Assignment 3

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GGPlot and Graphics in R: Climate and Plant Data

Loading Data

```
thinshallow <- read.table("esm262/docs/wk04_ggplot/data/resthin.shallow.txt", header=T)
thindeep <- read.table("esm262/docs/wk04_ggplot/data/resthin.deep.txt", header=T)
clim <- read.table("esm262/docs/wk04_ggplot/data/sierraclim.txt", header=T)
```

Plot 1

```
range(clim$month)
```

```
## [1]  1 12
```

```
clim$season = ifelse(clim$month %in% c(3,4,5),"Spring", ifelse(clim$month%in% c(6,7,8),"Summer", ifelse

ggplot(transform(clim, season = factor(season, levels = c("Spring", "Summer", "Fall", "Winter"))))+
  geom_boxplot(aes(y=tmax, x=year, group = year, fill = season))+
  facet_wrap(~season, ncol = 2)+
  theme_bw()+
  labs(x = "Year", y = expression("Temperature " ( degree*C)))+
  theme(panel.grid.major = element_blank(), panel.grid.minor = element_blank())+
  scale_fill_manual(values = c( "springgreen3", "brown2", "darkgoldenrod1","cyan3"))+
  theme(legend.position = "none")
```

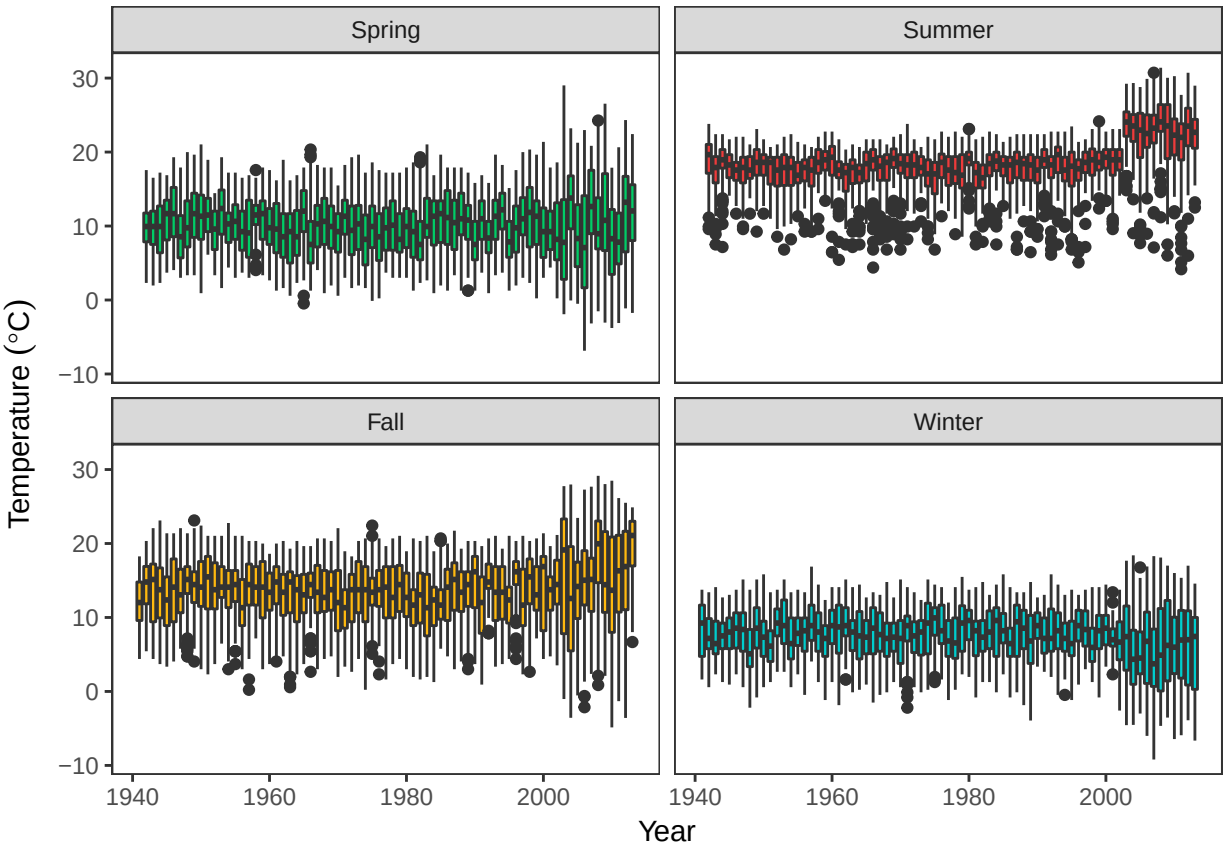


Figure 1. Seasonal temperatures through time in °C. Notice following the year 2000, more variability exists in data, additionally summer months are hotter on average. Spring is March-May, summer is June-August, fall is September-November, and winter is December-February.

Plot 2

```
thindeep$depth= "Deep"
thinshallow$depth="Shallow"
plants <- rbind(thindeep, thinshallow)

evap <- ggplot(plants, aes(y=evap,x=month, group=depth, color = depth))+
  stat_summary(fun.y="mean", geom="line")+
  stat_summary(fun.y="mean", geom="point")+
  scale_color_manual(values=c("#31a354", "#a1d99b"))+
  theme_classic()+
  theme(panel.grid.major = element_blank(), panel.grid.minor = element_blank())+
  scale_x_continuous(breaks = (1:12))+
  labs(y= "Evaporation", x = "", col = "")+
  theme(legend.position = c(0.8, 0.7))

trans<- ggplot(plants, aes(y=trans,x=month, group=depth, color = depth))+
  stat_summary(fun.y="mean", geom="line")+
  stat_summary(fun.y="mean", geom="point")+
  theme_classic()+
```

```
  scale_color_manual(values=c("#31a354", "#a1d99b"))+
  theme(panel.grid.major = element_blank(), panel.grid.minor = element_blank())+
  scale_x_continuous(breaks = (1:12))+
  labs(y= "Transpiration", x = "", col = "")+
  theme(legend.position = c(0.8, 0.7))

precip <- ggplot(subset(clim, year %in% c(1950:1980)), aes(y=rain, x=month))+
  stat_summary(fun.y="mean", geom="bar", fill = "darkslategray1")+
  stat_summary(fun.data = mean_se, geom = "errorbar", width = 0.1, color = "grey")+
  theme_classic()+
  theme(panel.grid.major = element_blank(), panel.grid.minor = element_blank())+
  scale_x_continuous(breaks = (1:12))+
  labs(x="Month", y = "Precipitation")

grid.arrange(evap, trans, precip, ncol = 1)
```

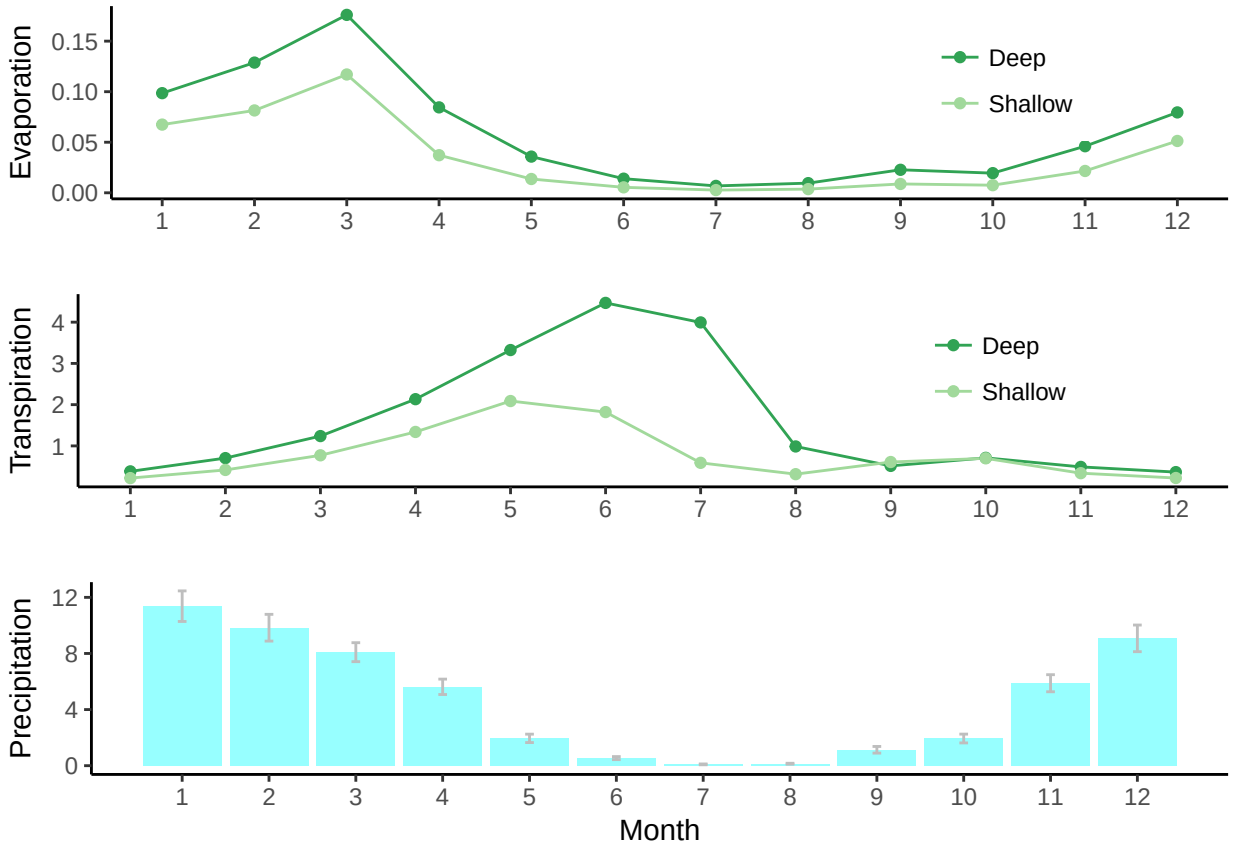
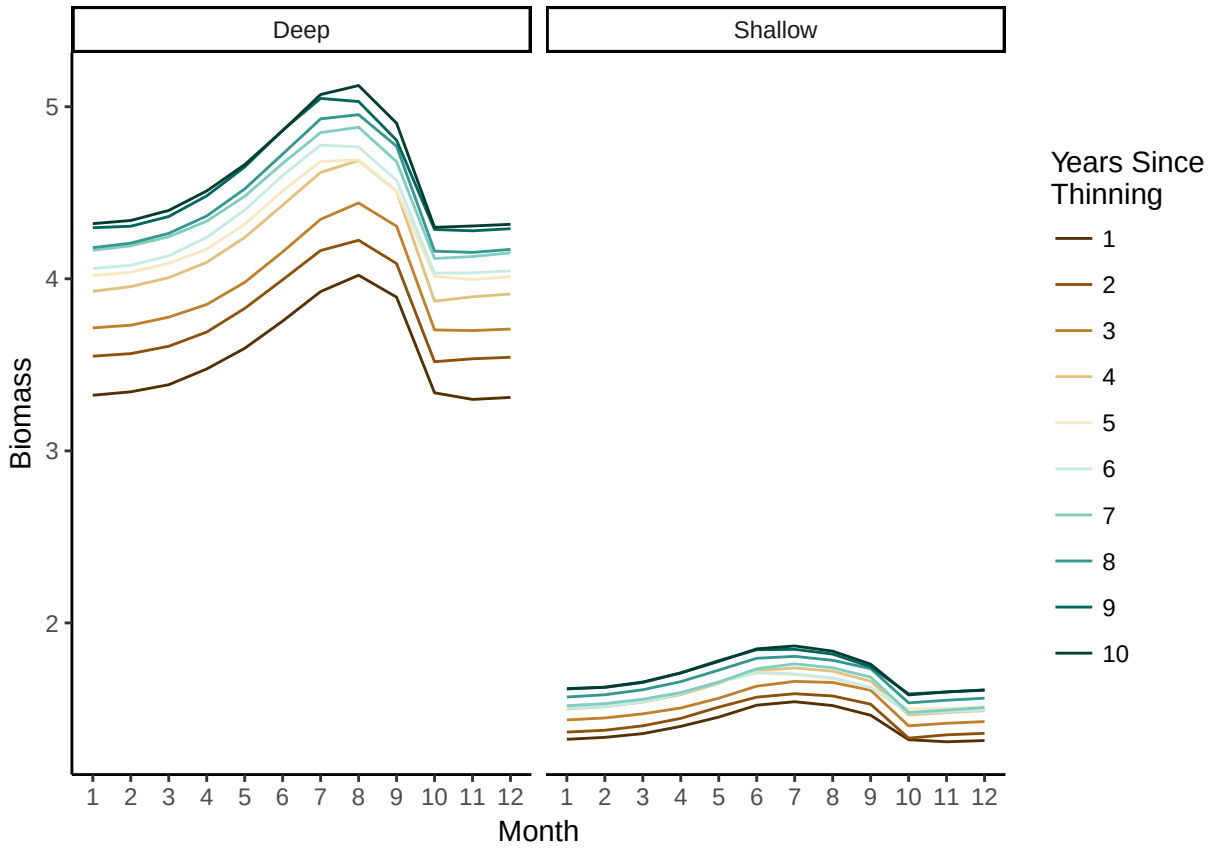


Figure 2. 30-year mean monthly evaporation, transpiration, and precipitation from 1950-1980. Error bars on bottom precipitation figure show +/- 1SE.

```
ggplot(plants, aes(x=month, y=plantc, col=as.factor(wy)))+
  stat_summary(fun.y="mean", geom="line", aes(col=as.factor(wy)))+
  facet_grid(~depth)+
  theme_classic()+
  labs(x="Month", y="Biomass", col = "Years Since \nThinning")+
  scale_x_continuous(breaks = c(1:12))+
  scale_color_brewer(type="div", palette="BrBG")
```




```
linreg <- lm(plants$psn >0 ~ plants$trans >0, data = plants)
summary(linreg)
```

```
##
## Call:
## lm(formula = plants$psn > 0 ~ plants$trans > 0, data = plants)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7147 -0.7147  0.2853  0.2853  0.3651
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)           0.634918   0.002709  234.37   <2e-16 ***
## plants$trans > 0TRUE 0.079806   0.002889   27.62   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4553 on 233758 degrees of freedom
## Multiple R-squared:  0.003253,   Adjusted R-squared:  0.003249
## F-statistic:   763 on 1 and 233758 DF,  p-value: < 2.2e-16
```

```
ggplot(subset(plants, plants$trans >0 & plants$psn >0), aes(x=psn, y=trans))+
  geom_point(aes(color=depth), shape=18, size=rel(1.5))+
  geom_smooth(method="lm", formula= (y ~ x), se=TRUE, color = "grey") +
  theme_classic()+
  labs(y="Photosynthesis", x = "Transpiration", col= "")+
  annotate("text", x=0.009, y=0.4, label="y=0.08x+0.635 \nR-squared = 0.003249 \np-value<0.005", colour=
```

```
  scale_color_manual(values = c("#31a354", "#7fcdbb"))+
  theme(legend.position = c(.2,.9))
```

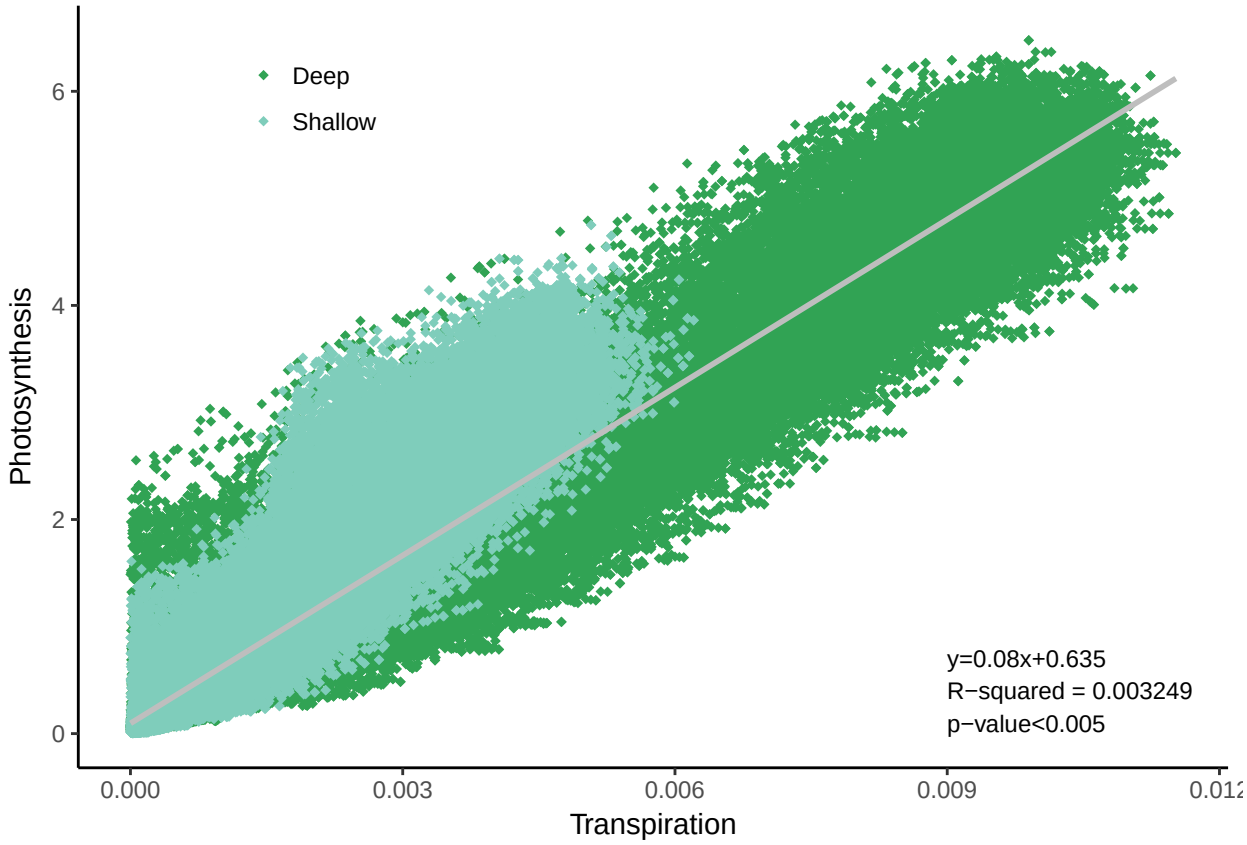


Figure 4. Relationship between transpiration and photosynthesis (for all positive values).