ECOL 610: NEON Data - Summary Data

Group - Santa Rita Experimental Range (SRER)

30 September, 2022

Contents

Group Members

- Emily Swartz
- Shahriar Shah Heydari
- Stephanie Cardinalli
- George Woolsey

Setup

Load in the needed packages

```
library(tidyverse)
library(lubridate)
library(viridis)
library(RColorBrewer)
library(scales)
library(latex2exp)
remove(list=ls())
# what is your site name?
site <- "Santa Rita Experimental Range"
```

Load Data

Information about these variables can be found in the metadata file

All daily data files can be found here.

```
# put all of the daily data you want to load in the directory up one level titled "data"
# load daily data
f_list <- list.files(path = "../data/", pattern="*daily.csv")
for (i in 1:length(f_list)){
  nm <- stringr::word(f_list[i], start = 1, sep = "daily") %>%
    # stringr::str_replace_all(pattern = "[[:punct:]]", replacement = "") %>%
    stringr::str_replace_all(pattern = "-", replacement = "") %>%
    stringr::str_trim() %>%
    stringr::str_squish()
  temp <- read.csv(paste0("../data/", f_list[i])) %>%
    dplyr::mutate(neon_site_name = nm) %>%
    dplyr::relocate(neon_site_name) %>%
    dplyr::rename_with(~ tolower(
      gsub(" ", "_",
         str_trim(gsub("\\s+", " ", .x))
      )
    ))
  if(i==1){
    dta_1day <- temp
  }else{
    dta_1day <- dplyr::union_all(dta_1day, temp)
  }
  remove(temp)
}
# create dates and record counts
# 1-day
dta_1day <- dta_1day %>%
  dplyr::mutate(
    date_id = lubridate::make_date(year = year, month = month, day = day)
    , week = lubridate::week(date_id)
    , has_gpp = ifelse(!is.na(gpp), 1, 0)
    , season =
        dplyr::case_when(
          month %in% c(1:2, 11:12) ~ "Winter"
          , month %in% c(3:5) ~ "Spring"
          , month %in% c(6:8) ~ "Summer"
          , month %in% c(9:10) ~ "Fall"
          , TRUE  ~ "Other")
  ) %>%
  dplyr::group_by(neon_site_name, week, year) %>%
  dplyr::mutate(is_full_week = sum(has_gpp)==7) %>%
  dplyr::ungroup() %>%
  dplyr::rename(ppfd = ppfd_in)
# count rows
dta_1day %>% dplyr::count(neon_site_name)
```

```
## # A tibble: 9 x 2
##   neon_site_name                        n
```

```
##   <chr>                              <int>
## 1 Central Plains Experimental Range   1276
## 2 Disney Wilderness                    911
## 3 Harvard Forest                      1460
## 4 Konza Prairie                       1095
## 5 Niwot Ridge                          364
## 6 Pu'u Maka'ala Natural Area Reserve   699
## 7 Santa Rita Experimental Range       1095
## 8 Toolik Field Station                1064
## 9 Wind River Experimental Forest      1095
```

Assignment

Part 1

One graph each with time on x-axis and each data type on the y-axis with fixed y-axis scale - turn in as a RMarkdown PDF

For each variable use the following y-scales (Max, Min):

- TA (40, -36)
- VPD (66, -1)
- PPFD_IN (1898, 0.5)
- SWC (41, 2.6)
- TS (51, -11)
- NEE (1.1, -1)
- GPP (1.6, -0.5)
- RE (1.2, 0)

```
# in progress
```

Part 2

The next item will be data you fill in on this templateDownload this template

Template key: sum = summer/ spring = spring/ fall = fall/ winter = winter; data types as above; metrics defined below

2. Some summary data broken out by time period -> average values for season across years (e.g., average across spring 2018, 2019, 2020)

For each Season and for each data type, provide the following metrics (code in template):

mean value for the season (mean) standard deviation (sd) 5th percentile value (5per) 95th percentile value (95per) number of days included/number of observations in your mean (N)

```
# list columns to summarize
summary_vars <- c(
  "gpp"
  , "nee"
  , "re"
```

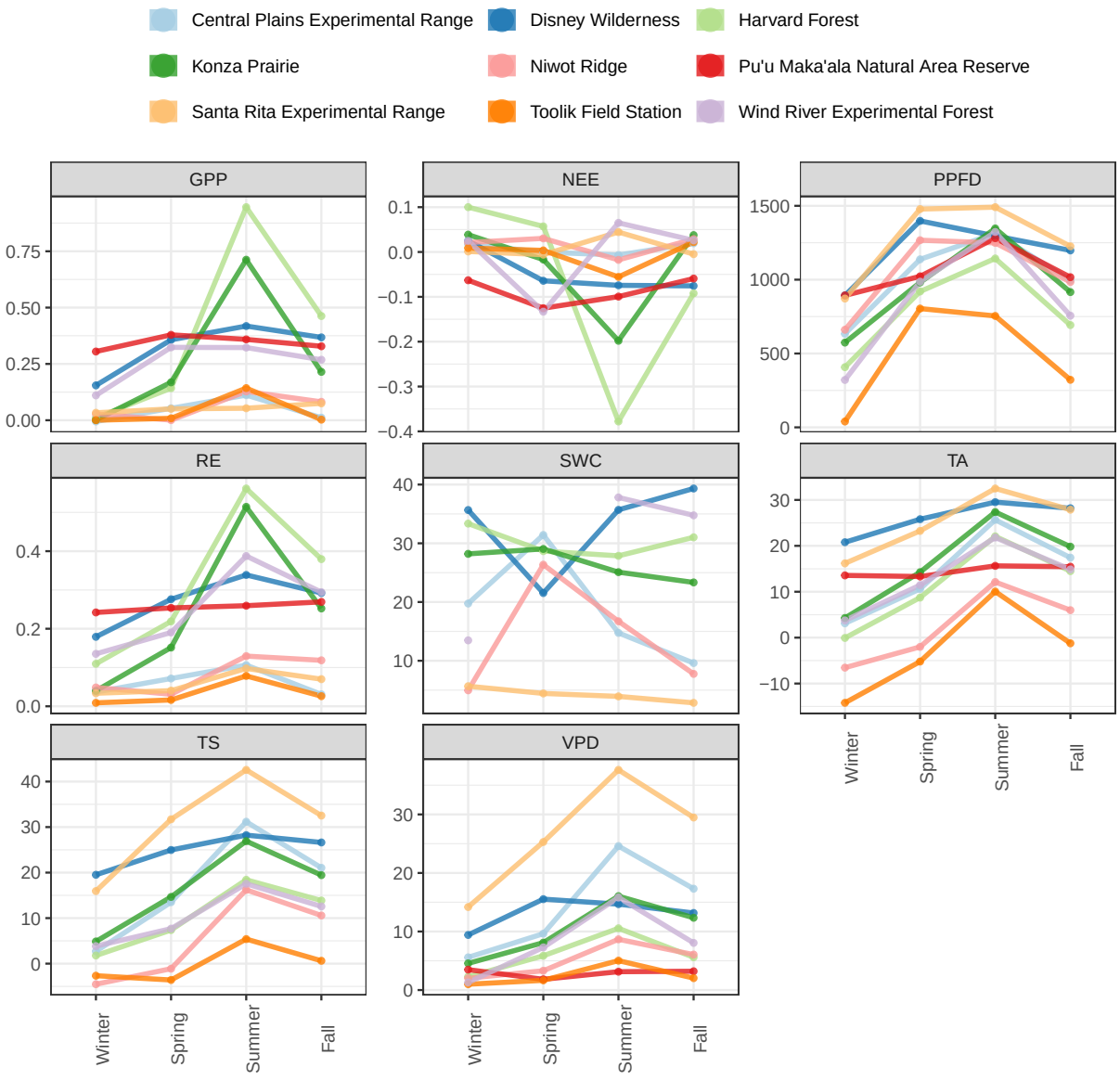
```
  , "ta"
  , "vpd"
  , "ppfd"
  , "swc"
  , "ts"
)
# named list of functions
summary_fns <- list(
  mean = ~mean(.x, na.rm = TRUE)
  , sd = ~sd(.x, na.rm = TRUE)
  , quantile5 = ~quantile(.x, probs = 0.05, na.rm = TRUE)
  , quantile95 = ~quantile(.x, probs = 0.95, na.rm = TRUE)
  , N = ~sum(ifelse(is.na(.x), 0, 1))
)
# can't start a var name with a number so need rename fn
rn_fn <- function(x) paste0(gsub("quantile", "", x), "per")
# aggregate data
dta_summary_long <- dta_1day %>%
  dplyr::rename_at(summary_vars, toupper) %>%
  dplyr::group_by(neon_site_name, season) %>%
  dplyr::summarise(
    dplyr::across(
      toupper(summary_vars)
      , summary_fns
      , .names = "{.col}_{.fn}"
    )
  ) %>%
  dplyr::ungroup() %>%
  dplyr::rename_at(
    vars(tidyselect::contains("quantile"))
    , rn_fn
  )
# reshape long to wide
dta_summary_wide <-
  dta_summary_long %>%
  dplyr::mutate(season = tolower(season)) %>%
  tidyr::pivot_wider(
    names_from = season
    , values_from = -tidyselect::all_of(c("neon_site_name", "season"))
    , names_glue = "{.value}_{season}"
  )
# here's a long vector of variable names so that they are in the same order as requested...yay!
vars_order <- c("Site", "GPP_mean_sum", "GPP_mean_spring", "GPP_mean_fall", "GPP_mean_winter", "GPP_sd_

# export data to csv
dta_temp <- dta_summary_wide %>%
    # we can have the season names "autumn" and "winter" (both 6 letters)
      # but "summer" needs to be shortened to "sum" ... not to be confused with "sum" as in summation
    dplyr::rename_at(
      vars(tidyselect::contains("summer"))
      , function(x) gsub("summer", "sum", x)
    ) %>%
    dplyr::rename(
```

```
      Site = neon_site_name
    ) %>%
    dplyr::select(
      tidyselect::all_of(vars_order)
    )
# write to csv
write.csv(dta_temp, file = "../data/summary_data_ALL.csv", append = FALSE, row.names = FALSE)
write.csv(
  dta_temp %>% dplyr::filter(Site == "Santa Rita Experimental Range")
  , file = "../data/summary_data_SRER.csv"
  , append = FALSE
  , row.names = FALSE
)
remove(dta_temp)
```

Quick plot of season means

```
dta_summary_long %>%
  dplyr::select(tidyselect::contains("mean"), neon_site_name, season) %>%
  tidyr::pivot_longer(
    cols = -tidyselect::all_of(c("neon_site_name", "season"))
    , names_to = "var_name"
    , values_to = "var_value"
    , values_drop_na = FALSE
  ) %>%
  dplyr::mutate(
    var_name = gsub("_mean", "", var_name)
    , season = ordered(season, levels = c("Winter", "Spring", "Summer", "Fall"))
  ) %>%
ggplot(data = ., mapping = aes(x = season, y = var_value, group = neon_site_name, color = neon_site_nam
  geom_line(lwd = 1.2, alpha = 0.8) +
  geom_point(size = 1.2, alpha = 0.8) +
  facet_wrap(~var_name, scales = "free_y") +
  scale_color_brewer(type = "qual", palette = "Paired") +
  xlab("") +
  ylab("") +
  labs(
    caption = "*seasonal mean values shown"
  ) +
  theme_bw() +
  theme(
    legend.title = element_blank()
    , legend.position = "top"
    , axis.text.x = element_text(angle = 90)
  ) +
  guides(
    color = guide_legend(override.aes = list(size = 5), nrow = 3, byrow = TRUE)
  )
```



*seasonal mean values shown