Food Availability Model

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```
library(ggplot2)
# Code for a simple food availability model based upon the assumptions of higher pelagic food quality
# in the summer.
```

Parameters We Set:

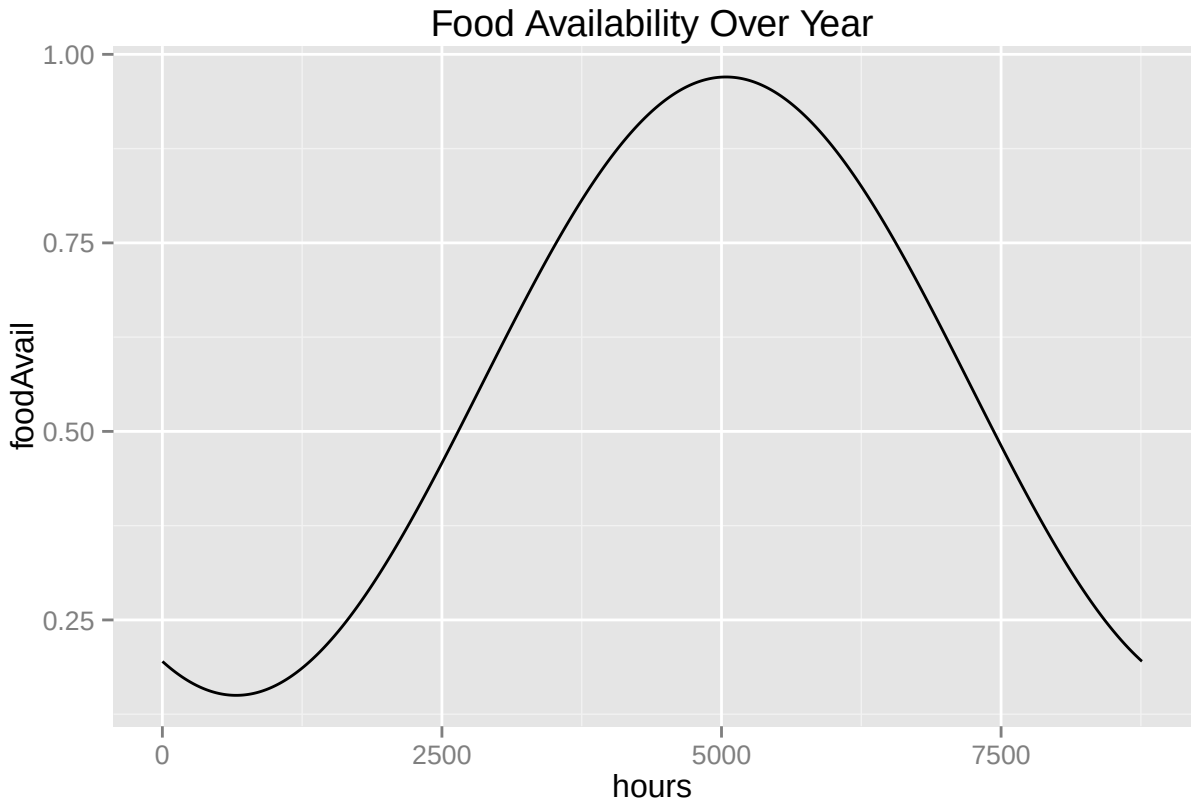
```
#First we set up some user defined variables.
min     = 0.15 #minimum food availability value
max     = 0.97 #max
highDay = 210*24 #Number of days into the year that the max food availability is (226 is aug 15)
august  = 5856 #hours into the year
```

The actual model

```
#Now we generate the others
scaler    = (max - min)/2 #range divided by two
heightAdj = (max + min)/2 #average value
hours      = 1:(365*24) #Set up a hour vector to loop over
foodAvail = NULL

#Quick loop to generate the data.
for (hour in hours){
  foodAvail = c(foodAvail, scaler * cos( (1/(365*24))*2*pi * (hour - highDay)) + heightAdj)
}

qplot(hours,foodAvail, geom = "line", main = "Food Availability Over Year")
```




```
setwd("/Users/Nick/mysisModeling/paperMaterials/figures")
ggsave(filename = "pres_foodAvailability.pdf", width = 6, height = 2.5)
```

The variability curve

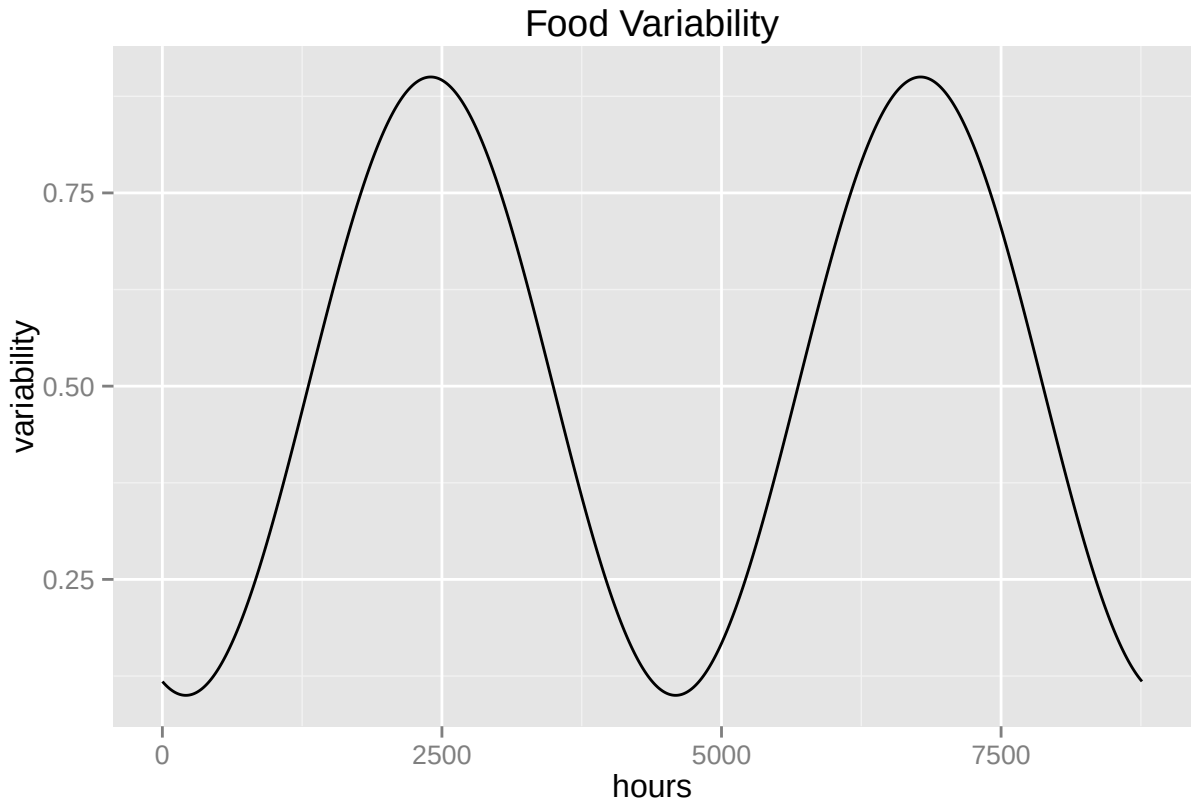
Here we set up another curve which represents the variablity of the food distribution at any time.

The value of the curve $f(hour)$ = variability of distribution.

```
min     = 0.1 #minimum food availability value
max     = 0.9 #max
highDay = 100*24
scaler    = (max - min)/2 #range divided by two
heightAdj = (max + min)/2 #average value
variability = NULL

#Quick loop to generate the data.
for (hour in hours){
  variability = c(variability, scaler * cos( (1/(365*24))*4*pi * (hour - highDay)) + heightAdj)
}

qplot(hours,variability, geom = "line", main = "Food Variability")
```




```
setwd("/Users/Nick/mysisModeling/paperMaterials/figures")
ggsave(filename = "pres_foodVariability.pdf", width = 6, height = 2.5)

avail_var_df = as.data.frame(cbind(foodAvail, variability))
```

Combined curves:

We will now generate the bounding curves by adding and subtracting the variablity from the main curve.

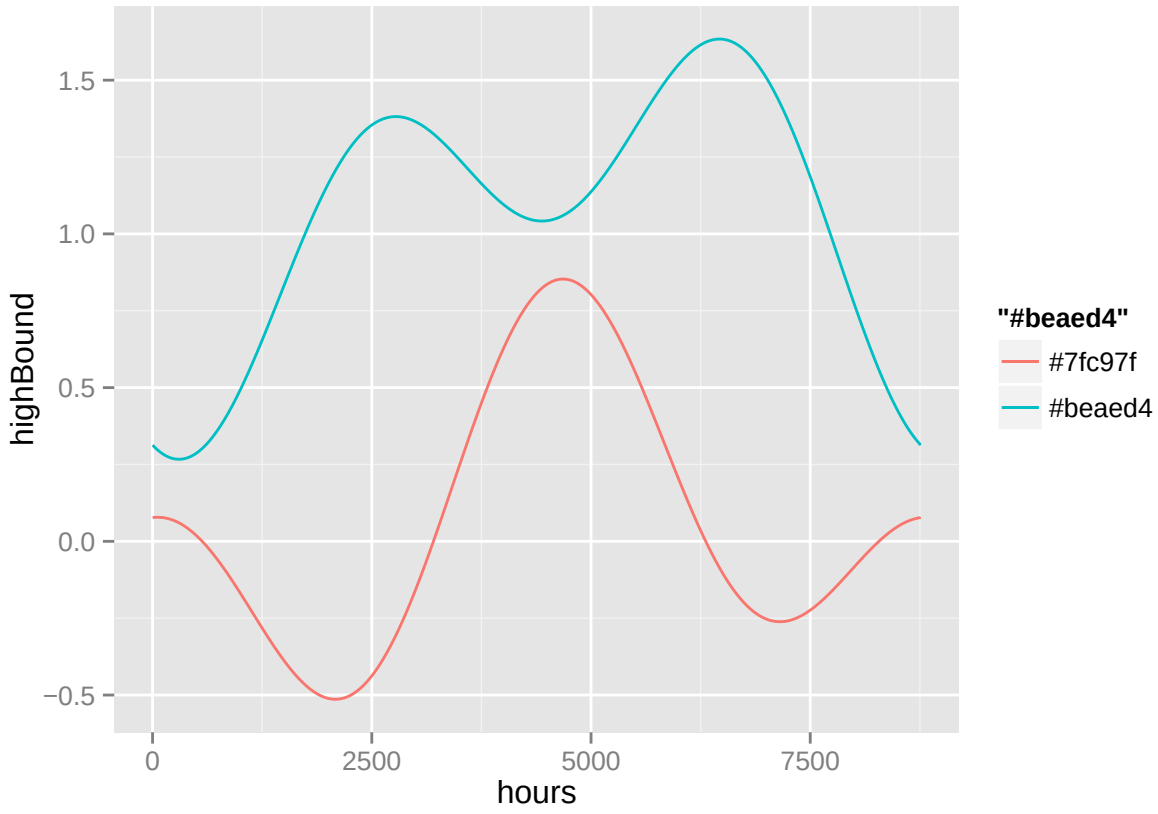
```
highBound = NULL
lowBound  = NULL

for (hour in hours){
  highBound = c(highBound, (foodAvail[hour] + variability[hour]))
  lowBound = c(lowBound, (foodAvail[hour] - variability[hour]))
}

distributionDf = as.data.frame(cbind(hours, highBound, lowBound))

library(ggplot2)

ggplot(distributionDf, aes(hours)) +
  geom_line(aes(y = highBound, colour = "#beaed4")) +
  geom_line(aes(y = lowBound, colour = "#7fc97f"))
```



Save to file

```
setwd("/Users/Nick/mysisModeling")
#write.csv(distributionDf, "data/FoodAvail_Hour.csv", row.names=FALSE) #The bounded model  #
#write.csv(avail_var_df, "data/FoodAvail_Hour.csv", row.names=FALSE) #The plain side curve.
```