Project 1

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```
knitr::opts_chunk$set(message = F, warning = F)
```

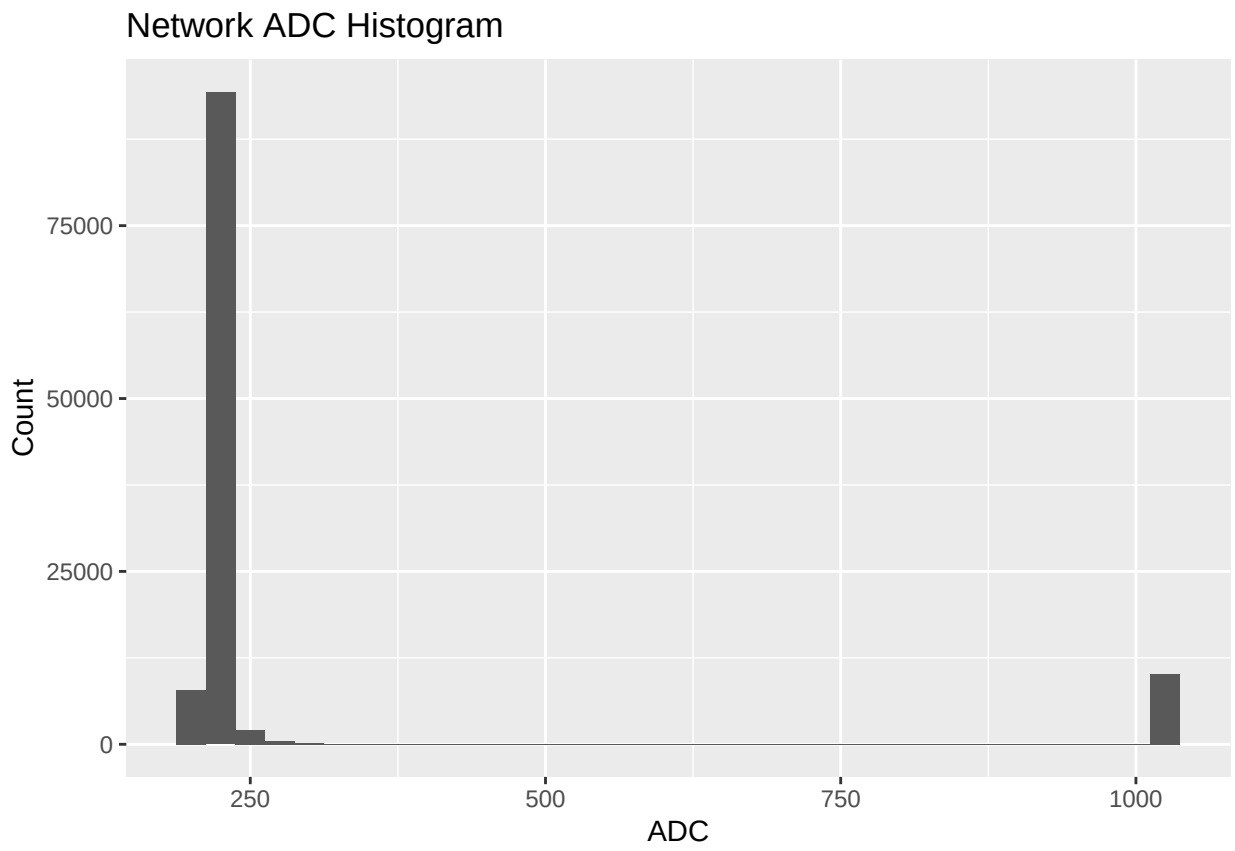
```
library(tidyverse)
data_net <- read_csv("data/sonoma-data-net.csv")
data_log <- read_csv("data/sonoma-data-log.csv")
```

2.

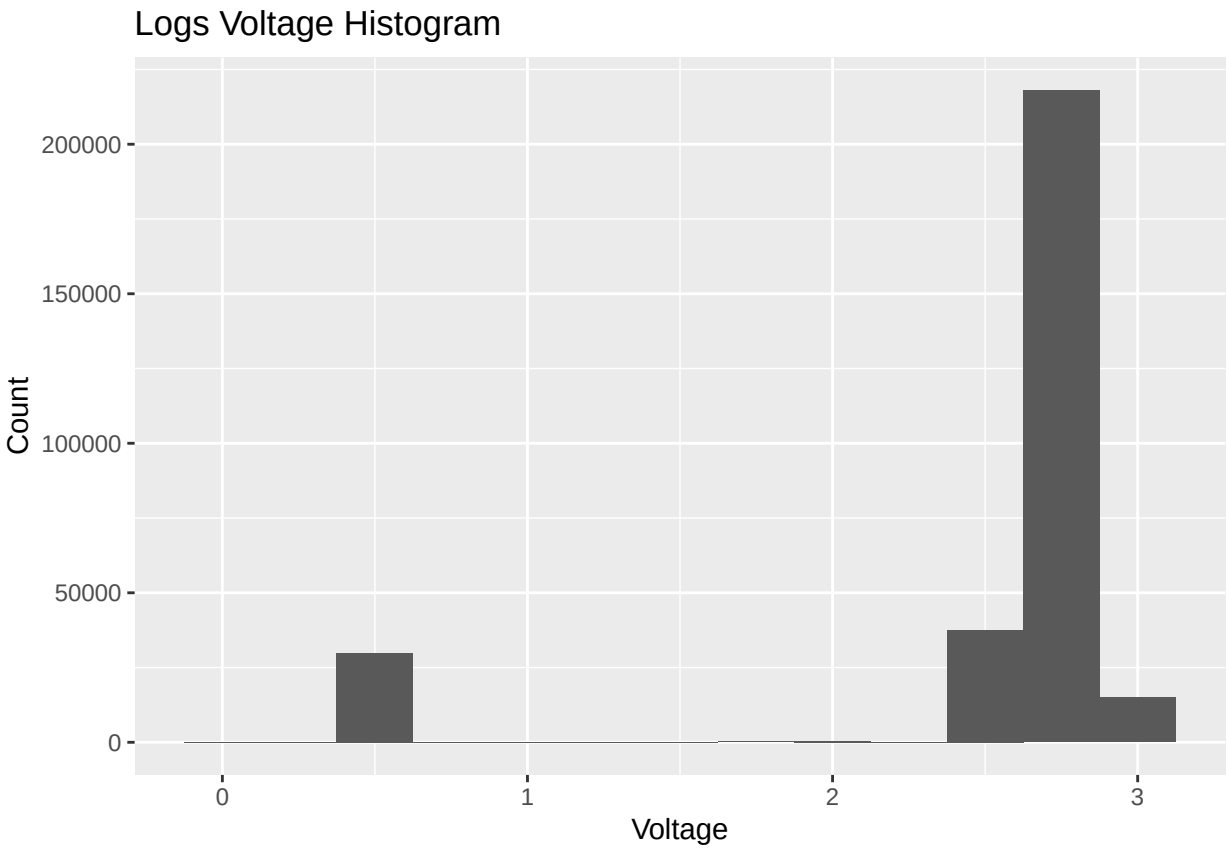
a)

Voltage

```
data_net %>%
  ggplot(data=., aes(x=voltage)) +
  geom_histogram(binwidth=25) +
  labs(title="Network ADC Histogram", x="ADC", y="Count")
```



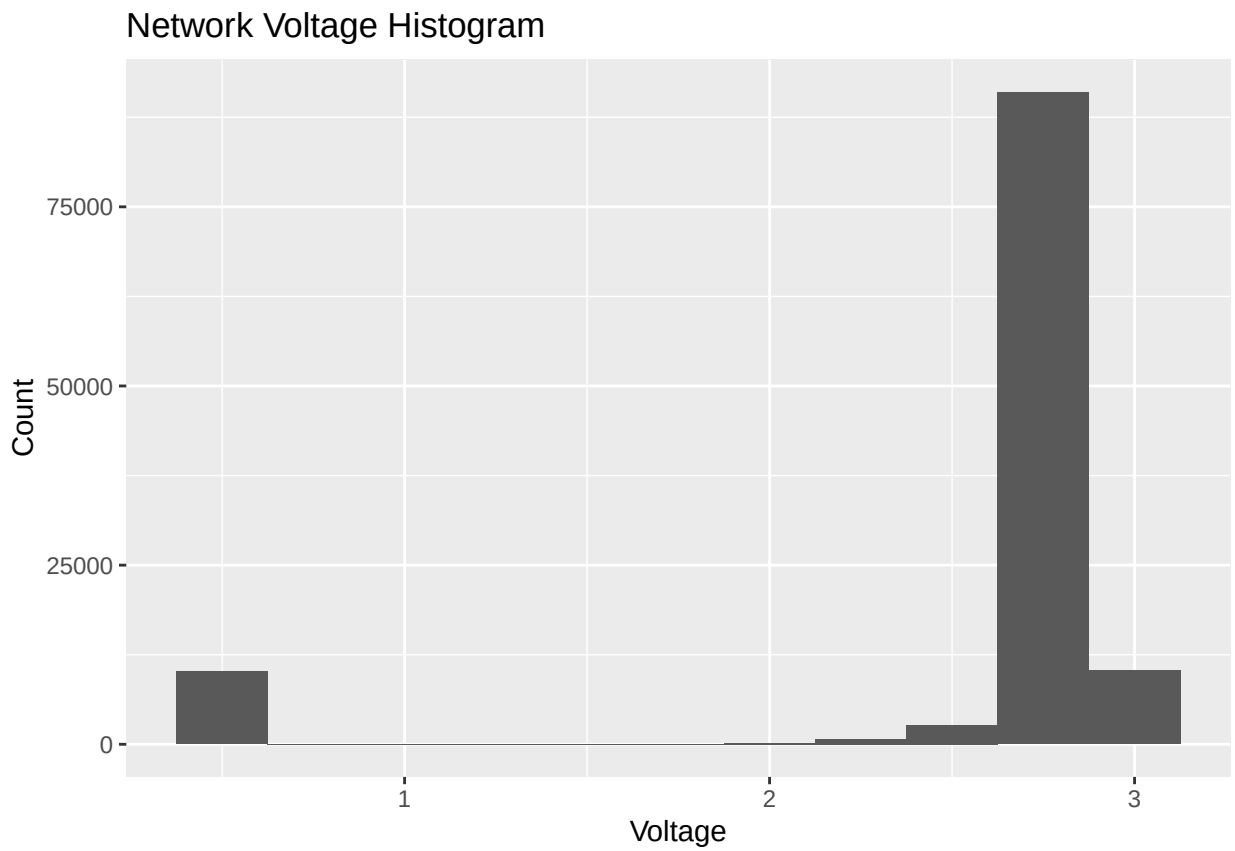

```
data_log %>%
  ggplot(data=., aes(x=voltage)) +
  geom_histogram(binwidth=0.25) +
  labs(title="Logs Voltage Histogram", x="Voltage", y="Count")
```



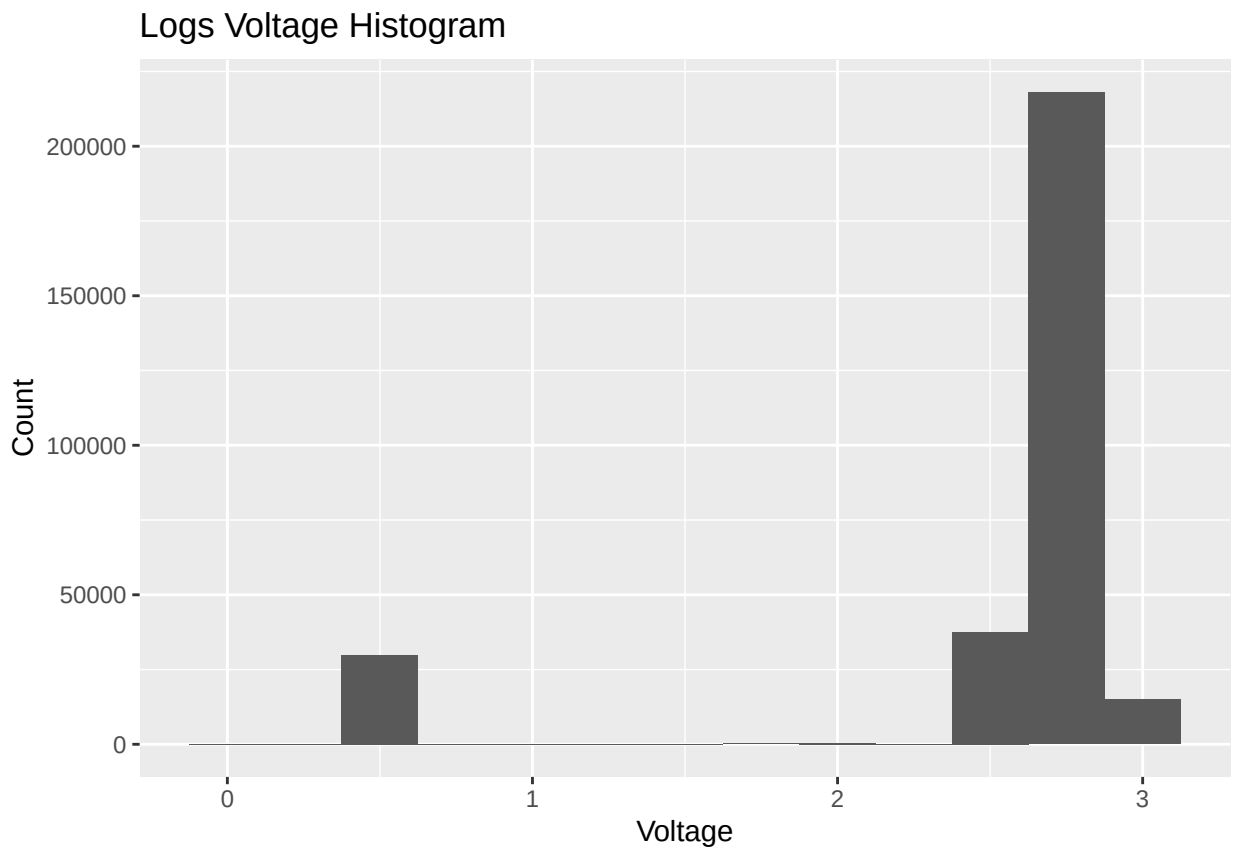
Voltage is inconsistent, link below for ADC to voltage conversion

- http://www-db.ics.uci.edu/pages/research/quasar/MPR-MIB%20Series%20User%20Manual%207430-0021-06_A.pdf
- page 23 (25 of pdf) has MICA2DOT conversion

```
data_net <- data_net %>%
  mutate(voltage = 0.6*(1024/voltage))

data_net %>%
  ggplot(data=., aes(x=voltage)) +
  geom_histogram(binwidth=0.25) +
  labs(title="Network Voltage Histogram", x="Voltage", y="Count")
```




```
data_log %>%
  ggplot(data=., aes(x=voltage)) +
  geom_histogram(binwidth=0.25) +
  labs(title="Logs Voltage Histogram", x="Voltage", y="Count")
```



Humidity

```
data_net %>%
  filter(!is.na(humidity) & voltage <= 3 & voltage >= 2.4) %>%
  select(humidity) %>%
  pull() %>%
  min()
```

```
## [1] 19.5147
```

```
data_log %>%
  filter(!is.na(humidity) & voltage <= 3 & voltage >= 2.4) %>%
  select(humidity) %>%
  pull() %>%
  min()
```

```
## [1] 16.2653
```

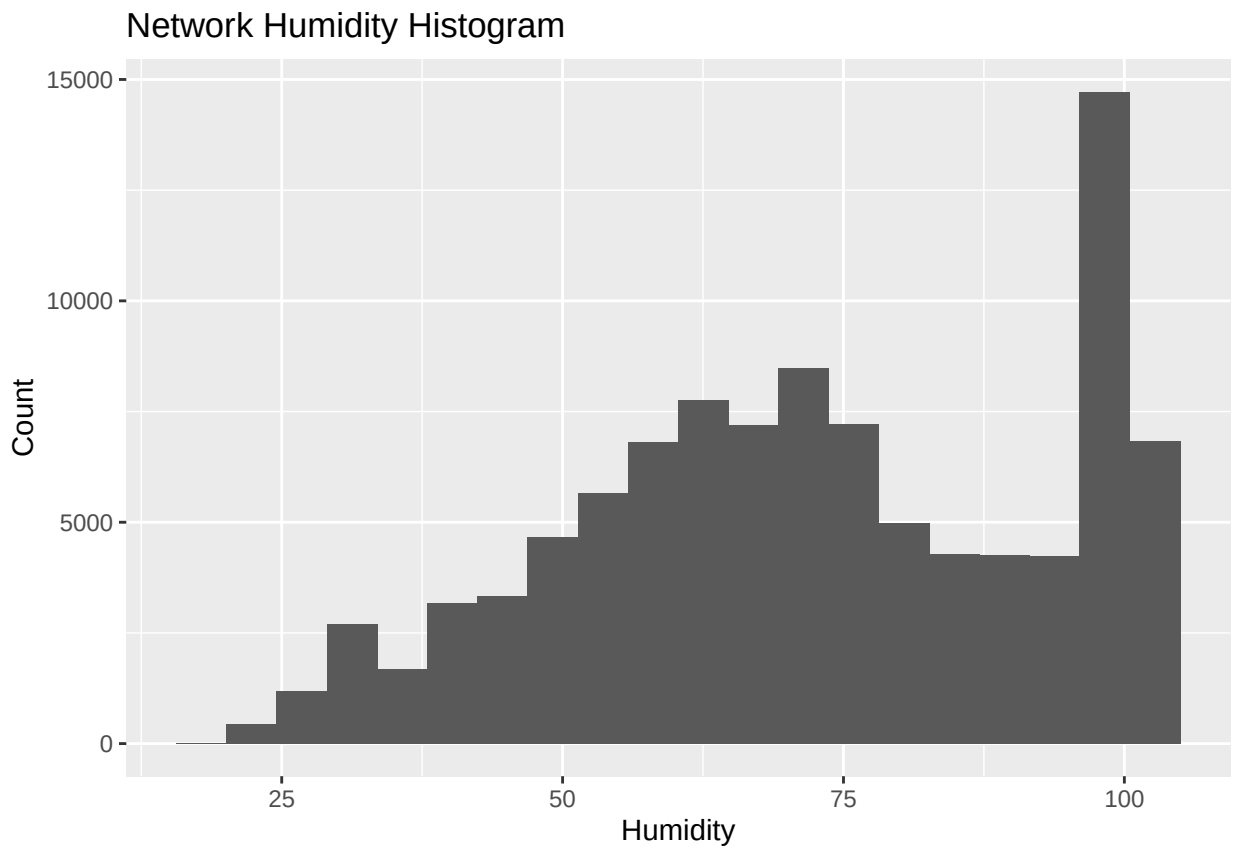
```
data_net %>%
  filter(!is.na(humidity) & voltage <= 3 & voltage >= 2.4 & humidity < 105) %>%
  select(humidity) %>%
  pull() %>%
  max()
```

```
## [1] 104.385
```

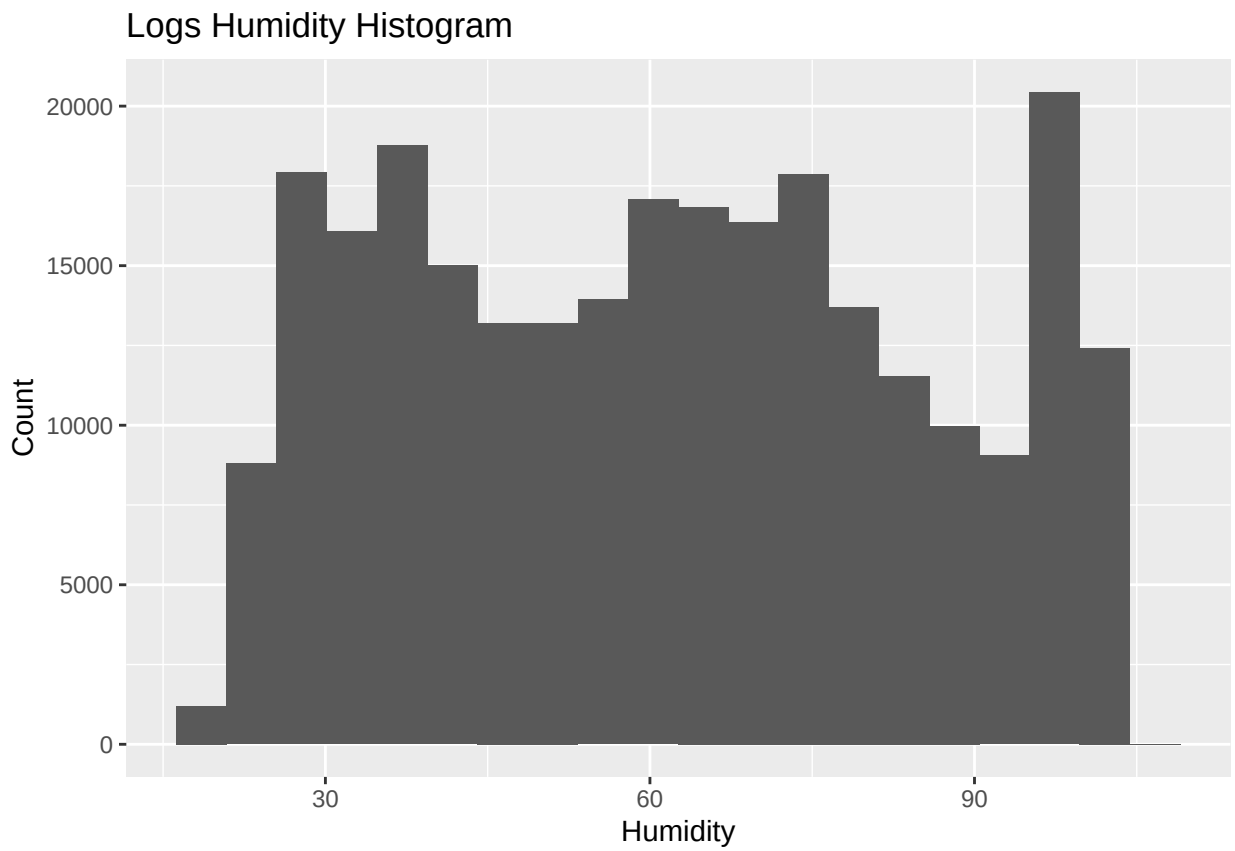
```
data_log %>%
  filter(!is.na(humidity) & voltage <= 3 & voltage >= 2.4) %>%
  select(humidity) %>%
  pull() %>%
  max()
```

```
## [1] 104.405
```

```
data_net %>%
  filter(!is.na(humidity) & voltage <= 3 & voltage >= 2.4 & humidity < 105) %>%
  ggplot(data=., aes(x=humidity)) +
  geom_histogram(bins=20) +
  labs(title="Network Humidity Histogram", x="Humidity", y="Count")
```




```
data_log %>%
  filter(!is.na(humidity) & voltage <= 3 & voltage >= 2.4) %>%
  ggplot(data=., aes(x=humidity)) +
  geom_histogram(bins=20) +
  labs(title="Logs Humidity Histogram", x="Humidity", y="Count")
```



Adjusted Humidity

```
data_net %>%
  filter(!is.na(humid_adj) & voltage <= 3 & voltage >= 2.4) %>%
  select(humid_adj) %>%
  pull() %>%
  min()
```

```
## [1] 19.3107
```

```
data_log %>%
  filter(!is.na(humid_adj) & voltage <= 3 & voltage >= 2.4) %>%
  select(humid_adj) %>%
  pull() %>%
  min()
```

```
## [1] 16.2282
```

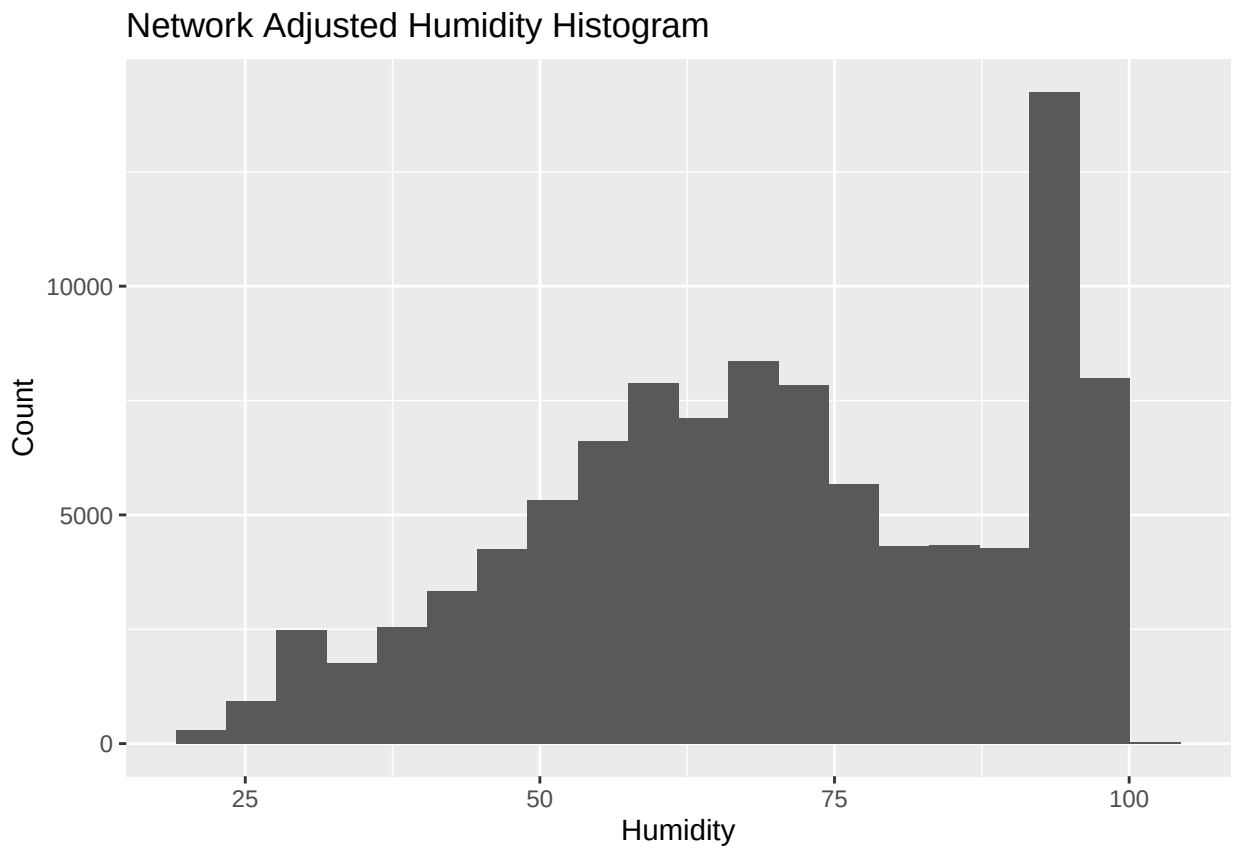
```
data_net %>%
  filter(!is.na(humid_adj) & voltage <= 3 & voltage >= 2.4 & humid_adj < 105) %>%
  select(humid_adj) %>%
  pull() %>%
  max()
```

```
## [1] 100.223
```

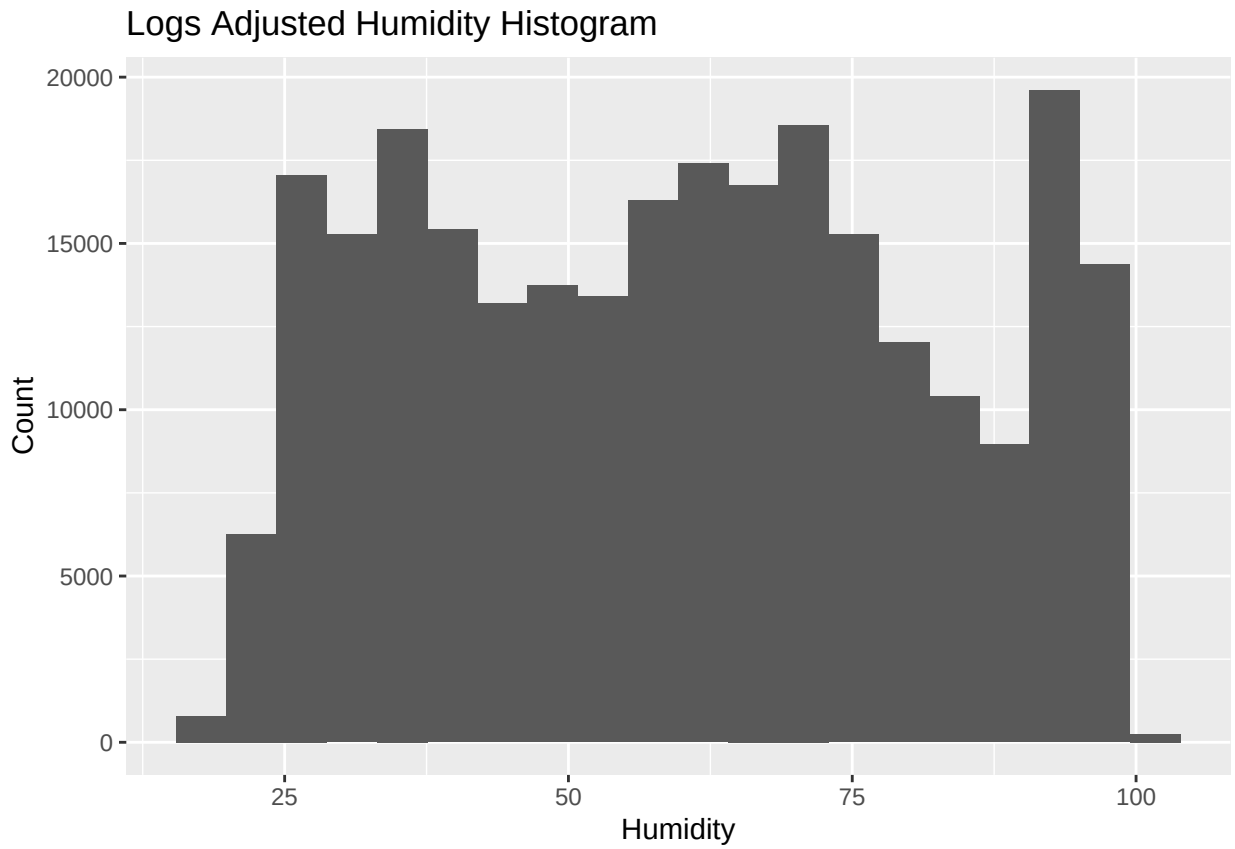
```
data_log %>%
  filter(!is.na(humid_adj) & voltage <= 3 & voltage >= 2.4) %>%
  select(humid_adj) %>%
  pull() %>%
  max()
```

```
## [1] 100.223
```

```
data_net %>%
  filter(!is.na(humid_adj) & voltage <= 3 & voltage >= 2.4 & humid_adj < 105) %>%
  ggplot(data=., aes(x=humid_adj)) +
  geom_histogram(bins=20) +
  labs(title="Network Adjusted Humidity Histogram", x="Humidity", y="Count")
```




```
data_log %>%
  filter(!is.na(humid_adj) & voltage <= 3 & voltage >= 2.4) %>%
  ggplot(data=., aes(x=humid_adj)) +
  geom_histogram(bins=20) +
  labs(title="Logs Adjusted Humidity Histogram", x="Humidity", y="Count")
```



Temperature

```
data_net %>%
  filter(!is.na(humid_temp) & voltage <= 3 & voltage >= 2.4) %>%
  select(humid_temp) %>%
  pull() %>%
  min()
```

```
## [1] 6.582
```

```
data_log %>%
  filter(!is.na(humid_temp) & voltage <= 3 & voltage >= 2.4) %>%
  select(humid_temp) %>%
  pull() %>%
  min()
```

```
## [1] 6.582
```

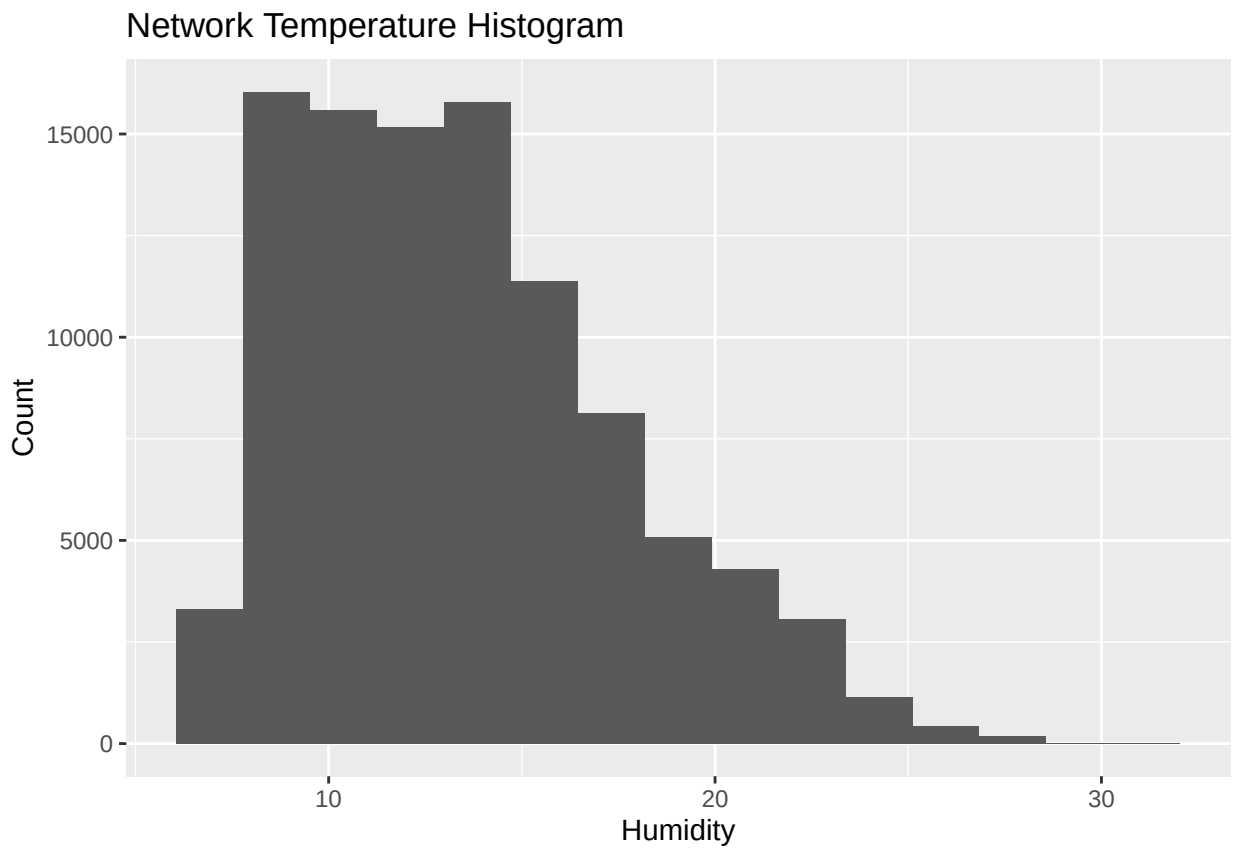
```
data_net %>%
  filter(!is.na(humid_temp) & voltage <= 3 & voltage >= 2.4 & humid_temp < 35) %>%
  select(humid_temp) %>%
  pull() %>%
  max()
```

```
## [1] 30.8272
```

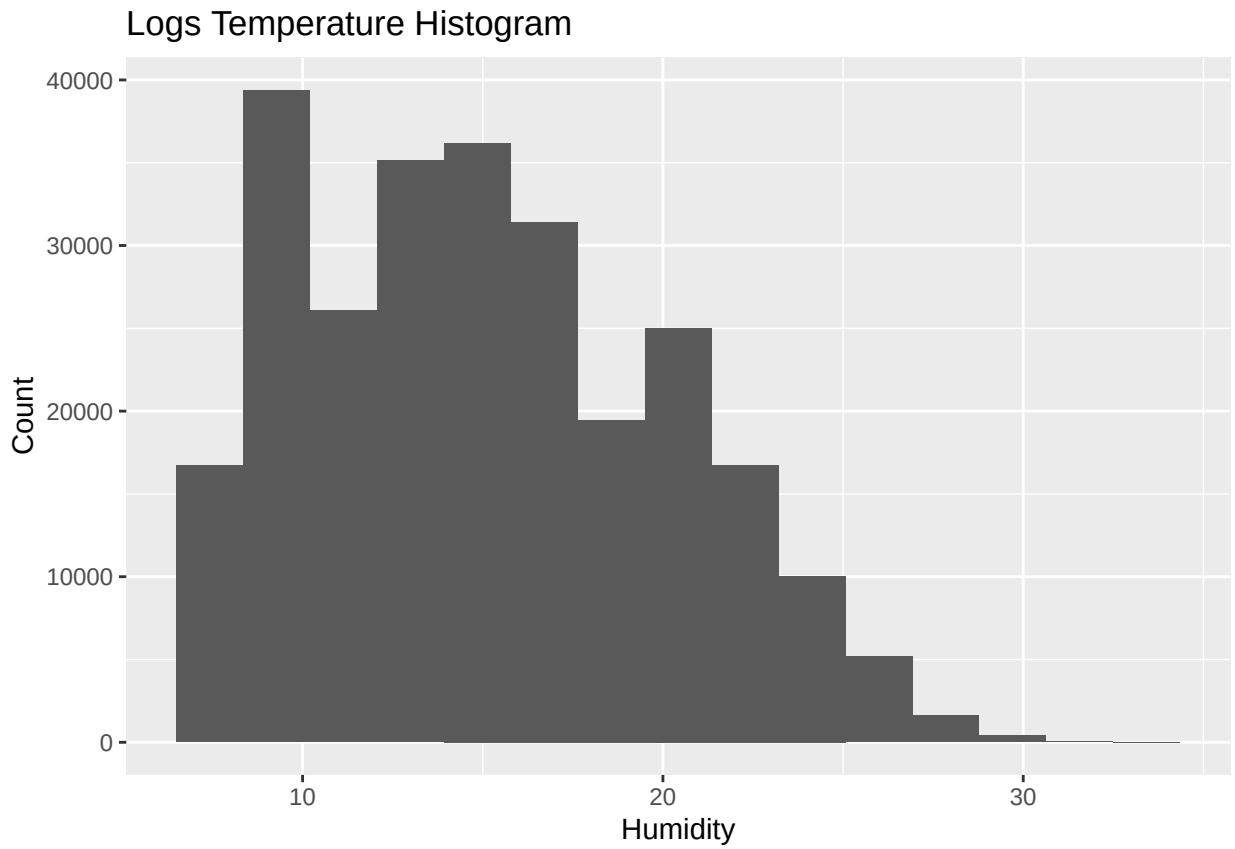
```
data_log %>%
  filter(!is.na(humid_temp) & voltage <= 3 & voltage >= 2.4) %>%
  select(humid_temp) %>%
  pull() %>%
  max()
```

```
## [1] 32.5814
```

```
data_net %>%
  filter(!is.na(humid_temp) & voltage <= 3 & voltage >= 2.4 & humid_temp < 35) %>%
  ggplot(data=., aes(x=humid_temp)) +
  geom_histogram(bins=15) +
  labs(title="Network Temperature Histogram", x="Humidity", y="Count")
```




```
data_log %>%
  filter(!is.na(humid_temp) & voltage <= 3 & voltage >= 2.4) %>%
  ggplot(data=., aes(x=humid_temp)) +
  geom_histogram(bins=15) +
  labs(title="Logs Temperature Histogram", x="Humidity", y="Count")
```



Incident PAR

```
data_net %>%
  filter(!is.na(hamatop) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamatop) %>%
  pull() %>%
  min()
```

```
## [1] 0
```

```
data_log %>%
  filter(!is.na(hamatop) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamatop) %>%
  pull() %>%
  min()
```

```
## [1] 0
```

```
data_net %>%
  filter(!is.na(hamatop) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamatop) %>%
  pull() %>%
  max()
```

```
## [1] 113376
```

```
data_log %>%
  filter(!is.na(hamatop) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamatop) %>%
  pull() %>%
  max()
```

```
## [1] 180255
```

Hamatop is inconsistent, link below for Lux to PPFD conversion

- https://www.apogeeinstruments.com/conversion-ppfd-to-lux/

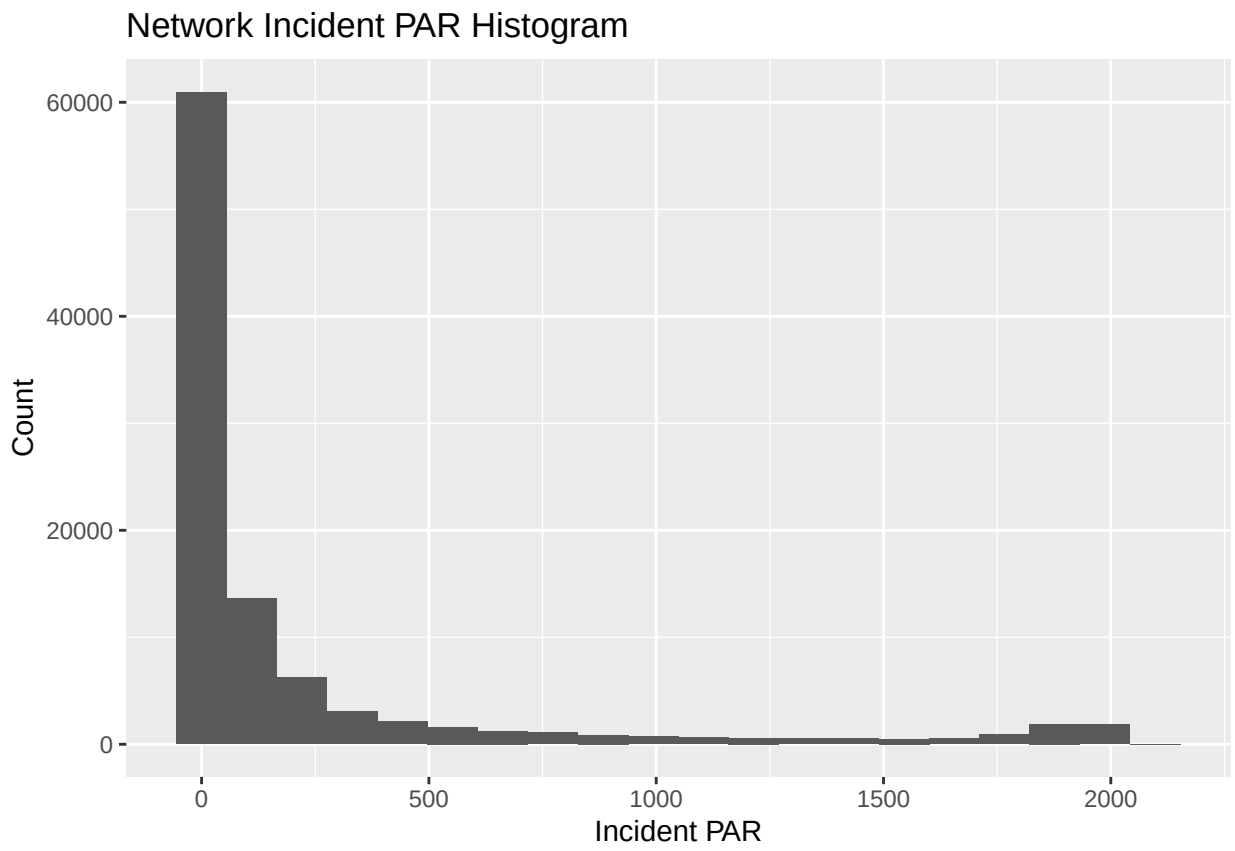
```
data_net <- data_net %>%
  mutate(hamatop=0.0185*hamatop)

data_log <- data_log %>%
  mutate(hamatop=0.0185*hamatop)

data_net %>%
  filter(!is.na(hamatop) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamatop) %>%
  pull() %>%
  max()
```

```
## [1] 2097.456
```

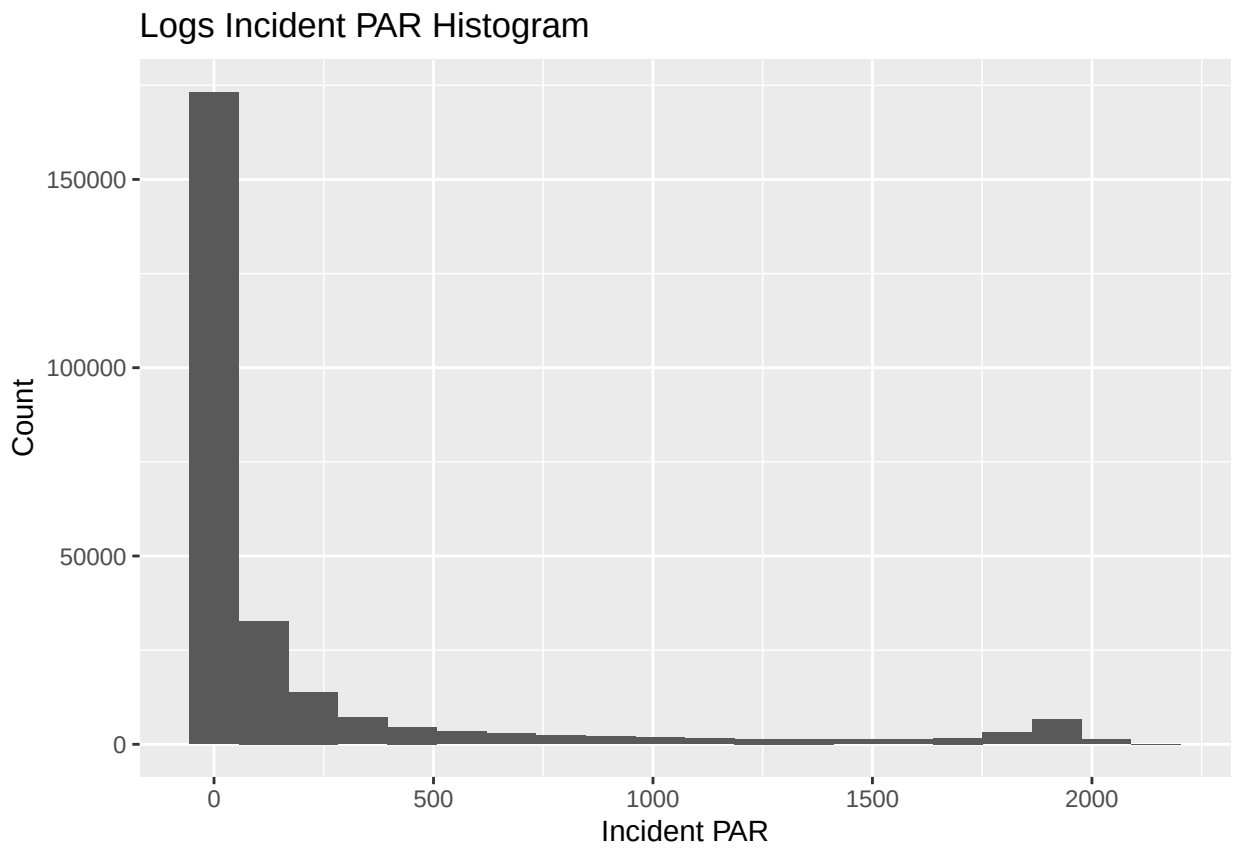
```
data_log %>%
  filter(!is.na(hamatop) & voltage <= 3 & voltage >= 2.4 & hamatop < 2200) %>%
  select(hamatop) %>%
  pull() %>%
  max()
```

```
## [1] 2146
```

```
data_net %>%
  filter(!is.na(hamatop) & voltage <= 3 & voltage >= 2.4) %>%
  ggplot(data=., aes(x=hamatop)) +
  geom_histogram(bins=20) +
  labs(title="Network Incident PAR Histogram", x="Incident PAR", y="Count")
```




```
data_log %>%
  filter(!is.na(hamatop) & voltage <= 3 & voltage >= 2.4  & hamatop < 2200) %>%
  ggplot(data=., aes(x=hamatop)) +
  geom_histogram(bins=20) +
  labs(title="Logs Incident PAR Histogram", x="Incident PAR", y="Count")
```



Reflected PAR

```
data_net %>%
  filter(!is.na(hamabot) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamabot) %>%
  pull() %>%
  min()
```

```
## [1] 0
```

```
data_log %>%
  filter(!is.na(hamabot) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamabot) %>%
  pull() %>%
  min()
```

```
## [1] 0
```

```
data_net %>%
  filter(!is.na(hamabot) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamabot) %>%
  pull() %>%
  max()
```

```
## [1] 9480.77
```

```
data_log %>%
  filter(!is.na(hamabot) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamabot) %>%
  pull() %>%
  max()
```

```
## [1] 9142.86
```

Fix hamabot like hamatop

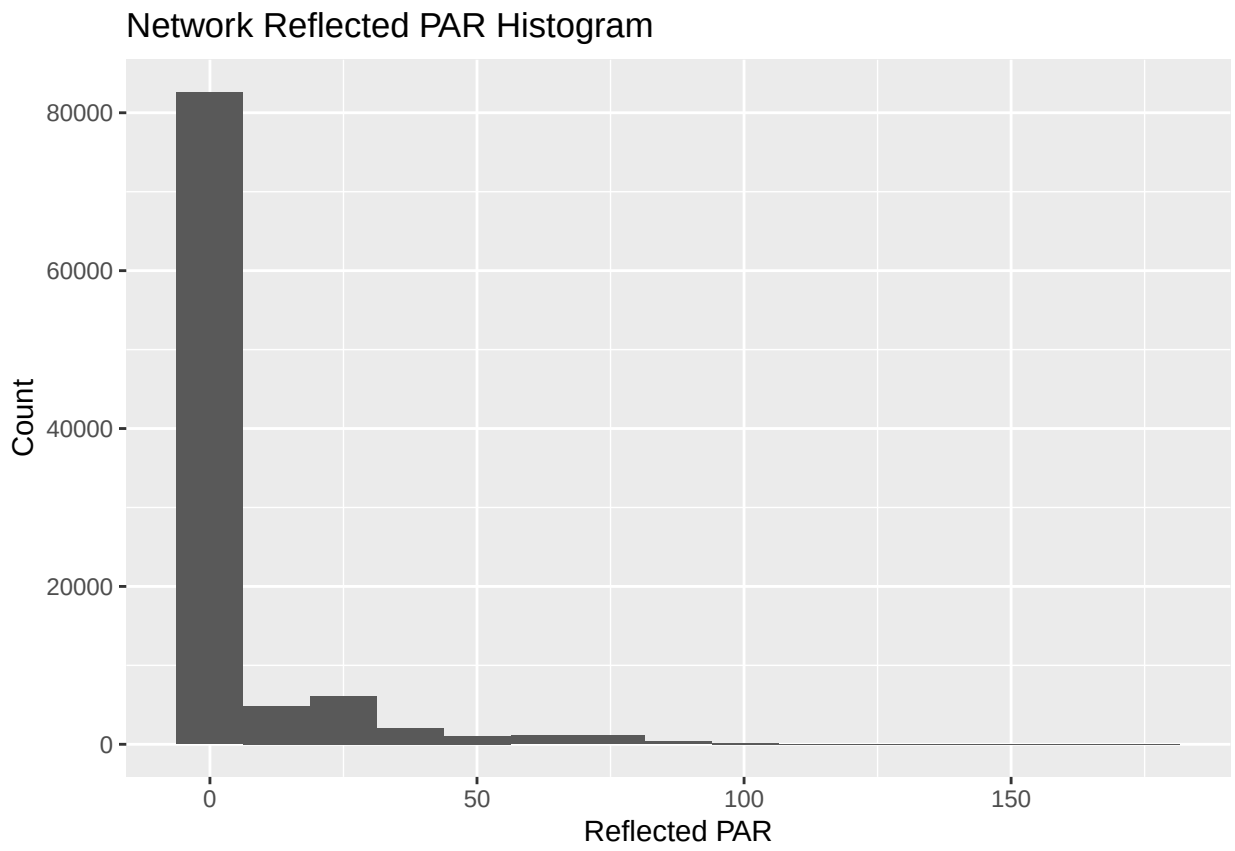
```
data_net <- data_net %>%
  mutate(hamabot=0.0185*hamabot)

data_log <- data_log %>%
  mutate(hamabot=0.0185*hamabot)

data_net %>%
  filter(!is.na(hamabot) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamabot) %>%
  pull() %>%
  max()
```

```
## [1] 175.3942
```

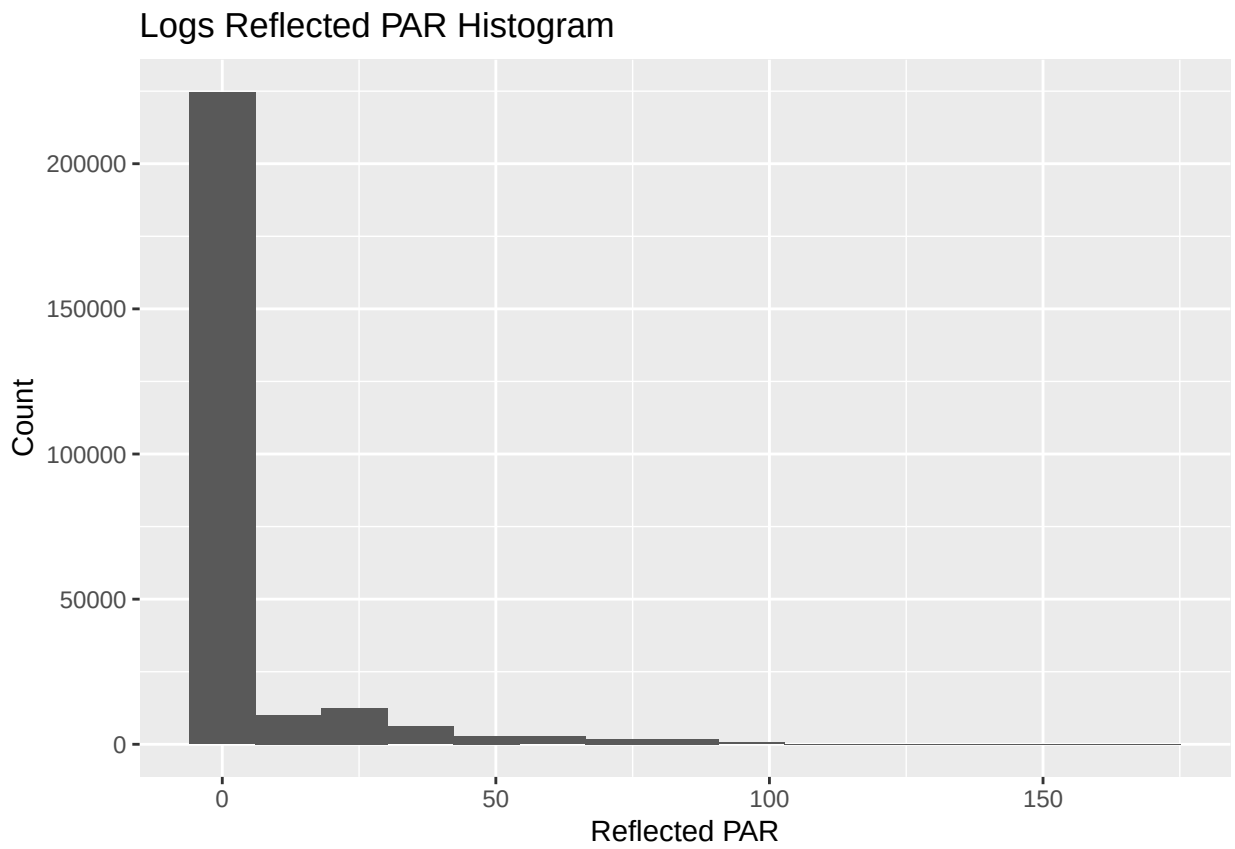
```
data_log %>%
  filter(!is.na(hamabot) & voltage <= 3 & voltage >= 2.4) %>%
  select(hamabot) %>%
  pull() %>%
  max()
```

```
## [1] 169.1429
```

```
data_net %>%
  filter(!is.na(hamabot) & voltage <= 3 & voltage >= 2.4) %>%
  ggplot(data=., aes(x=hamabot)) +
  geom_histogram(bins=15) +
  labs(title="Network Reflected PAR Histogram", x="Reflected PAR", y="Count")
```




```
data_log %>%
  filter(!is.na(hamabot) & voltage <= 3 & voltage >= 2.4) %>%
  ggplot(data=., aes(x=hamabot)) +
  geom_histogram(bins=15) +
  labs(title="Logs Reflected PAR Histogram", x="Reflected PAR", y="Count")
```



b)

How to read matlab arrays in "sonoma-dates"?

```
# library(rmatio)
# dates_file <- system.file("data/sonoma-dates.m", package = "rmatio")
# dates <- read.mat(dates_file)

data_both <- merge(data_net, data_log, by=c("epoch", "nodeid"))
```

```
missing_rows <- data_both %>%
                  filter_all(any_vars(is.na(.)))

paste0("# rows with missing data: ", nrow(missing_rows))
```

```
## [1] "# rows with missing data: 3629"
```