Data Structure and Characterization

This notebook is designed to check for general structure of all relevant datasets, distribution of observations, and shared naming conventions.

Key questions for Valerie:

- What are the distinctions between different species (WAPS/annuals/natives/weeds)?
- In particular, what is "other"? What is a "weed"?
- What is the definition of "fall clipping"
- Is there a "low fert"?
- Does the distribution of observations seem correct?

Ways to think about this dataset:

- Differences in temporal priority
- Single group treatments are used to give temporal priority
- Multi-group treatments remove priority for one or more groups
- Interactions with other treatment effects
- How does priority among groups differ with treatment effects
- Note - only present for a subset of all group treatments

Reading in all relevant datasets:

To add - resin data, when finished.

Variables:

- H2O
  - Control - No water added
  - Dry - Decrease water 25% Sept-Feb, 35% March-April
  - Wet - Increase water 25% Sept-April, 50% of all other times, add 3 weeks of rain at the end of season
  - Late wet - No change Sep-April, 50% of all other times, add 3 weeks of rain at the end of season
  - Added later in the experiment? (Sarah)
  - Control-2nd - No water added, less maintained for species composition (see notes)
- Fertilization
  - None
  - High fert - high fert = 45 kg N/ha/yr (4.5 g/m2/yr) spread out over 3 applications (early- mid-Nov, mid-Jan, early-March)
- Clipping
  - None
  - Fall clipping - ??
  - Spring clipping - 2 clips mid-march through mid-april

How many observations are there for each unique treatment combination?

```r
relevant_trts = c("annuals", "WAPS", "Natives", "natives+WAPS+annuals", "annuals+natives", "WAPS+annual

checklabels = checklabels[checklabels$Sp.comp %in% relevant_trts,]

table(checklabels %>% select(one_of("H2O", "Sp.comp", "Fertilization", "Clipping")))
```

```
## , , Fertilization = highfert, Clipping = fallclipping
##
##              Sp.comp
## H2O           annuals annuals+natives Natives natives+WAPS+annuals WAPS
##    control          0               0       0                    8    0
##    control-2nd      0               0       0                    7    0
##    dry              0               0       0                    3    0
##    latewet          0               0       0                    3    0
##    wet              0               0       0                    3    0
##              Sp.comp
## H2O           WAPS+annuals WAPS+natives
##    control               8            0
##    control-2nd           7            0
##    dry                   3            0
##    latewet               3            0
##    wet                   3            0
##
## , , Fertilization = none, Clipping = fallclipping
##
##              Sp.comp
## H2O           annuals annuals+natives Natives natives+WAPS+annuals WAPS
##    control          8               0       0                    8    8
##    control-2nd      7               0       0                    7    0
##    dry              3               0       0                    3    0
##    latewet          3               0       0                    3    0
##    wet              3               0       0                    3    0
##              Sp.comp
## H2O           WAPS+annuals WAPS+natives
##    control               8            0
##    control-2nd           7            0
##    dry                   3            0
##    latewet               3            0
##    wet                   3            0
##
## , , Fertilization = highfert, Clipping = none
##
##              Sp.comp
## H2O           annuals annuals+natives Natives natives+WAPS+annuals WAPS
##    control          0               0       0                    8    0
##    control-2nd      0               0       0                    7    0
##    dry              0               0       0                    3    0
##    latewet          0               0       0                    3    0
##    wet              0               0       0                    3    0
##              Sp.comp
```

```
## H2O           WAPS+annuals WAPS+natives
##    control               8            0
##    control-2nd           7            0
##    dry                   3            0
##    latewet               3            0
##    wet                   3            0
##
## , , Fertilization = none, Clipping = none
##
##             Sp.comp
## H2O           annuals annuals+natives Natives natives+WAPS+annuals WAPS
##    control          8               8       8                    8    8
##    control-2nd      7               7       7                    7    7
##    dry              3               3       3                    3    3
##    latewet          3               3       3                    3    3
##    wet              3               3       3                    3    3
##             Sp.comp
## H2O           WAPS+annuals WAPS+natives
##    control               8            8
##    control-2nd           7            7
##    dry                   3            3
##    latewet               3            3
##    wet                   3            3
##
## , , Fertilization = highfert, Clipping = springclipping
##
##             Sp.comp
## H2O           annuals annuals+natives Natives natives+WAPS+annuals WAPS
##    control          0               0       0                    8    0
##    control-2nd      0               0       0                    7    0
##    dry              0               0       0                    3    0
##    latewet          0               0       0                    3    0
##    wet              0               0       0                    3    0
##             Sp.comp
## H2O           WAPS+annuals WAPS+natives
##    control               8            0
##    control-2nd           7            0
##    dry                   3            0
##    latewet               3            0
##    wet                   3            0
##
## , , Fertilization = none, Clipping = springclipping
##
##             Sp.comp
## H2O           annuals annuals+natives Natives natives+WAPS+annuals WAPS
##    control          8               0       0                    8    8
##    control-2nd      7               0       0                    7    3
##    dry              3               0       0                    3    0
##    latewet          3               0       0                    3    3
##    wet              3               0       0                    3    2
##             Sp.comp
## H2O           WAPS+annuals WAPS+natives
##    control               8            0
##    control-2nd           7            0
```

```
##    dry                   3             0
##    latewet               3             0
##    wet                   3             0
```

How many total observations (plot x year) are there for each unique treatment combination in the cover dataset?

```
relevant_trts = c("annuals", "WAPS", "Natives", "natives+WAPS+annuals", "annuals+natives", "WAPS+annuals"

group_percents = group_percents[cover$sp.trt %in% relevant_trts,]
cover = cover[cover$sp.trt %in% relevant_trts,]

cover %>%
  group_by(sp.trt) %>%
  filter(h2o != "control-2nd") %>%
  summarise(count = n()) %>%
  arrange(desc(count))
```

```
## # A tibble: 7 x 2
##                   sp.trt count
##                    <chr> <int>
## 1 natives+WAPS+annuals   1020
## 2         WAPS+annuals   1020
## 3              annuals    510
## 4                 WAPS    380
## 5      annuals+natives    170
## 6              Natives    170
## 7         WAPS+natives    170
```

Do cover data labels line up with data checking labels?

```
library(testthat)
```

```
##
## Attaching package: 'testthat'
```

```
## The following object is masked from 'package:dplyr':
##
##     matches
```

```
for(rowindex in 1:nrow(cover)){

  plotno = cover$plot[rowindex]

  # Is water the same?
  expect_equivalent(cover$h2o[rowindex], checklabels$H2O[checklabels$Plot.. == plotno])

  # Is fertilizer the same?
  expect_equivalent(cover$fertilization[rowindex], checklabels$Fertilization[checklabels$Plot.. == plotn

  # Is clipping the same?
```

```r
  expect_equivalent(cover$clip[rowindex], checklabels$Clipping[checklabels$Plot.. == plotno])

}

head(cover)
```

```
##   X plot block subblock precip.block   h2o other.treatment  sp.trt
## 1 1    1     1        1            1     A        latewet       35 annuals
## 2 2    1     1        1            1     A        latewet       35 annuals
## 3 3    1     1        1            1     A        latewet       35 annuals
## 4 4    1     1        1            1     A        latewet       35 annuals
## 5 5    1     1        1            1     A        latewet       35 annuals
## 6 6    1     1        1            1     A        latewet       35 annuals
##   fertilization          clip year aegilops ag.big ag.small amsinckia
## 1          none springclipping 2008        0      0        0         0
## 2          none springclipping 2009        0      0        0         0
## 3          none springclipping 2010        0      0        0         0
## 4          none springclipping 2011        0      0        0         0
## 5          none springclipping 2012        0      0        0         0
## 6          none springclipping 2013        0      0        0         0
##   avena big.leaf.dandelion bindweed bro.carinatus bro.hordeaceous
## 1  12.5                  0        0             0             2.5
## 2  12.5                  0        0             0             2.5
## 3  25.0                  0        0             0             0.0
## 4  75.0                  0        0             0             0.0
## 5  35.0                  0        0             0             0.0
## 6  25.0                  0        0             0             0.0
##   bro.madritensis bro.diandrus bunchgrass cap.bur centaurea con.arv conyza
## 1               0            0          0       0         0       0      0
## 2               0            0          0       0         0       0      0
## 3               0            0          0       0         0       0      0
## 4               0            0          0       0         0       0      0
## 5               0            0          0       0         0       0      0
## 6               0            0          0       0         0       0      0
##   elymus epilobium.brach erodium.moschatum galium geranium gumplant
## 1      0               0                 0      0        0        0
## 2      0               0                 0      0        0        0
## 3      0               0                 0      0        0        0
## 4      0               0                 0      0        0        0
## 5      0               0                 0      0        0        0
## 6      0               0                 0      0        0        0
##   helianthus hordeum.sp italian.thistle kickxia.elatine lactuca.serriola
## 1          0          0               0               0                0
## 2          0          0               0               0                0
## 3          0          0               0               0                0
## 4          0          0               0               0                0
## 5          0          0               0               0                0
## 6          0          0               0               0                0
##   leymus lolium lotus lupinus melilotus milk.thistle mustard nassella oats
## 1      0   25.0     0     0.0         0            0       0        0    0
## 2      0    2.5     0     0.0         0            0       0        0    0
## 3      0    2.5     0     2.5         0            0       0        0    0
## 4      0    2.5     0     0.0         0            0       0        0    0
## 5      0    0.0     0     0.0         0            0       0        0    0
```

```
## 6        0    0.0     0    0.0          0            0        0        0    0
##   orchard.grass phalaris.sp poa redmaid senecio taeniatherum tarweed
## 1             0           0   0       0       0            0       0
## 2             0           0   0       0       0            0       0
## 3             0           0   0       0       0            0       0
## 4             0           0   0       0       0            0       0
## 5             0           0   0       0       0            0       0
## 6             0           0   0       0       0            0       0
##   thistle tragopogon.porrifolius trifolium unk.thistle veronica vicia
## 1       0                      0        55           0        0     0
## 2       0                      0        95           0        0     0
## 3       0                      0        55           0        0     0
## 4       0                      0         0           0        0     0
## 5       0                      0         0           0        0     0
## 6       0                      0         0           0        0     0
##   vulpia
## 1      0
## 2      0
## 3      0
## 4      0
## 5      0
## 6      0
```

Do group (class) totals equal those supplied on the general data summary?

```r
calc_class_percent <- function(x){

  sums = c()
  count = 1

  for(g in unique(waps.specs$group)){
    sums[count] = sum(x[,colnames(x) %in% waps.specs$specname[waps.specs$group == g]])
    count = count + 1
  }

  names(sums) =  unique(waps.specs$group)

  return(data.frame(t(sums)))
}

class_percent <- cover %>% group_by(plot, year) %>% do(calc_class_percent(.))

diff_ann <- c();diff_nat<- c();diff_waps<- c(); diff_weeds<- c()

for(rowindex in 1:nrow(class_percent)){

  diff_ann[rowindex] = class_percent$annual[rowindex] - group_percents$annuals[rowindex]
  diff_nat[rowindex] = class_percent$natives[rowindex] - group_percents$natives[rowindex]
  diff_waps[rowindex] = class_percent$waps[rowindex] - group_percents$waps[rowindex]
  diff_weeds[rowindex] = class_percent$weeds[rowindex] - group_percents$weeds[rowindex]
```
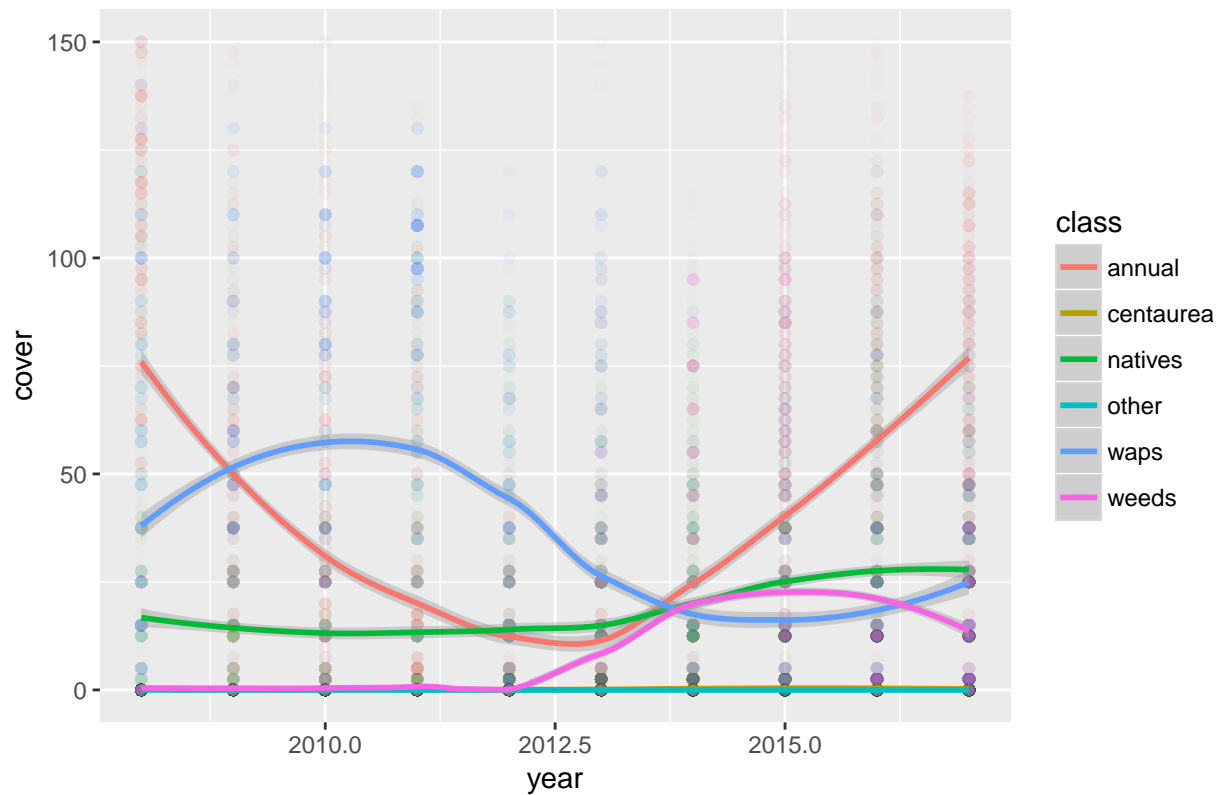
```
}

group_diffs = data.frame(diff_ann, diff_nat, diff_waps, diff_weeds)

library(ggplot2)

gather(class_percent, key = "class", value = "cover", -c(plot, year)) %>%
  ggplot(aes(x = year,
      y = cover,
      color = class)) +
  geom_point(alpha = .01) +
  stat_smooth(method = "loess") +
  ylim(0, 150) +
  ggtitle("Calculated Default Group Cover per Year")
```

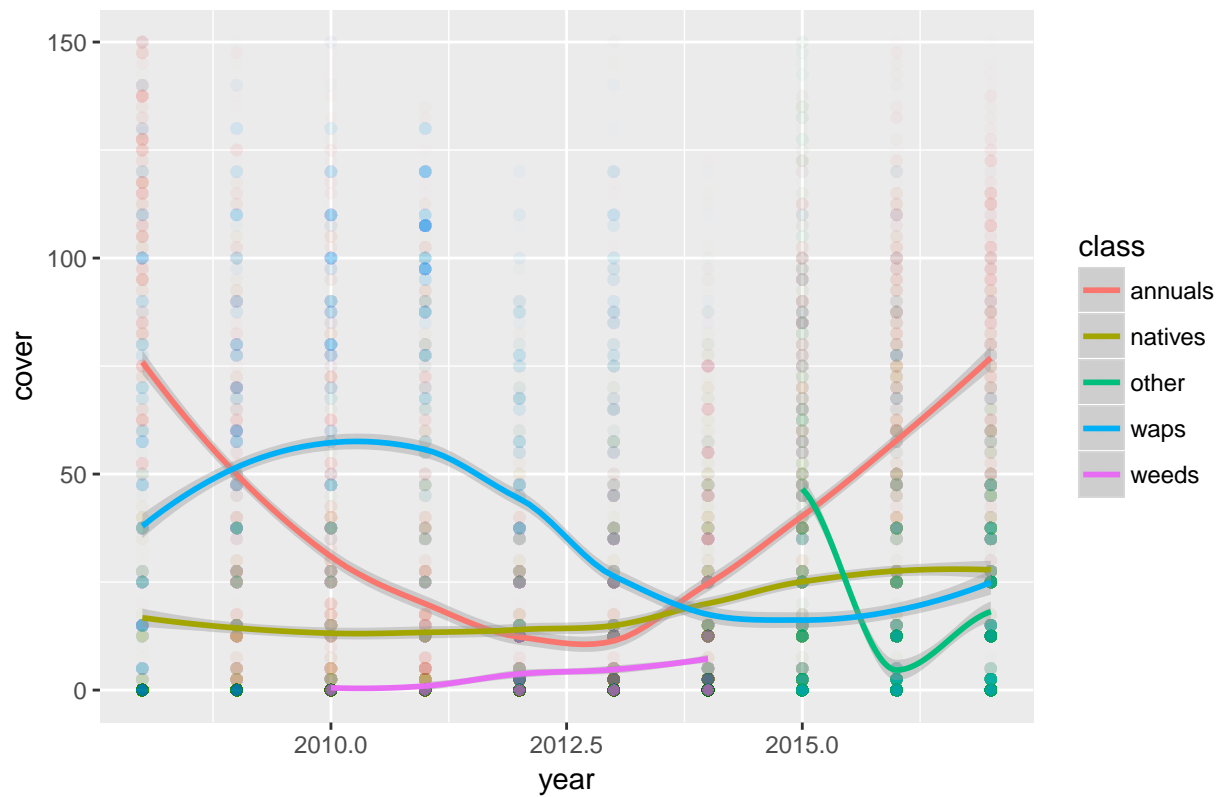### Calculated Default Group Cover per Year


```
gather(bind_cols(class_percent[,1:2], group_percents[,colnames(group_percents) %in% c("annuals", "native
      key = "class", value = "cover", -c(plot, year)) %>%
  ggplot(aes(x = year,
      y = cover,
      color = class)) +
  geom_point(alpha = .01) +
  stat_smooth(method = "loess") +
  ylim(0, 150) +
  ggtitle("Default Total Cover per Year")
```

Default Total Cover per Year


```r
data.frame(bind_cols(class_percent[,1:2], group_diffs)) %>%
  gather(key = "class", value = "cover", -c(plot, year), convert = TRUE) %>%
  ggplot(aes(x = year,
      y = cover,
      color = class)) +
  geom_jitter(alpha = .01, width = .01, height = 1) +
  stat_smooth(method = "loess") +
  facet_wrap(~class) +
  ggtitle("Difference in Calculated Group Cover")
```

Difference in Calculated Group Cover