# Group Creek Project - Do You Hear the Banjos?

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Measurements were taken 5 days: Wed 3/30/16 about 6-7 pm Fri 4/1/16 about 1-2 pm Sun 4/3/16 about 5-6 pm Tue 4/5/16 about 5-6 pm Thu 4/7/16 about 5:30-6:30 pm following rain!

```
library(ggplot2)
library(knitr)
knitr::opts_chunk$set(comment = NA, fig.width = 10.28,fig.height = 7.48, fig.align = "center")

pipelen <- 4.00

measure <- matrix(data=NA,nrow=4,ncol=4,byrow=TRUE,dimnames=list(c(1:4),c("Near Depth","Mid-Depth","Far

measure[1,] <- c(.5000,1.2500,.5833,12.4167)
measure[2,] <- c(.2917,.5833,.3333,5.3333)
measure[3,] <- c(.3750,.5417,.2500,9.000)
measure[4,] <- c(.6667,1.6667,.4583,12.5833)

rectvol <- numeric(4)

# Calculate volume of creek at 4 locations #
for (m in 1:4) {
  area <- measure[m,2]*measure[m,4]
  rectvol[m] <- area*pipelen
}
rectvol
```

```
## [1] 62.08350 12.44366 19.50120 83.89034
```

```
pentvol <- numeric(4)

# Calculate volume of creek at 4 locations #
for (m in 1:4) {
  area <- .25*measure[m,4]*(2*measure[m,2]-measure[m,1]-measure[m,3])+.5*measure[m,4]*(measure[m,1]+meas
  pentvol[m] <- area*pipelen
}
pentvol
```

```
## [1] 44.49276  9.55514 15.37560 56.10138
```

```
# Define a matrix to hold data for 3 trials each at 4 locations for 5 days #
timemx <- matrix(data=NA,nrow=20,ncol=4,byrow=TRUE,dimnames=list(c(1:20),c("Trial 1","Trial 2","Trial 3

# Day 1, Loc 1-4,
timemx[1,] <- c(6.76,6.1,10.56,0)     # bobber only this one time
timemx[2,] <- c(6.08,6.48,9.61,0)
timemx[3,] <- c(6.23,6.83,6.08,0)
timemx[4,] <- c(0,0,0,0)              # no data on 1st day
```

```
# Day 2
timemx[5,] <- c(6.93,5.65,6.11,0)
timemx[6,] <- c(3.75,4.22,3.24,0)
timemx[7,] <- c(4.93,5.31,5.88,0)
timemx[8,] <- c(0,0,0,0)              # no data on 2nd day
# Day 3
timemx[9,] <- c(7.3,5.83,5.65,0)
timemx[10,] <- c(2.81,2.51,2.57,0)
timemx[11,] <- c(3.51,3.67,3.42,0)
timemx[12,] <- c(9.03,9.63,8.4,0)
# Day 4
timemx[13,] <- c(6.42,6.20,5.63,0)
timemx[14,] <- c(2.58,2.59,2.66,0)
timemx[15,] <- c(2.77,3.21,3.10,0)
timemx[16,] <- c(7.43,8.74,8.22,0)
# Day 5
timemx[17,] <- c(5.52,5.42,6.24,0)
timemx[18,] <- c(2.82,2.42,2.47,0)
timemx[19,] <- c(3.32,3.12,3.05,0)
timemx[20,] <- c(10.04,9.64,9.53,0)

for (i in 1:20) {
  timemx[i,4] <- mean(timemx[i,1:3])
}
timemx
```

```
##    Trial 1 Trial 2 Trial 3 Mean Sec
## 1     6.76    6.10   10.56 7.806667
## 2     6.08    6.48    9.61 7.390000
## 3     6.23    6.83    6.08 6.380000
## 4     0.00    0.00    0.00 0.000000
## 5     6.93    5.65    6.11 6.230000
## 6     3.75    4.22    3.24 3.736667
## 7     4.93    5.31    5.88 5.373333
## 8     0.00    0.00    0.00 0.000000
## 9     7.30    5.83    5.65 6.260000
## 10    2.81    2.51    2.57 2.630000
## 11    3.51    3.67    3.42 3.533333
## 12    9.03    9.63    8.40 9.020000
## 13    6.42    6.20    5.63 6.083333
## 14    2.58    2.59    2.66 2.610000
## 15    2.77    3.21    3.10 3.026667
## 16    7.43    8.74    8.22 8.130000
## 17    5.52    5.42    6.24 5.726667
## 18    2.82    2.42    2.47 2.570000
## 19    3.32    3.12    3.05 3.163333
## 20   10.04    9.64    9.53 9.736667
```

```
# Create flow rate matrix to hold 5 days of flow rate data at each of 4 locations #
rate <- numeric(20)
for (i in 1:20) {
  for (p in 1:4) {
    if (timemx[i,4] != 0) {
```

```
      rate[i] <- pentvol[p]/timemx[i,4]}
    else {
      rate[i] <- 0}
  }
}
day <- c(rep(1,4),rep(2,4),rep(3,4),rep(4,4),rep(5,4))
loc <- c(rep(1:4,5))
flow <- data.frame(day,loc,rate)
flow$day <- factor(flow$day)
flow
```

```
   day loc      rate
1    1   1  7.186343
2    1   2  7.591527
3    1   3  8.793320
4    1   4  0.000000
5    2   1  9.005038
6    2   2 15.013751
7    2   3 10.440704
8    2   4  0.000000
9    3   1  8.961883
10   3   2 21.331325
11   3   3 15.877750
12   3   4  6.219666
13   4   1  9.222145
14   4   2 21.494783
15   4   3 18.535700
16   4   4  6.900539
17   5   1  9.796517
18   5   2 21.829333
19   5   3 17.734895
20   5   4  5.761868
```

```
mean(flow$rate[1:3])
```

```
[1] 7.857064
```

```
mean(flow$rate[5:7])
```

```
[1] 11.4865
```

```
mean(flow$rate[9:12])
```

```
[1] 13.09766
```

```
mean(flow$rate[13:16])
```

```
[1] 14.03829
```

```
mean(flow$rate[17:20])
```

```
[1] 13.78065
```

```
g1 <- ggplot(data=flow, aes(x=loc,y=rate,fill=day)) +
  geom_bar(stat="identity",position="dodge") +
  scale_y_continuous(limit=c(0.0000,35.0000)) +
  scale_color_manual(values = c("#DB2202","#0ECFE9","purple","#349D5C","orange")) +
  labs(x="Locations \n 1 = Durham           2 = Roess           3 = Walker           4 = Depot"
       ,y="Flow Rate \n (feet cubed per second)", title = "Flow Rate by Location") +
    theme_bw()
plot(g1)
```