

HJA_DIRT20_analysis

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#NEXT STEPS - Convert boxplots to bar graphs with std error bars. (reqs summary stats) - Analyze bulk soil C over time - Analyze bulk density dataset - Reproduce plots for N content - Stats: Mean comparisons - Secondary datasets: N-min, pH, root mass

Add interpretations/hypotheses in captions below figures

#H.J. Andrews DIRT - 20 Year Analysis This document contains the R analysis and figures for the H.J. Andrews DIRT 20 year sampling event. Sampling was done in June-July 2017.

##Datasets

####Dataset 1: Bulk and fractionated soil C and N concentration by plot and depth.

```
data.1 <- read.csv("DIRT20_soil_master_raw.csv", as.is=T, skip=1) #Load data as data.1
kable(data.1[1:8,], caption = "Data table structure") #Display first few rows of the table
```

Table 1: Data table structure

DNPF	Plot	Treatment	TRT	Depth	bulk_percC	bulk_percN	LF_wt	LF_percC	LF_percN	IF_wt
	1	No Root	NR	0-10	5.77	0.251	3.77	31.81	0.791	12.90
	2	Double Litter	DL	0-10	3.59	0.175	2.77	31.34	0.856	11.89
	3	No Litter	NL	0-10	5.73	0.209	4.08	32.90	0.775	9.77
	4	No Root	NR	0-10	4.04	0.206	2.18	31.78	0.728	7.06
	5	Double Wood	DW	0-10	3.73	0.160	4.71	23.65	0.531	8.65
	6	No Root	NR	0-10	5.38	0.223	5.88	26.39	0.589	8.73
	7	No Litter	NL	0-10	4.12	0.184	5.42	26.65	0.562	8.90
	8	Control	CTL	0-10	4.17	0.186	5.05	21.26	0.551	12.37

####Dataset 2: Bulk soil C over time, years 10, 15 and 20

To be continued...

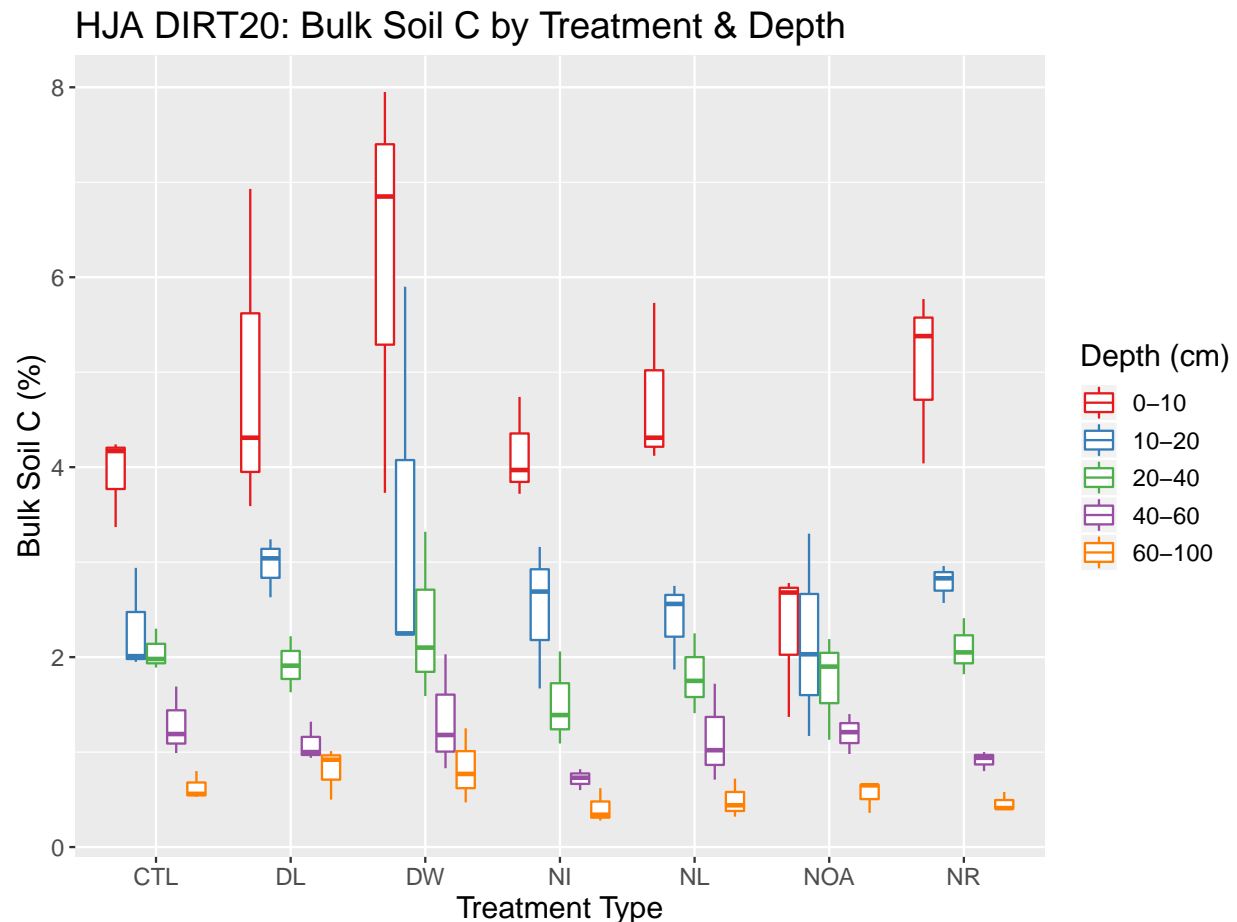
####Dataset 3: Bulk density and soil C and N by plot, in 5 cm increments from 0-15 cm

To be continued...

##Bulk soil C

```
### Plot soil percent C by treatment & depth
ggplot(data.1, aes(x=TRT, y=bulk_percC, color=Depth)) +
  geom_boxplot(data=data.1, aes(color=Depth)) +
  #geom_jitter(data=data.1, aes(size=0.5), width=0.05, height=0.1) +
  scale_color_brewer(palette="Set1") +
  scale_fill_brewer(palette="Set1") +
  ggtitle("HJA DIRT20: Bulk Soil C by Treatment & Depth") +
```

```
xlab("Treatment Type") + ylab("Bulk Soil C (%)") + labs(color="Depth (cm)") +
theme(text = element_text(size=14))
```



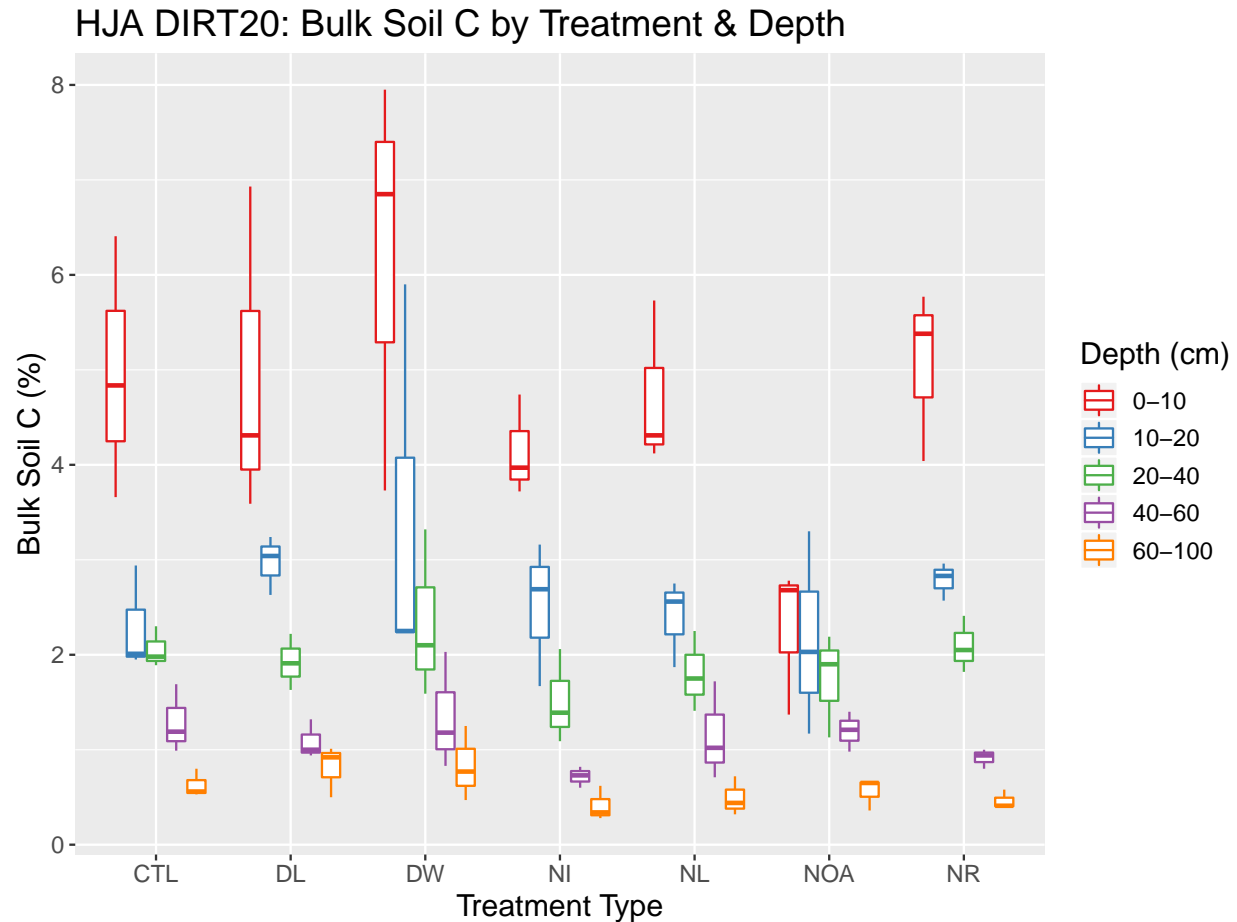
Modified C content for 0-10 cm Interpretation of the treatment effects is largely affected by the mean soil C value from the control plots. From the primary sampling in July 2017, these values were lower than expected. To validate the initial sampling data, we sampled on multiple (4x total) other occasions up through February 2018. Below, I have revised the plot using an average of all four samplings from the 0-10cm control plots. The mean C does rise, but remains somewhat low compared to expectations. I foresee we can easily justify using this slightly higher value, but in that case, it would be appropriate to use the average from all samplings for the rest of the treatments as well. Moving forward, we should be cognizant of how these small shift in control C change our interpretation of the results (How much does this shift matter?)

```
# Create modified dataframe for averaged 0-10 cm control C
data.1m <- data.1

# Values are averages from all samplings July 2017 - Feb 2018
data.1m[8,6] <- 4.836
data.1m[12,6] <- 6.407 # This value from plot 12 is where we get the boost
data.1m[14,6] <- 3.66

### Plot soil percent C by treatment & depth
ggplot(data.1m, aes(x=TRT, y=bulk_percC, color=Depth)) +
  geom_boxplot(data=data.1m, aes(color=Depth)) +
  #geom_jitter(data=data.1m, aes(size=0.5), width=0.05, height=0.1) +
```

```
scale_color_brewer(palette="Set1") +
scale_fill_brewer(palette="Set1") +
ggtitle("HJA DIRT20: Bulk Soil C by Treatment & Depth") +
xlab("Treatment Type") + ylab("Bulk Soil C (%)") + labs(color="Depth (cm)") +
theme(text = element_text(size=14))
```



###Soil C stocks to 1 m

To be continued... Soil C% x Bulk density x Depth

##Fractionated soil C

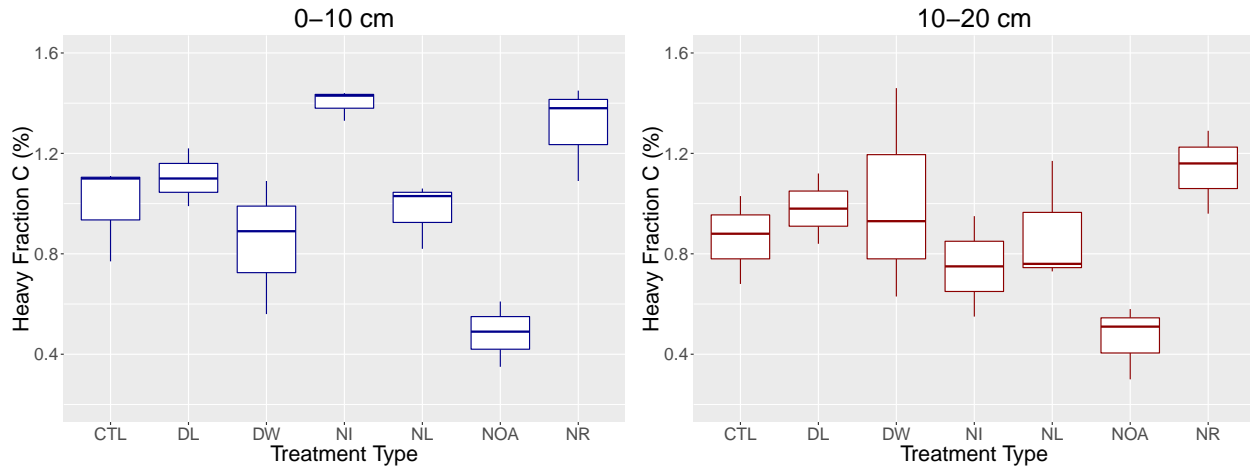
Missing two heavy fraction values:

- DNPF 38, Double litter, 10-20 cm
- DNPF 42, No input, 10-20 cm

###Heavy Fraction Soil C

```
#Create data frame with only the fractionated sample data
data.1f <- data.1 %>% filter(grepl("0-10|10-20", Depth)) %>% filter(Depth != "60-100")
```

```
### Plot 0-10 cm heavy fraction soil percent C
ggplot(data.1f %>% filter(Depth == "0-10"), aes(x=TRT, y=HF_percC)) +
  geom_boxplot(data=data.1f %>% filter(Depth == "0-10"), color="darkblue") +
  scale_color_brewer(palette="Set1") +
  scale_fill_brewer(palette="Set1") +
```



```
ggtitle("0-10 cm") +
  xlab("Treatment Type") + ylab("Heavy Fraction C (%)") +
  theme(legend.position="none", plot.title = element_text(hjust = 0.5), text = element_text(size=20)) +
  ylim(0.2,1.6)

### Plot 10-20 cm heavy fraction soil percent C
ggplot(data.1f %>% filter(Depth == "10-20"), aes(x=TRT, y=HF_percC)) +
  geom_boxplot(data=data.1f %>% filter(Depth == "10-20"), color="darkred") +
  scale_color_brewer(palette="Set1") +
  scale_fill_brewer(palette="Set1") +
  ggtitle("10-20 cm") +
  xlab("Treatment Type") + ylab("Heavy Fraction C (%)") +
  theme(legend.position="none", plot.title = element_text(hjust = 0.5), text = element_text(size=20)) +
  ylim(0.2,1.6)
```

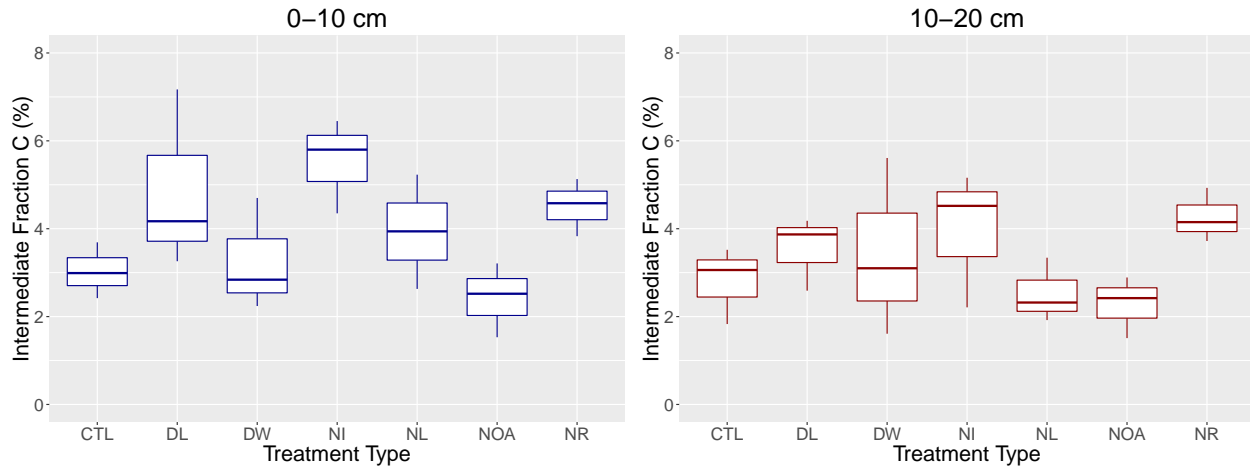
Warning: Removed 2 rows containing non-finite values (stat_boxplot).

Intermediate Fraction Soil C

```
#Create data frame with only the fractionated sample data
data.1f <- data.1 %>% filter(grepl("0-10|10-20", Depth)) %>% filter(Depth != "60-100")
```

```
### Plot 0-10 cm intermediate fraction soil percent C
ggplot(data.1f %>% filter(Depth == "0-10"), aes(x=TRT, y=IF_percC)) +
  geom_boxplot(data=data.1f %>% filter(Depth == "0-10"), color="darkblue") +
  scale_color_brewer(palette="Set1") +
  scale_fill_brewer(palette="Set1") +
  ggtitle("0-10 cm") +
  xlab("Treatment Type") + ylab("Intermediate Fraction C (%)") +
  theme(legend.position="none", plot.title = element_text(hjust = 0.5), text = element_text(size=20)) +
  ylim(0,8)
```

```
### Plot 10-20 cm intermediate fraction soil percent C
ggplot(data.1f %>% filter(Depth == "10-20"), aes(x=TRT, y=IF_percC)) +
  geom_boxplot(data=data.1f %>% filter(Depth == "10-20"), color="darkred") +
  scale_color_brewer(palette="Set1") +
  scale_fill_brewer(palette="Set1") +
  ggtitle("10-20 cm") +
```



```

xlab("Treatment Type") + ylab("Intermediate Fraction C (%)") +
theme(legend.position="none", plot.title = element_text(hjust = 0.5), text = element_text(size=20)) +
ylim(0,8)

```

###Light Fraction Soil C

```

#Create data frame with only the fractionated sample data
data.1f <- data.1 %>% filter(grepl("0-10|10-20", Depth)) %>% filter(Depth != "60-100")

```

Plot 0-10 cm light fraction soil percent C

```

ggplot(data.1f %>% filter(Depth == "0-10"), aes(x=TRT, y=LF_percC)) +
  geom_boxplot(data=data.1f %>% filter(Depth == "0-10"), color="darkblue") +
  scale_color_brewer(palette="Set1") +
  scale_fill_brewer(palette="Set1") +
  ggtitle("0-10 cm") +
  xlab("Treatment Type") + ylab("Light Fraction C (%)") +
  theme(legend.position="none", plot.title = element_text(hjust = 0.5), text = element_text(size=20)) +
  ylim(15,35)

```

Plot 10-20 cm light fraction soil percent C

```

ggplot(data.1f %>% filter(Depth == "10-20"), aes(x=TRT, y=LF_percC)) +
  geom_boxplot(data=data.1f %>% filter(Depth == "10-20"), color="darkred") +
  scale_color_brewer(palette="Set1") +
  scale_fill_brewer(palette="Set1") +
  ggtitle("10-20 cm") +
  xlab("Treatment Type") + ylab("Light Fraction C (%)") +
  theme(legend.position="none", plot.title = element_text(hjust = 0.5), text = element_text(size=20)) +
  ylim(15,35)

```

###Fraction mass proportions

