lab3.R

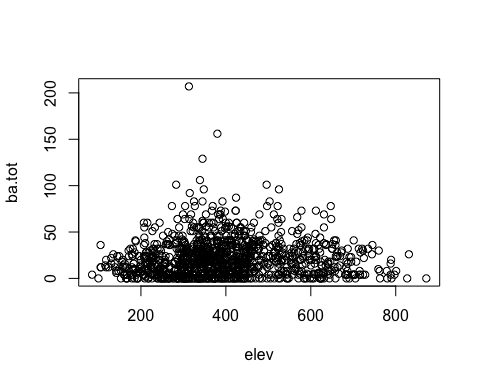
stonehuang

2022-09-28

###Q1  
#Basal area is the cross-sectional areas of tree stems. We measure the circumference at breast height (1.3 meters or 4.5 feet from the ground), estimate the diameter, and calculate the area.  
#basal area of a forest = total basal area of all trees / area of a forest  
library(here)

## here() starts at /Users/stonehuang/Documents/environmental\_data

dat\_bird = read.csv(here("data", "bird.sta.csv"))  
dat\_habitat = read.csv(here("data", "hab.sta.csv"))  
dat\_all = merge(dat\_bird, dat\_habitat)  
plot(ba.tot ~ elev, data = dat\_all)



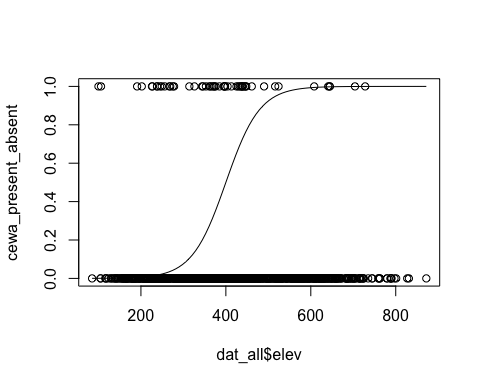
sample(dat\_all$CEWA, 100)

## [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
## [38] 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0  
## [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

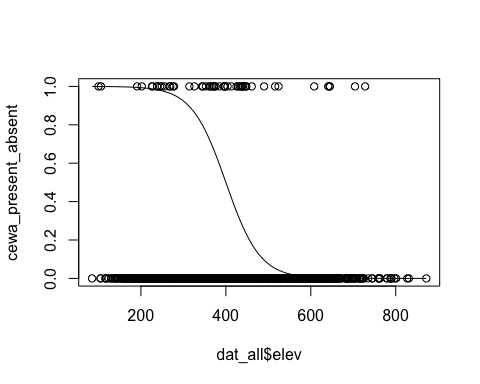
my\_vec = dat\_all$CEWA  
my\_vec > 0

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cewa\_present\_absent = as.numeric(my\_vec > 0)  
plot(x = dat\_all$elev, y = cewa\_present\_absent)  
  
# Function to calculate the logistic parameter a given the slope and midpoint  
get\_logistic\_param\_a = function(slope, midpoint)  
{  
 b = slope / 4  
 return (-midpoint \* (slope / 4))  
}  
  
# Function to calculate the logistic parameter b given the slope  
get\_logistic\_param\_b = function(slope)  
{  
 return (slope / 4)  
}  
  
  
# Calculate the value of the logistic function at x, given the parameters a and b.  
logistic = function(x, a, b)  
{  
 val = exp(a + b \* x)  
 return(val / (1 + val))  
}  
  
# Calculate the value of the logistic function at x, given a slope and midpoint.  
logistic\_midpoint\_slope = function(x, midpoint, slope)  
{  
 b = get\_logistic\_param\_b(slope)  
 a = get\_logistic\_param\_a(slope, midpoint)  
 return(logistic(x, a, b))  
}  
  
plot(x = dat\_all$elev, y = cewa\_present\_absent)  
curve(logistic\_midpoint\_slope(x, midpoint = 400, slope = 0.1), add = TRUE)



plot(x = dat\_all$elev, y = cewa\_present\_absent)  
curve(logistic\_midpoint\_slope(x, midpoint = 400, slope = -0.1), add = TRUE)

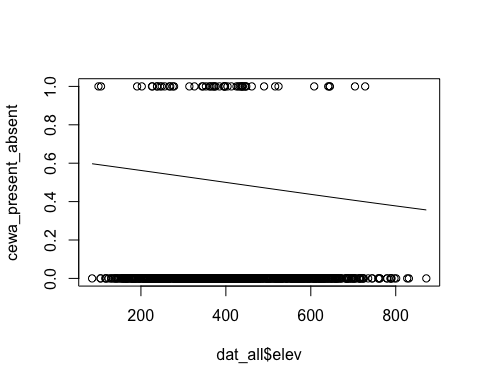


plot(x = dat\_all$elev, y = cewa\_present\_absent)  
curve(logistic\_midpoint\_slope(x, midpoint = 400, slope = -0.005), add = TRUE)  
  
#install.packages("tmvnsim")  
#install.packages("psych")  
require(psych)

## Loading required package: psych

##   
## Attaching package: 'psych'

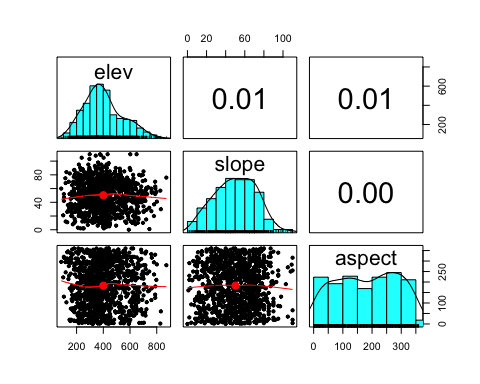
## The following object is masked \_by\_ '.GlobalEnv':  
##   
## logistic



names(dat\_all)

## [1] "basin" "sub" "sta" "AMCR" "AMDI" "AMGO"   
## [7] "AMRO" "BCCH" "BEWR" "BGWA" "BHCO" "BHGR"   
## [13] "BRCR" "BTPI" "BUSH" "CBCH" "CEWA" "CORA"   
## [19] "COYE" "DEJU" "DOWO" "EUST" "EVGR" "GCKI"   
## [25] "GCSP" "GRJA" "HAFL" "HAWO" "HETH" "HEWA"   
## [31] "HOME" "HOWR" "HUVI" "MALL" "MAMU" "MGWA"   
## [37] "MOQU" "NOFL" "OCWA" "OSFL" "PISI" "PIWO"   
## [43] "PSFL" "PUFI" "PYOW" "RBNU" "RBSA" "RCKI"   
## [49] "RECR" "RSTO" "RTHA" "RUGR" "RUHU" "SCOW"   
## [55] "SOSP" "SOVI" "SPOW" "SSHA" "STJA" "SWTH"   
## [61] "TOSO" "TOWA" "TRSW" "UNBI" "UNFL" "UNTH"   
## [67] "UNWA" "UNWO" "VATH" "VGSW" "WAVI" "WCSP"   
## [73] "WEBL" "WETA" "WIFL" "WIWA" "WIWR" "WODU"   
## [79] "WREN" "WWPE" "YRWA" "b.total" "b.rich" "b.sidi"   
## [85] "lat" "long" "elev" "slope" "aspect" "s.id"   
## [91] "s.edge" "p.edge" "p.edge.1" "p.cwedge" "ba.con" "ba.hard"   
## [97] "ba.snag" "ba.tot" "ba.ratio" "snag.sml" "snag.ml" "snag.l"   
## [103] "snag.dc1" "snag.dc2" "snag.dc4"

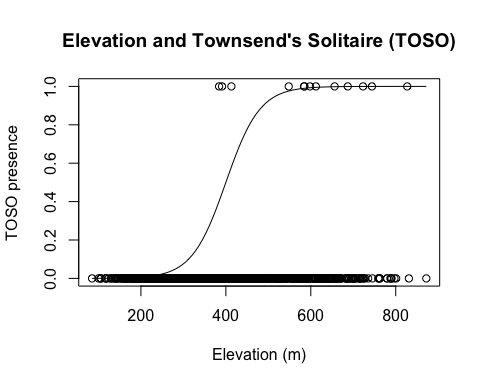
###Q2  
pairs.panels(dat\_all[, c("elev", "slope", "aspect")])



TOSO = dat\_all$TOSO  
TOSO > 0

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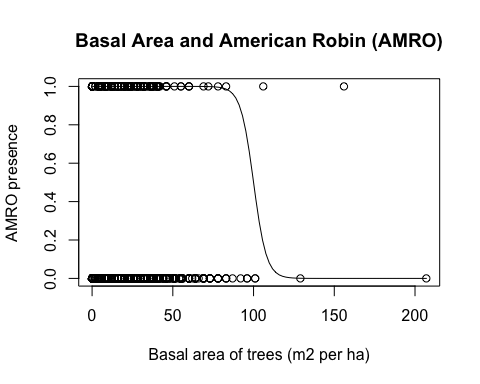
TOSO\_present\_absent = as.numeric(TOSO > 0)  
###Q3  
plot(x = dat\_all$elev, y = TOSO\_present\_absent, xlab = "Elevation (m)", ylab = "TOSO presence", main = "Elevation and Townsend's Solitaire (TOSO)")  
curve(logistic\_midpoint\_slope(x, midpoint = 400, slope = 0.1), add = TRUE)



###Q4  
#Townsend's Solitaire preferred mid to high elevations and were not found at elevations below 300 meters. The logistic model is not a good fit because TOSO was absent from many mid to high elevations. More observations of TOSO would better reflect the habitat preference.  
  
###Q5  
AMRO = dat\_all$AMRO  
AMRO > 0

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## [1045] TRUE TRUE

AMRO\_present\_absent = as.numeric(AMRO > 0)  
plot(x = dat\_all$ba.tot, y = AMRO\_present\_absent, xlab = "Basal area of trees (m2 per ha)", ylab = "AMRO presence", main = "Basal Area and American Robin (AMRO)")  
curve(logistic\_midpoint\_slope(x, midpoint = 100, slope = -1), add = TRUE)



###Q6  
#American Robin preferred low tree cover (basal area < 50 m2 per ha). However, there are many low basal area sites where robins were absent. So a logistic model is not a good fit. High basal area sites are not representative in this data set.  
  
###Q7  
#181 Gray Jays were observed in all of the sampling sites.  
###Q8  
GRJA = dat\_all$GRJA  
sum(GRJA)

## [1] 181

###Q9  
#There are 110 sampling sites in which Gray Jays were observed.  
###Q10  
GRJA > 0

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GRJA\_present\_absent = as.numeric(GRJA > 0)  
sum(GRJA\_present\_absent)

## [1] 110