestonic chl a & TP)

## Remove the two outliers.
db4.out = db4.total[which(!db4.total$uniqueID==27903 &
                            !db4.total$uniqueID==3210101), ]
```

2. CHL-A FOREST PLOTS

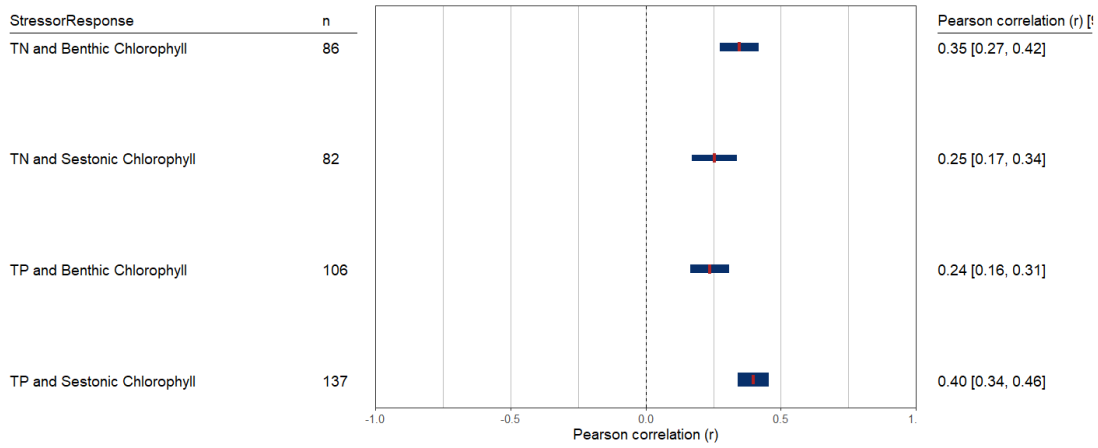
2.1 Stressor-Response relationships

```
## Reading in data
chl_all <- db4.out


## Change NA's to "Other"
chl_all$STUDY.DESIGN[is.na(chl_all$STUDY.DESIGN)] = "Other"
summary(as.factor(chl_all$STUDY.DESIGN))

## Gradient response             Other
##               401                38

summary(as.factor(chl_all$STUDY.TYPE))
```

```
## Manipulation        Model  Observation
##            2            2          435

summary(as.factor(chl_all$SOURCE.DATA))

##    Field Mesocosm
##      437        2

chl_all["StressorResponse"] <- paste(chl_all$CAUSE.TERM,
chl_all$EFFECT.MEASURE, sep = " and ")

## Remove non-observation study types
chl_all_obs <- dplyr::filter(chl_all, STUDY.TYPE=="Observation")

## Check stressor-response relationships included in the dataframe
summary(as.factor(chl_all_obs$CAUSE.TERM))

##          Total N Total N: total P          Total P
##              172               15              248

summary(as.factor(chl_all_obs$EFFECT.MEASURE))

##  Benthic chl-a    Other chl-a Sestonic chl-a
##            201              9            225

#Forest plot with 8 Stressor-Responses (includes TN:TP and Other chl-a)
count.SR <- chl_all_obs %>% group_by(StressorResponse) %>% tally()

rma_chl_all_obs <- rma.mv(yi, vi,
                    random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                    tdist=TRUE, data=chl_all_obs)

# This forest plot uses the above rma.mv model object and the method is
extracted from the rma.mv object. No need to define the method.
viz_forest(rma_chl_all_obs,
           group=chl_all_obs$StressorResponse,
           type="summary_only",
           study_labels=NULL,summary_label=NULL,
           xlab="Pearson correlation (r)",
           summary_table=(count.SR),variant="thick",
           text_size=5,x_limit=c(-1,1),annotate_CI=T)
```



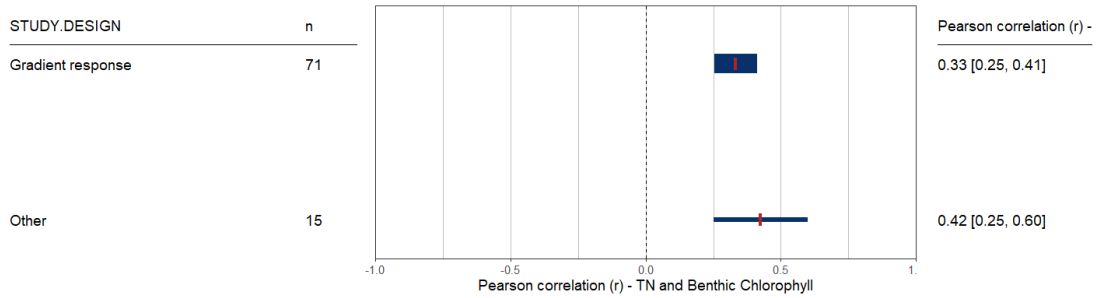

```
## Make Stressor-Response subsets for forest plots
chl_ben.TN = subset(chl_all_obs, EFFECT.MEASURE=="Benthic chl-a" &
CAUSE.TERM=="Total N")
chl_ben.TN["StressorResponse"]<- c("TN and Benthic Chlorophyll")
chl_ben.TP = subset(chl_all_obs, EFFECT.MEASURE=="Benthic chl-a" &
CAUSE.TERM=="Total P")
chl_ben.TP["StressorResponse"]<- c("TP and Benthic Chlorophyll")
chl_ses.TN = subset(chl_all_obs, EFFECT.MEASURE=="Sestonic chl-a" &
CAUSE.TERM=="Total N")
chl_ses.TN["StressorResponse"]<- c("TN and Sestonic Chlorophyll")
chl_ses.TP = subset(chl_all_obs, EFFECT.MEASURE=="Sestonic chl-a" &
CAUSE.TERM=="Total P")
chl_ses.TP["StressorResponse"]<- c("TP and Sestonic Chlorophyll")
chl_SR <- rbind(chl_ben.TN, chl_ben.TP, chl_ses.TN, chl_ses.TP)


#Forest plot with 4 Stressor-Responses
count.SR <- chl_SR %>% group_by(StressorResponse) %>% tally()

rma_chl_SR <- rma.mv(yi, vi,
                     random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                     tdist=TRUE, data=chl_SR)

#win.metafile(filename = "Figure 3 revised.wmf", width = 14, height =6,
pointsize = 18)
viz_forest(rma_chl_SR,
           group=chl_SR$StressorResponse,
           type="summary_only",
           study_labels=NULL,summary_label=NULL,
           xlab="Pearson correlation (r)",
           summary_table=(count.SR),variant="thick",
           text_size=5,x_limit=c(-1,1),annotate_CI=T)
```

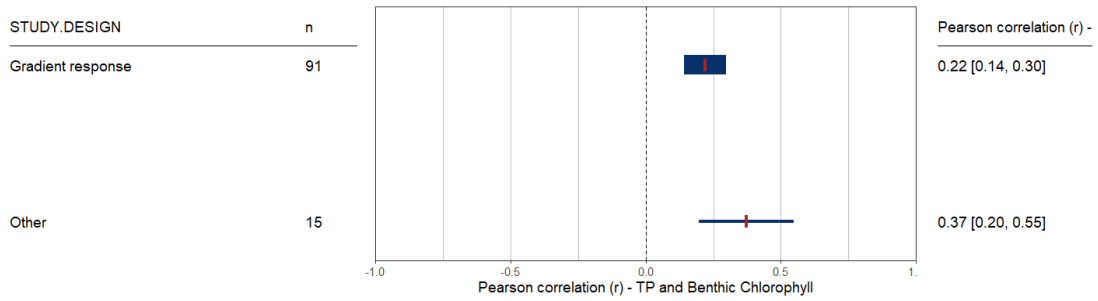


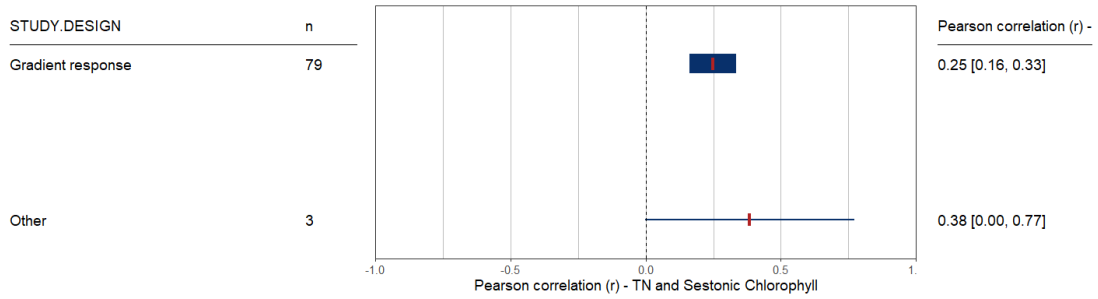

```
#dev.off()


# Write the dataframe used for the meta-analysis
write.csv(chl_SR, "metadataset_20201216.csv", row.names = F)
```

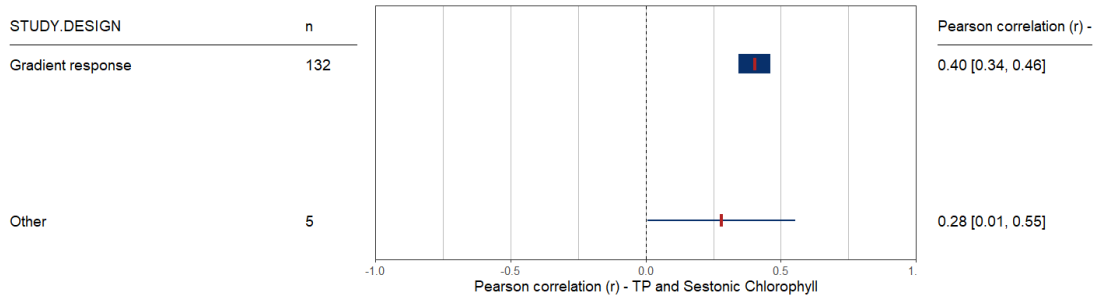
2.2 Study design

```
#Loop to make forest plots for each Stressor-Response subset####
allSRs<-unique(chl_SR$StressorResponse)

for(i in allSRs){

  SRdata <- chl_SR %>% filter(StressorResponse==i)

  count.SR <- SRdata %>% group_by(STUDY.DESIGN) %>% tally()

  rma_SRdata <- rma.mv(yi, vi,
                       random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                       tdist=TRUE, data=SRdata)

  vizforestPlot <- viz_forest(rma_SRdata,
              group=SRdata$STUDY.DESIGN,
              type="summary_only",
              study_labels=NULL,summary_label=NULL,
              xlab=paste(c("Pearson correlation (r)"), i, sep=" - "),
              summary_table=(count.SR),variant="thick",
              text_size=5,x_limit=c(-1,1),annotate_CI=T)

  plot(vizforestPlot)
}
```





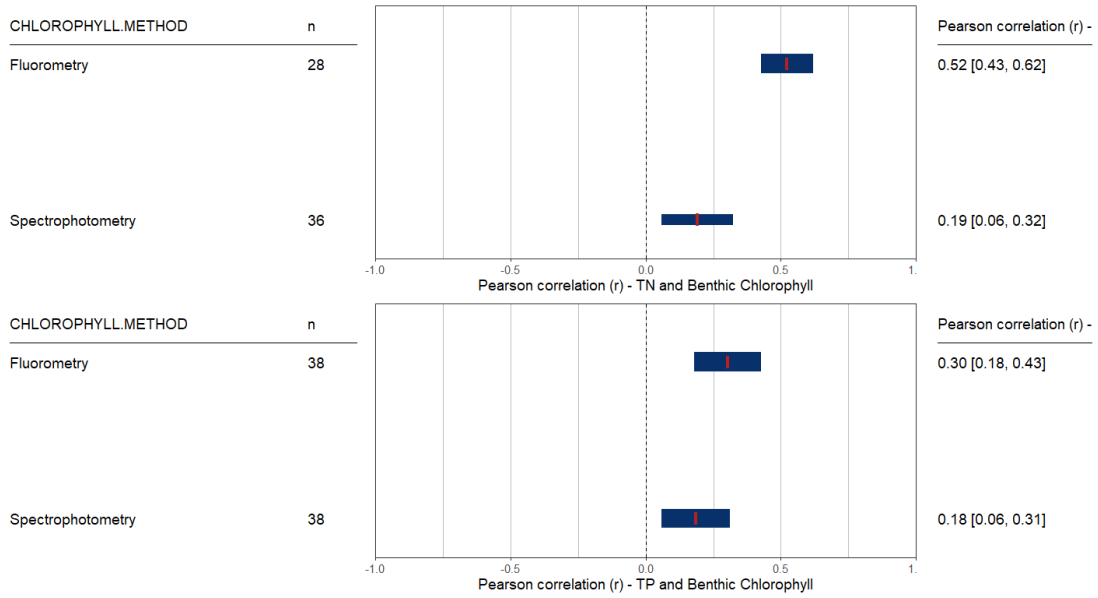


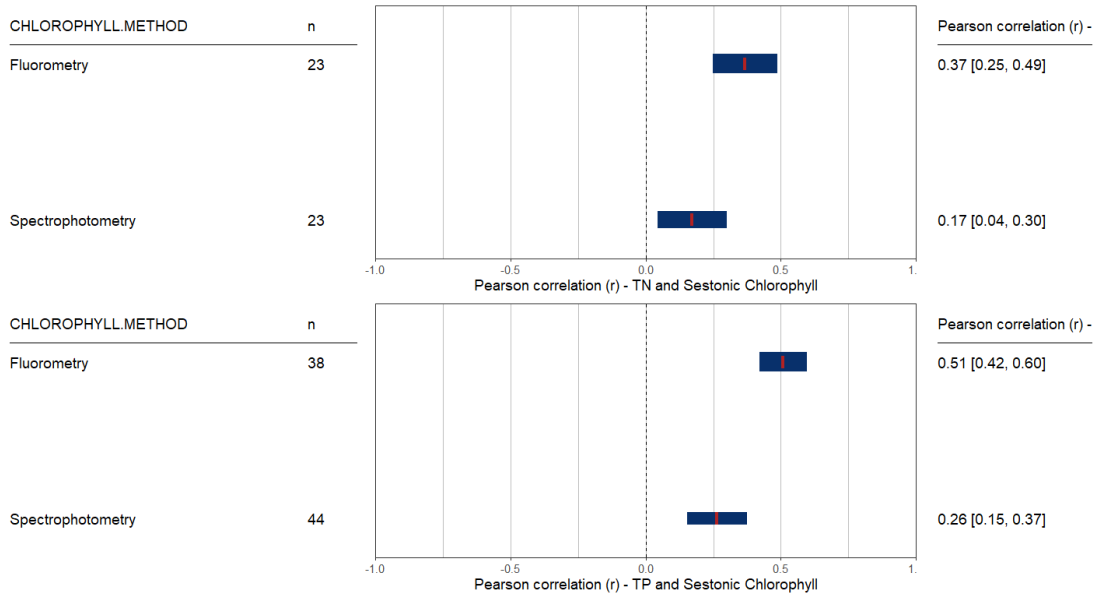


2.3 Chlorophyll measurement method

```
#Loop to make forest plots for each Stressor-Response subset####
allSRs<-unique(chl_SR$StressorResponse)

for(i in allSRs){

  SRdata <- dplyr::filter(chl_SR,CHLOROPHYLL.MEASUREMENT.METHOD %in%
                            c("Fluorometry", "Spectrophotometry"))
  SRdata["CHLOROPHYLL.METHOD"] <- SRdata$CHLOROPHYLL.MEASUREMENT.METHOD

  SRdata_chl <- SRdata %>% filter(StressorResponse==i)

  count.SR <- SRdata_chl %>% group_by(CHLOROPHYLL.METHOD) %>% tally()
```

```
  rma_SRdata_chl <- rma.mv(yi, vi,
                      random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                      tdist=TRUE, data=SRdata_chl)

  vizforestPlot <- viz_forest(rma_SRdata_chl,
             group=SRdata_chl$CHLOROPHYLL.METHOD,
             type="summary_only",
             study_labels=NULL,summary_label=NULL,
             xlab=paste(c("Pearson correlation (r)"), i, sep=" - "),
             summary_table=(count.SR),variant="thick",
             text_size=5,x_limit=c(-1,1),annotate_CI=T)

  plot(vizforestPlot)
}
```





2.4 State

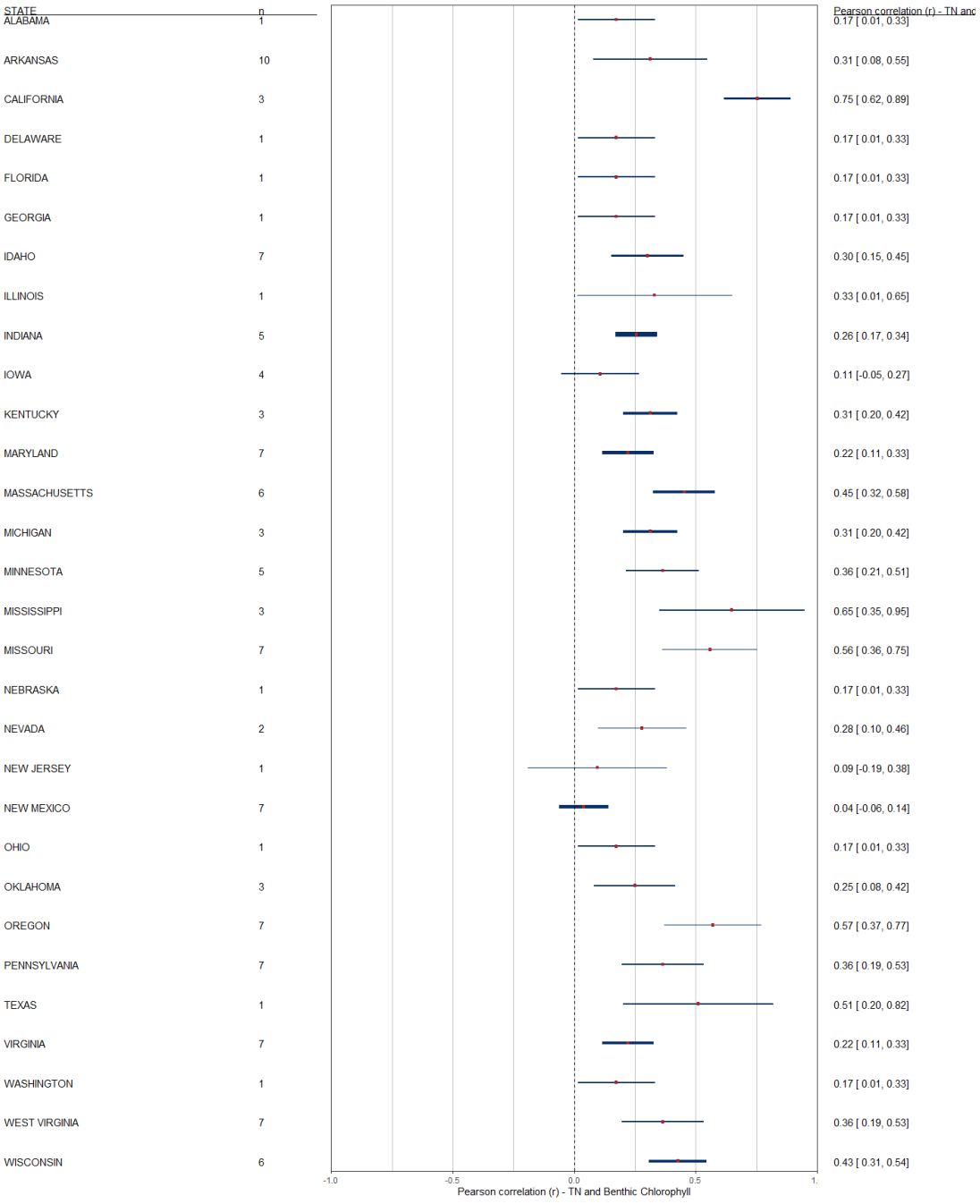
```
## Forest plot for group = STATE
## Subset to USA
chl_usa = subset(chl_SR, chl_SR$COUNTRY=="United States")


## If Multiple states, need to use the effect size more than once.
ALABAMA = which(colnames(chl_usa)=="ALABAMA")
WYOMING = which(colnames(chl_usa)=="WYOMING")
colnames(chl_usa[, c(ALABAMA:WYOMING)])
```

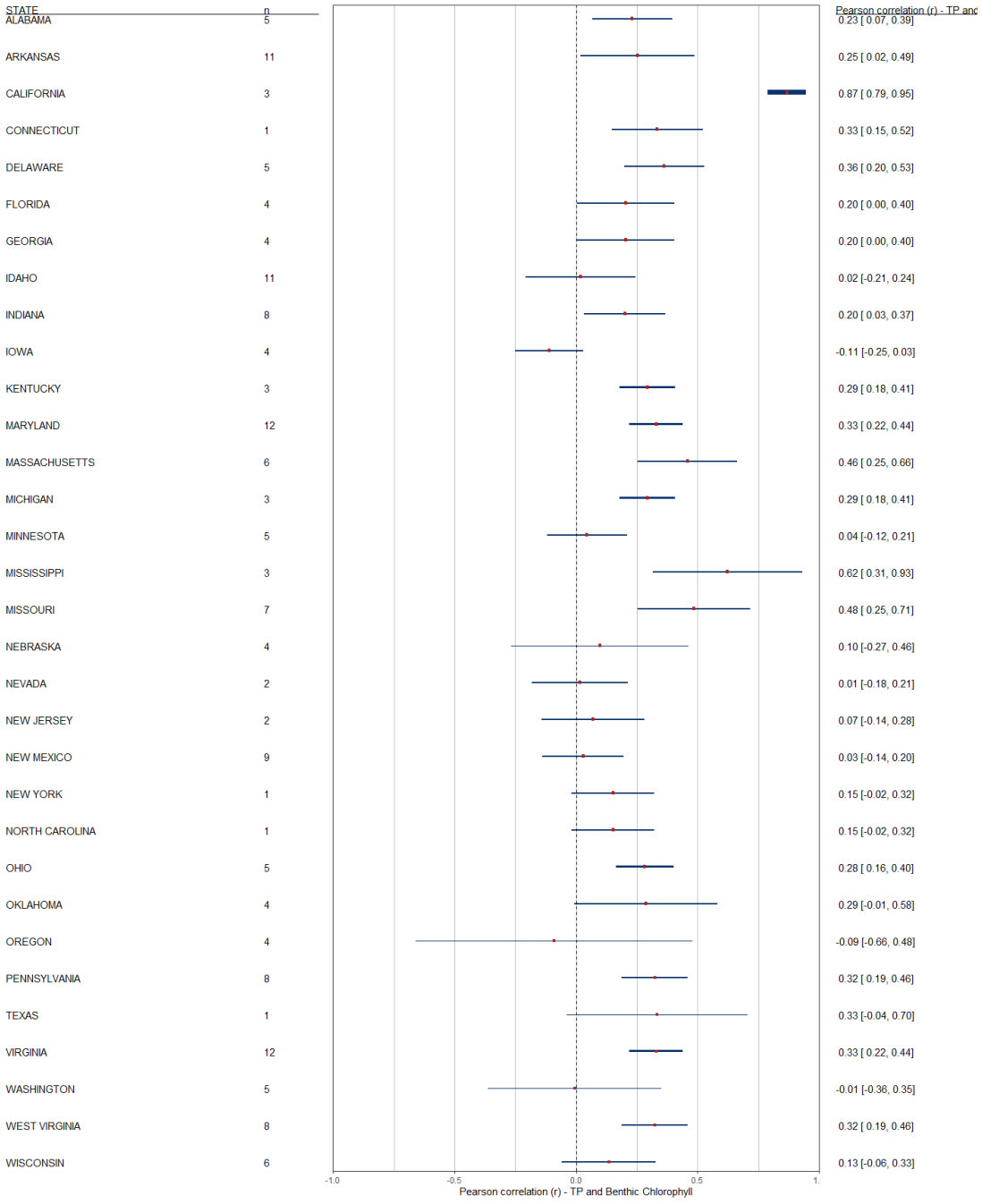
```
##  [1] "ALABAMA"              "ALASKA"               "ARIZONA"
##  [4] "ARKANSAS"             "CALIFORNIA"           "COLORADO"
##  [7] "CONNECTICUT"          "DELAWARE"             "DISTRICT.OF.COLUMBIA"
## [10] "FLORIDA"              "GEORGIA"              "HAWAII"
## [13] "IDAHO"                "ILLINOIS"             "INDIANA"
## [16] "IOWA"                 "KANSAS"               "KENTUCKY"
## [19] "LOUISIANA"            "MAINE"                "MARYLAND"
## [22] "MASSACHUSETTS"        "MICHIGAN"             "MINNESOTA"
## [25] "MISSISSIPPI"          "MISSOURI"             "MONTANA"
## [28] "NEBRASKA"             "NEVADA"               "NEW.HAMPSHIRE"
## [31] "NEW.JERSEY"           "NEW.MEXICO"           "NEW.YORK"
## [34] "NORTH.CAROLINA"       "NORTH.DAKOTA"         "OHIO"
## [37] "OKLAHOMA"             "OREGON"               "PENNSYLVANIA"
## [40] "RHODE.ISLAND"         "SOUTH.CAROLINA"       "SOUTH.DAKOTA"
## [43] "TENNESSEE"            "TEXAS"                "UTAH"
## [46] "VERMONT"              "VIRGINIA"             "WASHINGTON"
## [49] "WEST.VIRGINIA"        "WISCONSIN"            "WYOMING"
```

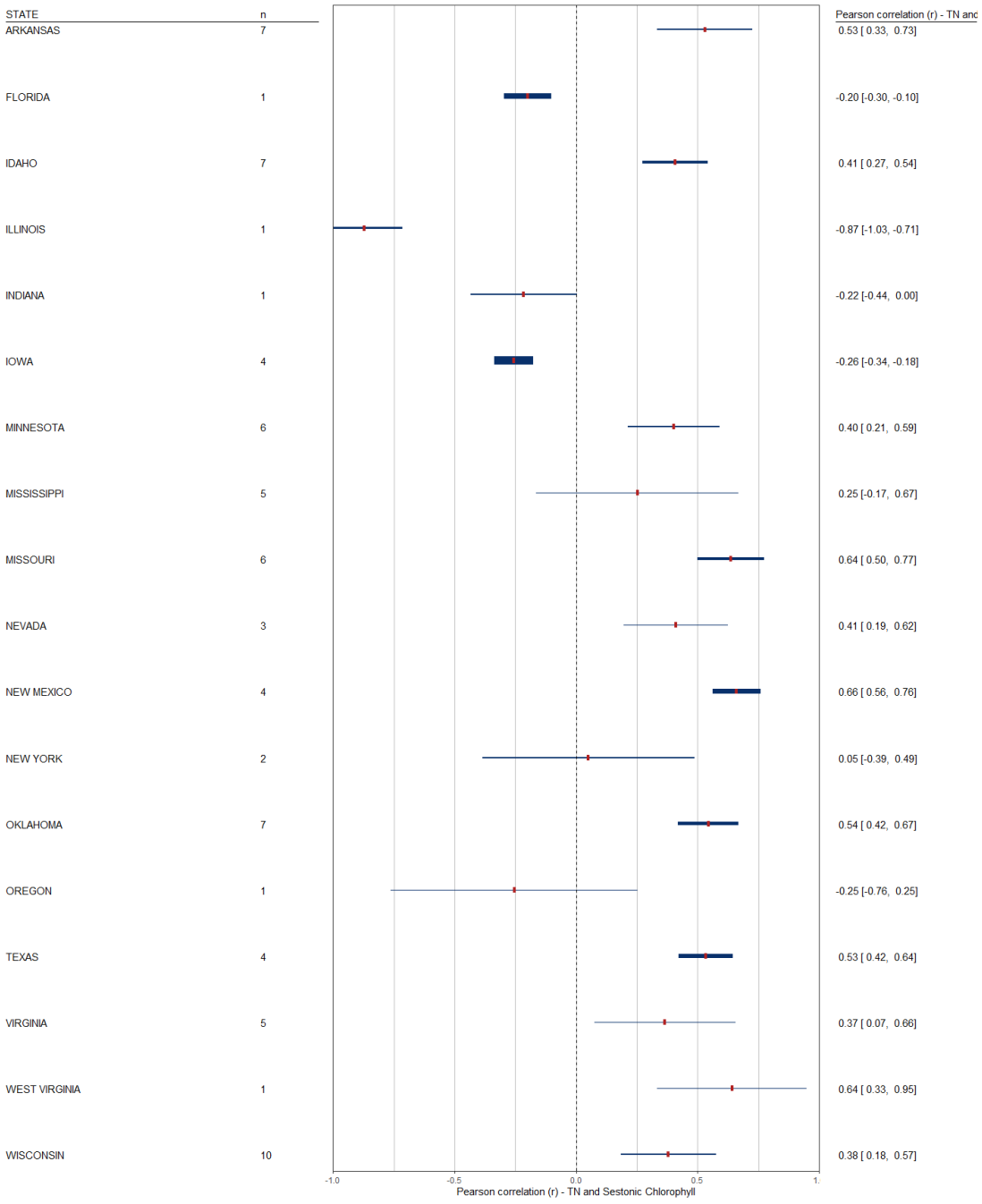
```
## Replace NAs in individual state columns to zero.
chl_usa[, c(ALABAMA:WYOMING)][is.na(chl_usa[, c(ALABAMA:WYOMING)])] = 0
```

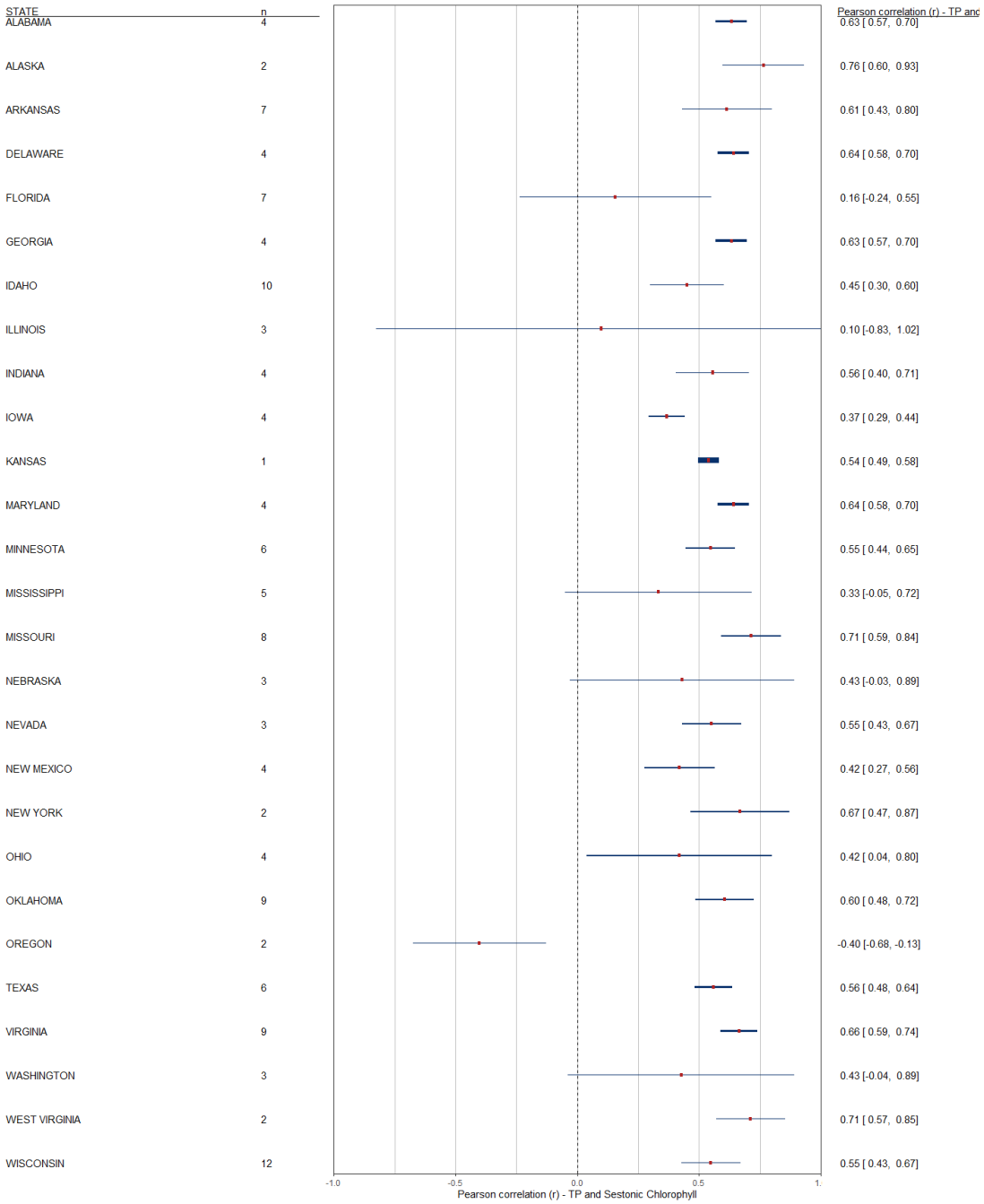
```r
## Add new column with number of states per row.
chl_usa$Mult_States = rowSums(chl_usa[, c(ALABAMA:WYOMING)])


## New expanded dataframe will have this number of rows.
sum(chl_usa$Mult_States) #526

## [1] 493

## Expand the dataframe so that rows with multiple states are
## duplicated by number of states.
chl_expanded = chl_usa[rep(row.names(chl_usa), chl_usa$Mult_States),
1:ncol(chl_usa)]
row.names(chl_expanded) = 1:nrow(chl_expanded)


## Get a list of state column names with a 1
## E.g., If a row included 4 states, the list will have 4 elements for that
row.
statenames = apply(chl_usa[, c(ALABAMA:WYOMING)], 1, function(x)
names(which(x >0)))


## Unlist the names so that each state has its own row.
State_unlist = unlist(statenames, use.names=F)
names(State_unlist) = "STATE_unlisted"


## Add the unlisted object as a column to db2.expanded.
chl_expanded$STATE = State_unlist

chl_exp.ben.TN = subset(chl_expanded, EFFECT.MEASURE=="Benthic chl-a" &
CAUSE.TERM=="Total N")
chl_exp.ben.TN["StressorResponse"]<- c("TN and Benthic Chlorophyll")
chl_exp.ben.TP = subset(chl_expanded, EFFECT.MEASURE=="Benthic chl-a" &
CAUSE.TERM=="Total P")
chl_exp.ben.TP["StressorResponse"]<- c("TP and Benthic Chlorophyll")
chl_exp.ses.TN = subset(chl_expanded, EFFECT.MEASURE=="Sestonic chl-a" &
CAUSE.TERM=="Total N")
chl_exp.ses.TN["StressorResponse"]<- c("TN and Sestonic Chlorophyll")
chl_exp.ses.TP = subset(chl_expanded, EFFECT.MEASURE=="Sestonic chl-a" &
CAUSE.TERM=="Total P")
chl_exp.ses.TP["StressorResponse"]<- c("TP and Sestonic Chlorophyll")

chl_exp.SR <- rbind(chl_exp.ben.TN, chl_exp.ben.TP, chl_exp.ses.TN,
chl_exp.ses.TP)
```

```r
## Writing to csv
write.csv(chl_exp.SR,"chl_expanded STATES 20201216.csv",row.names=F)


#Loop to make forest plots for each Stressor-Response subset####
allSRs<-unique(chl_exp.SR$StressorResponse)

for(i in allSRs){

  SRdata <- chl_exp.SR %>% filter(StressorResponse==i)

  count.SR <- SRdata %>% group_by(STATE) %>% tally()
  count.SR$STATE = sub("\\.", " ", count.SR$STATE)

  # means.SR <- SRdata %>% group_by(STATE) %>%
  # summarise(mean = mean(RESPONSE.MEASURE.VALUE2), n=n())


  #  print(SRdata$StressorResponse[1])
  #  print(means.SR, n=nrow(means.SR))

  rma_SRdata <- rma.mv(yi, vi,
                       random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                       tdist=TRUE, data=SRdata)

  vizforestPlot <- viz_forest(rma_SRdata,
             group=SRdata$STATE,
             type="summary_only",
             study_labels=NULL,summary_label=NULL,
             xlab=paste(c("Pearson correlation (r)"), i, sep=" - "),
             summary_table=(count.SR),variant="thick",
             text_size=4,x_limit=c(-1,1),annotate_CI=T)

  plot(vizforestPlot)

}
```


STATE
n
Pearson correlation (r) - TN and
ALABAMA 1 0.17 [0.01, 0.33]
ARKANSAS 10 0.31 [0.08, 0.55]
CALIFORNIA 3 0.75 [0.62, 0.89]
DELAWARE 1 0.17 [0.01, 0.33]
FLORIDA 1 0.17 [0.01, 0.33]
GEORGIA 1 0.17 [0.01, 0.33]
IDAHO 7 0.30 [0.15, 0.45]
ILLINOIS 1 0.33 [0.01, 0.65]
INDIANA 5 0.26 [0.17, 0.34]
IOWA 4 0.11 [-0.05, 0.27]
KENTUCKY 3 0.31 [0.20, 0.42]
MARYLAND 7 0.22 [0.11, 0.33]
MASSACHUSETTS 6 0.45 [0.32, 0.58]
MICHIGAN 3 0.31 [0.20, 0.42]
MINNESOTA 5 0.36 [0.21, 0.51]
MISSISSIPPI 3 0.65 [0.35, 0.95]
MISSOURI 7 0.56 [0.36, 0.75]
NEBRASKA 1 0.17 [0.01, 0.33]
NEVADA 2 0.28 [0.10, 0.46]
NEW JERSEY 1 0.09 [-0.19, 0.38]
NEW MEXICO 7 0.04 [-0.06, 0.14]
OHIO 1 0.17 [0.01, 0.33]
OKLAHOMA 3 0.25 [0.08, 0.42]
OREGON 7 0.57 [0.37, 0.77]
PENNSYLVANIA 7 0.36 [0.19, 0.53]
TEXAS 1 0.51 [0.20, 0.82]
VIRGINIA 7 0.22 [0.11, 0.33]
WASHINGTON 1 0.17 [0.01, 0.33]
WEST VIRGINIA 7 0.36 [0.19, 0.53]
WISCONSIN 6 0.43 [0.31, 0.54]
-1.0
-0.5
0.0
0.5
1.
Pearson correlation (r) - TN and Benthic Chlorophyll


STATE
n
Pearson correlation (r) - TP and
ALABAMA 5 0.23 [0.07, 0.39]
ARKANSAS 11 0.25 [0.02, 0.49]
CALIFORNIA 3 0.87 [0.79, 0.95]
CONNECTICUT 1 0.33 [0.15, 0.52]
DELAWARE 5 0.36 [0.20, 0.53]
FLORIDA 4 0.20 [0.00, 0.40]
GEORGIA 4 0.20 [0.00, 0.40]
IDAHO 11 0.02 [-0.21, 0.24]
INDIANA 8 0.20 [0.03, 0.37]
IOWA 4 -0.11 [-0.25, 0.03]
KENTUCKY 3 0.29 [0.18, 0.41]
MARYLAND 12 0.33 [0.22, 0.44]
MASSACHUSETTS 6 0.46 [0.25, 0.66]
MICHIGAN 3 0.29 [0.18, 0.41]
MINNESOTA 5 0.04 [-0.12, 0.21]
MISSISSIPPI 3 0.62 [0.31, 0.93]
MISSOURI 7 0.48 [0.25, 0.71]
NEBRASKA 4 0.10 [-0.27, 0.46]
NEVADA 2 0.01 [-0.18, 0.21]
NEW JERSEY 2 0.07 [-0.14, 0.28]
NEW MEXICO 9 0.03 [-0.14, 0.20]
NEW YORK 1 0.15 [-0.02, 0.32]
NORTH CAROLINA 1 0.15 [-0.02, 0.32]
OHIO 5 0.28 [0.16, 0.40]
OKLAHOMA 4 0.29 [-0.01, 0.58]
OREGON 4 -0.09 [-0.66, 0.48]
PENNSYLVANIA 8 0.32 [0.19, 0.46]
TEXAS 1 0.33 [-0.04, 0.70]
VIRGINIA 12 0.33 [0.22, 0.44]
WASHINGTON 5 -0.01 [-0.36, 0.35]
WEST VIRGINIA 8 0.32 [0.19, 0.46]
WISCONSIN 6 0.13 [-0.06, 0.33]
-1.0
-0.5
0.0
0.5
1.
Pearson correlation (r) - TP and Benthic Chlorophyll

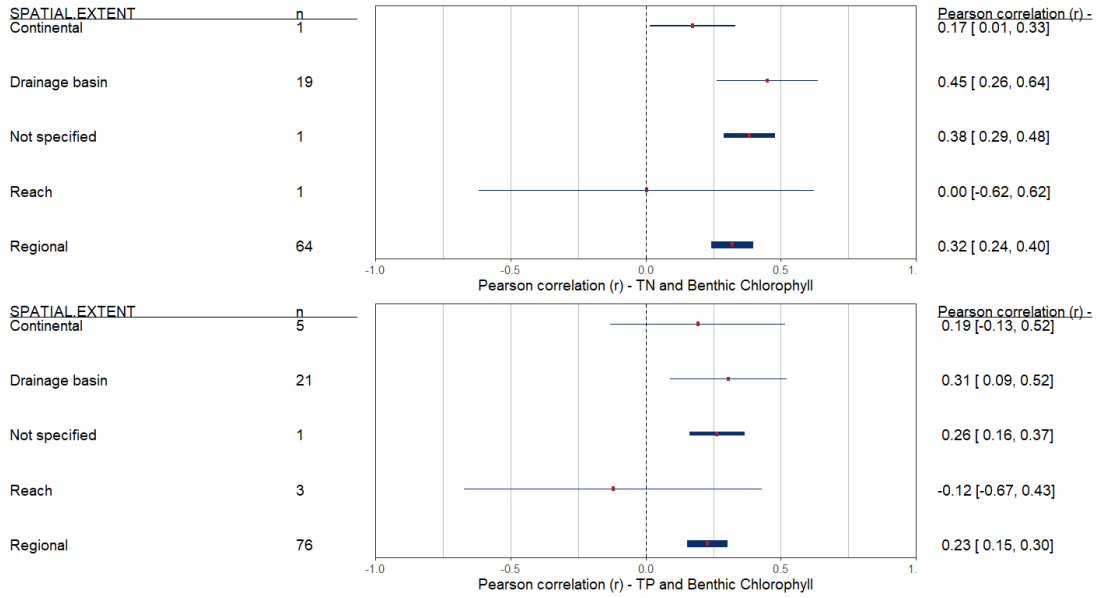

STATE
n
Pearson correlation (r) - TN and
ARKANSAS 7 0.53 [0.33, 0.73]
FLORIDA 1 -0.20 [-0.30, -0.10]
IDAHO 7 0.41 [0.27, 0.54]
ILLINOIS 1 -0.87 [-1.03, -0.71]
INDIANA 1 -0.22 [-0.44, 0.00]
IOWA 4 -0.26 [-0.34, -0.18]
MINNESOTA 6 0.40 [0.21, 0.59]
MISSISSIPPI 5 0.25 [-0.17, 0.67]
MISSOURI 6 0.64 [0.50, 0.77]
NEVADA 3 0.41 [0.19, 0.62]
NEW MEXICO 4 0.66 [0.56, 0.76]
NEW YORK 2 0.05 [-0.39, 0.49]
OKLAHOMA 7 0.54 [0.42, 0.67]
OREGON 1 -0.25 [-0.76, 0.25]
TEXAS 4 0.53 [0.42, 0.64]
VIRGINIA 5 0.37 [0.07, 0.66]
WEST VIRGINIA 1 0.64 [0.33, 0.95]
WISCONSIN 10 0.38 [0.18, 0.57]
-1.0
-0.5
0.0
0.5
1.
Pearson correlation (r) - TN and Sestonic Chlorophyll

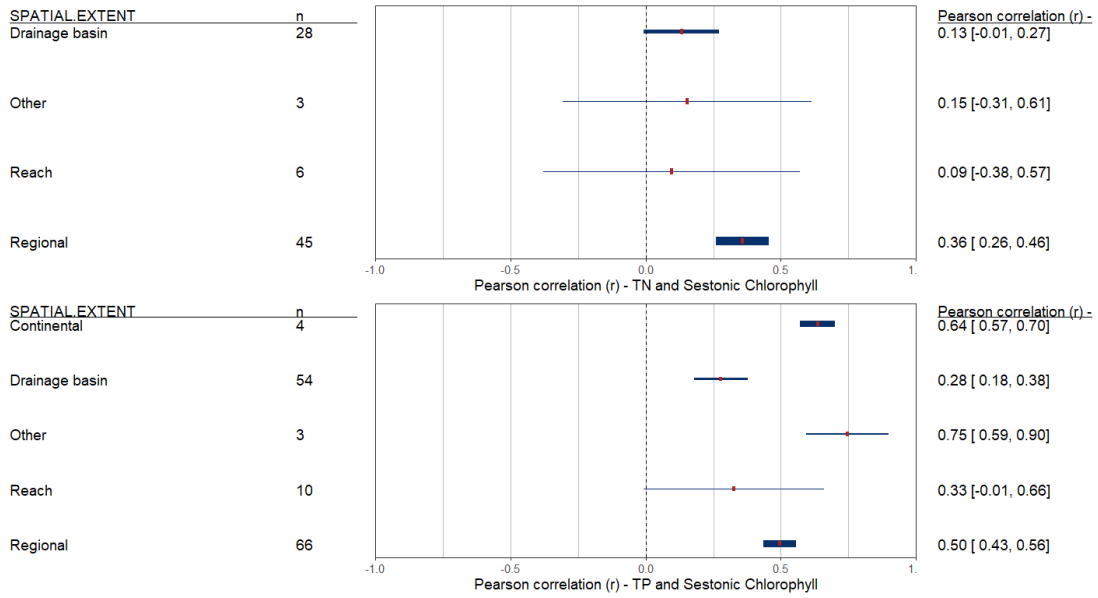


2.5 Spatial extent

```
#Loop to make forest plots for each Stressor-Response subset####
allSRs<-unique(chl_SR$StressorResponse)

for(i in allSRs){

  SRdata <- chl_SR %>% filter(StressorResponse==i)

  count.SR <- SRdata %>% group_by(SPATIAL.EXTENT) %>% tally()
```

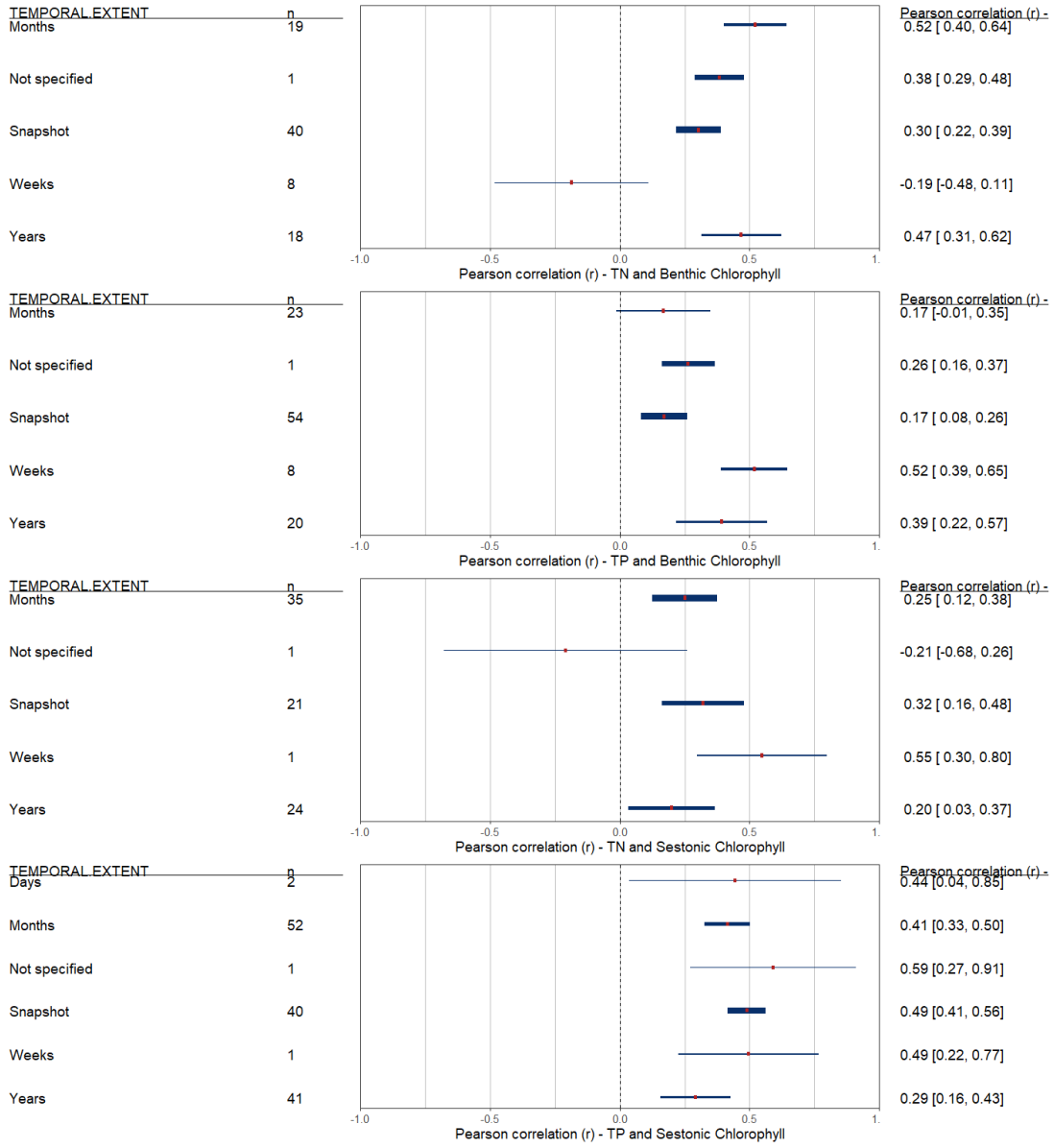
```
  rma_SRdata <- rma.mv(yi, vi,
                       random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                       tdist=TRUE, data=SRdata)

  vizforestPlot <- viz_forest(rma_SRdata,
             group=SRdata$SPATIAL.EXTENT,
             type="summary_only",
             study_labels=NULL,summary_label=NULL,
             xlab=paste(c("Pearson correlation (r)"), i, sep=" - "),
             summary_table=(count.SR),variant="thick",
             text_size=5,x_limit=c(-1,1),annotate_CI=T)

  plot(vizforestPlot)
}
```





2.6 Temporal extent

```
#Loop to make forest plots for each Stressor-Response subset####
allSRs<-unique(chl_SR$StressorResponse)

for(i in allSRs){

  SRdata <- chl_SR %>% filter(StressorResponse==i)

  count.SR <- SRdata %>% group_by(TEMPORAL.EXTENT) %>% tally()

  rma_SRdata <- rma.mv(yi, vi,
                       random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                       tdist=TRUE, data=SRdata)

  vizforestPlot <- viz_forest(rma_SRdata,
             group=SRdata$TEMPORAL.EXTENT,
             type="summary_only",
             study_labels=NULL,summary_label=NULL,
             xlab=paste(c("Pearson correlation (r)"), i, sep=" - "),
             summary_table=(count.SR),variant="thick",
             text_size=5,x_limit=c(-1,1),annotate_CI=T)

  plot(vizforestPlot)
}
```



3. ANALYSES

```
## Reading in data
chl_meta = read.csv("metadataset_20201216.csv", header=T, stringsAsFactors =
F)

## Check stressor-response relationships included in the dataframe
summary(as.factor(chl_meta$StressorResponse))

##  TN and Benthic Chlorophyll TN and Sestonic Chlorophyll
##                          86                          82
##  TP and Benthic Chlorophyll TP and Sestonic Chlorophyll
##                         106                         137
```

```
## Calculate Z-transformed effect sizes
chl_zcor = escalc(measure="ZCOR",ri=RESPONSE.MEASURE.VALUE2,
                  ni=IMPACT.SAMPLES,data=chl_meta)

## Check that effect sizes have been Z-transformed
min(chl_meta$yi)

## [1] -0.8712061

min(chl_zcor$yi)

## [1] -1.338063

## Saving to file
write.csv(chl_zcor, "ZCOR.chl_SR.csv", row.names = F)

# Split to StressorResponse subsets
ZCOR.chl_ses.TN <- filter(chl_zcor, StressorResponse == "TN and Sestonic
Chlorophyll")
ZCOR.chl_ses.TP <- filter(chl_zcor, StressorResponse == "TP and Sestonic
Chlorophyll")
ZCOR.chl_ben.TN <- filter(chl_zcor, StressorResponse == "TN and Benthic
Chlorophyll")
ZCOR.chl_ben.TP <- filter(chl_zcor, StressorResponse == "TP and Benthic
Chlorophyll")
```

3.1 Random effects model

```
## The formula for the random parameter in rma.mv function.
random_formula = list(~ 1 | uniqueID, ~ 1 | CITATION.ID)

## Run Assink code for random effects models (rem).
## Checks to see there is significant between study differences to do
moderator analyses.
## The amount of variance in level 1 should be <75% to proceed with moderator
analyses.
rem_ses.TN.zcor = Assink(ZCOR.chl_ses.TN, random_formula)

##
## Multivariate Meta-Analysis Model (k = 82; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -37.412    74.825    80.825    88.008    81.136
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.030  0.174     82     no     uniqueID
## sigma^2.2  0.160  0.400     38     no  CITATION.ID
##
## Test for Heterogeneity:
```

```
## Q(df = 81) = 704.813, p-val < .001
##
## Model Results:
##
## estimate     se   tval  df   pval  ci.lb  ci.ub
##    0.283  0.074  3.825  81  <.001  0.136  0.431  ***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "Within-study variance"
## [1] "Determine if fit of full model significantly better than reduced
model."
##
##         df      AIC      BIC     AICc   logLik     LRT   pval       QE
## Full     3  80.8246  88.0080  81.1363 -37.4123                704.8134
## Reduced  2 136.8651 141.6540 137.0189 -66.4325 58.0405 <.0001 704.8134
##
## [1] "between-study variance"
## [1] "Determine if fit of full model significantly better than reduced
model."
##
##         df      AIC      BIC     AICc   logLik     LRT   pval       QE
## Full     3  80.8246  88.0080  81.1363 -37.4123                704.8134
## Reduced  2 100.9764 105.7653 101.1303 -48.4882 22.1518 <.0001 704.8134
##
## [1] "Determining how the total variance is distributed over the three
levels of the meta-analytic model."
## [1] "Percent of the total variance attributed to the typical within-study
sampling variance."
## [1] "If amount of variance level 1 is <75%, proceed to moderator
analyses."

rem_ses.TP.zcor = Assink(ZCOR.chl_ses.TP, random_formula)

##
## Multivariate Meta-Analysis Model (k = 137; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -62.774   125.548   131.548   140.286   131.730
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.030  0.173    137     no     uniqueID
## sigma^2.2  0.126  0.354     68     no  CITATION.ID
##
## Test for Heterogeneity:
## Q(df = 136) = 1615.426, p-val < .001
##
```

```
## Model Results:
##
## estimate     se   tval   df   pval  ci.lb  ci.ub
##    0.449  0.050  8.899  136  <.001  0.349  0.548  ***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "Within-study variance"
## [1] "Determine if fit of full model significantly better than reduced
model."
##
##         df      AIC      BIC     AICc   logLik     LRT   pval        QE
## Full     3 131.5480 140.2859 131.7298 -62.7740                1615.4261
## Reduced  2 171.4319 177.2573 171.5222 -83.7160 41.8840 <.0001 1615.4261
##
## [1] "between-study variance"
## [1] "Determine if fit of full model significantly better than reduced
model."
##
##         df      AIC      BIC     AICc   logLik     LRT   pval        QE
## Full     3 131.5480 140.2859 131.7298 -62.7740                1615.4261
## Reduced  2 161.2680 167.0933 161.3582 -78.6340 31.7200 <.0001 1615.4261
##
## [1] "Determining how the total variance is distributed over the three
levels of the meta-analytic model."
## [1] "Percent of the total variance attributed to the typical within-study
sampling variance."
## [1] "If amount of variance level 1 is <75%, proceed to moderator
analyses."

rem_ben.TN.zcor = Assink(ZCOR.chl_ben.TN, random_formula)

##
## Multivariate Meta-Analysis Model (k = 86; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -24.540    49.080    55.080    62.408    55.377
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.002  0.045     86     no     uniqueID
## sigma^2.2  0.116  0.340     37     no  CITATION.ID
##
## Test for Heterogeneity:
## Q(df = 85) = 341.491, p-val < .001
##
## Model Results:
##
```

```
## estimate     se   tval  df   pval  ci.lb  ci.ub
##    0.432  0.063  6.882  85  <.001  0.307  0.557  ***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "Within-study variance"
## [1] "Determine if fit of full model significantly better than reduced
model."
##
##         df     AIC     BIC    AICc   logLik    LRT   pval       QE
## Full     3 55.0804 62.4083 55.3767 -24.5402               341.4908
## Reduced  2 53.3301 58.2154 53.4764 -24.6650 0.2497 0.6173 341.4908
##
## [1] "between-study variance"
## [1] "Determine if fit of full model significantly better than reduced
model."
##
##         df     AIC      BIC    AICc   logLik     LRT   pval       QE
## Full     3 55.0804  62.4083 55.3767 -24.5402                341.4908
## Reduced  2 95.5730 100.4583 95.7193 -45.7865 42.4926 <.0001 341.4908
##
## [1] "Determining how the total variance is distributed over the three
levels of the meta-analytic model."
## [1] "Percent of the total variance attributed to the typical within-study
sampling variance."
## [1] "If amount of variance level 1 is <75%, proceed to moderator
analyses."

rem_ben.TP.zcor = Assink(ZCOR.chl_ben.TP, random_formula)

##
## Multivariate Meta-Analysis Model (k = 106; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -57.049   114.098   120.098   128.060   120.336
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.065  0.255    106     no     uniqueID
## sigma^2.2  0.067  0.259     47     no  CITATION.ID
##
## Test for Heterogeneity:
## Q(df = 105) = 484.302, p-val < .001
##
## Model Results:
##
## estimate     se   tval   df   pval  ci.lb  ci.ub
##    0.296  0.054  5.537  105  <.001  0.190  0.402  ***
```

```
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "Within-study variance"
## [1] "Determine if fit of full model significantly better than reduced
model."
##
##         df      AIC      BIC     AICc   logLik     LRT   pval       QE
## Full     3 120.0985 128.0604 120.3361 -57.0492                484.3023
## Reduced  2 162.2355 167.5434 162.3531 -79.1177 44.1370 <.0001 484.3023
##
## [1] "between-study variance"
## [1] "Determine if fit of full model significantly better than reduced
model."
##
##         df      AIC      BIC     AICc   logLik    LRT   pval       QE
## Full     3 120.0985 128.0604 120.3361 -57.0492               484.3023
## Reduced  2 126.6351 131.9430 126.7527 -61.3175 8.5366 0.0035 484.3023
##
## [1] "Determining how the total variance is distributed over the three
levels of the meta-analytic model."
## [1] "Percent of the total variance attributed to the typical within-study
sampling variance."
## [1] "If amount of variance level 1 is <75%, proceed to moderator
analyses."

## Output results of how variance is distributed over the 3 levels in the
meta-analytic models.
rem_ses.TN.zcor

##            subset variance    amount
## 1 ZCOR.chl_ses.TN  level 1  6.488078
## 2 ZCOR.chl_ses.TN  level 2 14.871400
## 3 ZCOR.chl_ses.TN  level 3 78.640522

rem_ses.TP.zcor

##            subset variance    amount
## 1 ZCOR.chl_ses.TP  level 1  6.553836
## 2 ZCOR.chl_ses.TP  level 2 17.950664
## 3 ZCOR.chl_ses.TP  level 3 75.495500

rem_ben.TN.zcor

##            subset variance    amount
## 1 ZCOR.chl_ben.TN  level 1 18.081500
## 2 ZCOR.chl_ben.TN  level 2  1.436029
## 3 ZCOR.chl_ben.TN  level 3 80.482471

rem_ben.TP.zcor
```

```
##            subset variance   amount
## 1 ZCOR.chl_ben.TP  level 1 14.70084
## 2 ZCOR.chl_ben.TP  level 2 42.05476
## 3 ZCOR.chl_ben.TP  level 3 43.24440
```

3.2 Stressor-Response relationships

```
## Test with ben.TN as reference level
extractTable("rma mv output SR.csv", chl_zcor,
mods=~relevel(as.factor(StressorResponse), ref="TN and Benthic Chlorophyll"),
Decimals=5)

##
n
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Benthic
Chlorophyll")TN and Sestonic Chlorophyll 411
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TN
and Sestonic Chlorophyll           411
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Benthic Chlorophyll            411
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Sestonic Chlorophyll           411
##
Estimate
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Benthic
Chlorophyll")TN and Sestonic Chlorophyll  0.38273
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TN
and Sestonic Chlorophyll          -0.04255
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Benthic Chlorophyll           -0.11449
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Sestonic Chlorophyll           0.10419
##
Standard Error
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Benthic
Chlorophyll")TN and Sestonic Chlorophyll        0.05338
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TN
and Sestonic Chlorophyll                 0.05323
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Benthic Chlorophyll                  0.04467
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Sestonic Chlorophyll                 0.04918
##
T-Value
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Benthic
Chlorophyll")TN and Sestonic Chlorophyll  7.17044
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TN
and Sestonic Chlorophyll          -0.79945
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Benthic Chlorophyll           -2.56333
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
```

```
and Sestonic Chlorophyll            2.11862
##
P-Value
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Benthic
Chlorophyll")TN and Sestonic Chlorophyll 0.00000
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TN
and Sestonic Chlorophyll           0.42449
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Benthic Chlorophyll            0.01073
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Sestonic Chlorophyll           0.03473
##
CI-Lower
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Benthic
Chlorophyll")TN and Sestonic Chlorophyll  0.27780
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TN
and Sestonic Chlorophyll           -0.14719
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Benthic Chlorophyll            -0.20230
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Sestonic Chlorophyll            0.00751
##
CI-Upper
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Benthic
Chlorophyll")TN and Sestonic Chlorophyll  0.48766
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TN
and Sestonic Chlorophyll            0.06208
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Benthic Chlorophyll            -0.02669
## relevel(as.factor(StressorResponse), ref = "TN and Benthic Chlorophyll")TP
and Sestonic Chlorophyll            0.20087

## Test with ben.TP as reference level
extractTable("rma mv output SR.csv", chl_zcor,
mods=~relevel(as.factor(StressorResponse), ref="TP and Benthic Chlorophyll"),
Decimals=5)

##
n
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Benthic
Chlorophyll")TN and Benthic Chlorophyll 411
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Benthic Chlorophyll          411
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Sestonic Chlorophyll         411
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TP
and Sestonic Chlorophyll         411
##
Estimate
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Benthic
```

```
Chlorophyll")TN and Benthic Chlorophyll  0.26824
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Benthic Chlorophyll            0.11449
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Sestonic Chlorophyll           0.07194
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TP
and Sestonic Chlorophyll           0.21869
##
Standard Error
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Benthic
Chlorophyll")TN and Benthic Chlorophyll        0.05031
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Benthic Chlorophyll                 0.04467
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Sestonic Chlorophyll                0.05144
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TP
and Sestonic Chlorophyll                0.04647
##
T-Value
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Benthic
Chlorophyll")TN and Benthic Chlorophyll 5.33113
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Benthic Chlorophyll           2.56333
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Sestonic Chlorophyll          1.39853
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TP
and Sestonic Chlorophyll          4.70620
##
P-Value
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Benthic
Chlorophyll")TN and Benthic Chlorophyll 0.00000
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Benthic Chlorophyll           0.01073
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Sestonic Chlorophyll          0.16271
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TP
and Sestonic Chlorophyll          0.00000
##
CI-Lower
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Benthic
Chlorophyll")TN and Benthic Chlorophyll  0.16933
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Benthic Chlorophyll            0.02669
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Sestonic Chlorophyll          -0.02918
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TP
and Sestonic Chlorophyll           0.12734
##
CI-Upper
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Benthic
```

```
Chlorophyll")TN and Benthic Chlorophyll  0.36714
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Benthic Chlorophyll            0.20230
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TN
and Sestonic Chlorophyll           0.17307
## relevel(as.factor(StressorResponse), ref = "TP and Benthic Chlorophyll")TP
and Sestonic Chlorophyll           0.31003

## Test with ses.TN as reference level
extractTable("rma mv output SR.csv", chl_zcor,
mods=~relevel(as.factor(StressorResponse), ref="TN and Sestonic
Chlorophyll"), Decimals=5)

##
n
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll 411
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           411
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           411
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Sestonic Chlorophyll          411
##
Estimate
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll  0.34018
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           0.04255
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Benthic Chlorophyll          -0.07194
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Sestonic Chlorophyll          0.14674
##
Standard Error
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll       0.05186
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll                 0.05323
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Benthic Chlorophyll                 0.05144
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Sestonic Chlorophyll                0.04063
##
T-Value
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll  6.56014
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           0.79945
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
```

```
Chlorophyll")TP and Benthic Chlorophyll           -1.39853
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Sestonic Chlorophyll           3.61192
##
P-Value
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll 0.00000
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           0.42449
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           0.16271
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Sestonic Chlorophyll          0.00034
##
CI-Lower
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll  0.23824
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           -0.06208
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           -0.17307
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Sestonic Chlorophyll           0.06688
##
CI-Upper
## Intercept relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll  0.44212
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TN and Benthic Chlorophyll            0.14719
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Benthic Chlorophyll            0.02918
## relevel(as.factor(StressorResponse), ref = "TN and Sestonic
Chlorophyll")TP and Sestonic Chlorophyll           0.22661

## Test with ses.TP as reference level
extractTable("rma mv output SR.csv", chl_zcor,
mods=~relevel(as.factor(StressorResponse), ref="TP and Sestonic
Chlorophyll"), Decimals=5)

##
n
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll 411
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           411
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Sestonic Chlorophyll          411
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           411
##
```

```
Estimate
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll  0.48692
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           -0.10419
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Sestonic Chlorophyll          -0.14674
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           -0.21869
##
Standard Error
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll        0.04567
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll                  0.04918
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Sestonic Chlorophyll                 0.04063
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TP and Benthic Chlorophyll                  0.04647
##
T-Value
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll 10.66070
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           -2.11862
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Sestonic Chlorophyll          -3.61192
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           -4.70620
##
P-Value
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll 0.00000
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           0.03473
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Sestonic Chlorophyll          0.00034
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           0.00000
##
CI-Lower
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll  0.39713
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           -0.20087
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Sestonic Chlorophyll          -0.22661
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           -0.31003
##
```

```
CI-Upper
## Intercept relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll  0.57671
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Benthic Chlorophyll           -0.00751
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TN and Sestonic Chlorophyll          -0.06688
## relevel(as.factor(StressorResponse), ref = "TP and Sestonic
Chlorophyll")TP and Benthic Chlorophyll           -0.12734
```

3.3 Chl-a measure method

```
## Test potential moderating effect of CHL measurement method Fluorometry vs.
Spectrophotometry

#Loop to run rma.mv for each Stressor-Response subset####
allSRs<-unique(chl_zcor$StressorResponse)

for(i in allSRs){

  SRdata <- dplyr::filter(chl_zcor,CHLOROPHYLL.MEASUREMENT.METHOD %in%
                            c("Fluorometry", "Spectrophotometry"))
  SRdata["CHLOROPHYLL.METHOD"] <- SRdata$CHLOROPHYLL.MEASUREMENT.METHOD

  SRdata_chl <- SRdata %>% filter(StressorResponse==i)

  print(paste(i, c("spec vs. fluoro"), sep = " "))

  rma_cmm = rma.mv(yi, vi, mods = ~ CHLOROPHYLL.METHOD,
                   random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                   tdist=TRUE, data=SRdata_chl)

  print(summary(rma_cmm, digits=3))

}

## [1] "TN and Benthic Chlorophyll spec vs. fluoro"
##
## Multivariate Meta-Analysis Model (k = 64; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -19.732    39.465    47.465    55.973    48.167
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.000  0.000     64     no     uniqueID
## sigma^2.2  0.129  0.359     28     no  CITATION.ID
##
## Test for Residual Heterogeneity:
```

```
## QE(df = 62) = 232.655, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 62) = 2.925, p-val = 0.092
##
## Model Results:
##
##                                     estimate     se    tval  df   pval
ci.lb
## intrcpt                                0.569  0.111   5.117  62  <.001
0.347
## CHLOROPHYLL.METHODSpectrophotometry    -0.259  0.152  -1.710  62  0.092  -
0.562
##                                     ci.ub
## intrcpt                             0.791  ***
## CHLOROPHYLL.METHODSpectrophotometry  0.044    .
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Benthic Chlorophyll spec vs. fluoro"
##
## Multivariate Meta-Analysis Model (k = 76; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -44.887    89.775    97.775   106.991    98.354
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.077  0.277     76     no     uniqueID
## sigma^2.2  0.087  0.295     36     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 74) = 337.028, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 74) = 1.131, p-val = 0.291
##
## Model Results:
##
##                                     estimate     se    tval  df   pval
ci.lb
## intrcpt                                0.382  0.095   4.020  74  <.001
0.193
## CHLOROPHYLL.METHODSpectrophotometry    -0.145  0.136  -1.064  74  0.291  -
0.417
##                                     ci.ub
## intrcpt                             0.572  ***
## CHLOROPHYLL.METHODSpectrophotometry  0.127
```

```
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TN and Sestonic Chlorophyll spec vs. fluoro"
##
## Multivariate Meta-Analysis Model (k = 46; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -13.793    27.587    35.587    42.723    36.612
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.036  0.189     46     no     uniqueID
## sigma^2.2  0.078  0.280     19     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 44) = 289.094, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 44) = 0.666, p-val = 0.419
##
## Model Results:
##
##                                     estimate     se    tval  df   pval
ci.lb
## intrcpt                                0.360  0.137   2.620  44  0.012
0.083
## CHLOROPHYLL.METHODSpectrophotometry    -0.136  0.167  -0.816  44  0.419  -
0.472
##                                     ci.ub
## intrcpt                             0.636  *
## CHLOROPHYLL.METHODSpectrophotometry  0.200
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Sestonic Chlorophyll spec vs. fluoro"
##
## Multivariate Meta-Analysis Model (k = 82; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -33.572    67.144    75.144    84.672    75.677
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.031  0.175     82     no     uniqueID
## sigma^2.2  0.110  0.332     37     no  CITATION.ID
```

```
##
## Test for Residual Heterogeneity:
## QE(df = 80) = 819.164, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 80) = 3.045, p-val = 0.085
##
## Model Results:
##
##                                     estimate     se    tval  df   pval
ci.lb
## intrcpt                                0.561  0.113   4.943  80  <.001
0.335
## CHLOROPHYLL.METHODSpectrophotometry    -0.239  0.137  -1.745  80  0.085  -
0.511
##                                     ci.ub
## intrcpt                             0.787  ***
## CHLOROPHYLL.METHODSpectrophotometry  0.034    .
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

3.4 Climate

```
#Loop to run rma.mv for each Stressor-Response subset####
allSRs<-unique(chl_zcor$StressorResponse)

for(i in allSRs){

  print(i)

  SRdata <-  chl_zcor %>% filter(StressorResponse==i)

  rma_clim = rma.mv(yi,vi,mods=~relevel(as.factor(CLIMATE), ref="Temperate"),
                    random=list(~1|uniqueID,~1|CITATION.ID),
                    tdist=TRUE, data=SRdata)

  print(summary(rma_clim, digits=3))
}
```

```
## [1] "TN and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 86; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -22.462    44.924    58.924    75.685    60.458
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
```

```
## sigma^2.1  0.002  0.045     86     no     uniqueID
## sigma^2.2  0.127  0.356     37     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 81) = 303.773, p-val < .001
##
## Test of Moderators (coefficients 2:5):
## F(df1 = 4, df2 = 81) = 0.358, p-val = 0.838
##
## Model Results:
##
##
estimate
## intrcpt
0.442
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                    -
0.403
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified
0.113
## relevel(as.factor(CLIMATE), ref = "Temperate")Other
0.011
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical    -
0.037
##                                                                      se
## intrcpt                                                           0.074
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                 0.368
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified       0.281
## relevel(as.factor(CLIMATE), ref = "Temperate")Other               0.282
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.254
##                                                                    tval
df
## intrcpt                                                           5.975
81
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                -1.095
81
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified       0.404
81
## relevel(as.factor(CLIMATE), ref = "Temperate")Other               0.038
81
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  -0.145
81
##                                                                    pval
## intrcpt                                                          <.001
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                 0.277
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified       0.687
## relevel(as.factor(CLIMATE), ref = "Temperate")Other               0.970
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.885
##                                                                   ci.lb
## intrcpt                                                           0.295
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                -1.136
```

```
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         -0.445
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                -0.551
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  -0.541
##                                                                    ci.ub
## intrcpt                                                            0.589
***
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                  0.330
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified        0.672
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                0.573
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.468
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 106; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -54.075   108.150   124.150   144.992   125.733
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.064  0.254    106     no     uniqueID
## sigma^2.2  0.082  0.286     47     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 100) = 459.278, p-val < .001
##
## Test of Moderators (coefficients 2:6):
## F(df1 = 5, df2 = 100) = 0.410, p-val = 0.841
##
## Model Results:
##
##
estimate
## intrcpt
0.319
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic        -
0.267
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                    -
0.294
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified
0.105
## relevel(as.factor(CLIMATE), ref = "Temperate")Other
0.018
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical    -
0.028
##                                                                      se
```

```
## intrcpt                                                                  0.066
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic      0.266
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   0.310
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         0.294
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                 0.228
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.218
##                                                                       tval
df
## intrcpt                                                              4.841
100
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic      -1.003
100
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   -0.948
100
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified          0.358
100
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                  0.079
100
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  -0.128
100
##                                                                      pval
## intrcpt                                                             <.001
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic      0.318
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   0.346
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         0.721
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                 0.937
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.899
##                                                                      ci.lb
## intrcpt                                                              0.188
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic      -0.796
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   -0.908
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         -0.478
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                 -0.434
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  -0.461
##                                                                     ci.ub
## intrcpt                                                             0.449
***
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic      0.261
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   0.321
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         0.688
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                 0.470
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.405
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TN and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 82; method: REML)
##
```

```
##   logLik  Deviance       AIC       BIC      AICc
##  -34.599    69.199    81.199    95.339    82.382
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.030  0.174     82     no     uniqueID
## sigma^2.2  0.159  0.399     38     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 78) = 582.695, p-val < .001
##
## Test of Moderators (coefficients 2:4):
## F(df1 = 3, df2 = 78) = 0.929, p-val = 0.431
##
## Model Results:
##
##
estimate
## intrcpt
0.296
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry
0.481
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified
0.318
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical    -
0.164
##                                                                       se
## intrcpt                                                            0.087
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                  0.428
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified        0.482
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical 0.182
##                                                                      tval
df
## intrcpt                                                             3.417
78
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   1.125
78
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         0.660
78
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical -0.899
78
##                                                                      pval
## intrcpt                                                            0.001
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                  0.264
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified        0.511
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical 0.371
##                                                                     ci.lb
## intrcpt                                                             0.123
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                  -0.371
```

```
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         -0.642
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  -0.526
##                                                                    ci.ub
## intrcpt                                                            0.468
**
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                  1.334
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified        1.278
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.199
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 137; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -57.997   115.995   131.995   154.997   133.175
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.029  0.172    137     no     uniqueID
## sigma^2.2  0.128  0.358     68     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 131) = 1584.400, p-val < .001
##
## Test of Moderators (coefficients 2:6):
## F(df1 = 5, df2 = 131) = 1.043, p-val = 0.395
##
## Model Results:
##
##
estimate
## intrcpt
0.478
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic
0.420
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                    -
0.060
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified
0.064
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                  -
0.061
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical    -
0.198
##                                                                      se
## intrcpt                                                            0.060
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic     0.287
```

```
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                    0.386
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified          0.444
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                  0.376
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical   0.126
##                                                                        tval
df
## intrcpt                                                              7.918
131
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic       1.464
131
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   -0.156
131
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified          0.145
131
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                 -0.163
131
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  -1.578
131
##                                                                       pval
## intrcpt                                                             <.001
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic      0.146
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   0.877
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         0.885
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                 0.871
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.117
##                                                                      ci.lb
## intrcpt                                                              0.359
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic      -0.147
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   -0.824
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         -0.814
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                 -0.806
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  -0.447
##                                                                     ci.ub
## intrcpt                                                             0.598
***
## relevel(as.factor(CLIMATE), ref = "Temperate")Arctic/subarctic      0.986
## relevel(as.factor(CLIMATE), ref = "Temperate")Dry                   0.704
## relevel(as.factor(CLIMATE), ref = "Temperate")Not specified         0.942
## relevel(as.factor(CLIMATE), ref = "Temperate")Other                 0.683
## relevel(as.factor(CLIMATE), ref = "Temperate")Tropical/subtropical  0.050
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

3.5 Spatial extent

```
#Loop to run rma.mv for each Stressor-Response subset####
allSRs<-unique(chl_zcor$StressorResponse)

for(i in allSRs){
```

```
  SRdata <-  chl_zcor %>% filter(StressorResponse==i)

  print(i)

    rma_spat = rma.mv(yi,vi,mods=~relevel(as.factor(SPATIAL.EXTENT),
ref="Regional"),
                      random=list(~1|uniqueID,~1|CITATION.ID),
                      tdist=TRUE,data=SRdata)

  print(summary(rma_spat, digits=3))
}
```

```
## [1] "TN and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 86; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -23.382    46.764    60.764    77.525    62.298
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.002  0.046     86     no     uniqueID
## sigma^2.2  0.129  0.359     37     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 81) = 322.473, p-val < .001
##
## Test of Moderators (coefficients 2:5):
## F(df1 = 4, df2 = 81) = 0.369, p-val = 0.830
##
## Model Results:
##
##
estimate
## intrcpt
0.432
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental       -
0.257
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin
0.067
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified     -
0.028
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach             -
0.430
##                                                                        se
## intrcpt                                                             0.081
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental     0.380
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  0.151
```

```
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified   0.375
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach           0.512
##                                                                      tval
df
## intrcpt                                                             5.322
81
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental    -0.675
81
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  0.442
81
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified  -0.076
81
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          -0.839
81
##                                                                      pval
## intrcpt                                                            <.001
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental    0.502
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin 0.660
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified  0.940
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          0.404
##                                                                     ci.lb
## intrcpt                                                             0.270
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental    -1.013
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin -0.234
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified  -0.774
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          -1.449
##                                                                     ci.ub
## intrcpt                                                             0.593
***
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental    0.500
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin 0.368
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified  0.718
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          0.590
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 106; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -54.582   109.164   123.164   141.470   124.368
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.062  0.250    106     no     uniqueID
## sigma^2.2  0.075  0.274     47     no  CITATION.ID
##
```

```
## Test for Residual Heterogeneity:
## QE(df = 101) = 453.867, p-val < .001
##
## Test of Moderators (coefficients 2:5):
## F(df1 = 4, df2 = 101) = 1.079, p-val = 0.371
##
## Model Results:
##
##
estimate
## intrcpt
0.266
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental
0.143
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin
0.155
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified
0.004
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach             -
0.357
##                                                                       se
## intrcpt                                                             0.068
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental     0.188
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  0.126
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified   0.381
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach           0.268
##                                                                      tval
df
## intrcpt                                                             3.885
101
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental     0.763
101
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  1.233
101
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified   0.011
101
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach           -1.331
101
##                                                                      pval
## intrcpt                                                            <.001
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental     0.447
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  0.221
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified   0.991
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach           0.186
##                                                                      ci.lb
## intrcpt                                                              0.130
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental     -0.229
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  -0.094
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified   -0.752
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach           -0.889
```

```
##                                                                    ci.ub
## intrcpt                                                            0.402
***
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental    0.516
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin 0.404
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Not specified  0.760
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          0.175
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TN and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 82; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -32.462    64.925    76.925    91.065    78.108
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.027  0.165     82     no     uniqueID
## sigma^2.2  0.159  0.399     38     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 78) = 614.321, p-val < .001
##
## Test of Moderators (coefficients 2:4):
## F(df1 = 3, df2 = 78) = 2.648, p-val = 0.055
##
## Model Results:
##
##
estimate
## intrcpt
0.457
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin    -
0.301
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other            -
0.838
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach            -
0.408
##                                                                      se
## intrcpt                                                            0.107
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  0.154
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other          0.355
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          0.271
##                                                                     tval
df
## intrcpt                                                             4.267
```

```
78
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  -1.953
78
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other           -2.361
78
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach           -1.506
78
##                                                                      pval
## intrcpt                                                            <.001
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  0.054
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other           0.021
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach           0.136
##                                                                      ci.lb
## intrcpt                                                              0.244
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin  -0.608
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other           -1.544
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach           -0.947
##                                                                      ci.ub
## intrcpt                                                              0.671
***
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin   0.006
.
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other           -0.131
*
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach            0.131
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 137; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -55.985   111.969   125.969   146.149   126.873
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.025  0.157    137     no     uniqueID
## sigma^2.2  0.113  0.337     68     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 132) = 1465.168, p-val < .001
##
## Test of Moderators (coefficients 2:5):
## F(df1 = 4, df2 = 132) = 3.280, p-val = 0.013
##
## Model Results:
##
```

```
##
estimate
## intrcpt
0.591
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental
0.346
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin    -
0.263
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other
0.021
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach             -
0.266
##                                                                       se
## intrcpt                                                            0.075
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental    0.182
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin 0.102
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other          0.296
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          0.173
##                                                                     tval
df
## intrcpt                                                             7.914
132
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental     1.900
132
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin -2.589
132
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other           0.070
132
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          -1.537
132
##                                                                     pval
## intrcpt                                                            <.001
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental    0.060
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin 0.011
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other          0.944
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          0.127
##                                                                    ci.lb
## intrcpt                                                            0.443
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental   -0.014
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin -0.464
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other          -0.565
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach          -0.609
##                                                                    ci.ub
## intrcpt                                                            0.739
***
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Continental     0.705
.
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Drainage basin -0.062
*
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Other           0.607
```

```
## relevel(as.factor(SPATIAL.EXTENT), ref = "Regional")Reach            0.076
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

3.6 Temporal extent

```
#Loop to run rma.mv for each Stressor-Response subset####
allSRs<-unique(chl_zcor$StressorResponse)

for(i in allSRs){

  SRdata <-  chl_zcor %>% filter(StressorResponse==i)

  print(i)

    rma_temp = rma.mv(yi,vi,mods=~relevel(as.factor(TEMPORAL.EXTENT),
ref="Snapshot"),
                      random=list(~1|uniqueID,~1|CITATION.ID),
                      tdist=TRUE,data=SRdata)

  print(summary(rma_temp, digits=3))
}
```

```
## [1] "TN and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 86; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -20.233    40.465    54.465    71.226    55.999
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.002  0.043     86     no     uniqueID
## sigma^2.2  0.116  0.341     37     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 81) = 297.805, p-val < .001
##
## Test of Moderators (coefficients 2:5):
## F(df1 = 4, df2 = 81) = 1.687, p-val = 0.161
##
## Model Results:
##
##
estimate
## intrcpt
0.321
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months
```

```
0.354
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified
0.082
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks            -
0.169
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years
0.247
##                                                                      se
## intrcpt                                                           0.088
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       0.153
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.359
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        0.279
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        0.147
##                                                                    tval
df
## intrcpt                                                           3.658
81
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       2.308
81
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified   0.229
81
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        -0.608
81
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        1.677
81
##                                                                    pval
## intrcpt                                                           <.001
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       0.024
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.819
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        0.545
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        0.097
##                                                                    ci.lb
## intrcpt                                                           0.146
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       0.049
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  -0.632
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        -0.724
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        -0.046
##                                                                   ci.ub
## intrcpt                                                           0.496
***
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       0.659
*
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.796
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        0.385
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        0.541
.
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## [1] "TP and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 106; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -48.377    96.755   110.755   129.061   111.959
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.053  0.230    106     no     uniqueID
## sigma^2.2  0.071  0.267     47     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 101) = 463.049, p-val < .001
##
## Test of Moderators (coefficients 2:5):
## F(df1 = 4, df2 = 101) = 3.912, p-val = 0.005
##
## Model Results:
##
##
estimate
## intrcpt
0.184
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months
0.018
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified
0.086
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks
0.370
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years
0.535
##                                                                      se
## intrcpt                                                           0.072
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       0.134
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.364
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        0.252
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        0.145
##                                                                    tval
df
## intrcpt                                                           2.572
101
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       0.138
101
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.236
101
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        1.472
101
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        3.680
```

```
101
##                                                                    pval
## intrcpt                                                           0.012
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       0.891
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.814
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        0.144
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        <.001
##                                                                    ci.lb
## intrcpt                                                            0.042
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       -0.247
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  -0.636
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        -0.129
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years         0.247
##                                                                   ci.ub
## intrcpt                                                           0.326
*
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months       0.283
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.808
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks        0.870
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years        0.824
***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TN and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 82; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -34.026    68.052    82.052    98.458    83.675
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.030  0.173     82     no     uniqueID
## sigma^2.2  0.170  0.412     38     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 77) = 688.270, p-val < .001
##
## Test of Moderators (coefficients 2:5):
## F(df1 = 4, df2 = 77) = 0.943, p-val = 0.444
##
## Model Results:
##
##
estimate
## intrcpt
0.478
```

```
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months           -
0.263
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified    -
0.691
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks
0.136
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years            -
0.273
##                                                                        se
## intrcpt                                                              0.147
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months         0.188
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.541
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks          0.507
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years          0.201
##                                                                      tval
df
## intrcpt                                                             3.261
77
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months        -1.404
77
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified -1.279
77
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks          0.268
77
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years         -1.357
77
##                                                                      pval
## intrcpt                                                             0.002
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months         0.164
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.205
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks          0.790
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years          0.179
##                                                                     ci.lb
## intrcpt                                                             0.186
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months        -0.637
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified -1.768
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks         -0.873
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years         -0.674
##                                                                     ci.ub
## intrcpt                                                             0.770
**
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months         0.110
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.385
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks          1.144
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years          0.128
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Sestonic Chlorophyll"
```

```
##
## Multivariate Meta-Analysis Model (k = 137; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -58.385   116.770   132.770   155.772   133.951
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.029  0.169    137     no     uniqueID
## sigma^2.2  0.129  0.359     68     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 131) = 1570.724, p-val < .001
##
## Test of Moderators (coefficients 2:6):
## F(df1 = 5, df2 = 131) = 1.210, p-val = 0.308
##
## Model Results:
##
##
estimate
## intrcpt
0.616
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Days             -
0.166
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months           -
0.173
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified
0.062
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks            -
0.073
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years            -
0.310
##                                                                        se
## intrcpt                                                             0.097
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Days           0.417
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months         0.127
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  0.488
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks          0.450
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years          0.129
##                                                                       tval
df
## intrcpt                                                             6.320
131
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Days           -0.397
131
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months         -1.360
131
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified   0.126
```

```
131
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks          -0.163
131
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years          -2.398
131
##                                                                      pval
## intrcpt                                                            <.001
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Days          0.692
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months        0.176
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified 0.900
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks         0.871
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years         0.018
##                                                                     ci.lb
## intrcpt                                                             0.423
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Days          -0.990
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months        -0.425
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified -0.904
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks         -0.964
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years         -0.565
##                                                                     ci.ub
## intrcpt                                                             0.809
***
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Days           0.659
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Months         0.079
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Not specified  1.028
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Weeks          0.817
## relevel(as.factor(TEMPORAL.EXTENT), ref = "Snapshot")Years         -0.054
*
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

3.7 Year of publication

```
#Loop to run rma.mv for each Stressor-Response subset####
allSRs<-unique(chl_zcor$StressorResponse)

for(i in allSRs){

  SRdata <-  chl_zcor %>% filter(StressorResponse==i)

  print(i)
  rma_yr = rma.mv(yi,vi,mods=~YEAR,
                  random=list(~1|uniqueID,~1|CITATION.ID),
                  tdist=TRUE,data=SRdata)
  print(summary(rma_yr, digits=3))
}

## [1] "TN and Benthic Chlorophyll"
##
```

```
## Multivariate Meta-Analysis Model (k = 86; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -19.421    38.841    46.841    56.564    47.347
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.002  0.043     86     no     uniqueID
## sigma^2.2  0.089  0.298     37     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 84) = 266.053, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 84) = 10.438, p-val = 0.002
##
## Model Results:
##
##          estimate      se    tval  df   pval   ci.lb   ci.ub
## intrcpt    56.432  17.334   3.256  84  0.002  21.961  90.902  **
## YEAR       -0.028   0.009  -3.231  84  0.002  -0.045  -0.011  **
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 106; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -47.883    95.766   103.766   114.344   104.170
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.073  0.269    106     no     uniqueID
## sigma^2.2  0.015  0.121     47     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 104) = 382.409, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 104) = 23.685, p-val < .001
##
## Model Results:
##
##          estimate      se    tval   df   pval   ci.lb   ci.ub
## intrcpt    62.829  12.854   4.888  104  <.001  37.339  88.318  ***
## YEAR       -0.031   0.006  -4.867  104  <.001  -0.044  -0.018  ***
```

```
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TN and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 82; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -33.765    67.530    75.530    85.058    76.063
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.030  0.173     82     no     uniqueID
## sigma^2.2  0.139  0.373     38     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 80) = 658.056, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 80) = 6.450, p-val = 0.013
##
## Model Results:
##
##          estimate      se    tval  df   pval   ci.lb   ci.ub
## intrcpt    52.237  20.456   2.554  80  0.013  11.529  92.946  *
## YEAR       -0.026   0.010  -2.540  80  0.013  -0.046  -0.006  *
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 137; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -57.239   114.477   122.477   134.099   122.785
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.029  0.171    137     no     uniqueID
## sigma^2.2  0.107  0.327     68     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 135) = 1567.126, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 135) = 10.783, p-val = 0.001
```

```
##
## Model Results:
##
##          estimate      se    tval   df   pval   ci.lb   ci.ub
## intrcpt    45.877  13.834   3.316  135  0.001  18.517  73.237  **
## YEAR       -0.023   0.007  -3.284  135  0.001  -0.036  -0.009  **
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
## Benthic and Sestonic chl - from year 2000
ZCOR.chl_2000 = subset(chl_zcor, YEAR > 1999)

for(i in allSRs){

  SRdata <-  ZCOR.chl_2000 %>% filter(StressorResponse==i)

  print(i)
  rma_yr.2000 = rma.mv(yi,vi,mods=~YEAR,
                       random=list(~1|uniqueID,~1|CITATION.ID),
                       tdist=TRUE,data=SRdata)

  print(summary(rma_yr.2000, digits=3))
}
```

```
## [1] "TN and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 74; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -18.569    37.138    45.138    54.244    45.735
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.003  0.051     74     no     uniqueID
## sigma^2.2  0.095  0.308     32     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 72) = 241.210, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 72) = 2.346, p-val = 0.130
##
## Model Results:
##
##          estimate      se    tval  df   pval    ci.lb    ci.ub
## intrcpt    47.268  30.617   1.544  72  0.127  -13.765  108.301
## YEAR       -0.023   0.015  -1.532  72  0.130   -0.054    0.007
##
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Benthic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 91; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -43.694    87.388    95.388   105.342    95.864
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.081  0.284     91     no     uniqueID
## sigma^2.2  0.016  0.125     39     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 89) = 354.838, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 89) = 4.602, p-val = 0.035
##
## Model Results:
##
##          estimate      se    tval  df   pval   ci.lb   ci.ub
## intrcpt    47.625  22.105   2.154  89  0.034   3.702  91.548  *
## YEAR       -0.024   0.011  -2.145  89  0.035  -0.045  -0.002  *
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TN and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 71; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -30.604    61.207    69.207    78.144    69.832
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.031  0.176     71     no     uniqueID
## sigma^2.2  0.145  0.381     33     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 69) = 601.706, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 69) = 1.712, p-val = 0.195
##
```

```
## Model Results:
##
##          estimate      se    tval  df   pval    ci.lb    ci.ub
## intrcpt    56.041  42.654   1.314  69  0.193  -29.052  141.133
## YEAR       -0.028   0.021  -1.309  69  0.195   -0.070    0.015
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## [1] "TP and Sestonic Chlorophyll"
##
## Multivariate Meta-Analysis Model (k = 121; method: REML)
##
##   logLik  Deviance       AIC       BIC      AICc
##  -51.988   103.977   111.977   123.093   112.327
##
## Variance Components:
##
##            estim   sqrt  nlvls  fixed       factor
## sigma^2.1  0.032  0.179    121     no     uniqueID
## sigma^2.2  0.106  0.326     59     no  CITATION.ID
##
## Test for Residual Heterogeneity:
## QE(df = 119) = 1479.736, p-val < .001
##
## Test of Moderators (coefficient 2):
## F(df1 = 1, df2 = 119) = 1.457, p-val = 0.230
##
## Model Results:
##
##          estimate      se    tval   df   pval    ci.lb   ci.ub
## intrcpt    34.648  28.375   1.221  119  0.224  -21.538  90.833
## YEAR       -0.017   0.014  -1.207  119  0.230   -0.045   0.011
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

3.8 Study design

```
SRdata <-  chl_zcor %>% filter(StressorResponse=="TN and Benthic
Chlorophyll")

rma = rma.mv(yi,vi,mods=~relevel(as.factor(STUDY.DESIGN), ref="Gradient
response"),
             random=list(~1|uniqueID,~1|CITATION.ID),
             tdist=TRUE,data=SRdata)

print("TN and Benthic Chlorophyll")
summary(rma, digits=3)
```

```
SRdata <-  chl_zcor %>% filter(StressorResponse=="TP and Benthic
Chlorophyll")

rma = rma.mv(yi,vi,mods=~relevel(as.factor(STUDY.DESIGN), ref="Gradient
response"),
             random=list(~1|uniqueID,~1|CITATION.ID),
             tdist=TRUE,data=SRdata)

print("TP and Benthic Chlorophyll")
summary(rma, digits=3)


print("Sestonic Chlorophyll - Gradient response only")
```

3.9 Continuous moderators

```
## Check stressor-response relationships included in the dataframe
summary(as.factor(chl_zcor$EFFECT.MEASURE))

##  Benthic chl-a Sestonic chl-a
##            192            219

summary(as.factor(chl_zcor$CAUSE.TERM))

## Total N Total P
##     168     243

summary(as.factor(chl_zcor$StressorResponse))

##  TN and Benthic Chlorophyll TN and Sestonic Chlorophyll
##                          86                          82
##  TP and Benthic Chlorophyll TP and Sestonic Chlorophyll
##                         106                         137

# Fill in missing mean data by getting mean(min+max) or using median if
available.
chl_zcor$DO.FILL <- fillMissing(chl_zcor$DO.MIN, chl_zcor$DO..MEAN,
chl_zcor$DO..MEDIAN,
                                chl_zcor$DO..MAX)

chl_zcor$ALKALINITY.FILL <- fillMissing(chl_zcor$ALKALINITY.MIN2,
chl_zcor$ALKALINITY.MEAN2,
                                        chl_zcor$ALKALINITY.MEDIAN2,
chl_zcor$ALKALINITY.MAX2)

chl_zcor$CONV.CAUSE.FILL <- fillMissing(chl_zcor$CONV.CAUSE.MIN,
chl_zcor$CONV.CAUSE.MEAN,
                                        chl_zcor$CONV.CAUSE.MEDIAN,
chl_zcor$CONV.CAUSE.MAX)

chl_zcor$TURBIDITY.FILL <- fillMissing(chl_zcor$TURBIDITY.MIN2,
```

```
chl_zcor$TURBIDITY.MEAN2,
                                        chl_zcor$TURBIDITY.MEDIAN2,
chl_zcor$TURBIDITY.MAX2)

chl_zcor$DISCHARGE.FILL <- fillMissing(chl_zcor$DISCHARGE.MIN2,
chl_zcor$DISCHARGE.MEAN2,
                                       chl_zcor$DISCHARGE.MEDIAN2,
chl_zcor$DISCHARGE.MAX2)

chl_zcor$VELOCITY.FILL <- fillMissing(chl_zcor$VELOCITY.MIN2,
chl_zcor$VELOCITY.MEAN2,
                                      chl_zcor$VELOCITY.MEDIAN2,
chl_zcor$VELOCITY.MAX2)

chl_zcor$CHANNEL.WIDTH.FILL <- fillMissing(chl_zcor$CHANNEL.WIDTH.MIN2,
chl_zcor$CHANNEL.WIDTH.MEAN2,
                                           chl_zcor$CHANNEL.WIDTH.MEDIAN2,
chl_zcor$CHANNEL.WIDTH.MAX2)

chl_zcor$WATER.DEPTH.FILL <- fillMissing(chl_zcor$WATER.DEPTH.MIN2,
chl_zcor$WATER.DEPTH.MEAN2,
                                         chl_zcor$WATER.DEPTH.MEDIAN2,
chl_zcor$WATER.DEPTH.MAX2)

chl_zcor$WATERSHED.AREA.FILL <- fillMissing(chl_zcor$WATERSHED.AREA.MIN2,
                                            chl_zcor$WATERSHED.AREA.MEAN2,
                                            chl_zcor$WATERSHED.AREA.MEDIAN2,
                                            chl_zcor$WATERSHED.AREA.MAX2)

chl_zcor$GRADIENT.FILL <- fillMissing(chl_zcor$GRADIENT.MIN2,
chl_zcor$GRADIENT.MEAN2,
                                      chl_zcor$GRADIENT.MEDIAN2,
chl_zcor$GRADIENT.MAX2)

chl_zcor$LIGHT.FILL <- fillMissing(chl_zcor$LIGHT.MIN2, chl_zcor$LIGHT.MEAN2,
chl_zcor$LIGHT.MEDIAN2,
                                   chl_zcor$LIGHT.MAX2)

chl_zcor$DOC.FILL <- fillMissing(chl_zcor$DOC.MIN2, chl_zcor$DOC.MEAN2,
chl_zcor$DOC.MEDIAN2,
                                 chl_zcor$DOC.MAX2)

chl_zcor$pH.FILL <- fillMissing(chl_zcor$pH.MIN, chl_zcor$pH.MEAN,
chl_zcor$pH.MEDIAN,
                                chl_zcor$pH.MAX)

chl_zcor$CONDUCTIVITY.FILL <- fillMissing(chl_zcor$CONDUCTIVITY.MIN2,
chl_zcor$CONDUCTIVITY.MEAN2,
                                          chl_zcor$CONDUCTIVITY.MEDIAN2,
```

```
chl_zcor$CONDUCTIVITY.MAX2)

chl_zcor$WATER.TEMP.FILL <- fillMissing(chl_zcor$WATER.TEMP.MIN2,
chl_zcor$WATER.TEMP.MEAN2,
                                        chl_zcor$WATER.TEMP.MEDIAN2,
chl_zcor$WATER.TEMP.MAX2)

chl_zcor$TSS.FILL <- fillMissing(chl_zcor$TSS.MIN2, chl_zcor$TSS.MEAN2,
chl_zcor$TSS.MEDIAN2,
                                 chl_zcor$TSS.MAX2)

chl_zcor$SUSP.SED.FILL <- fillMissing(chl_zcor$SUSP.SED.MIN2,
chl_zcor$SUSP.SED.MEAN2,
                                      chl_zcor$SUSP.SED.MEDIAN2,
chl_zcor$SUSP.SED.MAX2)

chl_zcor$TKN.CONTEXT.FILL <- fillMissing(chl_zcor$TKN..CONTEXT....MIN,
chl_zcor$TKN..CONTEXT....MEAN,

chl_zcor$TKN..CONTEXT....MEDIAN,chl_zcor$TKN..CONTEXT....MAX)

chl_zcor$TN.CONTEXT.FILL <- fillMissing(chl_zcor$TN.CONTEXT.MIN2,
chl_zcor$TN.CONTEXT.MEAN2,
                                        chl_zcor$TN.CONTEXT.MEDIAN2,
chl_zcor$TN.CONTEXT.MAX2)

chl_zcor$TP.CONTEXT.FILL <- fillMissing(chl_zcor$TP.CONTEXT.MIN2,
chl_zcor$TP.CONTEXT.MEAN2,
                                        chl_zcor$TP.CONTEXT.MEDIAN2,
chl_zcor$TP.CONTEXT.MAX2)

## Transform the variables by log10
## Select columns that need transformation (all except pH and Canopy Cover)
cols = c( "MinLat", "MaxLat", "MinLong", "MaxLong",
          "DO.MIN","DO..MEAN","DO..MEDIAN","DO..MAX", "DO.FILL",
          "ALKALINITY.MIN2","ALKALINITY.MEAN2","ALKALINITY.MEDIAN2",
          "ALKALINITY.MAX2", "ALKALINITY.FILL",
          "CONV.CAUSE.MIN", "CONV.CAUSE.MEAN", "CONV.CAUSE.MEDIAN",
          "CONV.CAUSE.MAX", "CONV.CAUSE.FILL",
          "TURBIDITY.MIN2", "TURBIDITY.MEAN2","TURBIDITY.MEDIAN2",
          "TURBIDITY.MAX2", "TURBIDITY.FILL",
          "DISCHARGE.MIN2","DISCHARGE.MEAN2","DISCHARGE.MEDIAN2",
          "DISCHARGE.MAX2", "DISCHARGE.FILL",
          "VELOCITY.MIN2","VELOCITY.MEAN2", "VELOCITY.MEDIAN2",
          "VELOCITY.MAX2", "VELOCITY.FILL",
          "CHANNEL.WIDTH.MIN2",
"CHANNEL.WIDTH.MEAN2","CHANNEL.WIDTH.MEDIAN2",
          "CHANNEL.WIDTH.MAX2", "CHANNEL.WIDTH.FILL",
          "WATER.DEPTH.MIN2","WATER.DEPTH.MEAN2","WATER.DEPTH.MEDIAN2",
```

```
          "WATER.DEPTH.MAX2", "WATER.DEPTH.FILL",
          "WATERSHED.AREA.MIN2","WATERSHED.AREA.MEAN2",
"WATERSHED.AREA.MEDIAN2",
          "WATERSHED.AREA.MAX2", "WATERSHED.AREA.FILL",
          "GRADIENT.MIN2", "GRADIENT.MEAN2","GRADIENT.MEDIAN2",
          "GRADIENT.MAX2", "GRADIENT.FILL",
          "LIGHT.MIN2","LIGHT.MEAN2","LIGHT.MEDIAN2","LIGHT.MAX2",
"LIGHT.FILL",
          "DOC.MIN2","DOC.MEDIAN2","DOC.MEAN2","DOC.MAX2", "DOC.FILL",
          "CONDUCTIVITY.MIN2","CONDUCTIVITY.MEDIAN2","CONDUCTIVITY.MEAN2",
          "CONDUCTIVITY.MAX2", "CONDUCTIVITY.FILL",
          "WATER.TEMP.MIN2","WATER.TEMP.MAX2",  "WATER.TEMP.MEDIAN2",
          "WATER.TEMP.MEAN2", "WATER.TEMP.FILL",
          "TSS.MIN2","TSS.MEAN2", "TSS.MEDIAN2","TSS.MAX2", "TSS.FILL",
          "SUSP.SED.MIN2","SUSP.SED.MEAN2", "SUSP.SED.MEDIAN2",
          "SUSP.SED.MAX2", "SUSP.SED.FILL",
          "ELEV.MIN2","ELEV.MAX2",

#"NH4..CONTEXT....MIN","NH4..CONTEXT....MEDIAN","NH4..CONTEXT....MAX",
problem with units

"TKN..CONTEXT....MIN","TKN..CONTEXT....MEAN","TKN..CONTEXT....MEDIAN",
          "TKN..CONTEXT....MAX", "TKN.CONTEXT.FILL",
          #"SRP..CONTEXT....MIN","SRP..CONTEXT....MEAN",
"SRP..CONTEXT....MAX", problem with units
          "CONV.EFFECT.MIN","CONV.EFFECT.MEAN",
          "CONV.EFFECT.MEDIAN","CONV.EFFECT.MAX",
          "TN.CONTEXT.MIN2", "TN.CONTEXT.MEAN2","TN.CONTEXT.MEDIAN2",
          "TN.CONTEXT.MAX2", "TN.CONTEXT.FILL",
          "TP.CONTEXT.MIN2","TP.CONTEXT.MEAN2","TP.CONTEXT.MEDIAN2",
          "TP.CONTEXT.MAX2", "TP.CONTEXT.FILL")


## Make new names for transformed data columns by
## putting "log10" in front of column names
newcols = paste0("log10", cols)


# Make new column of canopy cover
# Fill in missing mean data by getting mean(min+max) or using median if
available.
chl_zcor$CANOPY.FILL <- fillMissing(chl_zcor$CANOPY.MIN2,
chl_zcor$CANOPY.MEAN2, chl_zcor$CANOPY.MEDIAN2,
                                    chl_zcor$CANOPY.MAX2)

## Transform proportional variables by arcsine square root
##  Select columns that need transformation
asincols = c("CANOPY.MIN2", "CANOPY.MEAN2", "CANOPY.MEDIAN2", "CANOPY.MAX2",
"CANOPY.FILL")
```

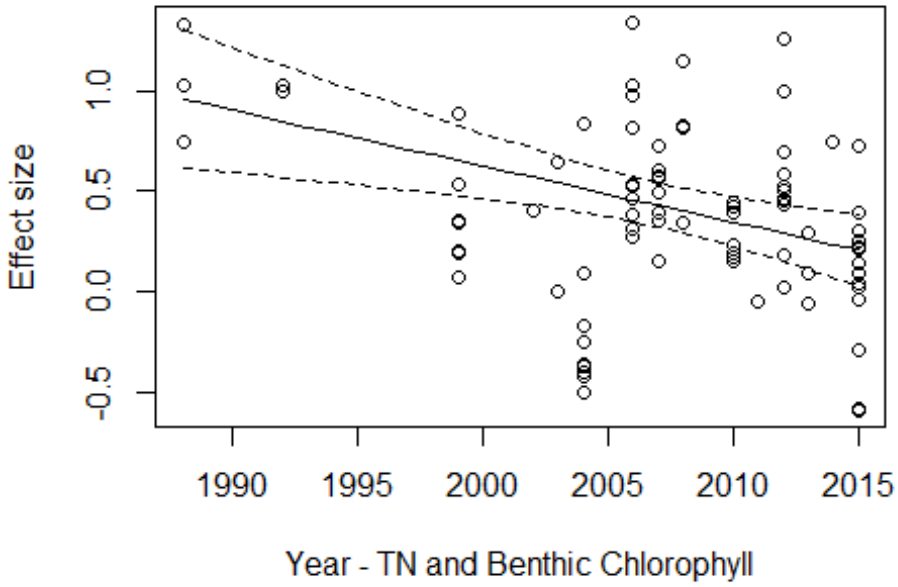
```
newasincols = paste0("asin", asincols)


## Fix Error in Math.data.frame(db2.zcor[cols]) :
## non-numeric variable(s) in data frame:
chl_zcor$DOC.MEDIAN2 =
as.numeric(levels(chl_zcor$DOC.MEDIAN2))[chl_zcor$DOC.MEDIAN2]
chl_zcor$TURBIDITY.MAX2 =
as.numeric(levels(chl_zcor$TURBIDITY.MAX2))[chl_zcor$TURBIDITY.MAX2]


## Batch transform variables and add to end of dataframe
chl_zcor[newcols] = log10(chl_zcor[cols])


## Function for arcsine square root transformation of proportional data
asinTransform = function(p) { asin(sqrt(p)) }


## Batch transform variables and add to end of dataframe
chl_zcor[newasincols] = asinTransform(chl_zcor[asincols])
## Warning that "NaNs produced" will be resolved below by replacing Inf
values.


## For raw data values = 0, log10 transformation created -Inf and Inf values.
## Replace -Inf or Inf values with small number (natural log(0.01)).
chl_zcor[chl_zcor == -Inf | chl_zcor == Inf] = log(0.01)
```

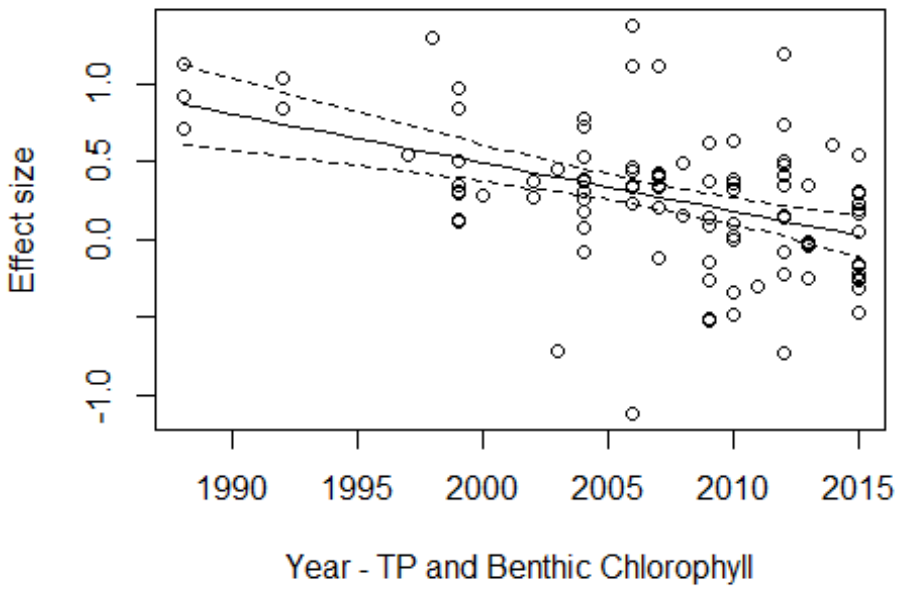
4 PLOTS

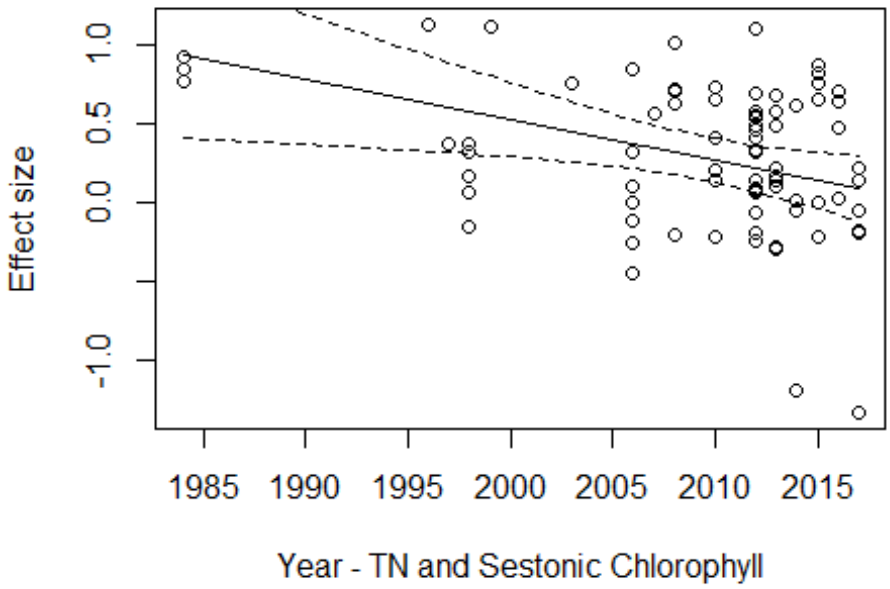
```
## Check stressor-response relationships included in the dataframe
summary(as.factor(chl_zcor$CAUSE.TERM))

## Total N Total P
##     168     243

summary(as.factor(chl_zcor$EFFECT.MEASURE))

##  Benthic chl-a Sestonic chl-a
##            192            219

summary(as.factor(chl_zcor$StressorResponse))

##  TN and Benthic Chlorophyll TN and Sestonic Chlorophyll
##                          86                          82
##  TP and Benthic Chlorophyll TP and Sestonic Chlorophyll
##                         106                         137
```

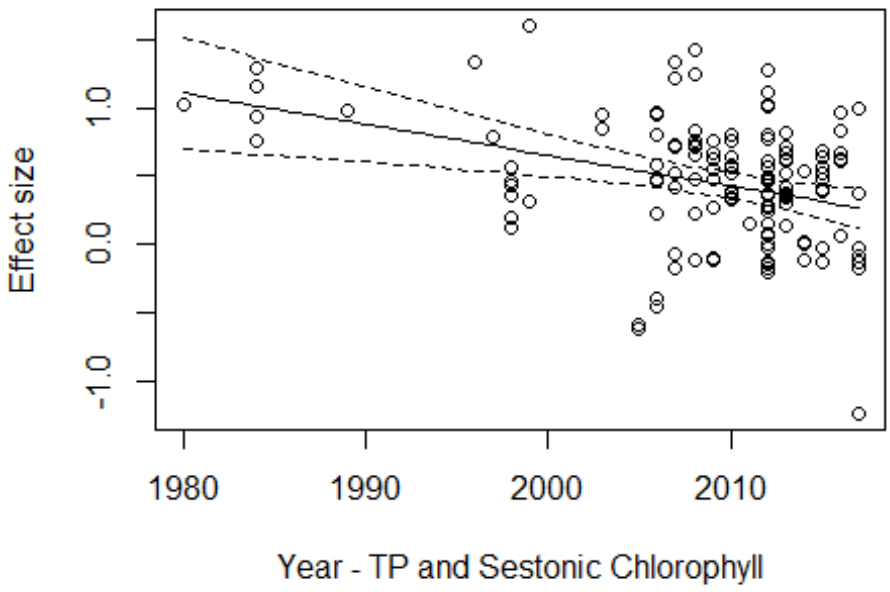
4.1 Year of publication

```
## Make plots for YEAR of publication
#Loop to run rma.mv and make plot for each Stressor-Response subset####
allSRs<-unique(chl_zcor$StressorResponse)

for(i in allSRs){

  SRdata <- chl_zcor %>% filter(StressorResponse==i)

  year.rma = rma.mv(yi,vi, mods= ~ YEAR,
                    random=list(~1|uniqueID,~1|CITATION.ID),
                    tdist=TRUE, data=SRdata)
  preds = predict(year.rma, newmods=c(min(SRdata$YEAR):max(SRdata$YEAR)))

  plot(y=SRdata$yi,x=SRdata$YEAR, xlab=paste("Year", i, sep = " - "),
       ylab="Effect size",
       cex=SRdata$size)
  lines(min(SRdata$YEAR):max(SRdata$YEAR), preds$pred)
  lines(min(SRdata$YEAR):max(SRdata$YEAR), preds$ci.lb, lty="dashed")
  lines(min(SRdata$YEAR):max(SRdata$YEAR), preds$ci.ub, lty="dashed")
}
```


Effect size
-0.5
0.0
0.5
1.0
1990
1995
2000
2005
2010
2015
Year - TN and Benthic Chlorophyll

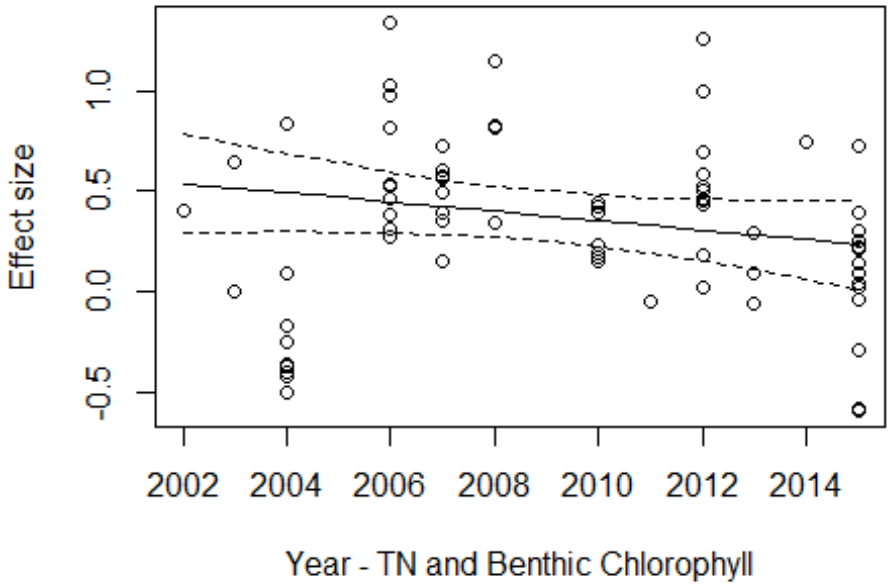

Effect size
-1.0
0.0
0.5
1.0
1990
1995
2000
2005
2010
2015
Year - TP and Benthic Chlorophyll



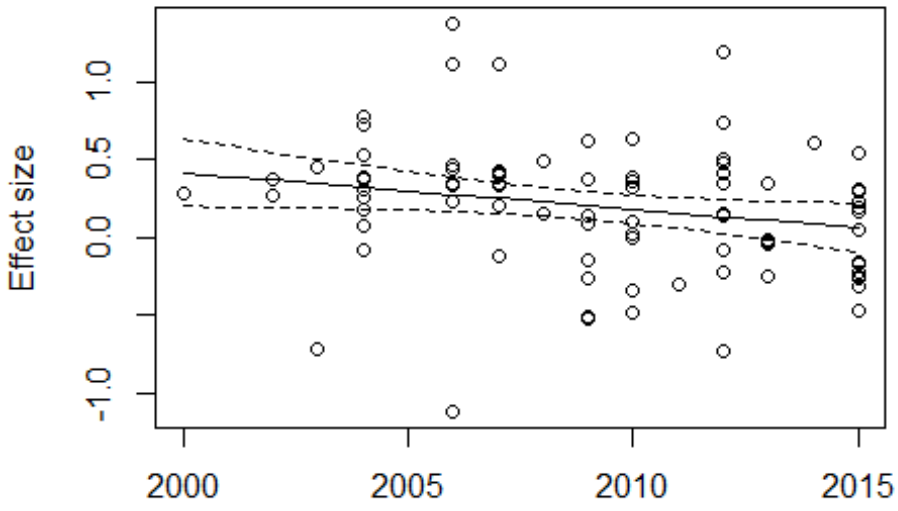



```
## Make plots for YEAR of publication from 2000 and later
for(i in allSRs){

  SRdata <- chl_zcor %>% filter(StressorResponse==i)
```

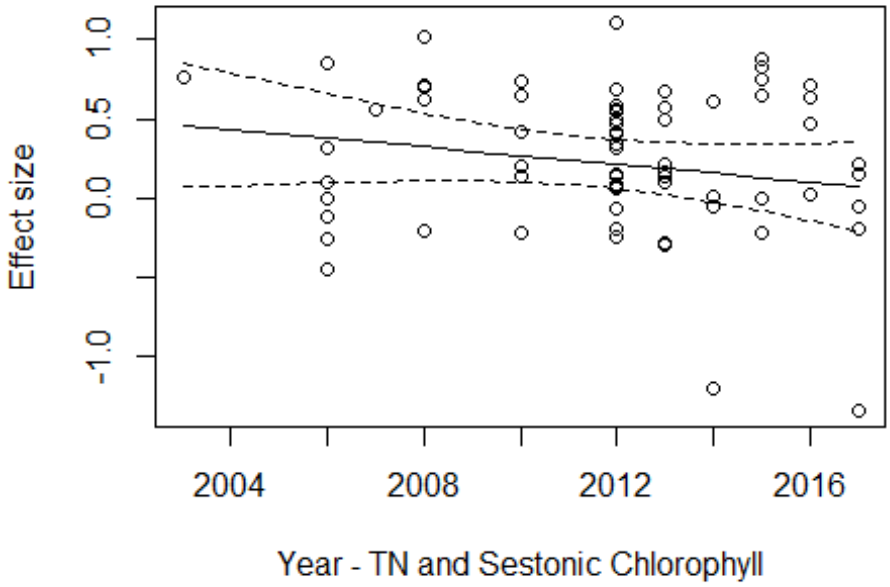
```
  chl_2000 = subset(SRdata, SRdata$YEAR > 1999)

  year.rma = rma.mv(yi,vi, mods= ~ YEAR,
                    random=list(~1|uniqueID,~1|CITATION.ID),
                    tdist=TRUE, data=chl_2000)
  preds = predict(year.rma, newmods=c(min(chl_2000$YEAR):max(chl_2000$YEAR)))

  plot(y=chl_2000$yi,x=chl_2000$YEAR, xlab=paste("Year", i, sep = " - "),
       ylab="Effect size",
       cex=chl_2000$size)
  lines(min(chl_2000$YEAR):max(chl_2000$YEAR), preds$pred)
  lines(min(chl_2000$YEAR):max(chl_2000$YEAR), preds$ci.lb, lty="dashed")
  lines(min(chl_2000$YEAR):max(chl_2000$YEAR), preds$ci.ub, lty="dashed")
}
```

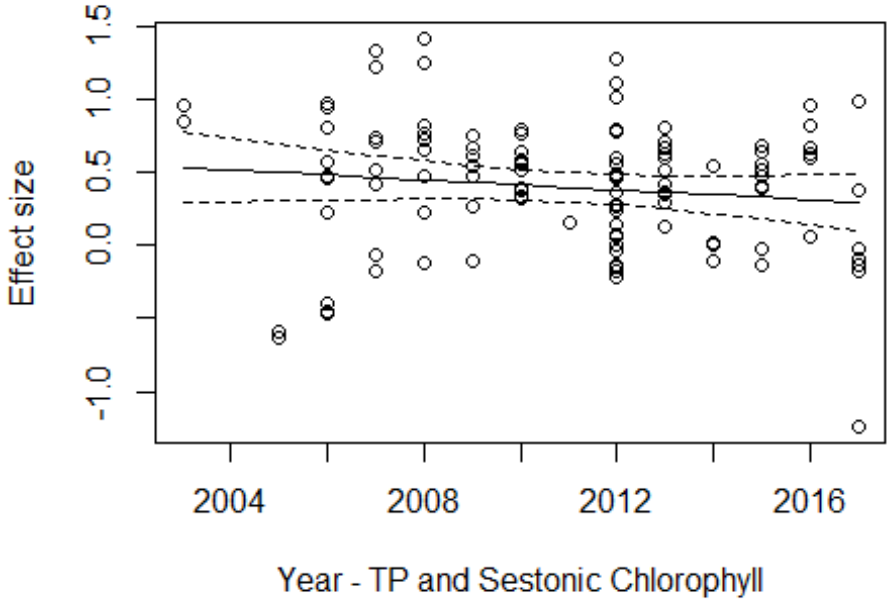


Year - TN and Benthic Chlorophyll



Year - TP and Benthic Chlorophyll





4.2 Continuous moderators

```
## Make 2x2 plots of the 4 stressor-response relationships for each
moderator.
```

```
## All variables log10 transformed, except pH (not transformed) and
CANOPY.MIN2 (arcsine sqrt transformed).

## Calculate point sizes to be used across all data subsets and add new
columns to dataframe
chl_zcor <- dotSize(chl_zcor, scaling=5)
head(chl_zcor$wi)

## [1] 3.316625 2.645751 2.828427 3.316625 3.316625 3.316625

head(chl_zcor$size)

## [1] 1.082274 1.000000 1.022403 1.082274 1.082274 1.082274

# Split to StressorResponse subsets with transformed data columns
ZCOR.chl_ses.TN <- filter(chl_zcor, StressorResponse == "TN and Sestonic
Chlorophyll")
ZCOR.chl_ses.TP <- filter(chl_zcor, StressorResponse == "TP and Sestonic
Chlorophyll")
ZCOR.chl_ben.TN <- filter(chl_zcor, StressorResponse == "TN and Benthic
Chlorophyll")
ZCOR.chl_ben.TP <- filter(chl_zcor, StressorResponse == "TP and Benthic
Chlorophyll")
```

4.2.01 Alkalinity

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("ALKALINITY.MIN2","ALKALINITY.MEAN2",
                      "ALKALINITY.MEDIAN2", "ALKALINITY.MAX2",
"ALKALINITY.FILL"),ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)

## [1] "Variable: ALKALINITY.MIN2.log10 || Plot: Ben.TN"

## [1] "Variable: ALKALINITY.MIN2.log10 || Plot: Ben.TP"

## [1] "Variable: ALKALINITY.MIN2.log10 || Plot: Ses.TN"

## [1] "Variable: ALKALINITY.MIN2.log10 || Plot: Ses.TP"

## [1] "Variable: ALKALINITY.MEAN2.log10 || Plot: Ben.TN"

## [1] "Variable: ALKALINITY.MEAN2.log10 || Plot: Ben.TP"

## [1] "Variable: ALKALINITY.MEAN2.log10 || Plot: Ses.TN"

## [1] "Variable: ALKALINITY.MEAN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: ALKALINITY.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: ALKALINITY.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: ALKALINITY.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: ALKALINITY.MAX2.log10 || Plot: Ses.TP"
## [1] "Variable: ALKALINITY.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: ALKALINITY.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: ALKALINITY.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: ALKALINITY.FILL.log10 || Plot: Ses.TP"
```

```r
print("ben.TN")
```

```
## [1] "ben.TN"
```

```r
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10ALKALINITY.MAX2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.MAX2 7   -0.759          0.559  -1.358   0.233
## log10ALKALINITY.MAX2           7    0.453          0.246   1.845   0.124
##                                CI-Lower CI-Upper
## Intercept log10ALKALINITY.MAX2   -2.197    0.678
## log10ALKALINITY.MAX2             -0.178    1.084
```

```r
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10ALKALINITY.MEAN2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.MEAN2 5    0.278          1.065   0.262   0.811
## log10ALKALINITY.MEAN2           5   -0.195          0.542  -0.360   0.742
##                                 CI-Lower CI-Upper
## Intercept log10ALKALINITY.MEAN2    -3.11    3.666
## log10ALKALINITY.MEAN2              -1.92    1.530
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10ALKALINITY.MEDIAN2, Decimals=3)

##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10ALKALINITY.MEDIAN2 4    1.258          1.813   0.694
0.559
## log10ALKALINITY.MEDIAN2           4   -0.428          0.795  -0.539
0.644
##                                   CI-Lower CI-Upper
## Intercept log10ALKALINITY.MEDIAN2   -6.544    9.060
## log10ALKALINITY.MEDIAN2             -3.847    2.991

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10ALKALINITY.MIN2, Decimals=3)

##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.MIN2 7    0.161          0.163   0.985   0.370
## log10ALKALINITY.MIN2           7   -0.030          0.063  -0.469   0.659
##                                 CI-Lower CI-Upper
## Intercept log10ALKALINITY.MIN2   -0.259    0.581
## log10ALKALINITY.MIN2             -0.193    0.133

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10ALKALINITY.FILL, Decimals=3)

##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.FILL 9   -0.316          0.717  -0.441   0.673
## log10ALKALINITY.FILL           9    0.244          0.353   0.691   0.512
##                                 CI-Lower CI-Upper
## Intercept log10ALKALINITY.FILL   -2.011    1.379
## log10ALKALINITY.FILL             -0.592    1.080

print("ben.TP")

## [1] "ben.TP"

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10ALKALINITY.MIN2, Decimals=3)

##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.MIN2 8    0.097          0.131   0.744   0.485
## log10ALKALINITY.MIN2           8   -0.026          0.052  -0.499   0.635
##                                 CI-Lower CI-Upper
## Intercept log10ALKALINITY.MIN2   -0.222    0.417
## log10ALKALINITY.MIN2             -0.152    0.100

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10ALKALINITY.MEAN2, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.MEAN2 5   -0.399          0.916  -0.436   0.692
```

```
## log10ALKALINITY.MEAN2           5    0.181          0.467   0.387   0.725
##                                 CI-Lower CI-Upper
## Intercept log10ALKALINITY.MEAN2   -3.316    2.517
## log10ALKALINITY.MEAN2             -1.307    1.668
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10ALKALINITY.MEDIAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10ALKALINITY.MEDIAN2 4    0.844          1.723   0.490
0.673
## log10ALKALINITY.MEDIAN2           4   -0.258          0.758  -0.341
0.766
##                                   CI-Lower CI-Upper
## Intercept log10ALKALINITY.MEDIAN2   -6.567    8.256
## log10ALKALINITY.MEDIAN2             -3.519    3.003
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10ALKALINITY.MAX2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.MAX2 8   -1.172          0.525  -2.230   0.067
## log10ALKALINITY.MAX2           8    0.602          0.229   2.633   0.039
##                                 CI-Lower CI-Upper
## Intercept log10ALKALINITY.MAX2   -2.458    0.114
## log10ALKALINITY.MAX2              0.042    1.161
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10ALKALINITY.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.FILL 10   -0.978          0.322  -3.036   0.016
## log10ALKALINITY.FILL           10    0.577          0.148   3.887   0.005
##                                 CI-Lower CI-Upper
## Intercept log10ALKALINITY.FILL   -1.722   -0.235
## log10ALKALINITY.FILL              0.235    0.919
```

```
print("ses.TN - insufficient data")
```

```
## [1] "ses.TN - insufficient data"
```

```
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10ALKALINITY..MAX, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10ALKALINITY..MEAN, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10ALKALINITY..MEDIAN, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10ALKALINITY..MIN, Decimals=3)
```

```
print("ses.TP")
```

```
## [1] "ses.TP"

# extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10ALKALINITY..MEAN, Decimals=3)
# extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10ALKALINITY..MEDIAN, Decimals=3)
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10ALKALINITY.MAX2, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.MAX2 8   -3.552          2.871  -1.237   0.262
## log10ALKALINITY.MAX2           8    1.831          1.257   1.457   0.195
##                                CI-Lower CI-Upper
## Intercept log10ALKALINITY.MAX2  -10.577    3.474
## log10ALKALINITY.MAX2             -1.244    4.907

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10ALKALINITY.MIN2, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.MIN2 8    1.584          0.896   1.767   0.128
## log10ALKALINITY.MIN2           8   -0.643          0.582  -1.106   0.311
##                                CI-Lower CI-Upper
## Intercept log10ALKALINITY.MIN2   -0.609    3.776
## log10ALKALINITY.MIN2             -2.067    0.780

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10ALKALINITY.FILL, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10ALKALINITY.FILL 8   -1.770          3.618  -0.489   0.642
## log10ALKALINITY.FILL           8    1.158          1.745   0.663   0.532
##                                CI-Lower CI-Upper
## Intercept log10ALKALINITY.FILL  -10.623    7.083
## log10ALKALINITY.FILL             -3.113    5.429
```

4.2.02 Canopy Cover

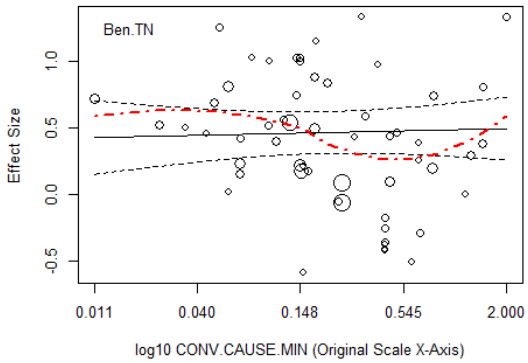
```
# Chunk not working, eval set to F.

plotMods2_Grid(Folder='Plots',DF=chl_zcor,Vars=c('CANOPY.MIN2',
'CANOPY.FILL'),ModTransform='arcsine',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)

## Vars not run due to insufficient data: 'CANOPY.MEAN2', 'CANOPY.MEDIAN2',
## 'CANOPY.MAX2'

print("ben.TN")
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~asinCANOPY.MIN2, Decimals=3)
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~asinCANOPY.FILL, Decimals=3)
```

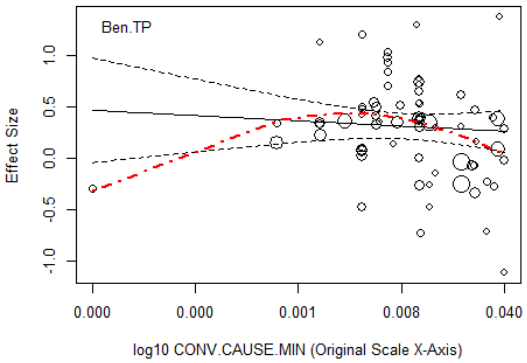
```
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~asinCANOPY.MAX2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~asinCANOPY.MEAN2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~asinCANOPY.MEDIAN2, Decimals=3)

print("ben.TP")
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~asinCANOPY.MIN2, Decimals=3)
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~asinCANOPY.FILL, Decimals=3)
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~asinCANOPY.MAX2, Decimals=3)
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~asinCANOPY.MEAN2, Decimals=3)
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~asinCANOPY.MEDIAN2, Decimals=3)

print("ses.TN")
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~asinCANOPY.MIN2, Decimals=3)
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~asinCANOPY.FILL, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~asinCANOPY.MAX2, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~asinCANOPY.MEAN2, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~asinCANOPY.MEDIAN2, Decimals=3)

print("ses.TP")
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~asinCANOPY.MIN2, Decimals=3)
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~asinCANOPY.FILL, Decimals=3)
# extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~asinCANOPY.MAX2, Decimals=3)
# extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~asinCANOPY.MEAN2, Decimals=3)
# extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~asinCANOPY.MEDIAN2, Decimals=3)
```

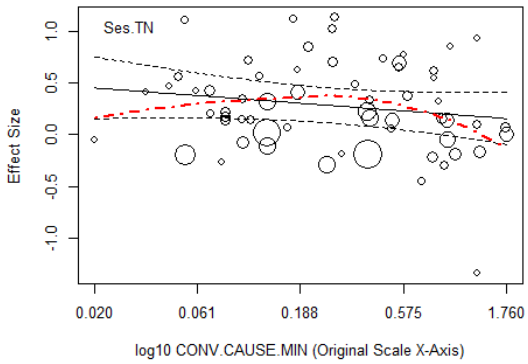
4.2.03 Cause (TN or TP)

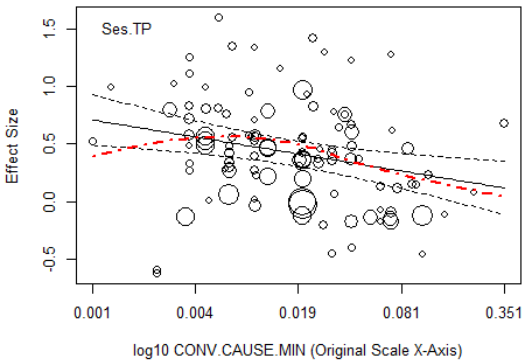
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("CONV.CAUSE.MIN","CONV.CAUSE.MEAN",
                      "CONV.CAUSE.MEDIAN","CONV.CAUSE.MAX",
"CONV.CAUSE.FILL"),ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: CONV.CAUSE.MIN.log10 || Plot: Ben.TN"
## [1] "Variable: CONV.CAUSE.MIN.log10 || Plot: Ben.TP"
## [1] "Variable: CONV.CAUSE.MIN.log10 || Plot: Ses.TN"
## [1] "Variable: CONV.CAUSE.MIN.log10 || Plot: Ses.TP"
```

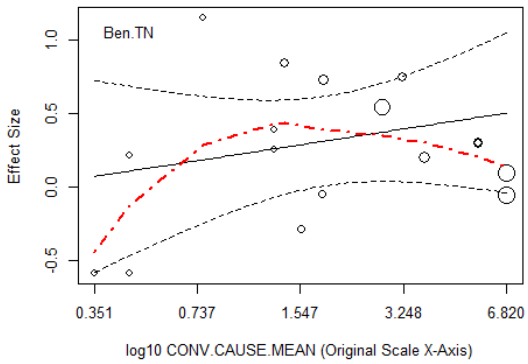


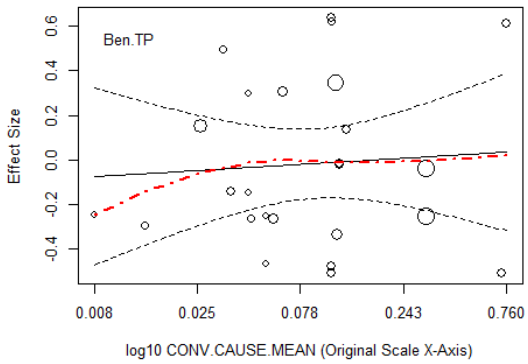


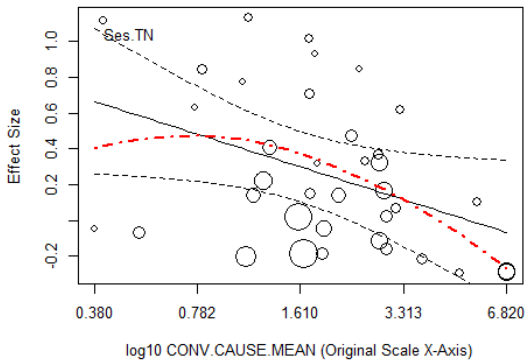


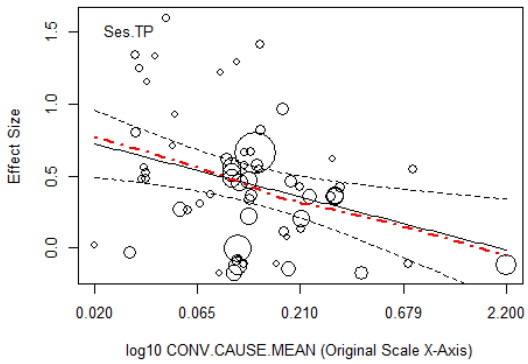



```
## [1] "Variable: CONV.CAUSE.MEAN.log10 || Plot: Ben.TN"
## [1] "Variable: CONV.CAUSE.MEAN.log10 || Plot: Ben.TP"
## [1] "Variable: CONV.CAUSE.MEAN.log10 || Plot: Ses.TN"
## [1] "Variable: CONV.CAUSE.MEAN.log10 || Plot: Ses.TP"
```

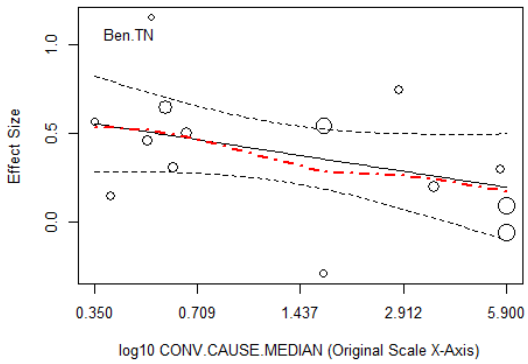


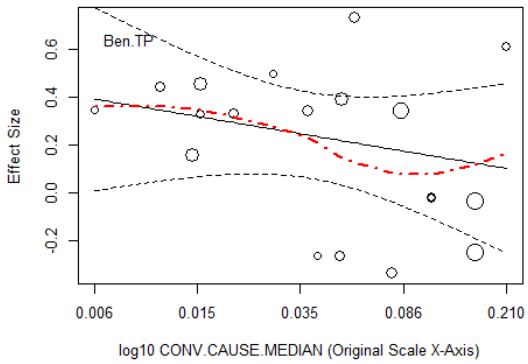


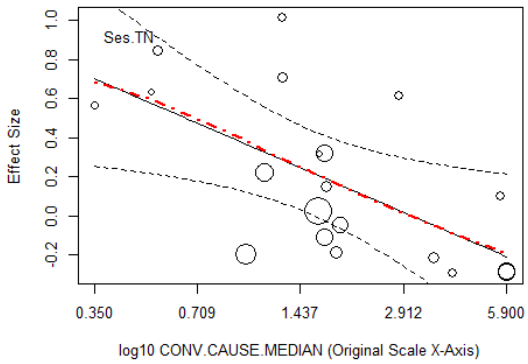


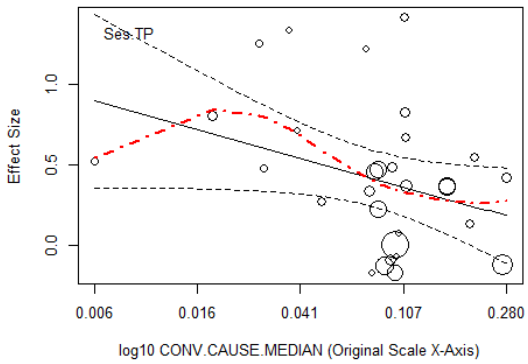



```
## [1] "Variable: CONV.CAUSE.MEDIAN.log10 || Plot: Ben.TN"
## [1] "Variable: CONV.CAUSE.MEDIAN.log10 || Plot: Ben.TP"
## [1] "Variable: CONV.CAUSE.MEDIAN.log10 || Plot: Ses.TN"
## [1] "Variable: CONV.CAUSE.MEDIAN.log10 || Plot: Ses.TP"
```

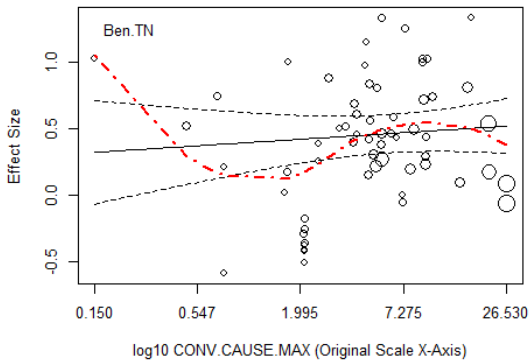


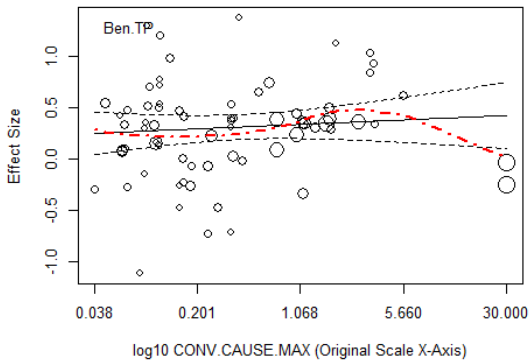


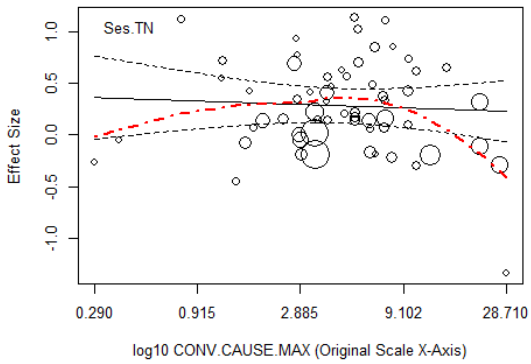


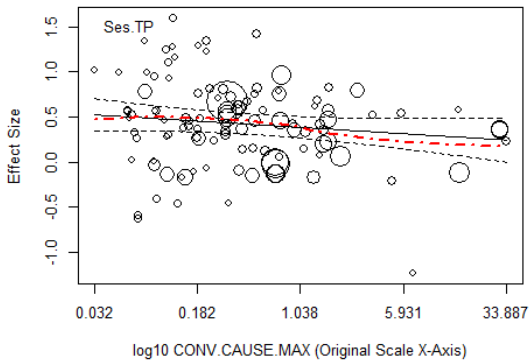



```
## [1] "Variable: CONV.CAUSE.MAX.log10 || Plot: Ben.TN"
## [1] "Variable: CONV.CAUSE.MAX.log10 || Plot: Ben.TP"
## [1] "Variable: CONV.CAUSE.MAX.log10 || Plot: Ses.TN"
## [1] "Variable: CONV.CAUSE.MAX.log10 || Plot: Ses.TP"
```

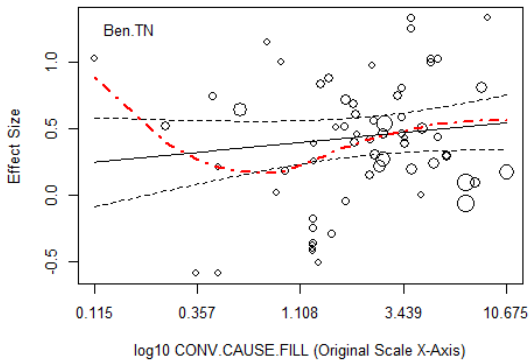


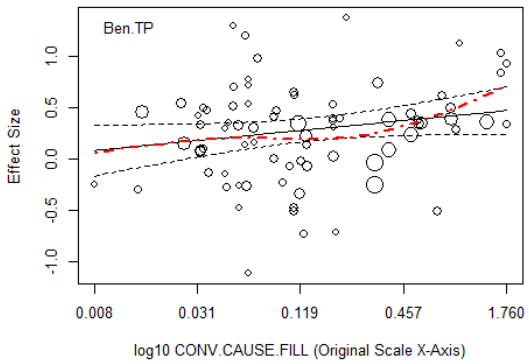


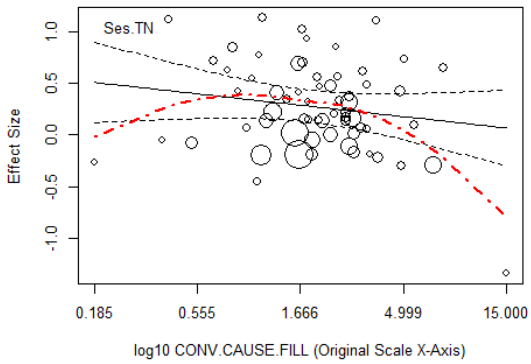


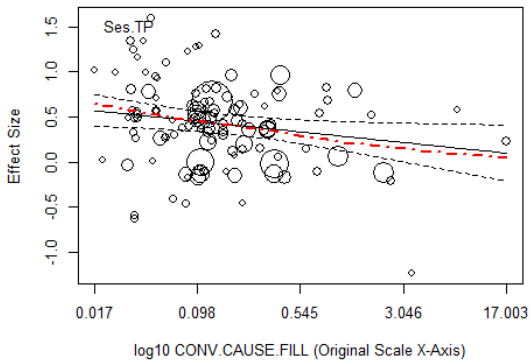



```
## [1] "Variable: CONV.CAUSE.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: CONV.CAUSE.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: CONV.CAUSE.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: CONV.CAUSE.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.CAUSE.MIN, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MIN 63    0.481          0.091   5.303   0.000
## log10CONV.CAUSE.MIN           63    0.016          0.055   0.287   0.775
##                                CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MIN    0.299    0.662
## log10CONV.CAUSE.MIN             -0.094    0.125
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.CAUSE.MEAN, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MEAN 17    0.221          0.175   1.263   0.226
## log10CONV.CAUSE.MEAN           17    0.335          0.374   0.895   0.385
##                                 CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MEAN   -0.152    0.595
## log10CONV.CAUSE.MEAN             -0.463    1.133
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.CAUSE.MEDIAN, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONV.CAUSE.MEDIAN 15    0.421          0.078   5.424
0.000
## log10CONV.CAUSE.MEDIAN           15   -0.291          0.176  -1.655
0.122
##                                   CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MEDIAN    0.253    0.589
## log10CONV.CAUSE.MEDIAN             -0.670    0.089

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.CAUSE.MAX, Decimals=3)

##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MAX 63    0.397          0.113   3.501   0.001
## log10CONV.CAUSE.MAX           63    0.088          0.113   0.776   0.440
##                                  CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MAX    0.170    0.624
## log10CONV.CAUSE.MAX             -0.138    0.313

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.CAUSE.FILL, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.FILL 65    0.390          0.085   4.611   0.000
## log10CONV.CAUSE.FILL           65    0.152          0.115   1.318   0.192
##                                  CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.FILL    0.221    0.560
## log10CONV.CAUSE.FILL             -0.078    0.382

print("ben.TP")

## [1] "ben.TP"

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.CAUSE.MIN, Decimals=3)

##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MIN 73    0.225          0.189   1.187   0.239
## log10CONV.CAUSE.MIN           73   -0.040          0.083  -0.489   0.626
##                                  CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MIN   -0.153    0.603
## log10CONV.CAUSE.MIN             -0.205    0.124

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.CAUSE.MEAN, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MEAN 25    0.041          0.189   0.216   0.831
```

```
## log10CONV.CAUSE.MEAN           25    0.056          0.167   0.335   0.740
##                                CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MEAN   -0.351    0.433
## log10CONV.CAUSE.MEAN             -0.290    0.402
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.CAUSE.MEDIAN, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-
Value
## Intercept log10CONV.CAUSE.MEDIAN 19   -0.026          0.293  -0.088
0.931
## log10CONV.CAUSE.MEDIAN           19   -0.188          0.199  -0.944
0.359
##                                  CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MEDIAN   -0.645    0.593
## log10CONV.CAUSE.MEDIAN             -0.607    0.232
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.CAUSE.MAX, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MAX 73    0.335          0.068   4.916   0.000
## log10CONV.CAUSE.MAX           73    0.060          0.081   0.739   0.462
##                               CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MAX    0.199    0.470
## log10CONV.CAUSE.MAX             -0.101    0.221
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.CAUSE.FILL, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.FILL 80    0.430          0.096   4.495    0.00
## log10CONV.CAUSE.FILL           80    0.165          0.090   1.838    0.07
##                                CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.FILL    0.240    0.620
## log10CONV.CAUSE.FILL             -0.014    0.344
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.CAUSE.MIN, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MIN 62    0.194          0.106   1.829   0.072
## log10CONV.CAUSE.MIN           62   -0.152          0.110  -1.382   0.172
##                               CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MIN   -0.018    0.406
## log10CONV.CAUSE.MIN             -0.371    0.068
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.CAUSE.MEAN, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MEAN 37    0.420          0.113   3.716   0.001
## log10CONV.CAUSE.MEAN           37   -0.583          0.277  -2.102   0.043
##                                CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MEAN    0.191     0.65
## log10CONV.CAUSE.MEAN             -1.146    -0.02
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.CAUSE.MEDIAN, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10CONV.CAUSE.MEDIAN 20    0.363          0.116   3.129
0.006
## log10CONV.CAUSE.MEDIAN           20   -0.743          0.294  -2.531
0.021
##                                  CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MEDIAN    0.119    0.607
## log10CONV.CAUSE.MEDIAN             -1.360   -0.126
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.CAUSE.MAX, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MAX 62    0.326          0.130   2.511   0.015
## log10CONV.CAUSE.MAX           62   -0.066          0.153  -0.432   0.667
##                               CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MAX    0.066    0.586
## log10CONV.CAUSE.MAX             -0.371    0.239
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.CAUSE.FILL, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.FILL 64    0.339           0.09   3.779   0.000
## log10CONV.CAUSE.FILL           64   -0.230           0.18  -1.277   0.206
##                                CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.FILL     0.16    0.518
## log10CONV.CAUSE.FILL              -0.59    0.130
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.CAUSE.MIN, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MIN 110    0.216          0.133   1.627   0.107
```

```
## log10CONV.CAUSE.MIN           110   -0.105          0.063  -1.666   0.099
##                                CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MIN   -0.047    0.479
## log10CONV.CAUSE.MIN             -0.231    0.020
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.CAUSE.MEAN, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MEAN 63    0.111          0.137   0.806   0.424
## log10CONV.CAUSE.MEAN           63   -0.361          0.129  -2.799   0.007
##                                 CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MEAN   -0.164    0.385
## log10CONV.CAUSE.MEAN             -0.619   -0.103
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.CAUSE.MEDIAN, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10CONV.CAUSE.MEDIAN 30   -0.049          0.253  -0.194
0.848
## log10CONV.CAUSE.MEDIAN           30   -0.425          0.219  -1.943
0.062
##                                  CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MEDIAN   -0.566    0.469
## log10CONV.CAUSE.MEDIAN             -0.874    0.023
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.CAUSE.MAX, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.MAX 110    0.386          0.060   6.465   0.000
## log10CONV.CAUSE.MAX           110   -0.092          0.059  -1.564   0.121
##                                CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.MAX    0.267    0.504
## log10CONV.CAUSE.MAX             -0.209    0.025
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.CAUSE.FILL, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.CAUSE.FILL 117    0.293          0.079   3.691   0.000
## log10CONV.CAUSE.FILL           117   -0.158          0.073  -2.158   0.033
##                                 CI-Lower CI-Upper
## Intercept log10CONV.CAUSE.FILL    0.136    0.450
## log10CONV.CAUSE.FILL             -0.302   -0.013
```

4.2.04 Channel Width

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("CHANNEL.WIDTH.MIN2","CHANNEL.WIDTH.MEAN2",
```

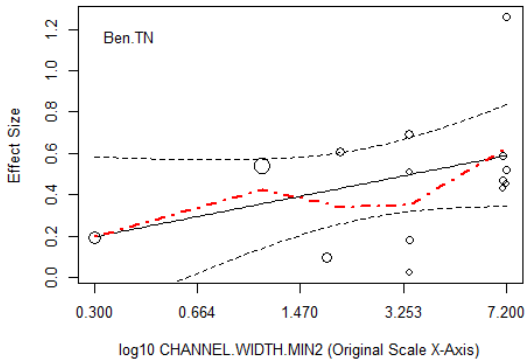
```
                    "CHANNEL.WIDTH.MEDIAN2","CHANNEL.WIDTH.MAX2",
                    "CHANNEL.WIDTH.FILL"),ModTransform='log10',
                StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

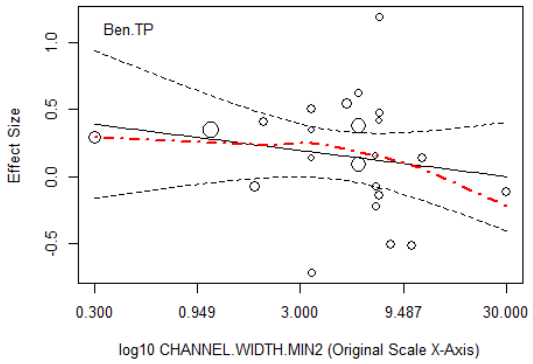
```
## [1] "Variable: CHANNEL.WIDTH.MIN2.log10 || Plot: Ben.TN"
```

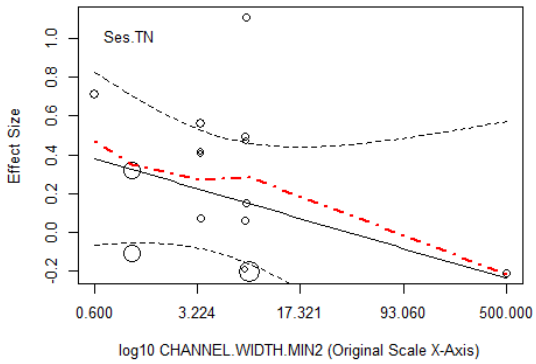
```
## [1] "Variable: CHANNEL.WIDTH.MIN2.log10 || Plot: Ben.TP"
```

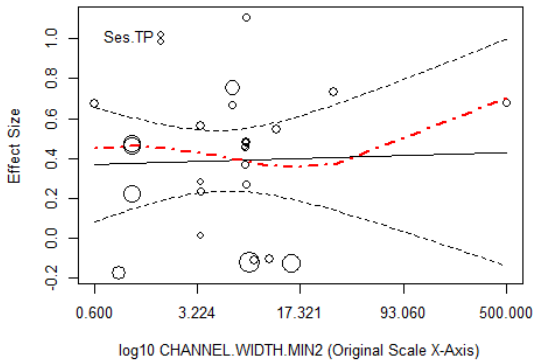
```
## [1] "Variable: CHANNEL.WIDTH.MIN2.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: CHANNEL.WIDTH.MIN2.log10 || Plot: Ses.TP"
```







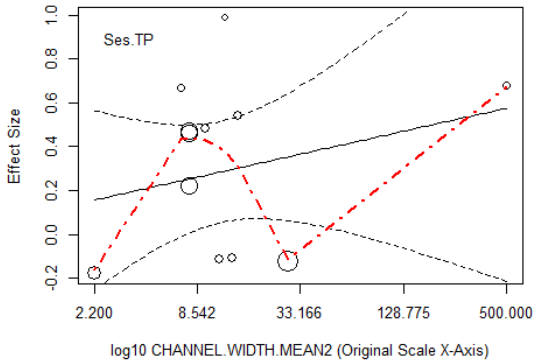



```
## [1] "Variable: CHANNEL.WIDTH.MEAN2.log10 || Plot: Ben.TN"
```

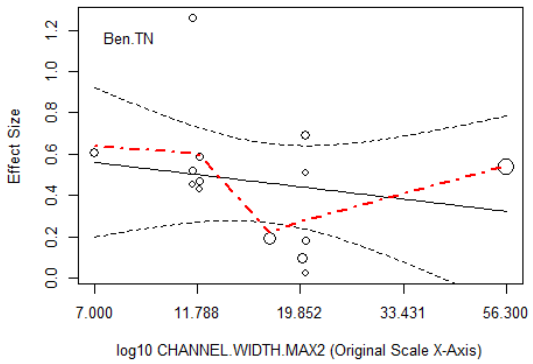
```
## [1] "Variable: CHANNEL.WIDTH.MEAN2.log10 || Plot: Ben.TP"
```

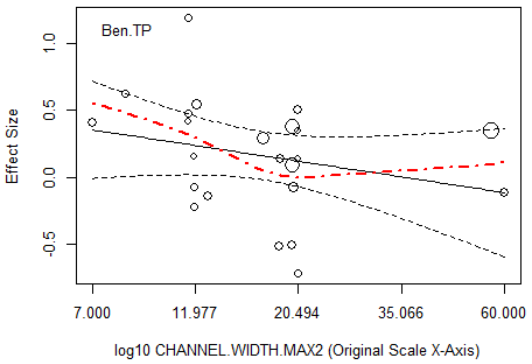
```
## [1] "Variable: CHANNEL.WIDTH.MEAN2.log10 || Plot: Ses.TN"
```

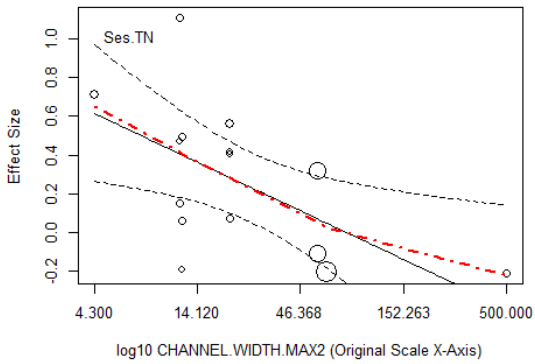
```
## [1] "Variable: CHANNEL.WIDTH.MEAN2.log10 || Plot: Ses.TP"
```

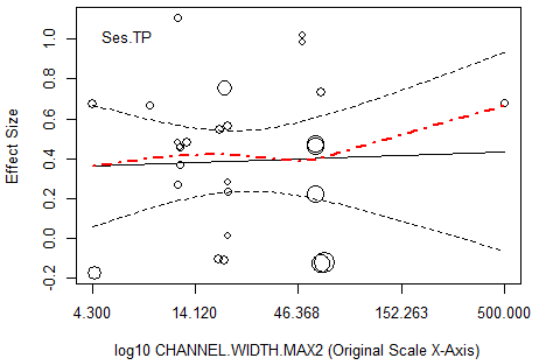



```
## [1] "Variable: CHANNEL.WIDTH.MAX2.log10 || Plot: Ben.TN"

## [1] "Variable: CHANNEL.WIDTH.MAX2.log10 || Plot: Ben.TP"

## [1] "Variable: CHANNEL.WIDTH.MAX2.log10 || Plot: Ses.TN"

## [1] "Variable: CHANNEL.WIDTH.MAX2.log10 || Plot: Ses.TP"
```

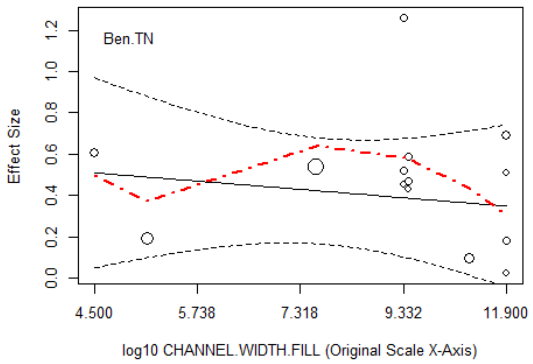


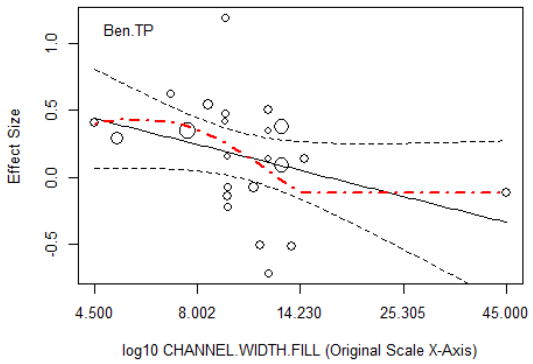


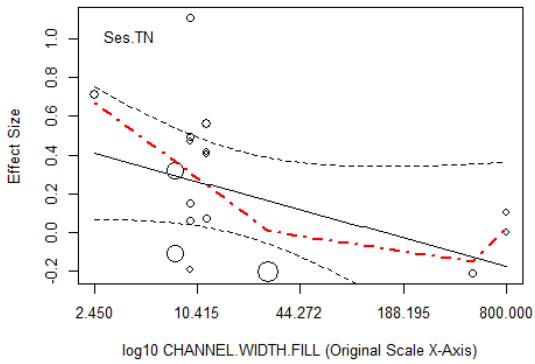


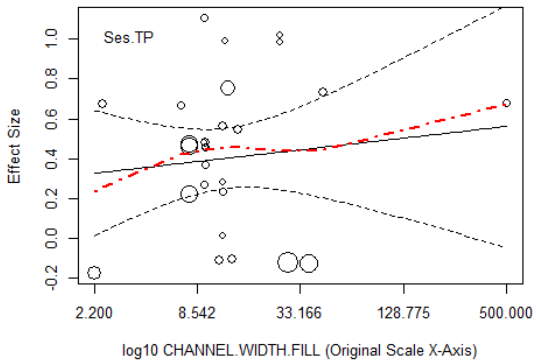



```
## [1] "Variable: CHANNEL.WIDTH.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: CHANNEL.WIDTH.FILL.log10 || Plot: Ben.TP"

## [1] "Variable: CHANNEL.WIDTH.FILL.log10 || Plot: Ses.TN"

## [1] "Variable: CHANNEL.WIDTH.FILL.log10 || Plot: Ses.TP"
```










```r
print("ben.TN")
```

```
## [1] "ben.TN"
```

```r
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CHANNEL.WIDTH.MIN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MIN2 14    0.346          0.103   3.346
0.006
## log10CHANNEL.WIDTH.MIN2           14    0.284          0.175   1.625
0.130
##                                   CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MIN2    0.121    0.570
## log10CHANNEL.WIDTH.MIN2             -0.097    0.666
```

```r
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CHANNEL.WIDTH.MEAN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MEAN2 2   -1.212          0.621  -1.951
0.302
```

```
## log10CHANNEL.WIDTH.MEAN2           2    1.984          0.747   2.657
0.229
##                                   CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MEAN2   -9.103    6.679
## log10CHANNEL.WIDTH.MEAN2             -7.502   11.471

#extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CHANNEL.WIDTH.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CHANNEL.WIDTH.MAX2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MAX2 14    0.781          0.461   1.695
0.116
## log10CHANNEL.WIDTH.MAX2           14   -0.261          0.368  -0.710
0.491
##                                   CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MAX2   -0.223    1.786
## log10CHANNEL.WIDTH.MAX2             -1.064    0.541

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CHANNEL.WIDTH.FILL, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.FILL 14    0.758          0.669   1.134
0.279
## log10CHANNEL.WIDTH.FILL           14   -0.380          0.740  -0.514
0.617
##                                   CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.FILL   -0.699    2.216
## log10CHANNEL.WIDTH.FILL             -1.992    1.232

print("ben.TP")

## [1] "ben.TP"

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CHANNEL.WIDTH.MIN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MIN2 23    0.289          0.164   1.756
0.094
## log10CHANNEL.WIDTH.MIN2           23   -0.195          0.212  -0.916
0.370
##                                   CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MIN2   -0.053    0.631
## log10CHANNEL.WIDTH.MIN2             -0.636    0.247
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CHANNEL.WIDTH.MEAN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MEAN2 7    1.671          0.792   2.109
0.089
## log10CHANNEL.WIDTH.MEAN2           7   -1.696          0.820  -2.067
0.094
##                                    CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MEAN2   -0.366    3.707
## log10CHANNEL.WIDTH.MEAN2             -3.804    0.413

#extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CHANNEL.WIDTH.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CHANNEL.WIDTH.MAX2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MAX2 23    0.780          0.490   1.593
0.126
## log10CHANNEL.WIDTH.MAX2           23   -0.502          0.391  -1.284
0.213
##                                   CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MAX2   -0.238    1.798
## log10CHANNEL.WIDTH.MAX2             -1.316    0.311

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CHANNEL.WIDTH.FILL, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.FILL 23    0.948          0.453   2.094
0.049
## log10CHANNEL.WIDTH.FILL           23   -0.777          0.440  -1.767
0.092
##                                   CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.FILL    0.006    1.890
## log10CHANNEL.WIDTH.FILL             -1.691    0.138

print("ses.TN")

## [1] "ses.TN"

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CHANNEL.WIDTH.MIN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MIN2 15    0.334          0.180   1.851
0.087
```

```
## log10CHANNEL.WIDTH.MIN2           15   -0.212          0.171  -1.236
0.238
##                                  CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MIN2   -0.056    0.723
## log10CHANNEL.WIDTH.MIN2             -0.581    0.158

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CHANNEL.WIDTH.MEAN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MEAN2 6    0.094          0.251   0.375
0.727
## log10CHANNEL.WIDTH.MEAN2           6   -0.071          0.145  -0.491
0.649
##                                  CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MEAN2   -0.604    0.792
## log10CHANNEL.WIDTH.MEAN2             -0.474    0.331

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CHANNEL.WIDTH.MEDIAN2, Decimals=3)

##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MEDIAN2 3    0.207          0.340   0.608
0.652
## log10CHANNEL.WIDTH.MEDIAN2           3   -0.156          0.233  -0.668
0.625
##                                    CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MEDIAN2   -4.115    4.529
## log10CHANNEL.WIDTH.MEDIAN2             -3.113    2.802

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CHANNEL.WIDTH.MAX2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MAX2 15    0.922          0.267   3.458
0.004
## log10CHANNEL.WIDTH.MAX2           15   -0.486          0.179  -2.712
0.018
##                                  CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MAX2    0.346    1.498
## log10CHANNEL.WIDTH.MAX2             -0.873   -0.099

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CHANNEL.WIDTH.FILL, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.FILL 17    0.498          0.206   2.420
0.029
```

```
## log10CHANNEL.WIDTH.FILL           17   -0.231          0.141  -1.641
0.122
##                                  CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.FILL    0.059    0.936
## log10CHANNEL.WIDTH.FILL             -0.530    0.069
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CHANNEL.WIDTH.MIN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MIN2 27    0.374          0.116   3.215
0.004
## log10CHANNEL.WIDTH.MIN2           27    0.020          0.132   0.154
0.879
##                                  CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MIN2    0.135    0.614
## log10CHANNEL.WIDTH.MIN2             -0.251    0.292
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CHANNEL.WIDTH.MEAN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MEAN2 12    0.096          0.245   0.394
0.702
## log10CHANNEL.WIDTH.MEAN2           12    0.177          0.207   0.856
0.412
##                                   CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MEAN2   -0.449    0.641
## log10CHANNEL.WIDTH.MEAN2             -0.284    0.639
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CHANNEL.WIDTH.MEDIAN2, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MEDIAN2 4    0.292          0.154   1.895
0.199
## log10CHANNEL.WIDTH.MEDIAN2           4    0.143          0.152   0.938
0.447
##                                     CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MEDIAN2   -0.371    0.955
## log10CHANNEL.WIDTH.MEDIAN2             -0.513    0.799
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CHANNEL.WIDTH.MAX2, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.MAX2 27    0.341          0.251   1.358
0.187
## log10CHANNEL.WIDTH.MAX2           27    0.034          0.174   0.196
0.846
##                                    CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.MAX2   -0.176    0.858
## log10CHANNEL.WIDTH.MAX2             -0.325    0.393
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CHANNEL.WIDTH.FILL, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10CHANNEL.WIDTH.FILL 28    0.292          0.209   1.403
0.173
## log10CHANNEL.WIDTH.FILL           28    0.100          0.178   0.559
0.581
##                                    CI-Lower CI-Upper
## Intercept log10CHANNEL.WIDTH.FILL   -0.136    0.721
## log10CHANNEL.WIDTH.FILL             -0.267    0.467
```

4.2.05 Conductivity

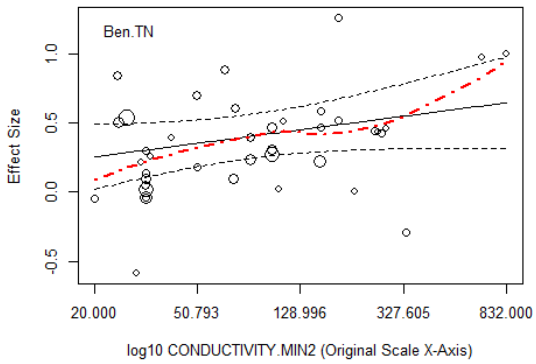
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("CONDUCTIVITY.MIN2","CONDUCTIVITY.MEDIAN2",
                      "CONDUCTIVITY.MEAN2","CONDUCTIVITY.MAX2",
"CONDUCTIVITY.FILL"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

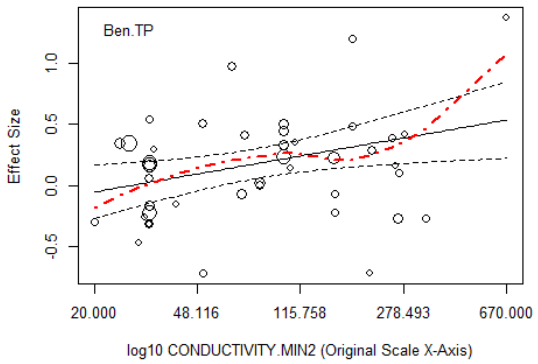
```
## [1] "Variable: CONDUCTIVITY.MIN2.log10 || Plot: Ben.TN"
```

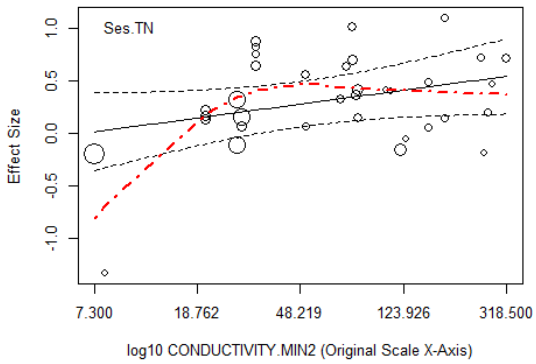
```
## [1] "Variable: CONDUCTIVITY.MIN2.log10 || Plot: Ben.TP"
```

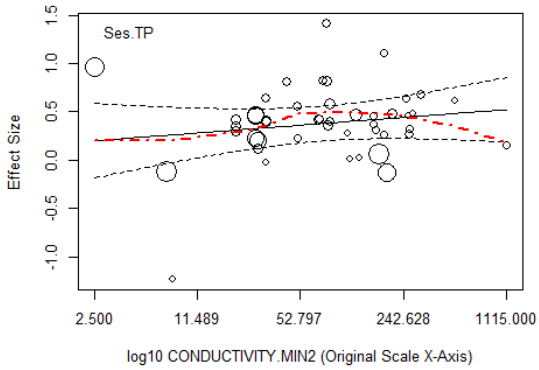
```
## [1] "Variable: CONDUCTIVITY.MIN2.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: CONDUCTIVITY.MIN2.log10 || Plot: Ses.TP"
```

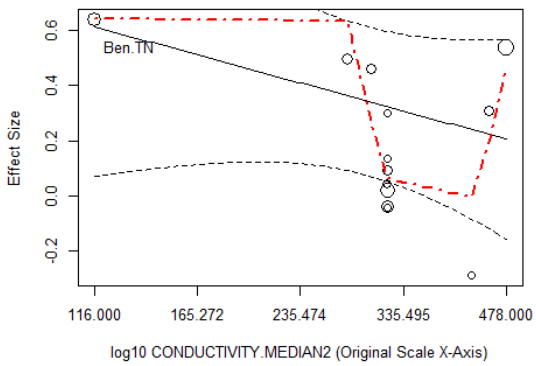


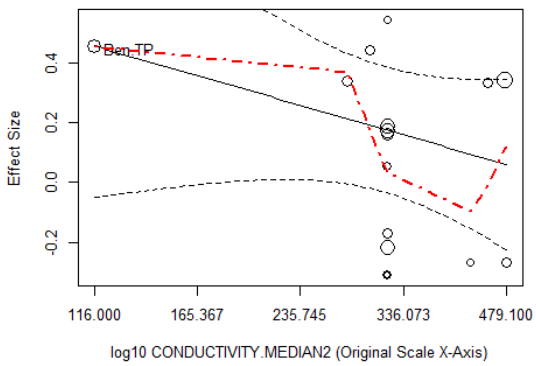


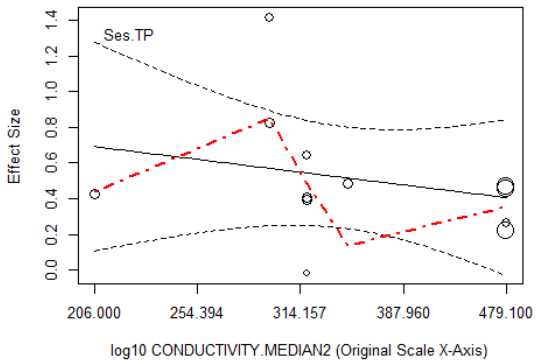




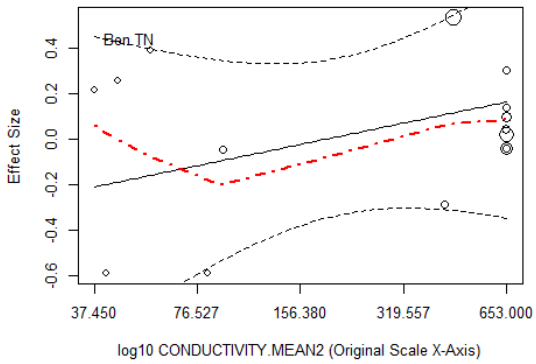

```
## [1] "Variable: CONDUCTIVITY.MEDIAN2.log10 || Plot: Ben.TN"
## [1] "Variable: CONDUCTIVITY.MEDIAN2.log10 || Plot: Ben.TP"
## [1] "Variable: CONDUCTIVITY.MEDIAN2.log10 || Plot: Ses.TN"
## [1] "Variable: CONDUCTIVITY.MEDIAN2.log10 || Plot: Ses.TP"
```

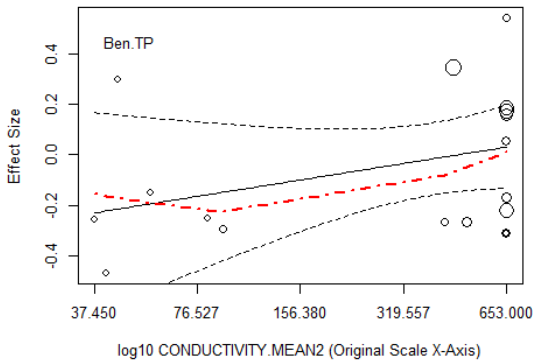


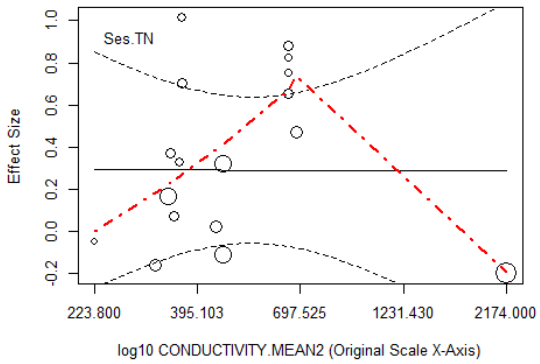


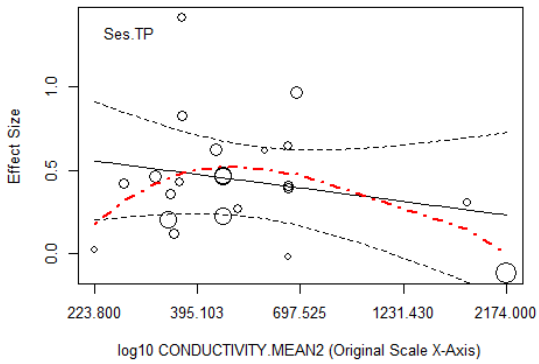



```
## [1] "Variable: CONDUCTIVITY.MEAN2.log10 || Plot: Ben.TN"
## [1] "Variable: CONDUCTIVITY.MEAN2.log10 || Plot: Ben.TP"
## [1] "Variable: CONDUCTIVITY.MEAN2.log10 || Plot: Ses.TN"
## [1] "Variable: CONDUCTIVITY.MEAN2.log10 || Plot: Ses.TP"
```

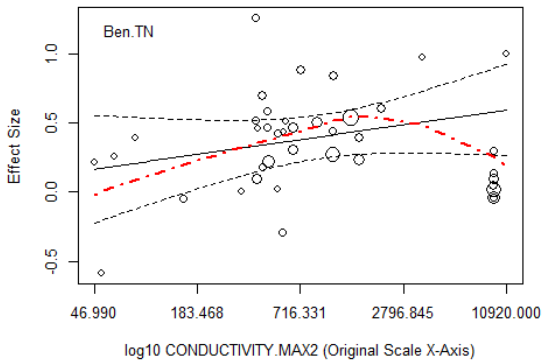


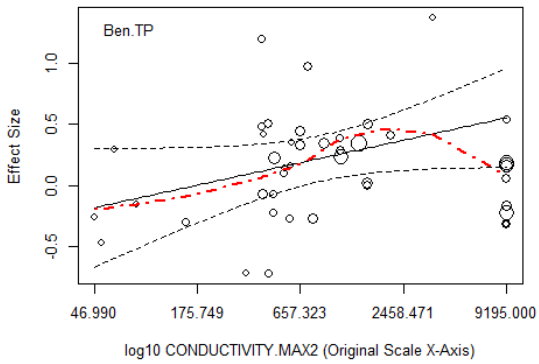


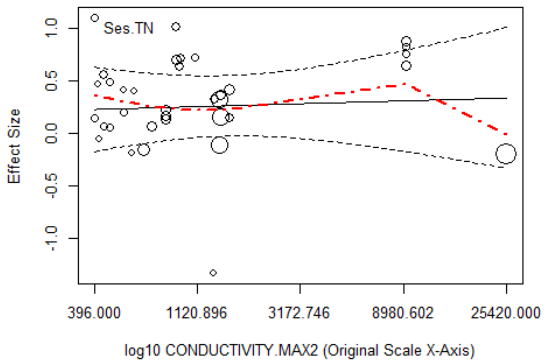


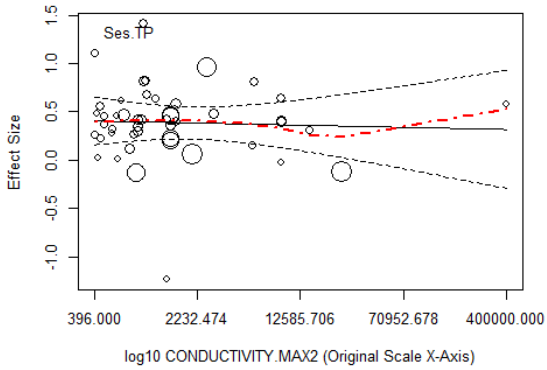



```
## [1] "Variable: CONDUCTIVITY.MAX2.log10 || Plot: Ben.TN"

## [1] "Variable: CONDUCTIVITY.MAX2.log10 || Plot: Ben.TP"

## [1] "Variable: CONDUCTIVITY.MAX2.log10 || Plot: Ses.TN"

## [1] "Variable: CONDUCTIVITY.MAX2.log10 || Plot: Ses.TP"
```

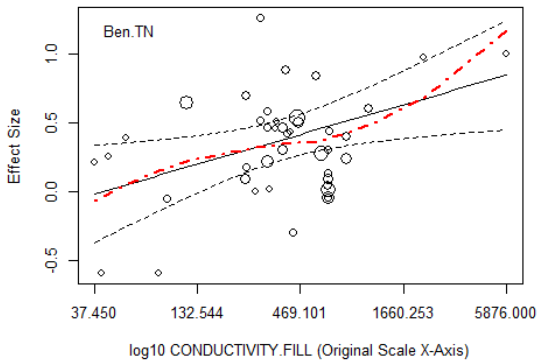


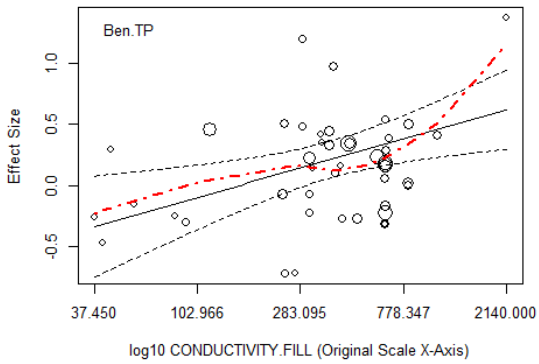


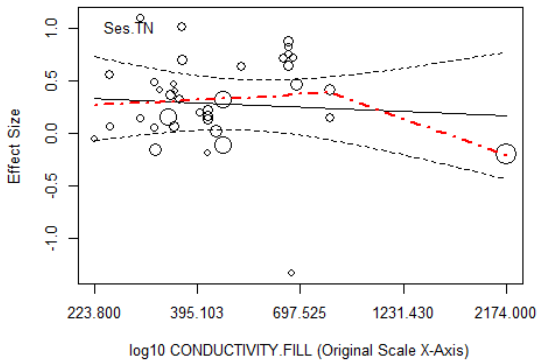


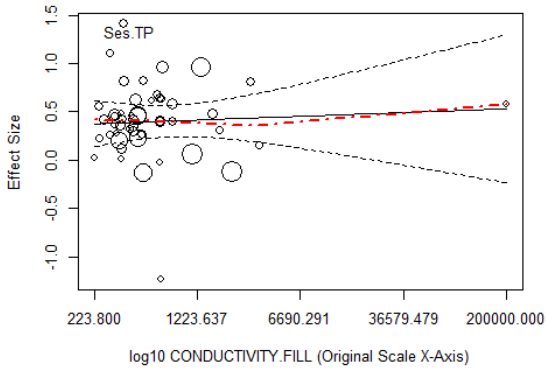



```
## [1] "Variable: CONDUCTIVITY.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: CONDUCTIVITY.FILL.log10 || Plot: Ben.TP"

## [1] "Variable: CONDUCTIVITY.FILL.log10 || Plot: Ses.TN"

## [1] "Variable: CONDUCTIVITY.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONDUCTIVITY.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MAX2 41   -0.135          0.409  -0.330
0.743
## log10CONDUCTIVITY.MAX2           41    0.180          0.135   1.334
0.190
##                                  CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MAX2   -0.962    0.693
## log10CONDUCTIVITY.MAX2             -0.093    0.453
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONDUCTIVITY.MEAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MEAN2 15   -0.686          0.829  -0.828
0.423
```

```
## log10CONDUCTIVITY.MEAN2           15    0.302          0.351   0.860
0.405
##                                  CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MEAN2   -2.476    1.104
## log10CONDUCTIVITY.MEAN2             -0.456    1.060
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONDUCTIVITY.MEDIAN2, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MEDIAN2 13    1.985          1.310   1.515
0.158
## log10CONDUCTIVITY.MEDIAN2           13   -0.664          0.528  -1.257
0.235
##                                    CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MEDIAN2   -0.898    4.868
## log10CONDUCTIVITY.MEDIAN2             -1.825    0.498
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONDUCTIVITY.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MIN2 41   -0.059          0.280  -0.212
0.833
## log10CONDUCTIVITY.MIN2           41    0.241          0.141   1.711
0.095
##                                 CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MIN2   -0.626    0.508
## log10CONDUCTIVITY.MIN2             -0.044    0.527
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONDUCTIVITY.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.FILL 43   -0.632          0.409  -1.546
0.130
## log10CONDUCTIVITY.FILL           43    0.392          0.155   2.525
0.016
##                                 CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.FILL   -1.458    0.194
## log10CONDUCTIVITY.FILL              0.078    0.705
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONDUCTIVITY.MAX2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MAX2 44   -0.716          0.523  -1.369
0.178
## log10CONDUCTIVITY.MAX2           44    0.321          0.175   1.833
0.074
##                                  CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MAX2   -1.771    0.339
## log10CONDUCTIVITY.MAX2             -0.032    0.673
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONDUCTIVITY.MEAN2, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MEAN2 18    -0.56          0.449  -1.247
0.230
## log10CONDUCTIVITY.MEAN2           18     0.21          0.171   1.228
0.237
##                                   CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MEAN2   -1.513    0.392
## log10CONDUCTIVITY.MEAN2             -0.153    0.573
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONDUCTIVITY.MEDIAN2, Decimals=3)
```

```
##                                       n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MEDIAN2 16    1.784          1.243   1.435
0.173
## log10CONDUCTIVITY.MEDIAN2           16   -0.643          0.496  -1.296
0.216
##                                     CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MEDIAN2   -0.882    4.449
## log10CONDUCTIVITY.MEDIAN2             -1.706    0.421
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONDUCTIVITY.MIN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MIN2 44   -0.553          0.298  -1.856
0.070
## log10CONDUCTIVITY.MIN2           44    0.385          0.154   2.509
0.016
##                                  CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MIN2   -1.154    0.048
## log10CONDUCTIVITY.MIN2              0.075    0.696
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONDUCTIVITY.FILL, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.FILL 46   -1.191          0.496  -2.402
0.021
## log10CONDUCTIVITY.FILL           46    0.544          0.190   2.865
0.006
##                                   CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.FILL   -2.190   -0.192
## log10CONDUCTIVITY.FILL              0.161    0.926
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONDUCTIVITY.MAX2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MAX2 35    0.074          0.775   0.096
0.924
## log10CONDUCTIVITY.MAX2           35    0.060          0.240   0.251
0.803
##                                   CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MAX2   -1.502    1.651
## log10CONDUCTIVITY.MAX2             -0.429    0.550
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONDUCTIVITY.MEAN2, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MEAN2 17    0.296          1.509   0.196
0.847
## log10CONDUCTIVITY.MEAN2           17   -0.002          0.550  -0.003
0.997
##                                    CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MEAN2   -2.920    3.511
## log10CONDUCTIVITY.MEAN2             -1.175    1.171
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONDUCTIVITY.MEDIAN2, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MEDIAN2 8    9.972          2.211    4.51
0.004
## log10CONDUCTIVITY.MEDIAN2           8   -3.681          0.862   -4.27
0.005
##                                      CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MEDIAN2    4.561   15.382
## log10CONDUCTIVITY.MEDIAN2             -5.791   -1.572
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONDUCTIVITY.MIN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MIN2 35   -0.262          0.318  -0.823
0.416
## log10CONDUCTIVITY.MIN2           35    0.323          0.176   1.835
0.075
##                                   CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MIN2   -0.908    0.385
## log10CONDUCTIVITY.MIN2             -0.035    0.681

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONDUCTIVITY.FILL, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.FILL 37    0.718          1.193   0.602
0.551
## log10CONDUCTIVITY.FILL           37   -0.164          0.438  -0.374
0.711
##                                   CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.FILL   -1.704    3.140
## log10CONDUCTIVITY.FILL             -1.052    0.725

print("ses.TP")

## [1] "ses.TP"

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONDUCTIVITY.MAX2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MAX2 47    0.484          0.430   1.126
0.266
## log10CONDUCTIVITY.MAX2           47   -0.030          0.127  -0.232
0.818
##                                   CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MAX2   -0.382    1.350
## log10CONDUCTIVITY.MAX2             -0.286    0.227

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONDUCTIVITY.MEAN2, Decimals=3)

##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MEAN2 22    1.327          0.973   1.364
0.188
## log10CONDUCTIVITY.MEAN2           22   -0.328          0.354  -0.927
0.365
```

```
##                                     CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MEAN2   -0.702    3.357
## log10CONDUCTIVITY.MEAN2             -1.067    0.410
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONDUCTIVITY.MEDIAN2, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MEDIAN2 12    2.499          2.622   0.953
0.363
## log10CONDUCTIVITY.MEDIAN2           12   -0.781          1.033  -0.756
0.467
##                                     CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MEDIAN2   -3.343    8.341
## log10CONDUCTIVITY.MEDIAN2             -3.082    1.520
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONDUCTIVITY.MIN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.MIN2 47    0.366          0.135   2.720
0.009
## log10CONDUCTIVITY.MIN2           47    0.012          0.064   0.187
0.852
##                                    CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.MIN2    0.095    0.638
## log10CONDUCTIVITY.MIN2             -0.116    0.140
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONDUCTIVITY.FILL, Decimals=3)
```

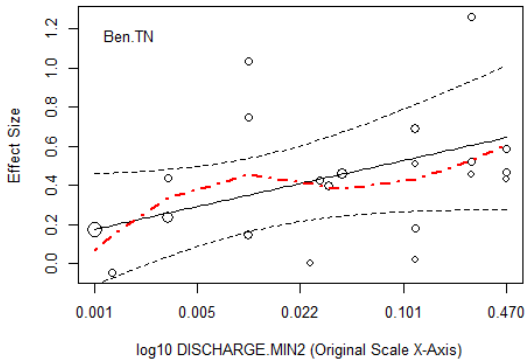
```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONDUCTIVITY.FILL 49    0.254          0.458   0.555
0.581
## log10CONDUCTIVITY.FILL           49    0.052          0.155   0.338
0.737
##                                    CI-Lower CI-Upper
## Intercept log10CONDUCTIVITY.FILL   -0.667    1.176
## log10CONDUCTIVITY.FILL             -0.260    0.365
```

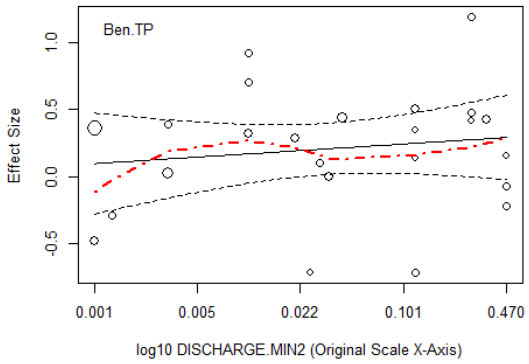
4.2.06 Discharge

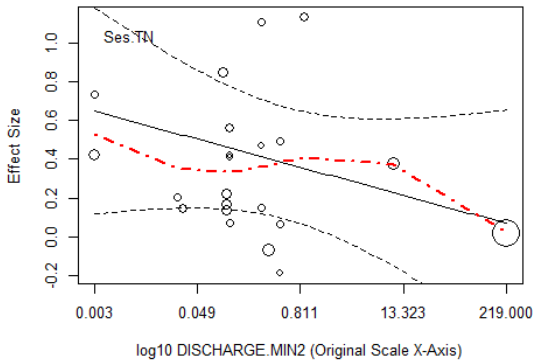
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("DISCHARGE.MIN2","DISCHARGE.MEAN2",
                      "DISCHARGE.MEDIAN2","DISCHARGE.MAX2",
"DISCHARGE.FILL"),ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

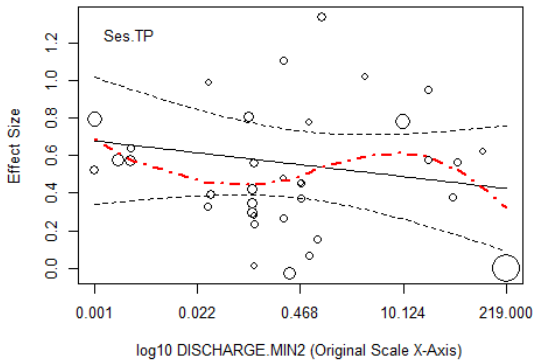
```
## [1] "Variable: DISCHARGE.MIN2.log10 || Plot: Ben.TN"
```

```
## [1] "Variable: DISCHARGE.MIN2.log10 || Plot: Ben.TP"
## [1] "Variable: DISCHARGE.MIN2.log10 || Plot: Ses.TN"
## [1] "Variable: DISCHARGE.MIN2.log10 || Plot: Ses.TP"
```



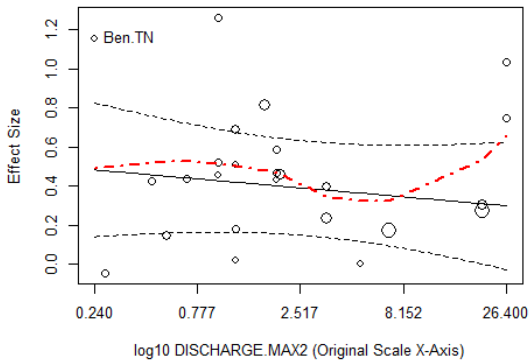


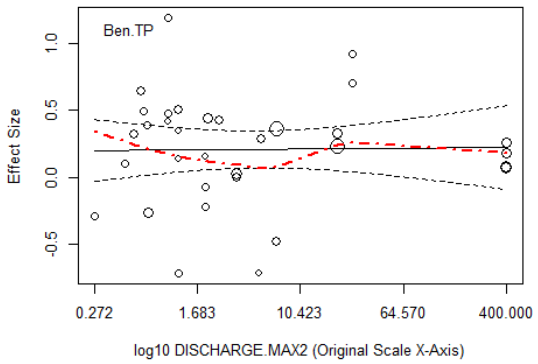


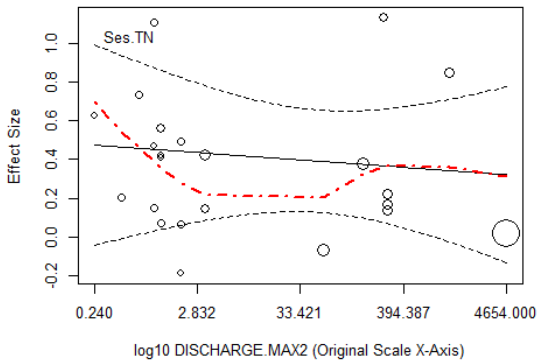


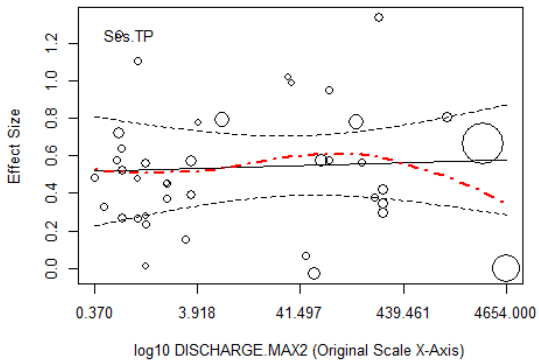

```
## [1] "Variable: DISCHARGE.MEAN2.log10 || Plot: Ben.TN"
## [1] "Variable: DISCHARGE.MEAN2.log10 || Plot: Ben.TP"
## [1] "Variable: DISCHARGE.MEAN2.log10 || Plot: Ses.TN"
## [1] "Variable: DISCHARGE.MEAN2.log10 || Plot: Ses.TP"
## [1] "Variable: DISCHARGE.MEDIAN2.log10 || Plot: Ben.TN"
## [1] "Variable: DISCHARGE.MEDIAN2.log10 || Plot: Ben.TP"
## [1] "Variable: DISCHARGE.MEDIAN2.log10 || Plot: Ses.TN"
## [1] "Variable: DISCHARGE.MEDIAN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: DISCHARGE.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: DISCHARGE.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: DISCHARGE.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: DISCHARGE.MAX2.log10 || Plot: Ses.TP"
```

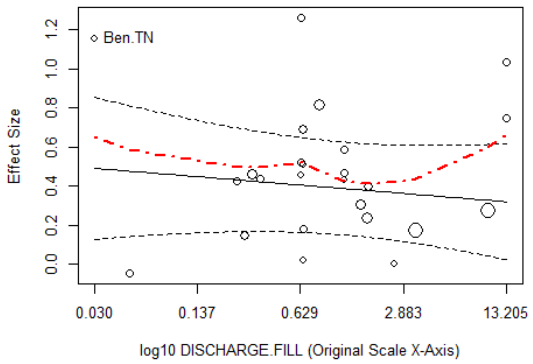


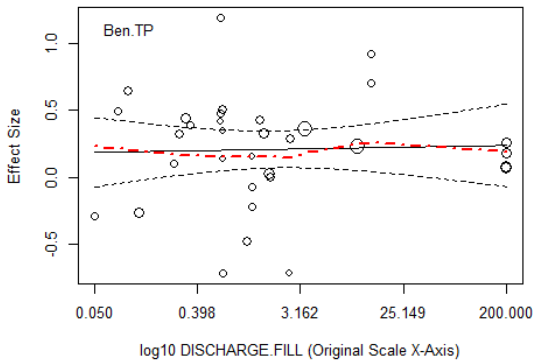


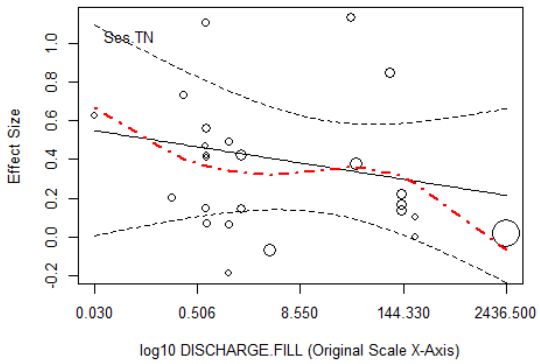


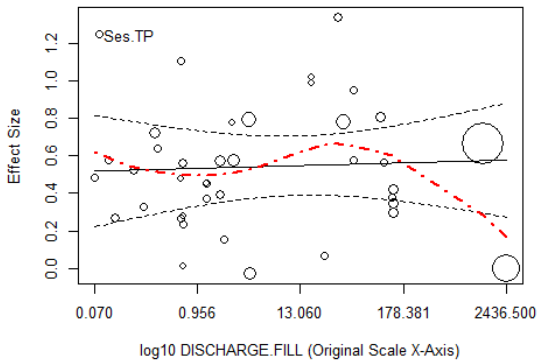



```
## [1] "Variable: DISCHARGE.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: DISCHARGE.FILL.log10 || Plot: Ben.TP"

## [1] "Variable: DISCHARGE.FILL.log10 || Plot: Ses.TN"

## [1] "Variable: DISCHARGE.FILL.log10 || Plot: Ses.TP"
```










```r
print("ben.TN")
```

```
## [1] "ben.TN"
```

```r
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DISCHARGE.MAX2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MAX2 25    0.427          0.127   3.372   0.003
## log10DISCHARGE.MAX2           25   -0.090          0.109  -0.824   0.419
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.MAX2    0.165    0.690
## log10DISCHARGE.MAX2             -0.315    0.136
```

```r
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DISCHARGE.MEAN2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MEAN2 4    0.244          0.406   0.601   0.609
## log10DISCHARGE.MEAN2           4   -0.215          0.258  -0.835   0.492
##                                CI-Lower CI-Upper
## Intercept log10DISCHARGE.MEAN2   -1.504    1.992
## log10DISCHARGE.MEAN2             -1.324    0.894
```

```
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DISCHARGE.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DISCHARGE.MIN2, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MIN2 25    0.509          0.161   3.165   0.004
## log10DISCHARGE.MIN2           25    0.046          0.044   1.048   0.306
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.MIN2    0.176    0.842
## log10DISCHARGE.MIN2             -0.045    0.137

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DISCHARGE.FILL, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.FILL 25    0.393          0.115   3.419   0.002
## log10DISCHARGE.FILL           25   -0.065          0.083  -0.781   0.443
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.FILL    0.155    0.631
## log10DISCHARGE.FILL             -0.236    0.106

print("ben.TP")

## [1] "ben.TP"

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DISCHARGE.MAX2, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MAX2 33    0.205          0.084   2.431   0.021
## log10DISCHARGE.MAX2           33    0.007          0.072   0.101   0.921
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.MAX2    0.033    0.377
## log10DISCHARGE.MAX2             -0.140    0.155

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DISCHARGE.MEAN2, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MEAN2 7    0.080          0.288   0.276   0.794
## log10DISCHARGE.MEAN2           7   -0.065          0.347  -0.189   0.858
##                                CI-Lower CI-Upper
## Intercept log10DISCHARGE.MEAN2   -0.662    0.821
## log10DISCHARGE.MEAN2             -0.958    0.827

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DISCHARGE.MEDIAN2, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MEDIAN2 4    0.146          0.572   0.255   0.822
## log10DISCHARGE.MEDIAN2           4   -0.045          0.523  -0.085   0.940
```

```
##                                  CI-Lower CI-Upper
## Intercept log10DISCHARGE.MEDIAN2   -2.315    2.607
## log10DISCHARGE.MEDIAN2             -2.293    2.204
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DISCHARGE.MIN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MIN2 33    0.249          0.123   2.015   0.053
## log10DISCHARGE.MIN2           33    0.016          0.042   0.376   0.710
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.MIN2   -0.003    0.500
## log10DISCHARGE.MIN2             -0.070    0.101
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DISCHARGE.FILL, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.FILL 33    0.206          0.071   2.915   0.007
## log10DISCHARGE.FILL           33    0.015          0.068   0.215   0.831
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.FILL    0.062    0.349
## log10DISCHARGE.FILL             -0.124    0.153
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DISCHARGE.MAX2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MAX2 23    0.452          0.203   2.233   0.037
## log10DISCHARGE.MAX2           23   -0.035          0.091  -0.388   0.702
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.MAX2    0.031    0.873
## log10DISCHARGE.MAX2             -0.225    0.155
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DISCHARGE.MEAN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MEAN2 7    0.470          0.301   1.564   0.179
## log10DISCHARGE.MEAN2           7    0.015          0.181   0.083   0.937
##                                CI-Lower CI-Upper
## Intercept log10DISCHARGE.MEAN2   -0.303    1.243
## log10DISCHARGE.MEAN2             -0.452    0.482
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DISCHARGE.MEDIAN2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MEDIAN2 2    0.777          0.149   5.209   0.121
## log10DISCHARGE.MEDIAN2           2    0.074          0.124   0.600   0.656
##                                 CI-Lower CI-Upper
## Intercept log10DISCHARGE.MEDIAN2   -1.118    2.672
## log10DISCHARGE.MEDIAN2             -1.502    1.651
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DISCHARGE.MIN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MIN2 23    0.341          0.128   2.662   0.015
## log10DISCHARGE.MIN2           23   -0.090          0.070  -1.289   0.211
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.MIN2    0.075    0.608
## log10DISCHARGE.MIN2             -0.236    0.055
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DISCHARGE.FILL, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.FILL 25    0.446          0.157   2.846   0.009
## log10DISCHARGE.FILL           25   -0.068          0.086  -0.797   0.434
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.FILL    0.122    0.770
## log10DISCHARGE.FILL             -0.245    0.109
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DISCHARGE.MAX2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MAX2 40    0.525          0.124   4.247   0.000
## log10DISCHARGE.MAX2           40    0.015          0.059   0.248   0.806
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.MAX2    0.275    0.775
## log10DISCHARGE.MAX2             -0.106    0.135
```

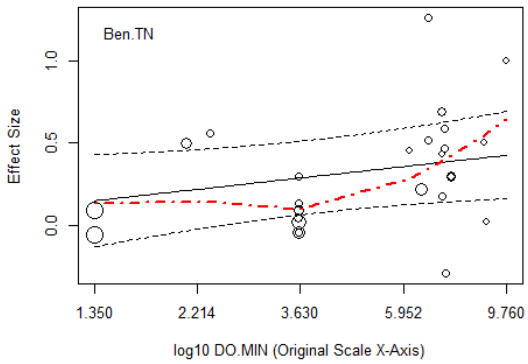
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DISCHARGE.MEAN2, Decimals=3)
```

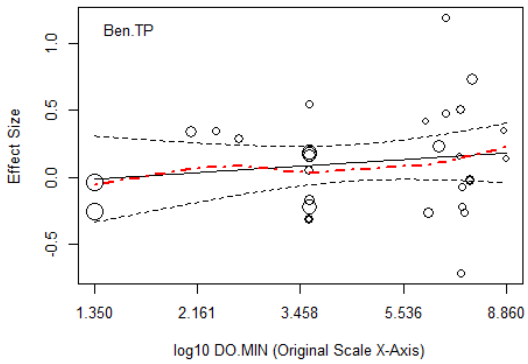
```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MEAN2 10    0.598          0.143   4.170   0.003
## log10DISCHARGE.MEAN2           10    0.112          0.118   0.951   0.370
##                                CI-Lower CI-Upper
## Intercept log10DISCHARGE.MEAN2    0.267    0.929
## log10DISCHARGE.MEAN2             -0.160    0.385
```

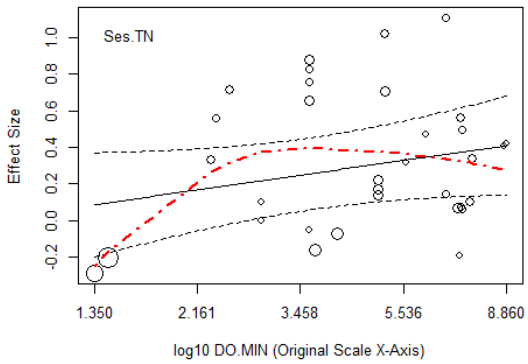
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DISCHARGE.MEDIAN2, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MEDIAN2 4    0.738          0.298   2.480   0.131
## log10DISCHARGE.MEDIAN2           4    0.082          0.248   0.331   0.772
##                                  CI-Lower CI-Upper
## Intercept log10DISCHARGE.MEDIAN2   -0.542    2.018
## log10DISCHARGE.MEDIAN2             -0.983    1.147

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DISCHARGE.MIN2, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.MIN2 41    0.528          0.081   6.486   0.000
## log10DISCHARGE.MIN2           41   -0.019          0.033  -0.587   0.561
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.MIN2    0.363    0.693
## log10DISCHARGE.MIN2             -0.085    0.047

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DISCHARGE.FILL, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10DISCHARGE.FILL 40    0.534          0.099   5.400   0.000
## log10DISCHARGE.FILL           40    0.013          0.056   0.233   0.817
##                               CI-Lower CI-Upper
## Intercept log10DISCHARGE.FILL    0.334    0.734
## log10DISCHARGE.FILL             -0.100    0.126
```

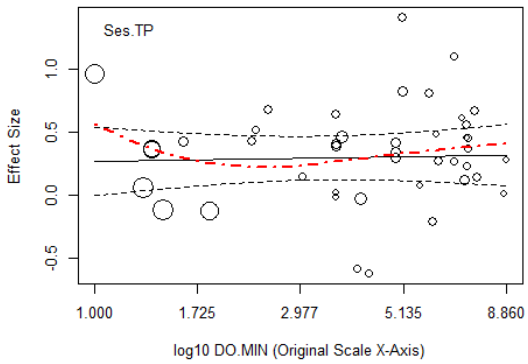
4.2.07 DO

```
## This plot creates grid for each of the 4 subsets in base R plotting style
plotMods2_Grid(Folder='Plots',DF=chl_zcor,

Vars=c("DO.MIN","DO..MEAN","DO..MEDIAN","DO..MAX","DO.FILL"),ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)

## [1] "Variable: DO.MIN.log10 || Plot: Ben.TN"

## [1] "Variable: DO.MIN.log10 || Plot: Ben.TP"

## [1] "Variable: DO.MIN.log10 || Plot: Ses.TN"

## [1] "Variable: DO.MIN.log10 || Plot: Ses.TP"
```

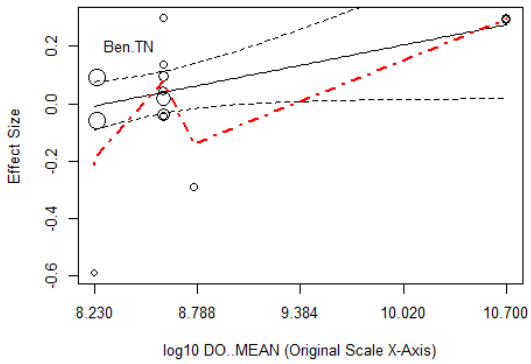


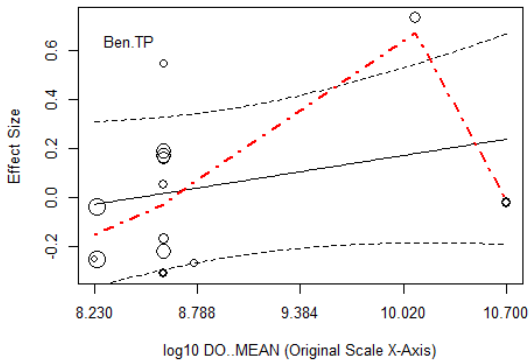


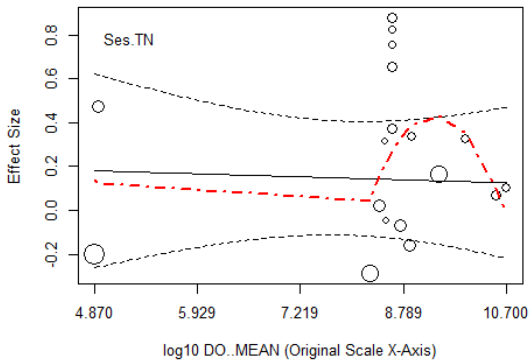


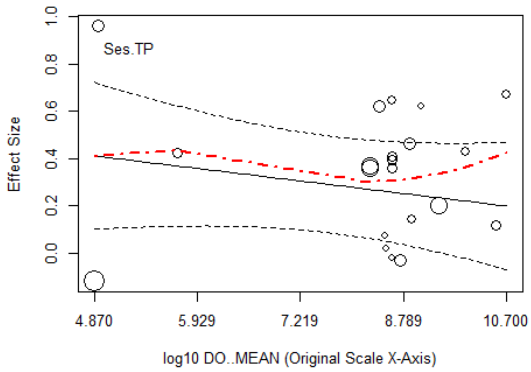



```
## [1] "Variable: DO..MEAN.log10 || Plot: Ben.TN"
## [1] "Variable: DO..MEAN.log10 || Plot: Ben.TP"
## [1] "Variable: DO..MEAN.log10 || Plot: Ses.TN"
## [1] "Variable: DO..MEAN.log10 || Plot: Ses.TP"
```

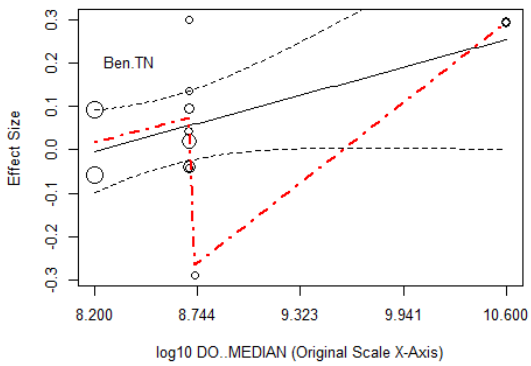


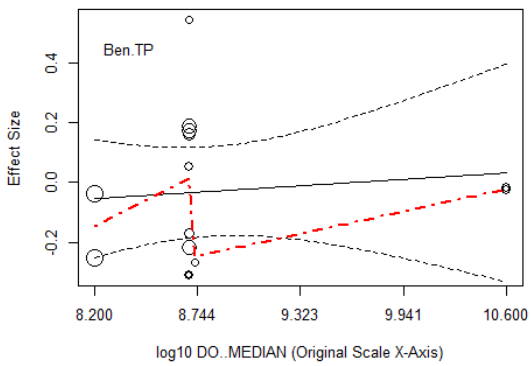




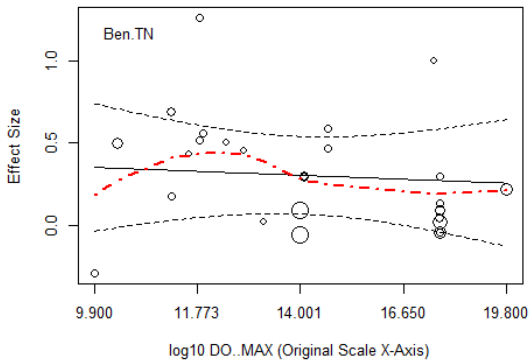


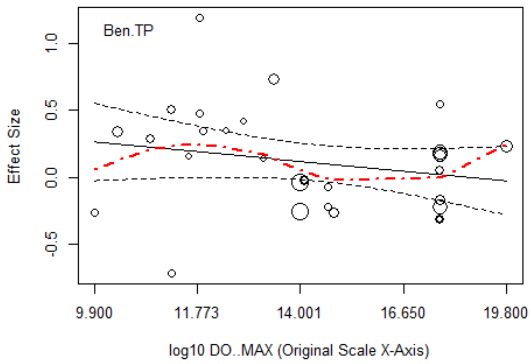

```
## [1] "Variable: DO..MEDIAN.log10 || Plot: Ben.TN"
## [1] "Variable: DO..MEDIAN.log10 || Plot: Ben.TP"
## [1] "Variable: DO..MEDIAN.log10 || Plot: Ses.TN"
## [1] "Variable: DO..MEDIAN.log10 || Plot: Ses.TP"
```

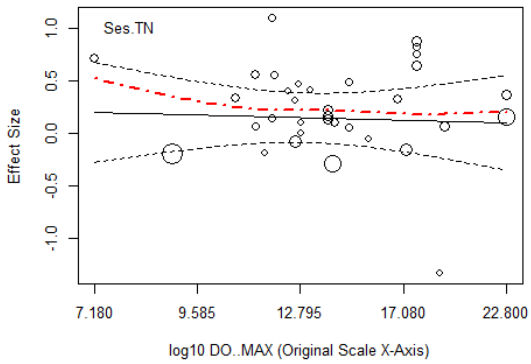


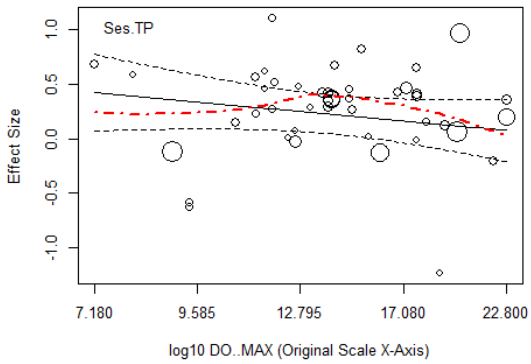



```
## [1] "Variable: DO..MAX.log10 || Plot: Ben.TN"
## [1] "Variable: DO..MAX.log10 || Plot: Ben.TP"
## [1] "Variable: DO..MAX.log10 || Plot: Ses.TN"
## [1] "Variable: DO..MAX.log10 || Plot: Ses.TP"
```

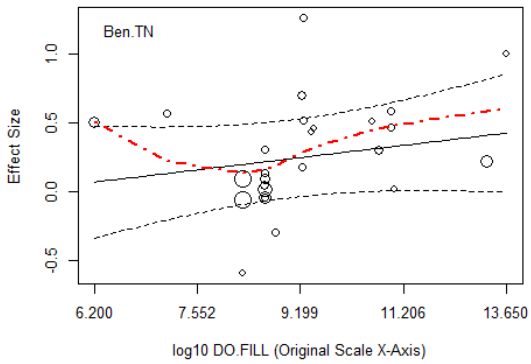


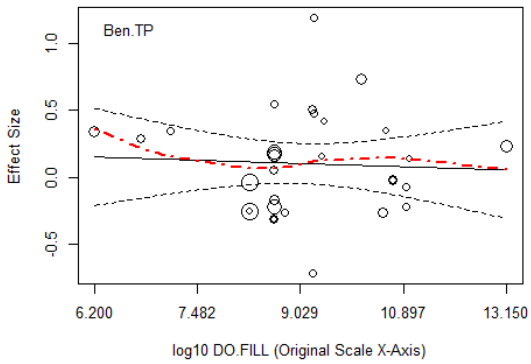


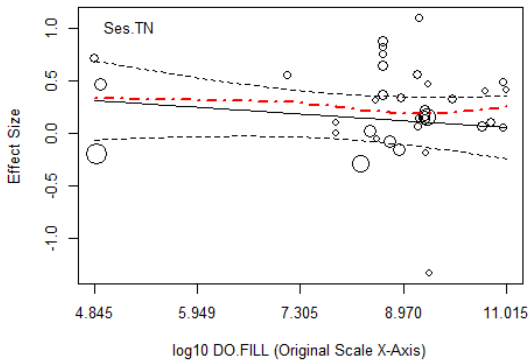


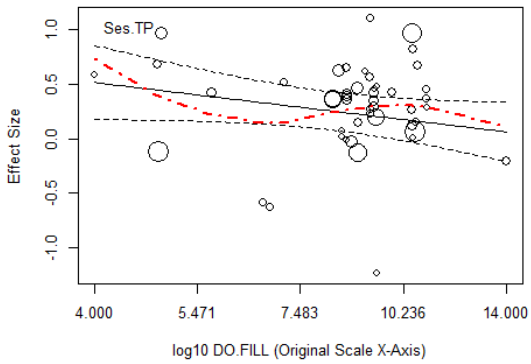



```
## [1] "Variable: DO.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: DO.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: DO.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: DO.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~log10DO.MIN,
Decimals=3 )
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO.MIN 26     0.11          0.150   0.734   0.470    -0.20
## log10DO.MIN           26     0.32          0.175   1.834   0.079    -0.04
##                          CI-Upper
## Intercept log10DO.MIN    0.420
## log10DO.MIN              0.681
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DO..MEAN, Decimals=3 )
```

```
##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10DO..MEAN 13   -2.285          1.078  -2.121   0.057   -
4.657
## log10DO..MEAN           13    2.488          1.156   2.153   0.054   -
0.056
##                          CI-Upper
```

```
## Intercept log10DO..MEAN    0.086
## log10DO..MEAN              5.031
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DO..MEDIAN, Decimals=3 )
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10DO..MEDIAN 12   -2.123          1.114  -1.906   0.086   -
4.605
## log10DO..MEDIAN           12    2.319          1.192   1.946   0.080   -
0.337
##                           CI-Upper
## Intercept log10DO..MEDIAN    0.359
## log10DO..MEDIAN              4.975
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~log10DO..MAX,
Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO..MAX 26    0.669          1.130   0.592    0.56   -1.664
## log10DO..MAX           26   -0.316          0.981  -0.322    0.75   -2.341
##                          CI-Upper
## Intercept log10DO..MAX    3.002
## log10DO..MAX              1.709
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~log10DO.FILL,
Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO.FILL 27   -0.749          0.848  -0.884   0.385   -2.496
## log10DO.FILL           27    1.034          0.876   1.181   0.249   -0.770
##                          CI-Upper
## Intercept log10DO.FILL    0.997
## log10DO.FILL              2.838
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~log10DO.MIN,
Decimals=3 )
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO.MIN 30   -0.045          0.191  -0.234   0.817   -0.436
## log10DO.MIN           30    0.239          0.280   0.855   0.400   -0.334
##                         CI-Upper
## Intercept log10DO.MIN    0.347
## log10DO.MIN              0.812
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DO..MEAN, Decimals=3 )
```

```
##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10DO..MEAN 16   -2.164          1.780  -1.216   0.244   -
5.981
## log10DO..MEAN           16    2.333          1.861   1.253   0.231   -
1.660
##                          CI-Upper
## Intercept log10DO..MEAN    1.653
## log10DO..MEAN              6.325
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DO..MEDIAN, Decimals=3 )
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10DO..MEDIAN 14   -0.758          1.790  -0.423   0.679   -
4.658
## log10DO..MEDIAN           14    0.771          1.893   0.407   0.691   -
3.354
##                            CI-Upper
## Intercept log10DO..MEDIAN    3.142
## log10DO..MEDIAN              4.895
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~log10DO..MAX,
Decimals=3)
```

```
##                           n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO..MAX 30    1.223          0.895   1.367   0.183    -0.610
## log10DO..MAX           30   -0.963          0.771  -1.249   0.222    -2.541
##                          CI-Upper
## Intercept log10DO..MAX    3.056
## log10DO..MAX              0.616
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~log10DO.FILL,
Decimals=3)
```

```
##                           n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO.FILL 31    0.386          0.951   0.406   0.687    -1.558
## log10DO.FILL           31   -0.295          0.992  -0.298   0.768    -2.324
##                          CI-Upper
## Intercept log10DO.FILL    2.331
## log10DO.FILL              1.734
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~log10DO.MIN,
Decimals=3 )
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO.MIN 37    0.201          0.119   1.690   0.100    -0.040
```

```
## log10DO.MIN           37   -0.003          0.032  -0.103   0.919   -0.068
##                       CI-Upper
## Intercept log10DO.MIN    0.443
## log10DO.MIN              0.061
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DO..MEAN, Decimals=3 )
```

```
##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10DO..MEAN 19    0.292          0.739   0.395   0.698   -
1.267
## log10DO..MEAN           19   -0.161          0.812  -0.198   0.845   -
1.874
##                         CI-Upper
## Intercept log10DO..MEAN    1.850
## log10DO..MEAN              1.552
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DO..MEDIAN, Decimals=3 )
```

```
##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10DO..MEDIAN 8   -3.021          1.527  -1.978   0.095   -
6.758
## log10DO..MEDIAN           8    3.553          1.615   2.200   0.070   -
0.399
##                           CI-Upper
## Intercept log10DO..MEDIAN    0.717
## log10DO..MEDIAN              7.505
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~log10DO..MAX,
Decimals=3)
```

```
##                         n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO..MAX 35    0.373          0.887   0.420   0.677   -1.432
## log10DO..MAX           35   -0.199          0.788  -0.252   0.803   -1.802
##                        CI-Upper
## Intercept log10DO..MAX    2.177
## log10DO..MAX              1.405
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~log10DO.FILL,
Decimals=3)
```

```
##                         n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO.FILL 37    0.811          0.653   1.242   0.223   -0.515
## log10DO.FILL           37   -0.721          0.717  -1.006   0.321   -2.177
##                        CI-Upper
## Intercept log10DO.FILL    2.137
## log10DO.FILL              0.734
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~log10DO.MIN,
Decimals=3 )
```

```
##                         n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO.MIN 47    0.260          0.089   2.915   0.006    0.080
## log10DO.MIN           47    0.027          0.022   1.210   0.233   -0.018
##                         CI-Upper
## Intercept log10DO.MIN    0.439
## log10DO.MIN              0.071
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DO..MEAN, Decimals=3 )
```

```
##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10DO..MEAN 21    0.838          0.513   1.633   0.119   -
0.236
## log10DO..MEAN           21   -0.620          0.570  -1.088   0.290   -
1.813
##                          CI-Upper
## Intercept log10DO..MEAN    1.911
## log10DO..MEAN              0.573
```

```
#extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~DO..MEDIAN,
Decimals=3 )
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~log10DO..MAX,
Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO..MAX 45    1.009          0.600   1.682   0.100   -0.201
## log10DO..MAX           45   -0.688          0.519  -1.325   0.192   -1.735
##                          CI-Upper
## Intercept log10DO..MAX    2.220
## log10DO..MAX              0.359
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~log10DO.FILL,
Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10DO.FILL 47    1.012          0.428   2.367   0.022    0.151
## log10DO.FILL           47   -0.829          0.456  -1.820   0.075   -1.747
##                          CI-Upper
## Intercept log10DO.FILL    1.873
## log10DO.FILL              0.089
```

4.2.08 DOC

```
print("insufficient data")
```

```
## [1] "insufficient data"
```

```
#plotMods2_Grid(Folder='Plots',DF=chl_zcor,
#                Vars=c("DOC.MIN2","DOC.MEDIAN2","DOC.MEAN2","DOC.MAX2"),
#                ModTransform='log10',
#                StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)

#print("ben.TN")
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DOC.MEAN2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DOC.MEDIAN2, Decimals=3)
#extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DOC.MAX2, Decimals=3)
#extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10DOC.MIN2, Decimals=3)

#print("ben.TP")
#extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DOC.MAX2, #Decimals=3)
#extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DOC.MIN2, #Decimals=3)
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DOC.MEAN2, #Decimals=3)
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10DOC.MEDIAN2, Decimals=3)

#print("ses.TN")
#extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DOC.MAX2, Decimals=3)
#extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DOC.MIN2, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DOC.MEAN2, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10DOC.MEDIAN2, Decimals=3)

#print("ses.TP")
#extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DOC.MAX2, Decimals=3)
#extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DOC.MIN2, Decimals=3)
# extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DOC.MEAN2, Decimals=3)
# extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10DOC.MEDIAN2, Decimals=3)
```

4.2.09 Effect (Chlorophyll)

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("CONV.EFFECT.MIN","CONV.EFFECT.MEAN",
                      "CONV.EFFECT.MEDIAN","CONV.EFFECT.MAX"),
```

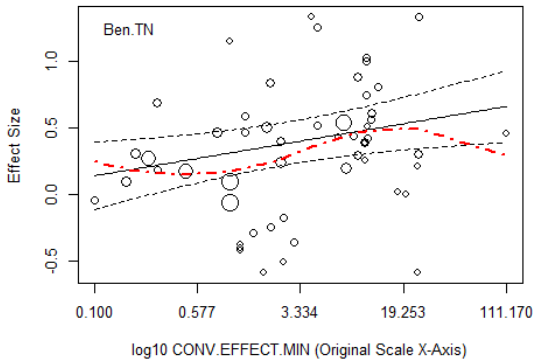
```
              ModTransform='log10',
              StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

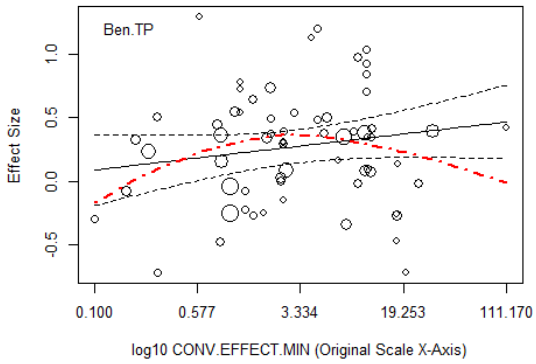
```
## [1] "Variable: CONV.EFFECT.MIN.log10 || Plot: Ben.TN"
```

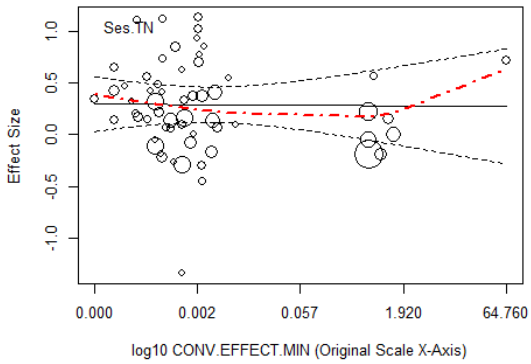
```
## [1] "Variable: CONV.EFFECT.MIN.log10 || Plot: Ben.TP"
```

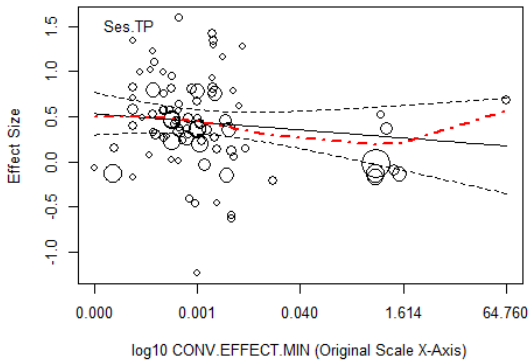
```
## [1] "Variable: CONV.EFFECT.MIN.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: CONV.EFFECT.MIN.log10 || Plot: Ses.TP"
```







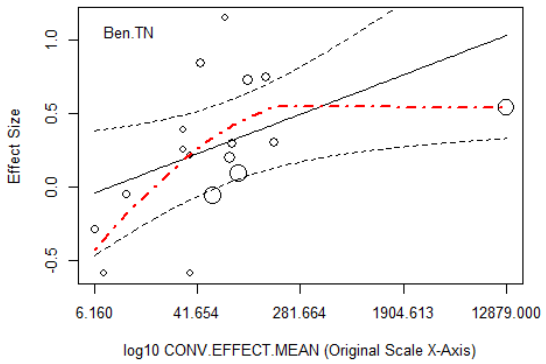


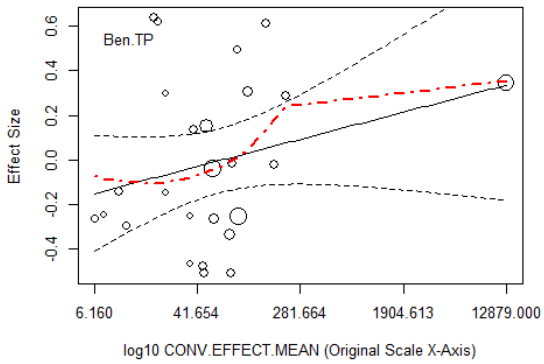

```
## [1] "Variable: CONV.EFFECT.MEAN.log10 || Plot: Ben.TN"
```

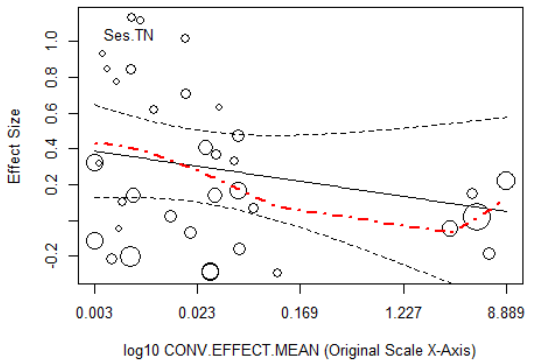
```
## [1] "Variable: CONV.EFFECT.MEAN.log10 || Plot: Ben.TP"
```

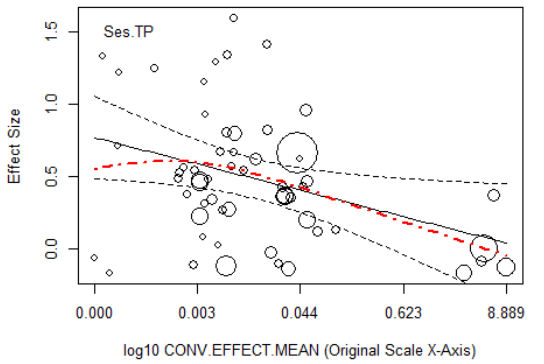
```
## [1] "Variable: CONV.EFFECT.MEAN.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: CONV.EFFECT.MEAN.log10 || Plot: Ses.TP"
```

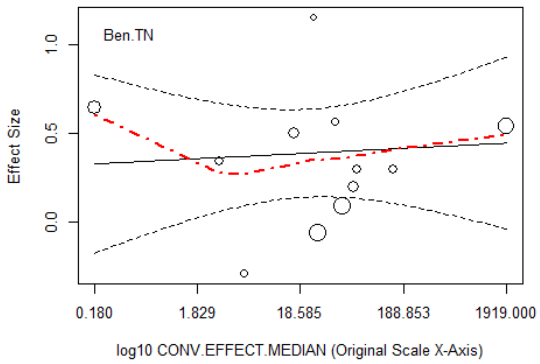


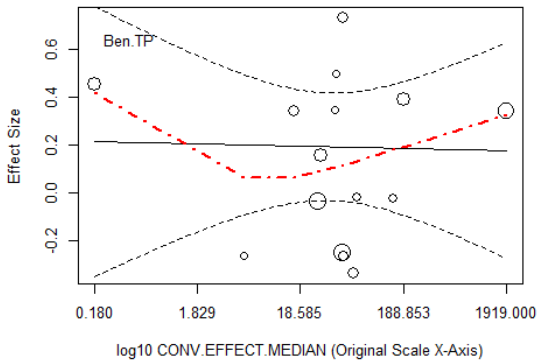


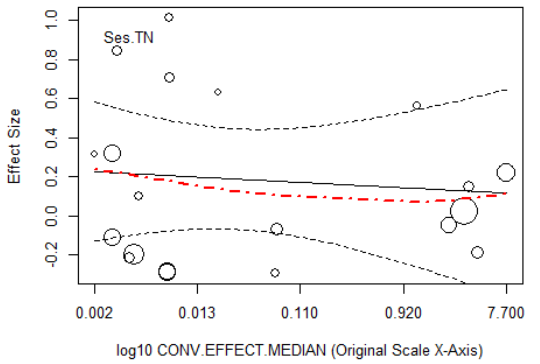


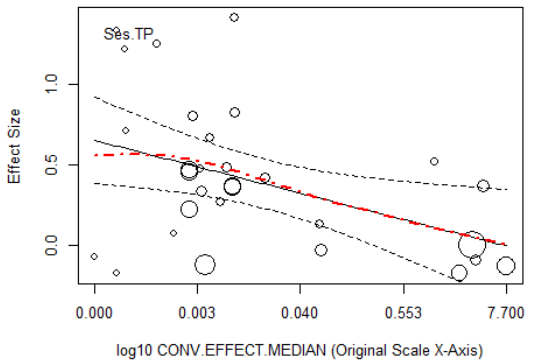



```
## [1] "Variable: CONV.EFFECT.MEDIAN.log10 || Plot: Ben.TN"

## [1] "Variable: CONV.EFFECT.MEDIAN.log10 || Plot: Ben.TP"

## [1] "Variable: CONV.EFFECT.MEDIAN.log10 || Plot: Ses.TN"

## [1] "Variable: CONV.EFFECT.MEDIAN.log10 || Plot: Ses.TP"
```

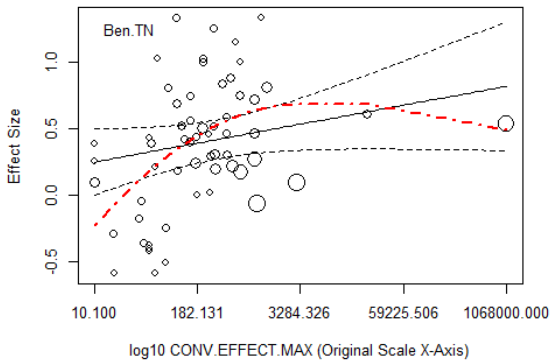


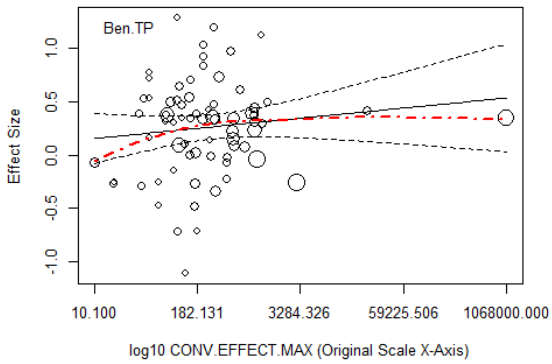


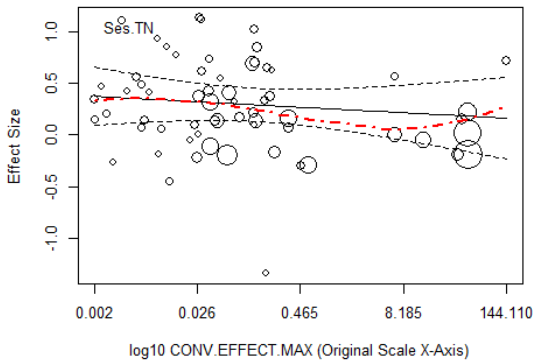


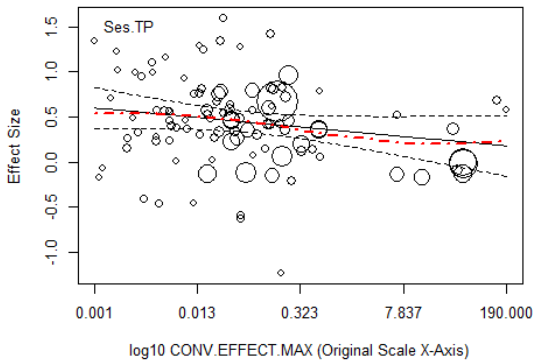



```
## [1] "Variable: CONV.EFFECT.MAX.log10 || Plot: Ben.TN"
## [1] "Variable: CONV.EFFECT.MAX.log10 || Plot: Ben.TP"
## [1] "Variable: CONV.EFFECT.MAX.log10 || Plot: Ses.TN"
## [1] "Variable: CONV.EFFECT.MAX.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.EFFECT.MIN, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MIN 61    0.428          0.080   5.347    0.00
## log10CONV.EFFECT.MIN           61    0.010          0.026   0.373    0.71
##                                CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MIN    0.268    0.589
## log10CONV.EFFECT.MIN             -0.042    0.061
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.EFFECT.MEAN, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MEAN 17   -0.299          0.288  -1.039   0.315
## log10CONV.EFFECT.MEAN           17    0.323          0.136   2.379   0.031
##                                 CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MEAN   -0.914    0.315
## log10CONV.EFFECT.MEAN              0.034    0.613
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.EFFECT.MEDIAN, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONV.EFFECT.MEDIAN 12    0.350          0.167   2.089
0.063
## log10CONV.EFFECT.MEDIAN           12    0.029          0.095   0.306
0.766
##                                   CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MEDIAN   -0.023    0.723
## log10CONV.EFFECT.MEDIAN             -0.183    0.241
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10CONV.EFFECT.MAX, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MAX 61    0.136          0.183   0.740   0.462
## log10CONV.EFFECT.MAX           61    0.114          0.066   1.715   0.092
##                                  CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MAX   -0.231    0.502
## log10CONV.EFFECT.MAX             -0.019    0.246
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.EFFECT.MIN, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MIN 71    0.270          0.058   4.659   0.000
## log10CONV.EFFECT.MIN           71    0.019          0.032   0.591   0.556
##                                  CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MIN    0.154    0.385
## log10CONV.EFFECT.MIN             -0.046    0.084
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.EFFECT.MEAN, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MEAN 26   -0.269          0.201  -1.335   0.195
## log10CONV.EFFECT.MEAN           26    0.147          0.105   1.406   0.173
##                                   CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MEAN   -0.684    0.147
## log10CONV.EFFECT.MEAN             -0.069    0.363
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.EFFECT.MEDIAN, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
```

```
## Intercept log10CONV.EFFECT.MEDIAN 15    0.206          0.193   1.068
0.305
## log10CONV.EFFECT.MEDIAN           15   -0.009          0.105  -0.090
0.929
##                                   CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MEDIAN   -0.211    0.624
## log10CONV.EFFECT.MEDIAN             -0.236    0.217
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10CONV.EFFECT.MAX, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MAX 71    0.080          0.182   0.442    0.66
## log10CONV.EFFECT.MAX           71    0.076          0.070   1.088    0.28
##                                CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MAX   -0.282    0.443
## log10CONV.EFFECT.MAX             -0.063    0.214
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.EFFECT.MIN, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MIN 65    0.277          0.164   1.684   0.097
## log10CONV.EFFECT.MIN           65   -0.001          0.050  -0.017   0.986
##                                CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MIN   -0.052    0.605
## log10CONV.EFFECT.MIN             -0.100    0.099
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.EFFECT.MEAN, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MEAN 36    0.143          0.181   0.794   0.433
## log10CONV.EFFECT.MEAN           36   -0.098          0.093  -1.057   0.298
##                                 CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MEAN   -0.224     0.51
## log10CONV.EFFECT.MEAN             -0.286     0.09
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.EFFECT.MEDIAN, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10CONV.EFFECT.MEDIAN 20    0.142          0.186   0.764
0.455
## log10CONV.EFFECT.MEDIAN           20   -0.030          0.091  -0.324
0.750
##                                   CI-Lower CI-Upper
```

```
## Intercept log10CONV.EFFECT.MEDIAN   -0.248    0.532
## log10CONV.EFFECT.MEDIAN             -0.221    0.162
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10CONV.EFFECT.MAX, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MAX 64    0.254          0.096   2.660   0.010
## log10CONV.EFFECT.MAX           64   -0.042          0.059  -0.713   0.478
##                                CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MAX    0.063    0.446
## log10CONV.EFFECT.MAX             -0.160    0.076
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.EFFECT.MIN, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MIN 105    0.303          0.147   2.059   0.042
## log10CONV.EFFECT.MIN           105   -0.040          0.042  -0.953   0.343
##                                CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MIN    0.011    0.595
## log10CONV.EFFECT.MIN             -0.124    0.044
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.EFFECT.MEAN, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MEAN 58    0.189          0.144   1.311   0.195
## log10CONV.EFFECT.MEAN           58   -0.158          0.068  -2.312   0.024
##                                 CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MEAN   -0.100    0.478
## log10CONV.EFFECT.MEAN             -0.295   -0.021
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.EFFECT.MEDIAN, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10CONV.EFFECT.MEDIAN 30    0.125          0.127   0.985
0.333
## log10CONV.EFFECT.MEDIAN           30   -0.143          0.057  -2.502
0.018
##                                   CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MEDIAN   -0.135    0.386
## log10CONV.EFFECT.MEDIAN             -0.260   -0.026
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10CONV.EFFECT.MAX, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10CONV.EFFECT.MAX 104    0.352          0.079   4.441   0.000
## log10CONV.EFFECT.MAX           104   -0.076          0.046  -1.646   0.103
##                                CI-Lower CI-Upper
## Intercept log10CONV.EFFECT.MAX    0.195    0.509
## log10CONV.EFFECT.MAX             -0.168    0.016
```

4.2.10 Elevation

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("ELEV.MIN2","ELEV.MAX2"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: ELEV.MIN2.log10 || Plot: Ben.TN"

## [1] "Variable: ELEV.MIN2.log10 || Plot: Ben.TP"

## [1] "Variable: ELEV.MIN2.log10 || Plot: Ses.TN"

## [1] "Variable: ELEV.MIN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: ELEV.MAX2.log10 || Plot: Ben.TN"

## [1] "Variable: ELEV.MAX2.log10 || Plot: Ben.TP"
```

```
## [1] "Variable: ELEV.MAX2.log10 || Plot: Ses.TN"

## [1] "Variable: ELEV.MAX2.log10 || Plot: Ses.TP"
```

```
print("ben.TN")

## [1] "ben.TN"

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10ELEV.MAX2, Decimals=3)

##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10ELEV.MAX2 9    1.255          0.957   1.312   0.231   -
1.007
## log10ELEV.MAX2           9   -0.275          0.292  -0.942   0.377   -
0.967
##                          CI-Upper
## Intercept log10ELEV.MAX2    3.517
## log10ELEV.MAX2              0.416

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10ELEV.MIN2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10ELEV.MIN2 8    0.297          0.177   1.680   0.144   -
0.136
## log10ELEV.MIN2           8   -0.142          0.051  -2.806   0.031   -
0.267
##                          CI-Upper
## Intercept log10ELEV.MIN2    0.730
## log10ELEV.MIN2             -0.018
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10ELEV.MAX2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10ELEV.MAX2 9    1.539          0.977   1.575   0.159   -
0.772
## log10ELEV.MAX2           9   -0.354          0.294  -1.206   0.267   -
1.050
##                          CI-Upper
## Intercept log10ELEV.MAX2    3.850
## log10ELEV.MAX2              0.341
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10ELEV.MIN2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10ELEV.MIN2 9    0.451          0.080   5.659   0.001
0.263
## log10ELEV.MIN2           9   -0.182          0.027  -6.650   0.000   -
0.246
##                          CI-Upper
## Intercept log10ELEV.MIN2    0.640
## log10ELEV.MIN2             -0.117
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10ELEV.MAX2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10ELEV.MAX2 4    0.929          1.233   0.753   0.530   -
4.377
## log10ELEV.MAX2           4   -0.188          0.405  -0.464   0.688   -
```

```
1.931
##                           CI-Upper
## Intercept log10ELEV.MAX2    6.234
## log10ELEV.MAX2              1.555

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10ELEV.MIN2, Decimals=3)

##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10ELEV.MIN2 4    0.934          0.734   1.274   0.331    -
2.222
## log10ELEV.MIN2           4   -0.249          0.315  -0.791   0.512    -
1.604
##                           CI-Upper
## Intercept log10ELEV.MIN2    4.090
## log10ELEV.MIN2              1.106

print("ses.TP")

## [1] "ses.TP"

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10ELEV.MAX2, Decimals=3)

##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10ELEV.MAX2 7   -0.689          0.445  -1.547   0.183    -
1.833
## log10ELEV.MAX2           7    0.407          0.171   2.375   0.064    -
0.033
##                           CI-Upper
## Intercept log10ELEV.MAX2    0.456
## log10ELEV.MAX2              0.848

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10ELEV.MIN2, Decimals=3)

##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10ELEV.MIN2 7    0.129          0.485   0.267   0.800    -
1.117
## log10ELEV.MIN2           7    0.088          0.216   0.405   0.702    -
0.468
##                           CI-Upper
## Intercept log10ELEV.MIN2    1.375
## log10ELEV.MIN2              0.644
```

4.2.11 Gradient

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("GRADIENT.MIN2","GRADIENT.MEAN2",
```

```
                      "GRADIENT.MEDIAN2","GRADIENT.MAX2",
"GRADIENT.FILL"),ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: GRADIENT.MIN2.log10 || Plot: Ben.TN"
```

```
## [1] "Variable: GRADIENT.MIN2.log10 || Plot: Ben.TP"
```

```
## [1] "Variable: GRADIENT.MIN2.log10 || Plot: Ses.TN"
```

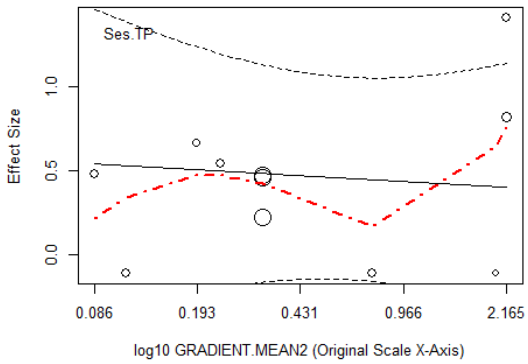
```
## [1] "Variable: GRADIENT.MIN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: GRADIENT.MEAN2.log10 || Plot: Ben.TN"
```

```
## [1] "Variable: GRADIENT.MEAN2.log10 || Plot: Ben.TP"
```

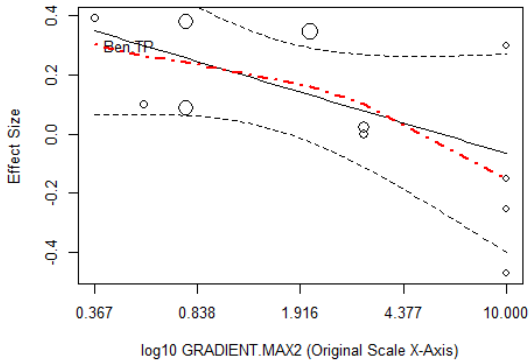
```
## [1] "Variable: GRADIENT.MEAN2.log10 || Plot: Ses.TN"
```

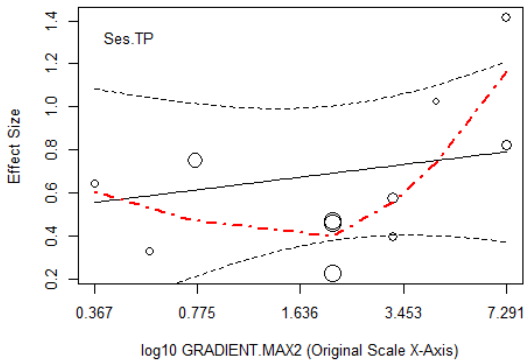
```
## [1] "Variable: GRADIENT.MEAN2.log10 || Plot: Ses.TP"
```



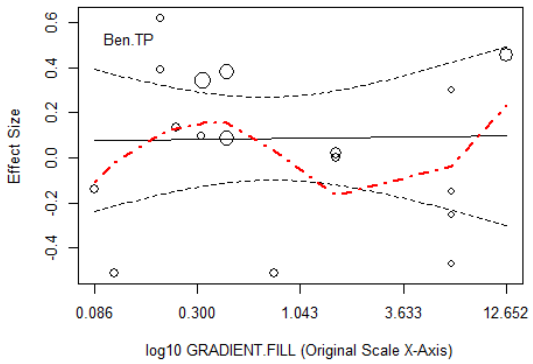

```
## [1] "Variable: GRADIENT.MEDIAN2.log10 || Plot: Ben.TN"

## [1] "Variable: GRADIENT.MEDIAN2.log10 || Plot: Ben.TP"

## [1] "Variable: GRADIENT.MEDIAN2.log10 || Plot: Ses.TN"

## [1] "Variable: GRADIENT.MEDIAN2.log10 || Plot: Ses.TP"
```

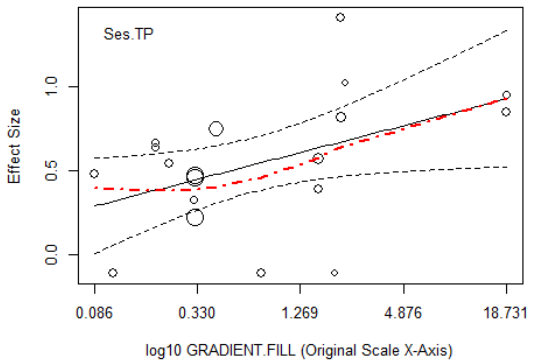
```
## [1] "Variable: GRADIENT.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: GRADIENT.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: GRADIENT.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: GRADIENT.MAX2.log10 || Plot: Ses.TP"
```






```
## [1] "Variable: GRADIENT.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: GRADIENT.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: GRADIENT.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: GRADIENT.FILL.log10 || Plot: Ses.TP"
```






```
print("ben.TN")

## [1] "ben.TN"

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10GRADIENT.MAX2, Decimals=3)

##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10GRADIENT.MAX2 9    0.484          0.129   3.750   0.007
0.179
## log10GRADIENT.MAX2           9   -0.273          0.197  -1.386   0.208   -
0.740
##                              CI-Upper
## Intercept log10GRADIENT.MAX2    0.789
## log10GRADIENT.MAX2              0.193

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10GRADIENT.MEAN2, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MEAN2 5    0.358          0.216   1.658   0.196
## log10GRADIENT.MEAN2           5   -0.359          0.317  -1.132   0.340
##                               CI-Lower CI-Upper
```

```
## Intercept log10GRADIENT.MEAN2   -0.329    1.046
## log10GRADIENT.MEAN2             -1.367    0.650
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10GRADIENT.MEDIAN2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MEDIAN2 2    0.573          0.055  10.329   0.061
## log10GRADIENT.MEDIAN2           2    0.062          0.066   0.933   0.522
##                                 CI-Lower CI-Upper
## Intercept log10GRADIENT.MEDIAN2   -0.132    1.278
## log10GRADIENT.MEDIAN2             -0.778    0.901
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10GRADIENT.MIN2, Decimals=3)
```

```
##                               n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10GRADIENT.MIN2 9    0.173          0.108   1.602   0.153    -
0.082
## log10GRADIENT.MIN2           9   -0.079          0.030  -2.630   0.034    -
0.150
##                               CI-Upper
## Intercept log10GRADIENT.MIN2    0.428
## log10GRADIENT.MIN2             -0.008
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10GRADIENT.FILL, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.FILL 10    0.443          0.143   3.103   0.015
## log10GRADIENT.FILL           10   -0.082          0.158  -0.518   0.619
##                               CI-Lower CI-Upper
## Intercept log10GRADIENT.FILL    0.114    0.773
## log10GRADIENT.FILL             -0.446    0.283
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10GRADIENT.MAX2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MAX2 11    0.223          0.076   2.949   0.016
## log10GRADIENT.MAX2           11   -0.288          0.165  -1.742   0.115
##                               CI-Lower CI-Upper
## Intercept log10GRADIENT.MAX2    0.052    0.394
## log10GRADIENT.MAX2             -0.662    0.086
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10GRADIENT.MEAN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MEAN2 10   -0.064          0.149  -0.428   0.680
## log10GRADIENT.MEAN2           10   -0.092          0.198  -0.465   0.654
##                               CI-Lower CI-Upper
## Intercept log10GRADIENT.MEAN2   -0.408    0.280
## log10GRADIENT.MEAN2             -0.549    0.365
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10GRADIENT.MEDIAN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MEDIAN2 2    0.382          0.055   6.879   0.092
## log10GRADIENT.MEDIAN2           2    0.065          0.066   0.977   0.507
##                                  CI-Lower CI-Upper
## Intercept log10GRADIENT.MEDIAN2   -0.323    1.087
## log10GRADIENT.MEDIAN2             -0.775    0.904
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10GRADIENT.MIN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MIN2 11    0.041          0.104   0.392   0.704
## log10GRADIENT.MIN2           11   -0.070          0.044  -1.604   0.143
##                              CI-Lower CI-Upper
## Intercept log10GRADIENT.MIN2   -0.194    0.276
## log10GRADIENT.MIN2             -0.169    0.029
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10GRADIENT.FILL, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.FILL 17    0.086          0.089   0.976   0.344
## log10GRADIENT.FILL           17    0.010          0.131   0.075   0.941
##                              CI-Lower CI-Upper
## Intercept log10GRADIENT.FILL   -0.102    0.275
## log10GRADIENT.FILL             -0.270    0.290
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10GRADIENT.MAX2, Decimals=3)
```

```
##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10GRADIENT.MAX2 8    0.443          0.269   1.649   0.150   -
0.215
## log10GRADIENT.MAX2           8   -0.032          0.326  -0.097   0.926   -
0.830
##                              CI-Upper
```

```
## Intercept log10GRADIENT.MAX2    1.101
## log10GRADIENT.MAX2              0.766

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10GRADIENT.MEAN2, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MEAN2 5   -0.048          0.841  -0.057   0.958
## log10GRADIENT.MEAN2           5   -0.224          2.166  -0.103   0.924
##                               CI-Lower CI-Upper
## Intercept log10GRADIENT.MEAN2   -2.723    2.628
## log10GRADIENT.MEAN2             -7.118    6.670

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10GRADIENT.MEDIAN2, Decimals=3)

##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MEDIAN2 5    0.471          0.207   2.276   0.107
## log10GRADIENT.MEDIAN2           5    0.414          0.289   1.431   0.248
##                                 CI-Lower CI-Upper
## Intercept log10GRADIENT.MEDIAN2   -0.187    1.129
## log10GRADIENT.MEDIAN2             -0.507    1.335

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10GRADIENT.MIN2, Decimals=3)

##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10GRADIENT.MIN2 8    0.718          0.185   3.878   0.008
0.265
## log10GRADIENT.MIN2           8    0.139          0.064   2.173   0.073   -
0.018
##                              CI-Upper
## Intercept log10GRADIENT.MIN2    1.172
## log10GRADIENT.MIN2              0.295

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10GRADIENT.FILL, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.FILL 10    0.229          0.368   0.622   0.551
## log10GRADIENT.FILL           10   -0.104          0.318  -0.326   0.753
##                              CI-Lower CI-Upper
## Intercept log10GRADIENT.FILL   -0.619    1.077
## log10GRADIENT.FILL             -0.836    0.629

print("ses.TP")

## [1] "ses.TP"

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10GRADIENT.MAX2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MAX2 11    0.635          0.162   3.930   0.003
## log10GRADIENT.MAX2           11    0.181          0.240   0.756   0.469
##                               CI-Lower CI-Upper
## Intercept log10GRADIENT.MAX2    0.269    1.000
## log10GRADIENT.MAX2             -0.362    0.725
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10GRADIENT.MEAN2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MEAN2 11    0.437          0.276   1.584   0.148
## log10GRADIENT.MEAN2           11   -0.100          0.356  -0.281   0.785
##                                CI-Lower CI-Upper
## Intercept log10GRADIENT.MEAN2   -0.187    1.061
## log10GRADIENT.MEAN2             -0.904    0.704
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10GRADIENT.MEDIAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MEDIAN2 7    0.699          0.235   2.973   0.031
## log10GRADIENT.MEDIAN2           7    0.282          0.289   0.973   0.375
##                                  CI-Lower CI-Upper
## Intercept log10GRADIENT.MEDIAN2    0.095    1.303
## log10GRADIENT.MEDIAN2             -0.462    1.026
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10GRADIENT.MIN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.MIN2 11    0.927          0.153   6.061   0.000
## log10GRADIENT.MIN2           11    0.126          0.057   2.221   0.053
##                               CI-Lower CI-Upper
## Intercept log10GRADIENT.MIN2    0.581    1.273
## log10GRADIENT.MIN2             -0.002    0.255
```

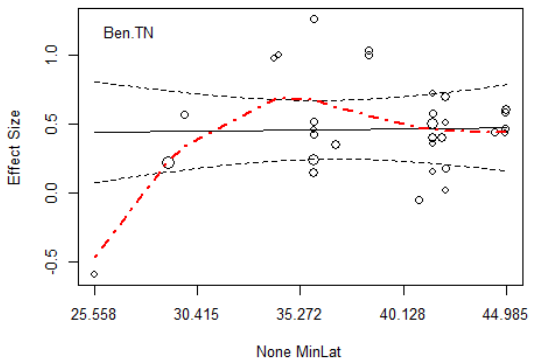
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10GRADIENT.FILL, Decimals=3)
```

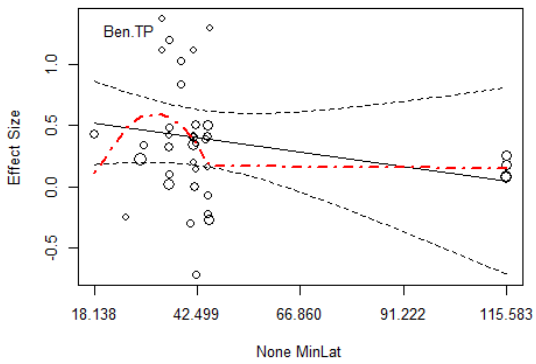
```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10GRADIENT.FILL 19    0.583          0.079   7.348    0.00
## log10GRADIENT.FILL           19    0.273          0.123   2.222    0.04
##                               CI-Lower CI-Upper
## Intercept log10GRADIENT.FILL    0.415    0.750
## log10GRADIENT.FILL              0.014    0.533
```

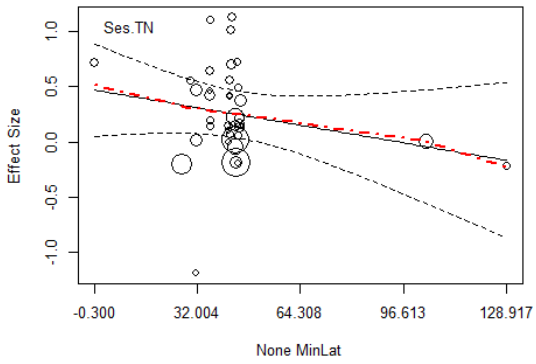
4.2.12 Latitude and Longitude

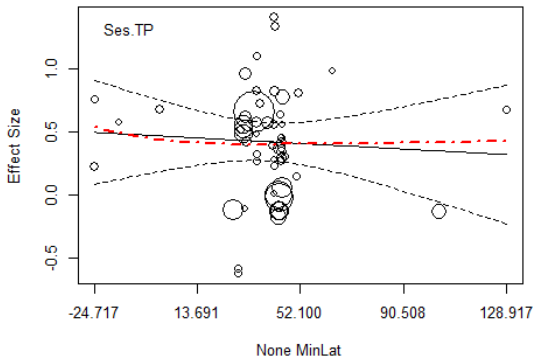
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,Vars=c('MinLat'),
ModTransform='None',
               StdAxes=F,Transform.X=F,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: MinLat || Plot: Ben.TN"

## [1] "Variable: MinLat || Plot: Ben.TP"

## [1] "Variable: MinLat || Plot: Ses.TN"

## [1] "Variable: MinLat || Plot: Ses.TP"
```

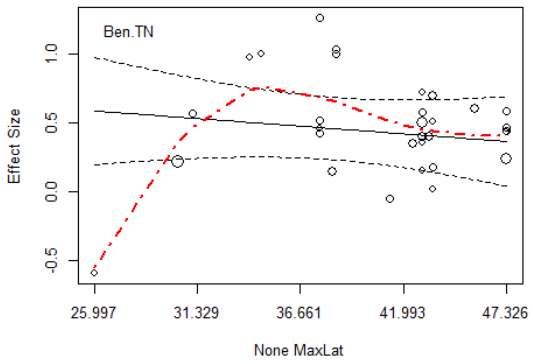


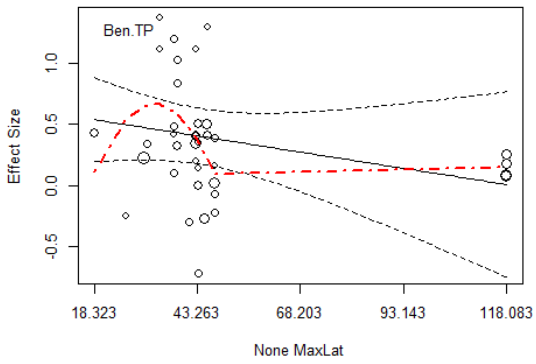


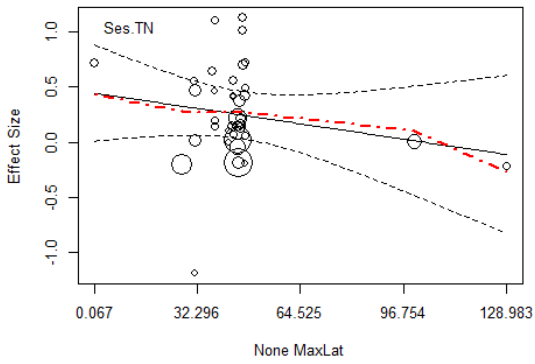


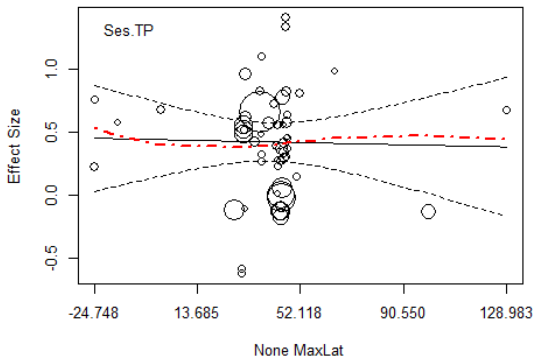



```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,Vars=c('MaxLat'),
ModTransform='None',
               StdAxes=F,Transform.X=F,LOESS.Ind=T,Legend.Ind=F,Lambda=1)

## [1] "Variable: MaxLat || Plot: Ben.TN"

## [1] "Variable: MaxLat || Plot: Ben.TP"

## [1] "Variable: MaxLat || Plot: Ses.TN"

## [1] "Variable: MaxLat || Plot: Ses.TP"
```









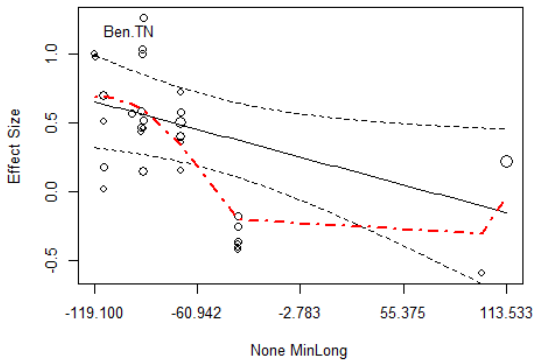

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,Vars=c('MinLong'),
ModTransform='None',
               StdAxes=F,Transform.X=F,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

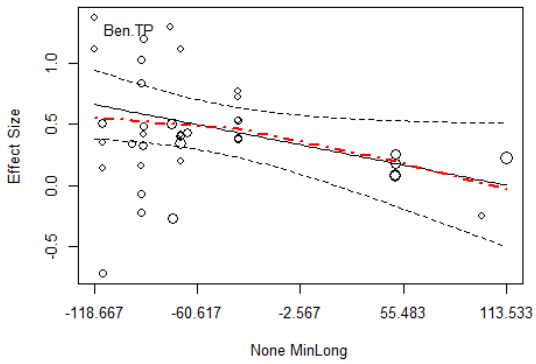
```
## [1] "Variable: MinLong || Plot: Ben.TN"
```

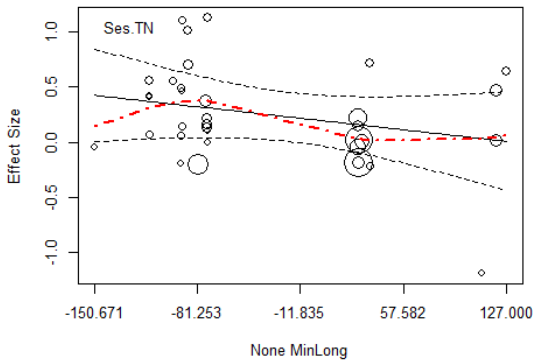
```
## [1] "Variable: MinLong || Plot: Ben.TP"
```

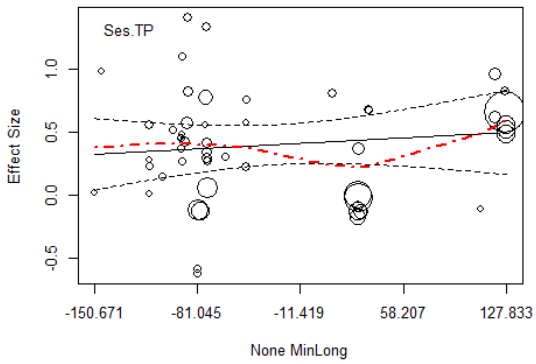
```
## [1] "Variable: MinLong || Plot: Ses.TN"
```

```
## [1] "Variable: MinLong || Plot: Ses.TP"
```









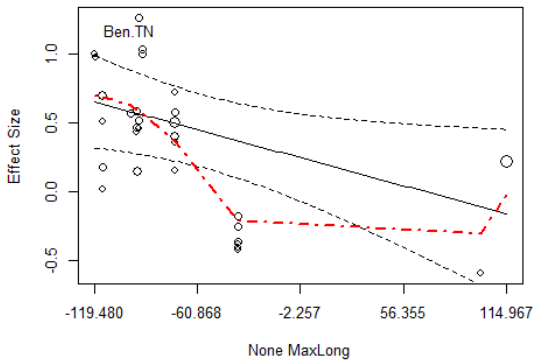

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,Vars=c('MaxLong'),
ModTransform='None',
               StdAxes=F,Transform.X=F,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

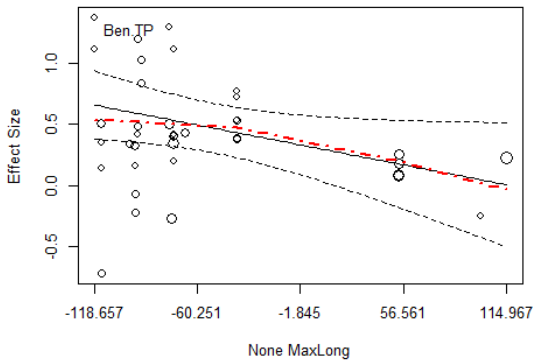
```
## [1] "Variable: MaxLong || Plot: Ben.TN"
```

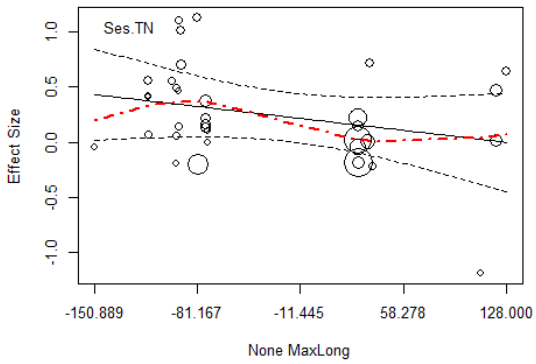
```
## [1] "Variable: MaxLong || Plot: Ben.TP"
```

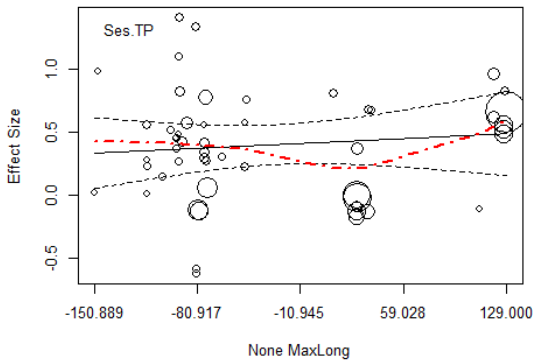
```
## [1] "Variable: MaxLong || Plot: Ses.TN"
```

```
## [1] "Variable: MaxLong || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~MinLat,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MinLat 32    0.398          0.495   0.804   0.428   -0.613
1.409
## MinLat           32    0.002          0.013   0.123   0.903   -0.025
0.029
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~MaxLat,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MaxLat 32    0.853          0.495   1.725   0.095   -0.157
1.863
## MaxLat           32   -0.010          0.013  -0.820   0.419   -0.036
0.015
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~MinLong,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MinLong 31    0.242          0.155   1.559   0.130   -0.075
0.559
## MinLong           31   -0.003          0.002  -2.190   0.037   -0.007
0.000
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~MaxLong,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MaxLong 31    0.239          0.156   1.528   0.137   -0.081
0.559
## MaxLong           31   -0.003          0.002  -2.191   0.037   -0.007
0.000
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~MinLat,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MinLat 39    0.611          0.243   2.518   0.016    0.119
1.102
## MinLat           39   -0.005          0.005  -0.981   0.333   -0.015
0.005
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~MaxLat,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MaxLat 39    0.637          0.244   2.614   0.013    0.143
1.130
## MaxLat           39   -0.005          0.005  -1.095   0.280   -0.015
0.005
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~MinLong,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MinLong 39    0.326          0.121   2.692   0.011    0.081
0.572
```

```
## MinLong           39   -0.003          0.001  -2.021   0.051   -0.006
0.000

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~MaxLong,
Decimals=3)

##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MaxLong 39    0.328          0.122   2.690   0.011    0.081
0.575
## MaxLong           39   -0.003          0.001  -1.998   0.053   -0.006
0.000

print("ses.TN")

## [1] "ses.TN"

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~MinLat,
Decimals=3)

##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MinLat 38    0.470          0.206   2.281   0.029    0.052
0.888
## MinLat           38   -0.005          0.004  -1.250   0.219   -0.013
0.003

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~MaxLat,
Decimals=3)

##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MaxLat 38    0.447          0.216   2.073   0.045    0.010
0.884
## MaxLat           38   -0.004          0.004  -1.059   0.296   -0.013
0.004

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~MinLong,
Decimals=3)

##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MinLong 35    0.201          0.113   1.784   0.084   -0.028
0.430
## MinLong           35   -0.002          0.001  -1.135   0.264   -0.004
0.001

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~MaxLong,
Decimals=3)

##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
```

```
## Intercept MaxLong 35    0.199          0.112   1.780   0.084   -0.029
0.427
## MaxLong           35   -0.002          0.001  -1.195   0.241   -0.004
0.001
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~MinLat,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MinLat 56    0.471          0.141   3.343   0.002    0.188
0.753
## MinLat           56   -0.001          0.003  -0.388   0.700   -0.007
0.005
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~MaxLat,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MaxLat 56    0.443          0.145   3.063   0.003    0.153
0.733
## MaxLat           56    0.000          0.003  -0.149   0.882   -0.006
0.006
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~MinLong,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MinLong 52    0.421          0.083   5.073   0.000    0.254
0.587
## MinLong           52    0.001          0.001   0.659   0.513   -0.001
0.003
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~MaxLong,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept MaxLong 52    0.419          0.083   5.046   0.000    0.252
0.586
## MaxLong           52    0.001          0.001   0.589   0.559   -0.001
0.002
```

4.2.13 Light

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
```

```
Vars=c("LIGHT.MIN2","LIGHT.MEAN2","LIGHT.MEDIAN2","LIGHT.MAX2",
"LIGHT.FILL"),
              ModTransform='log10',
              StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: LIGHT.MIN2.log10 || Plot: Ben.TN"

## [1] "Variable: LIGHT.MIN2.log10 || Plot: Ben.TP"

## [1] "Variable: LIGHT.MIN2.log10 || Plot: Ses.TN"

## [1] "Variable: LIGHT.MIN2.log10 || Plot: Ses.TP"

## [1] "Variable: LIGHT.MAX2.log10 || Plot: Ben.TN"

## [1] "Variable: LIGHT.MAX2.log10 || Plot: Ben.TP"

## [1] "Variable: LIGHT.MAX2.log10 || Plot: Ses.TN"

## [1] "Variable: LIGHT.MAX2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: LIGHT.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: LIGHT.FILL.log10 || Plot: Ben.TP"
```

```
## [1] "Variable: LIGHT.FILL.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: LIGHT.FILL.log10 || Plot: Ses.TP"
```

```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10LIGHT.MAX2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MAX2 7   -0.233          1.025  -0.227   0.829   -
2.868
## log10LIGHT.MAX2           7   -0.046          0.421  -0.110   0.917   -
1.129
##                          CI-Upper
## Intercept log10LIGHT.MAX2    2.402
## log10LIGHT.MAX2              1.037
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10LIGHT.MIN2, Decimals=3)
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MIN2 7   -0.361          0.116  -3.099   0.027   -
0.660
## log10LIGHT.MIN2           7    0.032          0.066   0.488   0.646   -
0.137
##                            CI-Upper
## Intercept log10LIGHT.MIN2   -0.062
## log10LIGHT.MIN2              0.201
```

```
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10LIGHT.MEAN2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10LIGHT.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10LIGHT.FILL, Decimals=3)
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.FILL 7   -0.247          0.964  -0.256   0.808   -
2.726
## log10LIGHT.FILL           7   -0.046          0.448  -0.102   0.922   -
1.197
##                            CI-Upper
## Intercept log10LIGHT.FILL    2.232
## log10LIGHT.FILL              1.105
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10LIGHT.MAX2, Decimals=3)
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MAX2 8   -0.538          0.270  -1.993   0.093   -
1.198
## log10LIGHT.MAX2           8    0.395          0.126   3.126   0.020
0.086
##                            CI-Upper
## Intercept log10LIGHT.MAX2    0.123
## log10LIGHT.MAX2              0.704
```

```
#extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10LIGHT.MEDIAN2, Decimals=3)
#extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10LIGHT.MEAN2, Decimals=3)
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10LIGHT.MIN2, Decimals=3)
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MIN2 8    0.130          0.380   0.342   0.744    -
0.799
## log10LIGHT.MIN2           8    0.045          0.066   0.693   0.514    -
0.115
##                           CI-Upper
## Intercept log10LIGHT.MIN2    1.058
## log10LIGHT.MIN2              0.206
```

```
#extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10LIGHT.FILL, Decimals=3)
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
#extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10LIGHT.MEDIAN2, Decimals=3)
#extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10LIGHT.MAX2, Decimals=3)
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10LIGHT.MEAN2, Decimals=3)
```

```
##                             n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MEAN2 2     5.74          4.058   1.414   0.392  -
45.824
## log10LIGHT.MEAN2           2   -17.55         14.896  -1.178   0.448 -
206.818
##                            CI-Upper
## Intercept log10LIGHT.MEAN2   57.304
## log10LIGHT.MEAN2            171.718
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10LIGHT.MIN2, Decimals=3)
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MIN2 5   -1.403          1.789  -0.784   0.490   -
7.096
## log10LIGHT.MIN2           5  -11.099          9.355  -1.186   0.321  -
40.871
##                           CI-Upper
## Intercept log10LIGHT.MIN2    4.290
## log10LIGHT.MIN2             18.673
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10LIGHT.FILL, Decimals=3)
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
```

```
## Intercept log10LIGHT.FILL 5    1.654          0.238   6.963   0.006
0.898
## log10LIGHT.FILL           5   -2.533          0.480  -5.280   0.013   -
4.060
##                           CI-Upper
## Intercept log10LIGHT.FILL    2.410
## log10LIGHT.FILL             -1.006
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10LIGHT.MAX2, Decimals=3)
```

```
##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MAX2 9    0.662          0.206   3.218   0.015
0.175
## log10LIGHT.MAX2           9   -0.029          0.131  -0.218   0.833   -
0.338
##                           CI-Upper
## Intercept log10LIGHT.MAX2    1.148
## log10LIGHT.MAX2              0.281
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10LIGHT.MEAN2, Decimals=3)
```

```
##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MEAN2 3    2.008           0.64   3.138   0.196   -
6.123
## log10LIGHT.MEAN2           3   -3.472           1.74  -1.995   0.296  -
25.579
##                            CI-Upper
## Intercept log10LIGHT.MEAN2   10.140
## log10LIGHT.MEAN2             18.636
```

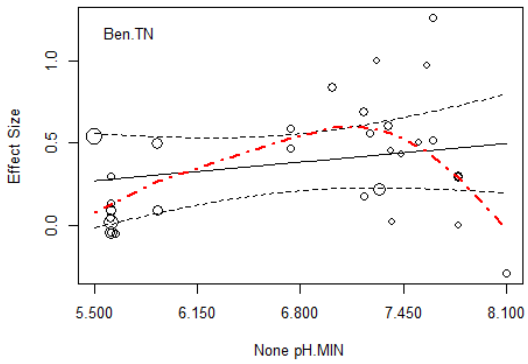
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10LIGHT.MEDIAN2, Decimals=3)
```

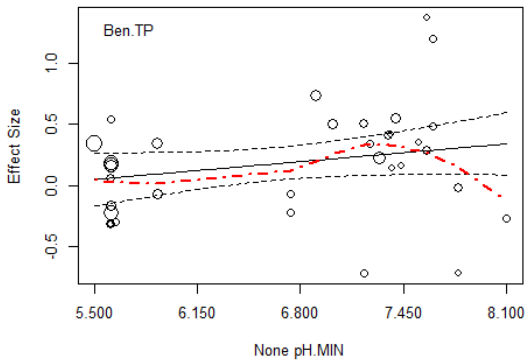
```
##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MEDIAN2 2    1.039          0.229   4.538   0.138   -
1.870
## log10LIGHT.MEDIAN2           2   -1.437          0.596  -2.413   0.250   -
9.006
##                              CI-Upper
## Intercept log10LIGHT.MEDIAN2    3.949
## log10LIGHT.MEDIAN2              6.131
```

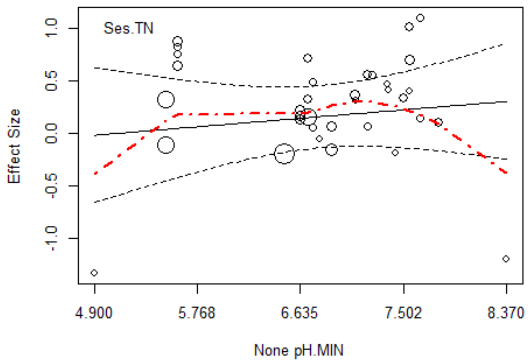
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10LIGHT.MIN2, Decimals=3)

##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.MIN2 9    0.684          0.252   2.716    0.03
0.089
## log10LIGHT.MIN2           9    0.034          0.117   0.291    0.78   -
0.243
##                            CI-Upper
## Intercept log10LIGHT.MIN2    1.280
## log10LIGHT.MIN2              0.311

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10LIGHT.FILL, Decimals=3)

##                            n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10LIGHT.FILL 9    0.655          0.186   3.515   0.010
0.214
## log10LIGHT.FILL           9   -0.041          0.131  -0.313   0.763   -
0.350
##                            CI-Upper
## Intercept log10LIGHT.FILL    1.095
## log10LIGHT.FILL              0.268
```

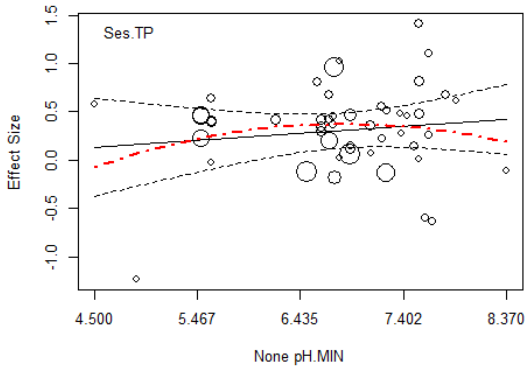
4.2.14 pH

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("pH.MIN", "pH.MEAN", "pH.MEDIAN", "pH.MAX", "pH.FILL"),
               ModTransform='None',
               StdAxes=F,Transform.X=F,LOESS.Ind=T,Legend.Ind=F,Lambda=1)

## [1] "Variable: pH.MIN || Plot: Ben.TN"

## [1] "Variable: pH.MIN || Plot: Ben.TP"

## [1] "Variable: pH.MIN || Plot: Ses.TN"

## [1] "Variable: pH.MIN || Plot: Ses.TP"
```

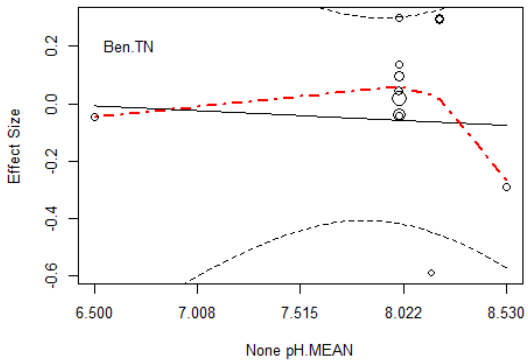


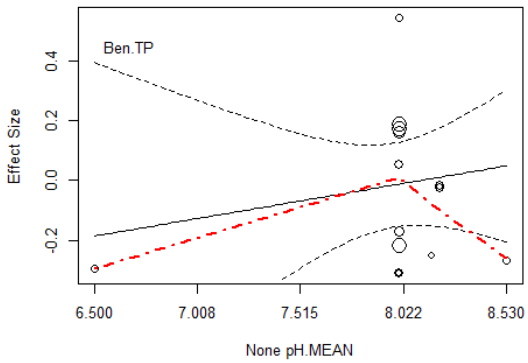


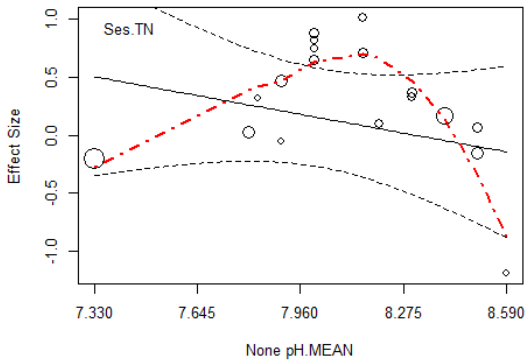


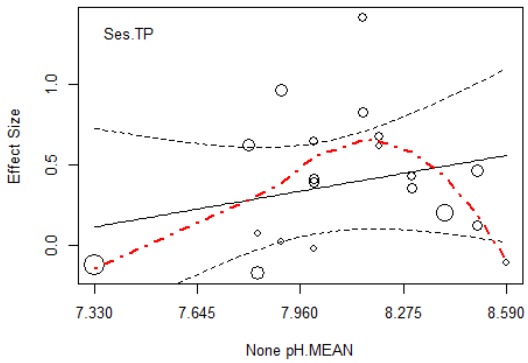



```
## [1] "Variable: pH.MEAN || Plot: Ben.TN"
## [1] "Variable: pH.MEAN || Plot: Ben.TP"
## [1] "Variable: pH.MEAN || Plot: Ses.TN"
## [1] "Variable: pH.MEAN || Plot: Ses.TP"
```

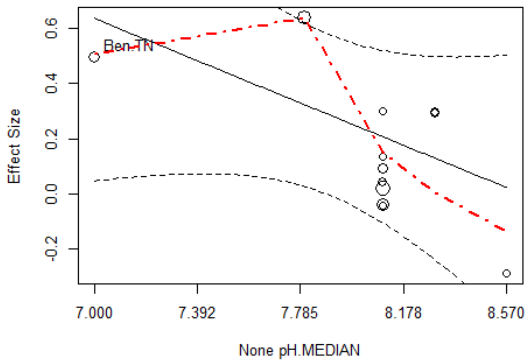


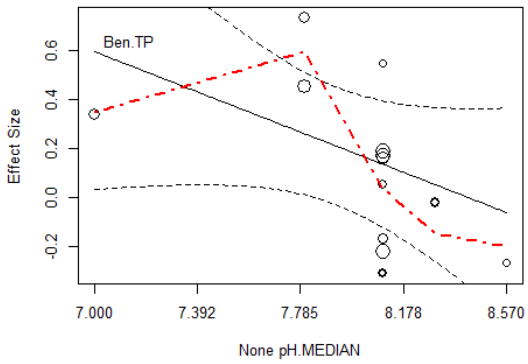




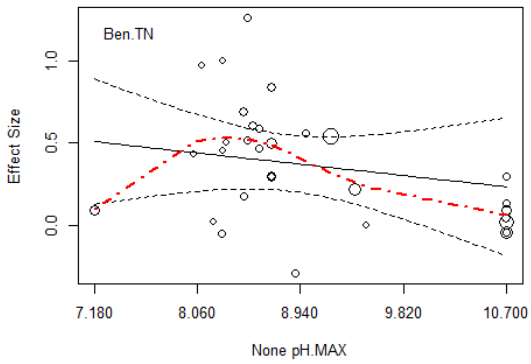


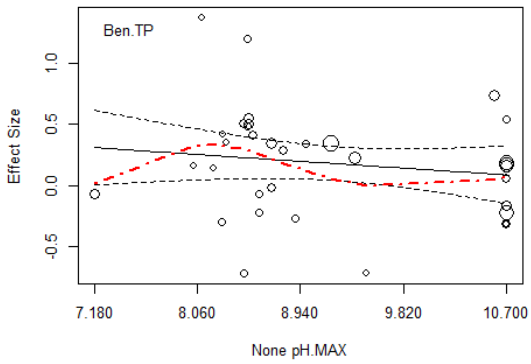

```
## [1] "Variable: pH.MEDIAN || Plot: Ben.TN"
## [1] "Variable: pH.MEDIAN || Plot: Ben.TP"
## [1] "Variable: pH.MEDIAN || Plot: Ses.TN"
## [1] "Variable: pH.MEDIAN || Plot: Ses.TP"
```

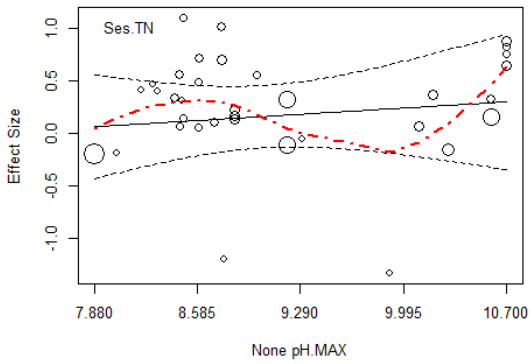


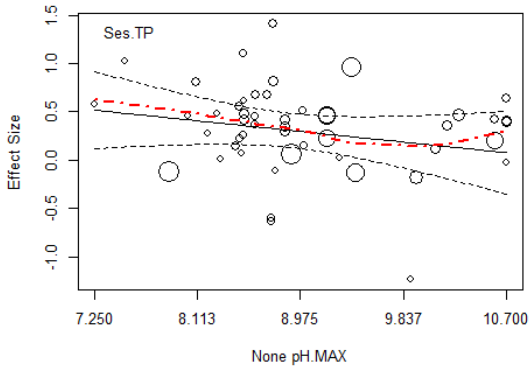



```
## [1] "Variable: pH.MAX || Plot: Ben.TN"
## [1] "Variable: pH.MAX || Plot: Ben.TP"
## [1] "Variable: pH.MAX || Plot: Ses.TN"
## [1] "Variable: pH.MAX || Plot: Ses.TP"
```

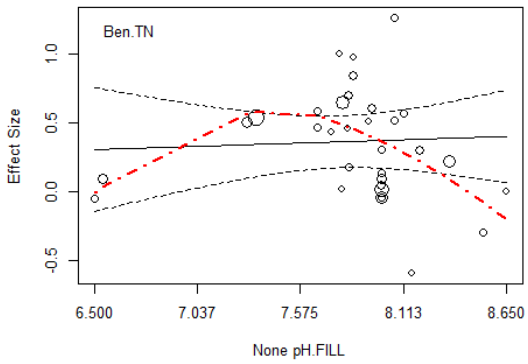


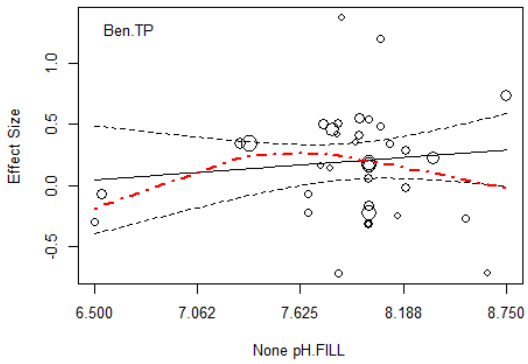


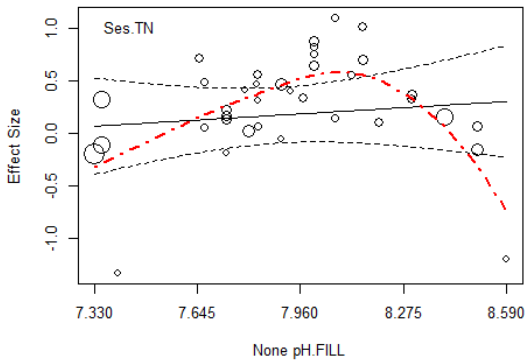


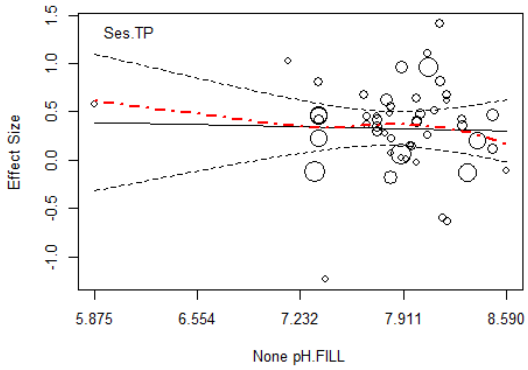



```
## [1] "Variable: pH.FILL || Plot: Ben.TN"
## [1] "Variable: pH.FILL || Plot: Ben.TP"
## [1] "Variable: pH.FILL || Plot: Ses.TN"
## [1] "Variable: pH.FILL || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~pH.MIN,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MIN 31   -0.203          0.606  -0.336   0.740   -1.443
1.036
## pH.MIN           31    0.087          0.089   0.975   0.338   -0.095
0.268
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~pH.MEAN,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MEAN 12    0.212          1.866   0.114   0.912   -3.946
4.370
## pH.MEAN           12   -0.034          0.236  -0.143   0.889   -0.560
0.492
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~pH.MEDIAN,
Decimals=3)

##                       n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept pH.MEDIAN 12    3.375          2.024   1.668   0.126   -1.133
## pH.MEDIAN           12   -0.391          0.256  -1.530   0.157   -0.961
##                      CI-Upper
## Intercept pH.MEDIAN    7.884
## pH.MEDIAN              0.178

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~pH.MAX,
Decimals=3)

##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MAX 31    1.067          0.889   1.199   0.240   -0.752
2.885
## pH.MAX           31   -0.078          0.100  -0.774   0.445   -0.283
0.127

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN, mods=~pH.FILL,
Decimals=3)

##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.FILL 33    0.017          1.219   0.014   0.989   -2.470
2.504
## pH.FILL           33    0.044          0.156   0.283   0.779   -0.275
0.363

print("ben.TP")

## [1] "ben.TP"

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~pH.MIN,
Decimals=3)

##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MIN 35   -0.565          0.493  -1.146   0.260   -1.568
0.438
## pH.MIN           35    0.112          0.073   1.526   0.137   -0.037
0.261

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~pH.MEAN,
Decimals=3)

##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MEAN 14   -0.938          1.402  -0.669   0.516   -3.992
2.115
```

```
## pH.MEAN           14    0.116          0.176   0.659   0.522   -0.267
0.498

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~pH.MEDIAN,
Decimals=3)

##                       n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept pH.MEDIAN 15    3.517          2.012   1.748   0.104   -0.829
## pH.MEDIAN           15   -0.418          0.253  -1.648   0.123   -0.965
##                      CI-Upper
## Intercept pH.MEDIAN    7.863
## pH.MEDIAN              0.130

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~pH.MAX,
Decimals=3)

##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MAX 35    0.765          0.599   1.277   0.211   -0.454
1.984
## pH.MAX           35   -0.063          0.064  -0.983   0.333   -0.194
0.068

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP, mods=~pH.FILL,
Decimals=3)

##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.FILL 37   -0.659          1.169  -0.564   0.577   -3.033
1.715
## pH.FILL           37    0.109          0.148   0.734   0.468   -0.192
0.409

print("ses.TN")

## [1] "ses.TN"

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~pH.MIN,
Decimals=3)

##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MIN 35   -0.469          1.011  -0.464   0.646   -2.526
1.588
## pH.MIN           35    0.093          0.147   0.632   0.532   -0.206
0.392

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~pH.MEAN,
Decimals=3)

##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
```

```
## Intercept pH.MEAN 18    4.264          4.030   1.058   0.306   -4.280
12.808
## pH.MEAN           18   -0.513          0.502  -1.022   0.322   -1.577
0.551
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~pH.MEDIAN,
Decimals=3)
```

```
##                     n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MEDIAN 8    2.155         11.470   0.188   0.857  -25.912
30.222
## pH.MEDIAN           8   -0.199          1.412  -0.141   0.893   -3.653
3.255
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~pH.MAX,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MAX 35   -0.599          1.542  -0.388   0.700   -3.736
2.538
## pH.MAX           35    0.084          0.170   0.496   0.623   -0.261
0.430
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN, mods=~pH.FILL,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.FILL 37   -1.307          2.587  -0.505   0.617   -6.559
3.945
## pH.FILL           37    0.188          0.327   0.574   0.569   -0.477
0.852
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~pH.MIN,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MIN 49   -0.200          0.696  -0.287   0.775   -1.600
1.200
## pH.MIN           49    0.074          0.101   0.735   0.466   -0.129
0.278
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~pH.MEAN,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MEAN 20   -2.471          3.044  -0.812   0.428   -8.865
3.924
## pH.MEAN           20    0.353          0.379   0.929   0.365   -0.445
1.150
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~pH.MEDIAN,
Decimals=3)
```

```
##                      n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept pH.MEDIAN 10   -2.273          3.147  -0.722   0.491   -9.531
## pH.MEDIAN           10    0.357          0.394   0.904   0.392   -0.553
##                     CI-Upper
## Intercept pH.MEDIAN    4.985
## pH.MEDIAN              1.266
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~pH.MAX,
Decimals=3)
```

```
##                   n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.MAX 49    1.445          0.960   1.506   0.139   -0.485
3.376
## pH.MAX           49   -0.128          0.107  -1.190   0.240   -0.344
0.088
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP, mods=~pH.FILL,
Decimals=3)
```

```
##                    n Estimate Standard Error T-Value P-Value CI-Lower CI-
Upper
## Intercept pH.FILL 51    0.580          1.371   0.423   0.674   -2.174
3.335
## pH.FILL           51   -0.032          0.175  -0.184   0.855   -0.383
0.319
```

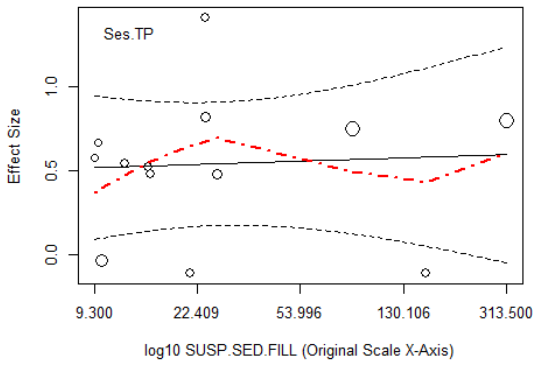
4.2.15 Suspended Sediments

```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("SUSP.SED.MIN2","SUSP.SED.MEAN2",
                      "SUSP.SED.MEDIAN2","SUSP.SED.MAX2", "SUSP.SED.FILL"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: SUSP.SED.MIN2.log10 || Plot: Ben.TN"

## [1] "Variable: SUSP.SED.MIN2.log10 || Plot: Ben.TP"

## [1] "Variable: SUSP.SED.MIN2.log10 || Plot: Ses.TN"

## [1] "Variable: SUSP.SED.MIN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: SUSP.SED.MEAN2.log10 || Plot: Ben.TN"
## [1] "Variable: SUSP.SED.MEAN2.log10 || Plot: Ben.TP"
## [1] "Variable: SUSP.SED.MEAN2.log10 || Plot: Ses.TN"
## [1] "Variable: SUSP.SED.MEAN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: SUSP.SED.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: SUSP.SED.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: SUSP.SED.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: SUSP.SED.MAX2.log10 || Plot: Ses.TP"
## [1] "Variable: SUSP.SED.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: SUSP.SED.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: SUSP.SED.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: SUSP.SED.FILL.log10 || Plot: Ses.TP"
```




```
print("ben.TN - insufficient data")
```

```
## [1] "ben.TN - insufficient data"
```

```
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10SUSP.SED.MAX2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10SUSP.SED.MEAN2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10SUSP.SED.MEDIAN2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10SUSP.SED.MIN2, Decimals=3)
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10SUSP.SED.MAX2, Decimals=3)
```

```
##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10SUSP.SED.MAX2 5    0.517          0.953   0.543   0.625   -
2.515
```

```
## log10SUSP.SED.MAX2           5   -0.146          0.434  -0.336   0.759   -
1.529
##                              CI-Upper
## Intercept log10SUSP.SED.MAX2    3.549
## log10SUSP.SED.MAX2              1.237
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10SUSP.SED.MEAN2, Decimals=3)
```

```
##                               n Estimate Standard Error T-Value P-Value
## Intercept log10SUSP.SED.MEAN2 7    1.037          0.526   1.973   0.106
## log10SUSP.SED.MEAN2           7   -0.833          0.389  -2.144   0.085
##                               CI-Lower CI-Upper
## Intercept log10SUSP.SED.MEAN2   -0.314    2.388
## log10SUSP.SED.MEAN2             -1.832    0.166
```

```
#extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10SUSP.SED.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10SUSP.SED.MIN2, Decimals=3)
```

```
##                             n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10SUSP.SED.MIN2 5    0.155          0.519   0.299   0.784   -
1.497
## log10SUSP.SED.MIN2           5    0.082          0.746   0.110   0.919   -
2.293
##                             CI-Upper
## Intercept log10SUSP.SED.MIN2    1.808
## log10SUSP.SED.MIN2              2.457
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10SUSP.SED.FILL, Decimals=3)
```

```
##                               n Estimate Standard Error T-Value P-Value
## Intercept log10SUSP.SED.FILL 10    0.194          0.462   0.420   0.685
## log10SUSP.SED.FILL           10   -0.082          0.279  -0.292   0.777
##                              CI-Lower CI-Upper
## Intercept log10SUSP.SED.FILL   -0.870    1.259
## log10SUSP.SED.FILL             -0.725    0.562
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10SUSP.SED.MAX2, Decimals=3)
```

```
##                             n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10SUSP.SED.MAX2 3   -3.647          1.061  -3.436   0.180  -
17.132
```

```
## log10SUSP.SED.MAX2           3    2.317          0.598   3.871   0.161   -
5.287
##                              CI-Upper
## Intercept log10SUSP.SED.MAX2    9.838
## log10SUSP.SED.MAX2              9.920

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10SUSP.SED.MEAN2, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10SUSP.SED.MEAN2 3   -2.453          0.756  -3.246   0.190
## log10SUSP.SED.MEAN2           3    2.391          0.618   3.871   0.161
##                               CI-Lower CI-Upper
## Intercept log10SUSP.SED.MEAN2  -12.054    7.148
## log10SUSP.SED.MEAN2             -5.457   10.240

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10SUSP.SED.MEDIAN2, Decimals=3)

##             n Estimate Standard Error T-Value P-Value CI-Lower CI-Upper
## Intercept NA 2    0.852          0.155   5.507   0.114   -1.114    2.817

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10SUSP.SED.MIN2, Decimals=3)

##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10SUSP.SED.MIN2 3    0.852          0.160   5.325   0.118   -
1.181
## log10SUSP.SED.MIN2           3   -1.932          0.499  -3.871   0.161   -
8.274
##                              CI-Upper
## Intercept log10SUSP.SED.MIN2    2.884
## log10SUSP.SED.MIN2              4.410

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10SUSP.SED.FILL, Decimals=3)

##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10SUSP.SED.FILL 3   -2.453          0.756  -3.246   0.190  -
12.054
## log10SUSP.SED.FILL           3    2.391          0.618   3.871   0.161   -
5.457
##                              CI-Upper
## Intercept log10SUSP.SED.FILL    7.148
## log10SUSP.SED.FILL             10.240

print("ses.TP")

## [1] "ses.TP"
```

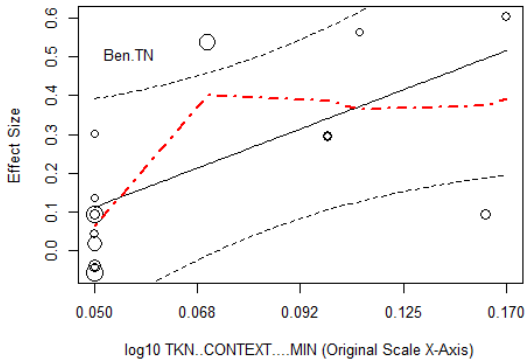
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10SUSP.SED.MAX2, Decimals=3)

##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10SUSP.SED.MAX2 8    0.097          0.481   0.202   0.847   -
1.079
## log10SUSP.SED.MAX2           8    0.280          0.240   1.166   0.288   -
0.307
##                              CI-Upper
## Intercept log10SUSP.SED.MAX2    1.273
## log10SUSP.SED.MAX2              0.867

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10SUSP.SED.MEAN2, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10SUSP.SED.MEAN2 10    1.097          0.454   2.416   0.042
## log10SUSP.SED.MEAN2           10   -0.507          0.302  -1.679   0.132
##                               CI-Lower CI-Upper
## Intercept log10SUSP.SED.MEAN2    0.050    2.144
## log10SUSP.SED.MEAN2             -1.203    0.190

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10SUSP.SED.MEDIAN2, Decimals=3)

##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10SUSP.SED.MEDIAN2 3    4.799          3.320   1.445   0.385
## log10SUSP.SED.MEDIAN2           3   -3.214          2.719  -1.182   0.447
##                                 CI-Lower CI-Upper
## Intercept log10SUSP.SED.MEDIAN2  -37.391   46.990
## log10SUSP.SED.MEDIAN2            -37.767   31.339

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10SUSP.SED.MIN2, Decimals=3)

##                              n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10SUSP.SED.MIN2 8    0.788          0.340   2.315   0.060   -
0.045
## log10SUSP.SED.MIN2           8   -0.389          0.608  -0.640   0.546   -
1.876
##                              CI-Upper
## Intercept log10SUSP.SED.MIN2    1.620
## log10SUSP.SED.MIN2              1.098

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10SUSP.SED.FILL, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10SUSP.SED.FILL 13    0.471          0.356   1.323   0.213
## log10SUSP.SED.FILL           13    0.051          0.222   0.229   0.823
```

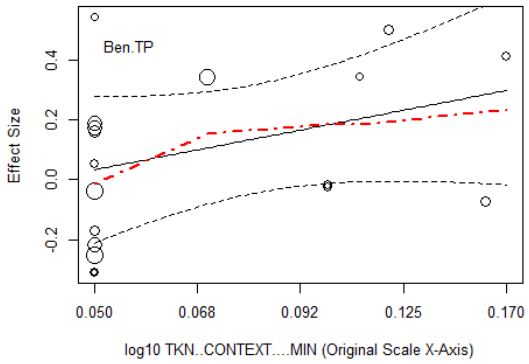
```
##                                CI-Lower CI-Upper
## Intercept log10SUSP.SED.FILL   -0.313    1.256
## log10SUSP.SED.FILL             -0.438    0.540
```

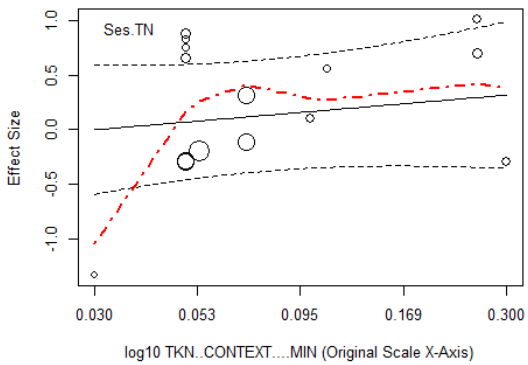
4.2.16 TKN Context

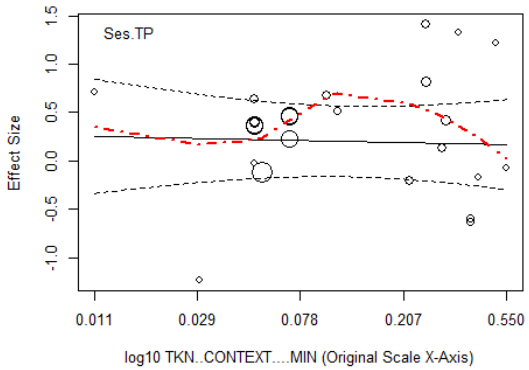
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("TKN..CONTEXT....MIN","TKN..CONTEXT....MEAN",
                      "TKN..CONTEXT....MEDIAN", "TKN..CONTEXT....MAX",
"TKN.CONTEXT.FILL"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: TKN..CONTEXT....MIN.log10 || Plot: Ben.TN"

## [1] "Variable: TKN..CONTEXT....MIN.log10 || Plot: Ben.TP"

## [1] "Variable: TKN..CONTEXT....MIN.log10 || Plot: Ses.TN"

## [1] "Variable: TKN..CONTEXT....MIN.log10 || Plot: Ses.TP"
```



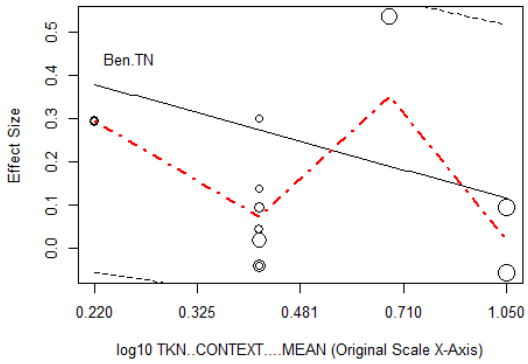


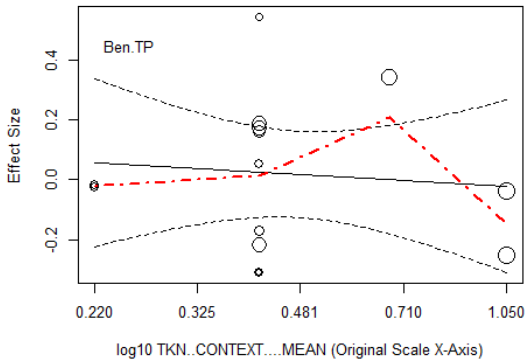


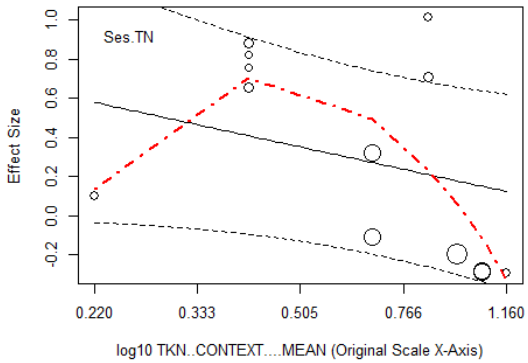


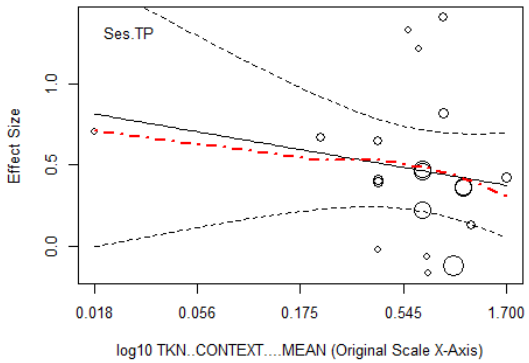

```
## [1] "Variable: TKN..CONTEXT....MEAN.log10 || Plot: Ben.TN"

## [1] "Variable: TKN..CONTEXT....MEAN.log10 || Plot: Ben.TP"
```

```
## [1] "Variable: TKN..CONTEXT....MEAN.log10 || Plot: Ses.TN"
## [1] "Variable: TKN..CONTEXT....MEAN.log10 || Plot: Ses.TP"
```

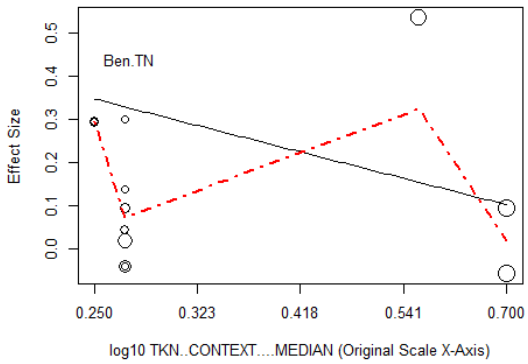


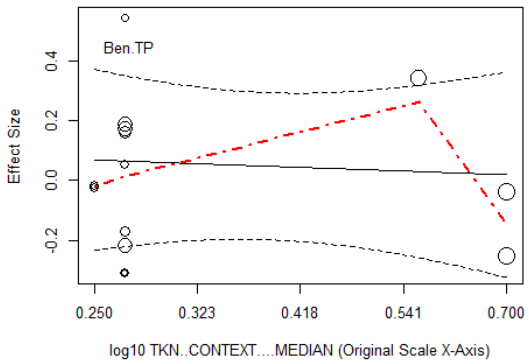


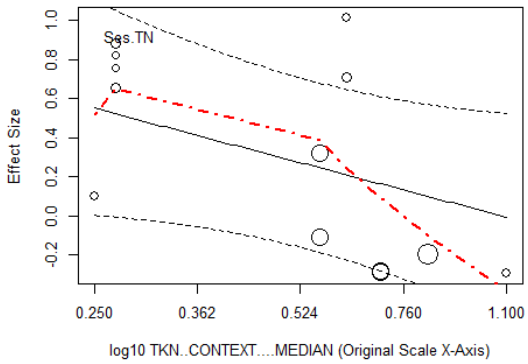


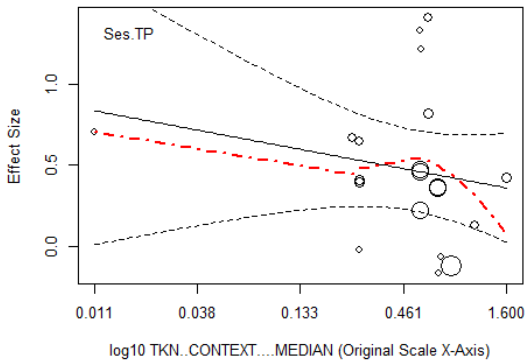



```
## [1] "Variable: TKN..CONTEXT....MEDIAN.log10 || Plot: Ben.TN"
## [1] "Variable: TKN..CONTEXT....MEDIAN.log10 || Plot: Ben.TP"
## [1] "Variable: TKN..CONTEXT....MEDIAN.log10 || Plot: Ses.TN"
## [1] "Variable: TKN..CONTEXT....MEDIAN.log10 || Plot: Ses.TP"
```

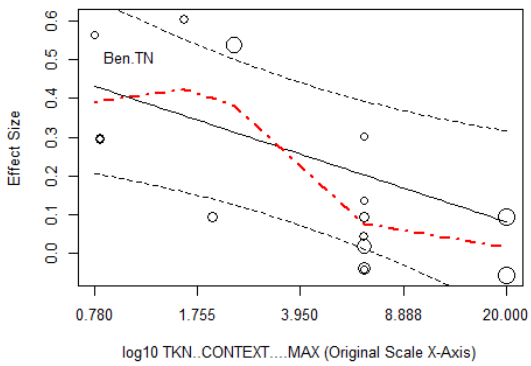


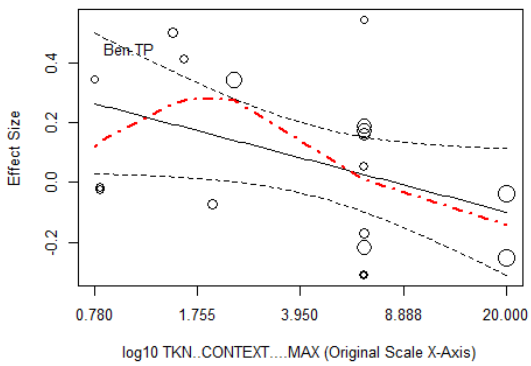


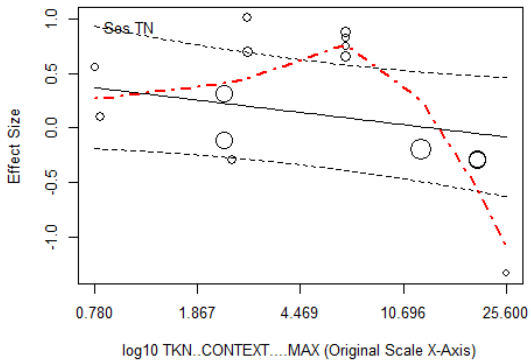


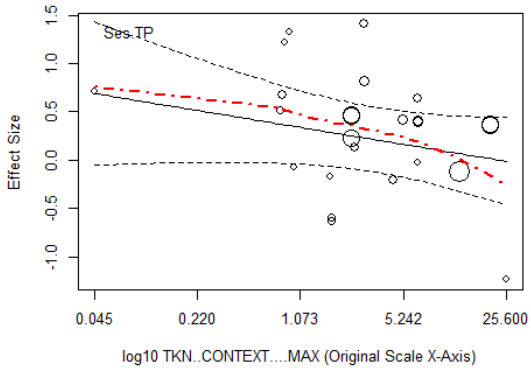



```
## [1] "Variable: TKN..CONTEXT....MAX.log10 || Plot: Ben.TN"

## [1] "Variable: TKN..CONTEXT....MAX.log10 || Plot: Ben.TP"

## [1] "Variable: TKN..CONTEXT....MAX.log10 || Plot: Ses.TN"

## [1] "Variable: TKN..CONTEXT....MAX.log10 || Plot: Ses.TP"
```

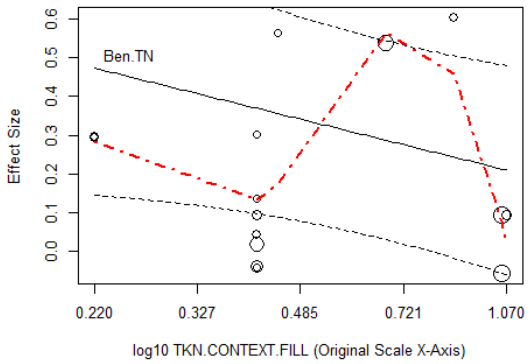


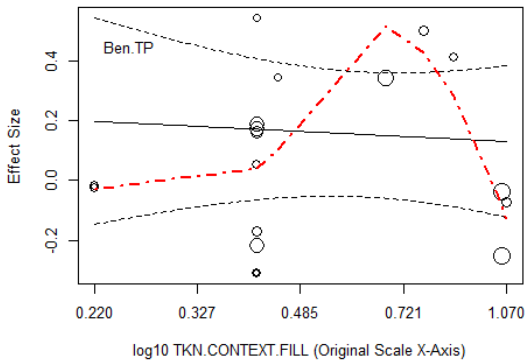


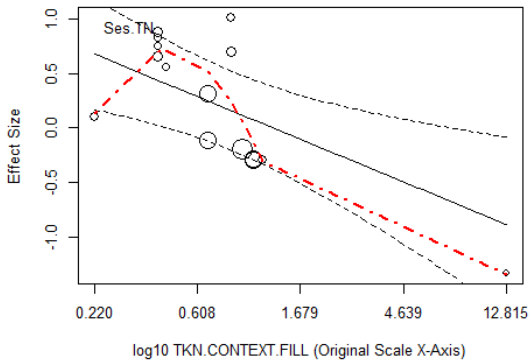


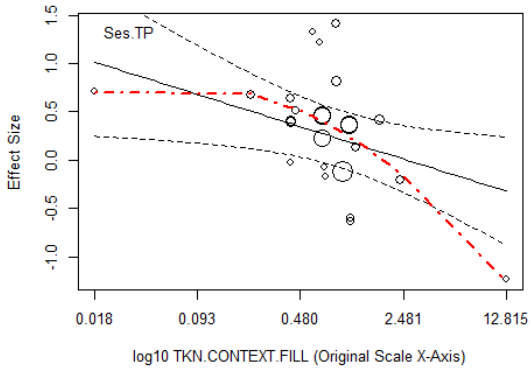



```
## [1] "Variable: TKN.CONTEXT.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: TKN.CONTEXT.FILL.log10 || Plot: Ben.TP"

## [1] "Variable: TKN.CONTEXT.FILL.log10 || Plot: Ses.TN"

## [1] "Variable: TKN.CONTEXT.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")

## [1] "ben.TN"

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TKN..CONTEXT....MIN, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MIN 15    1.100          0.379   2.906
0.012
## log10TKN..CONTEXT....MIN           15    0.759          0.337   2.256
0.042
##                                    CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MIN    0.282    1.918
## log10TKN..CONTEXT....MIN              0.032    1.487

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TKN..CONTEXT....MEAN, Decimals=3)

##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MEAN 12    0.124          0.179   0.691
0.505
```

```
## log10TKN..CONTEXT....MEAN           12   -0.388          0.199  -1.954
0.079
##                                    CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MEAN   -0.276    0.524
## log10TKN..CONTEXT....MEAN             -0.831    0.054
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TKN..CONTEXT....MEDIAN, Decimals=3)
```

```
##                                       n Estimate Standard Error T-Value
## Intercept log10TKN..CONTEXT....MEDIAN 12    0.018          0.225   0.078
## log10TKN..CONTEXT....MEDIAN           12   -0.547          0.296  -1.847
##                                      P-Value CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MEDIAN   0.939   -0.483    0.518
## log10TKN..CONTEXT....MEDIAN             0.095   -1.208    0.113
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TKN..CONTEXT....MAX, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MAX 15    0.405          0.099   4.082
0.001
## log10TKN..CONTEXT....MAX           15   -0.249          0.090  -2.758
0.016
##                                   CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MAX    0.191    0.620
## log10TKN..CONTEXT....MAX             -0.443   -0.054
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TKN.CONTEXT.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TKN.CONTEXT.FILL 15    0.221          0.123   1.794   0.096
## log10TKN.CONTEXT.FILL           15   -0.383          0.194  -1.970   0.071
##                                 CI-Lower CI-Upper
## Intercept log10TKN.CONTEXT.FILL   -0.045    0.488
## log10TKN.CONTEXT.FILL             -0.803    0.037
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TKN..CONTEXT....MIN, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MIN 18    0.682          0.419   1.627
0.123
## log10TKN..CONTEXT....MIN           18    0.498          0.375   1.327
0.203
```

```
##                                      CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MIN    -0.207    1.570
## log10TKN..CONTEXT....MIN              -0.298    1.293
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TKN..CONTEXT....MEAN, Decimals=3)
```

```
##                                       n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MEAN 14   -0.019          0.126  -0.154
0.88
## log10TKN..CONTEXT....MEAN           14   -0.117          0.330  -0.353
0.73
##                                      CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MEAN   -0.293    0.255
## log10TKN..CONTEXT....MEAN             -0.836    0.603
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TKN..CONTEXT....MEDIAN, Decimals=3)
```

```
##                                        n Estimate Standard Error T-Value
## Intercept log10TKN..CONTEXT....MEDIAN 14    0.003          0.209   0.013
## log10TKN..CONTEXT....MEDIAN           14   -0.110          0.427  -0.257
##                                       P-Value CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MEDIAN   0.990   -0.453    0.458
## log10TKN..CONTEXT....MEDIAN             0.801   -1.040    0.820
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TKN..CONTEXT....MAX, Decimals=3)
```

```
##                                       n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MAX 18    0.237          0.099   2.378
0.030
## log10TKN..CONTEXT....MAX           18   -0.257          0.128  -2.014
0.061
##                                      CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MAX    0.026    0.448
## log10TKN..CONTEXT....MAX             -0.528    0.014
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TKN.CONTEXT.FILL, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-Value
## Intercept log10TKN.CONTEXT.FILL 18    0.134          0.115   1.162   0.262
## log10TKN.CONTEXT.FILL           18   -0.098          0.287  -0.343   0.736
##                                   CI-Lower CI-Upper
## Intercept log10TKN.CONTEXT.FILL   -0.110    0.378
## log10TKN.CONTEXT.FILL             -0.706    0.509
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TKN..CONTEXT....MIN, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MIN 15    0.485          0.448   1.083
0.299
## log10TKN..CONTEXT....MIN           15    0.318          0.340   0.936
0.366
##                                    CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MIN   -0.482    1.452
## log10TKN..CONTEXT....MIN             -0.416    1.053
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TKN..CONTEXT....MEAN, Decimals=3)
```

```
##                                       n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MEAN 13    0.163          0.220   0.744
0.473
## log10TKN..CONTEXT....MEAN           13   -0.632          0.355  -1.777
0.103
##                                     CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MEAN   -0.320    0.647
## log10TKN..CONTEXT....MEAN             -1.414    0.151
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TKN..CONTEXT....MEDIAN, Decimals=3)
```

```
##                                         n Estimate Standard Error T-Value
## Intercept log10TKN..CONTEXT....MEDIAN 13    0.029          0.231   0.124
## log10TKN..CONTEXT....MEDIAN           13   -0.867          0.452  -1.918
##                                       P-Value CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MEDIAN   0.903   -0.479    0.536
## log10TKN..CONTEXT....MEDIAN             0.081   -1.862    0.128
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TKN..CONTEXT....MAX, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MAX 15    0.339          0.251   1.351
0.200
## log10TKN..CONTEXT....MAX           15   -0.300          0.166  -1.805
0.094
##                                    CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MAX   -0.203    0.881
## log10TKN..CONTEXT....MAX             -0.658    0.059
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TKN.CONTEXT.FILL, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TKN.CONTEXT.FILL 15    0.098          0.170   0.576   0.574
## log10TKN.CONTEXT.FILL           15   -0.886          0.281  -3.155   0.008
##                                 CI-Lower CI-Upper
## Intercept log10TKN.CONTEXT.FILL   -0.269    0.464
## log10TKN.CONTEXT.FILL             -1.492   -0.279

print("ses.TP")

## [1] "ses.TP"

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TKN..CONTEXT....MIN, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MIN 25    0.156          0.264   0.590
0.561
## log10TKN..CONTEXT....MIN           25   -0.051          0.215  -0.235
0.816
##                                   CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MIN   -0.390    0.702
## log10TKN..CONTEXT....MIN             -0.495    0.394

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TKN..CONTEXT....MEAN, Decimals=3)

##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MEAN 20    0.428          0.127   3.356
0.004
## log10TKN..CONTEXT....MEAN           20   -0.223          0.238  -0.936
0.361
##                                    CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MEAN    0.160    0.695
## log10TKN..CONTEXT....MEAN             -0.724    0.278

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TKN..CONTEXT....MEDIAN, Decimals=3)

##                                       n Estimate Standard Error T-Value
## Intercept log10TKN..CONTEXT....MEDIAN 20    0.407          0.134   3.031
## log10TKN..CONTEXT....MEDIAN           20   -0.220          0.224  -0.985
##                                      P-Value CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MEDIAN   0.007    0.125    0.689
## log10TKN..CONTEXT....MEDIAN             0.338   -0.690    0.250

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TKN..CONTEXT....MAX, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10TKN..CONTEXT....MAX 25    0.348          0.187   1.863
0.075
## log10TKN..CONTEXT....MAX           25   -0.255          0.169  -1.504
0.146
##                                     CI-Lower CI-Upper
## Intercept log10TKN..CONTEXT....MAX   -0.038    0.734
## log10TKN..CONTEXT....MAX             -0.605    0.096
```

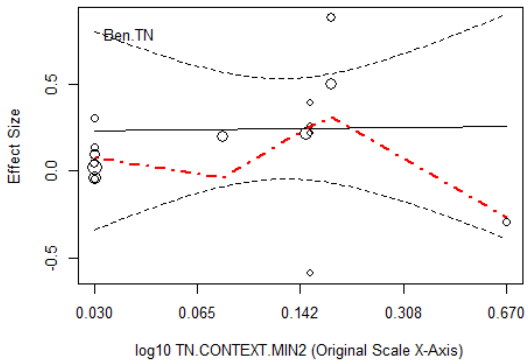
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TKN.CONTEXT.FILL, Decimals=3)
```

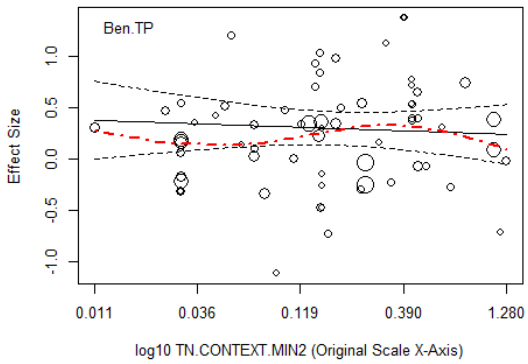
```
##                                    n Estimate Standard Error T-Value P-Value
## Intercept log10TKN.CONTEXT.FILL 25    0.199          0.143   1.395   0.176
## log10TKN.CONTEXT.FILL           25   -0.469          0.202  -2.326   0.029
##                                    CI-Lower CI-Upper
## Intercept log10TKN.CONTEXT.FILL   -0.096    0.494
## log10TKN.CONTEXT.FILL             -0.886   -0.052
```

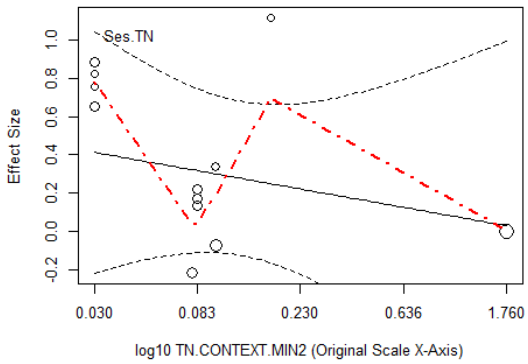
4.2.17 TN Context

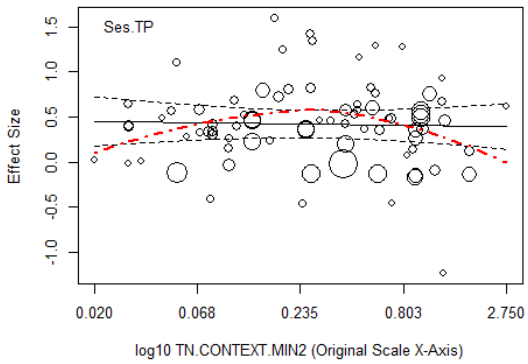
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("TN.CONTEXT.MIN2",# "TN.CONTEXT.MEAN2",
                      "TN.CONTEXT.MEDIAN2",
                      "TN.CONTEXT.MAX2", "TN.CONTEXT.FILL"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: TN.CONTEXT.MIN2.log10 || Plot: Ben.TN"

## [1] "Variable: TN.CONTEXT.MIN2.log10 || Plot: Ben.TP"

## [1] "Variable: TN.CONTEXT.MIN2.log10 || Plot: Ses.TN"

## [1] "Variable: TN.CONTEXT.MIN2.log10 || Plot: Ses.TP"
```

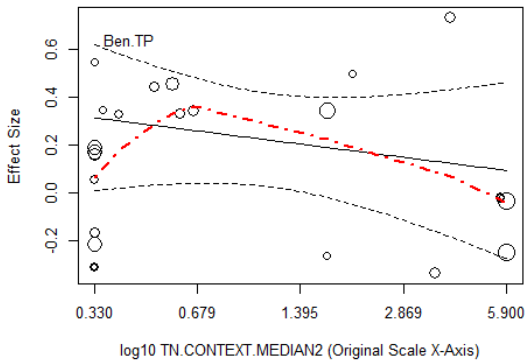


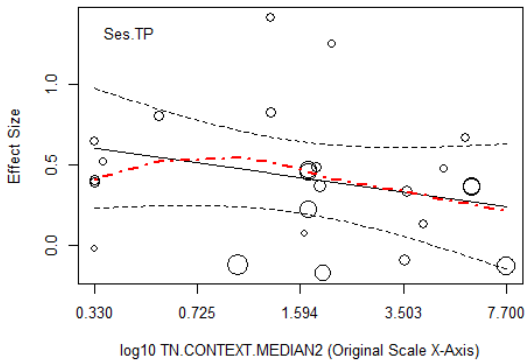




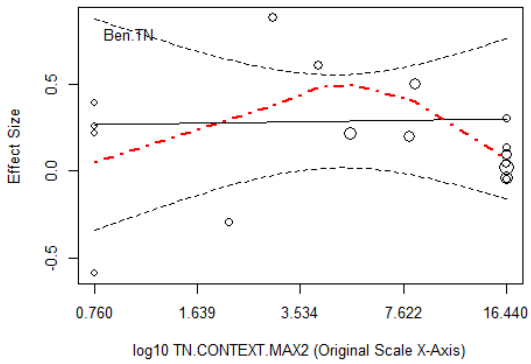


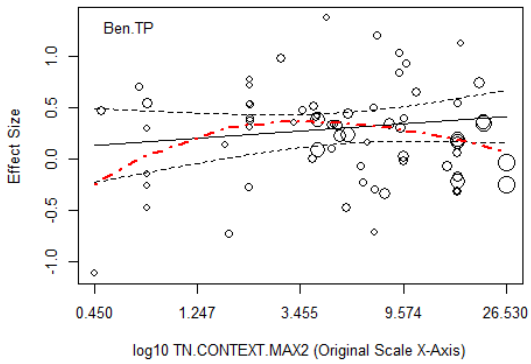

```
## [1] "Variable: TN.CONTEXT.MEDIAN2.log10 || Plot: Ben.TN"

## [1] "Variable: TN.CONTEXT.MEDIAN2.log10 || Plot: Ben.TP"

## [1] "Variable: TN.CONTEXT.MEDIAN2.log10 || Plot: Ses.TN"

## [1] "Variable: TN.CONTEXT.MEDIAN2.log10 || Plot: Ses.TP"
```

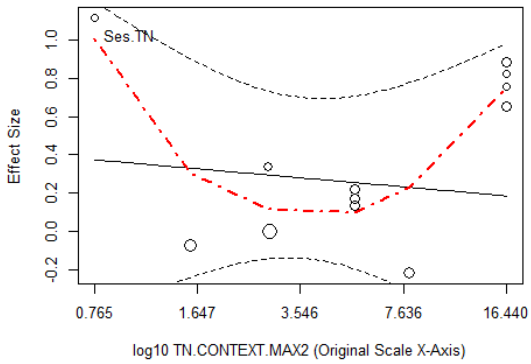


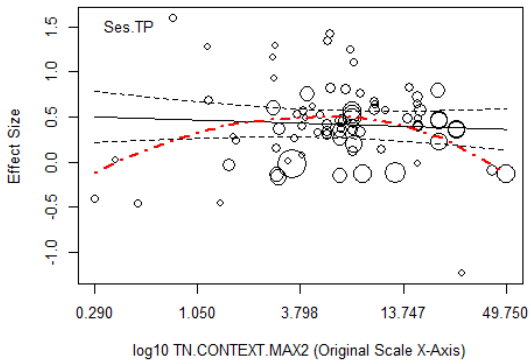



```
## [1] "Variable: TN.CONTEXT.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: TN.CONTEXT.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: TN.CONTEXT.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: TN.CONTEXT.MAX2.log10 || Plot: Ses.TP"
```

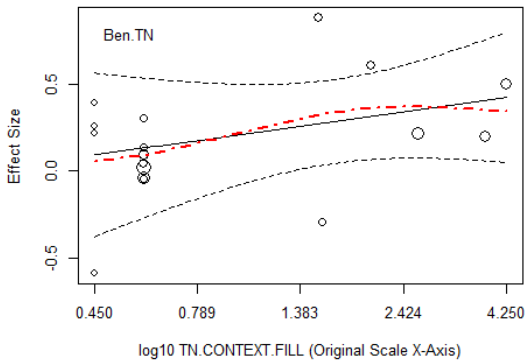


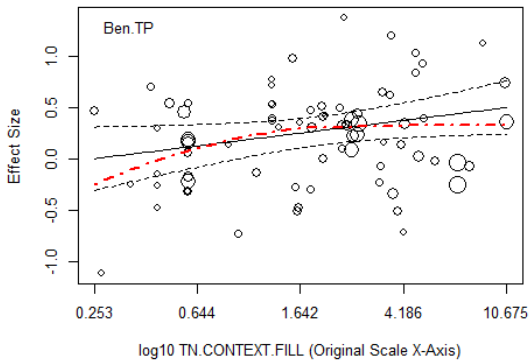


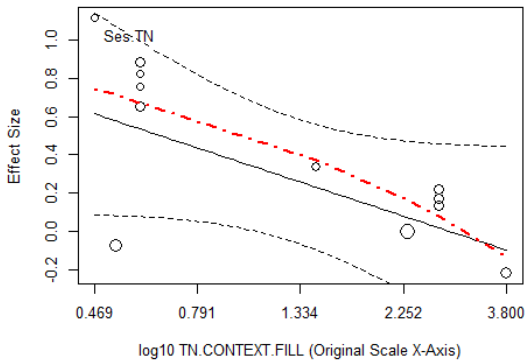


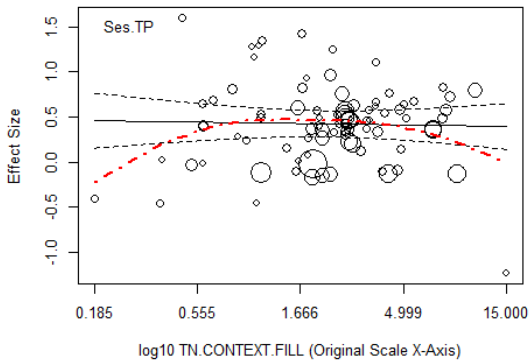



```
## [1] "Variable: TN.CONTEXT.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: TN.CONTEXT.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: TN.CONTEXT.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: TN.CONTEXT.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TN.CONTEXT.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TN.CONTEXT.MAX2 71    0.187          0.134   1.397   0.167
## log10TN.CONTEXT.MAX2           71    0.157          0.151   1.037   0.303
##                                CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.MAX2   -0.080    0.454
## log10TN.CONTEXT.MAX2             -0.145    0.459
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TN.CONTEXT.MEAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10TN.CONTEXT.MEAN2 31   -0.028          0.066  -0.429   0.671
## log10TN.CONTEXT.MEAN2           31    0.035          0.144   0.243   0.810
##                                 CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.MEAN2   -0.163    0.107
## log10TN.CONTEXT.MEAN2             -0.260    0.330
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TN.CONTEXT.MEDIAN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10TN.CONTEXT.MEDIAN2 24    0.228          0.095   2.398
0.025
## log10TN.CONTEXT.MEDIAN2           24   -0.176          0.211  -0.833
0.414
##                                   CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.MEDIAN2    0.031    0.426
## log10TN.CONTEXT.MEDIAN2             -0.614    0.262

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TN.CONTEXT.MIN2, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TN.CONTEXT.MIN2 71    0.272          0.100   2.731   0.008
## log10TN.CONTEXT.MIN2           71   -0.027          0.065  -0.412   0.682
##                                  CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.MIN2    0.073    0.471
## log10TN.CONTEXT.MIN2             -0.157    0.103

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TN.CONTEXT.FILL, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TN.CONTEXT.FILL 78    0.186          0.085   2.184   0.032
## log10TN.CONTEXT.FILL           78    0.305          0.152   2.012   0.048
##                                  CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.FILL    0.016    0.355
## log10TN.CONTEXT.FILL              0.003    0.607

print("ses.TP")

## [1] "ses.TP"

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TN.CONTEXT.MAX2, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TN.CONTEXT.MAX2 80    0.467          0.103   4.509   0.000
## log10TN.CONTEXT.MAX2           80   -0.061          0.092  -0.665   0.508
##                                  CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.MAX2    0.261    0.672
## log10TN.CONTEXT.MAX2             -0.245    0.122

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TN.CONTEXT.MEAN2, Decimals=3)

##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10TN.CONTEXT.MEAN2 51    0.505          0.100   5.059   0.000
```

```
## log10TN.CONTEXT.MEAN2           51   -0.116          0.182  -0.639   0.526
##                                 CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.MEAN2    0.304    0.705
## log10TN.CONTEXT.MEAN2             -0.481    0.249
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TN.CONTEXT.MEDIAN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10TN.CONTEXT.MEDIAN2 25    0.476          0.114   4.161
0.000
## log10TN.CONTEXT.MEDIAN2           25   -0.264          0.218  -1.209
0.239
##                                   CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.MEDIAN2    0.240    0.713
## log10TN.CONTEXT.MEDIAN2             -0.715    0.188
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TN.CONTEXT.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TN.CONTEXT.MIN2 80    0.405          0.095   4.278   0.000
## log10TN.CONTEXT.MIN2           80   -0.026          0.100  -0.265   0.791
##                                  CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.MIN2    0.217    0.594
## log10TN.CONTEXT.MIN2             -0.225    0.172
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TN.CONTEXT.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TN.CONTEXT.FILL 87    0.434          0.085   5.121   0.000
## log10TN.CONTEXT.FILL           87   -0.033          0.125  -0.263   0.793
##                                  CI-Lower CI-Upper
## Intercept log10TN.CONTEXT.FILL    0.266    0.603
## log10TN.CONTEXT.FILL             -0.281    0.216
```

4.2.18 TP Context

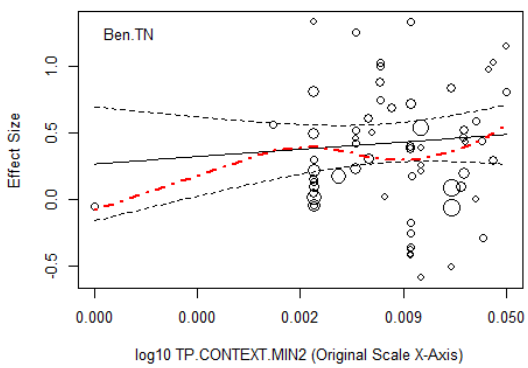
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("TP.CONTEXT.MIN2","TP.CONTEXT.MEAN2",
                      "TP.CONTEXT.MEDIAN2","TP.CONTEXT.MAX2",
"TP.CONTEXT.FILL"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

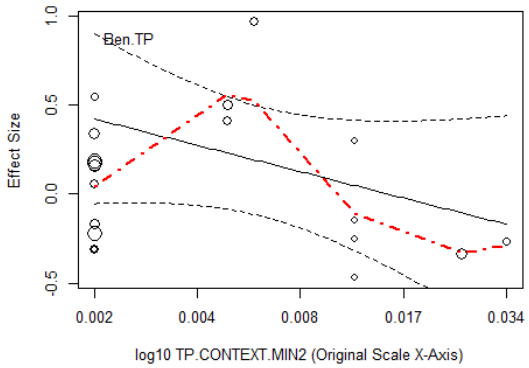
```
## [1] "Variable: TP.CONTEXT.MIN2.log10 || Plot: Ben.TN"
```

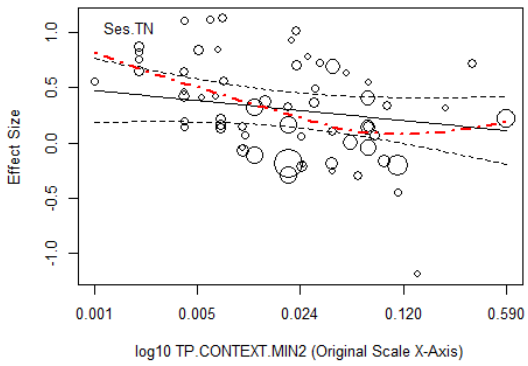
```
## [1] "Variable: TP.CONTEXT.MIN2.log10 || Plot: Ben.TP"
```

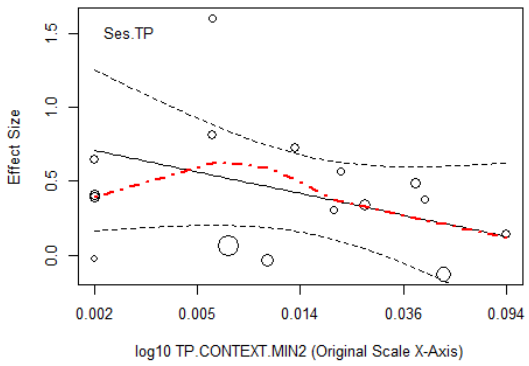
```
## [1] "Variable: TP.CONTEXT.MIN2.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: TP.CONTEXT.MIN2.log10 || Plot: Ses.TP"
```

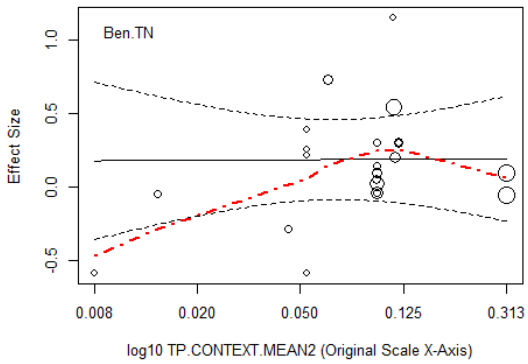


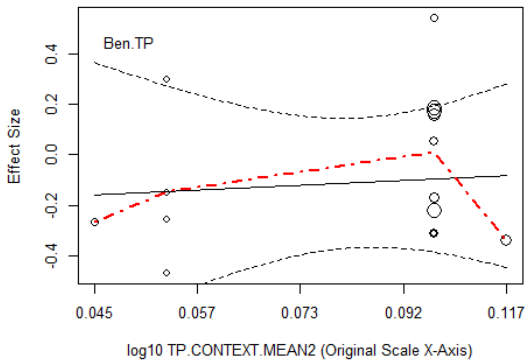


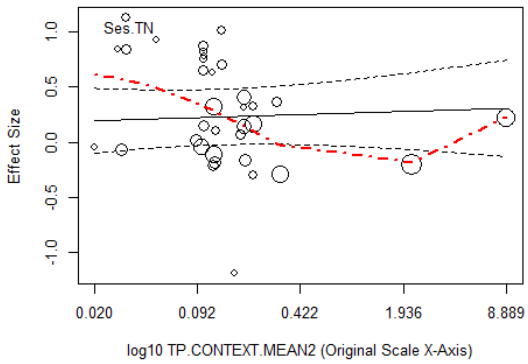




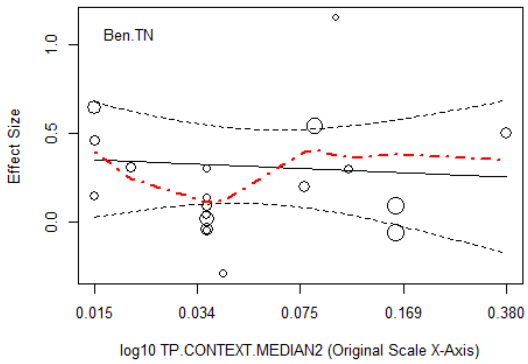

```
## [1] "Variable: TP.CONTEXT.MEAN2.log10 || Plot: Ben.TN"
## [1] "Variable: TP.CONTEXT.MEAN2.log10 || Plot: Ben.TP"
## [1] "Variable: TP.CONTEXT.MEAN2.log10 || Plot: Ses.TN"
## [1] "Variable: TP.CONTEXT.MEAN2.log10 || Plot: Ses.TP"
```

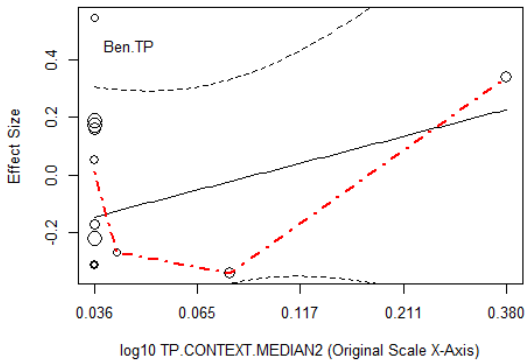


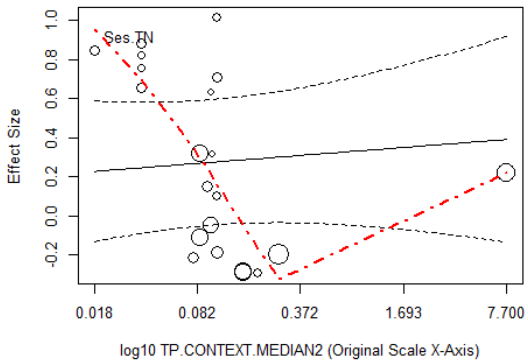




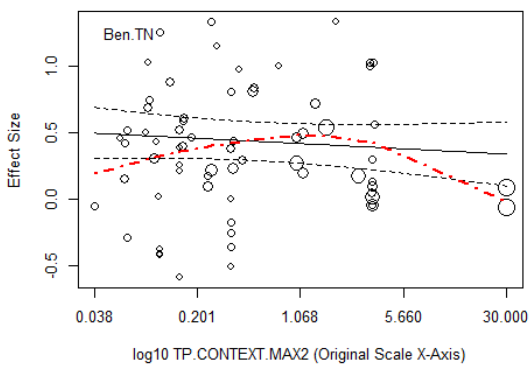

```
## [1] "Variable: TP.CONTEXT.MEDIAN2.log10 || Plot: Ben.TN"

## [1] "Variable: TP.CONTEXT.MEDIAN2.log10 || Plot: Ben.TP"

## [1] "Variable: TP.CONTEXT.MEDIAN2.log10 || Plot: Ses.TN"

## [1] "Variable: TP.CONTEXT.MEDIAN2.log10 || Plot: Ses.TP"
```

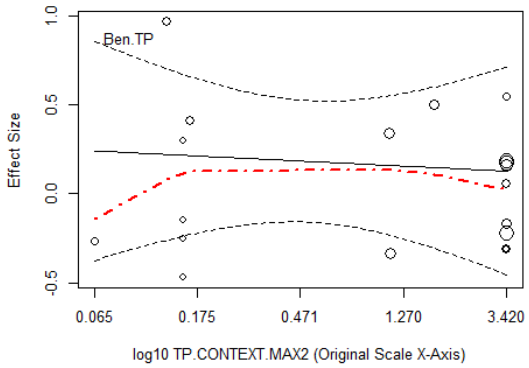


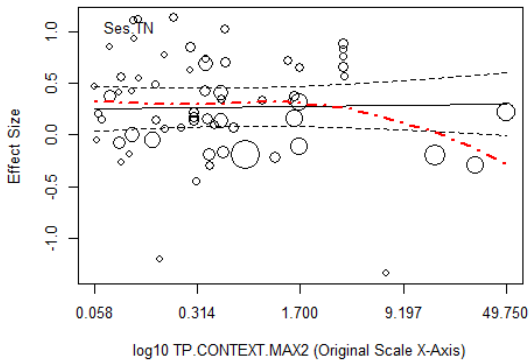


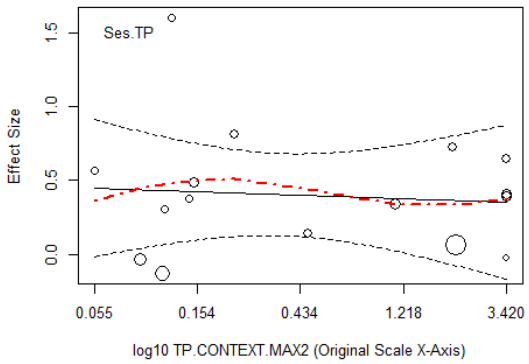



```
## [1] "Variable: TP.CONTEXT.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: TP.CONTEXT.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: TP.CONTEXT.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: TP.CONTEXT.MAX2.log10 || Plot: Ses.TP"
```

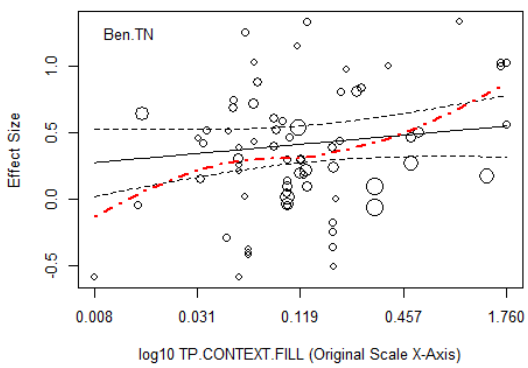


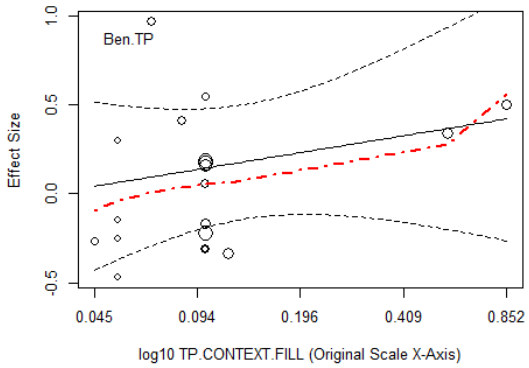


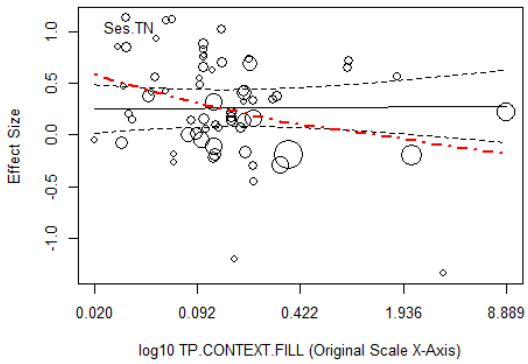


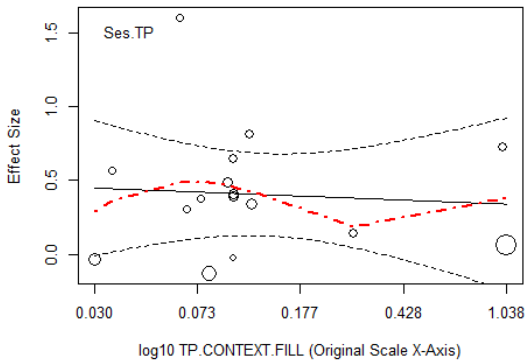



```
## [1] "Variable: TP.CONTEXT.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: TP.CONTEXT.FILL.log10 || Plot: Ben.TP"

## [1] "Variable: TP.CONTEXT.FILL.log10 || Plot: Ses.TN"

## [1] "Variable: TP.CONTEXT.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TP.CONTEXT.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TP.CONTEXT.MAX2 69    0.423          0.075   5.667   0.000
## log10TP.CONTEXT.MAX2           69   -0.054          0.055  -0.984   0.329
##                                  CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.MAX2    0.274    0.572
## log10TP.CONTEXT.MAX2             -0.164    0.056
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TP.CONTEXT.MEAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10TP.CONTEXT.MEAN2 22    0.195          0.307   0.637   0.532
## log10TP.CONTEXT.MEAN2           22    0.009          0.238   0.039   0.969
##                                   CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.MEAN2   -0.444    0.835
## log10TP.CONTEXT.MEAN2             -0.487    0.506
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TP.CONTEXT.MEDIAN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10TP.CONTEXT.MEDIAN2 20    0.225          0.286   0.785
0.443
## log10TP.CONTEXT.MEDIAN2           20   -0.069          0.212  -0.326
0.748
##                                   CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.MEDIAN2   -0.377    0.827
## log10TP.CONTEXT.MEDIAN2             -0.515    0.376

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TP.CONTEXT.MIN2, Decimals=3)

##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10TP.CONTEXT.MIN2 69    0.451          0.146   3.078   0.003
## log10TP.CONTEXT.MIN2           69    0.005          0.055   0.100   0.921
##                                   CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.MIN2    0.158    0.743
## log10TP.CONTEXT.MIN2             -0.104    0.115

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TP.CONTEXT.FILL, Decimals=3)

##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10TP.CONTEXT.FILL 71    0.522          0.101   5.190   0.000
## log10TP.CONTEXT.FILL           71    0.118          0.086   1.364   0.177
##                                   CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.FILL    0.321    0.723
## log10TP.CONTEXT.FILL             -0.054    0.290

print("ses.TN")

## [1] "ses.TN"

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TP.CONTEXT.MAX2, Decimals=3)

##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10TP.CONTEXT.MAX2 66    0.272          0.094   2.899   0.005
## log10TP.CONTEXT.MAX2           66    0.015          0.061   0.252   0.802
##                                   CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.MAX2    0.085    0.460
## log10TP.CONTEXT.MAX2             -0.106    0.137

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TP.CONTEXT.MEAN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-Value
## Intercept log10TP.CONTEXT.MEAN2 37    0.268          0.152   1.763   0.087
```

```
## log10TP.CONTEXT.MEAN2           37    0.042          0.095   0.447   0.658
##                                 CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.MEAN2   -0.041    0.576
## log10TP.CONTEXT.MEAN2             -0.150    0.235
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TP.CONTEXT.MEDIAN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10TP.CONTEXT.MEDIAN2 21    0.335          0.186   1.798
0.088
## log10TP.CONTEXT.MEDIAN2           21    0.062          0.105   0.591
0.561
##                                   CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.MEDIAN2   -0.055    0.725
## log10TP.CONTEXT.MEDIAN2             -0.158    0.282
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TP.CONTEXT.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TP.CONTEXT.MIN2 66    0.309          0.174   1.772   0.081
## log10TP.CONTEXT.MIN2           66    0.024          0.085   0.280   0.780
##                                  CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.MIN2   -0.039    0.658
## log10TP.CONTEXT.MIN2             -0.146    0.193
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TP.CONTEXT.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10TP.CONTEXT.FILL 67    0.268          0.113   2.360   0.021
## log10TP.CONTEXT.FILL           67    0.009          0.086   0.111   0.912
##                                  CI-Lower CI-Upper
## Intercept log10TP.CONTEXT.FILL    0.041    0.494
## log10TP.CONTEXT.FILL             -0.162    0.181
```

4.2.19 TSS

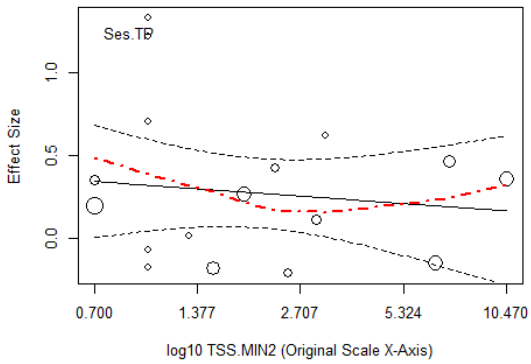
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("TSS.MIN2","TSS.MEAN2","TSS.MEDIAN2","TSS.MAX2",
"TSS.FILL"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: TSS.MIN2.log10 || Plot: Ben.TN"
```

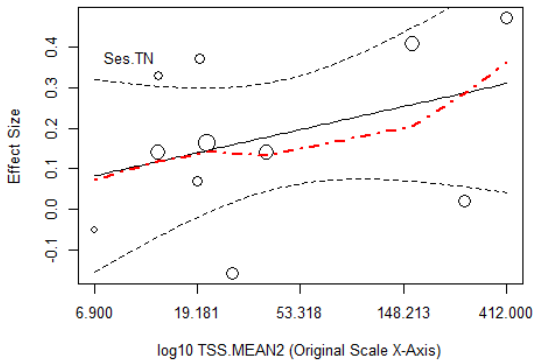
```
## [1] "Variable: TSS.MIN2.log10 || Plot: Ben.TP"
```

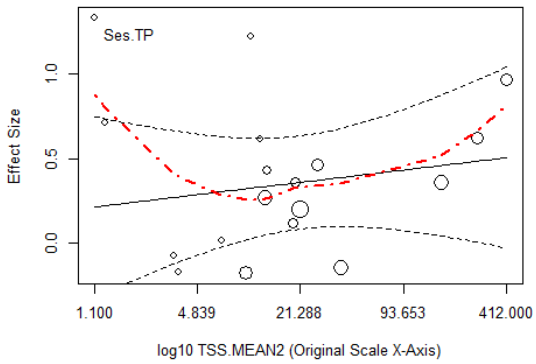
```
## [1] "Variable: TSS.MIN2.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: TSS.MIN2.log10 || Plot: Ses.TP"
```

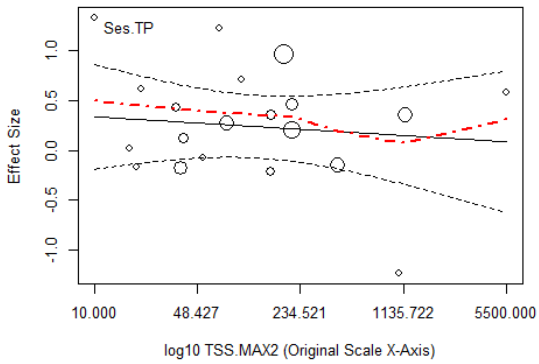



```
## [1] "Variable: TSS.MEAN2.log10 || Plot: Ben.TN"
## [1] "Variable: TSS.MEAN2.log10 || Plot: Ben.TP"
## [1] "Variable: TSS.MEAN2.log10 || Plot: Ses.TN"
## [1] "Variable: TSS.MEAN2.log10 || Plot: Ses.TP"
```

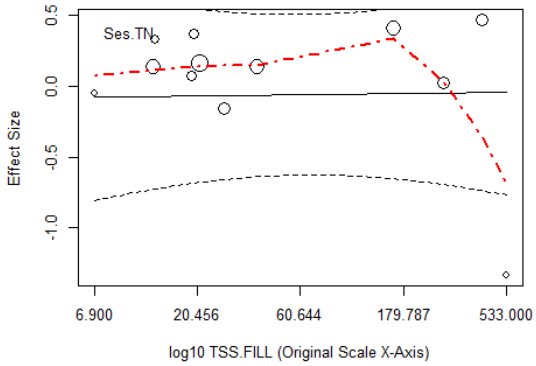


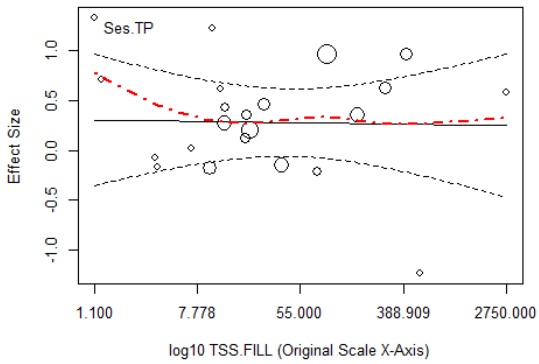



```
## [1] "Variable: TSS.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: TSS.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: TSS.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: TSS.MAX2.log10 || Plot: Ses.TP"
```




```
## [1] "Variable: TSS.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: TSS.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: TSS.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: TSS.FILL.log10 || Plot: Ses.TP"
```






```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TSS.MAX2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10TSS.MAX2 4    0.087          1.285   0.068   0.952   -5.440
## log10TSS.MAX2           4    0.211          0.491   0.430   0.709   -1.902
##                          CI-Upper
## Intercept log10TSS.MAX2    5.614
## log10TSS.MAX2              2.325
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TSS.MIN2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10TSS.MIN2 4    0.819          0.567   1.445   0.285   -1.619
## log10TSS.MIN2           4    0.069          0.153   0.451   0.696   -0.588
##                          CI-Upper
## Intercept log10TSS.MIN2    3.257
## log10TSS.MIN2              0.725
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TSS.FILL, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10TSS.FILL 4    0.138          1.154   0.119   0.916   -4.828
## log10TSS.FILL           4    0.216          0.495   0.438   0.704   -1.912
##                          CI-Upper
## Intercept log10TSS.FILL    5.104
## log10TSS.FILL              2.345
```

```
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TSS.MEDIAN2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TSS.MEAN2, Decimals=3)
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TSS.MAX2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10TSS.MAX2 5   -0.130          0.921  -0.141   0.897   -3.060
## log10TSS.MAX2           5    0.184          0.396   0.464   0.674   -1.077
##                          CI-Upper
## Intercept log10TSS.MAX2    2.800
## log10TSS.MAX2              1.444
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TSS.MIN2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10TSS.MIN2 5    0.375          0.502   0.746   0.510   -1.224
## log10TSS.MIN2           5    0.053          0.156   0.339   0.757   -0.445
##                          CI-Upper
## Intercept log10TSS.MIN2    1.974
## log10TSS.MIN2              0.551
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TSS.FILL, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-Lower
## Intercept log10TSS.FILL 5   -0.120          0.857  -0.140   0.897   -2.848
## log10TSS.FILL           5    0.204          0.415   0.493   0.656   -1.116
##                          CI-Upper
## Intercept log10TSS.FILL    2.608
## log10TSS.FILL              1.525
```

```
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TSS.MEAN2, Decimals=3)
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
```

```
mods=~log10TSS.MEDIAN2, Decimals=3)

print("ses.TN")

## [1] "ses.TN"

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TSS.MAX2, Decimals=3)

##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10TSS.MAX2 10   -0.182          0.497  -0.366   0.724   -
1.328
## log10TSS.MAX2           10    0.003          0.168   0.019   0.986   -
0.385
##                          CI-Upper
## Intercept log10TSS.MAX2    0.964
## log10TSS.MAX2              0.391

# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TSS.MEDIAN2, Decimals=3)
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TSS.MEAN2, Decimals=3)

##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10TSS.MEAN2 11   -0.024          0.186  -0.130   0.899   -
0.445
## log10TSS.MEAN2           11    0.128          0.107   1.194   0.263   -
0.114
##                           CI-Upper
## Intercept log10TSS.MEAN2    0.396
## log10TSS.MEAN2              0.370

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TSS.MIN2, Decimals=3)

##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10TSS.MIN2 10    0.057          0.079   0.725   0.489   -
0.125
## log10TSS.MIN2           10    0.236          0.077   3.042   0.016
0.057
##                          CI-Upper
## Intercept log10TSS.MIN2    0.239
## log10TSS.MIN2              0.414

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TSS.FILL, Decimals=3)

##                          n Estimate Standard Error T-Value P-Value CI-
Lower
```

```
## Intercept log10TSS.FILL 12   -0.092          0.464  -0.198   0.847   -
1.126
## log10TSS.FILL           12    0.018          0.217   0.084   0.934   -
0.465
##                         CI-Upper
## Intercept log10TSS.FILL    0.942
## log10TSS.FILL              0.501
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TSS.MAX2, Decimals=3)
```

```
##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10TSS.MAX2 20    0.428          0.413   1.037   0.313   -
0.439
## log10TSS.MAX2           20   -0.091          0.184  -0.496   0.626   -
0.478
##                         CI-Upper
## Intercept log10TSS.MAX2    1.295
## log10TSS.MAX2              0.295
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TSS.MEAN2, Decimals=3)
```

```
##                           n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10TSS.MEAN2 18    0.211          0.257   0.819   0.425   -
0.334
## log10TSS.MEAN2           18    0.113          0.167   0.674   0.510   -
0.242
##                          CI-Upper
## Intercept log10TSS.MEAN2    0.756
## log10TSS.MEAN2              0.468
```

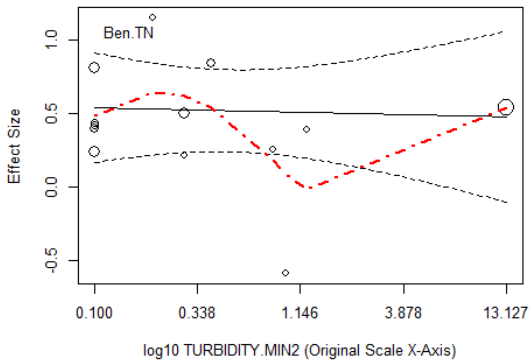
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TSS.MEDIAN2, Decimals=3)
```

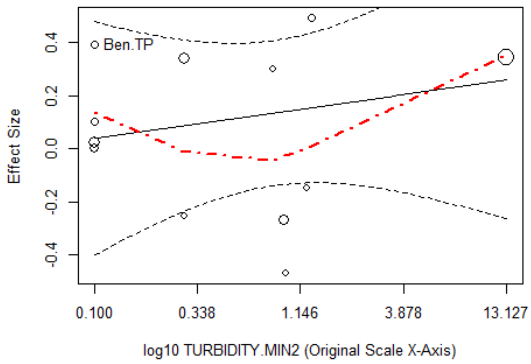
```
##                             n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10TSS.MEDIAN2 5    0.265          0.635   0.418   0.704   -
1.756
## log10TSS.MEDIAN2           5    0.694          1.097   0.633   0.572   -
2.798
##                            CI-Upper
## Intercept log10TSS.MEDIAN2    2.287
## log10TSS.MEDIAN2              4.186
```

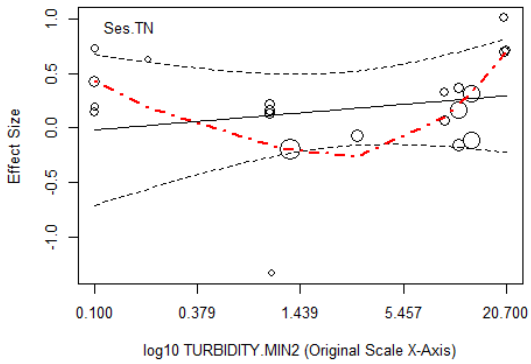
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TSS.FILL, Decimals=3)

##                          n Estimate Standard Error T-Value P-Value CI-
Lower
## Intercept log10TSS.FILL 22    0.306          0.321   0.952   0.352   -
0.364
## log10TSS.FILL           22   -0.017          0.169  -0.098   0.923   -
0.369
##                          CI-Upper
## Intercept log10TSS.FILL    0.975
## log10TSS.FILL              0.335
```

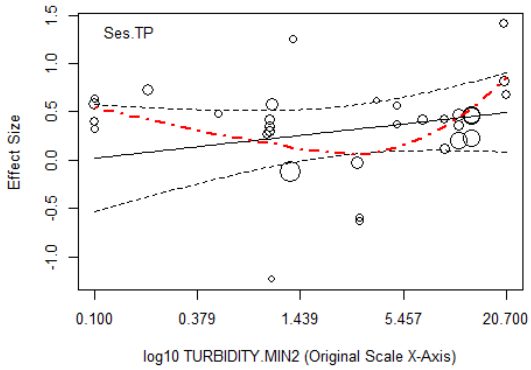
4.2.20 Turbidity

```
#check secchi depth
#check secchi tube depth

plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("TURBIDITY.MIN2","TURBIDITY.MEAN2",
                      "TURBIDITY.MEDIAN2","TURBIDITY.MAX2",
"TURBIDITY.FILL"),ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)

## [1] "Variable: TURBIDITY.MIN2.log10 || Plot: Ben.TN"

## [1] "Variable: TURBIDITY.MIN2.log10 || Plot: Ben.TP"

## [1] "Variable: TURBIDITY.MIN2.log10 || Plot: Ses.TN"

## [1] "Variable: TURBIDITY.MIN2.log10 || Plot: Ses.TP"
```

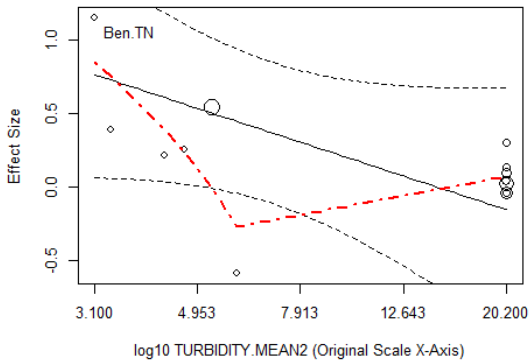


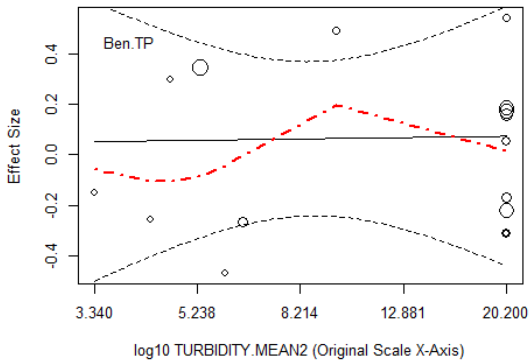


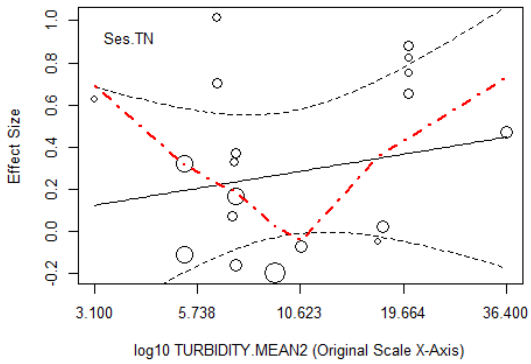


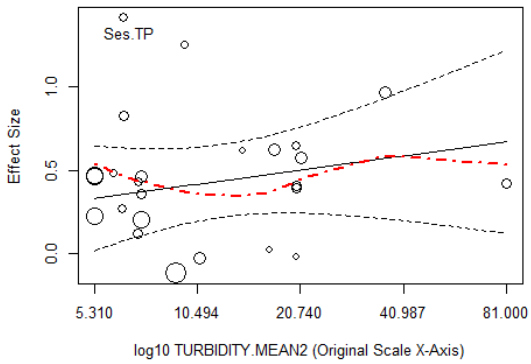



```
## [1] "Variable: TURBIDITY.MEAN2.log10 || Plot: Ben.TN"
## [1] "Variable: TURBIDITY.MEAN2.log10 || Plot: Ben.TP"
## [1] "Variable: TURBIDITY.MEAN2.log10 || Plot: Ses.TN"
## [1] "Variable: TURBIDITY.MEAN2.log10 || Plot: Ses.TP"
```

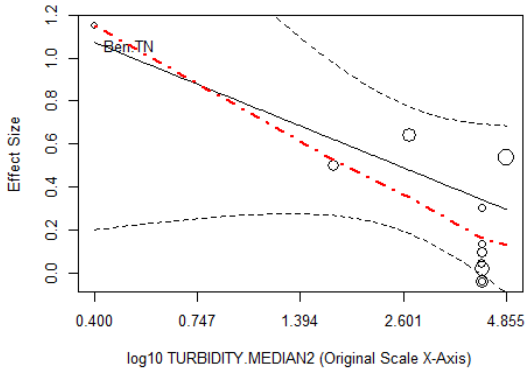


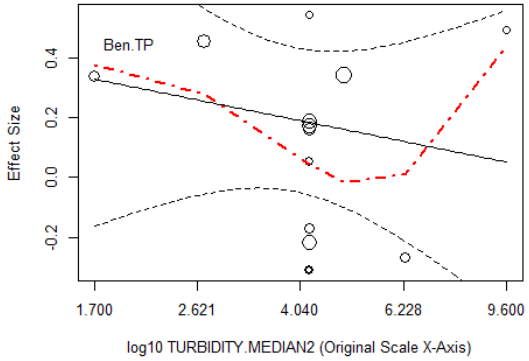


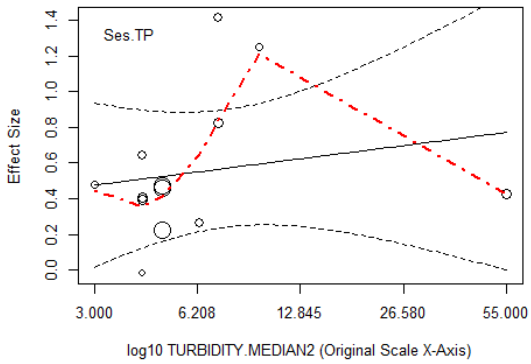




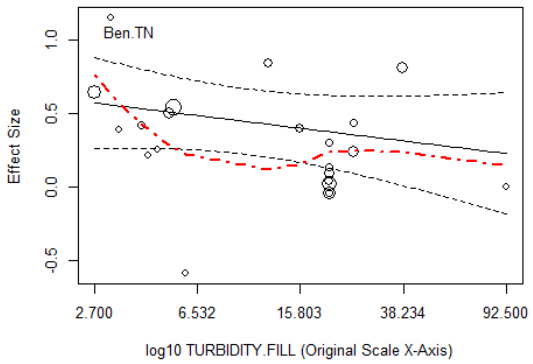

```
## [1] "Variable: TURBIDITY.MEDIAN2.log10 || Plot: Ben.TN"
## [1] "Variable: TURBIDITY.MEDIAN2.log10 || Plot: Ben.TP"
## [1] "Variable: TURBIDITY.MEDIAN2.log10 || Plot: Ses.TN"
## [1] "Variable: TURBIDITY.MEDIAN2.log10 || Plot: Ses.TP"
```

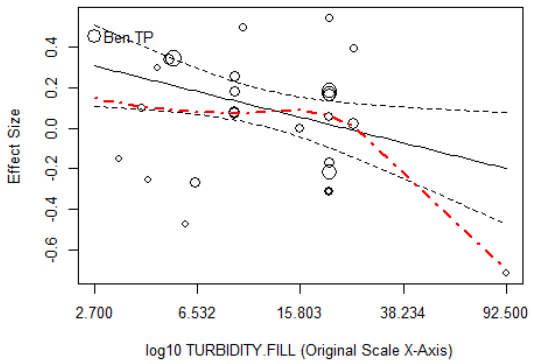


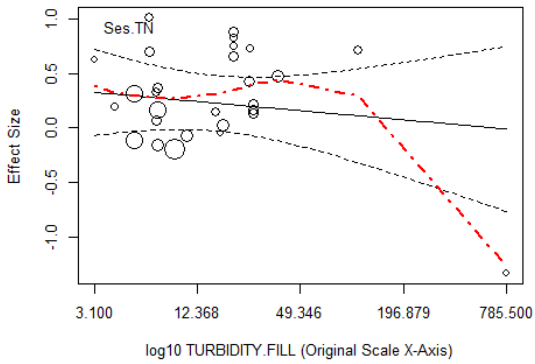


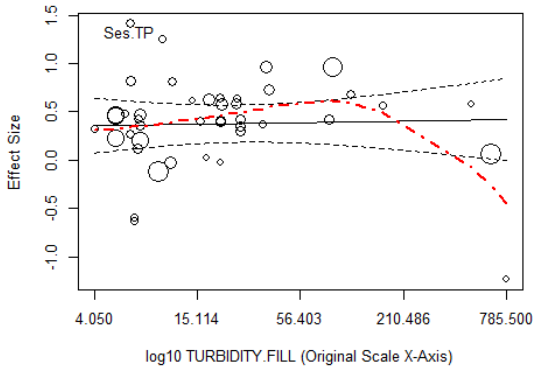



```
## [1] "Variable: TURBIDITY.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: TURBIDITY.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: TURBIDITY.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: TURBIDITY.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TURBIDITY.MAX2, Decimals=3)
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TURBIDITY.MEAN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MEAN2 13    1.319          0.601   2.192   0.051
## log10TURBIDITY.MEAN2           13   -1.128          0.665  -1.696   0.118
##                                CI-Lower CI-Upper
## Intercept log10TURBIDITY.MEAN2   -0.005    2.642
## log10TURBIDITY.MEAN2             -2.592    0.336
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TURBIDITY.MEDIAN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-
Value
## Intercept log10TURBIDITY.MEDIAN2 11    0.788          0.229   3.435
0.007
## log10TURBIDITY.MEDIAN2           11   -0.717          0.438  -1.636
```

```
0.136
##                                  CI-Lower CI-Upper
## Intercept log10TURBIDITY.MEDIAN2    0.269    1.307
## log10TURBIDITY.MEDIAN2             -1.709    0.275

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TURBIDITY.MIN2, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MIN2 21    0.530          0.119   4.440   0.000
## log10TURBIDITY.MIN2           21    0.095          0.053   1.809   0.086
##                               CI-Lower CI-Upper
## Intercept log10TURBIDITY.MIN2    0.280    0.780
## log10TURBIDITY.MIN2             -0.015    0.206

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10TURBIDITY.FILL, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.FILL 22    0.668          0.208   3.220   0.004
## log10TURBIDITY.FILL           22   -0.224          0.175  -1.279   0.216
##                               CI-Lower CI-Upper
## Intercept log10TURBIDITY.FILL    0.235    1.101
## log10TURBIDITY.FILL             -0.590    0.141

print("ben.TP")

## [1] "ben.TP"

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TURBIDITY.MEAN2, Decimals=3)

##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MEAN2 16    0.038          0.509   0.075   0.942
## log10TURBIDITY.MEAN2           16    0.028          0.523   0.053   0.958
##                                CI-Lower CI-Upper
## Intercept log10TURBIDITY.MEAN2   -1.055    1.130
## log10TURBIDITY.MEAN2             -1.093    1.149

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TURBIDITY.MEDIAN2, Decimals=3)

##                                  n Estimate Standard Error T-Value P-
Value
## Intercept log10TURBIDITY.MEDIAN2 14    0.414          0.339   1.221
0.246
## log10TURBIDITY.MEDIAN2           14   -0.369          0.535  -0.689
0.504
##                                  CI-Lower CI-Upper
## Intercept log10TURBIDITY.MEDIAN2   -0.325    1.153
## log10TURBIDITY.MEDIAN2             -1.535    0.797
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TURBIDITY.MIN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MIN2 26    0.140          0.096   1.455   0.159
## log10TURBIDITY.MIN2           26    0.027          0.031   0.880   0.387
##                               CI-Lower CI-Upper
## Intercept log10TURBIDITY.MIN2   -0.059    0.339
## log10TURBIDITY.MIN2             -0.037    0.092
```

```
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TURBIDITY.MAX2, Decimals=3)
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10TURBIDITY.FILL, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.FILL 27     0.45          0.153   2.930   0.007
## log10TURBIDITY.FILL           27    -0.33          0.139  -2.369   0.026
##                               CI-Lower CI-Upper
## Intercept log10TURBIDITY.FILL    0.134    0.766
## log10TURBIDITY.FILL             -0.617   -0.043
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
# extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TURBIDITY.MAX2, Decimals=3)
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TURBIDITY.MEAN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MEAN2 25    0.123          0.343   0.358   0.723
## log10TURBIDITY.MEAN2           25    0.287          0.299   0.958   0.348
##                               CI-Lower CI-Upper
## Intercept log10TURBIDITY.MEAN2   -0.587    0.833
## log10TURBIDITY.MEAN2             -0.332    0.906
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TURBIDITY.MEDIAN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-
Value
## Intercept log10TURBIDITY.MEDIAN2 13    0.365          0.354   1.032
0.324
## log10TURBIDITY.MEDIAN2           13    0.234          0.366   0.638
0.536
##                                  CI-Lower CI-Upper
## Intercept log10TURBIDITY.MEDIAN2   -0.414    1.143
## log10TURBIDITY.MEDIAN2             -0.572    1.040
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TURBIDITY.MIN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MIN2 41     0.34          0.105   3.225   0.003
## log10TURBIDITY.MIN2           41    -0.02          0.043  -0.465   0.644
##                               CI-Lower CI-Upper
## Intercept log10TURBIDITY.MIN2    0.127    0.553
## log10TURBIDITY.MIN2             -0.107    0.067
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10TURBIDITY.FILL, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.FILL 43    0.341          0.204   1.671   0.102
## log10TURBIDITY.FILL           43    0.028          0.127   0.217   0.829
##                               CI-Lower CI-Upper
## Intercept log10TURBIDITY.FILL   -0.071    0.752
## log10TURBIDITY.FILL             -0.229    0.285
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TURBIDITY.MEAN2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MEAN2 19   -0.025          0.473  -0.052   0.959
## log10TURBIDITY.MEAN2           19    0.302          0.456   0.662   0.517
##                                CI-Lower CI-Upper
## Intercept log10TURBIDITY.MEAN2   -1.023    0.974
## log10TURBIDITY.MEAN2             -0.661    1.265
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TURBIDITY.MEDIAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MEDIAN2 9    0.580          0.355   1.633   0.146
## log10TURBIDITY.MEDIAN2           9    0.004          0.520   0.007   0.995
##                                  CI-Lower CI-Upper
## Intercept log10TURBIDITY.MEDIAN2   -0.260    1.420
## log10TURBIDITY.MEDIAN2             -1.227    1.234
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TURBIDITY.MIN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.MIN2 26    0.204          0.151   1.346   0.191
## log10TURBIDITY.MIN2           26   -0.029          0.076  -0.384   0.704
##                               CI-Lower CI-Upper
```

```
## Intercept log10TURBIDITY.MIN2   -0.109    0.516
## log10TURBIDITY.MIN2             -0.186    0.128
```

```
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TURBIDITY.MAX2, Decimals=3)
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10TURBIDITY.FILL, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10TURBIDITY.FILL 28    0.396          0.277   1.431   0.164
## log10TURBIDITY.FILL           28   -0.139          0.205  -0.678   0.504
##                               CI-Lower CI-Upper
## Intercept log10TURBIDITY.FILL   -0.173    0.965
## log10TURBIDITY.FILL             -0.561    0.283
```

4.2.21 Velocity

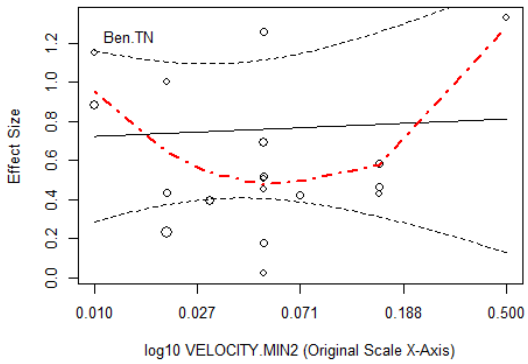
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("VELOCITY.MIN2","VELOCITY.MEDIAN2",
                      "VELOCITY.MEAN2","VELOCITY.MAX2",
"VELOCITY.FILL"),ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

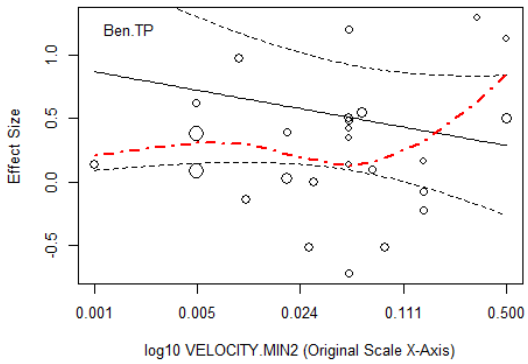
```
## [1] "Variable: VELOCITY.MIN2.log10 || Plot: Ben.TN"
```

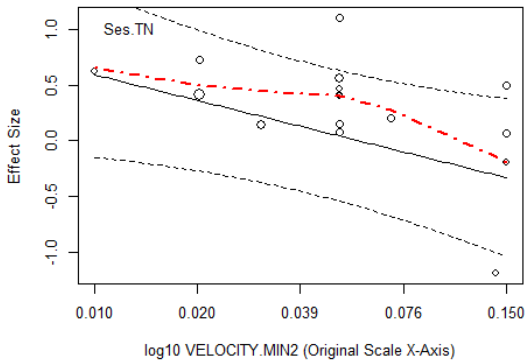
```
## [1] "Variable: VELOCITY.MIN2.log10 || Plot: Ben.TP"
```

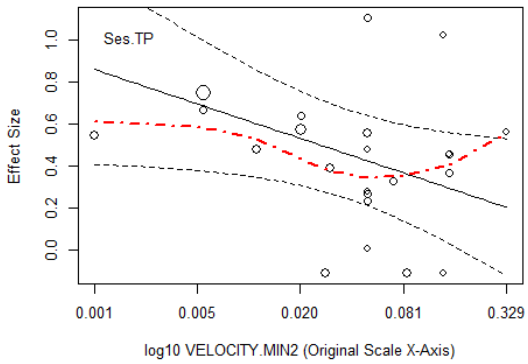
```
## [1] "Variable: VELOCITY.MIN2.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: VELOCITY.MIN2.log10 || Plot: Ses.TP"
```



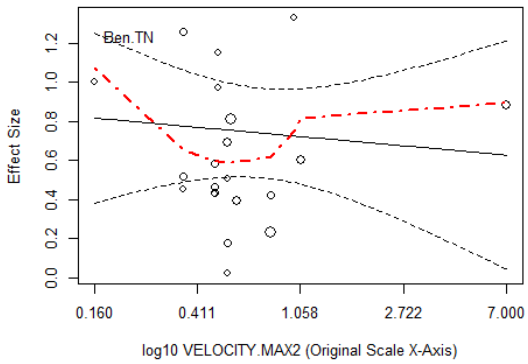


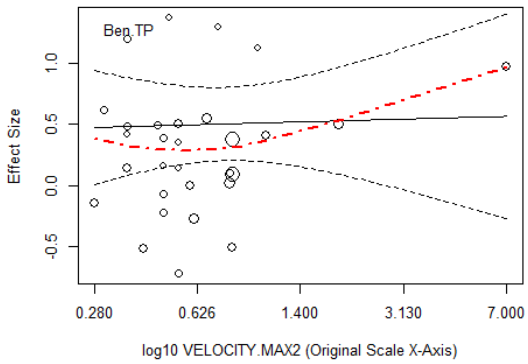


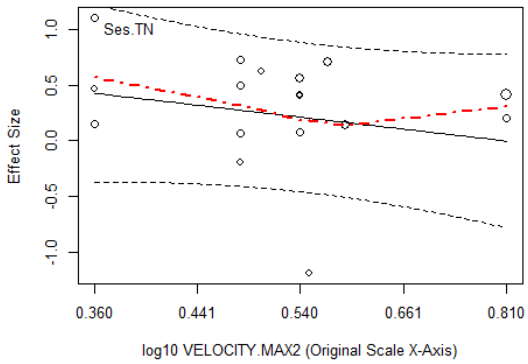


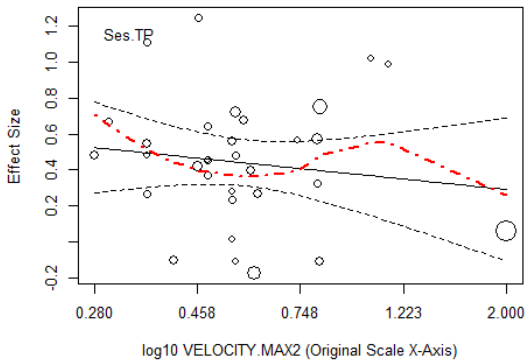

```
## [1] "Variable: VELOCITY.MEAN2.log10 || Plot: Ben.TN"

## [1] "Variable: VELOCITY.MEAN2.log10 || Plot: Ben.TP"

## [1] "Variable: VELOCITY.MEAN2.log10 || Plot: Ses.TN"

## [1] "Variable: VELOCITY.MEAN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: VELOCITY.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: VELOCITY.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: VELOCITY.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: VELOCITY.MAX2.log10 || Plot: Ses.TP"
```

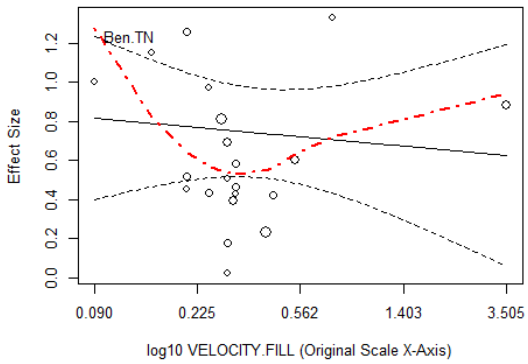


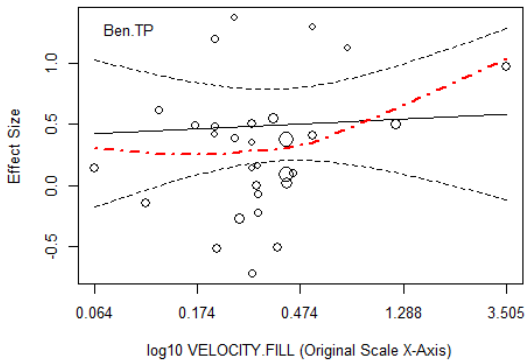


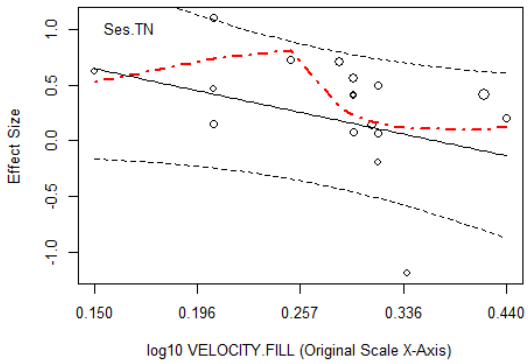


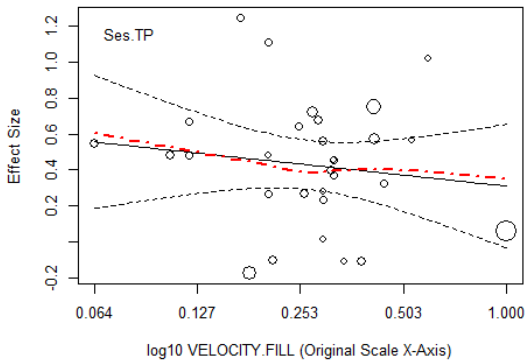



```
## [1] "Variable: VELOCITY.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: VELOCITY.FILL.log10 || Plot: Ben.TP"

## [1] "Variable: VELOCITY.FILL.log10 || Plot: Ses.TN"

## [1] "Variable: VELOCITY.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10VELOCITY.MEDIAN2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10VELOCITY.MEAN2, Decimals=3)
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10VELOCITY.MAX2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MAX2 22    0.727          0.115   6.327   0.000
## log10VELOCITY.MAX2           22   -0.115          0.264  -0.435   0.668
##                                CI-Lower CI-Upper
## Intercept log10VELOCITY.MAX2    0.487    0.966
## log10VELOCITY.MAX2             -0.667    0.437
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10VELOCITY.MIN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MIN2 22    0.691          0.193   3.585   0.002
## log10VELOCITY.MIN2           22   -0.015          0.061  -0.245   0.809
```

```
##                               CI-Lower CI-Upper
## Intercept log10VELOCITY.MIN2    0.289    1.093
## log10VELOCITY.MIN2             -0.143    0.113
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10VELOCITY.FILL, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.FILL 22    0.692          0.152   4.543   0.000
## log10VELOCITY.FILL           22   -0.119          0.262  -0.455   0.654
##                               CI-Lower CI-Upper
## Intercept log10VELOCITY.FILL    0.375    1.010
## log10VELOCITY.FILL             -0.667    0.428
```

```
print("ben.TP")
```

```
## [1] "ben.TP"
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10VELOCITY.MAX2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MAX2 31    0.512          0.154   3.333   0.002
## log10VELOCITY.MAX2           31    0.065          0.397   0.163   0.872
##                               CI-Lower CI-Upper
## Intercept log10VELOCITY.MAX2    0.198    0.826
## log10VELOCITY.MAX2             -0.748    0.877
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10VELOCITY.MEAN2, Decimals=3)
```

```
##                                n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MEAN2 7   -0.826          0.499  -1.655   0.159
## log10VELOCITY.MEAN2           7   -0.986          0.604  -1.633   0.163
##                                CI-Lower CI-Upper
## Intercept log10VELOCITY.MEAN2   -2.110    0.457
## log10VELOCITY.MEAN2             -2.539    0.566
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10VELOCITY.MEDIAN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MEDIAN2 2   -2.171          0.897  -2.420   0.249
## log10VELOCITY.MEDIAN2           2   -3.350          1.414  -2.369   0.254
##                                  CI-Lower CI-Upper
## Intercept log10VELOCITY.MEDIAN2  -13.567    9.225
## log10VELOCITY.MEDIAN2            -21.316   14.616
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10VELOCITY.MIN2, Decimals=3)
```

```
##                               n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MIN2 31    0.348          0.251   1.386   0.176
## log10VELOCITY.MIN2           31   -0.073          0.086  -0.841   0.407
##                              CI-Lower CI-Upper
## Intercept log10VELOCITY.MIN2   -0.165    0.861
## log10VELOCITY.MIN2             -0.249    0.104
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10VELOCITY.FILL, Decimals=3)
```

```
##                               n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.FILL 31    0.534          0.195   2.737   0.010
## log10VELOCITY.FILL           31    0.092          0.326   0.281   0.781
##                              CI-Lower CI-Upper
## Intercept log10VELOCITY.FILL    0.135    0.933
## log10VELOCITY.FILL             -0.576    0.759
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10VELOCITY.MAX2, Decimals=3)
```

```
##                               n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MAX2 17   -0.112          0.427  -0.264   0.796
## log10VELOCITY.MAX2           17   -1.218          1.103  -1.105   0.287
##                              CI-Lower CI-Upper
## Intercept log10VELOCITY.MAX2   -1.022    0.797
## log10VELOCITY.MAX2             -3.569    1.132
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10VELOCITY.MIN2, Decimals=3)
```

```
##                               n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MIN2 17   -0.543          0.498  -1.091   0.293
## log10VELOCITY.MIN2           17   -0.370          0.195  -1.899   0.077
##                              CI-Lower CI-Upper
## Intercept log10VELOCITY.MIN2   -1.604    0.518
## log10VELOCITY.MIN2             -0.786    0.045
```

```
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10VELOCITY.MEAN2, Decimals=3)
# extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10VELOCITY.MEDIAN2, Decimals=3)
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10VELOCITY.FILL, Decimals=3)
```

```
##                               n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.FILL 17   -0.728          0.607  -1.199   0.249
## log10VELOCITY.FILL           17   -1.669          0.951  -1.756   0.100
##                              CI-Lower CI-Upper
```

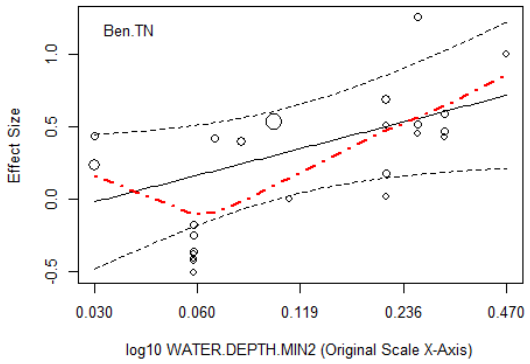
```
## Intercept log10VELOCITY.FILL   -2.022    0.566
## log10VELOCITY.FILL             -3.695    0.357

print("ses.TP")

## [1] "ses.TP"

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10VELOCITY.MAX2, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MAX2 32    0.374          0.104   3.601   0.001
## log10VELOCITY.MAX2           32   -0.273          0.342  -0.798   0.431
##                              CI-Lower CI-Upper
## Intercept log10VELOCITY.MAX2    0.162    0.586
## log10VELOCITY.MAX2             -0.972    0.426

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10VELOCITY.MEAN2, Decimals=3)

##                                n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MEAN2 10   -0.471          0.398  -1.182   0.271
## log10VELOCITY.MEAN2           10   -0.996          0.494  -2.015   0.079
##                               CI-Lower CI-Upper
## Intercept log10VELOCITY.MEAN2   -1.388    0.447
## log10VELOCITY.MEAN2             -2.136    0.144

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10VELOCITY.MEDIAN2, Decimals=3)

##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MEDIAN2 3    0.622          1.660   0.375   0.772
## log10VELOCITY.MEDIAN2           3   -0.007          1.985  -0.003   0.998
##                                  CI-Lower CI-Upper
## Intercept log10VELOCITY.MEDIAN2  -20.471   21.714
## log10VELOCITY.MEDIAN2            -25.227   25.213

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10VELOCITY.MIN2, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.MIN2 30    0.407          0.164   2.477   0.020
## log10VELOCITY.MIN2           30   -0.003          0.053  -0.049   0.961
##                              CI-Lower CI-Upper
## Intercept log10VELOCITY.MIN2    0.071    0.744
## log10VELOCITY.MIN2             -0.110    0.105

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10VELOCITY.FILL, Decimals=3)

##                               n Estimate Standard Error T-Value P-Value
## Intercept log10VELOCITY.FILL 30    0.310          0.168   1.847   0.075
```

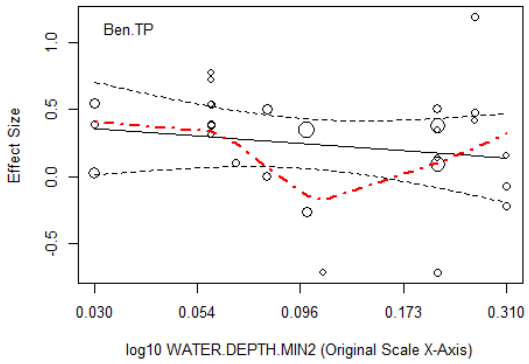
```
## log10VELOCITY.FILL            30   -0.206          0.270  -0.762   0.452
##                                CI-Lower CI-Upper
## Intercept log10VELOCITY.FILL   -0.034    0.655
## log10VELOCITY.FILL             -0.760    0.348
```

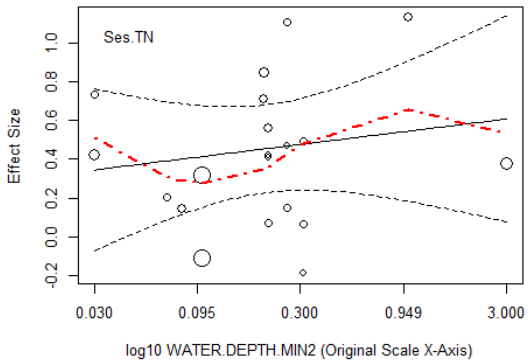
4.2.22 Water Depth

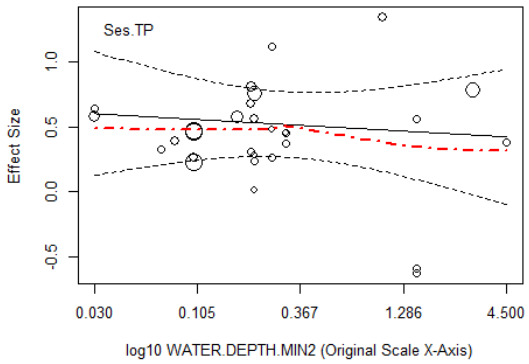
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("WATER.DEPTH.MIN2","WATER.DEPTH.MEAN2",
                      "WATER.DEPTH.MEDIAN2","WATER.DEPTH.MAX2",
"WATER.DEPTH.FILL"),ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: WATER.DEPTH.MIN2.log10 || Plot: Ben.TN"

## [1] "Variable: WATER.DEPTH.MIN2.log10 || Plot: Ben.TP"

## [1] "Variable: WATER.DEPTH.MIN2.log10 || Plot: Ses.TN"

## [1] "Variable: WATER.DEPTH.MIN2.log10 || Plot: Ses.TP"
```



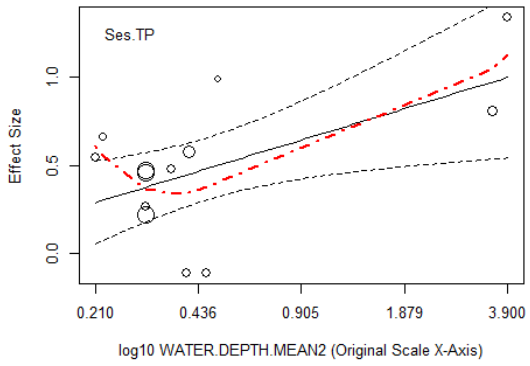






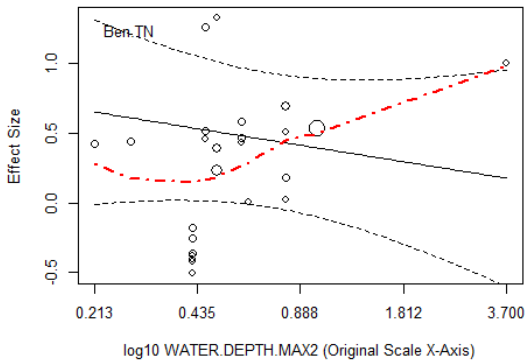

```
## [1] "Variable: WATER.DEPTH.MEAN2.log10 || Plot: Ben.TN"

## [1] "Variable: WATER.DEPTH.MEAN2.log10 || Plot: Ben.TP"
```

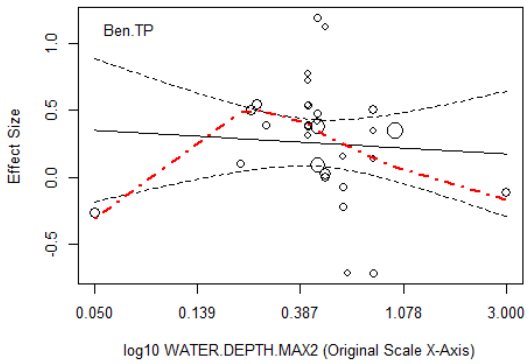
```
## [1] "Variable: WATER.DEPTH.MEAN2.log10 || Plot: Ses.TN"
## [1] "Variable: WATER.DEPTH.MEAN2.log10 || Plot: Ses.TP"
```

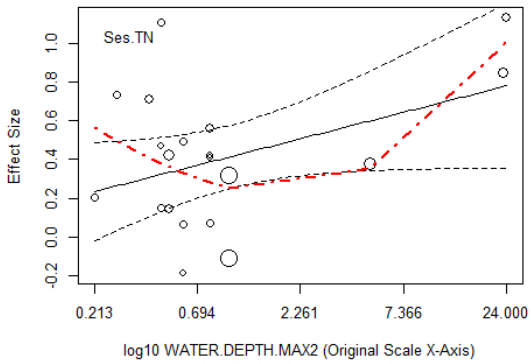


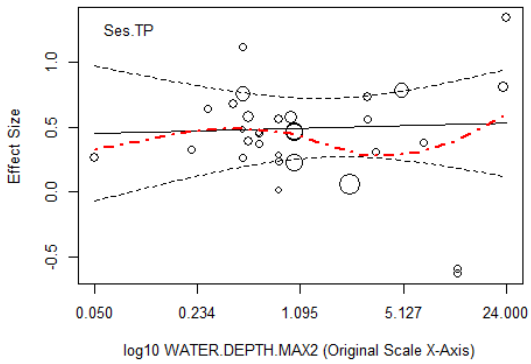

```
## [1] "Variable: WATER.DEPTH.MEDIAN2.log10 || Plot: Ben.TN"
## [1] "Variable: WATER.DEPTH.MEDIAN2.log10 || Plot: Ben.TP"
## [1] "Variable: WATER.DEPTH.MEDIAN2.log10 || Plot: Ses.TN"
## [1] "Variable: WATER.DEPTH.MEDIAN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: WATER.DEPTH.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: WATER.DEPTH.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: WATER.DEPTH.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: WATER.DEPTH.MAX2.log10 || Plot: Ses.TP"
```

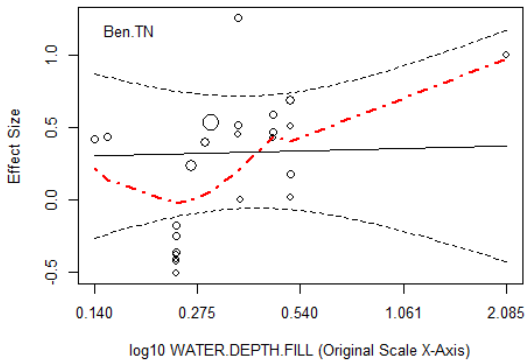


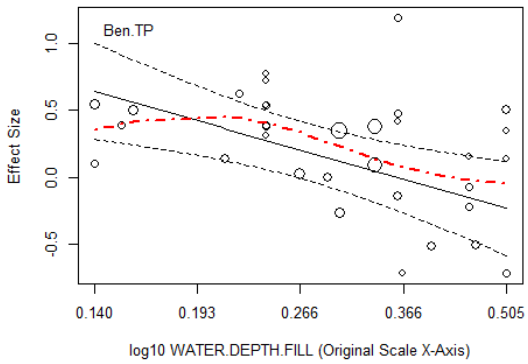


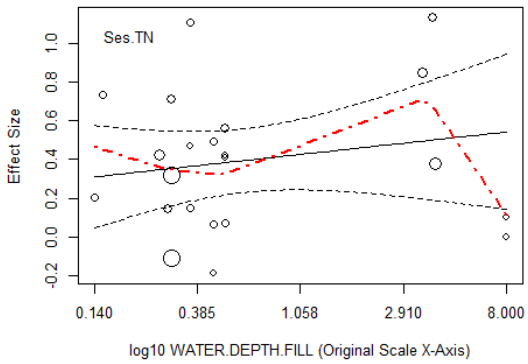


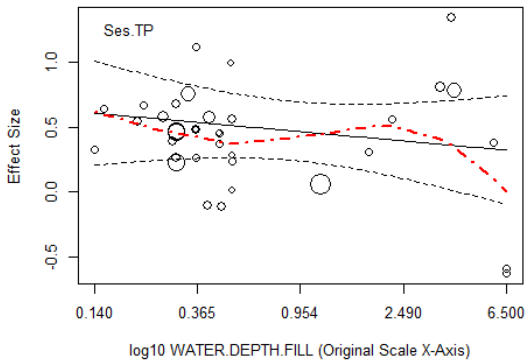



```
## [1] "Variable: WATER.DEPTH.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: WATER.DEPTH.FILL.log10 || Plot: Ben.TP"

## [1] "Variable: WATER.DEPTH.FILL.log10 || Plot: Ses.TN"

## [1] "Variable: WATER.DEPTH.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.DEPTH.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MAX2 25    0.396          0.240   1.649   0.113
## log10WATER.DEPTH.MAX2           25   -0.383          0.416  -0.921   0.367
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MAX2   -0.101    0.893
## log10WATER.DEPTH.MAX2             -1.242    0.477
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.DEPTH.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MIN2 24    0.918          0.327   2.806   0.010
## log10WATER.DEPTH.MIN2           24    0.614          0.303   2.025   0.055
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MIN2    0.240    1.597
## log10WATER.DEPTH.MIN2             -0.015    1.243
```

```r
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.DEPTH.MEAN2, Decimals=3)
# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.DEPTH.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.DEPTH.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.FILL 24    0.355          0.267   1.332   0.197
## log10WATER.DEPTH.FILL           24    0.058          0.457   0.127   0.900
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.FILL   -0.198    0.909
## log10WATER.DEPTH.FILL             -0.891    1.007
```

```r
print("ben.TP")
```

```
## [1] "ben.TP"
```

```r
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.DEPTH.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MAX2 30    0.223          0.124   1.802   0.082
## log10WATER.DEPTH.MAX2           30   -0.100          0.259  -0.386   0.702
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MAX2    -0.03    0.476
## log10WATER.DEPTH.MAX2              -0.63    0.430
```

```r
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.DEPTH.MEAN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MEAN2 7   -1.399          0.461  -3.037   0.029
## log10WATER.DEPTH.MEAN2           7   -2.730          0.843  -3.239   0.023
##                                  CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MEAN2   -2.583   -0.215
## log10WATER.DEPTH.MEAN2             -4.896   -0.563
```

```r
# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.DEPTH.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.DEPTH.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MIN2 28    0.029          0.288   0.101   0.921
## log10WATER.DEPTH.MIN2           28   -0.217          0.273  -0.793   0.435
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MIN2   -0.563    0.621
## log10WATER.DEPTH.MIN2             -0.778    0.345
```

```r
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.DEPTH.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.FILL 33   -0.698          0.304  -2.293   0.029
## log10WATER.DEPTH.FILL           33   -1.569          0.501  -3.130   0.004
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.FILL   -1.318   -0.077
## log10WATER.DEPTH.FILL             -2.592   -0.547
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.DEPTH.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MAX2 20    0.413          0.078   5.306   0.000
## log10WATER.DEPTH.MAX2           20    0.266          0.136   1.949   0.067
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MAX2    0.249    0.576
## log10WATER.DEPTH.MAX2             -0.021    0.553
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.DEPTH.MEAN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MEAN2 6    0.417          0.361   1.155   0.312
## log10WATER.DEPTH.MEAN2           6    0.291          0.553   0.527   0.626
##                                  CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MEAN2   -0.585    1.419
## log10WATER.DEPTH.MEAN2             -1.243    1.826
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.DEPTH.MEDIAN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10WATER.DEPTH.MEDIAN2 3    0.565          0.234   2.409
0.251
## log10WATER.DEPTH.MEDIAN2           3    0.879          0.500   1.758
0.329
##                                    CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MEDIAN2   -2.414    3.543
## log10WATER.DEPTH.MEDIAN2             -5.476    7.234
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.DEPTH.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MIN2 20    0.545          0.172   3.165   0.005
## log10WATER.DEPTH.MIN2           20    0.131          0.198   0.663   0.516
##                                 CI-Lower CI-Upper
```

```
## Intercept log10WATER.DEPTH.MIN2    0.183    0.907
## log10WATER.DEPTH.MIN2             -0.284    0.547
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.DEPTH.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.FILL 22    0.423          0.086   4.923   0.000
## log10WATER.DEPTH.FILL           22    0.132          0.157   0.843   0.409
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.FILL    0.244    0.602
## log10WATER.DEPTH.FILL             -0.194    0.458
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.DEPTH.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MAX2 31    0.489          0.115   4.238   0.000
## log10WATER.DEPTH.MAX2           31    0.030          0.148   0.200   0.843
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MAX2    0.253    0.725
## log10WATER.DEPTH.MAX2             -0.274    0.333
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.DEPTH.MEAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10WATER.DEPTH.MEAN2 13    0.669          0.106   6.332
0.00
## log10WATER.DEPTH.MEAN2           13    0.558          0.206   2.705
0.02
##                                  CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MEAN2    0.436    0.901
## log10WATER.DEPTH.MEAN2              0.104    1.012
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.DEPTH.MEDIAN2, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATER.DEPTH.MEDIAN2 5    0.641          0.120   5.335
0.013
## log10WATER.DEPTH.MEDIAN2           5    0.517          0.239   2.164
0.119
##                                    CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MEDIAN2    0.258    1.023
## log10WATER.DEPTH.MEDIAN2             -0.243    1.276
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.DEPTH.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.MIN2 30    0.537          0.135   3.975    0.00
## log10WATER.DEPTH.MIN2           30    0.068          0.090   0.749    0.46
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.MIN2    0.260    0.813
## log10WATER.DEPTH.MIN2             -0.117    0.252
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.DEPTH.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.DEPTH.FILL 36    0.461          0.112   4.129     0.0
## log10WATER.DEPTH.FILL           36   -0.170          0.200  -0.853     0.4
##                                 CI-Lower CI-Upper
## Intercept log10WATER.DEPTH.FILL    0.234    0.688
## log10WATER.DEPTH.FILL             -0.577    0.236
```

4.2.23 Water Temp

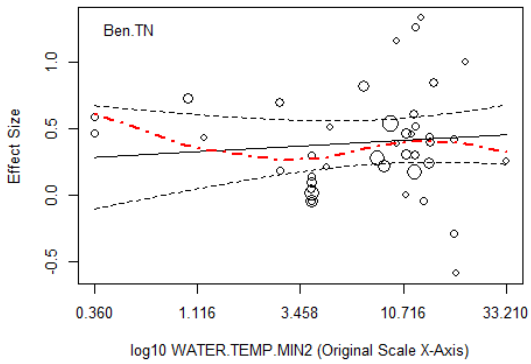
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("WATER.TEMP.MIN2","WATER.TEMP.MAX2",
                      "WATER.TEMP.MEDIAN2","WATER.TEMP.MEAN2",
"WATER.TEMP.FILL"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

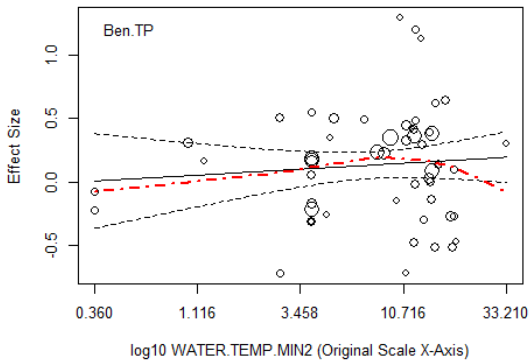
```
## [1] "Variable: WATER.TEMP.MIN2.log10 || Plot: Ben.TN"
```

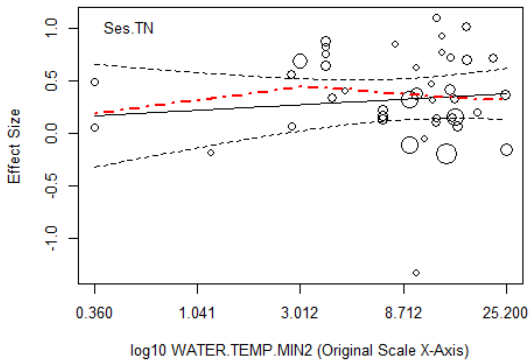
```
## [1] "Variable: WATER.TEMP.MIN2.log10 || Plot: Ben.TP"
```

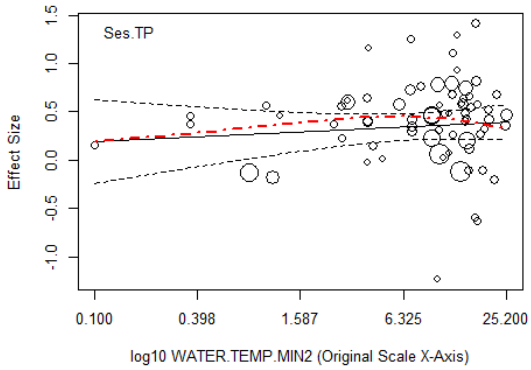
```
## [1] "Variable: WATER.TEMP.MIN2.log10 || Plot: Ses.TN"
```

```
## [1] "Variable: WATER.TEMP.MIN2.log10 || Plot: Ses.TP"
```

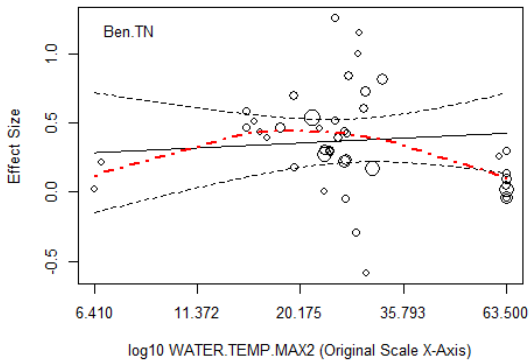


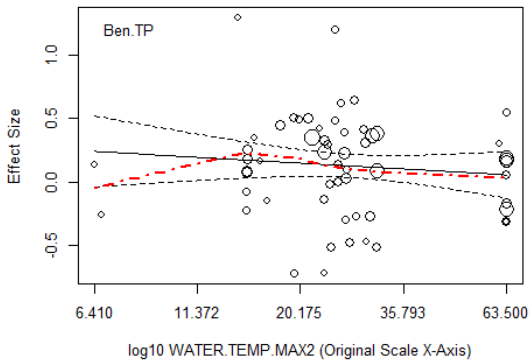


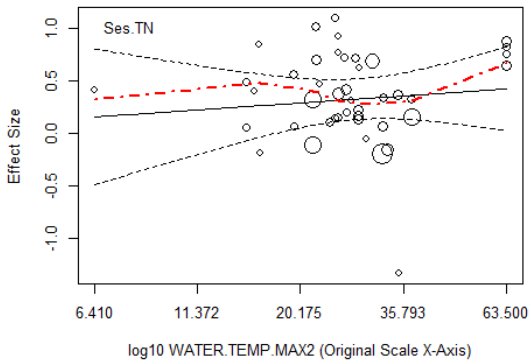


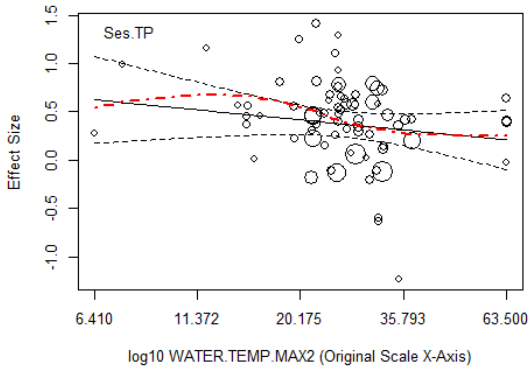



```
## [1] "Variable: WATER.TEMP.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: WATER.TEMP.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: WATER.TEMP.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: WATER.TEMP.MAX2.log10 || Plot: Ses.TP"
```

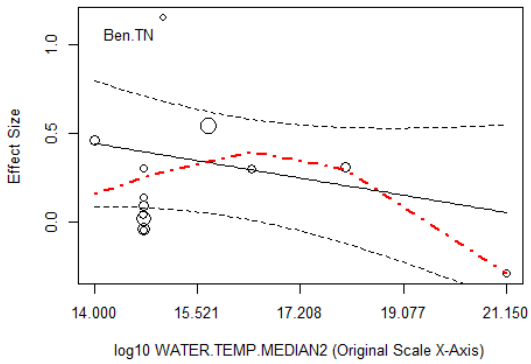


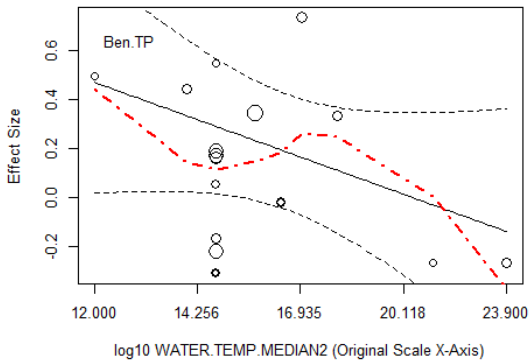


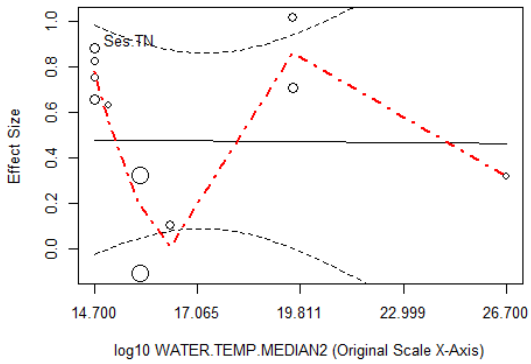


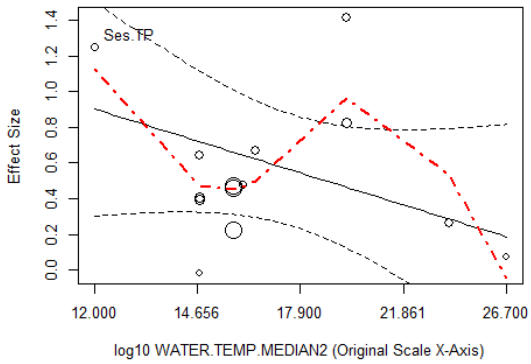



```
## [1] "Variable: WATER.TEMP.MEDIAN2.log10 || Plot: Ben.TN"

## [1] "Variable: WATER.TEMP.MEDIAN2.log10 || Plot: Ben.TP"

## [1] "Variable: WATER.TEMP.MEDIAN2.log10 || Plot: Ses.TN"

## [1] "Variable: WATER.TEMP.MEDIAN2.log10 || Plot: Ses.TP"
```

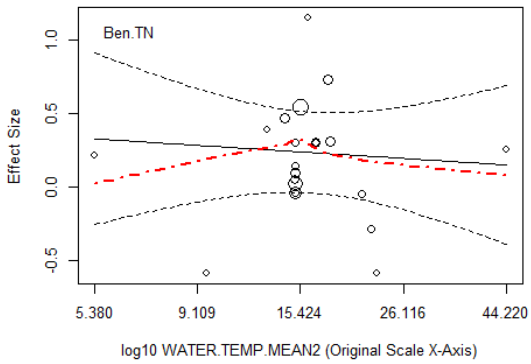


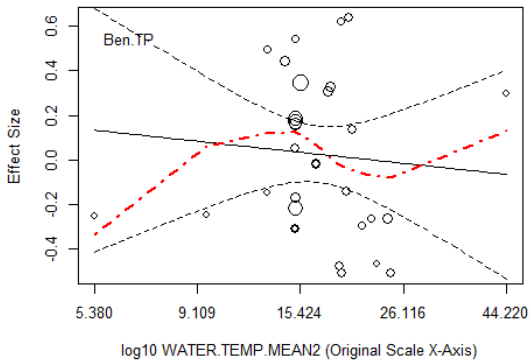


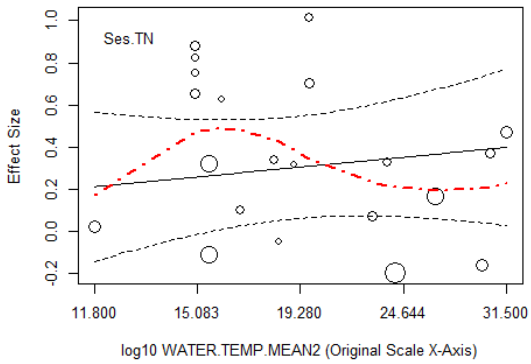


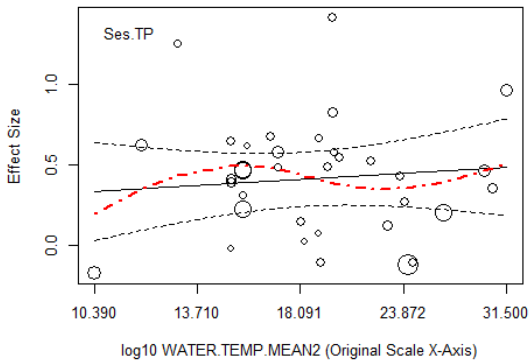



```
## [1] "Variable: WATER.TEMP.MEAN2.log10 || Plot: Ben.TN"

## [1] "Variable: WATER.TEMP.MEAN2.log10 || Plot: Ben.TP"

## [1] "Variable: WATER.TEMP.MEAN2.log10 || Plot: Ses.TN"

## [1] "Variable: WATER.TEMP.MEAN2.log10 || Plot: Ses.TP"
```

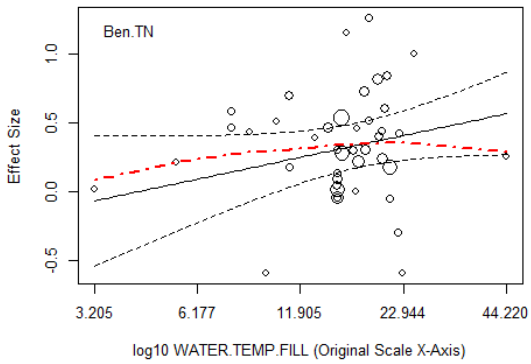


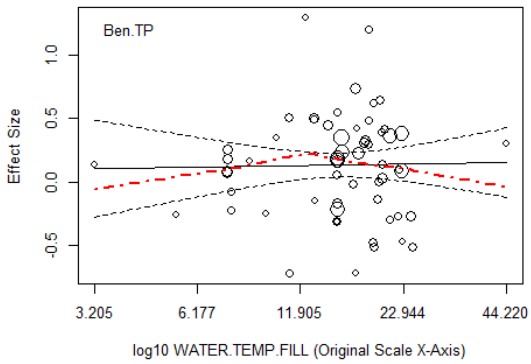


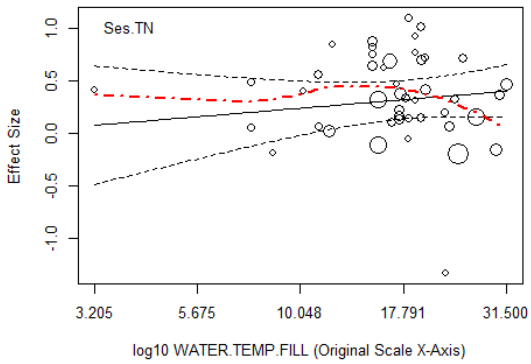


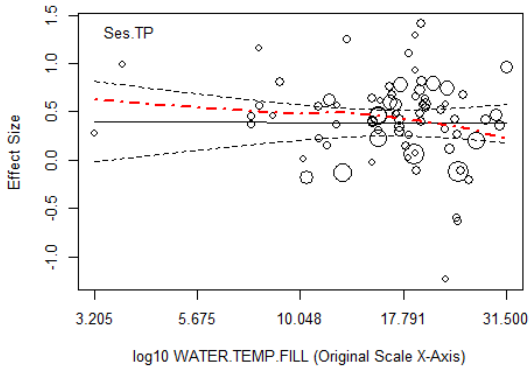



```
## [1] "Variable: WATER.TEMP.FILL.log10 || Plot: Ben.TN"
## [1] "Variable: WATER.TEMP.FILL.log10 || Plot: Ben.TP"
## [1] "Variable: WATER.TEMP.FILL.log10 || Plot: Ses.TN"
## [1] "Variable: WATER.TEMP.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.TEMP.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MAX2 42    0.171          0.465   0.368   0.715
## log10WATER.TEMP.MAX2           42    0.141          0.321   0.440   0.663
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MAX2   -0.769    1.111
## log10WATER.TEMP.MAX2             -0.507    0.790
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.TEMP.MEAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MEAN2 21    0.468          0.634   0.737   0.470
## log10WATER.TEMP.MEAN2           21   -0.194          0.512  -0.380   0.708
##                                 CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MEAN2   -0.860    1.795
## log10WATER.TEMP.MEAN2             -1.265    0.877
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.TEMP.MEDIAN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10WATER.TEMP.MEDIAN2 14    2.925          1.907   1.534
0.151
## log10WATER.TEMP.MEDIAN2           14   -2.166          1.575  -1.375
0.194
##                                   CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MEDIAN2   -1.230    7.081
## log10WATER.TEMP.MEDIAN2             -5.599    1.267

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.TEMP.MIN2, Decimals=3)

##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MIN2 43    0.304          0.096   3.172   0.003
## log10WATER.TEMP.MIN2           43    0.106          0.055   1.908   0.063
##                                  CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MIN2    0.110    0.497
## log10WATER.TEMP.MIN2             -0.006    0.218

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATER.TEMP.FILL, Decimals=3)

##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.FILL 43   -0.347          0.381  -0.910   0.368
## log10WATER.TEMP.FILL           43    0.554          0.301   1.837   0.073
##                                  CI-Lower CI-Upper
## Intercept log10WATER.TEMP.FILL   -1.117    0.423
## log10WATER.TEMP.FILL             -0.055    1.163

print("ben.TP")

## [1] "ben.TP"

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.TEMP.MAX2, Decimals=3)

##                                   n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MAX2 58    0.389          0.306   1.272   0.209
## log10WATER.TEMP.MAX2           58   -0.184          0.212  -0.869   0.389
##                                  CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MAX2   -0.224    1.003
## log10WATER.TEMP.MAX2             -0.610    0.241

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.TEMP.MEAN2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MEAN2 31    0.292          0.650   0.449   0.657
```

```
## log10WATER.TEMP.MEAN2           31   -0.217          0.528  -0.412   0.683
##                                 CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MEAN2   -1.038    1.622
## log10WATER.TEMP.MEAN2             -1.297    0.862
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.TEMP.MEDIAN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10WATER.TEMP.MEDIAN2 18    2.663          1.596   1.669
0.115
## log10WATER.TEMP.MEDIAN2           18   -2.033          1.306  -1.557
0.139
##                                   CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MEDIAN2   -0.720    6.047
## log10WATER.TEMP.MEDIAN2             -4.802    0.736
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.TEMP.MIN2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MIN2 59    0.134          0.048   2.784   0.007
## log10WATER.TEMP.MIN2           59    0.003          0.029   0.110   0.913
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MIN2    0.038    0.231
## log10WATER.TEMP.MIN2             -0.054    0.060
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATER.TEMP.FILL, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.FILL 60    0.084          0.327   0.256   0.799
## log10WATER.TEMP.FILL           60    0.042          0.274   0.155   0.878
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.FILL   -0.570    0.738
## log10WATER.TEMP.FILL             -0.505    0.590
```

```
print("ses.TN")
```

```
## [1] "ses.TN"
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.TEMP.MAX2, Decimals=3)
```

```
##                                 n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MAX2 43   -0.056           0.70  -0.080   0.937
## log10WATER.TEMP.MAX2           43    0.267           0.48   0.557   0.581
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MAX2   -1.470    1.358
## log10WATER.TEMP.MAX2             -0.702    1.237
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.TEMP.MEAN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MEAN2 21   -0.257          0.778  -0.330   0.745
## log10WATER.TEMP.MEAN2           21    0.438          0.603   0.726   0.477
##                                 CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MEAN2   -1.886    1.371
## log10WATER.TEMP.MEAN2             -0.824    1.699
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.TEMP.MEDIAN2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10WATER.TEMP.MEDIAN2 11    0.550          2.598   0.212
0.837
## log10WATER.TEMP.MEDIAN2           11   -0.061          2.098  -0.029
0.977
##                                   CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MEDIAN2   -5.327    6.426
## log10WATER.TEMP.MEDIAN2             -4.806    4.684
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.TEMP.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MIN2 43    0.323          0.112   2.891   0.006
## log10WATER.TEMP.MIN2           43    0.009          0.065   0.142   0.888
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MIN2    0.097    0.549
## log10WATER.TEMP.MIN2             -0.122    0.141
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATER.TEMP.FILL, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.FILL 45   -0.085          0.453  -0.188   0.852
## log10WATER.TEMP.FILL           45    0.327          0.353   0.927   0.359
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.FILL   -0.999    0.829
## log10WATER.TEMP.FILL             -0.385    1.039
```

```
print("ses.TP")
```

```
## [1] "ses.TP"
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.TEMP.MAX2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MAX2 74    0.962          0.508   1.896   0.062
```

```
## log10WATER.TEMP.MAX2           74   -0.417          0.356  -1.171   0.245
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MAX2   -0.050    1.974
## log10WATER.TEMP.MAX2             -1.127    0.293
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.TEMP.MEAN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MEAN2 35    0.016          0.652   0.024   0.981
## log10WATER.TEMP.MEAN2           35    0.313          0.513   0.609   0.547
##                                 CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MEAN2   -1.311    1.342
## log10WATER.TEMP.MEAN2             -0.731    1.356
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.TEMP.MEDIAN2, Decimals=3)
```

```
##                                   n Estimate Standard Error T-Value P-
Value
## Intercept log10WATER.TEMP.MEDIAN2 14    3.127          1.754   1.783
0.100
## log10WATER.TEMP.MEDIAN2           14   -2.061          1.402  -1.470
0.167
##                                   CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MEDIAN2   -0.695    6.950
## log10WATER.TEMP.MEDIAN2             -5.115    0.993
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.TEMP.MIN2, Decimals=3)
```

```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.MIN2 74    0.386          0.073   5.288   0.000
## log10WATER.TEMP.MIN2           74   -0.023          0.043  -0.549   0.585
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.MIN2    0.240    0.531
## log10WATER.TEMP.MIN2             -0.108    0.062
```

```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATER.TEMP.FILL, Decimals=3)
```

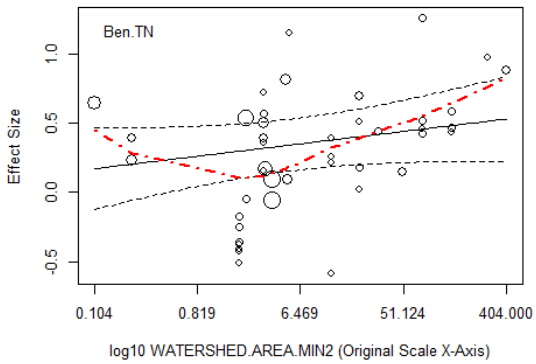
```
##                                  n Estimate Standard Error T-Value P-Value
## Intercept log10WATER.TEMP.FILL 76    0.409          0.342   1.194   0.236
## log10WATER.TEMP.FILL           76   -0.019          0.273  -0.069   0.945
##                                CI-Lower CI-Upper
## Intercept log10WATER.TEMP.FILL   -0.274    1.091
## log10WATER.TEMP.FILL             -0.563    0.525
```

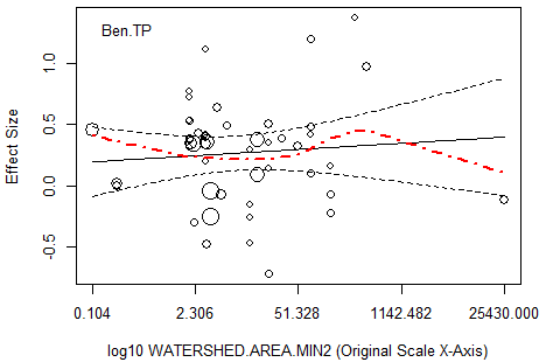
4.2.24 Watershed Area

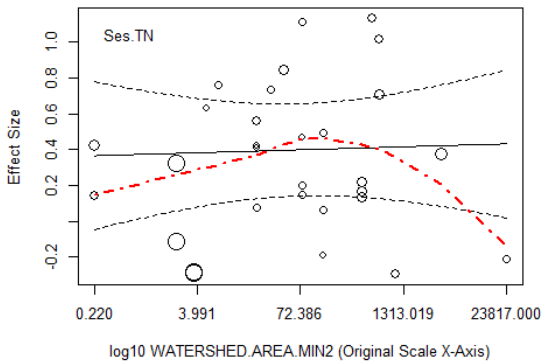
```
plotMods2_Grid(Folder='Plots',DF=chl_zcor,
               Vars=c("WATERSHED.AREA.MIN2","WATERSHED.AREA.MEAN2",
```

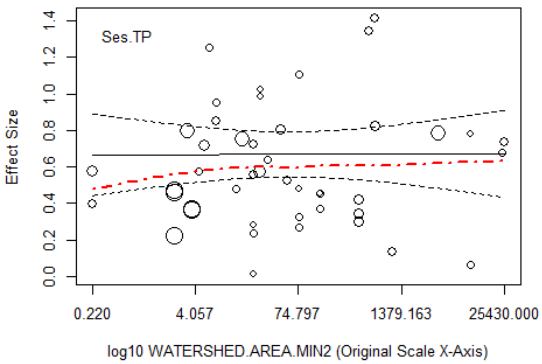
```
                      "WATERSHED.AREA.MEDIAN2","WATERSHED.AREA.MAX2",
"WATERSHED.AREA.FILL"),
               ModTransform='log10',
               StdAxes=F,Transform.X=T,LOESS.Ind=T,Legend.Ind=F,Lambda=1)
```

```
## [1] "Variable: WATERSHED.AREA.MIN2.log10 || Plot: Ben.TN"

## [1] "Variable: WATERSHED.AREA.MIN2.log10 || Plot: Ben.TP"

## [1] "Variable: WATERSHED.AREA.MIN2.log10 || Plot: Ses.TN"

## [1] "Variable: WATERSHED.AREA.MIN2.log10 || Plot: Ses.TP"
```

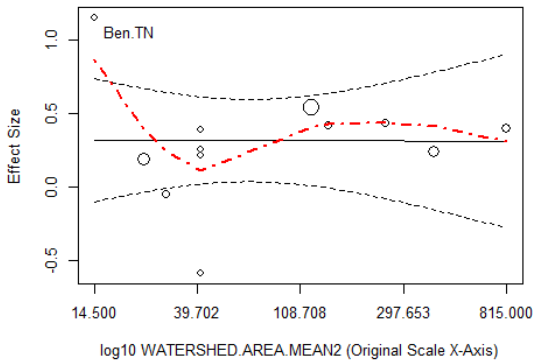


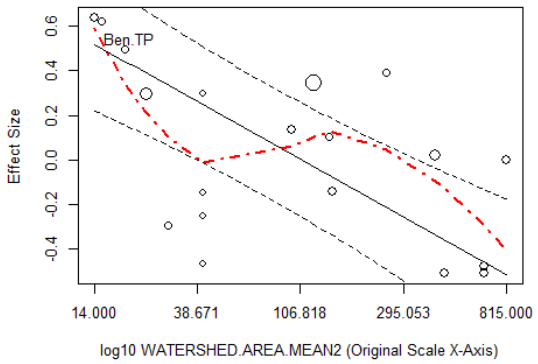


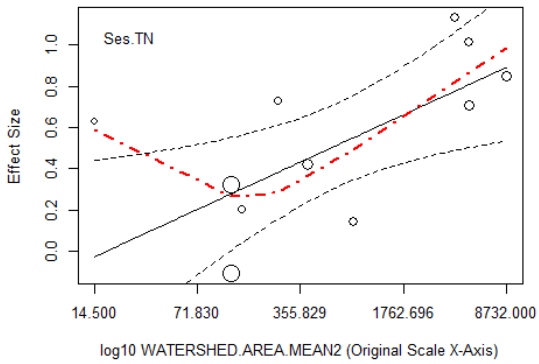


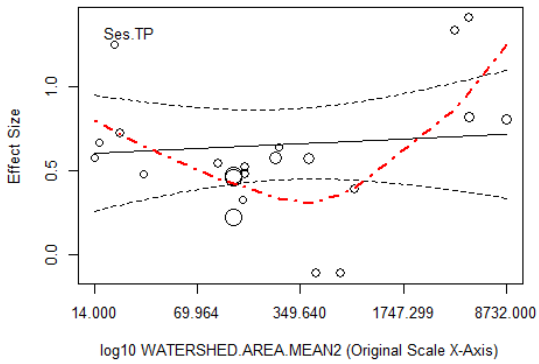



```
## [1] "Variable: WATERSHED.AREA.MEAN2.log10 || Plot: Ben.TN"

## [1] "Variable: WATERSHED.AREA.MEAN2.log10 || Plot: Ben.TP"

## [1] "Variable: WATERSHED.AREA.MEAN2.log10 || Plot: Ses.TN"

## [1] "Variable: WATERSHED.AREA.MEAN2.log10 || Plot: Ses.TP"
```



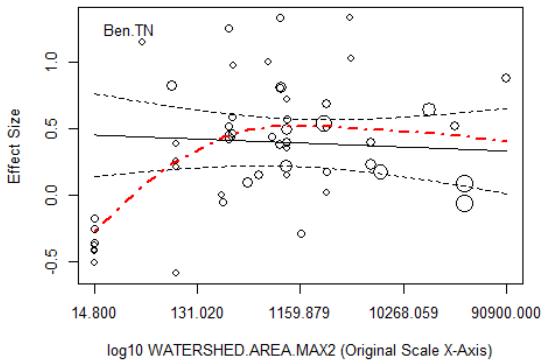


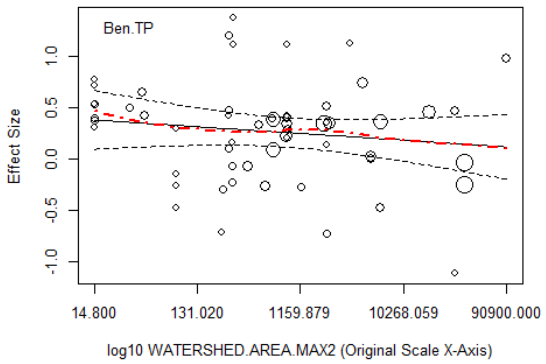


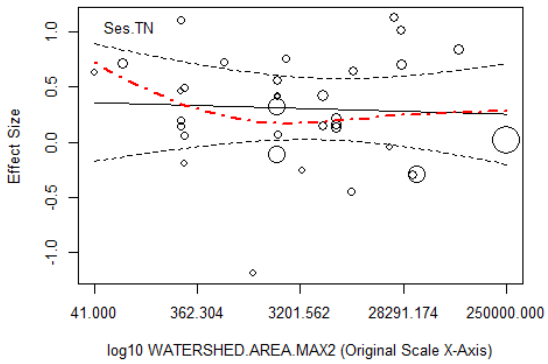


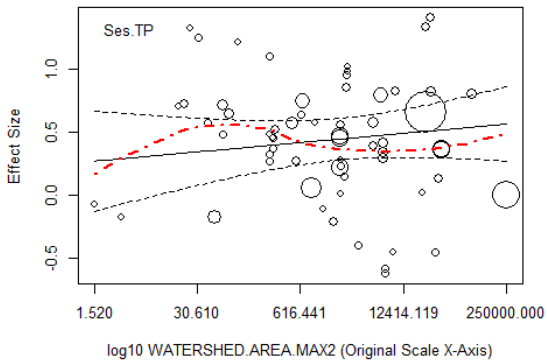

```
## [1] "Variable: WATERSHED.AREA.MEDIAN2.log10 || Plot: Ben.TN"
## [1] "Variable: WATERSHED.AREA.MEDIAN2.log10 || Plot: Ben.TP"
## [1] "Variable: WATERSHED.AREA.MEDIAN2.log10 || Plot: Ses.TN"
## [1] "Variable: WATERSHED.AREA.MEDIAN2.log10 || Plot: Ses.TP"
```

```
## [1] "Variable: WATERSHED.AREA.MAX2.log10 || Plot: Ben.TN"
## [1] "Variable: WATERSHED.AREA.MAX2.log10 || Plot: Ben.TP"
## [1] "Variable: WATERSHED.AREA.MAX2.log10 || Plot: Ses.TN"
## [1] "Variable: WATERSHED.AREA.MAX2.log10 || Plot: Ses.TP"
```

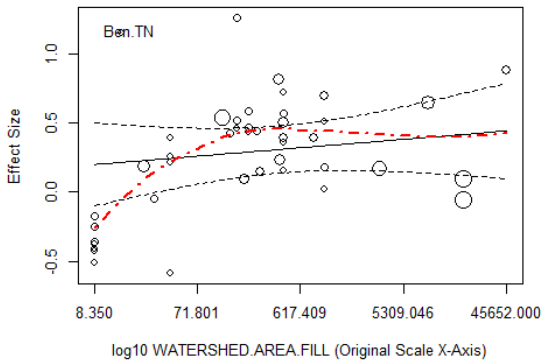


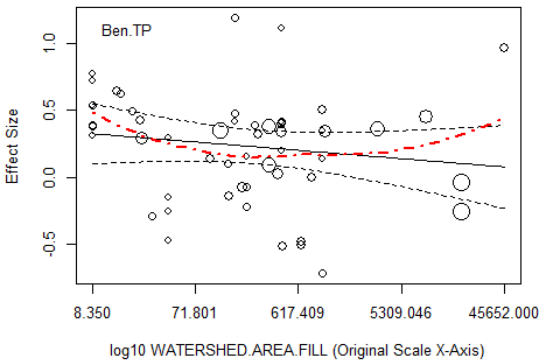


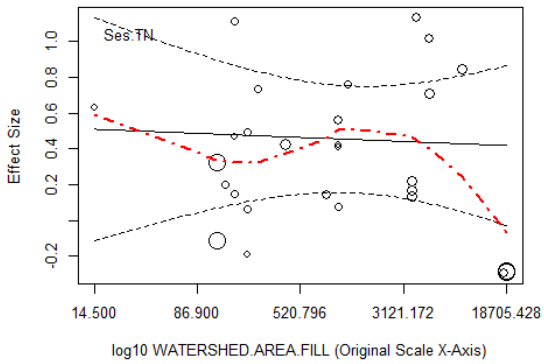


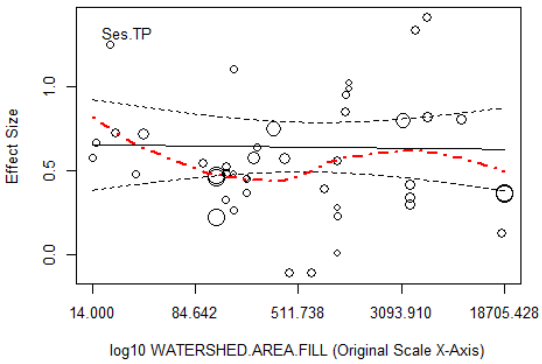



```
## [1] "Variable: WATERSHED.AREA.FILL.log10 || Plot: Ben.TN"

## [1] "Variable: WATERSHED.AREA.FILL.log10 || Plot: Ben.TP"

## [1] "Variable: WATERSHED.AREA.FILL.log10 || Plot: Ses.TN"

## [1] "Variable: WATERSHED.AREA.FILL.log10 || Plot: Ses.TP"
```










```
print("ben.TN")
```

```
## [1] "ben.TN"
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATERSHED.AREA.MAX2, Decimals=3)
```

```
##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MAX2 54    0.492          0.226   2.176
0.034
## log10WATERSHED.AREA.MAX2           54   -0.032          0.069  -0.460
0.647
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MAX2    0.038    0.946
## log10WATERSHED.AREA.MAX2             -0.170    0.106
```

```
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATERSHED.AREA.MEAN2, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MEAN2 12    0.322          0.408   0.790
0.448
```

```
## log10WATERSHED.AREA.MEAN2           12   -0.004          0.214  -0.018
0.986
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MEAN2   -0.587    1.231
## log10WATERSHED.AREA.MEAN2             -0.480    0.472

# extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATERSHED.AREA.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATERSHED.AREA.MIN2, Decimals=3)

##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MIN2 43     0.27          0.105   2.580
0.014
## log10WATERSHED.AREA.MIN2           43     0.10          0.065   1.536
0.132
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MIN2    0.059    0.481
## log10WATERSHED.AREA.MIN2             -0.031    0.230

extractTable("rma mv output ben TN.csv", ZCOR.chl_ben.TN,
mods=~log10WATERSHED.AREA.FILL, Decimals=3)

##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.FILL 43    0.139          0.207   0.672
0.505
## log10WATERSHED.AREA.FILL           43    0.065          0.072   0.900
0.374
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.FILL   -0.278    0.556
## log10WATERSHED.AREA.FILL             -0.081    0.211

print("ben.TP")

## [1] "ben.TP"

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATERSHED.AREA.MAX2, Decimals=3)

##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MAX2 58    0.460          0.216   2.125
0.038
## log10WATERSHED.AREA.MAX2           58   -0.069          0.070  -0.989
0.327
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MAX2    0.026    0.893
## log10WATERSHED.AREA.MAX2             -0.208    0.071
```

```
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATERSHED.AREA.MEAN2, Decimals=3)

##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MEAN2 19    1.195          0.230   5.206
0
## log10WATERSHED.AREA.MEAN2           19   -0.588          0.104  -5.664
0
##                                     CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MEAN2    0.711    1.679
## log10WATERSHED.AREA.MEAN2             -0.807   -0.369

# extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATERSHED.AREA.MEDIAN2, Decimals=3)
extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATERSHED.AREA.MIN2, Decimals=3)

##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MIN2 49    0.234          0.091   2.563
0.014
## log10WATERSHED.AREA.MIN2           49    0.037          0.065   0.574
0.569
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MIN2    0.050    0.417
## log10WATERSHED.AREA.MIN2             -0.094    0.168

extractTable("rma mv output ben TP.csv", ZCOR.chl_ben.TP,
mods=~log10WATERSHED.AREA.FILL, Decimals=3)

##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.FILL 53    0.388          0.163   2.389
0.021
## log10WATERSHED.AREA.FILL           53   -0.067          0.062  -1.067
0.291
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.FILL    0.062    0.715
## log10WATERSHED.AREA.FILL             -0.192    0.059

print("ses.TN")

## [1] "ses.TN"

extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATERSHED.AREA.MAX2, Decimals=3)

##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MAX2 35    0.405          0.416   0.974
0.337
```

```
## log10WATERSHED.AREA.MAX2           35   -0.028          0.106  -0.262
0.795
##                                   CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MAX2   -0.441    1.252
## log10WATERSHED.AREA.MAX2             -0.243    0.187
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATERSHED.AREA.MEAN2, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MEAN2 11   -0.411          0.329  -1.249
0.243
## log10WATERSHED.AREA.MEAN2           11    0.330          0.113   2.919
0.017
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MEAN2   -1.157    0.334
## log10WATERSHED.AREA.MEAN2              0.074    0.587
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATERSHED.AREA.MEDIAN2, Decimals=3)
```

```
##                                       n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MEDIAN2 6    0.045           1.12   0.040
0.970
## log10WATERSHED.AREA.MEDIAN2           6    0.118           0.37   0.318
0.766
##                                      CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MEDIAN2   -3.066    3.156
## log10WATERSHED.AREA.MEDIAN2             -0.909    1.144
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATERSHED.AREA.MIN2, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MIN2 30    0.374          0.171   2.194
0.037
## log10WATERSHED.AREA.MIN2           30    0.013          0.062   0.212
0.834
##                                   CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MIN2    0.025    0.724
## log10WATERSHED.AREA.MIN2             -0.114    0.141
```

```
extractTable("rma mv output ses TN.csv", ZCOR.chl_ses.TN,
mods=~log10WATERSHED.AREA.FILL, Decimals=3)
```

```
##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.FILL 28    0.544          0.451   1.206
0.239
```

```
## log10WATERSHED.AREA.FILL           28   -0.029          0.138  -0.213
0.833
##                                   CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.FILL   -0.383    1.470
## log10WATERSHED.AREA.FILL             -0.312    0.254

print("ses.TP")

## [1] "ses.TP"

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATERSHED.AREA.MAX2, Decimals=3)

##                                    n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MAX2 62    0.262          0.208   1.255
0.214
## log10WATERSHED.AREA.MAX2           62    0.057          0.058   0.974
0.334
##                                   CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MAX2   -0.155    0.679
## log10WATERSHED.AREA.MAX2             -0.060    0.173

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATERSHED.AREA.MEAN2, Decimals=3)

##                                     n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MEAN2 22    0.561          0.267   2.100
0.049
## log10WATERSHED.AREA.MEAN2           22    0.040          0.101   0.399
0.694
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MEAN2    0.004    1.117
## log10WATERSHED.AREA.MEAN2             -0.171    0.252

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATERSHED.AREA.MEDIAN2, Decimals=3)

##                                       n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MEDIAN2 8    0.501          0.517   0.968
0.370
## log10WATERSHED.AREA.MEDIAN2           8    0.053          0.188   0.283
0.787
##                                      CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MEDIAN2   -0.765    1.767
## log10WATERSHED.AREA.MEDIAN2             -0.406    0.512

extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATERSHED.AREA.MIN2, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.MIN2 45    0.667          0.092   7.291
0.00
## log10WATERSHED.AREA.MIN2           45    0.001          0.039   0.025
0.98
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.MIN2    0.483    0.852
## log10WATERSHED.AREA.MIN2             -0.077    0.079
```

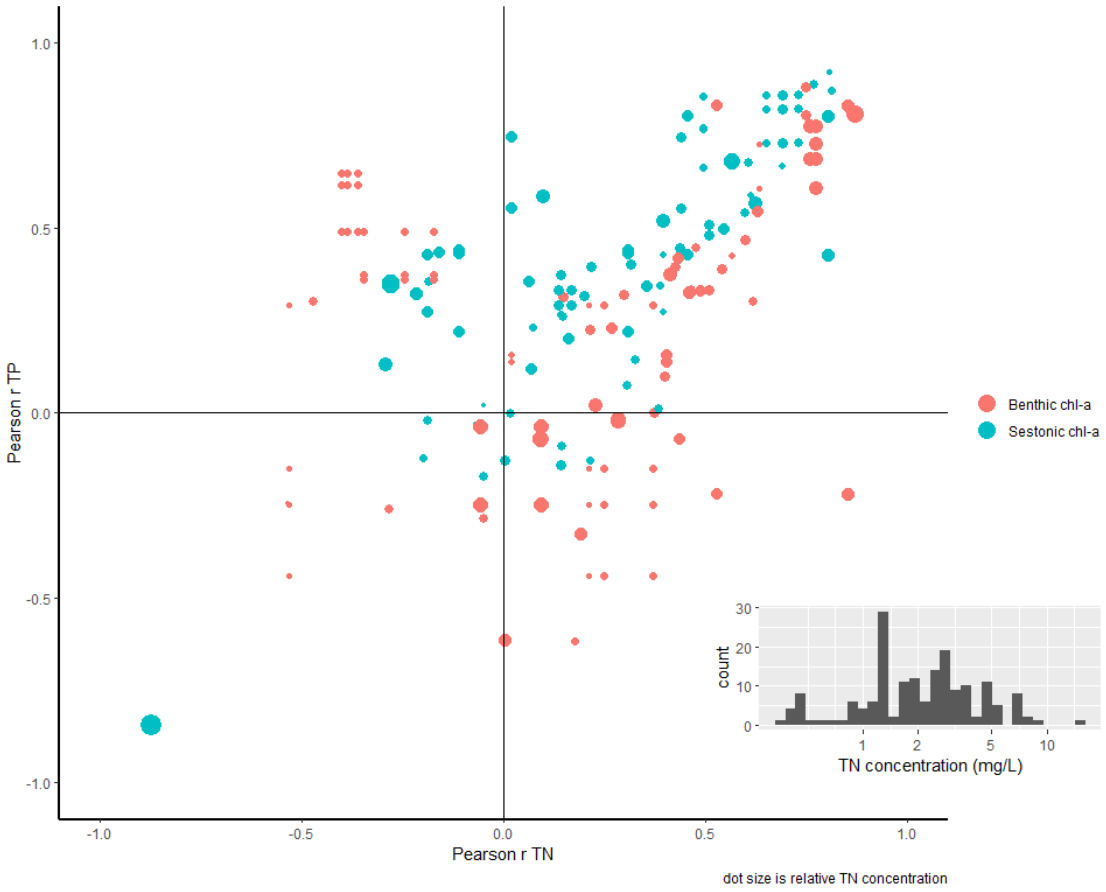
```
extractTable("rma mv output ses TP.csv", ZCOR.chl_ses.TP,
mods=~log10WATERSHED.AREA.FILL, Decimals=3)
```

```
##                                      n Estimate Standard Error T-Value P-
Value
## Intercept log10WATERSHED.AREA.FILL 45    0.667          0.202   3.297
0.002
## log10WATERSHED.AREA.FILL           45   -0.009          0.067  -0.130
0.897
##                                    CI-Lower CI-Upper
## Intercept log10WATERSHED.AREA.FILL    0.259    1.075
## log10WATERSHED.AREA.FILL             -0.144    0.127
```

4.3 TN and TP co-limitation

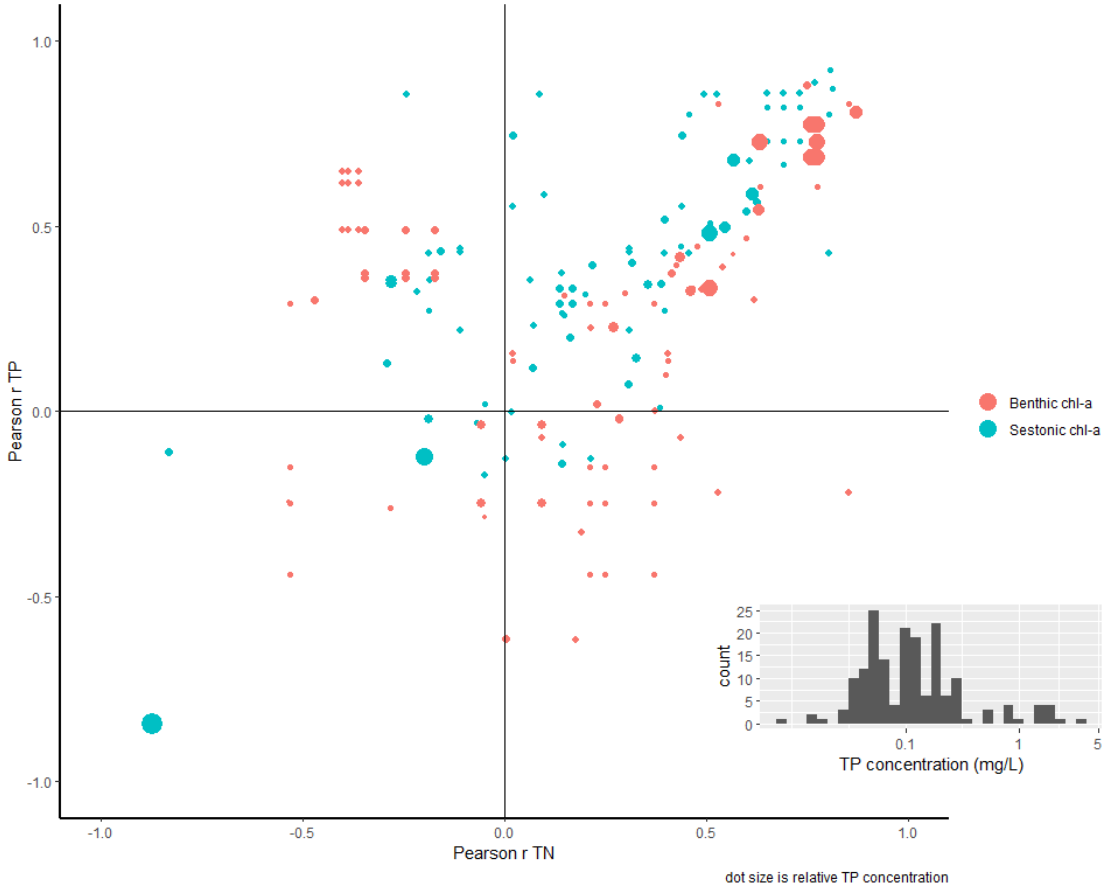
```
# Use chl_SR, which is not Z transformed
chl_TP <- subset(chl_SR,CAUSE.TERM=="Total P" & EFFECT.TERM=="Chlorophyll a")
chl_TN <- subset(chl_SR,CAUSE.TERM=="Total N" & EFFECT.TERM=="Chlorophyll a")


## Merge based on paper, effect term info and sample size for a conservative
dataset
## of studies reporting TN and TP responses of chl
chl.both <-
merge(chl_TN,chl_TP,by=c("CITATION.ID","EFFECT.TERM","EFFECT.MEASURE",

"EFFECT.MEASURE.DETAIL","IMPACT.SAMPLES"))

# x is TN, y is TP
chl.both$TN_size <- ifelse(is.na(chl.both$CONV.CAUSE.MEAN.x),

(as.numeric(chl.both$CONV.CAUSE.MIN.x)+as.numeric(chl.both$CONV.CAUSE.MAX.x))
/2,
                           chl.both$CONV.CAUSE.MEAN.x)

chl.both$TN_size <- ifelse(is.na(chl.both$TN_size),
chl.both$CONV.CAUSE.MEDIAN.x, chl.both$TN_size)

chl.both$TP_size <- ifelse(is.na(chl.both$CONV.CAUSE.MEAN.y),

(as.numeric(chl.both$CONV.CAUSE.MIN.y)+as.numeric(chl.both$CONV.CAUSE.MAX.y))
```

```
/2,
                            chl.both$CONV.CAUSE.MEAN.y)

chl.both$TP_size <- ifelse(is.na(chl.both$TP_size),
chl.both$CONV.CAUSE.MEDIAN.y, chl.both$TP_size)

chl.TN_size <- chl.both %>%  filter(!is.na(TN_size))
chl.TP_size <- chl.both %>%  filter(!is.na(TP_size))

chl.both.sel <- chl.both %>% select(CAUSE.TERM.x, CAUSE.TERM.y,
                                    paper.x, paper.y,
                                    RESPONSE.MEASURE.VALUE2.x,
RESPONSE.MEASURE.VALUE2.y,
                                    CONV.CAUSE.MIN.x, CONV.CAUSE.MIN.y,
                                    CONV.CAUSE.MEAN.x, CONV.CAUSE.MEAN.y,
                                    CONV.CAUSE.MEDIAN.x, CONV.CAUSE.MEDIAN.y,
                                    CONV.CAUSE.MAX.x, CONV.CAUSE.MAX.y,
                                    TN_size, TP_size)

write.csv(chl.both.sel, "chl.both.sel.csv", row.names=F)

###############
# Make inset histogram of TN concentrations
histTN <- ggplot(chl.TN_size, aes(x=TN_size)) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,10000))+
  labs(x="TN concentration (mg/L)")

#win.metafile(filename="TNsize.wmf", width=10, height=10, pointsize = 20)
# Plot effect sizes with histogram inset
ggplot(data=chl.TN_size,aes(x=yi.x,x,y=yi.y)) +
  geom_point(aes(fill=EFFECT.MEASURE, size=TN_size, color=EFFECT.MEASURE)) +
  labs(x="Pearson r TN", y="Pearson r TP", caption = "dot size is relative TN
concentration") +
  theme_classic() +
  theme(axis.line.x=element_line(colour="black", size=0.9),
        axis.line.y=element_line(colour="black", size=0.9)) +
  ylim(-1,1) + xlim(-1,1) + guides(size=F) +
  guides(fill=guide_legend(override.aes=list(size=5))) +
  theme(legend.title = element_blank())+
  geom_hline(yintercept=0) + geom_vline(xintercept=0) +
  annotation_custom(
    ggplotGrob(histTN),
    xmin = .5, xmax = 1.5, ymin = -1, ymax = -.5)
```



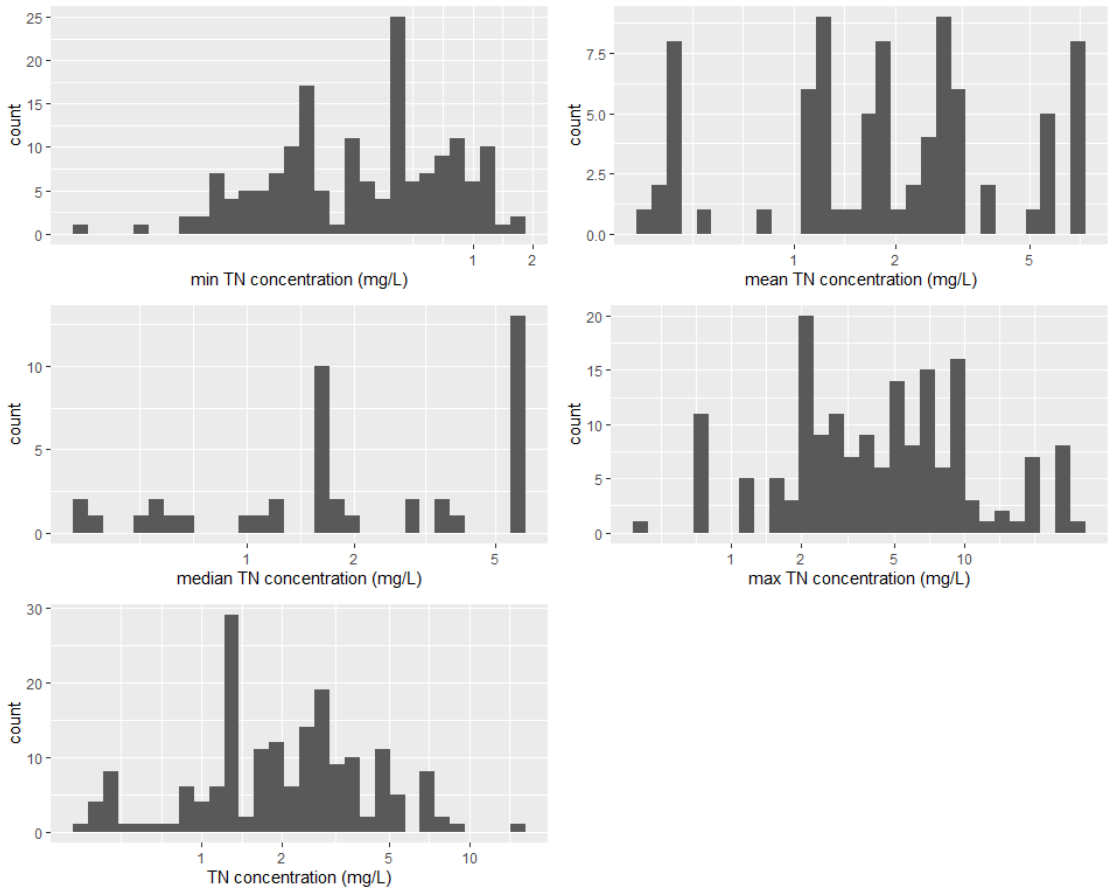

```
#dev.off()

ggsave("TNsize.png",plot = last_plot(), dpi = 300)

# Make inset histogram of TP concentrations
histTP <- ggplot(chl.TP_size, aes(x=TP_size)) +
  geom_histogram()+
  scale_x_log10(breaks=c(0.1,1,5,10,100,1000), label=c(0.1,1,5,10,100,1000))+
  labs(x="TP concentration (mg/L)")

#win.metafile(filename="TPsize.wmf", width=10, height=10, pointsize = 20)
# Plot effect sizes and histogram inset
ggplot(data=chl.TP_size,aes(x=yi.x,x,y=yi.y)) +
  geom_point(aes(fill=EFFECT.MEASURE, size=TP_size, color=EFFECT.MEASURE)) +
  labs(x="Pearson r TN", y="Pearson r TP", caption = "dot size is relative TP
concentration") +
  theme_classic() +
  theme(axis.line.x=element_line(colour="black", size=0.9),
        axis.line.y=element_line(colour="black", size=0.9)) +
  ylim(-1,1) + xlim(-1,1) + guides(size=F) +
  guides(fill=guide_legend(override.aes=list(size=5))) +
  theme(legend.title = element_blank())+
  geom_hline(yintercept=0) + geom_vline(xintercept=0) +
```

```
    annotation_custom(
    ggplotGrob(histTP),
    xmin = .5, xmax = 1.5, ymin = -1, ymax = -.5)
```



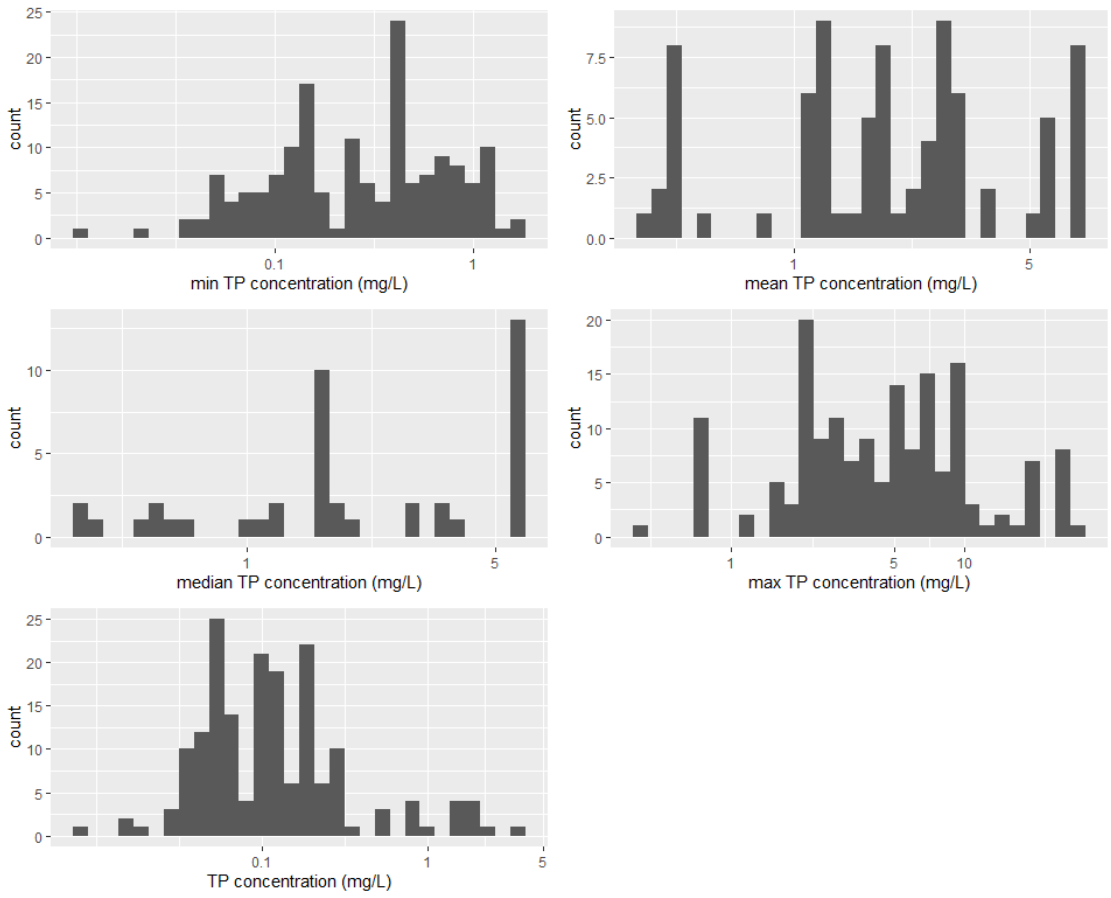

```
#dev.off()

ggsave("TPsize.png",plot = last_plot(), dpi = 300)



############
#Histograms of TN columns
histTN_min <- ggplot(chl.TN_size, aes(x=as.numeric(CONV.CAUSE.MIN.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,10000))+
  labs(x="min TN concentration (mg/L)")
histTN_mean <- ggplot(chl.TN_size, aes(x=as.numeric(CONV.CAUSE.MEAN.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,10000))+
  labs(x="mean TN concentration (mg/L)")
histTN_median <- ggplot(chl.TN_size, aes(x=as.numeric(CONV.CAUSE.MEDIAN.x)))
+
  geom_histogram()+
```

```
  scale_x_log10(breaks=c(1,2,5,10,100,500,10000))+
  labs(x="median TN concentration (mg/L)")
histTN_max <- ggplot(chl.TN_size, aes(x=as.numeric(CONV.CAUSE.MAX.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,10000))+
  labs(x="max TN concentration (mg/L)")

TNgrid <- grid.arrange(histTN_min, histTN_mean, histTN_median, histTN_max,
histTN)
```




```
ggsave("TNsize_grid.png",plot = TNgrid, dpi = 300)


#Histograms of TP columns
histTP_min <- ggplot(chl.TP_size, aes(x=as.numeric(CONV.CAUSE.MIN.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(0.1,1,5,10,100,1000), label=c(0.1,1,5,10,100,1000))+
  labs(x="min TP concentration (mg/L)")
histTP_mean <- ggplot(chl.TP_size, aes(x=as.numeric(CONV.CAUSE.MEAN.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(0.1,1,5,10,100,1000), label=c(0.1,1,5,10,100,1000))+
  labs(x="mean TP concentration (mg/L)")
histTP_median <- ggplot(chl.TP_size, aes(x=as.numeric(CONV.CAUSE.MEDIAN.x)))
```

```
+
  geom_histogram()+
  scale_x_log10(breaks=c(0.1,1,5,10,100,1000), label=c(0.1,1,5,10,100,1000))+
  labs(x="median TP concentration (mg/L)")
histTP_max <- ggplot(chl.TP_size, aes(x=as.numeric(CONV.CAUSE.MAX.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(0.1,1,5,10,100,1000), label=c(0.1,1,5,10,100,1000))+
  labs(x="max TP concentration (mg/L)")

TPgrid <- grid.arrange(histTP_min, histTP_mean, histTP_median, histTP_max,
histTP)
```



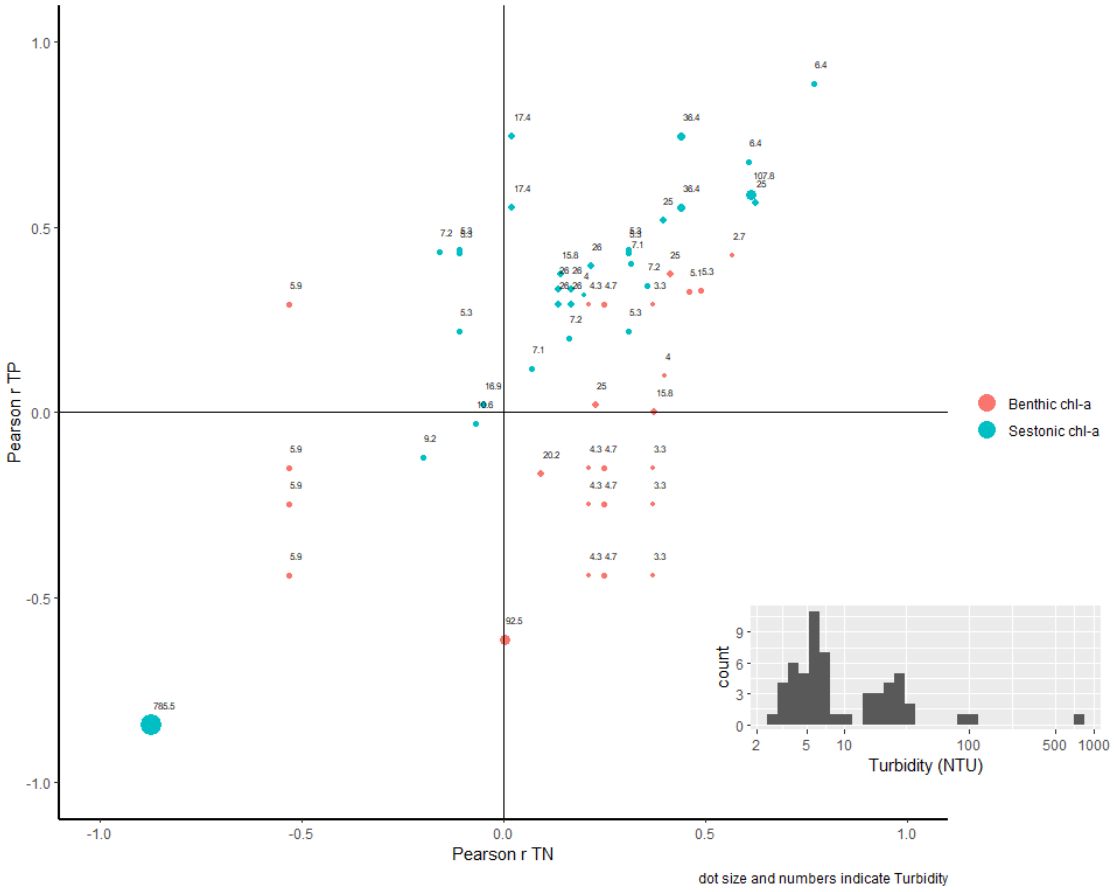

```
ggsave("TPsize_grid.png",plot = TPgrid, dpi = 300)
```

4.3.1 TN and TP co-limitation (turbidity)

```
# Use chl_SR, which is not Z transformed
chl_TP <- subset(chl_SR,CAUSE.TERM=="Total P" & EFFECT.TERM=="Chlorophyll a")
chl_TN <- subset(chl_SR,CAUSE.TERM=="Total N" & EFFECT.TERM=="Chlorophyll a")


## Merge based on paper, effect term info and sample size for a conservative
dataset
## of studies reporting TN and TP responses of chl
```

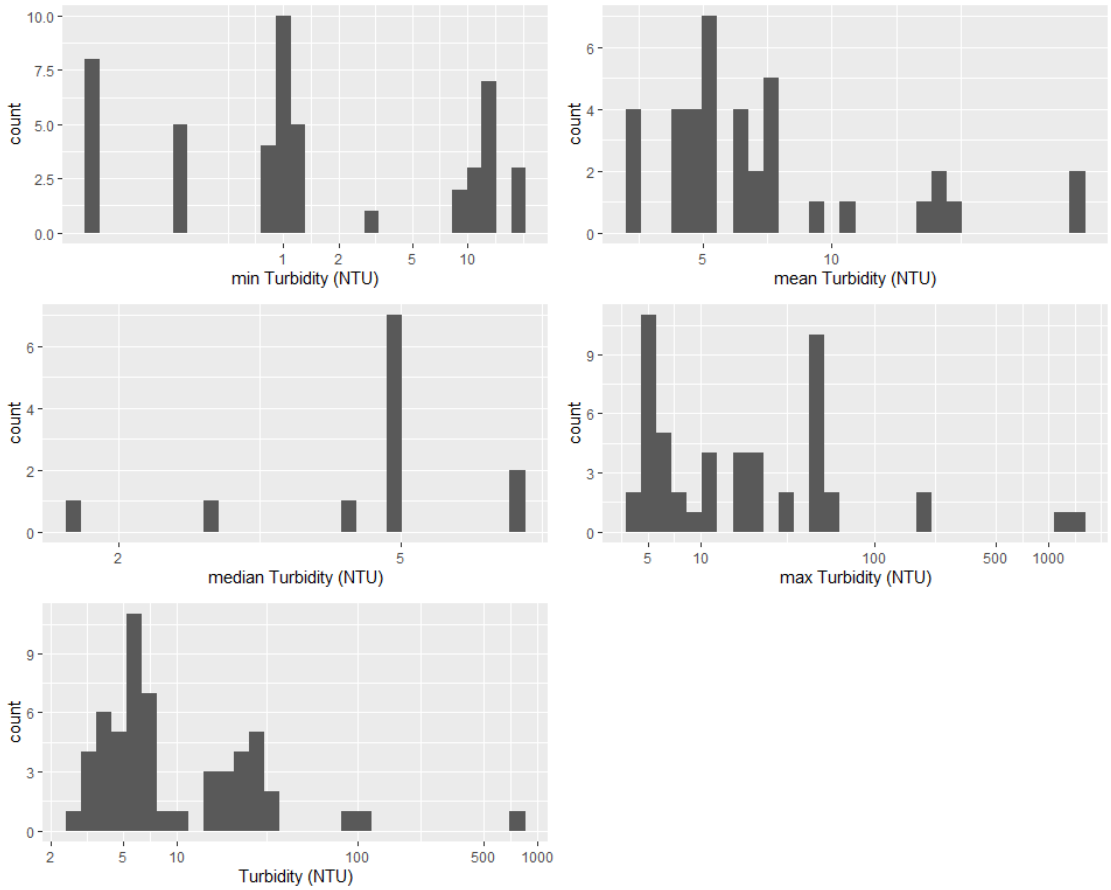
```r
chl.both <-
merge(chl_TN,chl_TP,by=c("CITATION.ID","EFFECT.TERM","EFFECT.MEASURE",

"EFFECT.MEASURE.DETAIL","IMPACT.SAMPLES"))

# create column with size based on Turbidity
chl.both$Turbid_size <- ifelse(is.na(chl.both$TURBIDITY.MEAN2.x),

(as.numeric(chl.both$TURBIDITY.MIN2.x)+as.numeric(chl.both$TURBIDITY.MAX2.x))
/2,
                               chl.both$TURBIDITY.MEAN2.x)

chl.both$Turbid_size <- ifelse(is.na(chl.both$Turbid_size),
chl.both$TURBIDITY.MEDIAN2.x, chl.both$Turbid_size)



chl.both.Turbid <- chl.both %>% select(EFFECT.MEASURE, CAUSE.TERM.x,
CAUSE.TERM.y,
                                       yi.x, vi.x, yi.y, vi.y,
                                       paper.x, paper.y, STATE.x,
                                       RESPONSE.MEASURE.VALUE2.x,
RESPONSE.MEASURE.VALUE2.y,
                                       TURBIDITY.MIN2.x, TURBIDITY.MIN2.y,
                                       TURBIDITY.MEAN2.x, TURBIDITY.MEAN2.y,
                                       TURBIDITY.MEDIAN2.x,
TURBIDITY.MEDIAN2.y,
                                       TURBIDITY.MAX2.x, TURBIDITY.MAX2.y,
                                       Turbid_size)

write.csv(chl.both.Turbid, "chl.both.Turbid.csv", row.names=F)

###############
# Make inset histogram of Turbid concentrations
histTurbid <- ggplot(chl.both.Turbid, aes(x=Turbid_size)) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="Turbidity (NTU)")

# Plot effect sizes with histogram inset
ggplot(data=chl.both.Turbid,aes(x=yi.x,x,y=yi.y)) +
  geom_point(aes(fill=EFFECT.MEASURE, size=Turbid_size,
color=EFFECT.MEASURE)) +
  geom_text(aes(label=round(Turbid_size, digits = 1)), size=2, hjust=-.1,
vjust=-2) +
  labs(x="Pearson r TN", y="Pearson r TP", caption = "dot size and numbers
indicate Turbidity") +
  theme_classic() +
  theme(axis.line.x=element_line(colour="black", size=0.9),
        axis.line.y=element_line(colour="black", size=0.9)) +
```

```
  ylim(-1,1) + xlim(-1,1) + guides(size=F) +
  guides(fill=guide_legend(override.aes=list(size=5))) +
  theme(legend.title = element_blank())+
  geom_hline(yintercept=0) + geom_vline(xintercept=0) +
  annotation_custom(
    ggplotGrob(histTurbid),
    xmin = .5, xmax = 1.5, ymin = -1, ymax = -.5)
```




```
ggsave("Turbidsize.png",plot = last_plot(), dpi = 300)


############
#Histograms of Turbidity columns
histTurbid_min <- ggplot(chl.both.Turbid,
aes(x=as.numeric(TURBIDITY.MIN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="min Turbidity (NTU)")
histTurbid_mean <- ggplot(chl.both.Turbid,
aes(x=as.numeric(TURBIDITY.MEAN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="mean Turbidity (NTU)")
```

```
histTurbid_median <- ggplot(chl.both.Turbid,
aes(x=as.numeric(TURBIDITY.MEDIAN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="median Turbidity (NTU)")
histTurbid_max <- ggplot(chl.both.Turbid,
aes(x=as.numeric(TURBIDITY.MAX2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="max Turbidity (NTU)")

Turbidgrid <- grid.arrange(histTurbid_min, histTurbid_mean,
histTurbid_median, histTurbid_max, histTurbid)
```



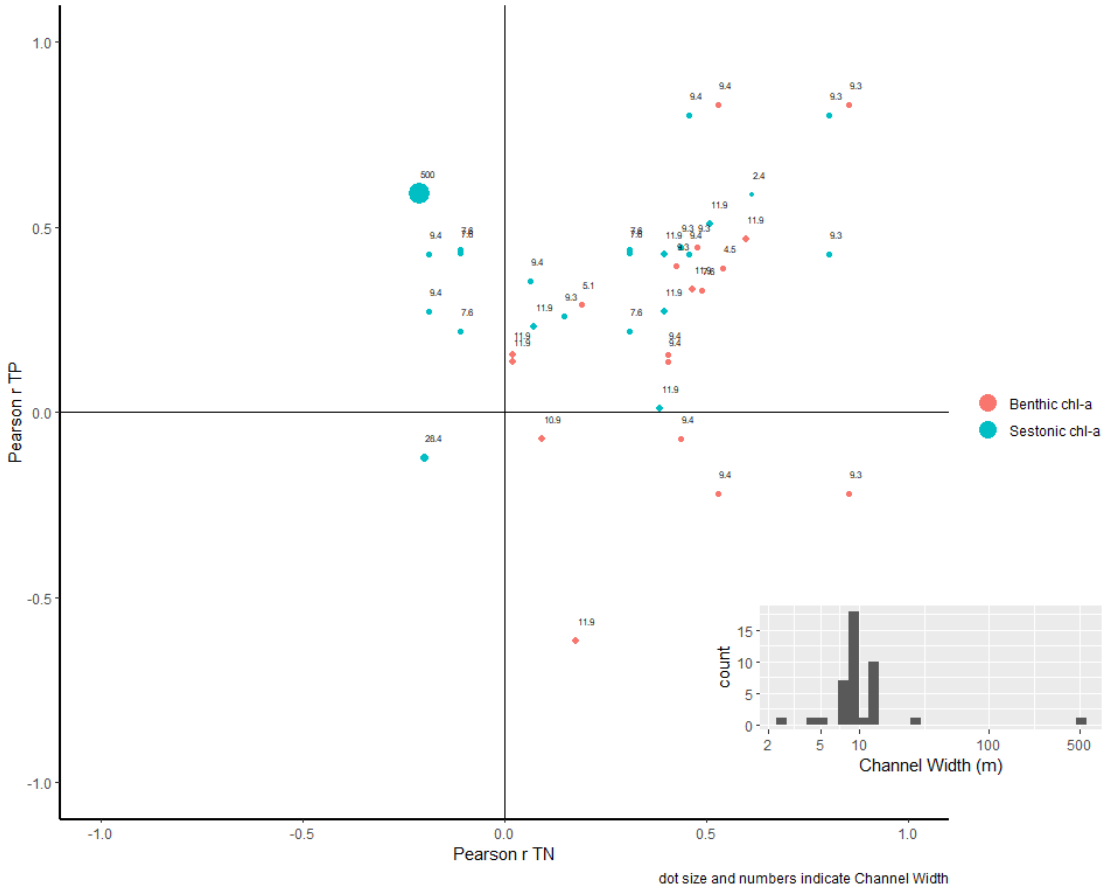

```
ggsave("Turbidsize_grid.png",plot = Turbidgrid, dpi = 300)
```

4.3.2 TN and TP co-limitation (channel width)

```
# Use chl_SR, which is not Z transformed
chl_TP <- subset(chl_SR,CAUSE.TERM=="Total P" & EFFECT.TERM=="Chlorophyll a")
chl_TN <- subset(chl_SR,CAUSE.TERM=="Total N" & EFFECT.TERM=="Chlorophyll a")


## Merge based on paper, effect term info and sample size for a conservative
```

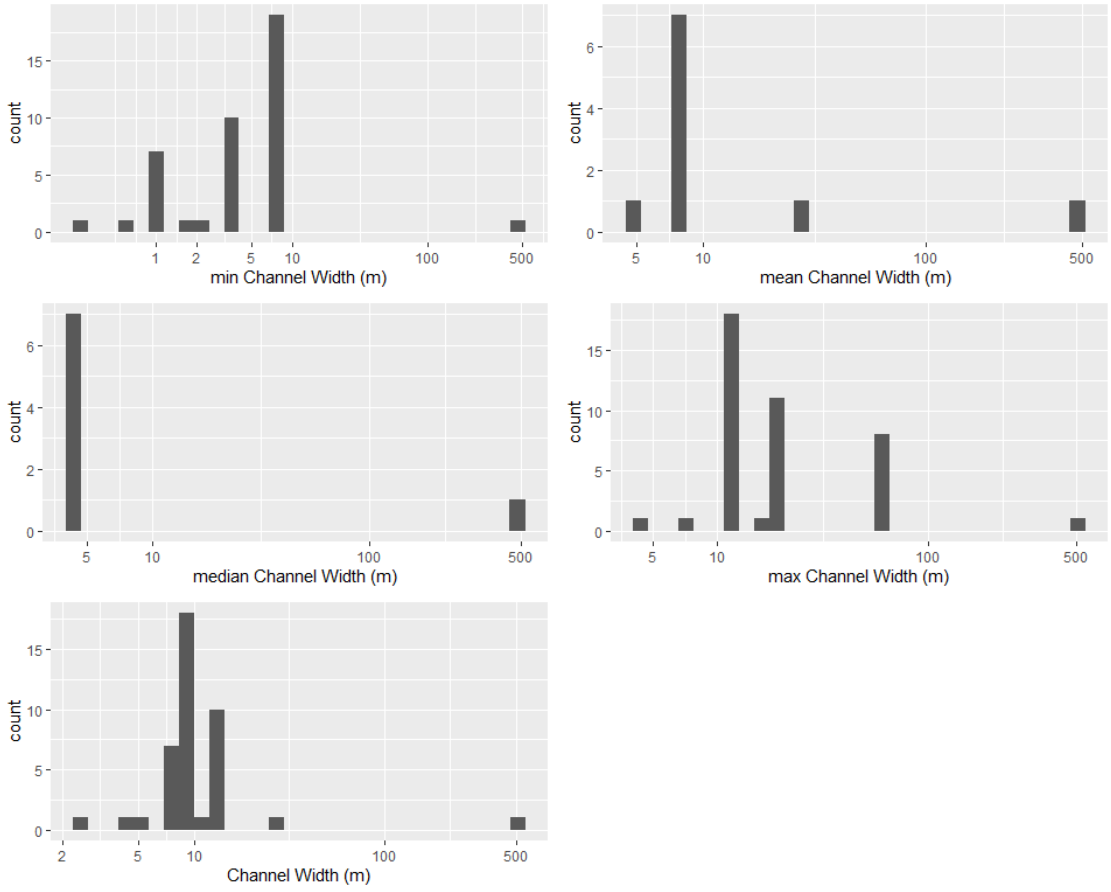
```
dataset
## of studies reporting TN and TP responses of chl
chl.both <-
merge(chl_TN,chl_TP,by=c("CITATION.ID","EFFECT.TERM","EFFECT.MEASURE",

"EFFECT.MEASURE.DETAIL","IMPACT.SAMPLES"))

# create column with size based on Channel Width
chl.both$Channel_size <- ifelse(is.na(chl.both$CHANNEL.WIDTH.MEAN2.x),

(as.numeric(chl.both$CHANNEL.WIDTH.MIN2.x)+as.numeric(chl.both$CHANNEL.WIDTH.
MAX2.x))/2,
                            chl.both$CHANNEL.WIDTH.MEAN2.x)

chl.both$Channel_size <- ifelse(is.na(chl.both$Channel_size),
chl.both$CHANNEL.WIDTH.MEDIAN2.x, chl.both$Channel_size)


chl.both.Channel <- chl.both %>% select(EFFECT.MEASURE, CAUSE.TERM.x,
CAUSE.TERM.y,
                                        yi.x, vi.x, yi.y, vi.y,
                                        paper.x, paper.y, STATE.x,
                                        RESPONSE.MEASURE.VALUE2.x,
RESPONSE.MEASURE.VALUE2.y,
                                        CHANNEL.WIDTH.MIN2.x,
CHANNEL.WIDTH.MIN2.y,
                                        CHANNEL.WIDTH.MEAN2.x,
CHANNEL.WIDTH.MEAN2.y,
                                        CHANNEL.WIDTH.MEDIAN2.x,
CHANNEL.WIDTH.MEDIAN2.y,
                                        CHANNEL.WIDTH.MAX2.x,
CHANNEL.WIDTH.MAX2.y,
                                        Channel_size)

write.csv(chl.both.Channel, "chl.both.Channel.csv", row.names=F)

###############
# Make inset histogram of Channel width
histChannel <- ggplot(chl.both.Channel, aes(x=Channel_size)) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="Channel Width (m)")

# Plot effect sizes with histogram inset
ggplot(data=chl.both.Channel,aes(x=yi.x,x,y=yi.y)) +
  geom_point(aes(fill=EFFECT.MEASURE, size=Channel_size,
color=EFFECT.MEASURE)) +
  geom_text(aes(label=round(Channel_size, digits = 1)), size=2, hjust=-.1,
vjust=-2) +
```

```
  labs(x="Pearson r TN", y="Pearson r TP", caption = "dot size and numbers
indicate Channel Width") +
  theme_classic() +
  theme(axis.line.x=element_line(colour="black", size=0.9),
        axis.line.y=element_line(colour="black", size=0.9)) +
  ylim(-1,1) + xlim(-1,1) + guides(size=F) +
  guides(fill=guide_legend(override.aes=list(size=5))) +
  theme(legend.title = element_blank())+
  geom_hline(yintercept=0) + geom_vline(xintercept=0) +
  annotation_custom(
    ggplotGrob(histChannel),
    xmin = .5, xmax = 1.5, ymin = -1, ymax = -.5)
```




```
ggsave("Channelsize.png",plot = last_plot(), dpi = 300)


############
#Histograms of Channel Width columns
histChannel_min <- ggplot(chl.both.Channel,
aes(x=as.numeric(CHANNEL.WIDTH.MIN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="min Channel Width (m)")
```

```
histChannel_mean <- ggplot(chl.both.Channel,
aes(x=as.numeric(CHANNEL.WIDTH.MEAN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="mean Channel Width (m)")
histChannel_median <- ggplot(chl.both.Channel,
aes(x=as.numeric(CHANNEL.WIDTH.MEDIAN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="median Channel Width (m)")
histChannel_max <- ggplot(chl.both.Channel,
aes(x=as.numeric(CHANNEL.WIDTH.MAX2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="max Channel Width (m)")

Channelgrid <- grid.arrange(histChannel_min, histChannel_mean,
histChannel_median, histChannel_max, histChannel)
```

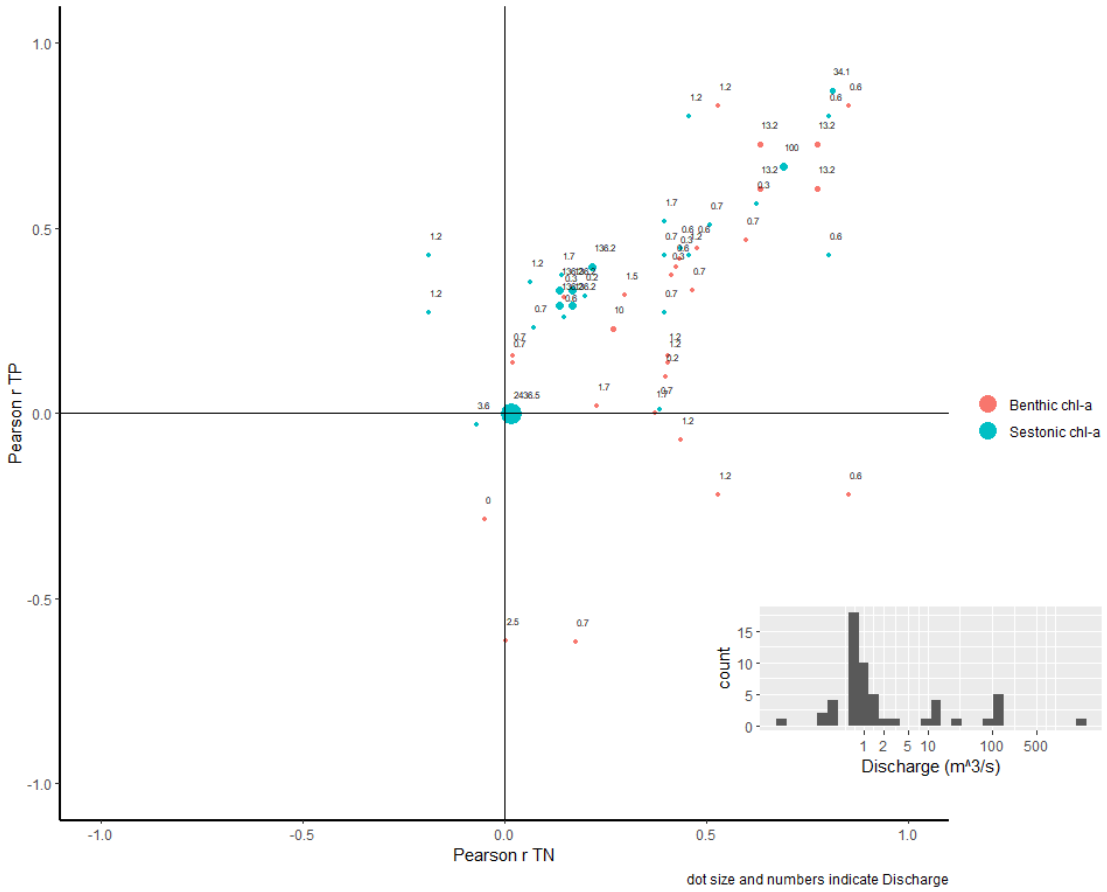



```
ggsave("Channelsize_grid.png",plot = Channelgrid, dpi = 300)
```

4.3.3 TN and TP co-limitation (discharge)

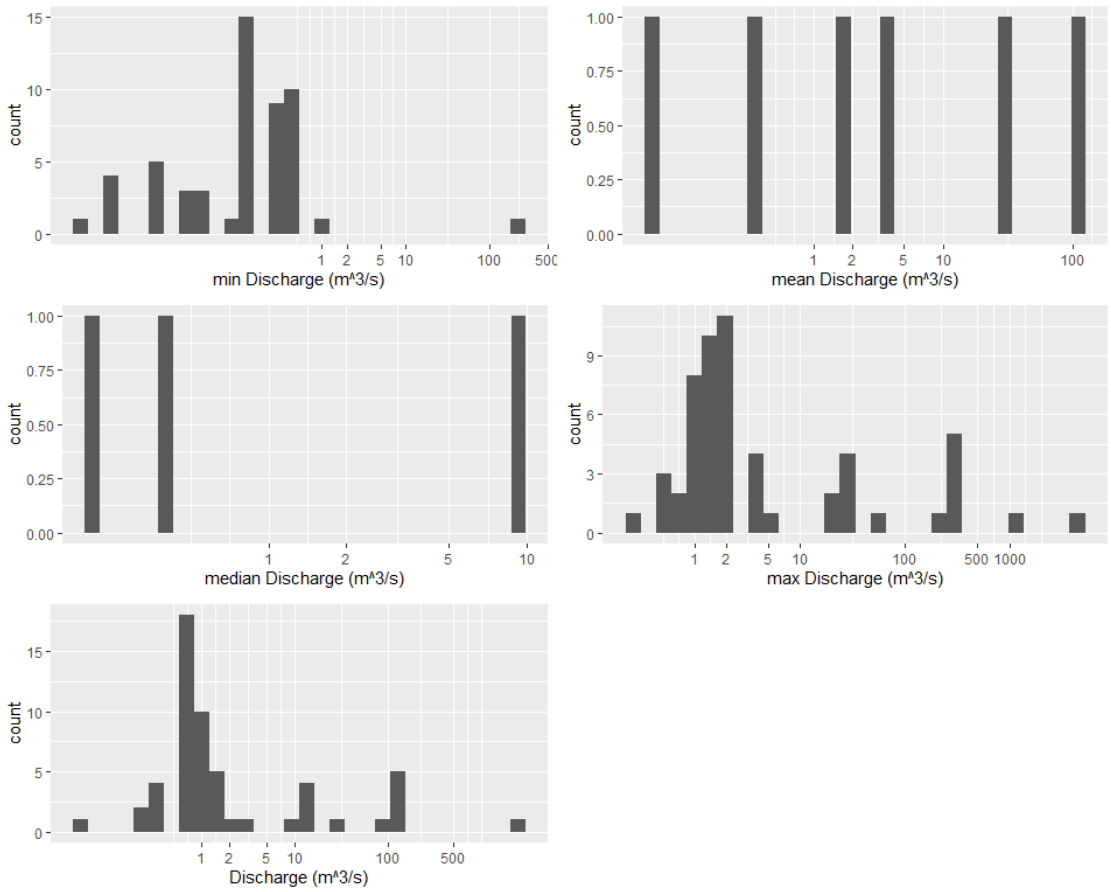
```
# Use chl_SR, which is not Z transformed
chl_TP <- subset(chl_SR,CAUSE.TERM=="Total P" & EFFECT.TERM=="Chlorophyll a")
chl_TN <- subset(chl_SR,CAUSE.TERM=="Total N" & EFFECT.TERM=="Chlorophyll a")


## Merge based on paper, effect term info and sample size for a conservative
dataset
## of studies reporting TN and TP responses of chl
chl.both <-
merge(chl_TN,chl_TP,by=c("CITATION.ID","EFFECT.TERM","EFFECT.MEASURE",

"EFFECT.MEASURE.DETAIL","IMPACT.SAMPLES"))

# create column with size based on Discharge
chl.both$Discharge_size <- ifelse(is.na(chl.both$DISCHARGE.MEAN2.x),

(as.numeric(chl.both$DISCHARGE.MIN2.x)+as.numeric(chl.both$DISCHARGE.MAX2.x))
/2,
                            chl.both$DISCHARGE.MEAN2.x)

chl.both$Discharge_size <- ifelse(is.na(chl.both$Discharge_size),
chl.both$DISCHARGE.MEDIAN2.x, chl.both$Discharge_size)


chl.both.Discharge <- chl.both %>% select(EFFECT.MEASURE, CAUSE.TERM.x,
CAUSE.TERM.y,
                                          yi.x, vi.x, yi.y, vi.y,
                                          paper.x, paper.y, STATE.x,
                                          RESPONSE.MEASURE.VALUE2.x,
RESPONSE.MEASURE.VALUE2.y,
                                          DISCHARGE.MIN2.x, DISCHARGE.MIN2.y,
                                          DISCHARGE.MEAN2.x, DISCHARGE.MEAN2.y,
                                          DISCHARGE.MEDIAN2.x,
DISCHARGE.MEDIAN2.y,
                                          DISCHARGE.MAX2.x, DISCHARGE.MAX2.y,
                                          Discharge_size)

write.csv(chl.both.Discharge, "chl.both.Discharge.csv", row.names=F)

###############
# Make inset histogram of Discharge
histDischarge <- ggplot(chl.both.Discharge, aes(x=Discharge_size)) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500))+
  labs(x="Discharge (m^3/s)")

# Plot effect sizes with histogram inset
```

```
ggplot(data=chl.both.Discharge,aes(x=yi.x,x,y=yi.y)) +
  geom_point(aes(fill=EFFECT.MEASURE, size=Discharge_size,
color=EFFECT.MEASURE)) +
  geom_text(aes(label=round(Discharge_size, digits = 1)), size=2, hjust=-.1,
vjust=-2) +
  labs(x="Pearson r TN", y="Pearson r TP", caption = "dot size and numbers
indicate Discharge") +
  theme_classic() +
  theme(axis.line.x=element_line(colour="black", size=0.9),
        axis.line.y=element_line(colour="black", size=0.9)) +
  ylim(-1,1) + xlim(-1,1) + guides(size=F) +
  guides(fill=guide_legend(override.aes=list(size=5))) +
  theme(legend.title = element_blank())+
  geom_hline(yintercept=0) + geom_vline(xintercept=0) +
  annotation_custom(
    ggplotGrob(histDischarge),
    xmin = .5, xmax = 1.5, ymin = -1, ymax = -.5)
```




```
ggsave("Dischargesize.png",plot = last_plot(), dpi = 300)


############
#Histograms of Discharge columns
```

```r
histDischarge_min <- ggplot(chl.both.Discharge,
aes(x=as.numeric(DISCHARGE.MIN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="min Discharge (m^3/s)")
histDischarge_mean <- ggplot(chl.both.Discharge,
aes(x=as.numeric(DISCHARGE.MEAN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="mean Discharge (m^3/s)")
histDischarge_median <- ggplot(chl.both.Discharge,
aes(x=as.numeric(DISCHARGE.MEDIAN2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="median Discharge (m^3/s)")
histDischarge_max <- ggplot(chl.both.Discharge,
aes(x=as.numeric(DISCHARGE.MAX2.x))) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,1000))+
  labs(x="max Discharge (m^3/s)")

Dischargegrid <- grid.arrange(histDischarge_min, histDischarge_mean,
histDischarge_median, histDischarge_max, histDischarge)
```

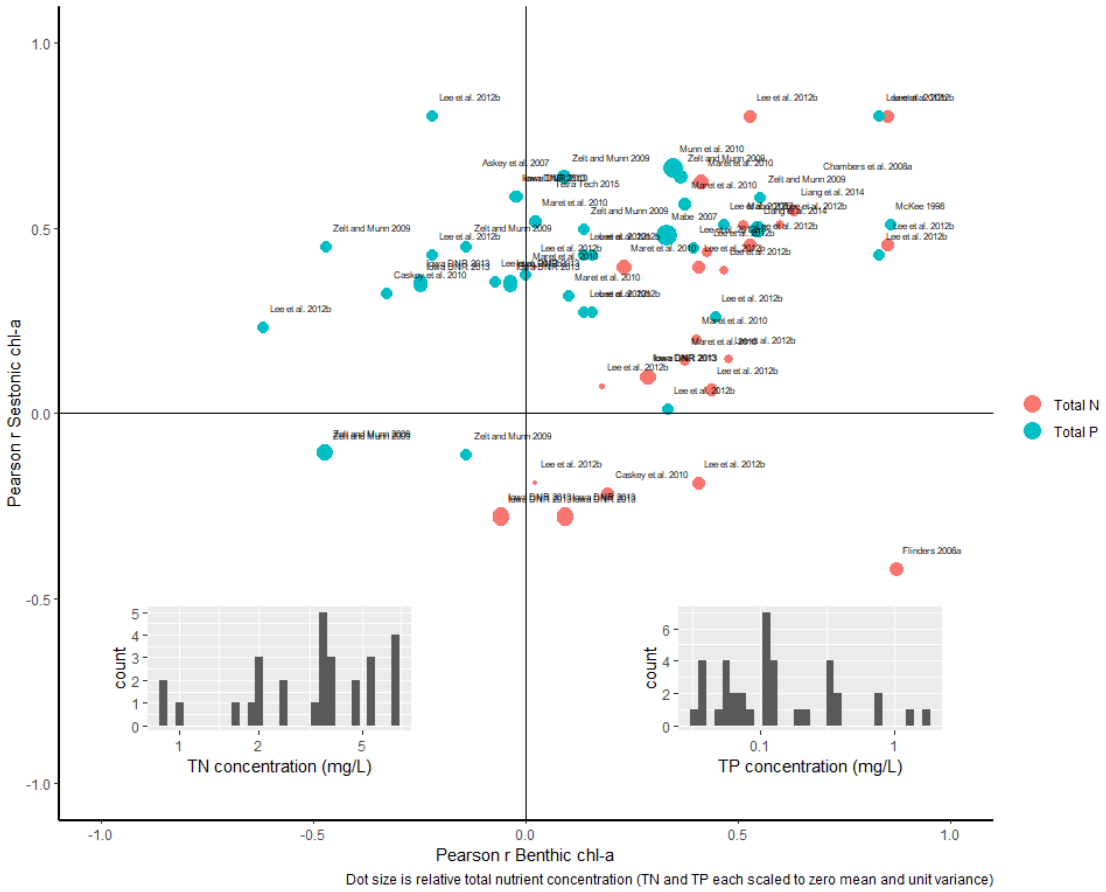


```
ggsave("Dischargesize_grid.png",plot = Dischargegrid, dpi = 300)
```

4.4 Co-measured sestonic and benthic chl

```
# Use chl_SR, which is not Z transformed
chl_ses <- subset(chl_SR, EFFECT.MEASURE=="Benthic chl-a")
chl_ben <- subset(chl_SR, EFFECT.MEASURE=="Sestonic chl-a")


## Merge based on paper, effect term info and sample size for a conservative
dataset
## of studies reporting TP responses of chl
chl.bothSB <-
merge(chl_ses,chl_ben,by=c("CITATION.ID","CAUSE.TERM","CAUSE.MEASURE",
                                    "IMPACT.SAMPLES"))


chl.bothSB$cause_size <- ifelse(is.na(chl.bothSB$CONV.CAUSE.MEAN.x),
(as.numeric(chl.bothSB$CONV.CAUSE.MIN.x)+as.numeric(chl.bothSB$CONV.CAUSE.MAX
.x)/2),
                                chl.bothSB$CONV.CAUSE.MEAN.x)

chl.bothSB.TN <- chl.bothSB %>% filter(CAUSE.TERM=="Total N")
chl.bothSB.TN$scaled_size <- scale(chl.bothSB.TN$cause_size)

chl.bothSB.TP <- chl.bothSB %>% filter(CAUSE.TERM=="Total P")
chl.bothSB.TP$scaled_size <- scale(chl.bothSB.TP$cause_size)

chl.both.scaled <- rbind(chl.bothSB.TN, chl.bothSB.TP)


chl.bothSB.sel <- chl.both.scaled %>% select(EFFECT.MEASURE.x,
EFFECT.MEASURE.y,
                                    paper.x, paper.y,
                                    RESPONSE.MEASURE.VALUE2.x,
RESPONSE.MEASURE.VALUE2.y,
                                    cause_size, scaled_size, CAUSE.TERM)

write.csv(chl.bothSB.sel, "chl.bothSB.sel.csv", row.names=F)

# Make inset histogram of TN concentrations
histTN <- ggplot(chl.bothSB.TN, aes(x=cause_size)) +
  geom_histogram()+
  scale_x_log10(breaks=c(1,2,5,10,100,500,10000))+
  labs(x="TN concentration (mg/L)")

# Make inset histogram of TP concentrations
histTP <- ggplot(chl.bothSB.TP, aes(x=cause_size)) +
  geom_histogram()+
```

```
  scale_x_log10(breaks=c(0.1,1,5,10,100,1000), label=c(0.1,1,5,10,100,1000))+
  labs(x="TP concentration (mg/L)")

# Plot effect sizes
ggplot(data=chl.both.scaled,aes(x=yi.x,x,y=yi.y)) +
  geom_point(aes(fill=CAUSE.TERM, color=CAUSE.TERM, size=scaled_size)) + ##
,alpha=0.75
  labs(x="Pearson r Benthic chl-a", y="Pearson r Sestonic chl-a", caption =
"Dot size is relative total nutrient concentration (TN and TP each scaled to
zero mean and unit variance)") +
  geom_text(aes(label=paper.x), size=2, hjust=-.1, vjust=-2) +
  theme_classic() +
  theme(axis.line.x=element_line(colour="black", size=0.9),
        axis.line.y=element_line(colour="black", size=0.9)) +
  ylim(-1,1) + xlim(-1,1) + guides(size=F) +
  guides(fill=guide_legend(override.aes=list(size=5))) +
  theme(legend.title = element_blank())+
  geom_hline(yintercept=0) + geom_vline(xintercept=0)+
  annotation_custom(ggplotGrob(histTP),
                    xmin = .25, xmax = 1, ymin = -1, ymax = -.5)+
  annotation_custom(ggplotGrob(histTN),
                    xmin = -1, xmax = -.25, ymin = -1, ymax = -.5)
```



```
ggsave("BenSes.png",plot = last_plot(), dpi = 300)
```

5 MAPS

5.1 Full Database (with diatoms & macros)

```
## Full database maps (all cause terms, all effect measures)
## Read in data
db4 = read.csv("db4_20201216.csv", header=T, stringsAsFactors = F)


## Subset to USA
db4_usa = subset(db4, db4$COUNTRY=="United States")


## If Multiple states, need to use the effect size more than once.
ALABAMA = which(colnames(db4_usa)=="ALABAMA")
WYOMING = which(colnames(db4_usa)=="WYOMING")
colnames(db4_usa[, c(ALABAMA:WYOMING)])
```

```
##  [1] "ALABAMA"              "ALASKA"               "ARIZONA"
##  [4] "ARKANSAS"             "CALIFORNIA"           "COLORADO"
##  [7] "CONNECTICUT"          "DELAWARE"             "DISTRICT.OF.COLUMBIA"
## [10] "FLORIDA"              "GEORGIA"              "HAWAII"
## [13] "IDAHO"                "ILLINOIS"             "INDIANA"
## [16] "IOWA"                 "KANSAS"               "KENTUCKY"
## [19] "LOUISIANA"            "MAINE"                "MARYLAND"
## [22] "MASSACHUSETTS"        "MICHIGAN"             "MINNESOTA"
## [25] "MISSISSIPPI"          "MISSOURI"             "MONTANA"
## [28] "NEBRASKA"             "NEVADA"               "NEW.HAMPSHIRE"
## [31] "NEW.JERSEY"           "NEW.MEXICO"           "NEW.YORK"
## [34] "NORTH.CAROLINA"       "NORTH.DAKOTA"         "OHIO"
## [37] "OKLAHOMA"             "OREGON"               "PENNSYLVANIA"
## [40] "RHODE.ISLAND"         "SOUTH.CAROLINA"       "SOUTH.DAKOTA"
## [43] "TENNESSEE"            "TEXAS"                "UTAH"
## [46] "VERMONT"              "VIRGINIA"             "WASHINGTON"
## [49] "WEST.VIRGINIA"        "WISCONSIN"            "WYOMING"
```

```
## Replace NAs in individual state columns to zero.
db4_usa[, c(ALABAMA:WYOMING)][is.na(db4_usa[, c(ALABAMA:WYOMING)])] = 0


## Add new column with number of states per row.
db4_usa$Mult_States = rowSums(db4_usa[, c(ALABAMA:WYOMING)])


## New expanded dataframe will have this number of rows.
sum(db4_usa$Mult_States) #16260
```

```
## [1] 15678

## Expand the dataframe so that rows with multiple states are
## duplicated by number of states.
db4_expanded = db4_usa[rep(row.names(db4_usa), db4_usa$Mult_States),
1:ncol(db4_usa)]
row.names(db4_expanded) = 1:nrow(db4_expanded)


## Get a list of state column names with a 1
## E.g., If a row included 4 states, the list will have 4 elements for that
row.
statenames = apply(db4_usa[, c(ALABAMA:WYOMING)], 1, function(x)
names(which(x >0)))


## Unlist the names so that each state has its own row.
State_unlist = unlist(statenames, use.names=F)
names(State_unlist) = "STATE_unlisted"


## Add the unlisted object as a column to db2.expanded.
db4_expanded$STATE_unlisted = State_unlist


## Remove . in state names (run twice for District of Columbia)
db4_expanded$STATE_unlisted = sub("\\.", " ", db4_expanded$STATE_unlisted)
db4_expanded$STATE_unlisted = sub("\\.", " ", db4_expanded$STATE_unlisted)


## Remove rows with no RESPONSE.MEASURE.VALUE
db4_expanded = db4_expanded[!is.na(db4_expanded$RESPONSE.MEASURE.VALUE),]


## Check stressor-response relationships included in the dataframe
summary(as.factor(db4_expanded$EFFECT.MEASURE))

##          Abundance      Benthic chl-a            Biomass
Biovolume
##                 54                757                 31
46
##          Diversity          Dominance           Evenness  Multimetric
index
##                 85                 52                 29
484
##              Other        Other chl-a Relative abundance Relative
Abundance
##               1045                 20                  3
8107
```

```
##           Richness     Sestonic chl-a         Similarity
##               1293                536                 21
```

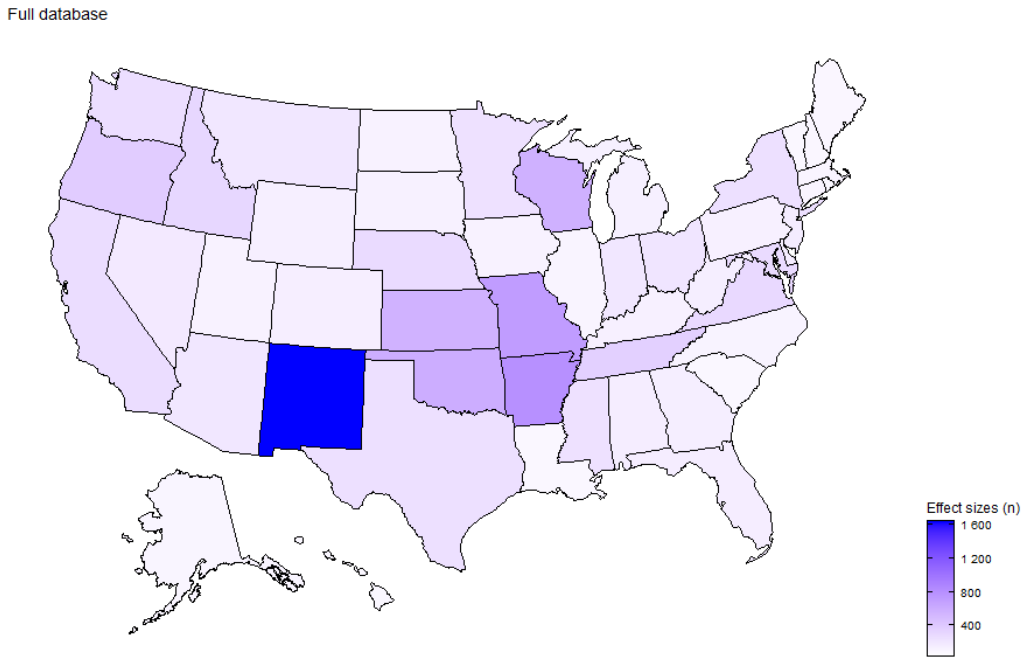
```
summary(as.factor(db4_expanded$CAUSE.TERM))
```

```
##          Ammonium               DIN           Nitrate Nitrate + nitrite
##               743                27               116              1889
##           Nitrite             Other               SRP               TKN
##                21                28              1615               108
##           Total N  Total N: total P          Total P              NA's
##              3401                94              4178               343
```

```
## Mapping
esMap(db4_expanded, type='count', "Full database", "Effect sizes (n)")
```

```
##                   state    n
## 1               ALABAMA  152
## 2                ALASKA  100
## 3               ARIZONA  195
## 4              ARKANSAS  802
## 5            CALIFORNIA  265
## 6              COLORADO  146
## 7           CONNECTICUT  111
## 8              DELAWARE  154
## 9  DISTRICT OF COLUMBIA   33
## 10              FLORIDA  157
## 11              GEORGIA  151
## 12               HAWAII   90
## 13                IDAHO  309
## 14             ILLINOIS  107
## 15              INDIANA  199
## 16                 IOWA  118
## 17               KANSAS  560
## 18             KENTUCKY  135
## 19            LOUISIANA   90
## 20                MAINE   92
## 21             MARYLAND  278
## 22        MASSACHUSETTS  110
## 23             MICHIGAN  138
## 24            MINNESOTA  236
## 25          MISSISSIPPI  235
## 26             MISSOURI  715
## 27              MONTANA  196
## 28             NEBRASKA  276
## 29               NEVADA  181
## 30        NEW HAMPSHIRE   92
## 31           NEW JERSEY  163
## 32           NEW MEXICO 1639
## 33             NEW YORK  246
## 34       NORTH CAROLINA  114
## 35         NORTH DAKOTA  123
```

```
## 36                 OHIO  209
## 37             OKLAHOMA  598
## 38               OREGON  385
## 39         PENNSYLVANIA  133
## 40         RHODE ISLAND   90
## 41       SOUTH CAROLINA   90
## 42         SOUTH DAKOTA  128
## 43            TENNESSEE  355
## 44                TEXAS  242
## 45                 UTAH  123
## 46              VERMONT   90
## 47             VIRGINIA  292
## 48           WASHINGTON  256
## 49        WEST VIRGINIA  148
## 50            WISCONSIN  571
## 51              WYOMING  145
```



5.2 Chlorophyll only

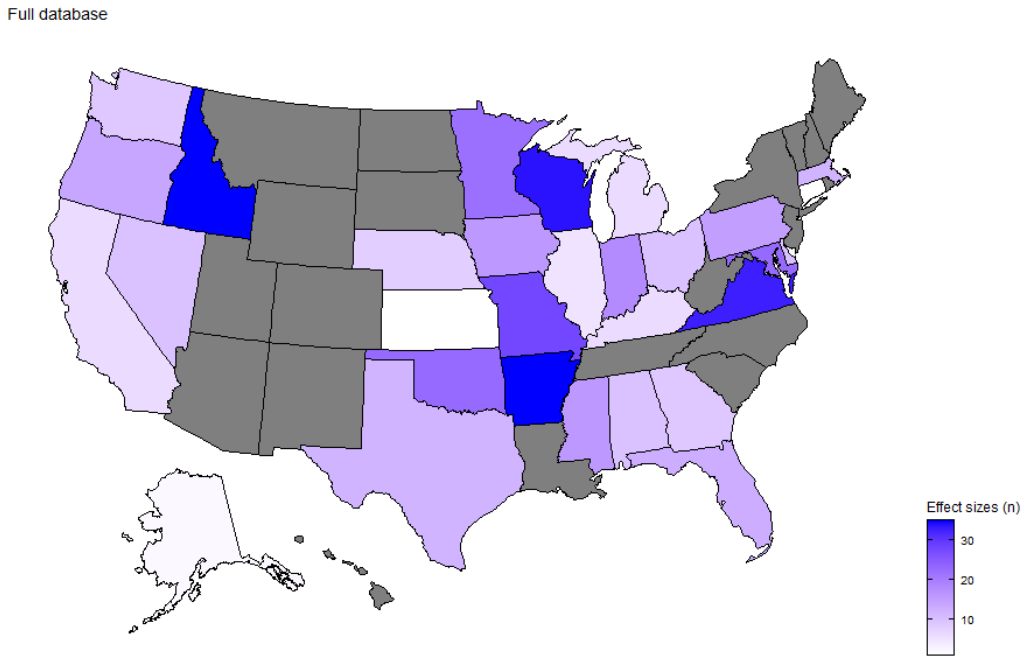
```
chl_expanded <- read.csv("chl_expanded STATES 20201216.csv", header=T,
stringsAsFactors = F)

## Check stressor-response relationships included in the dataframe
summary(as.factor(chl_expanded$EFFECT.MEASURE))

##  Benthic chl-a Sestonic chl-a
##            286            207

summary(as.factor(chl_expanded$CAUSE.TERM))
```

```
## Total N Total P
##     194     299
```

```
#Make STATE_unlisted column to run esMap
chl_expanded$STATE_unlisted <- chl_expanded$STATE
```

```
esMap(chl_expanded, type='count', "Full database", "Effect sizes (n)")
```

```
##             state  n
## 1         ALABAMA 10
## 2          ALASKA  2
## 3        ARKANSAS 35
## 4      CALIFORNIA  6
## 5     CONNECTICUT  1
## 6        DELAWARE 10
## 7         FLORIDA 13
## 8         GEORGIA  9
## 9           IDAHO 35
## 10       ILLINOIS  5
## 11        INDIANA 18
## 12           IOWA 16
## 13         KANSAS  1
## 14       KENTUCKY  6
## 15       MARYLAND 23
## 16  MASSACHUSETTS 12
## 17       MICHIGAN  6
## 18      MINNESOTA 22
## 19    MISSISSIPPI 16
## 20       MISSOURI 28
## 21       NEBRASKA  8
## 22         NEVADA 10
## 23     NEW.JERSEY  3
## 24     NEW.MEXICO 24
## 25       NEW.YORK  5
## 26 NORTH.CAROLINA  1
## 27           OHIO 10
## 28       OKLAHOMA 23
## 29         OREGON 14
## 30   PENNSYLVANIA 15
## 31          TEXAS 12
## 32       VIRGINIA 33
## 33     WASHINGTON  9
## 34  WEST.VIRGINIA 18
## 35      WISCONSIN 34
```



6 EXPERIMENTS

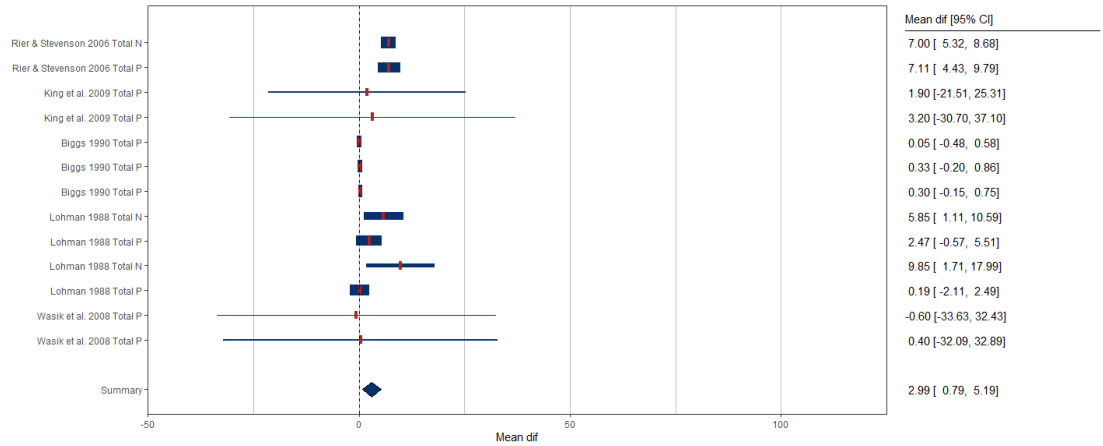
```
## Read in cleaned dataframe
db4 = read.csv("db4_20201216.csv", header=T, stringsAsFactors = F)


## Subset chlorophyll experimental studies with raw mean differences
db4.chlexp = dplyr::filter(db4, RESPONSE.MEASURE.TYPE == c("Mean difference")
&
                               EFFECT.TERM == c("Chlorophyll a") &
                               !is.na(RESPONSE.MEASURE.VALUE) &
                               !is.na(CAUSE.TERM))


## Check that the rows are in the correct order and mean differences equal
response measure values
## All values returned equal 0
round(db4.chlexp$RESPONSE.MEASURE.VALUE - abs(db4.chlexp$MEAN.TREATMENT.GROUP
- db4.chlexp$MEAN.CONTROL.GROUP), 2)

##  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0

## Saving to csv
write.csv(db4.chlexp, "experimental papers 20201216.csv", row.names=F)


## Meta analysis
db4.yv = escalc(m2i=MEAN.CONTROL.GROUP, m1i=MEAN.TREATMENT.GROUP,
                sd2i=as.numeric(STD.DEV.OF.EFFECT...CONTROL.GROUP),
```

```
                  sd1i =as.numeric(STD.DEV.OF.EFFECT...TREATMENT.GROUP),
                  n2i=as.numeric(CONTROL.REPLICATES),
                  n1i=as.numeric(IMPACT.REPLICATES),
                  measure = "MD", data=db4.chlexp)


## Put yi and vi as first and second columns
chl_exper = db4.yv[,c(ncol(db4.yv)-1, ncol(db4.yv), 1:(ncol(db4.yv)-2))]
head(chl_exper[,1:6])

##       yi      vi uniqueID uniquedataset CITATION.ID HERO.ID
## 1 7.0000  2.1986  2263101         22631        2263 4543774
## 2 7.1100  5.5969  2263102         22631        2263 4543774
## 3 1.9000 35.6525  2942101         29421        2942 5097848
## 4 3.2000 74.8025  2942102         29421        2942 5097848
## 5 0.0500  0.0242  3007102         30071        3007 4479455
## 6 0.3300  0.0242  3007202         30072        3007 4479455
```

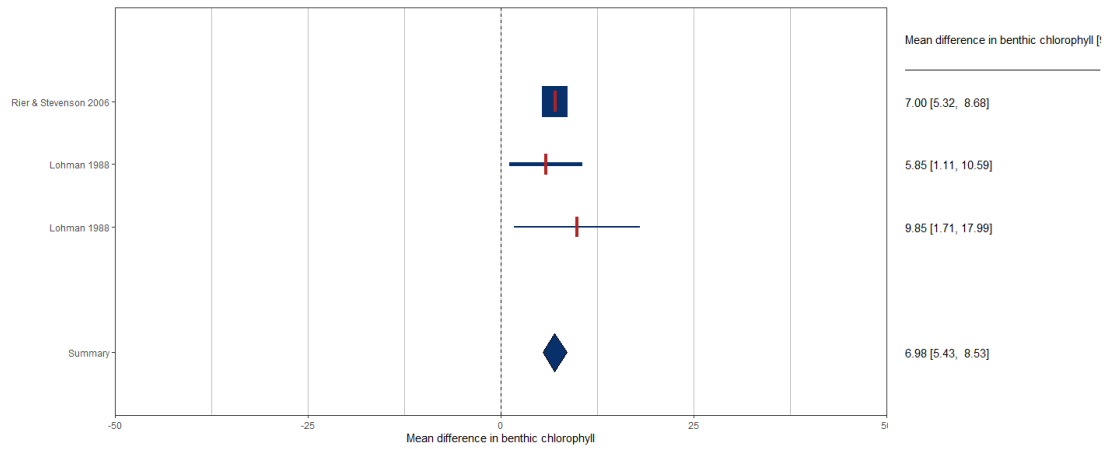
6.1 Forest plots

```
chl_exper0 <- read.csv("experimental papers 20201216.csv", header = T,
stringsAsFactors = F)

chl_exper <- escalc(m2i=MEAN.CONTROL.GROUP, m1i=MEAN.TREATMENT.GROUP,
                    sd2i=as.numeric(STD.DEV.OF.EFFECT...CONTROL.GROUP),
                    sd1i =as.numeric(STD.DEV.OF.EFFECT...TREATMENT.GROUP),
                    n2i=as.numeric(CONTROL.SAMPLES),
                    n1i=as.numeric(IMPACT.SAMPLES),
                    measure = "MD", data=chl_exper0)

## Put yi and vi as first and second columns
chl_exper <- chl_exper[,c(ncol(chl_exper)-1, ncol(chl_exper),
1:(ncol(chl_exper)-2))]
head(chl_exper[,1:6])

##       yi       vi uniqueID uniquedataset CITATION.ID HERO.ID
## 1 7.0000   0.7329  2263101         22631        2263 4543774
## 2 7.1100   1.8656  2263102         22631        2263 4543774
## 3 1.9000 142.6100  2942101         29421        2942 5097848
## 4 3.2000 299.2100  2942102         29421        2942 5097848
## 5 0.0500   0.0725  3007102         30071        3007 4479455
## 6 0.3300   0.0725  3007202         30072        3007 4479455

## Forest plot of all 13 experimental studies with mean differences
chl_exper$studylabs = paste(chl_exper$paper, chl_exper$CAUSE.TERM, sep=" ")

rma_chl_exper <- rma.mv(yi, vi,
                    random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                    tdist=TRUE, data=chl_exper)

viz_forest(rma_chl_exper, group = NULL, type="standard",
```

```
            study_labels = chl_exper$studylabs, summary_label = NULL,
            xlab = "Mean dif",
            summary_table = NULL, variant="thick",
            text_size=4, x_limit = c(-50,125),
            annotate_CI = TRUE)
```




```
## Forest plot of ben.TN experimental studies with mean differences
chl_exper.ben.TN = subset(chl_exper, EFFECT.MEASURE == "Benthic chl-a"
                          & CAUSE.TERM == "Total N")

rma_chl_exper.ben.TN <- rma.mv(yi, vi,
                      random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                      tdist=TRUE, data=chl_exper.ben.TN)

viz_forest(rma_chl_exper.ben.TN, group = NULL, type="standard",
            study_labels = chl_exper.ben.TN$paper, summary_label = NULL,
            xlab = "Mean difference in benthic chlorophyll",
            summary_table = NULL, variant="thick",
            text_size=4, x_limit = c(-50, 50),
            annotate_CI = TRUE)
```




```
## Forest plot of ben.TP experimental studies with mean differences
chl_exper.ben.TP = subset(chl_exper, EFFECT.MEASURE == "Benthic chl-a"
```

```
                          & CAUSE.TERM == "Total P")

rma_chl_exper.ben.TP <- rma.mv(yi, vi,
                      random = list(~ 1 | uniqueID, ~ 1 | CITATION.ID),
                      tdist=TRUE, data=chl_exper.ben.TP)

viz_forest(rma_chl_exper.ben.TP, group = NULL, type="standard",
           study_labels = chl_exper.ben.TP$paper, summary_label = NULL,
           xlab = "Mean difference in benthic chlorophyll",
           summary_table = NULL, variant="thick",
           text_size=4, x_limit = c(-5,15),
           annotate_CI = TRUE)
```