Seagrass_vs_Production_Rates

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```
# import libraries
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.3     v readr     2.1.4
## v forcats   1.0.0     v stringr   1.5.0
## v ggplot2   3.4.3     v tibble    3.2.1
## v lubridate 1.9.2     v tidyr     1.3.0
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(readr)
library(ggplot2)
library(lubridate)
library(here)
```

```
## here() starts at /home/guest/Final Project/BeyerBolgerNoor_Env872_EDA_FinalProject
```

```
# check that here points to the project folder
here()
```

```
## [1] "/home/guest/Final Project/BeyerBolgerNoor_Env872_EDA_FinalProject"
```

```
# setting plot theme
mytheme <- theme_classic(base_size = 14) +
  theme(axis.text = element_text(color = "darkblue"),
        title = element_text(color='darkgreen'),
        panel.grid.major = element_line(color = "gray", linetype = "solid"))
# set theme
theme_set(mytheme)
```

```
Seagrass_production_rates <- read_csv("Data/Raw/Seagrass-production-rates.csv")
```

```
## Rows: 792 Columns: 6
## -- Column specification --------------------------------------------------------
## Delimiter: ","
```

```
## chr  (1): treatment
## dbl  (4): plot, interval, exp_week, gr_mass
## date (1): date
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
#View(Seagrass_production_rates)
class(Seagrass_production_rates$date) #it is already a date
```

```
## [1] "Date"
```

```
temp_sal <- read.csv(here("./Data/Raw/Temperature-Salinity.csv"),
                     stringsAsFactors = TRUE)
temp_sal$date <- as.Date(temp_sal$date)
#view(temp_sal)
```

```
# filtering for only reference data (represents whole experiment time)
# creating a mean temp column
# selecting needed columns
# getting rid of possible NAs
temp_processed <- temp_sal %>%
  filter(treatment == "reference") %>%
  mutate(mean_temp = (min_temp + max_temp) / 2) %>%
  select(date, mean_temp, exp_week) %>%
  na.omit()
#view(temp_processed)
write.csv(temp_processed, row.names = FALSE,
file = "Data/Processed/PROCESSED_Temperature.csv")

prod_rates_clean <- Seagrass_production_rates %>%
  select("treatment", "date", "exp_week", "gr_mass") %>%
  filter(treatment == "reference") %>%
  group_by(date) %>%
  summarise(meangrowth = mean(gr_mass), exp_week = median(exp_week)) %>%
  mutate(treatment = "reference")
#view(prod_rates_clean)

write.csv(prod_rates_clean, row.names = FALSE,
file = "Data/Processed/PROCESSED_Seagrass-production-rates.csv")
```

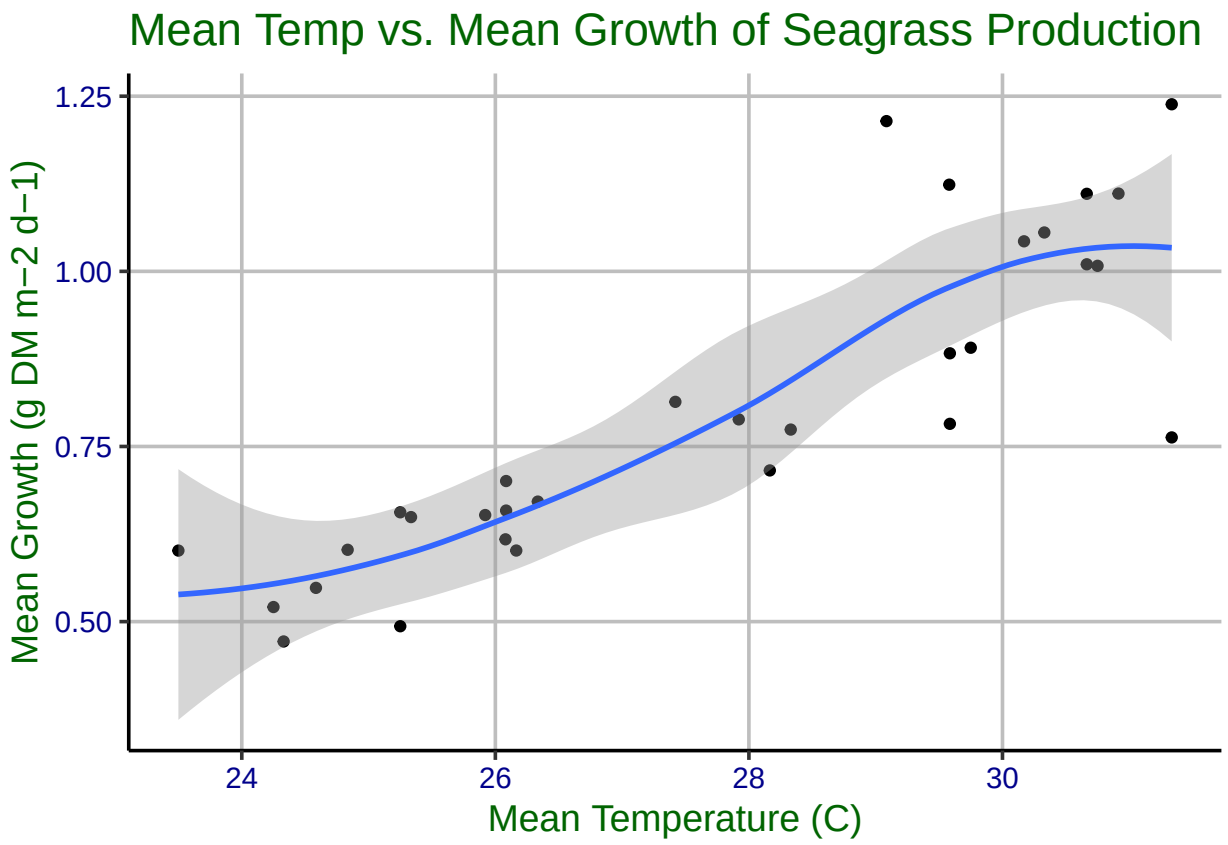
```
temp_production_rate <- full_join(temp_processed,
                                  prod_rates_clean,
                                  by = "exp_week")

# selecting the full date column and removing NAs
temp_production_rate_processed <- temp_production_rate %>%
  select(date.x, mean_temp, exp_week, meangrowth) %>%
  na.omit()
view(temp_production_rate_processed)

write.csv(temp_production_rate_processed, row.names = FALSE,
file = "Data/Processed/PROCESSED_temp_Production_rate.csv")
```

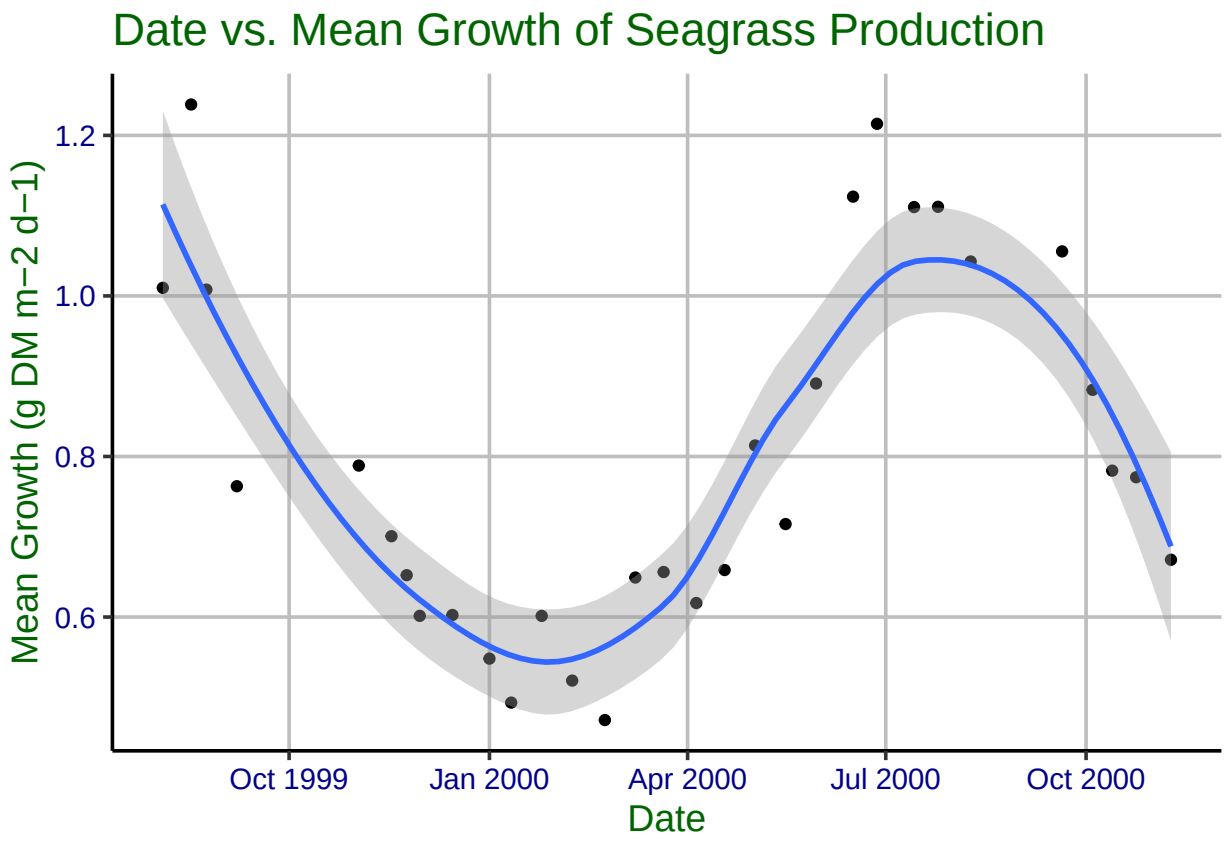
```
ggplot(temp_production_rate_processed, aes(x = mean_temp, y = meangrowth)) +
geom_point() +
  geom_smooth(method = 'loess') +
xlab("Mean Temperature (C)")+
ylab("Mean Growth (g DM m-2 d-1)")+
labs(title = "Mean Temp vs. Mean Growth of Seagrass Production")
```

```
## `geom_smooth()` using formula = 'y ~ x'
```




```
ggplot(temp_production_rate_processed, aes(x = date.x, y = meangrowth)) +
geom_point() +
  geom_smooth(method = 'loess') +
xlab("Date")+
ylab("Mean Growth (g DM m-2 d-1)")+
labs(title = "Date vs. Mean Growth of Seagrass Production")
```

```
## `geom_smooth()` using formula = 'y ~ x'
```




```
ggplot(temp_production_rate_processed, aes(x = date.x, y = mean_temp)) +
geom_point() +
  geom_smooth(method = 'loess') +
xlab("Date")+
ylab("Mean Temperature (C)")+
labs(title = "Date vs. Mean Growth of Seagrass Production")
```

```
## `geom_smooth()` using formula = 'y ~ x'
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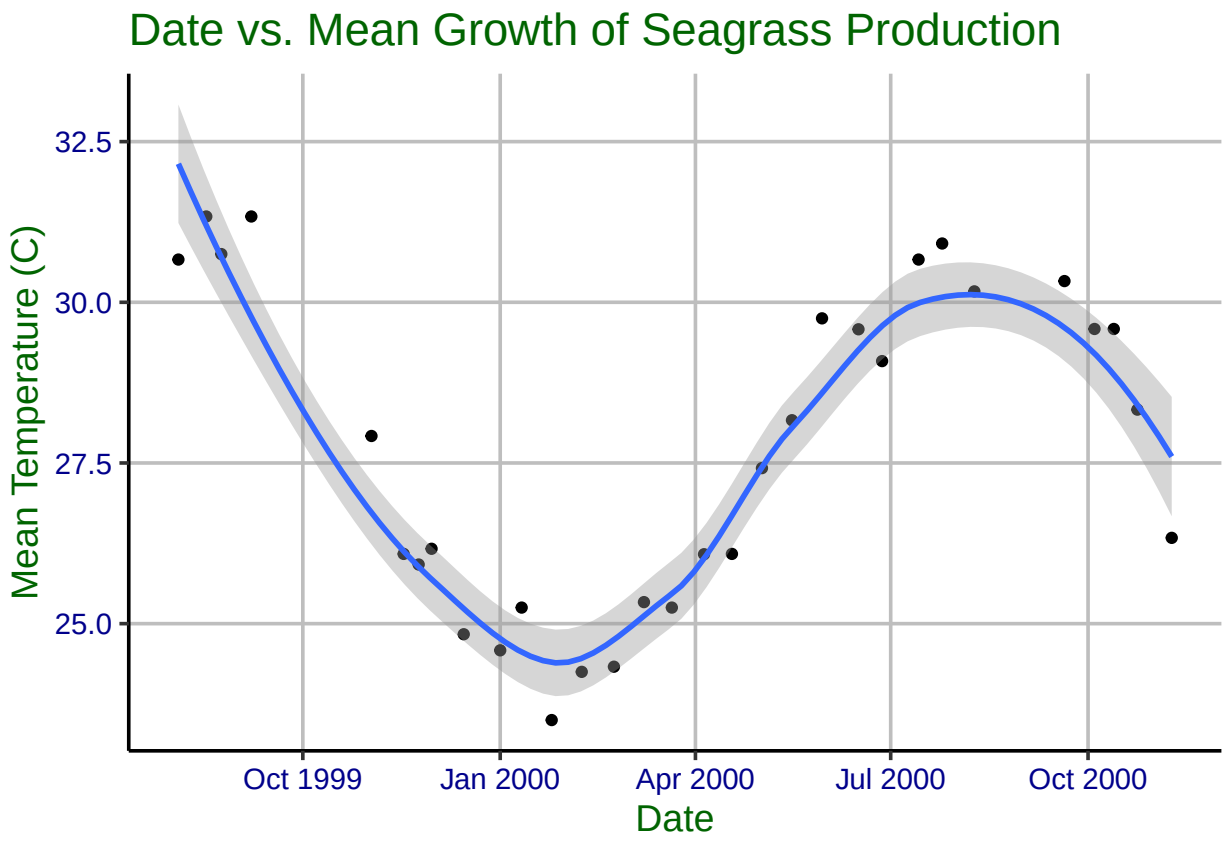


```
temp_growth_regression <-
  lm(data = temp_production_rate_processed, mean_temp ~ meangrowth)
summary(temp_growth_regression)
```

```
##
## Call:
## lm(formula = mean_temp ~ meangrowth, data = temp_production_rate_processed)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6417 -0.7128 -0.0632  0.6524  3.9540
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  20.0372     0.8545  23.448  < 2e-16 ***
## meangrowth    9.6257     1.0310   9.337 3.06e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.265 on 29 degrees of freedom
## Multiple R-squared:  0.7504, Adjusted R-squared:  0.7418
## F-statistic: 87.17 on 1 and 29 DF,  p-value: 3.06e-10
```

```
#According to this test, temperature significantly impacts seagrass production
#rate.  P < 3.06 e-10, R^2 = 0.7504.  ProductionRate = 9.6257(temp) + 20.0372
```

“‘