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(DT)

# Store temperature for each of 5 days in Fahrenheit #
temp <- matrix(data=c(66,45,67,44,55),nrow=5,ncol=1,byrow=FALSE)

# Convert temp to Celsius #
for (c in 1:5) {
  temp[c] <- (5/9)*(temp[c]-32)
}
temp
```

```
##           [,1]
## [1,] 18.888889
## [2,]  7.222222
## [3,] 19.444444
## [4,]  6.666667
## [5,] 12.777778
```

```
pipelen <- 48*2.54/100

#measure holds near, middle and far depths, width, and volume at 4 locations in meters #
measure <- matrix(data=NA,nrow=4,ncol=4,byrow=TRUE,dimnames=list(c(1:4),c("Near Depth","Mid-Depth","Far

measure[1,] <- c(.1524,.3810,.1778,3.7846)
measure[2,] <- c(.0889,.1778,.1016,1.6256)
measure[3,] <- c(.1143,.1651,.0762,2.7432)
measure[4,] <- c(.2032,.5080,.1397,3.8354)

vol <- numeric(4)

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

```
## [1] 1.2599030 0.2705832 0.4353715 1.5885948
```

```
# 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
```

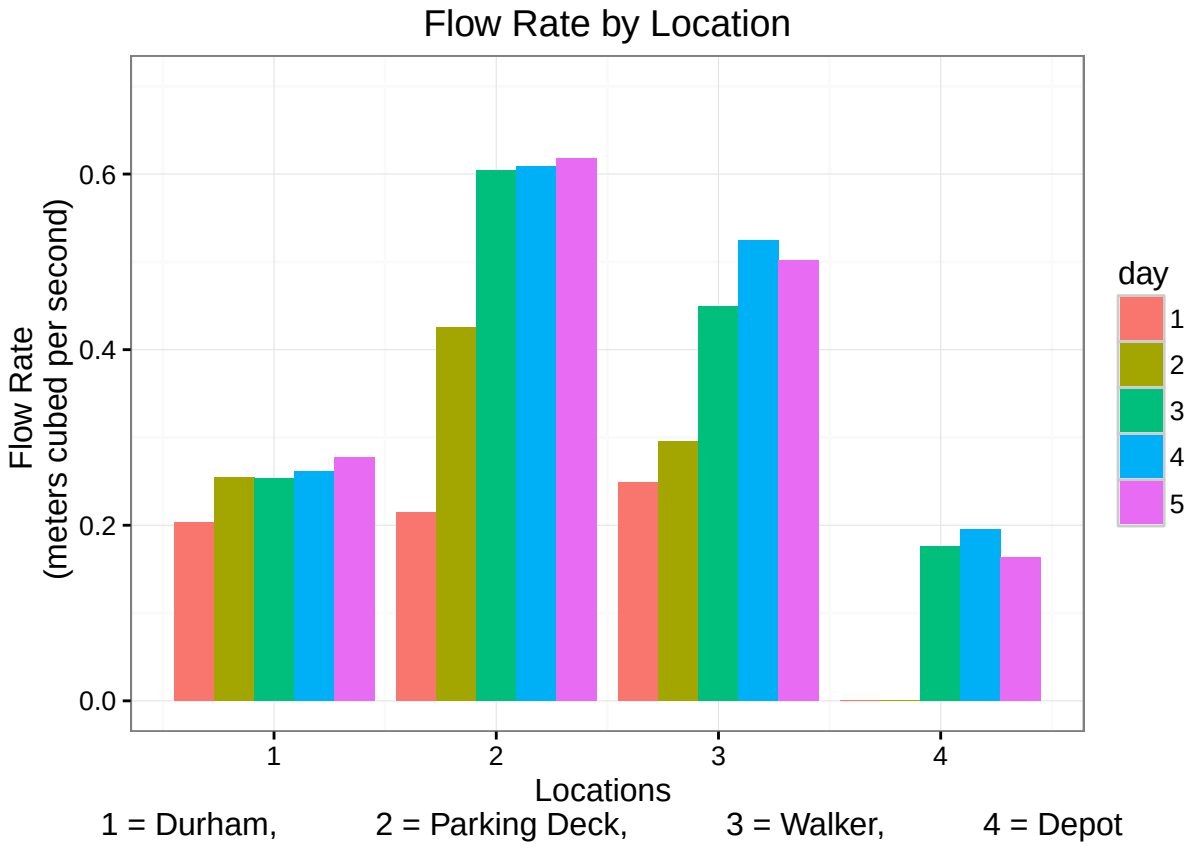
```
# Day 1, Loc 1-4,
timemx[1,] <- c(6.76,6.1,10.56,0)      # bobber only this one time
timemx[2,] <- c(6.08,6.48,9.61,0)
timemx[3,] <- c(6.23,6.83,6.08,0)
timemx[4,] <- c(0,0,0,0)               # no data on 1st day
# Day 2
timemx[5,] <- c(6.93,5.65,6.11,0)
timemx[6,] <- c(3.75,4.22,3.24,0)
timemx[7,] <- 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
```

```r
# 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] <- vol[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 0.2034921
## 2    1   2 0.2149655
## 3    1   3 0.2489960
## 4    1   4 0.0000000
## 5    2   1 0.2549911
## 6    2   2 0.4251369
## 7    2   3 0.2956442
## 8    2   4 0.0000000
## 9    3   1 0.2537691
## 10   3   2 0.6040284
## 11   3   3 0.4496023
## 12   3   4 0.1761192
## 13   4   1 0.2611389
## 14   4   2 0.6086570
## 15   4   3 0.5248661
## 16   4   4 0.1953991
## 17   5   1 0.2774030
## 18   5   2 0.6181303
## 19   5   3 0.5021901
## 20   5   4 0.1631559
```

```r
g1 <- ggplot(data=flow, aes(x=loc,y=rate,fill=day)) +
  geom_bar(stat="identity",position="dodge") +
  scale_y_continuous(limit=c(0.0000,.7000)) +
  scale_color_manual(values = c("#DB2202","#0ECFE9","purple","#349D5C","orange")) +
  labs(x="Locations \n 1 = Durham,           2 = Parking Deck,           3 = Walker,           4 = Depo
       ,y="Flow Rate \n (meters cubed per second)", title = "Flow Rate by Location") +
    theme_bw()
plot(g1)
```


Flow Rate by Location
Flow Rate
(meters cubed per second)
0.0
0.2
0.4
0.6
1
2
3
4
Locations
day
1
2
3
4
5
1 = Durham,
2 = Parking Deck,
3 = Walker,
4 = Depot