IRC_Data_Analysis_Training_2

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Load packages

```
# Load packages
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 4.0.2
```

```
## -- Attaching packages --------------------------------- tidyverse 1.3.0 --
```

```
## v ggplot2 3.3.2     v purrr   0.3.4
## v tibble  3.0.3     v dplyr   1.0.1
## v tidyr   1.1.1     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.5.0
```

```
## Warning: package 'ggplot2' was built under R version 4.0.2
```

```
## Warning: package 'tibble' was built under R version 4.0.2
```

```
## Warning: package 'tidyr' was built under R version 4.0.2
```

```
## Warning: package 'dplyr' was built under R version 4.0.2
```

```
## -- Conflicts ------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(here)
```

```
## here() starts at /Users/rachelkenny/Documents/IRC/R Code/IRC_Data_Analysis_Training
```

```
library(janitor)
```

```
##
## Attaching package: 'janitor'
```

```
## The following objects are masked from 'package:stats':
##
##     chisq.test, fisher.test
```

```
library(readxl)
```

Load data

```
# Load oak data
oak_data_raw <- read_csv(here("data", "Weir_Oak_Restoration_Data_winter19.csv"))
```

```
## Parsed with column specification:
## cols(
##   `Short ID` = col_character(),
##   Survival = col_logical(),
##   Quantity = col_double(),
##   `Height (cm)` = col_double(),
##   `Open Closed` = col_character(),
##   `Location UML` = col_character(),
##   `Water Yes No` = col_character(),
##   `Sampling Group` = col_character()
## )
```

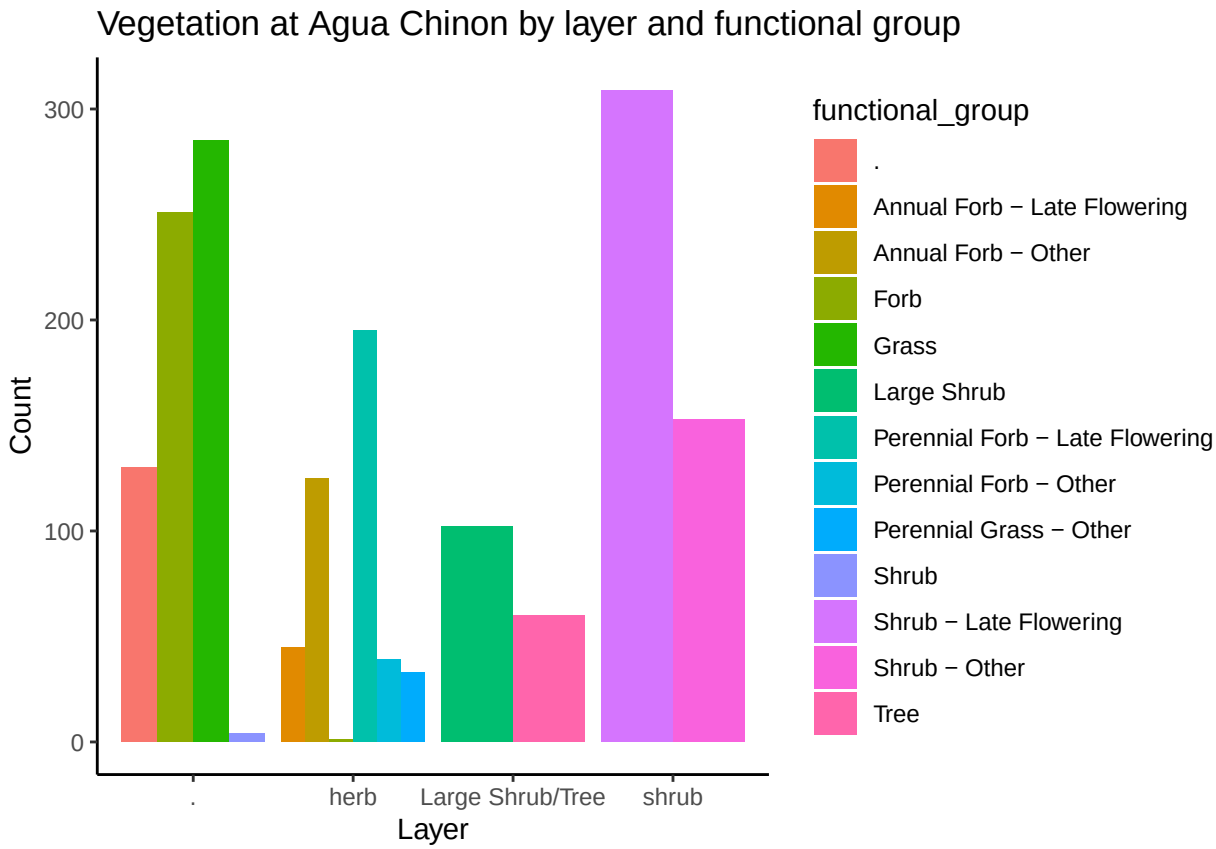
```
oak_data <- clean_names(oak_data_raw)

# Load agua chinon veg data
ac_data_raw <- read_excel(here("data", "OCWR_AC_2019_Data.xlsx"))
ac_data <- clean_names(ac_data_raw)

hp_raw <- read_csv(here("data", "harry_potter_aggression_full.csv"))
```

```
## Parsed with column specification:
## cols(
##   Name = col_character(),
##   abb = col_character(),
##   book = col_character(),
##   aggressions = col_double(),
##   paragraphs = col_double(),
##   mentions = col_double(),
##   agg.per.mention = col_double(),
##   mentions.per.p = col_double(),
##   agg.weighted = col_double()
## )
```

```
hp_data <- clean_names(hp_raw)
```

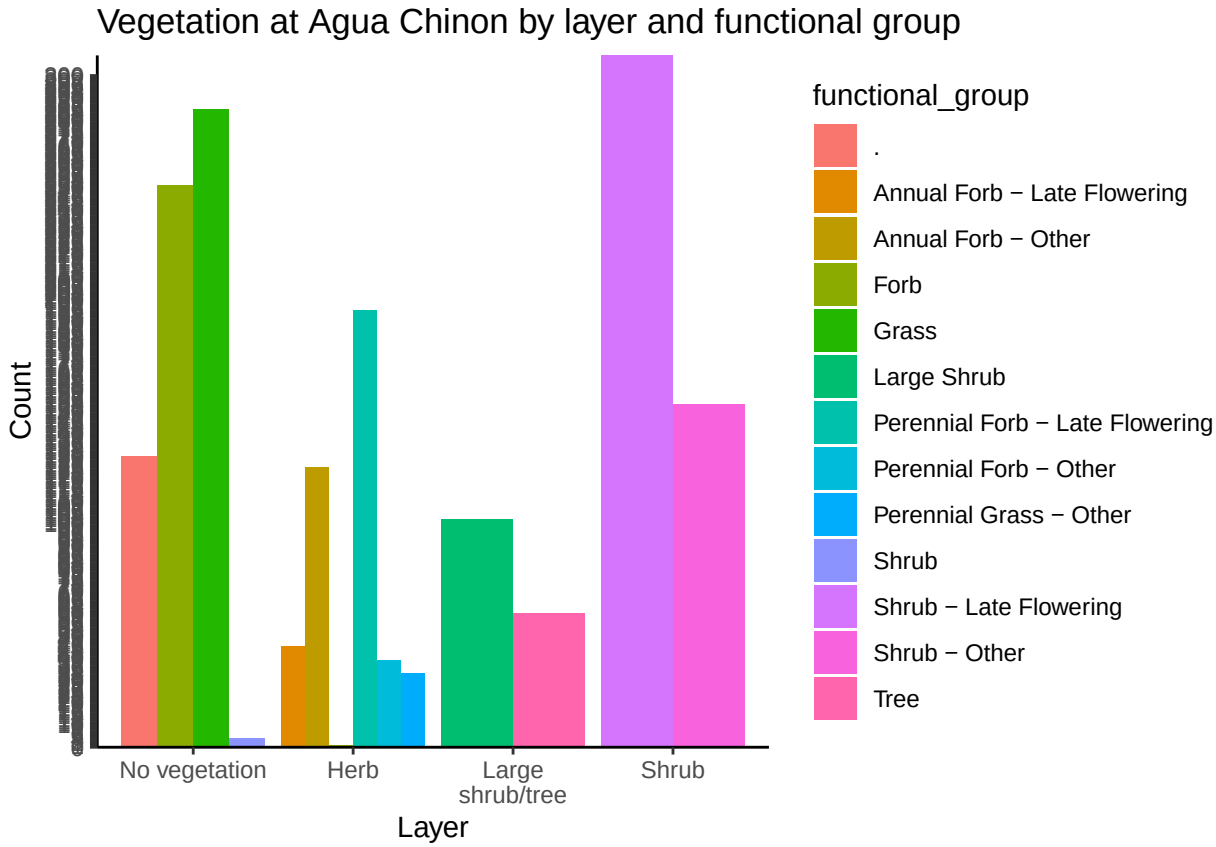
Default plot

```
# Plot 1 - default plot plus titles and axis labels
plot1 <- ggplot(ac_data, aes(layer, fill=functional_group)) +
  geom_bar(position="dodge") +
  xlab("Layer") +
  ylab("Count") +
  ggtitle("Vegetation at Agua Chinon by layer and functional group") +
  theme_classic()

plot1
```

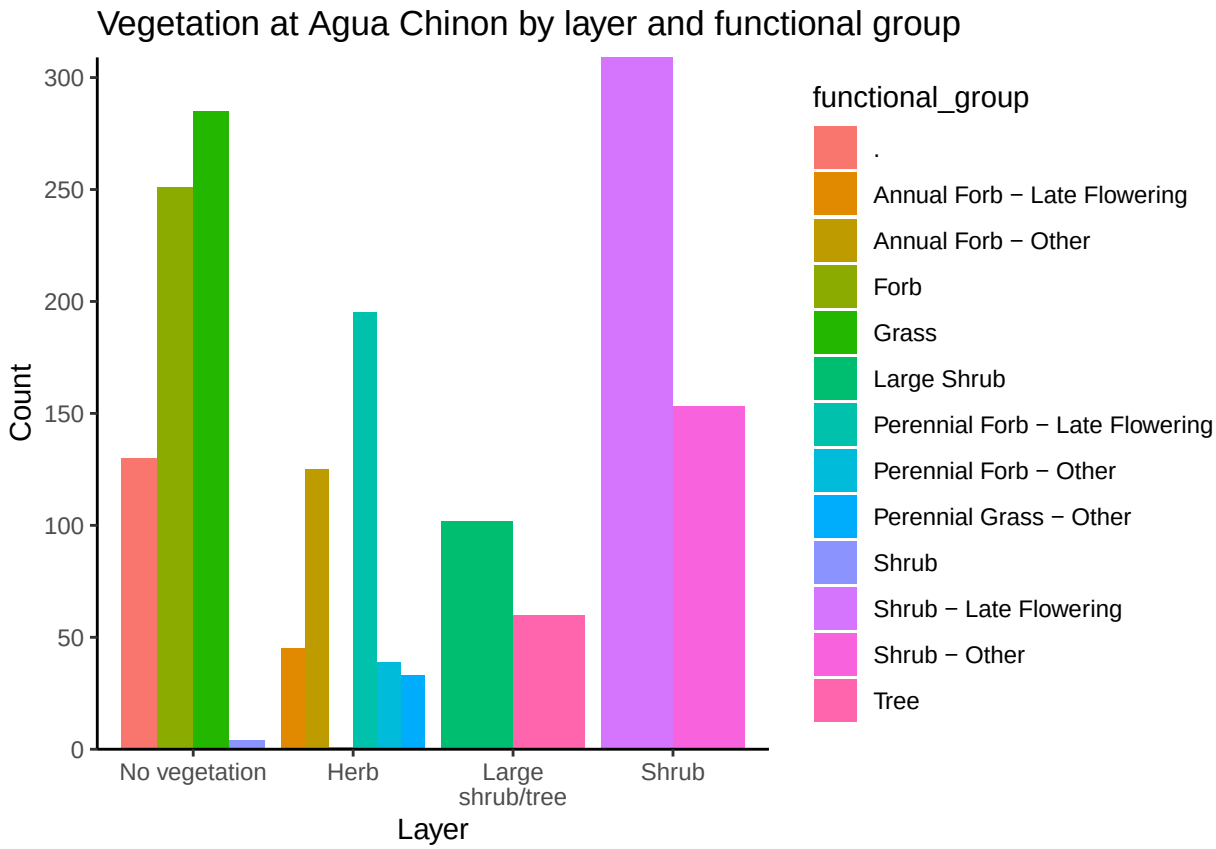


Adjust axes position and tick mark labels

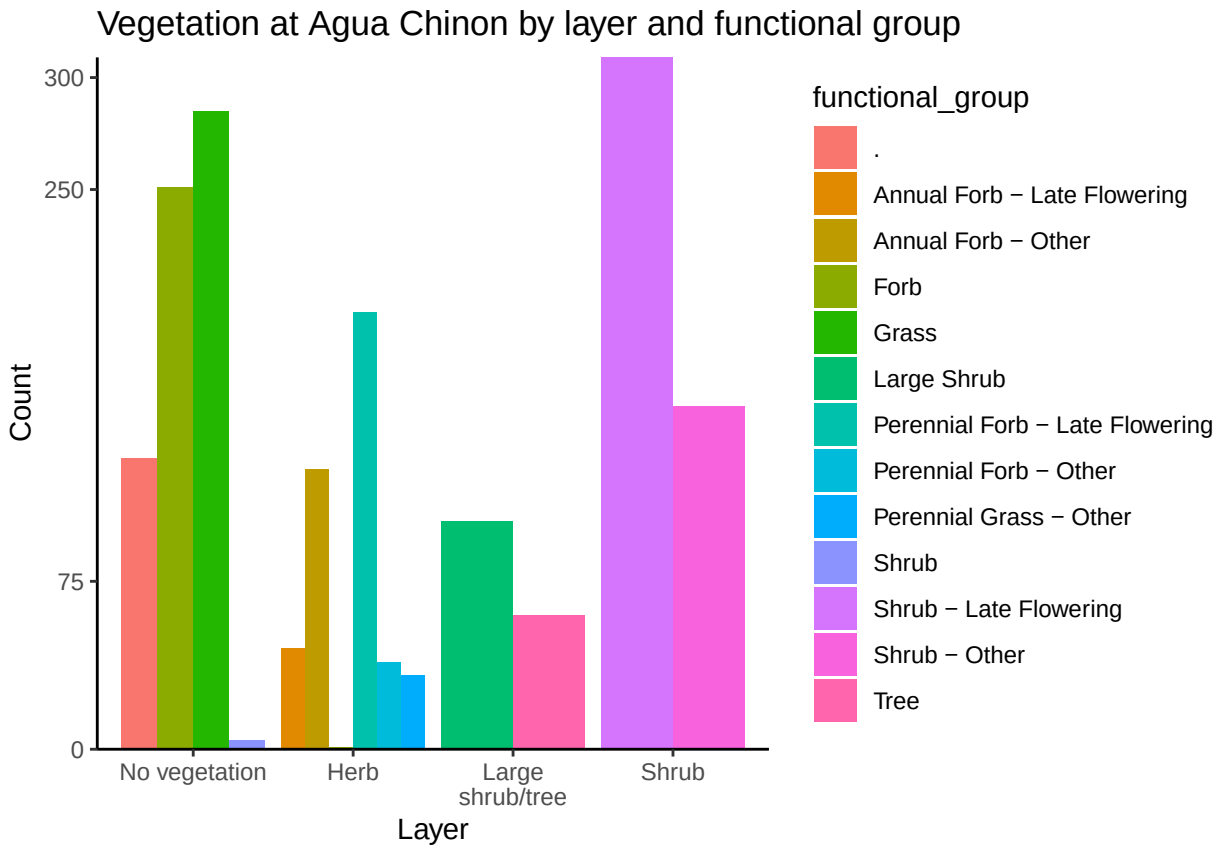
```
# Plot 2 - Use scale x/y discrete/continuous to adjust where the x and y axis lay in relation to the da

# Show every tick mark from 0 - 300
plot2a <- plot1 +
  scale_x_discrete(expand=c(0.2,0), labels = c("No vegetation", "Herb", "Large\nshrub/tree", "Shrub")) +
  scale_y_continuous(expand=c(0,0), breaks = 0:300)

# Use a predefined sequence and range for tick marks
plot2b <- plot1 +
  scale_x_discrete(expand=c(0.2,0), labels = c("No vegetation", "Herb", "Large\nshrub/tree", "Shrub")) +
  scale_y_continuous(expand=c(0,0), breaks=seq(0, 350, by = 50))

# Define sequence manually
plot2c <- plot1 +
  scale_x_discrete(expand=c(0.2,0), labels = c("No vegetation", "Herb", "Large\nshrub/tree", "Shrub")) +
  scale_y_continuous(expand=c(0,0), breaks=c(0, 75, 250, 300))

plot2a
```


Vegetation at Agua Chinon by layer and functional group
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
functional_group
.
Annual Forb − Late Flowering
Annual Forb − Other
Forb
Grass
Large Shrub
Perennial Forb − Late Flowering
Perennial Forb − Other
Perennial Grass − Other
Shrub
Shrub − Late Flowering
Shrub − Other
Tree

```
plot2b
```

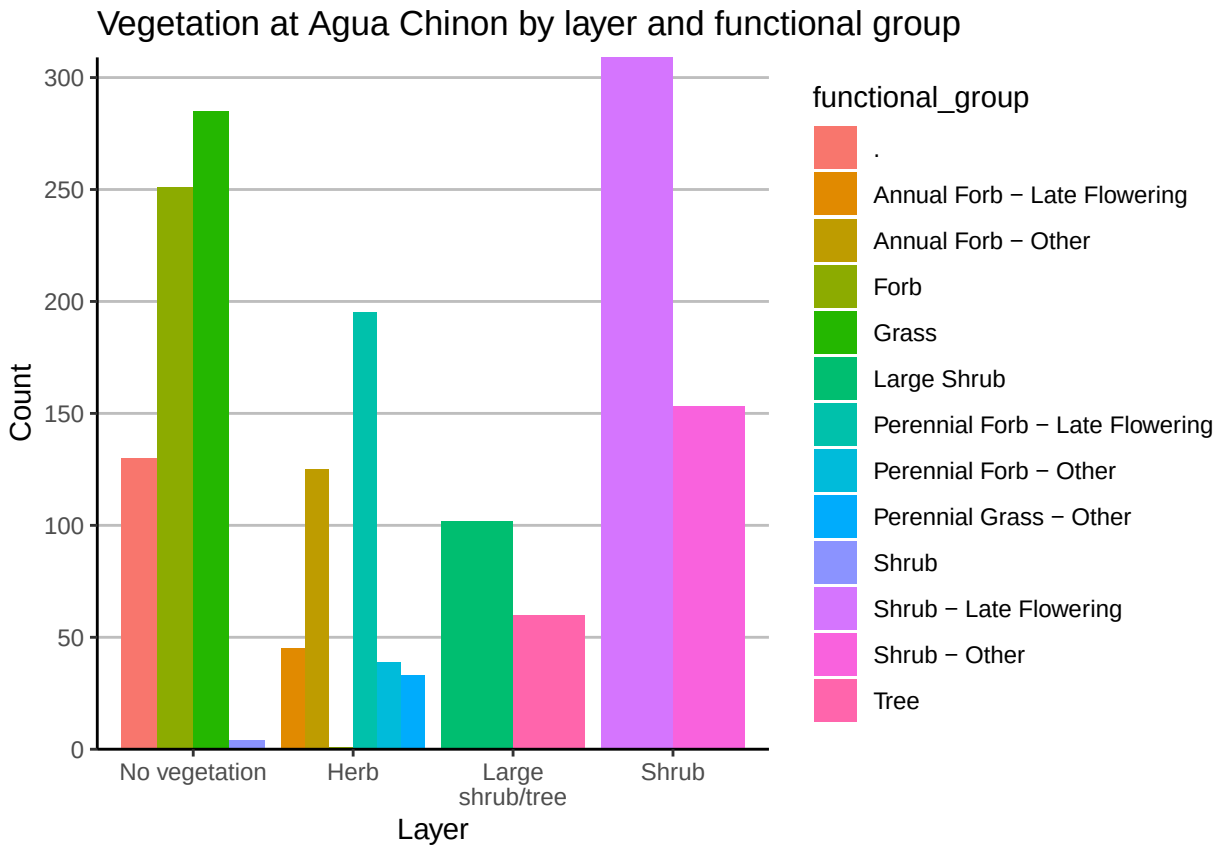

Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
functional_group
.
Annual Forb − Late Flowering
Annual Forb − Other
Forb
Grass
Large Shrub
Perennial Forb − Late Flowering
Perennial Forb − Other
Perennial Grass − Other
Shrub
Shrub − Late Flowering
Shrub − Other
Tree

```
plot2c
```

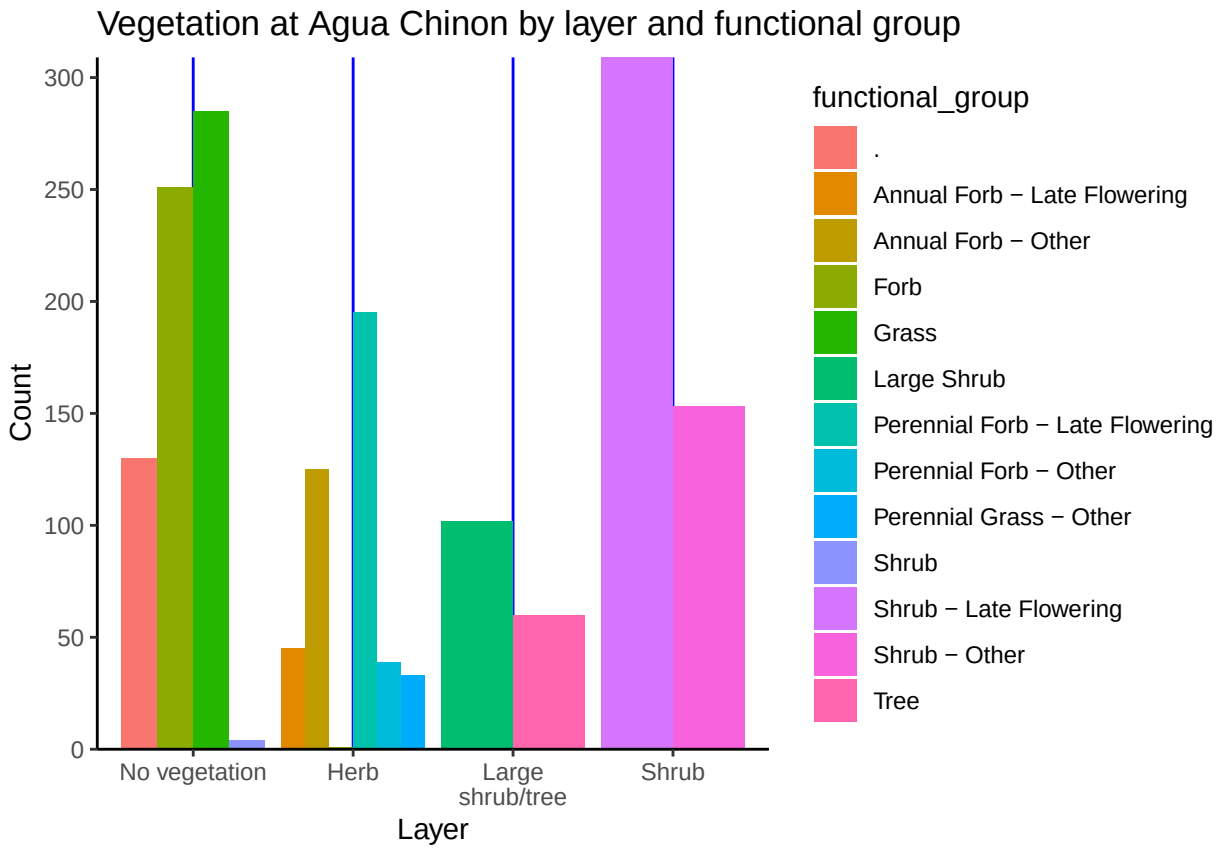


Add horizontal or vertical lines to plot

```
# Plot 3 - Add horizontal or vertical lines to plot

plot3a <- plot2b +
  theme(panel.grid.major.y = element_line(colour = "grey"))

plot3b <- plot2b +
  theme(panel.grid.major.x = element_line(colour = "blue"))

plot3a
```

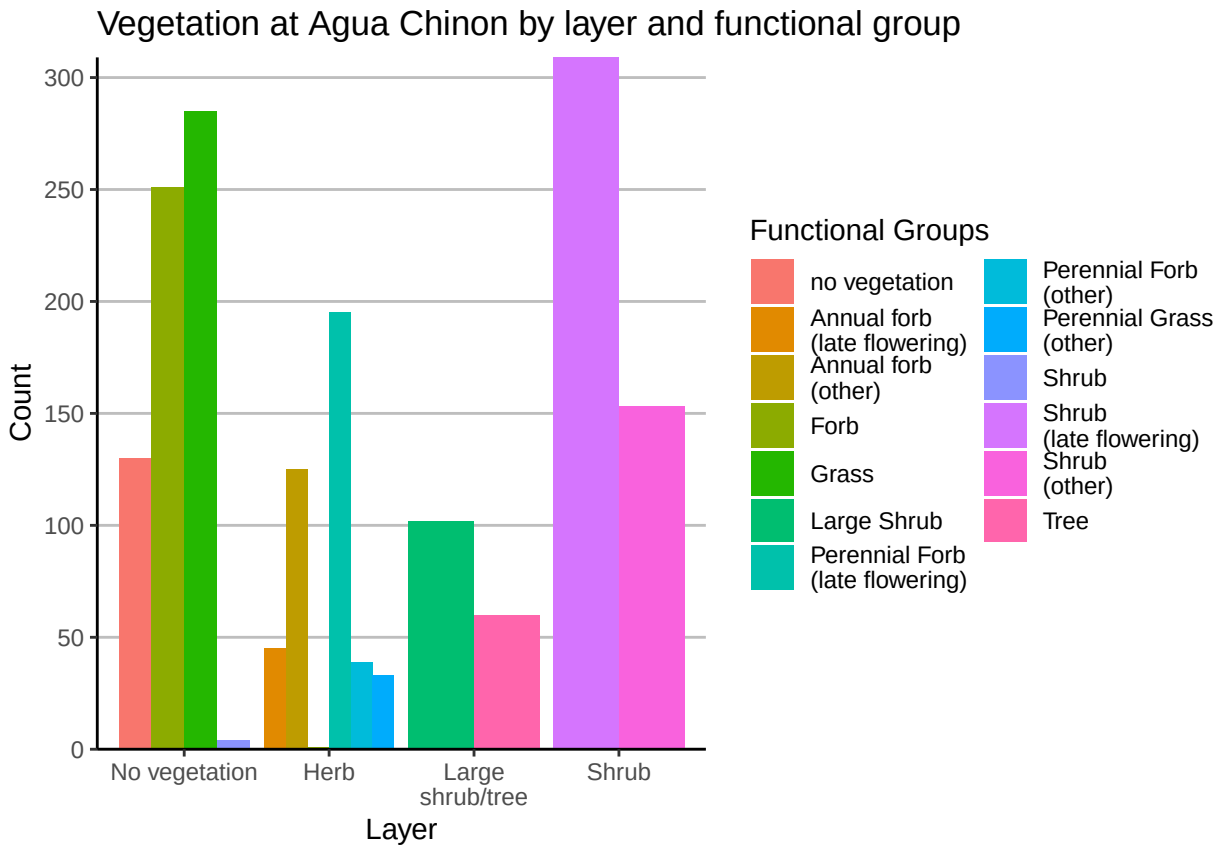

Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
functional_group
.
Annual Forb − Late Flowering
Annual Forb − Other
Forb
Grass
Large Shrub
Perennial Forb − Late Flowering
Perennial Forb − Other
Perennial Grass − Other
Shrub
Shrub − Late Flowering
Shrub − Other
Tree

```
plot3b
```



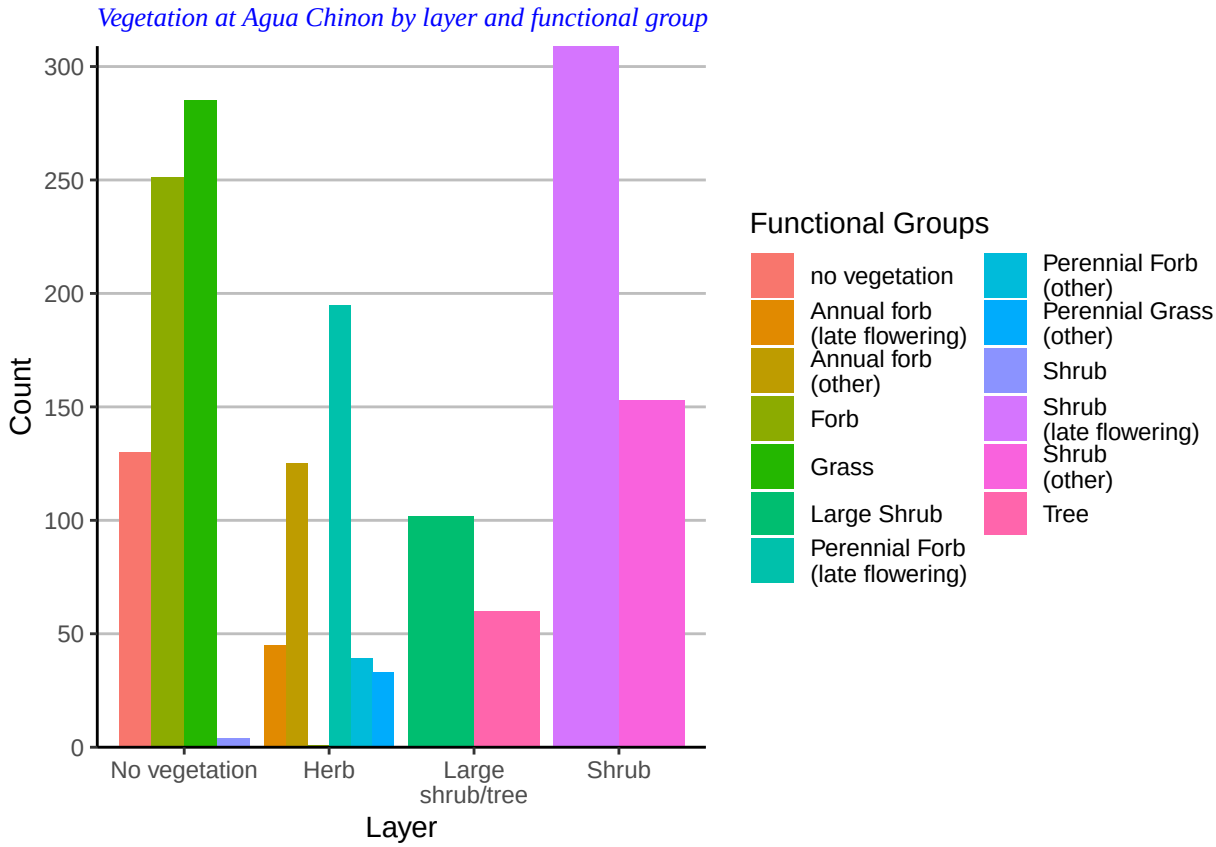
Adjust legend items fit

```
# Plot 4 - Make legend fit better

plot4 <- plot3a + scale_fill_discrete(name="Functional Groups", labels = c("no vegetation", "Annual forb
  guides(fill=guide_legend(nrow=7)) # This breaks it up into columns based on having 7 observations per

plot4
```

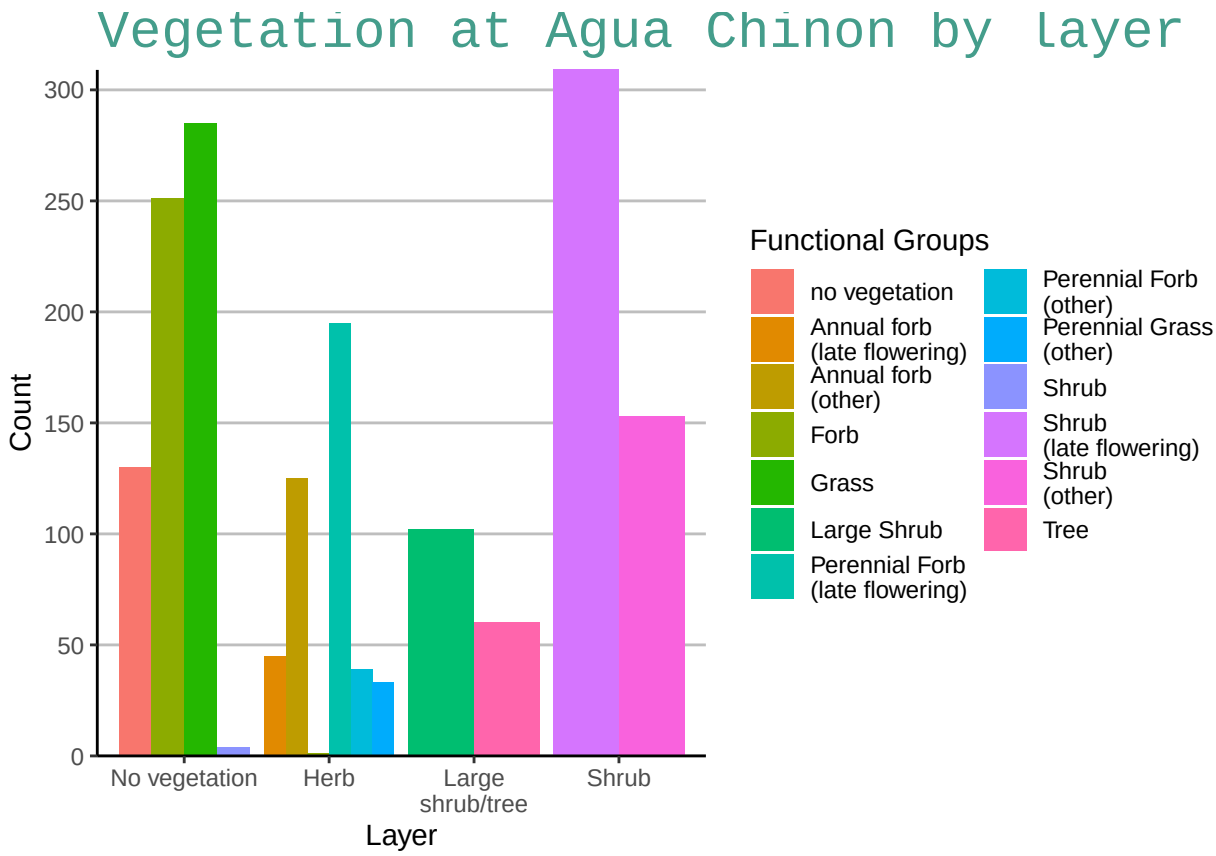


Adjust text size, color, font family, and bold/italic

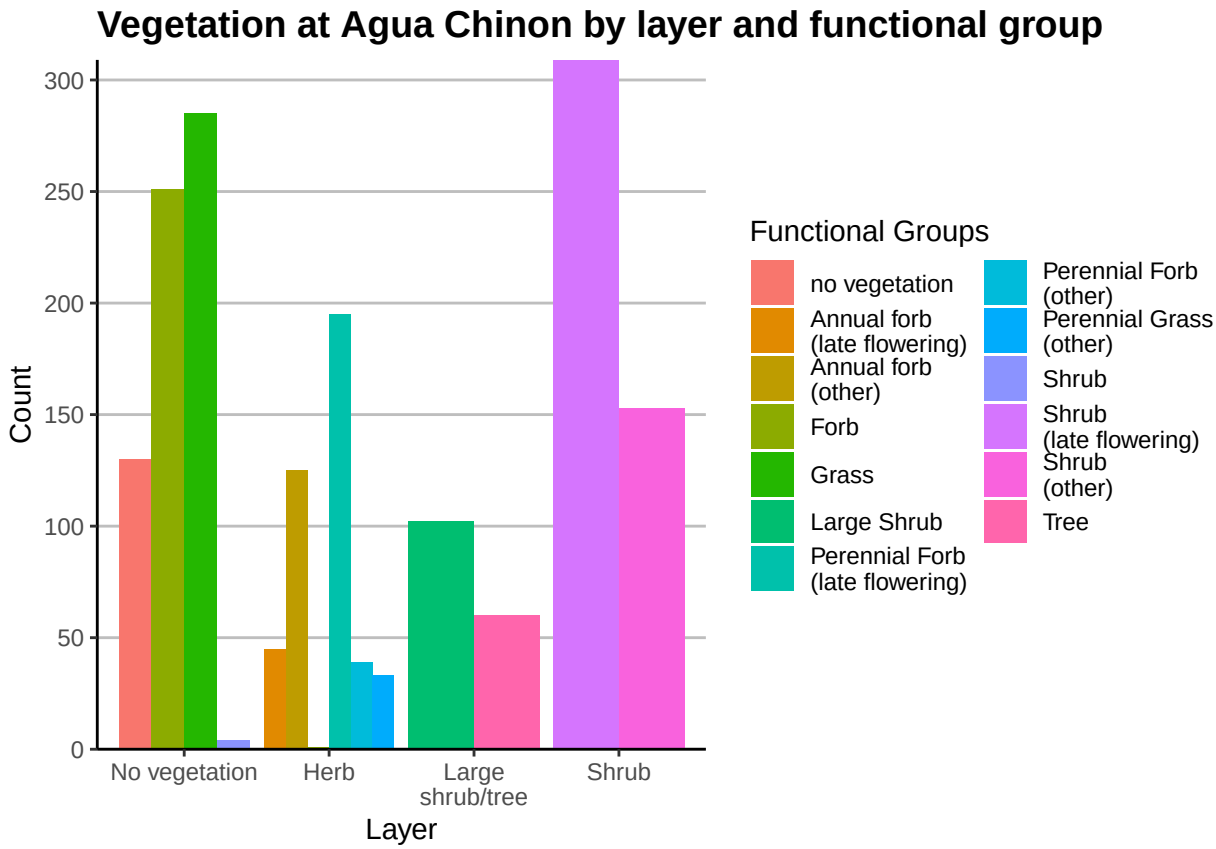
```
# Plot 5 - Adjust text size, color, font family, and bold/italic

plot5a <- plot4 +
  theme(plot.title=element_text(size = 10, color = "blue", family = "serif", face="italic"))

plot5b <- plot4 +
  theme(plot.title=element_text(size = 20, color = "#449d8b", family = "mono"))

plot5c <- plot4 +
  theme(plot.title=element_text(size = 14, family = "sans", face="bold"))

plot5d <- plot4 +
  theme(plot.title=element_text(size = 12, family = "Times"))

plot5a
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

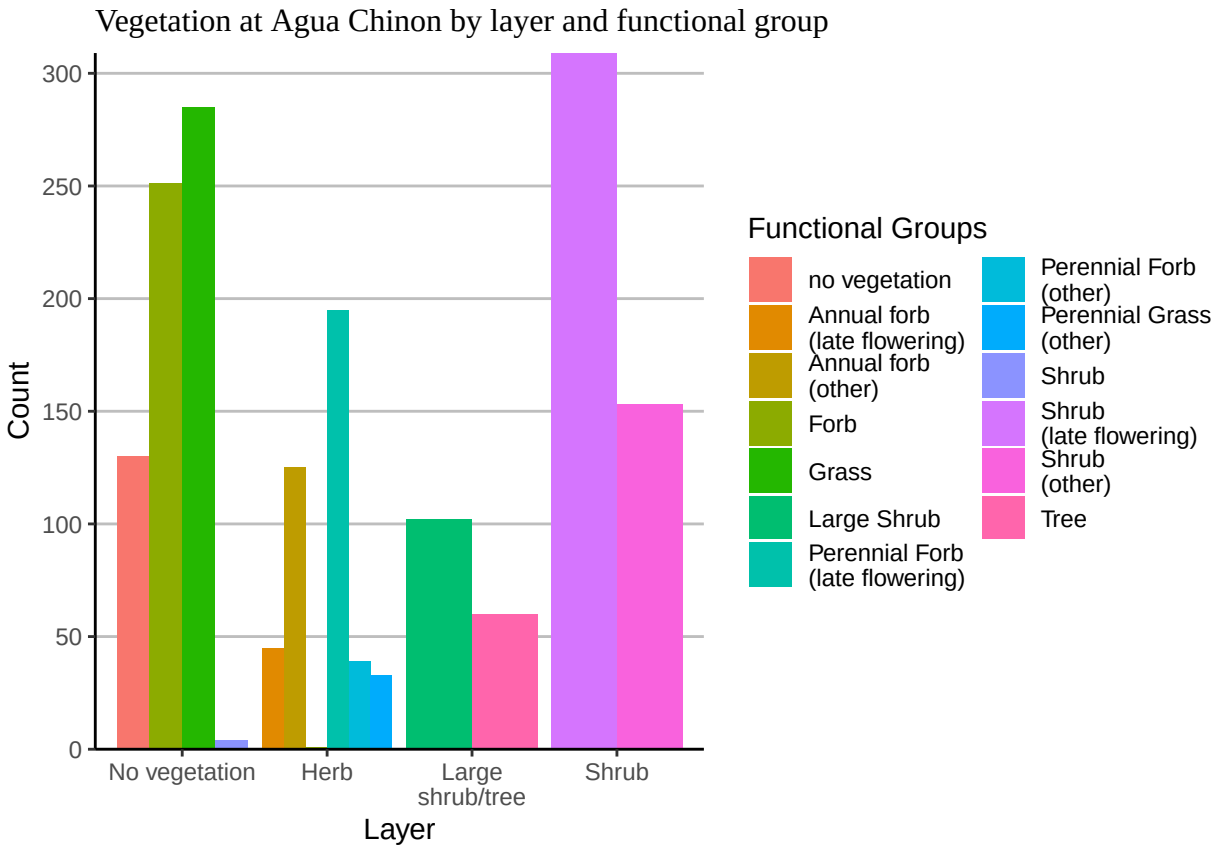
```
plot5b
```


Vegetation at Agua Chinon by layer a
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot5c
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

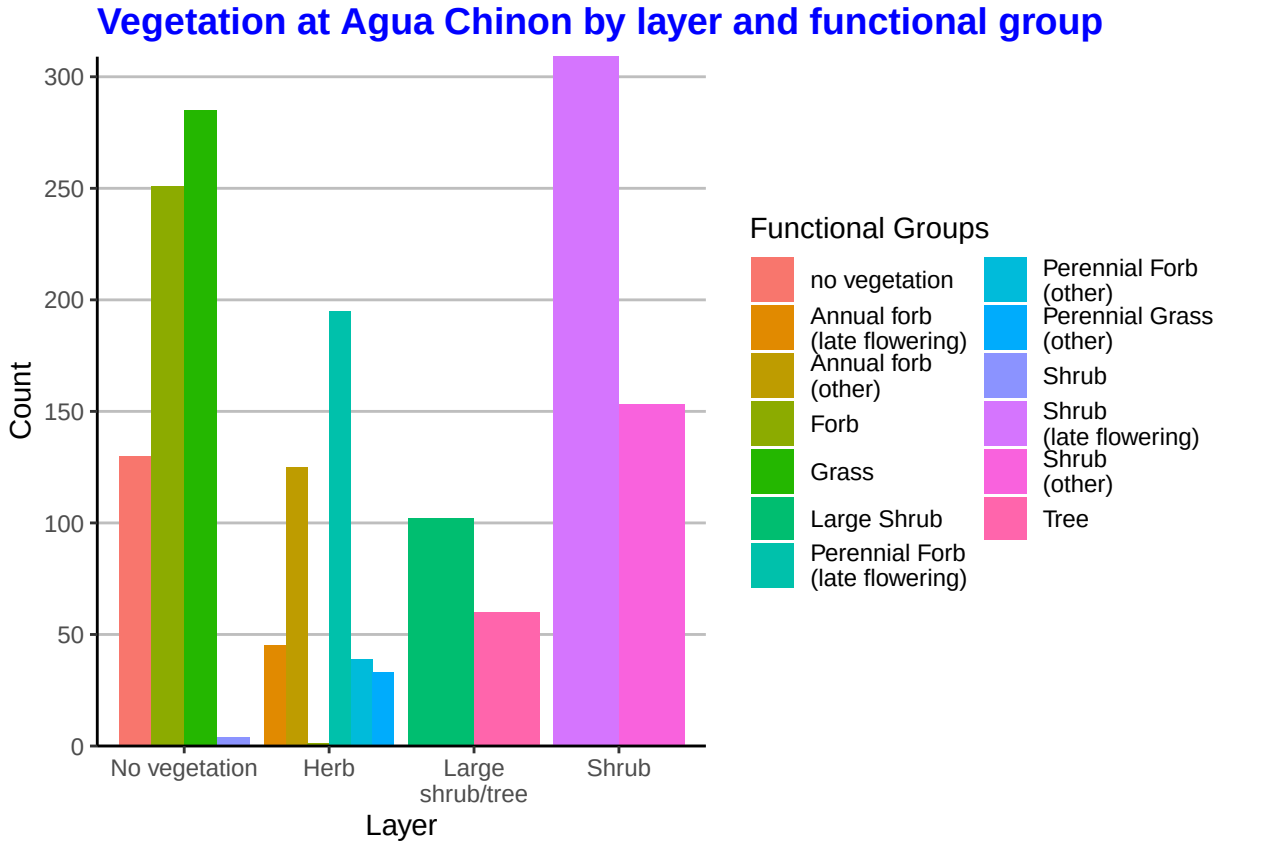
```
plot5d
```



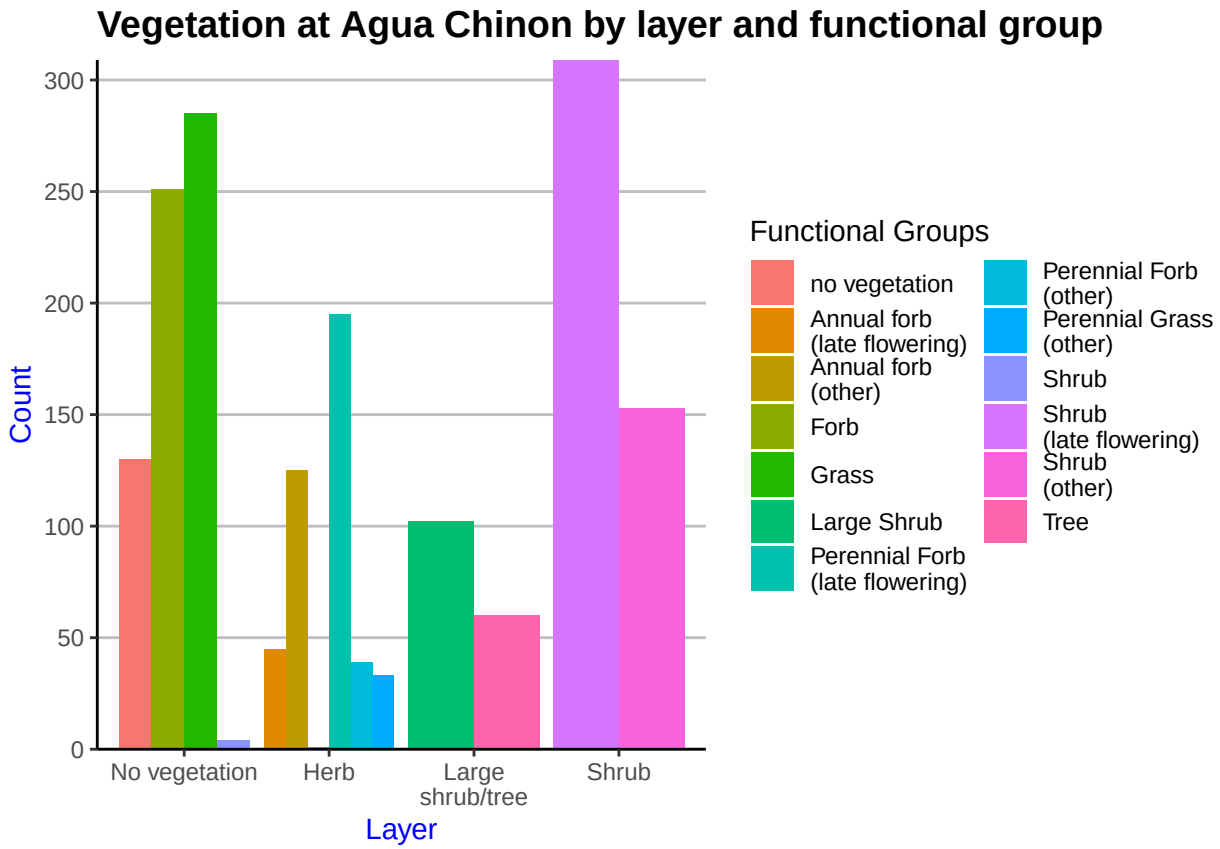
Adjust all plot text elements

```
# Plot 6 - Adjust all plot text elements

# Plot title
plot6a <- plot5c +
  theme(plot.title = element_text(color = "blue"))

# Axes titles
plot6b <- plot5c +
  theme(axis.title = element_text(color = "blue"))

plot6c <- plot5c +
  theme(axis.title.x = element_text(color = "blue"))

plot6d <- plot5c +
  theme(axis.title.y = element_text(color = "blue"))

# Axes tick marks
plot6e <- plot5c +
  theme(axis.text = element_text(color = "blue"))

plot6f <- plot5c +
  theme(axis.text.x = element_text(color = "blue"))
```

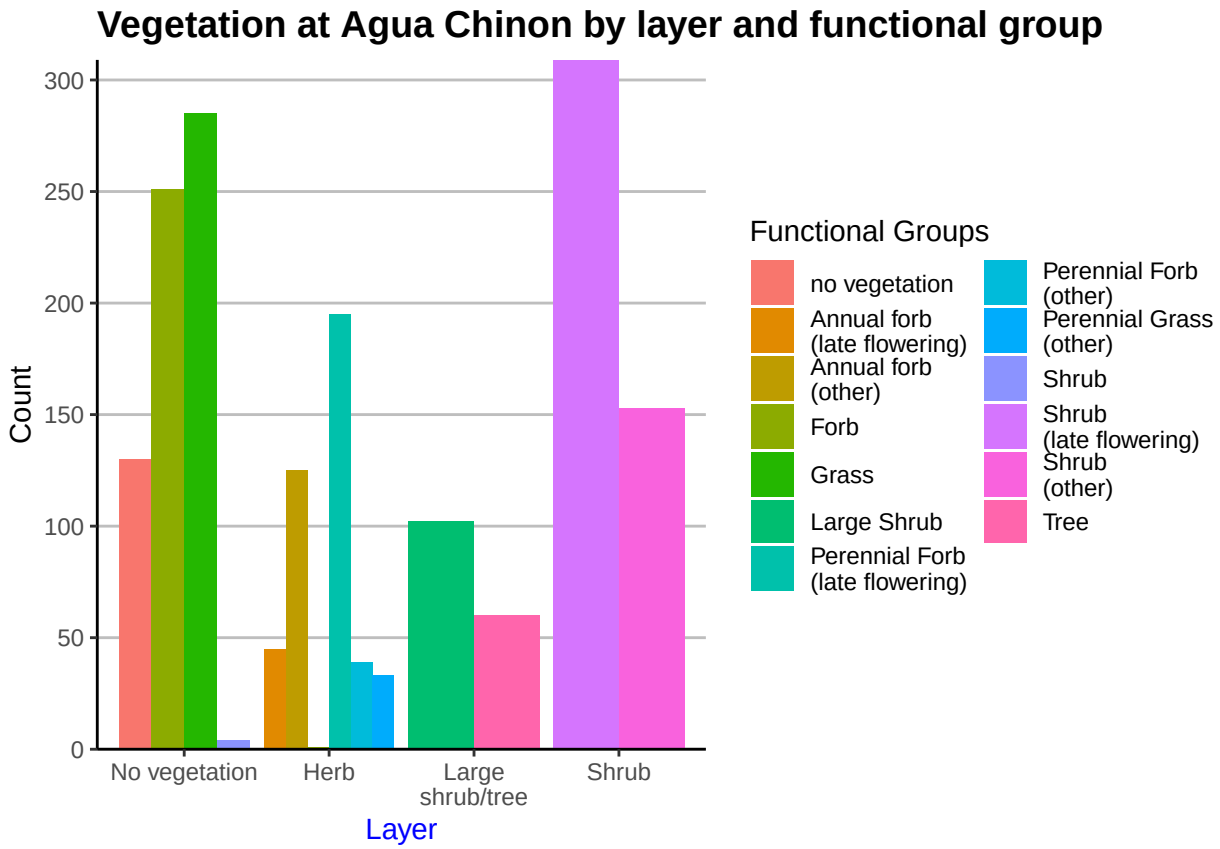
```
plot6g <- plot5c +
  theme(axis.text.y = element_text(color = "blue"))

# Legend
plot6h <- plot5c +
  theme(legend.title = element_text(color = "blue"))

plot6i <- plot5c +
  theme(legend.text = element_text(color = "blue"))

plot6a
```



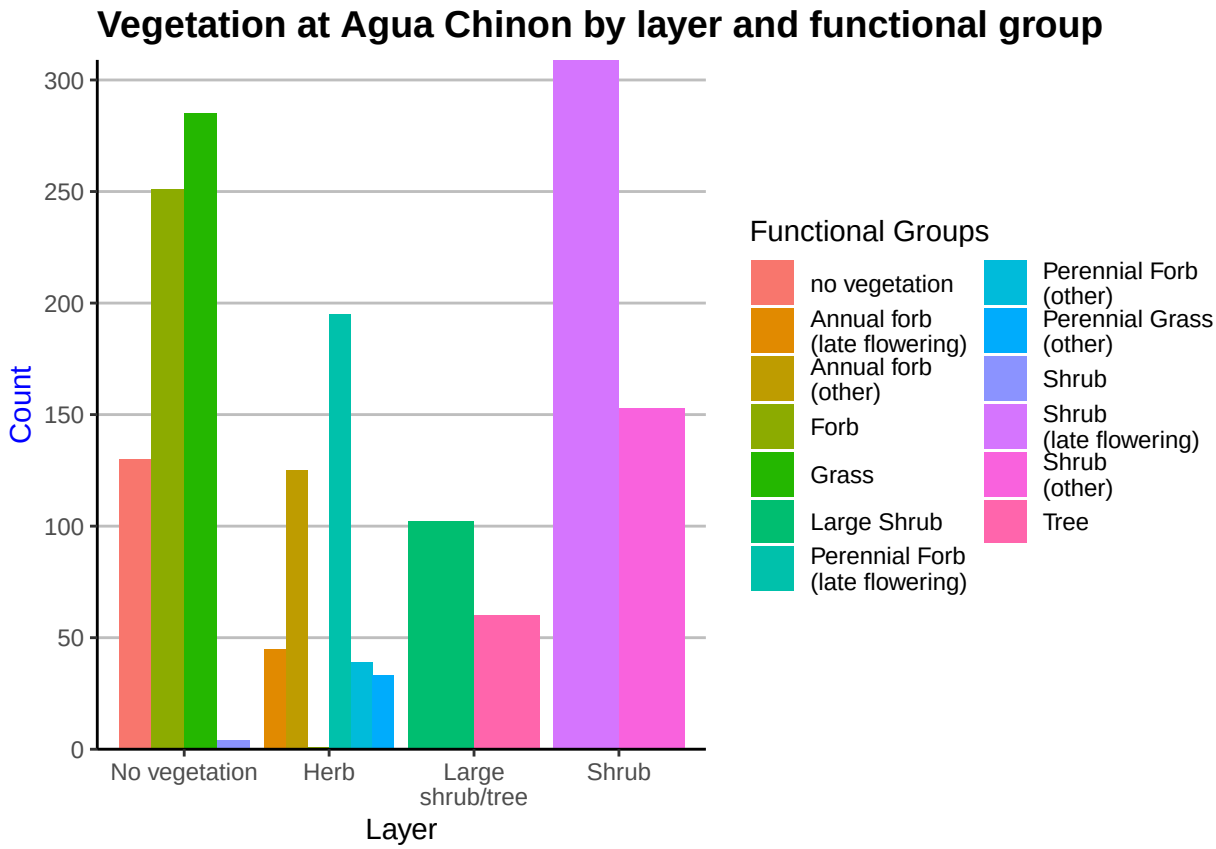

```
plot6b
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot6c
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot6d
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
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150
100
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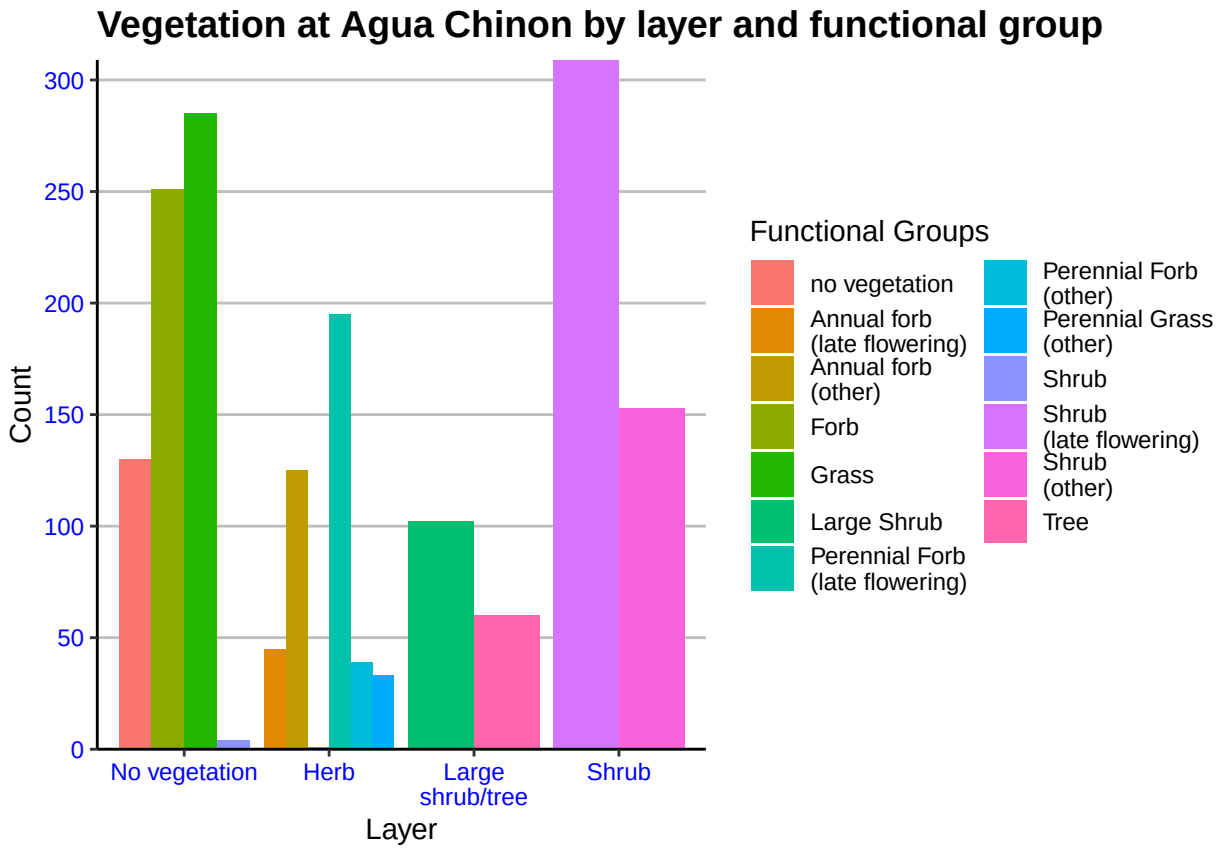
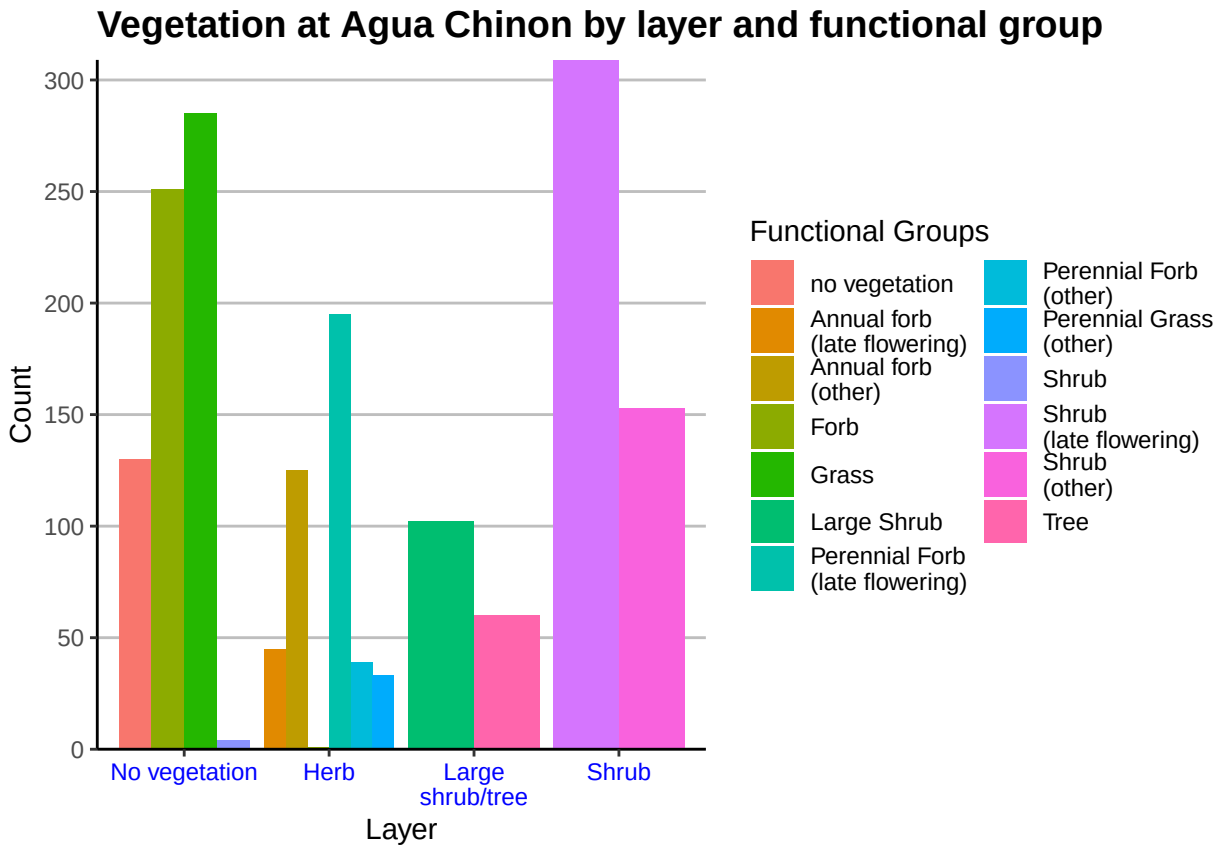
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

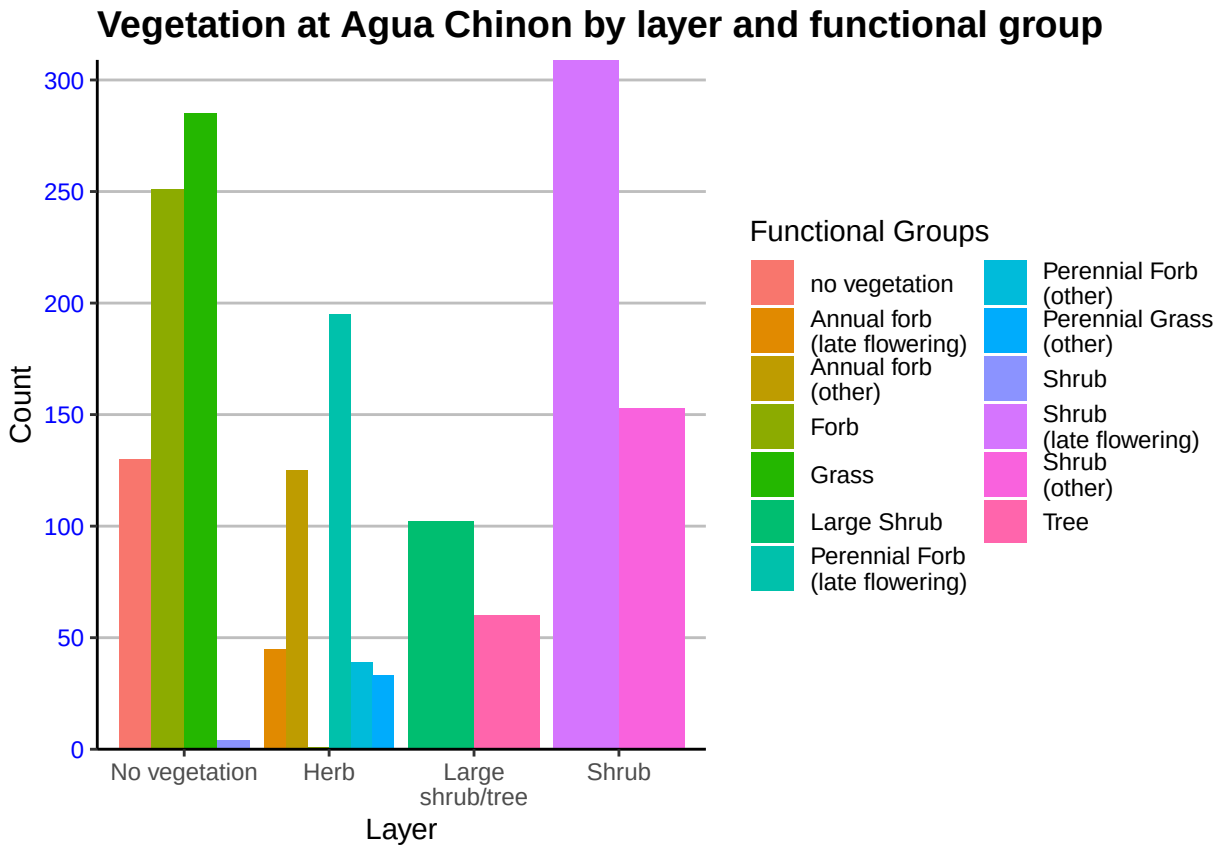
```
plot6e
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

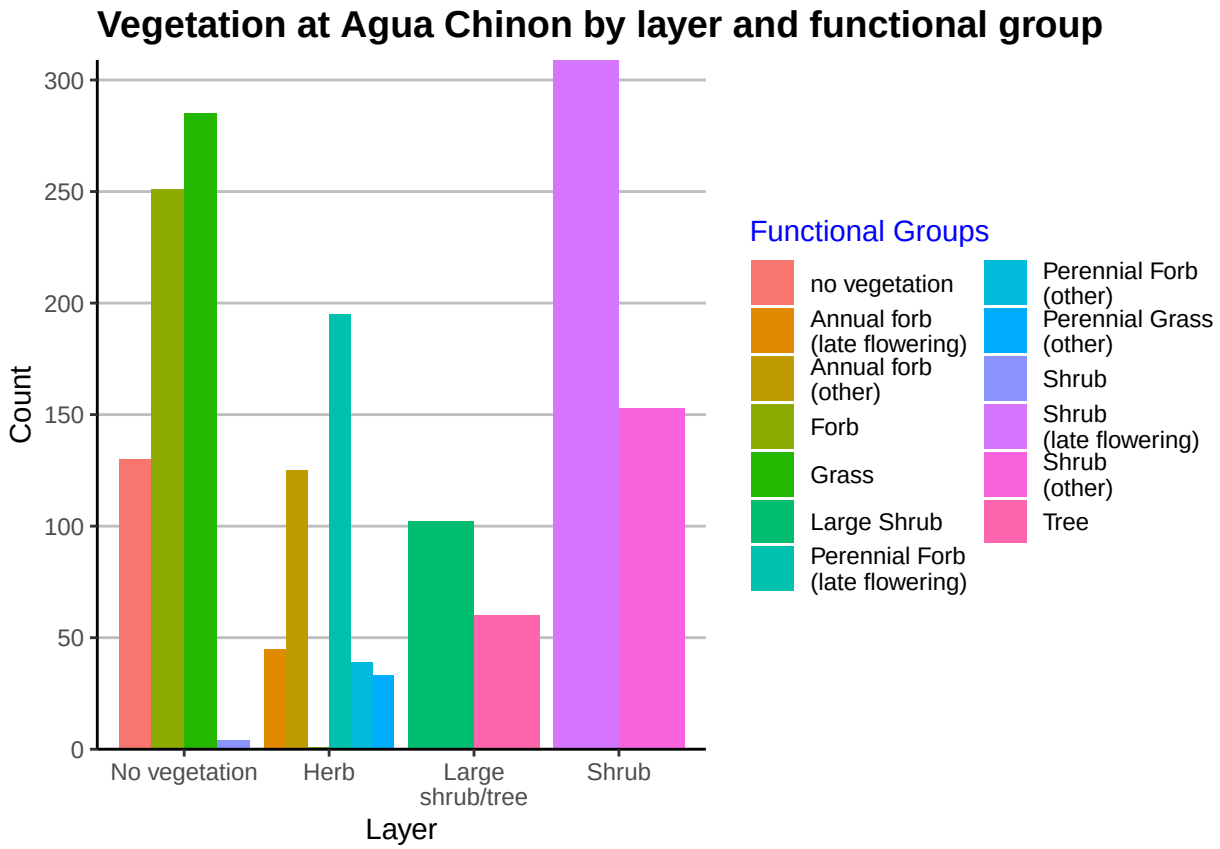
```
plot6f
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

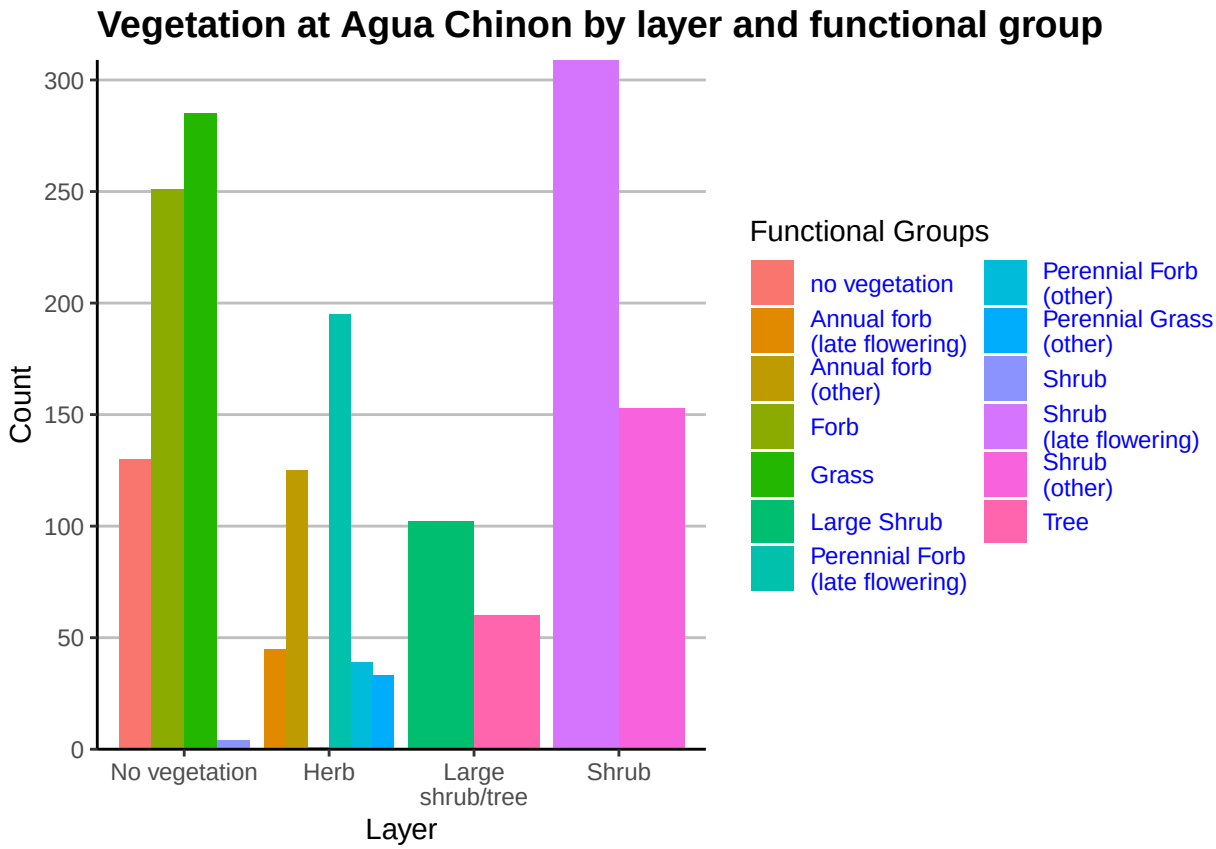
```
plot6g
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot6h
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

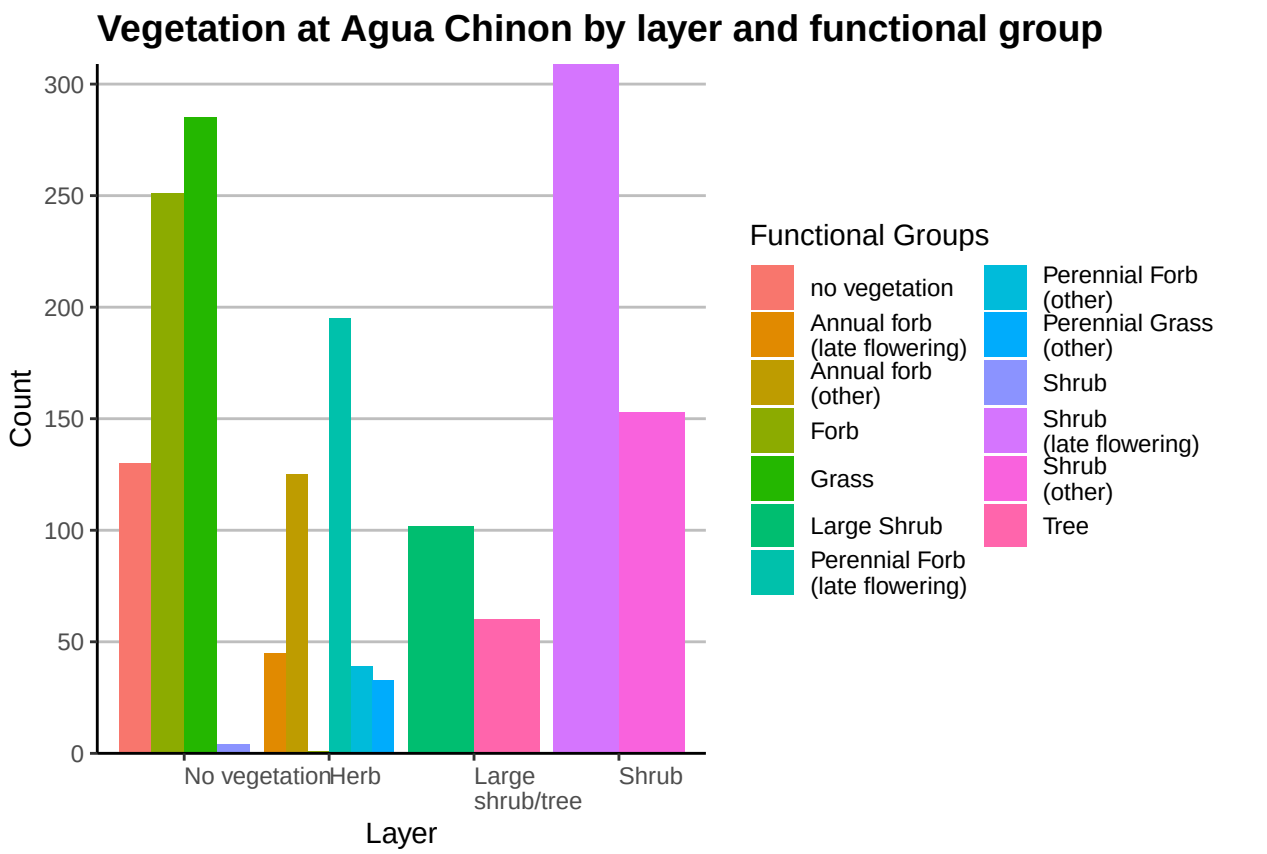
```
plot6i
```



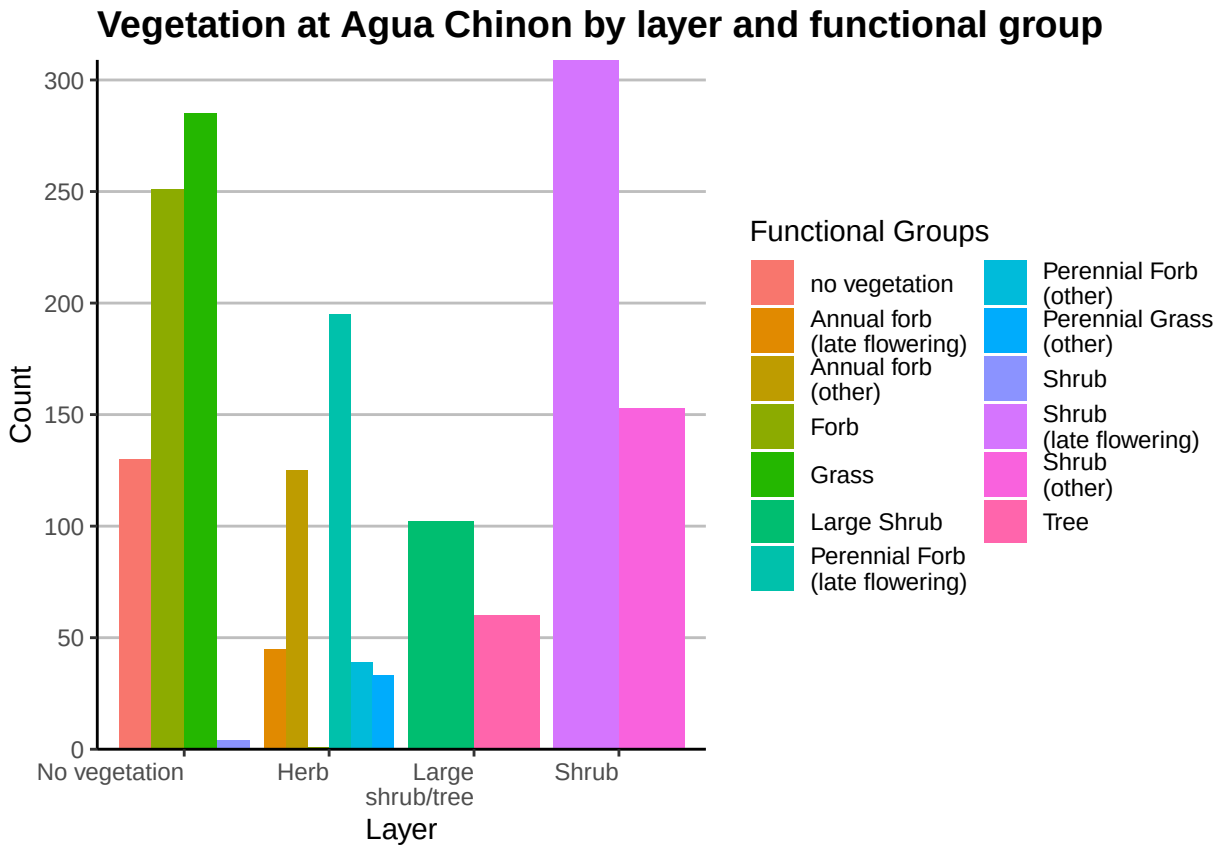
Adjust axes text position

```
# Adjust horizontal justification
plot7a <- plot5c +
  theme(axis.text.x = element_text(hjust = 0))

plot7b <- plot5c +
  theme(axis.text.x = element_text(hjust = 1))

plot7c <- plot5c +
  theme(axis.text.x = element_text(hjust = .5))

# Adjust vertical justification
plot7d <- plot5c +
  theme(axis.text.x = element_text(vjust = 0))

plot7e <- plot5c +
  theme(axis.text.x = element_text(vjust = 1))

# Adjust angle
plot7f <- plot5c +
  theme(axis.text.x = element_text(angle = 30))

plot7g <- plot5c +
  theme(axis.text.x = element_text(angle = 90))
```

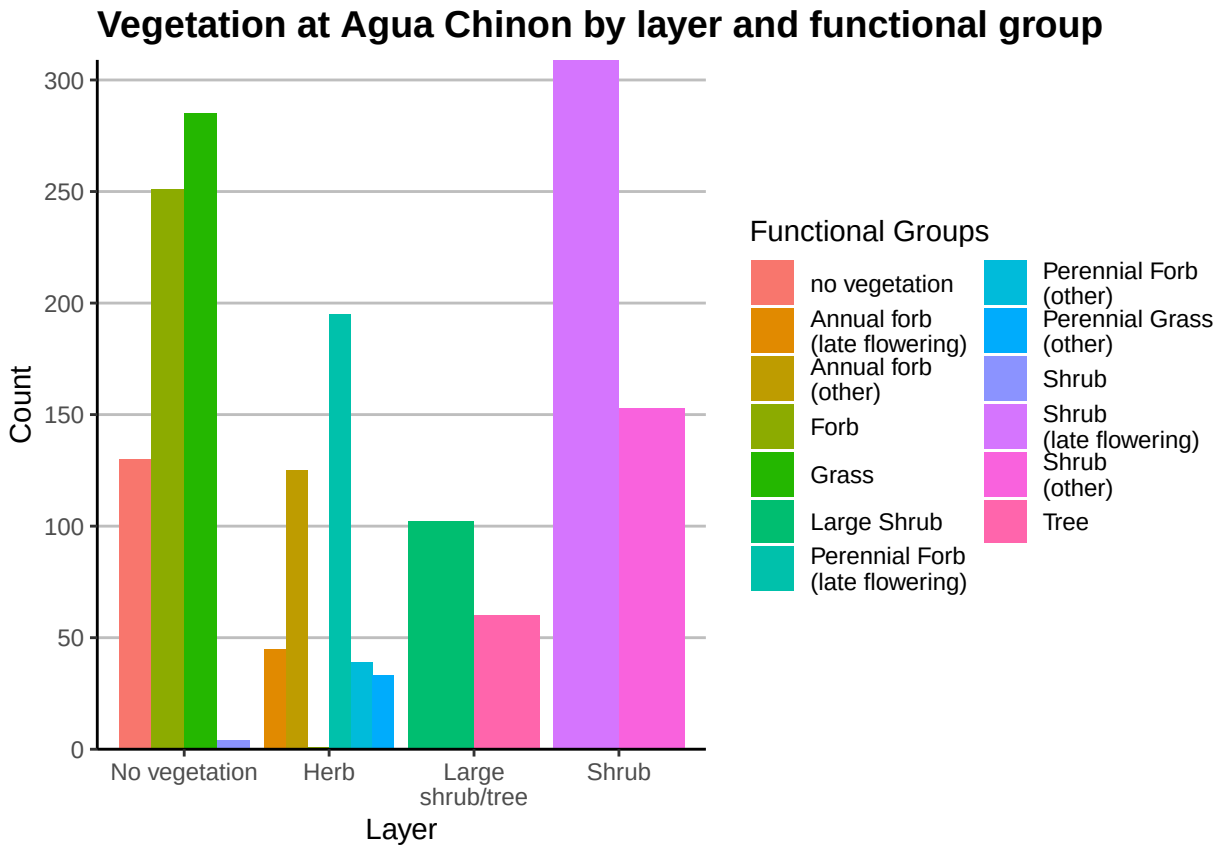
```
plot7h <- plot5c +
  theme(axis.text.x = element_text(angle = -90))


plot7i <- plot1 +
  theme(axis.text.x = element_text(angle = -90, hjust = 0, vjust = .3))

plot7a
```




```
plot7b
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot7c
```


Vegetation at Agua Chinon by layer and functional group
300
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No vegetation
Herb
Large shrub/tree
Shrub
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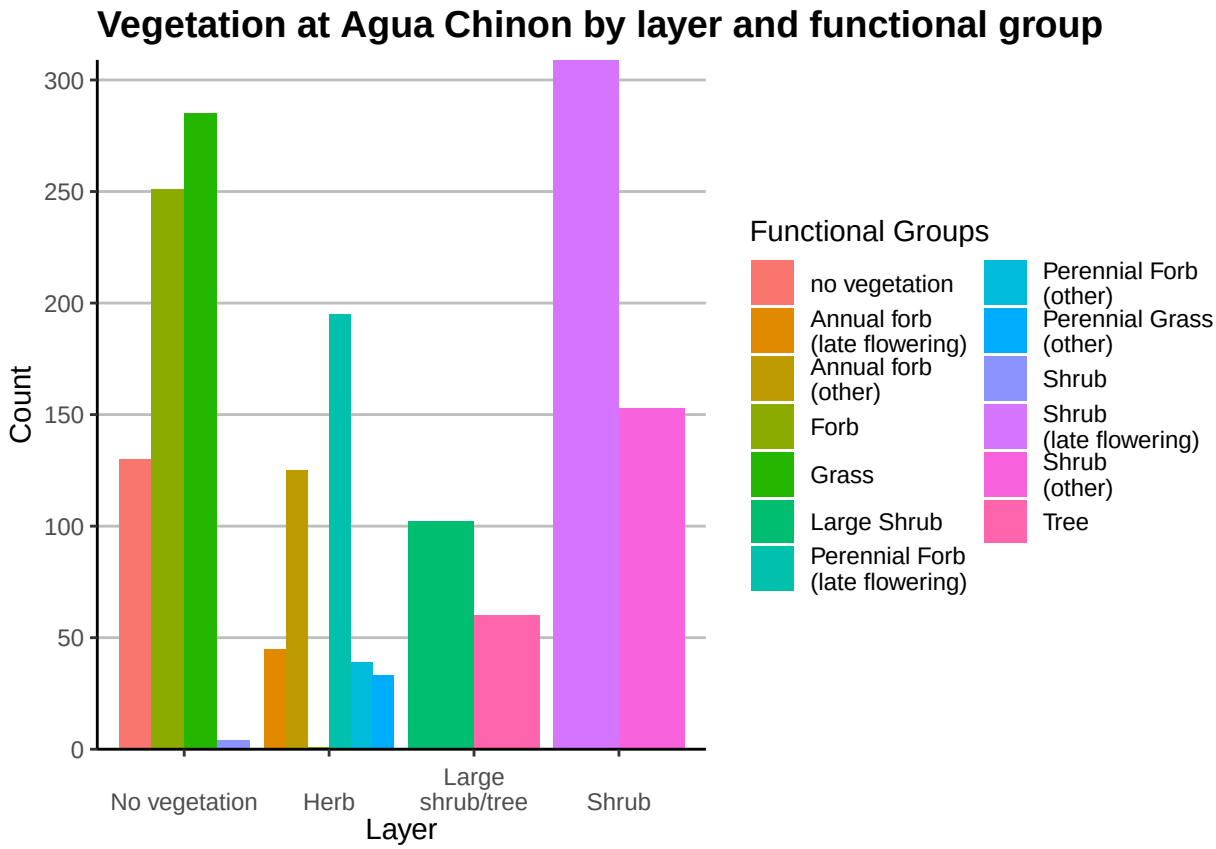
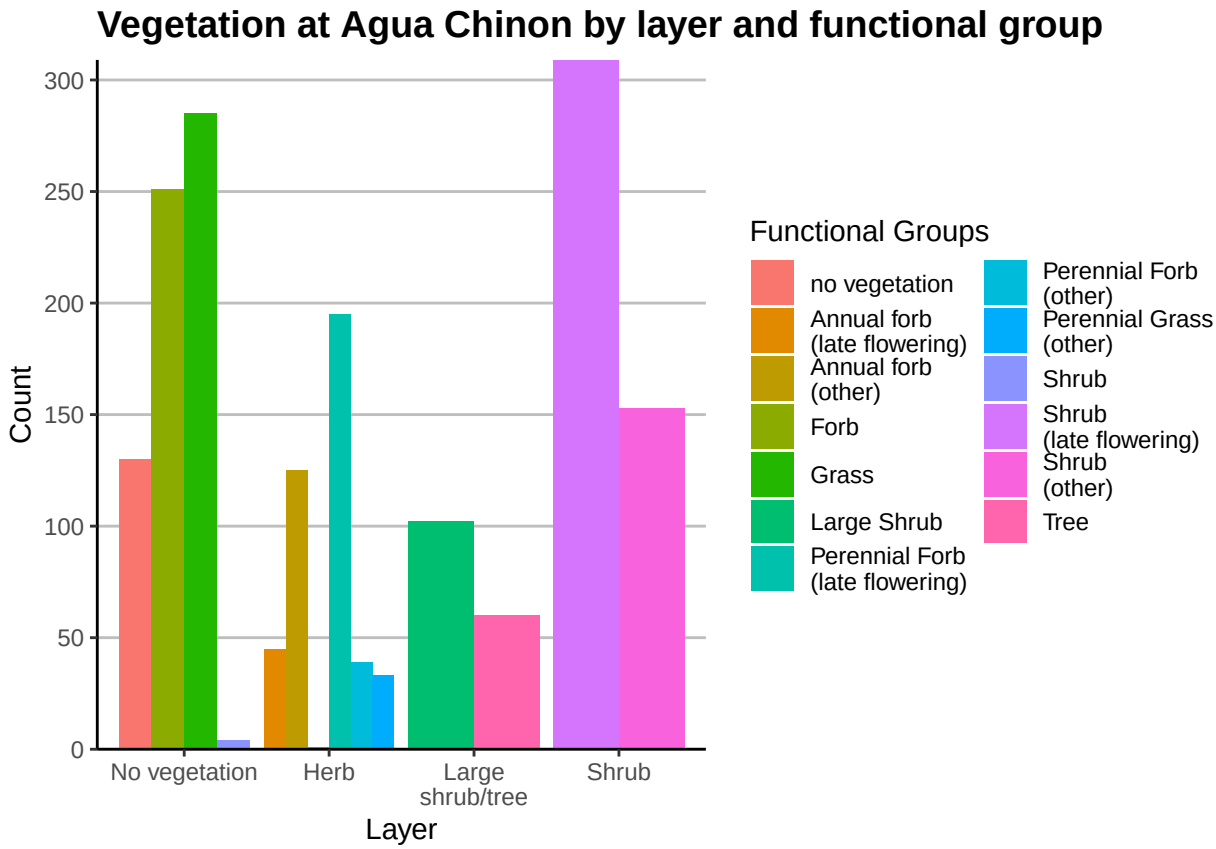
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

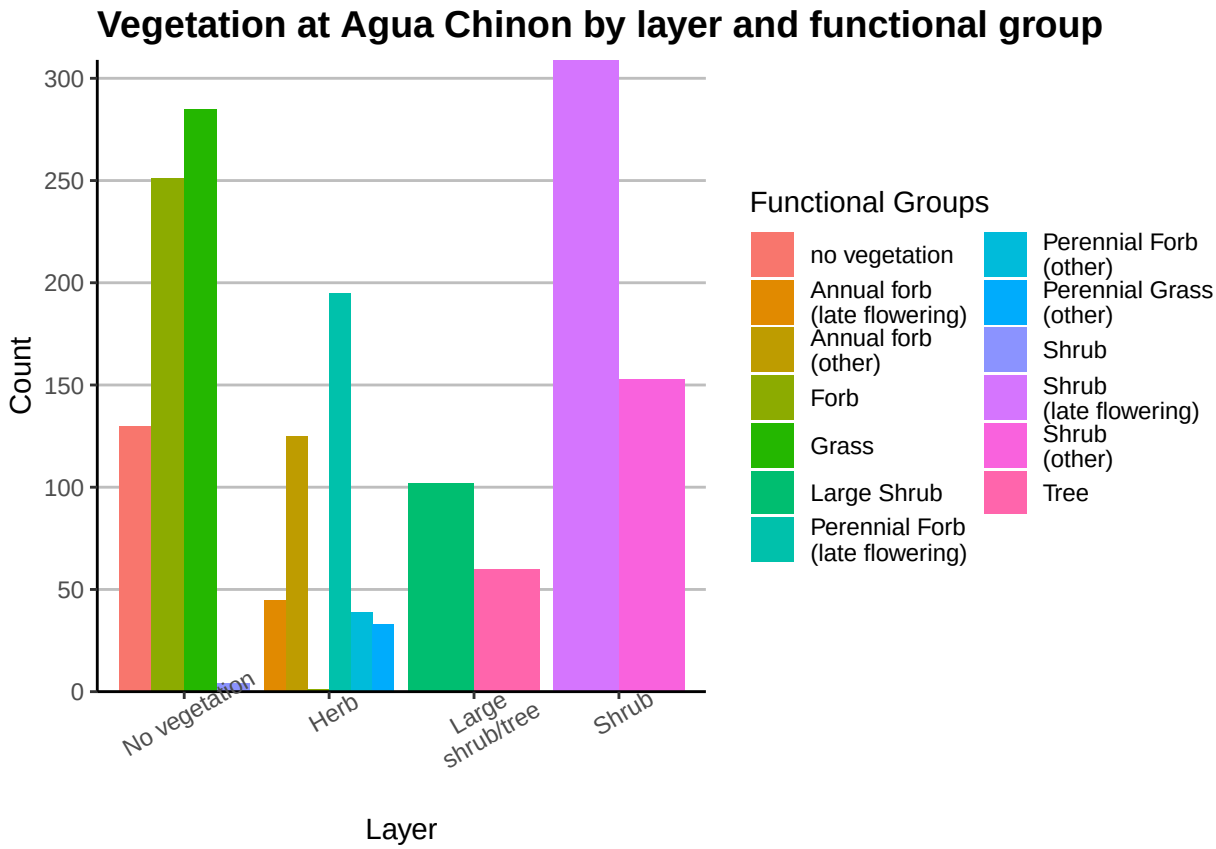
```
plot7d
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

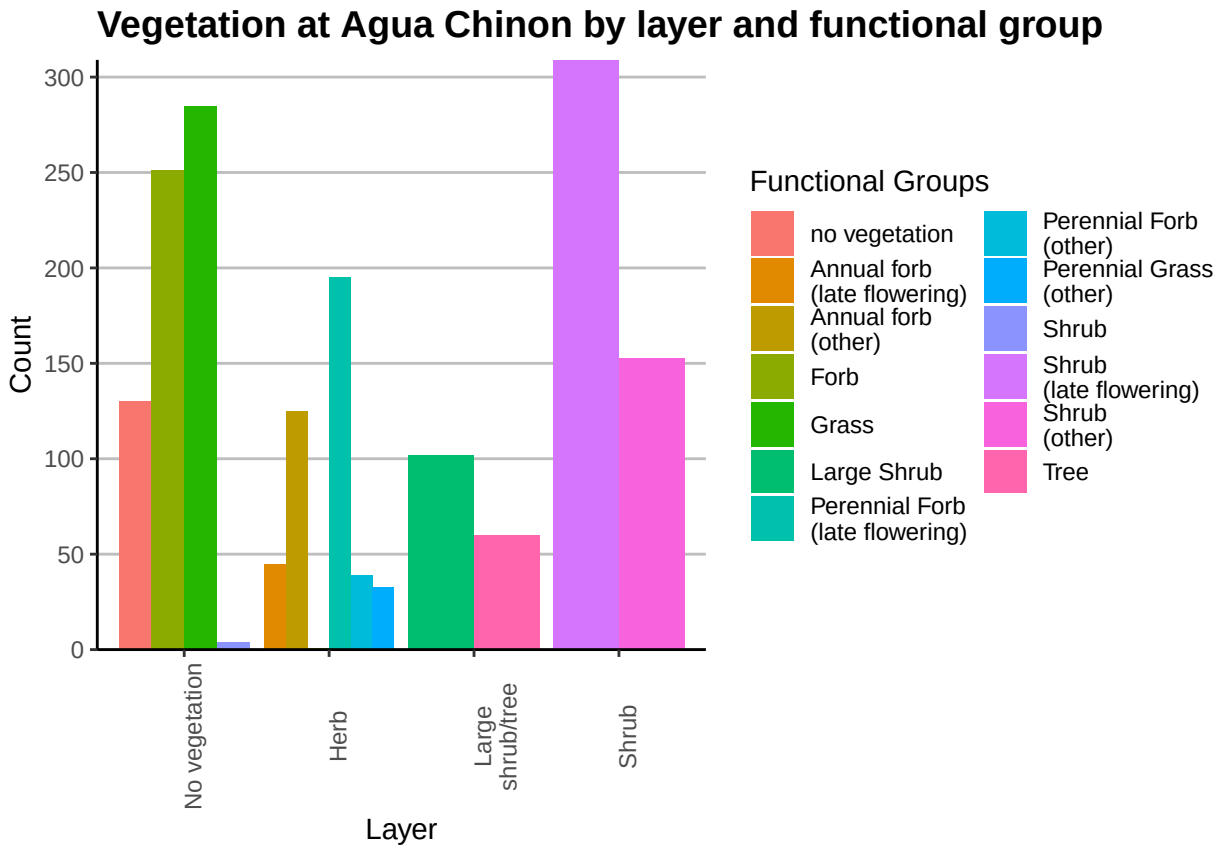
```
plot7e
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

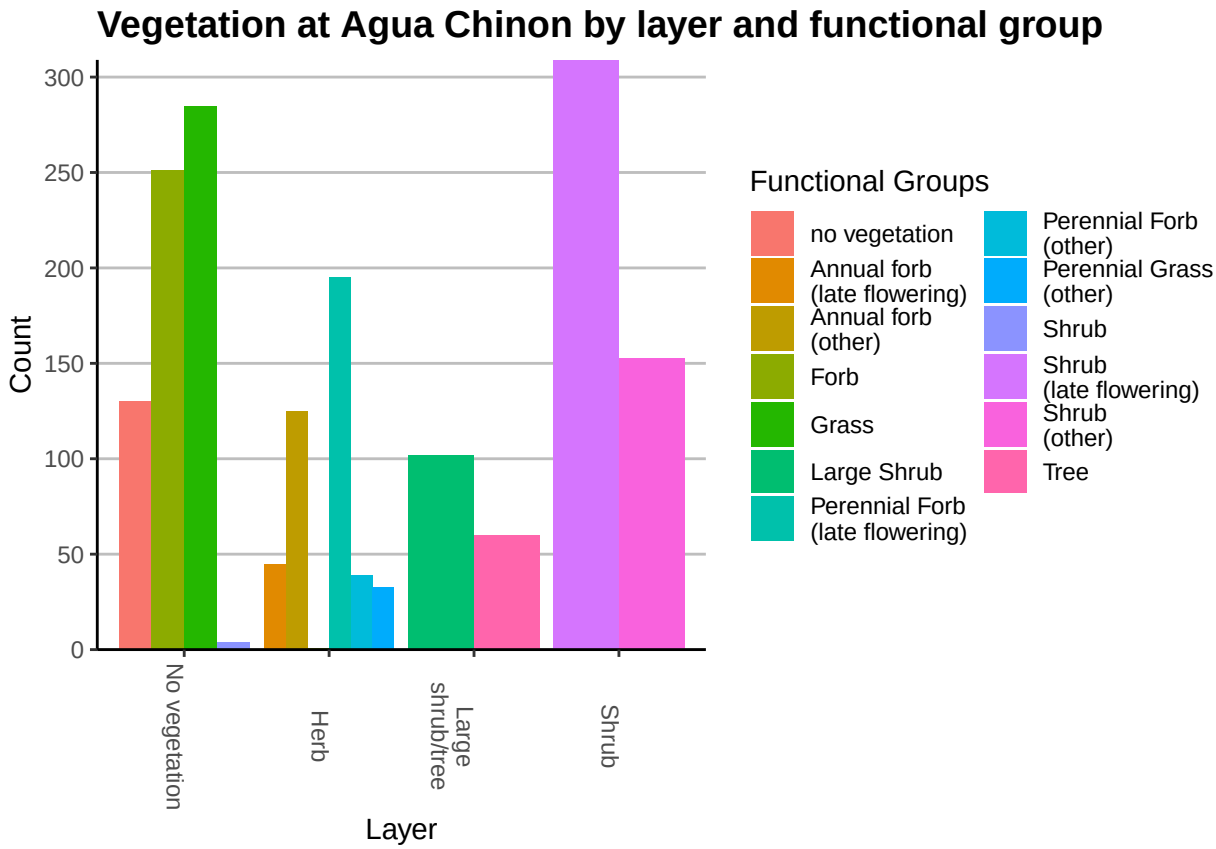
```
plot7f
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

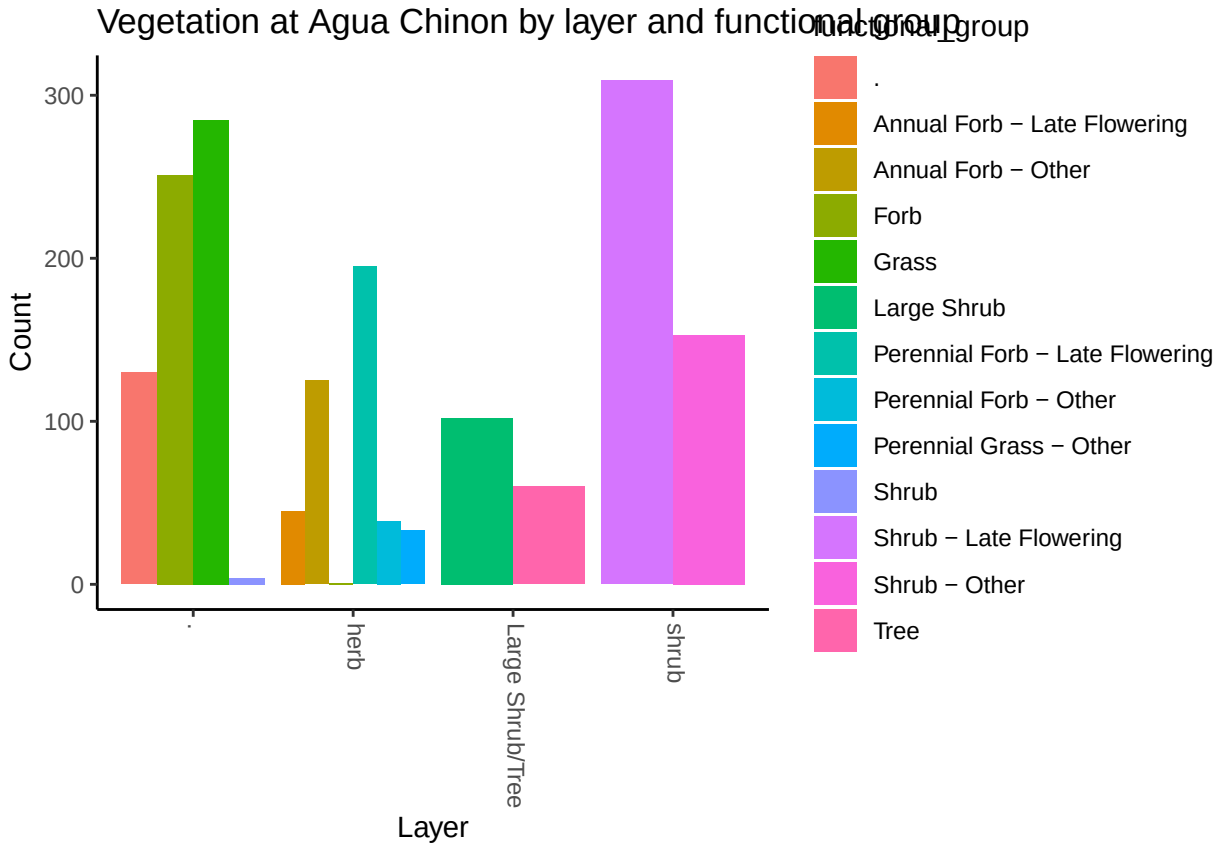
```
plot7g
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

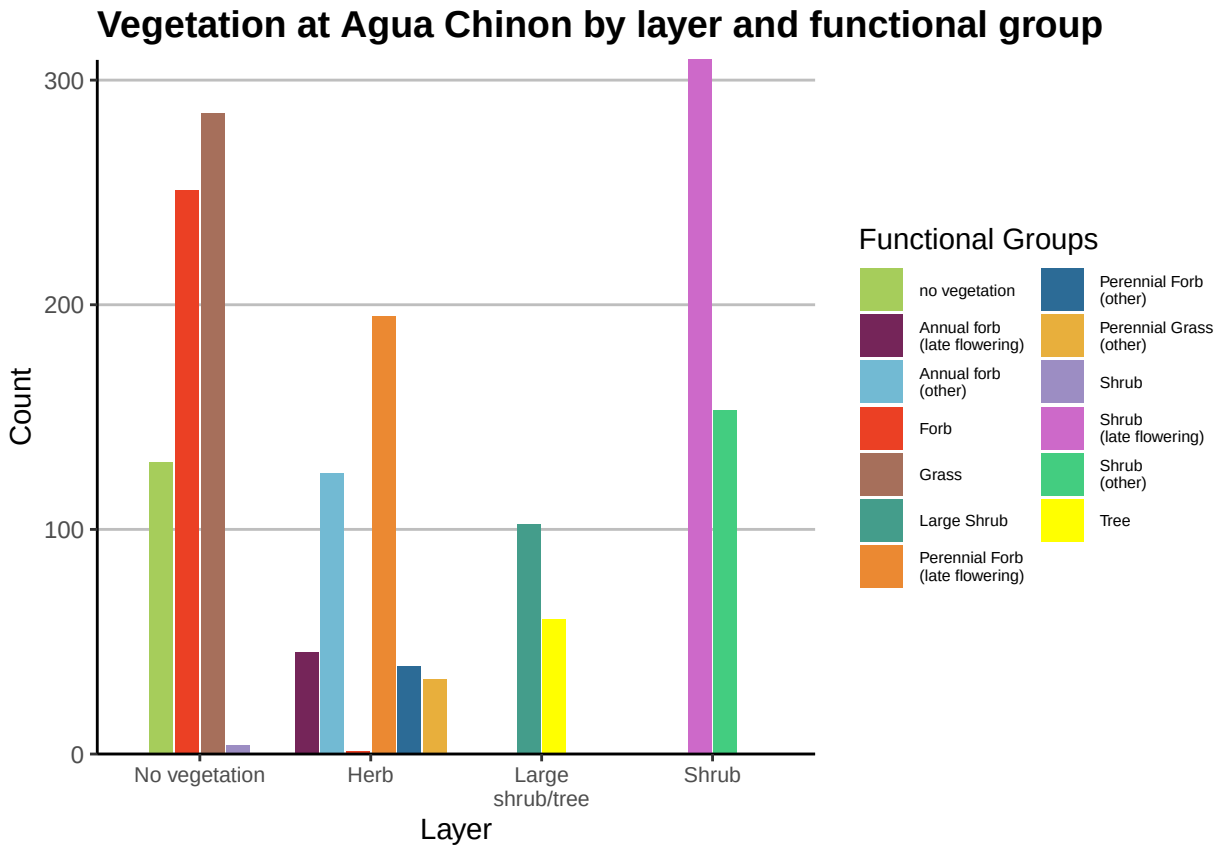
```
plot7h
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot7i
```

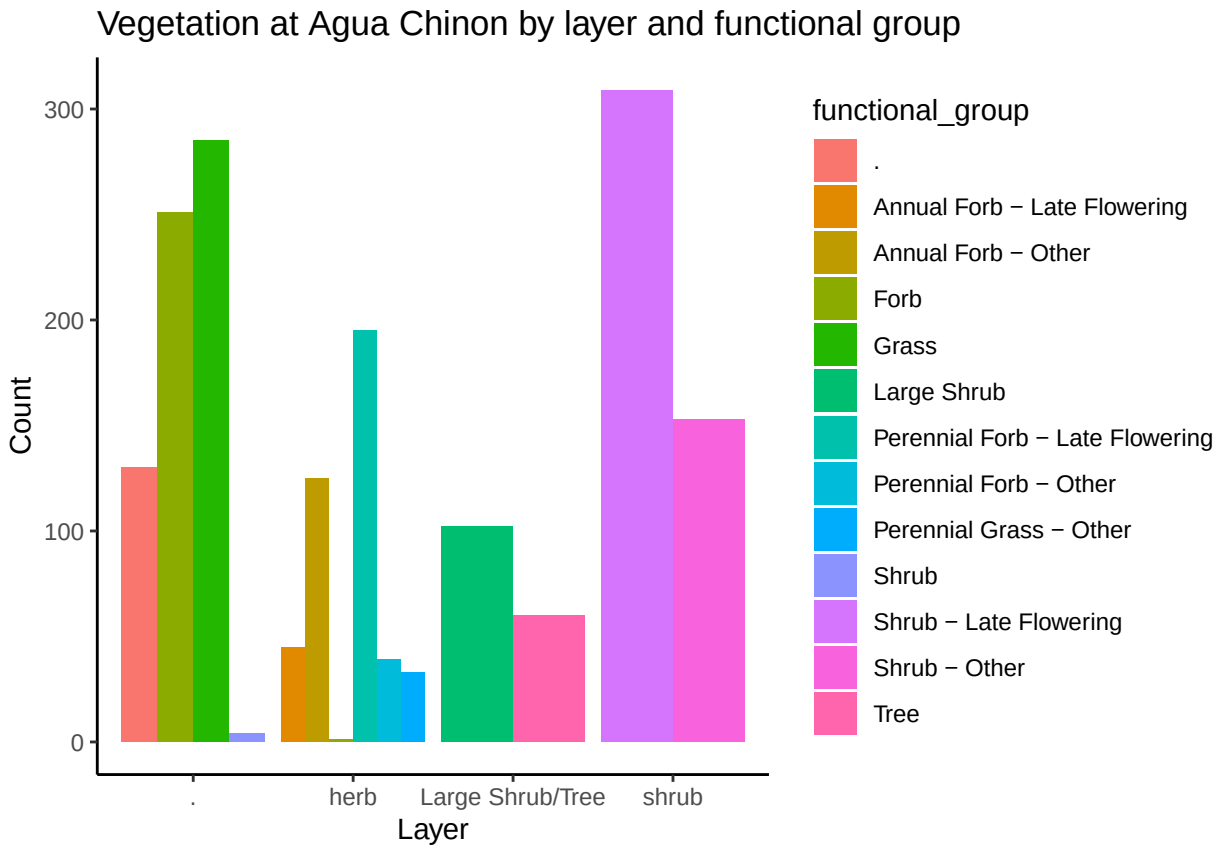



```
# Notice I added a code to even out the column width under geom bar

plot_final <- ggplot(ac_data, aes(layer, fill=functional_group)) +
  geom_bar(position = position_dodge2(width = 0.9, preserve = "single")) +
  xlab("Layer") +
  ylab("Count") +
  ggtitle("Vegetation at Agua Chinon by layer and functional group") +
  scale_x_discrete(expand=c(0.2,0), labels = c("No vegetation", "Herb", "Large\nshrub/tree", "Shrub")) +
  scale_y_continuous(expand=c(0,0)) +
  theme_classic() +
  theme(plot.title=element_text(face="bold", size = 14),
        axis.text.x = element_text(size = 8),
        legend.text = element_text(size = 6),
        panel.grid.major.y = element_line(colour = "grey"))+
  scale_fill_manual(name="Functional Groups",
                    labels = c("no vegetation", "Annual forb\n(late flowering)", "Annual forb\n(other)"
                    values = c("#a6cd5b", "#752559", "#72bad3", "#eb4024", "#a66f5b", "#449d8b", "#eb893
  guides(fill=guide_legend(nrow=7))

plot_final
```



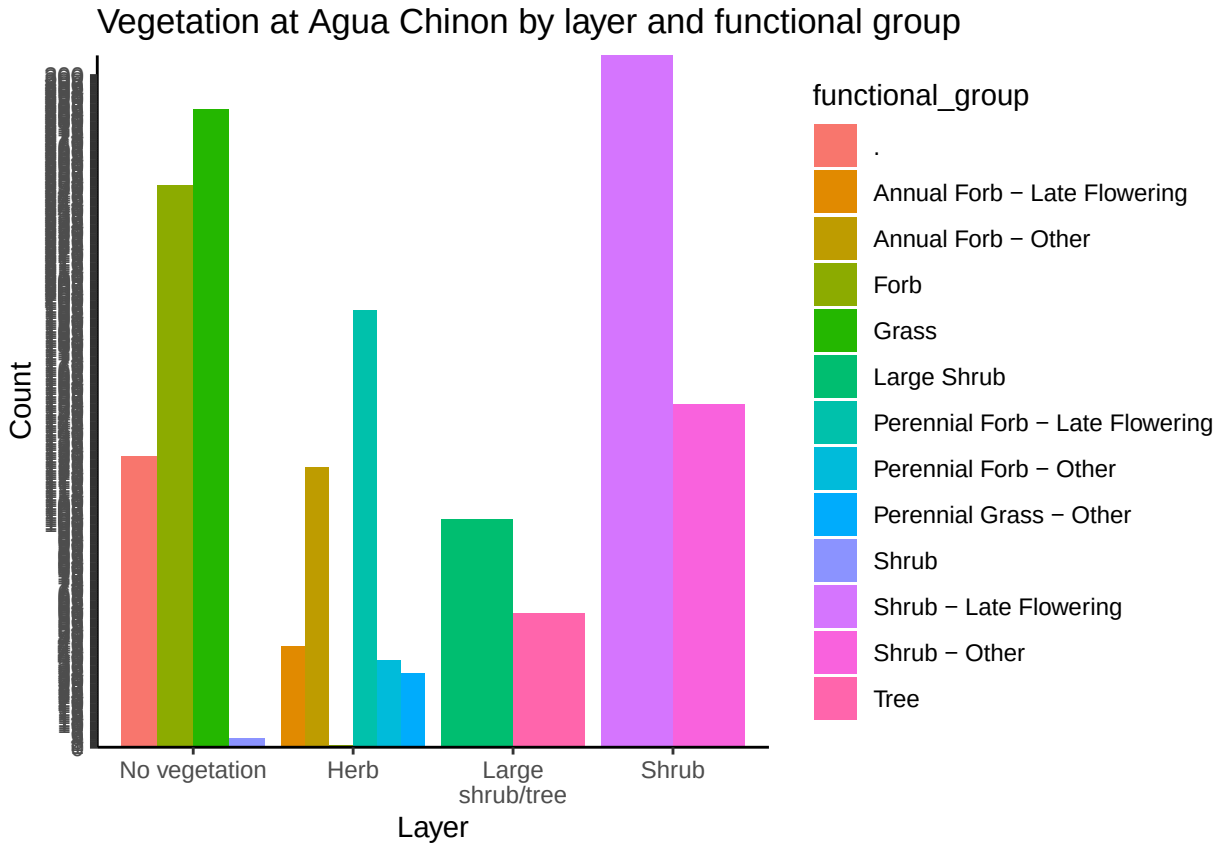
Default plot

```
# Plot 1 - default plot plus titles and axis labels
plot1 <- ggplot(ac_data, aes(layer, fill=functional_group)) +
  geom_bar(position="dodge") +
  xlab("Layer") +
  ylab("Count") +
  ggtitle("Vegetation at Agua Chinon by layer and functional group") +
  theme_classic()

plot1
```

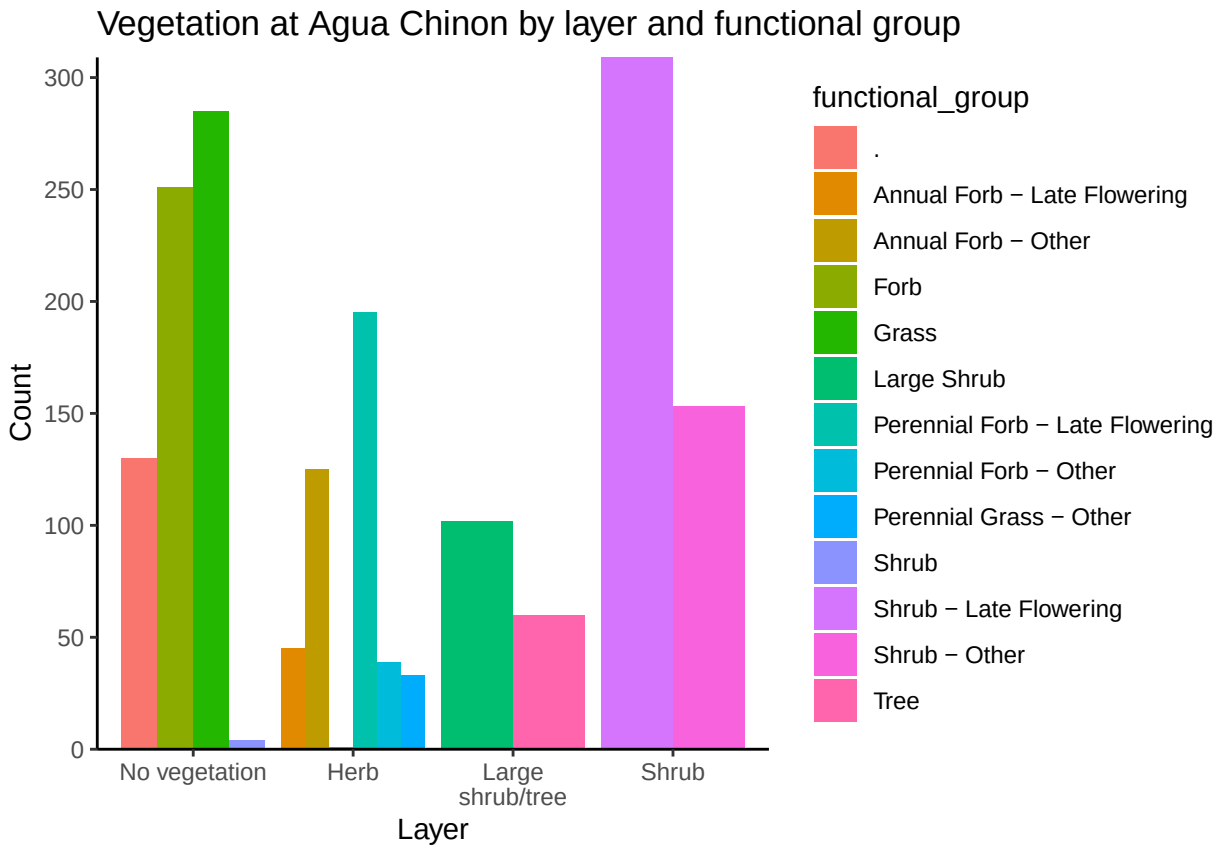


Adjust axes position and tick mark labels

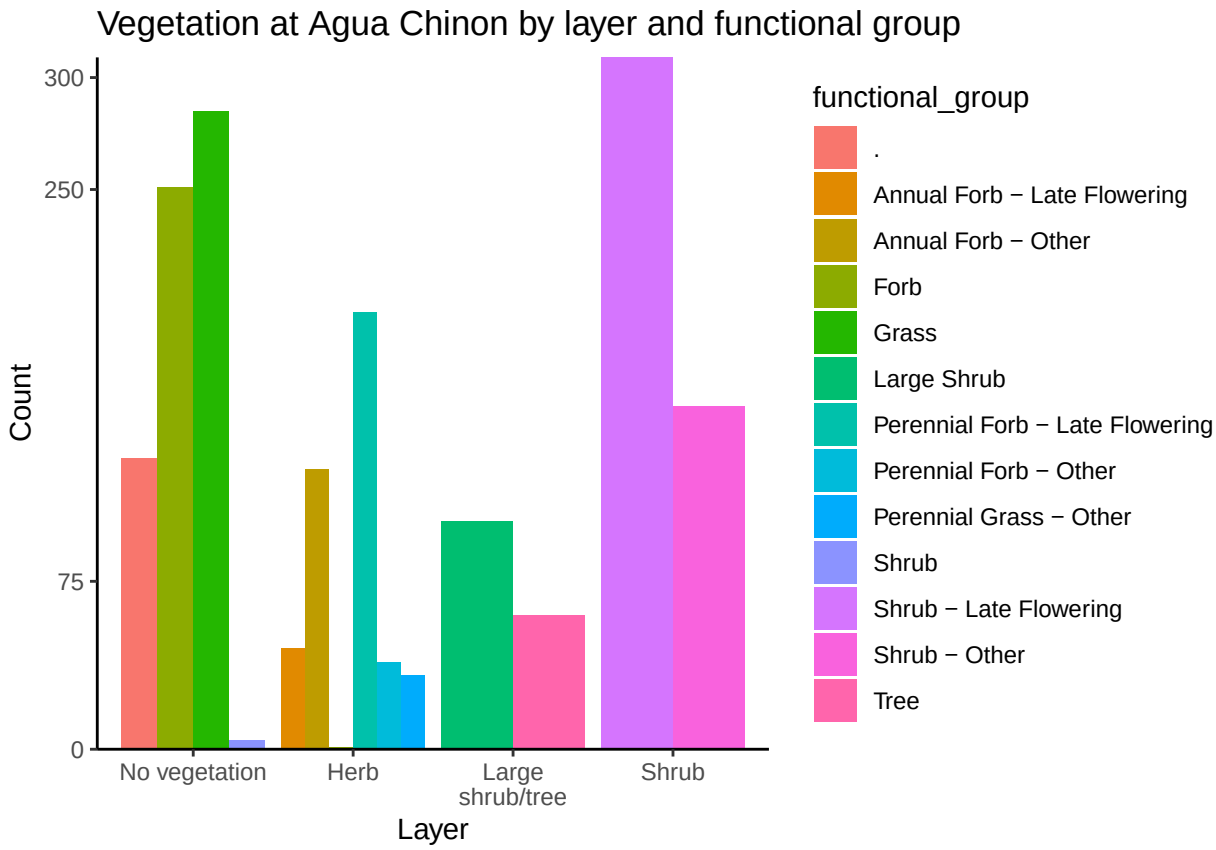
```
# Plot 2 - Use scale x/y discrete/continuous to adjust where the x and y axis lay in relation to the da

# Show every tick mark from 0 - 300
plot2a <- plot1 +
  scale_x_discrete(expand=c(0.2,0), labels = c("No vegetation", "Herb", "Large\nshrub/tree", "Shrub")) +
  scale_y_continuous(expand=c(0,0), breaks = 0:300)

# Use a predefined sequence and range for tick marks
plot2b <- plot1 +
  scale_x_discrete(expand=c(0.2,0), labels = c("No vegetation", "Herb", "Large\nshrub/tree", "Shrub")) +
  scale_y_continuous(expand=c(0,0), breaks=seq(0, 350, by = 50))

# Define sequence manually
plot2c <- plot1 +
  scale_x_discrete(expand=c(0.2,0), labels = c("No vegetation", "Herb", "Large\nshrub/tree", "Shrub")) +
  scale_y_continuous(expand=c(0,0), breaks=c(0, 75, 250, 300))

plot2a
```


Vegetation at Agua Chinon by layer and functional group
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
functional_group
.
Annual Forb − Late Flowering
Annual Forb − Other
Forb
Grass
Large Shrub
Perennial Forb − Late Flowering
Perennial Forb − Other
Perennial Grass − Other
Shrub
Shrub − Late Flowering
Shrub − Other
Tree

```
plot2b
```

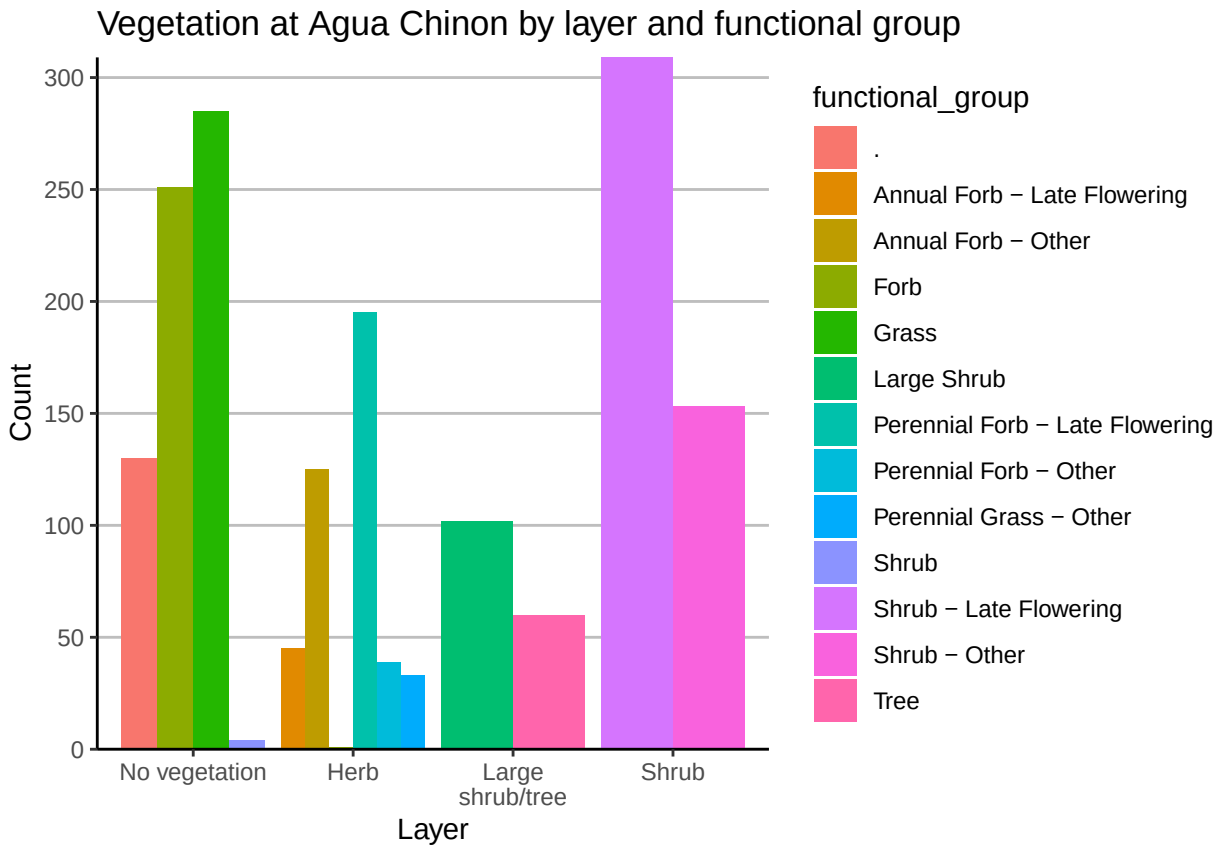

Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
functional_group
.
Annual Forb − Late Flowering
Annual Forb − Other
Forb
Grass
Large Shrub
Perennial Forb − Late Flowering
Perennial Forb − Other
Perennial Grass − Other
Shrub
Shrub − Late Flowering
Shrub − Other
Tree

```
plot2c
```

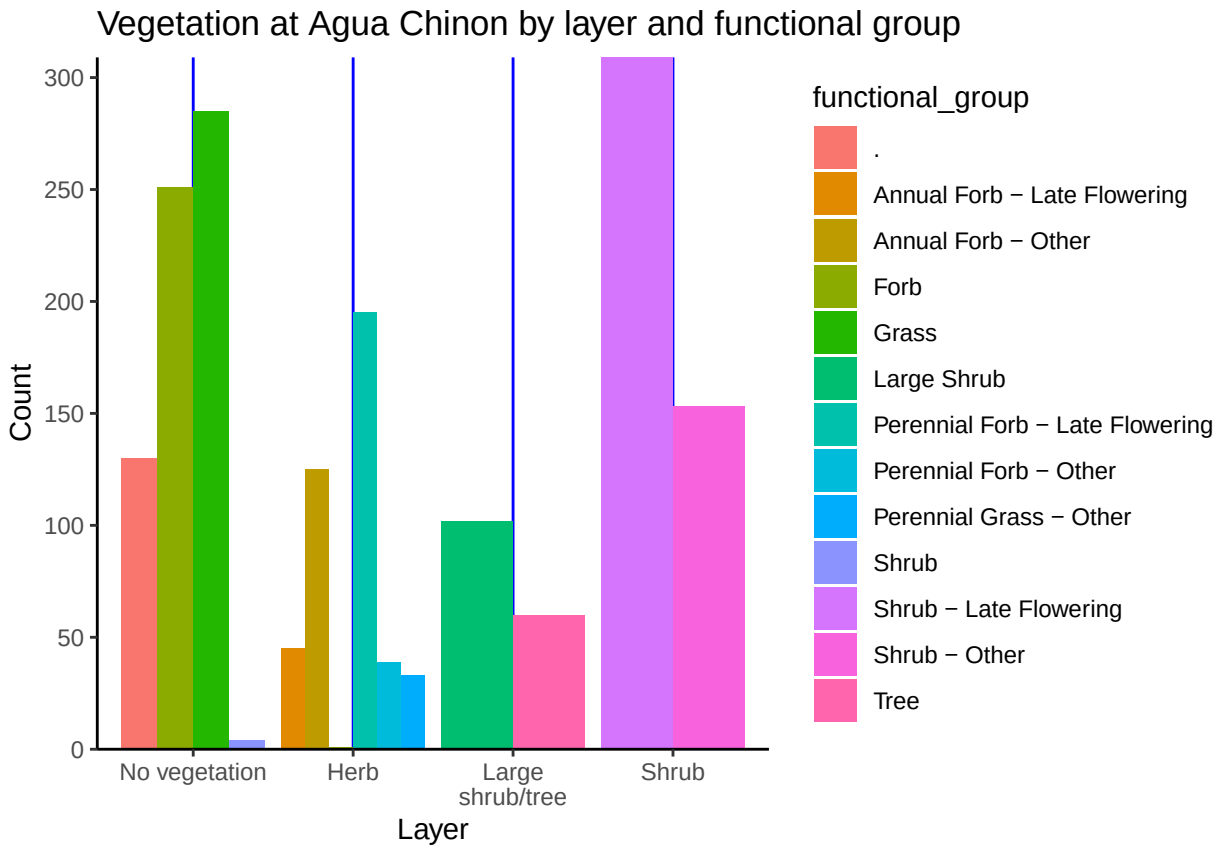


Add horizontal or vertical lines to plot

```
# Plot 3 - Add horizontal or vertical lines to plot

plot3a <- plot2b +
  theme(panel.grid.major.y = element_line(colour = "grey"))

plot3b <- plot2b +
  theme(panel.grid.major.x = element_line(colour = "blue"))

plot3a
```

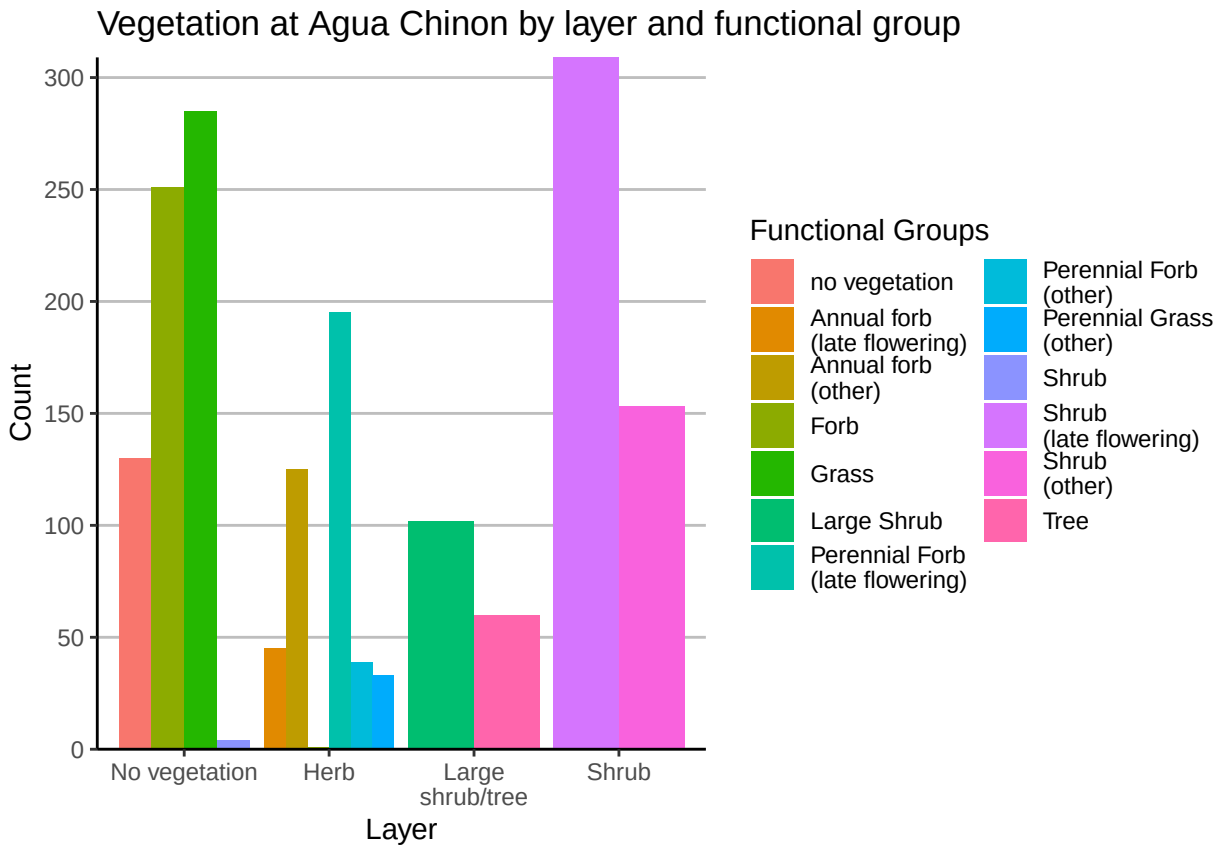

Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
functional_group
.
Annual Forb − Late Flowering
Annual Forb − Other
Forb
Grass
Large Shrub
Perennial Forb − Late Flowering
Perennial Forb − Other
Perennial Grass − Other
Shrub
Shrub − Late Flowering
Shrub − Other
Tree

```
plot3b
```



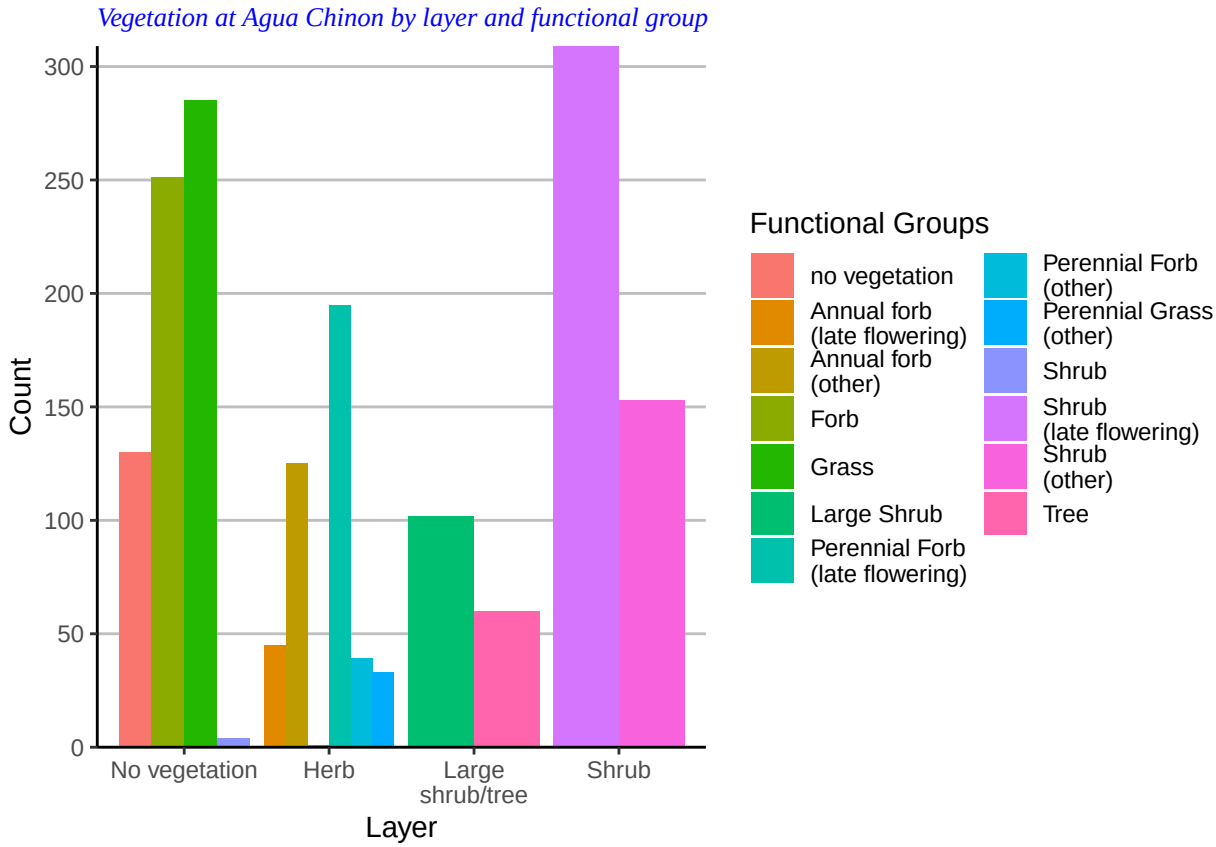
Adjust legend items fit

```
# Plot 4 - Make legend fit better

plot4 <- plot3a + scale_fill_discrete(name="Functional Groups", labels = c("no vegetation", "Annual forb
  guides(fill=guide_legend(nrow=7)) # This breaks it up into columns based on having 7 observations per

plot4
```

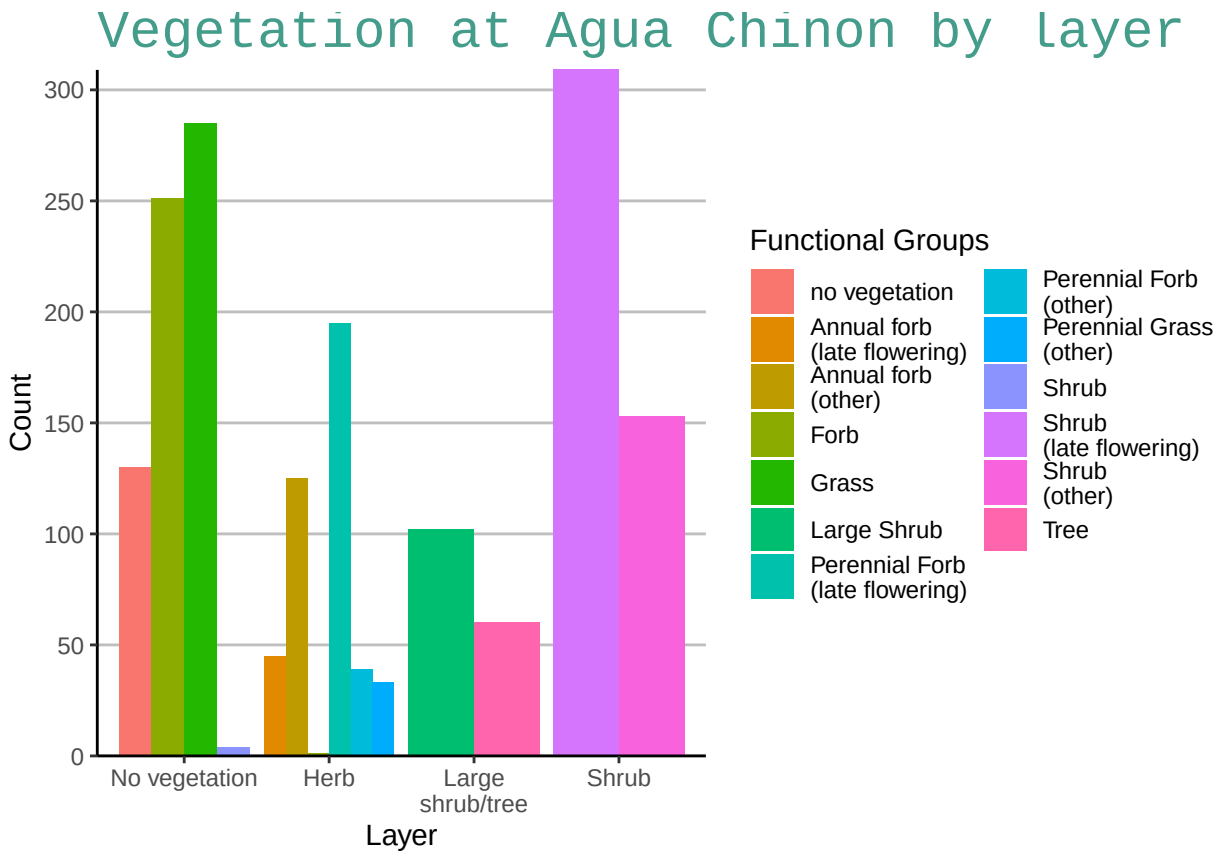


Adjust text size, color, font family, and bold/italic

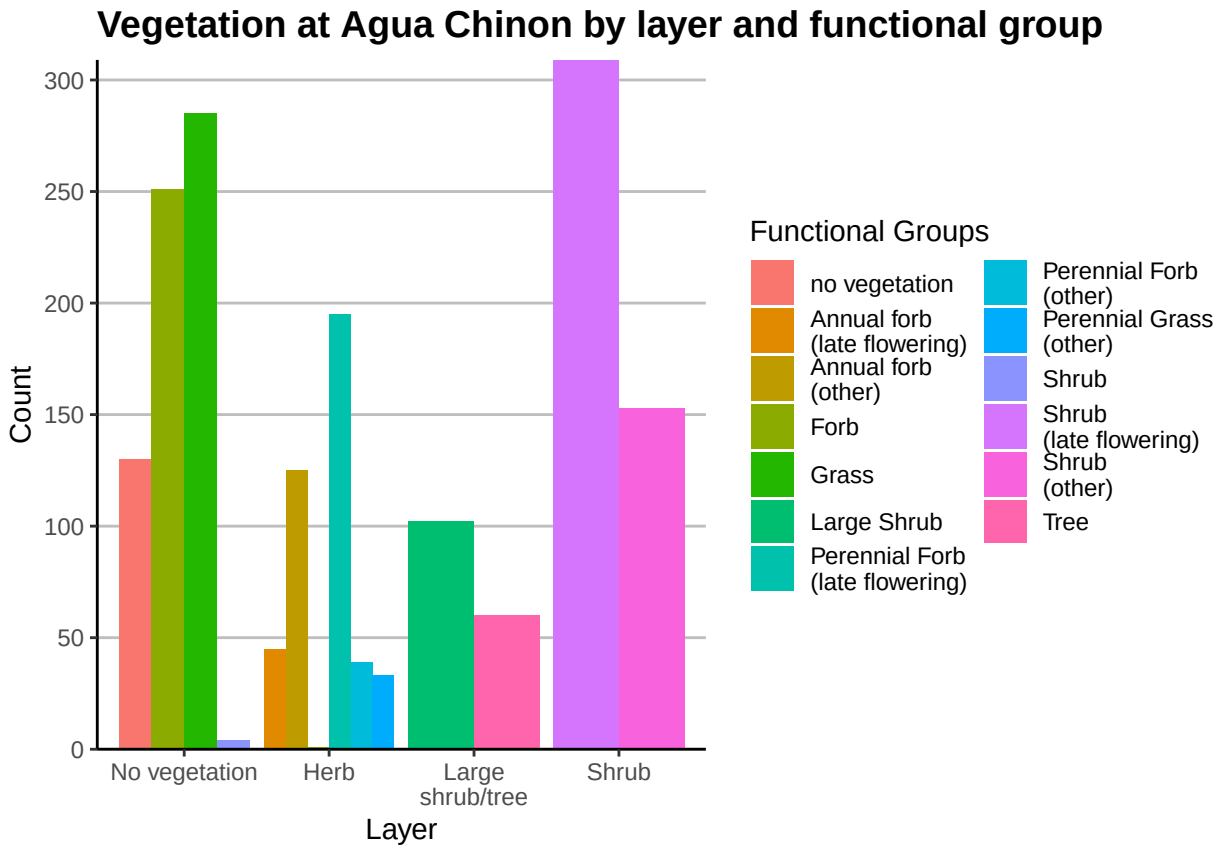
```
# Plot 5 - Adjust text size, color, font family, and bold/italic

plot5a <- plot4 +
  theme(plot.title=element_text(size = 10, color = "blue", family = "serif", face="italic"))

plot5b <- plot4 +
  theme(plot.title=element_text(size = 20, color = "#449d8b", family = "mono"))

plot5c <- plot4 +
  theme(plot.title=element_text(size = 14, family = "sans", face="bold"))

plot5d <- plot4 +
  theme(plot.title=element_text(size = 12, family = "Times"))

plot5a
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

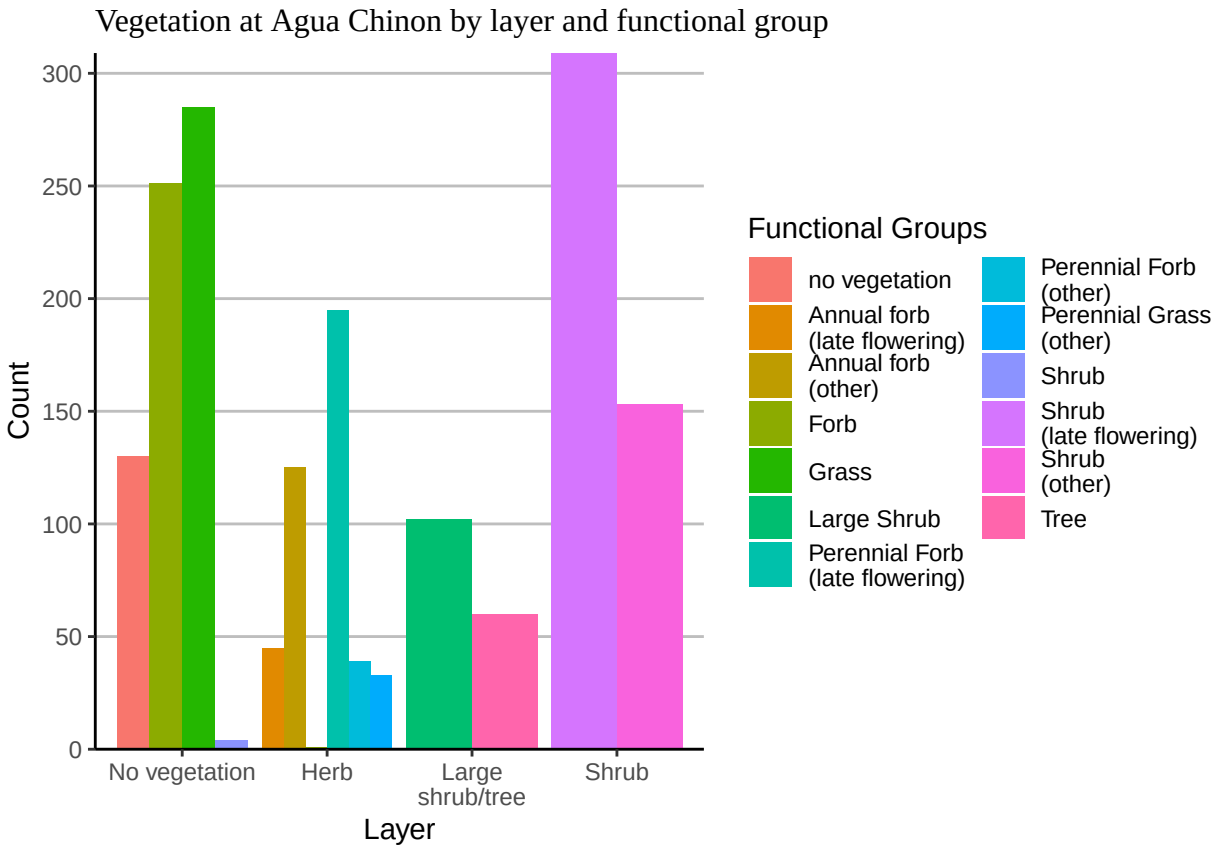
```
plot5b
```


Vegetation at Agua Chinon by layer a
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot5c
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

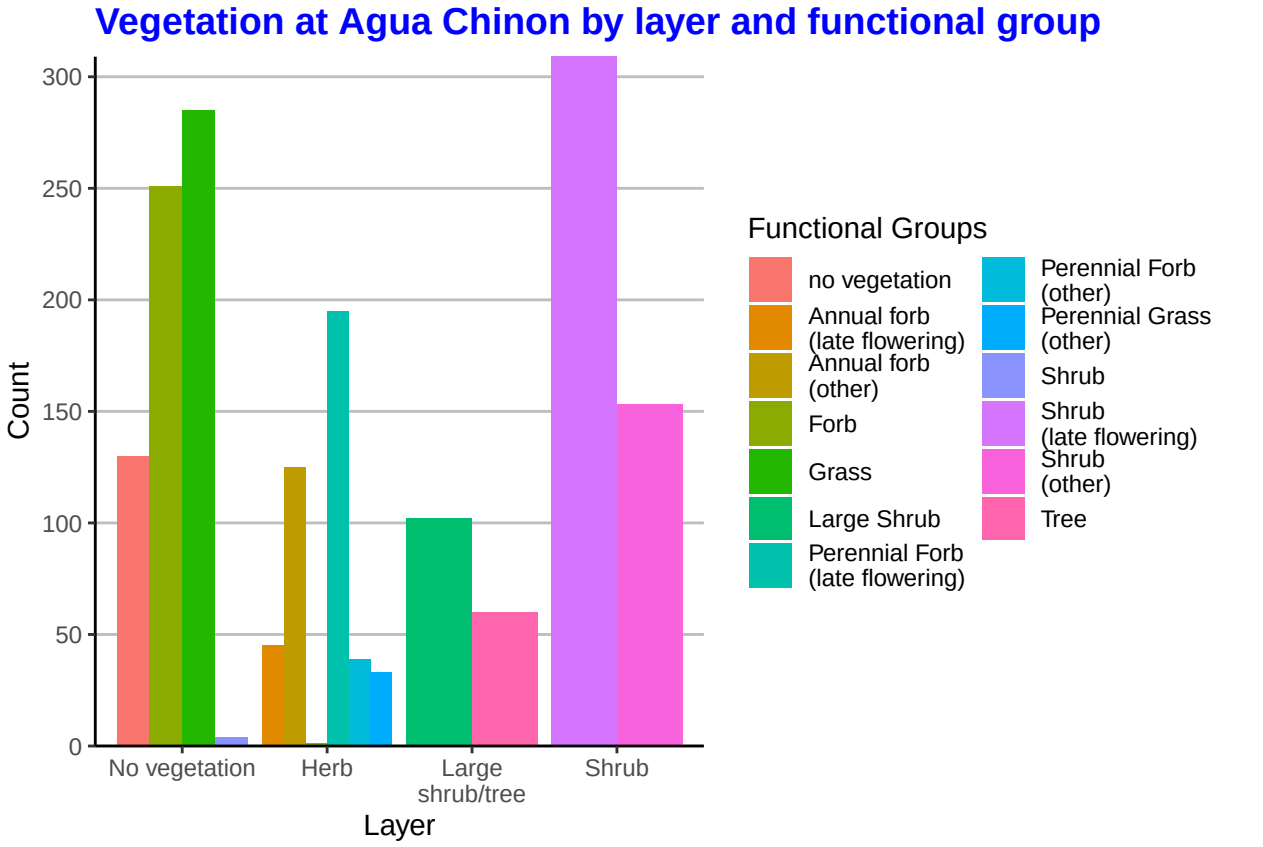
```
plot5d
```



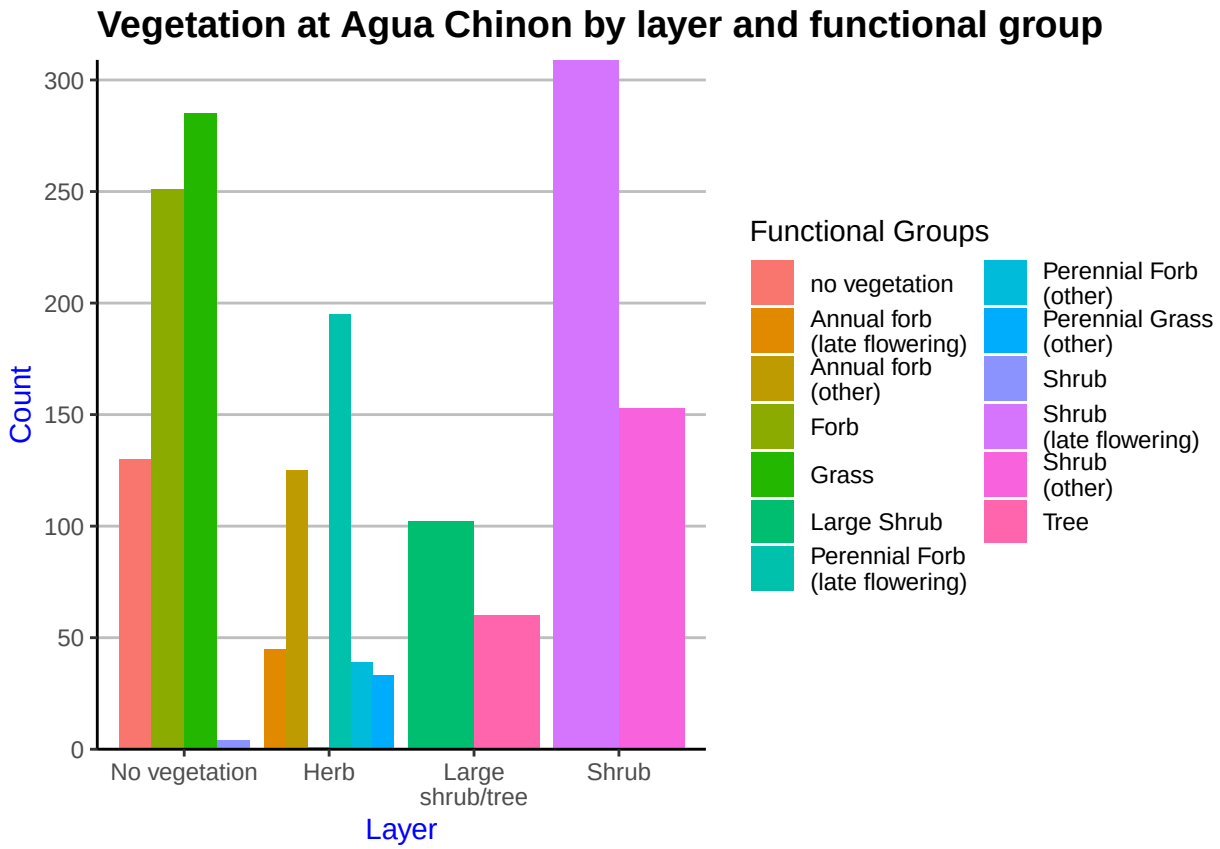
Adjust all plot text elements

```
# Plot 6 - Adjust all plot text elements

# Plot title
plot6a <- plot5c +
  theme(plot.title = element_text(color = "blue"))

# Axes titles
plot6b <- plot5c +
  theme(axis.title = element_text(color = "blue"))

plot6c <- plot5c +
  theme(axis.title.x = element_text(color = "blue"))

plot6d <- plot5c +
  theme(axis.title.y = element_text(color = "blue"))

# Axes tick marks
plot6e <- plot5c +
  theme(axis.text = element_text(color = "blue"))

plot6f <- plot5c +
  theme(axis.text.x = element_text(color = "blue"))
```

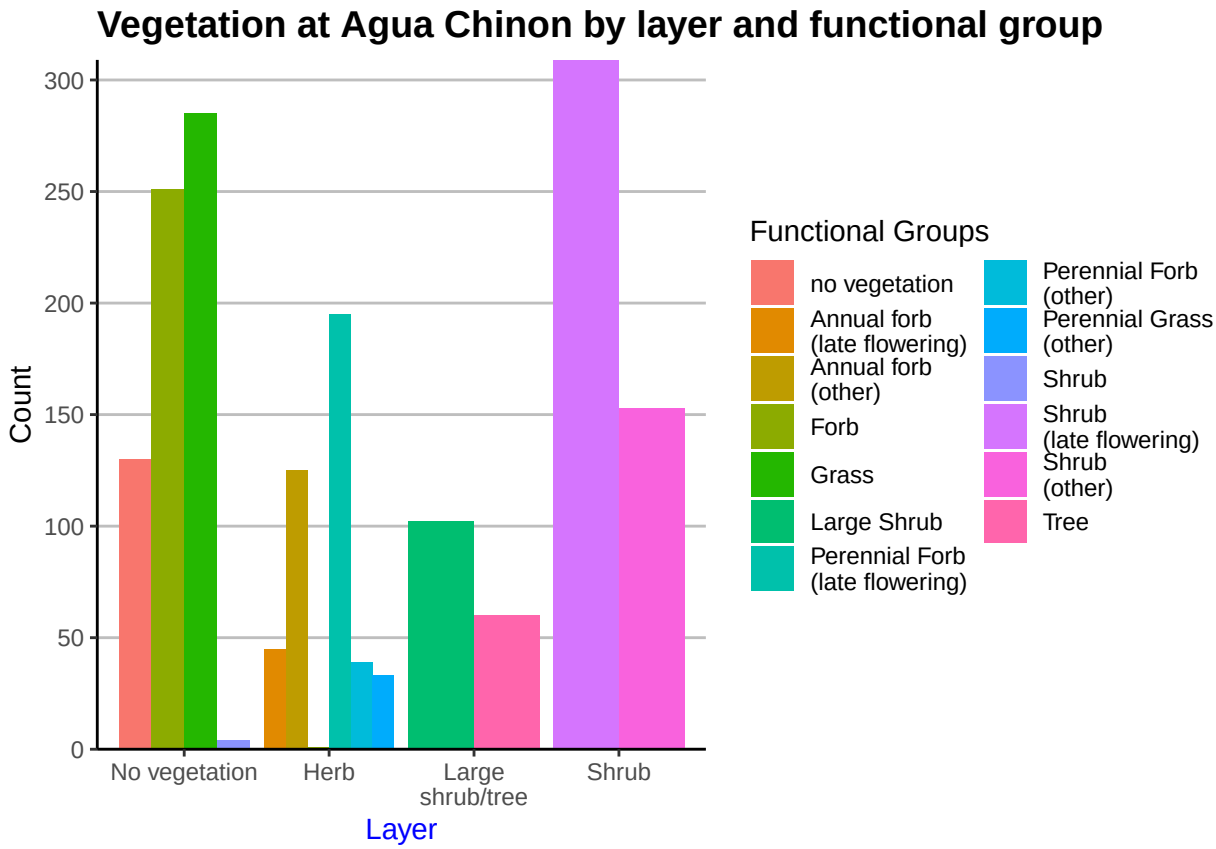
```
plot6g <- plot5c +
  theme(axis.text.y = element_text(color = "blue"))

# Legend
plot6h <- plot5c +
  theme(legend.title = element_text(color = "blue"))

plot6i <- plot5c +
  theme(legend.text = element_text(color = "blue"))

plot6a
```



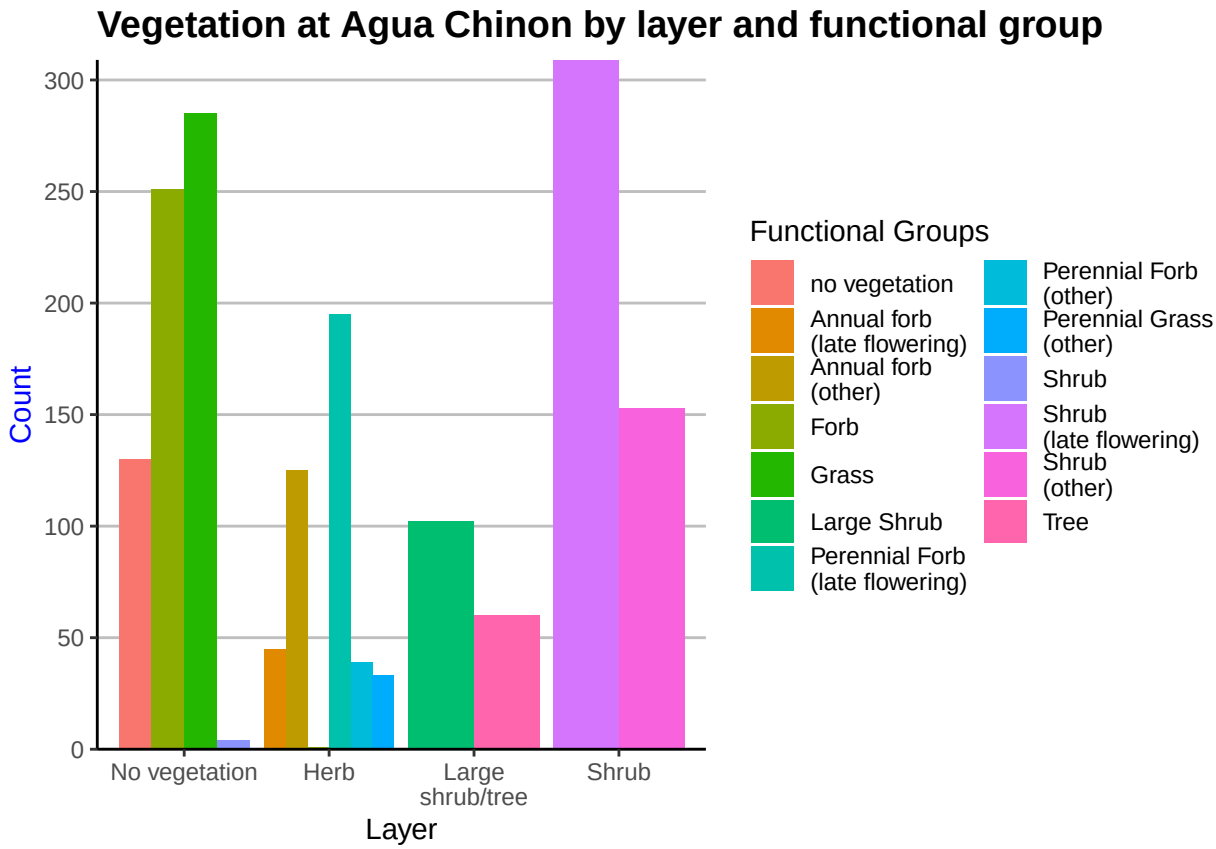

```
plot6b
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

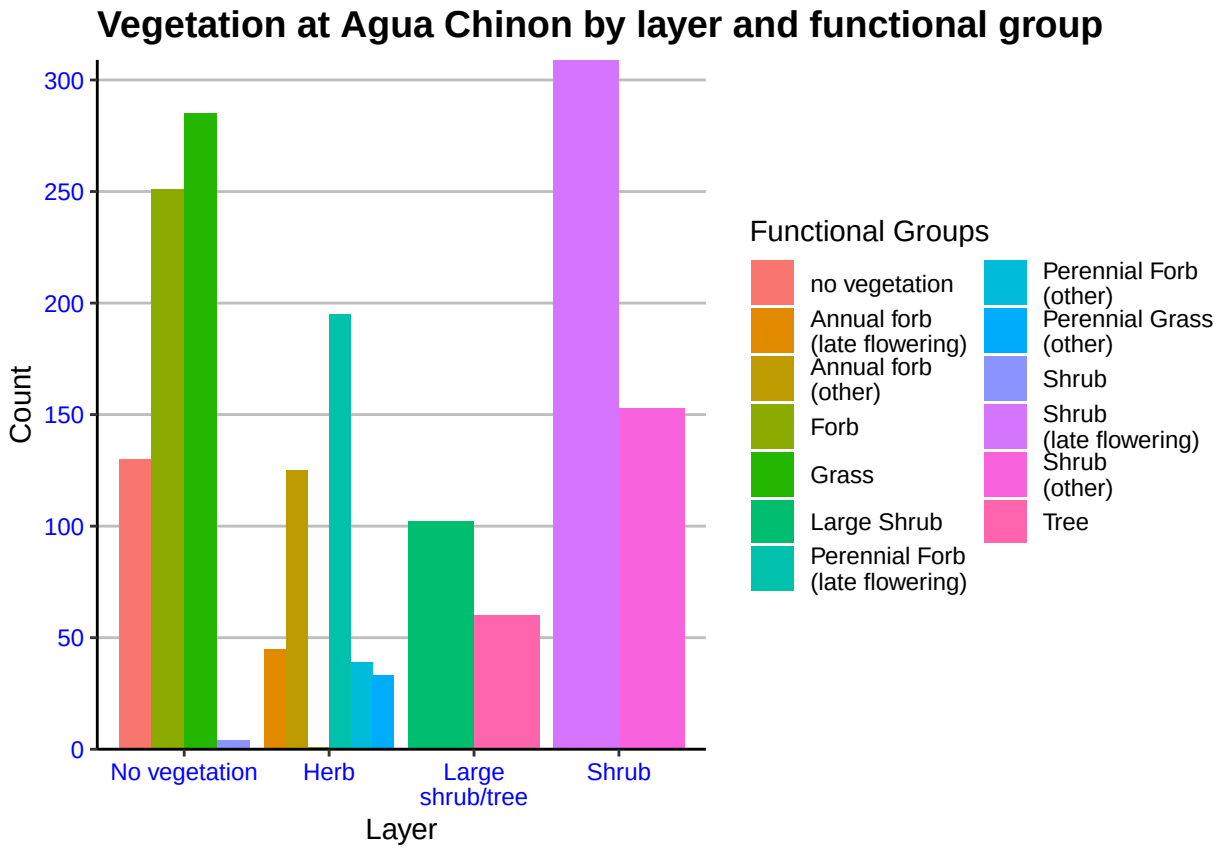
```
plot6c
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

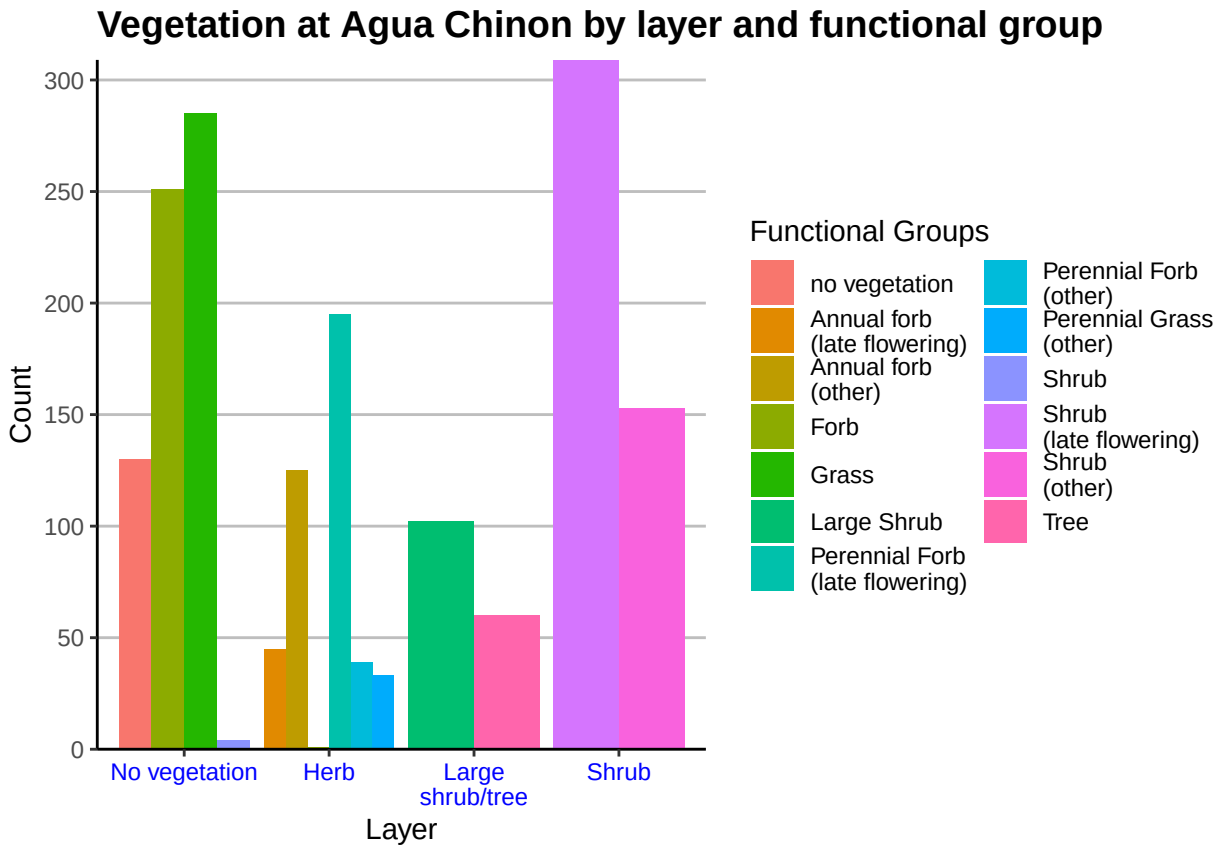
```
plot6d
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

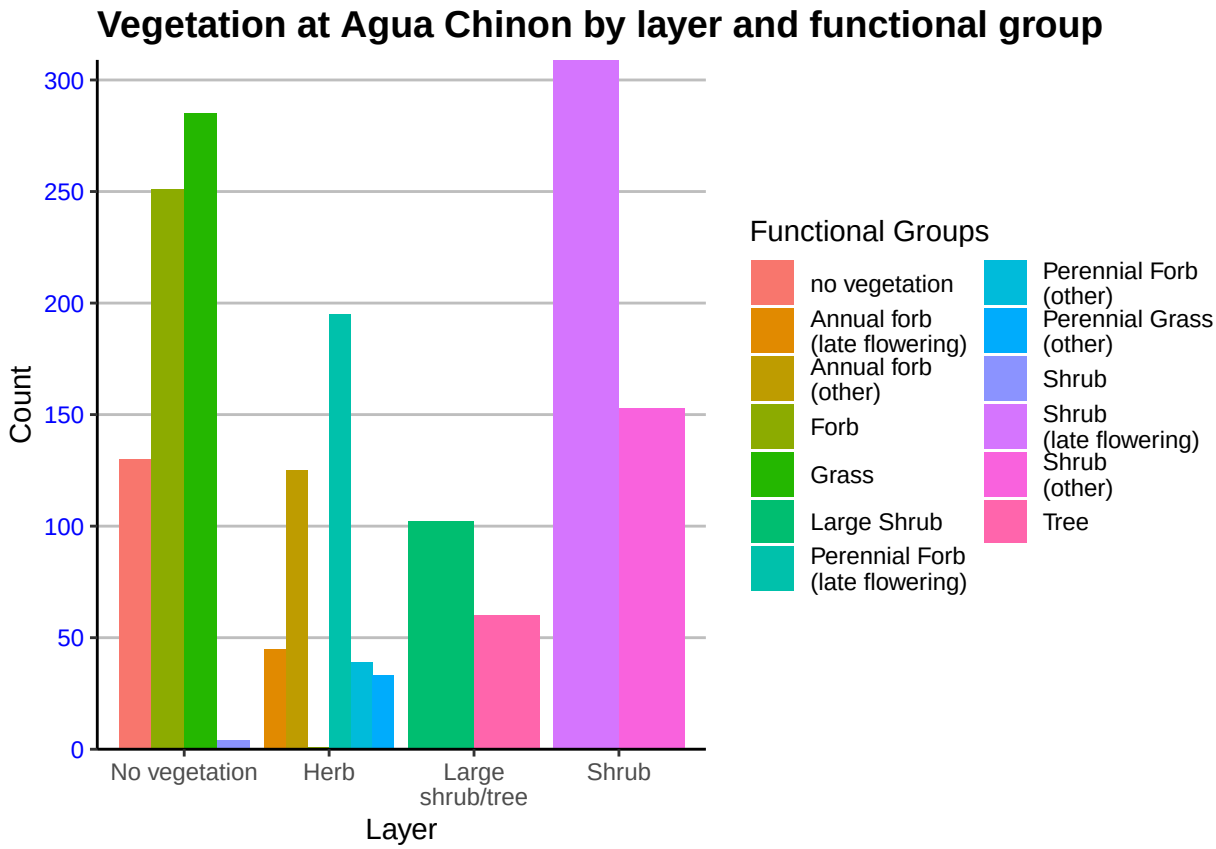
```
plot6e
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

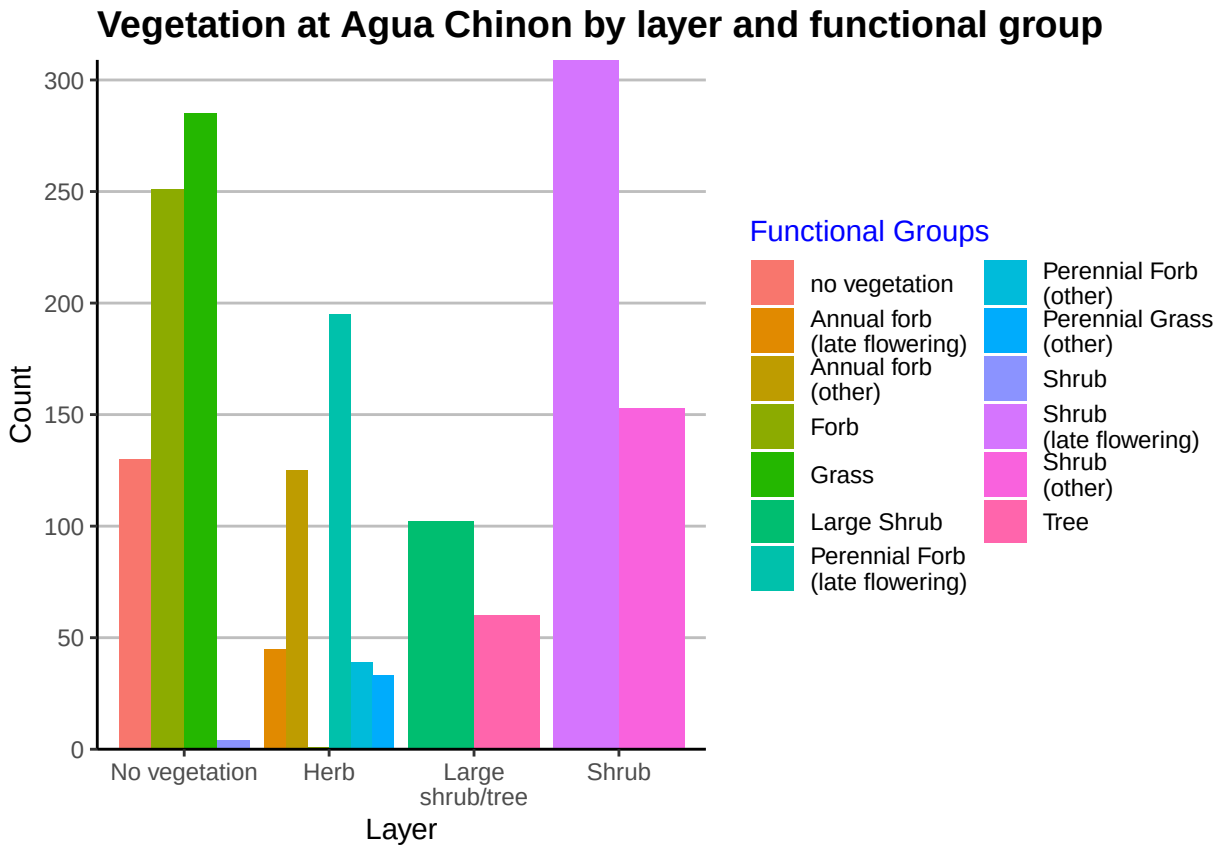
```
plot6f
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

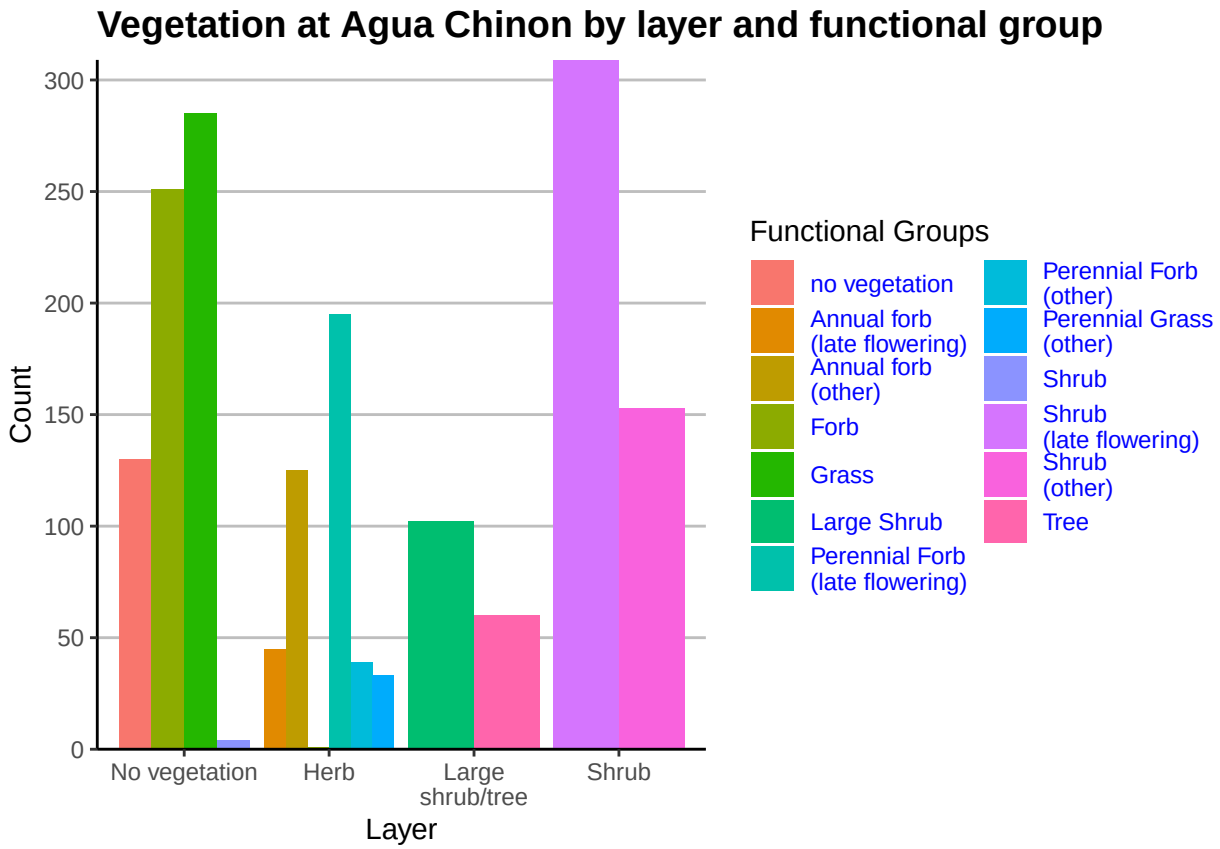
```
plot6g
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot6h
```


Vegetation at Agua Chinon by layer and functional group
300
250
200
150
100
50
0
Count
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

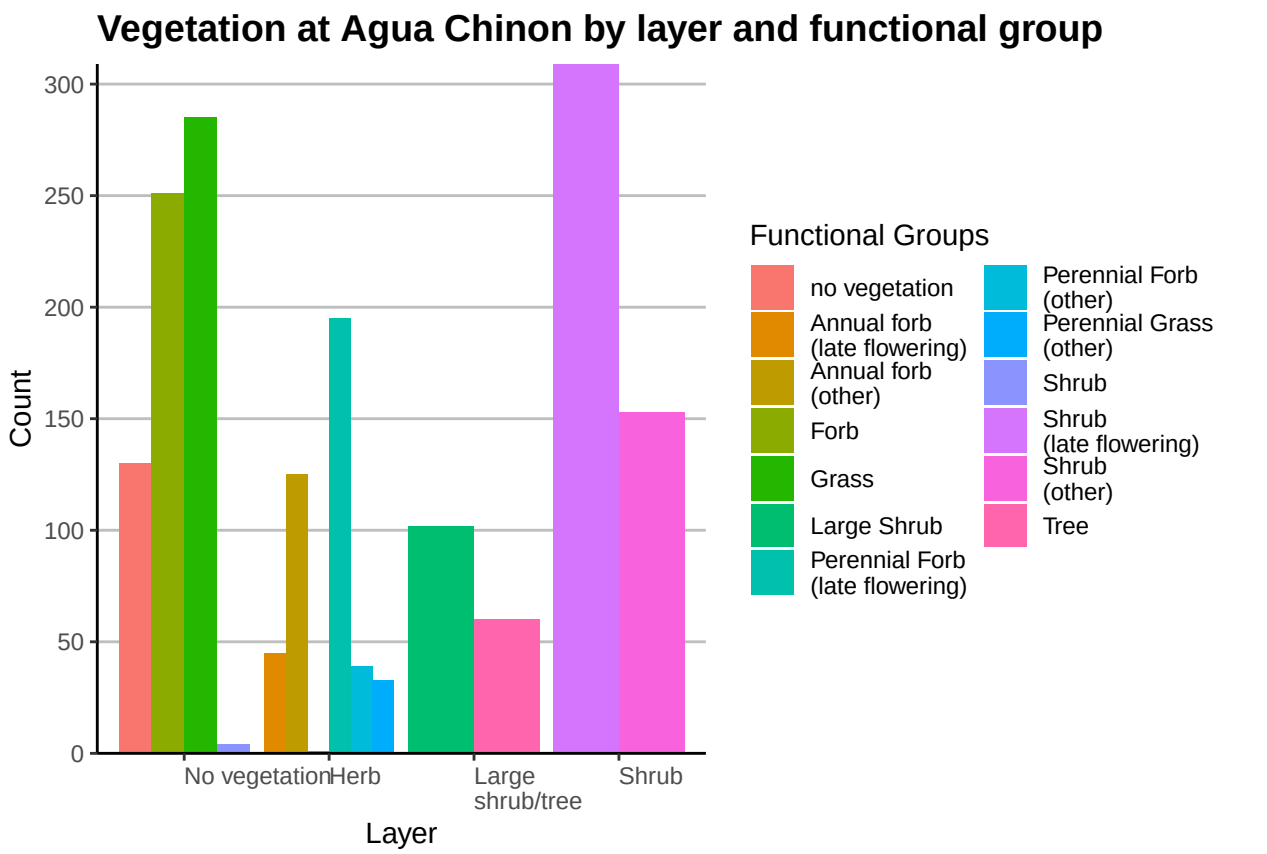
```
plot6i
```



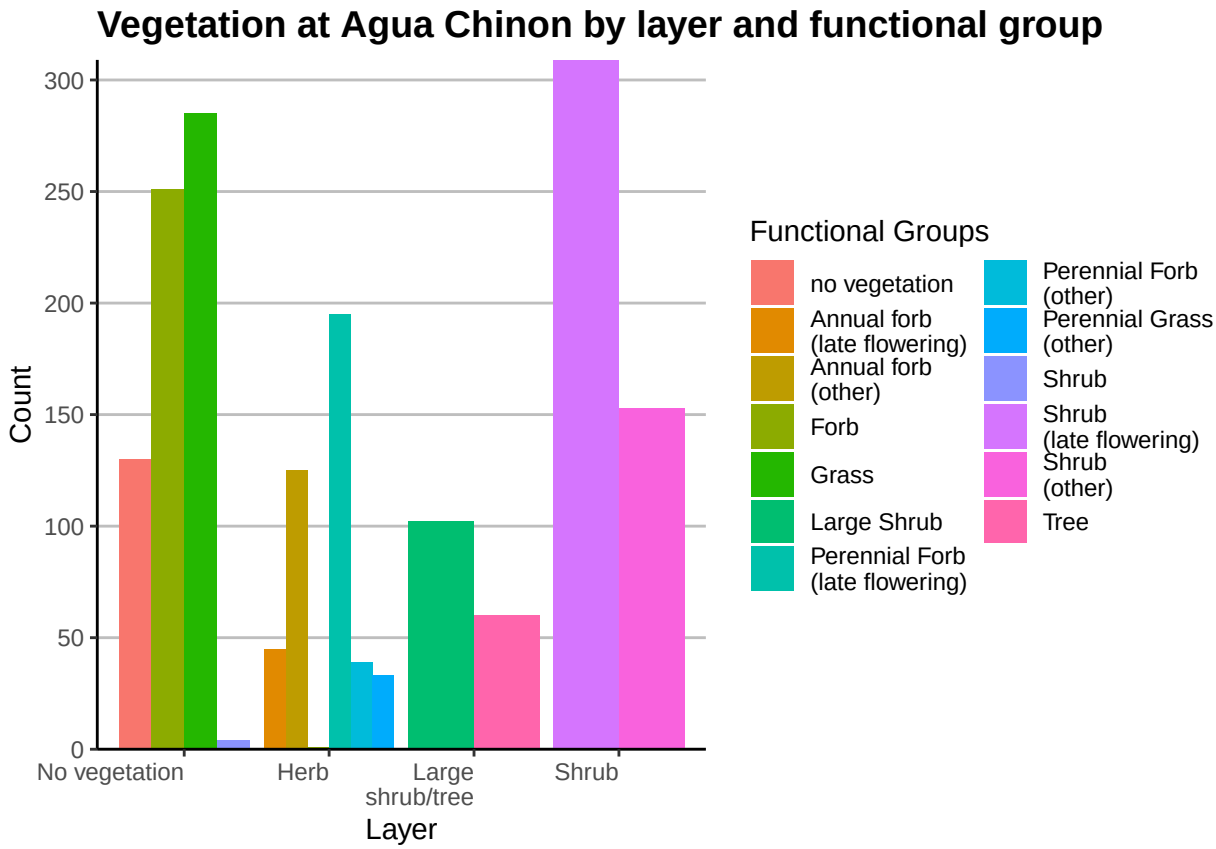
Adjust axes text position

```
# Adjust horizontal justification
plot7a <- plot5c +
  theme(axis.text.x = element_text(hjust = 0))

plot7b <- plot5c +
  theme(axis.text.x = element_text(hjust = 1))

plot7c <- plot5c +
  theme(axis.text.x = element_text(hjust = .5))

# Adjust vertical justification
plot7c <- plot5c +
  theme(axis.text.x = element_text(vjust = 0))

plot7d <- plot5c +
  theme(axis.text.x = element_text(vjust = 1))

# Adjust angle
plot7e <- plot5c +
  theme(axis.text.x = element_text(angle = 30))

plot7f <- plot5c +
  theme(axis.text.x = element_text(angle = 90))
```

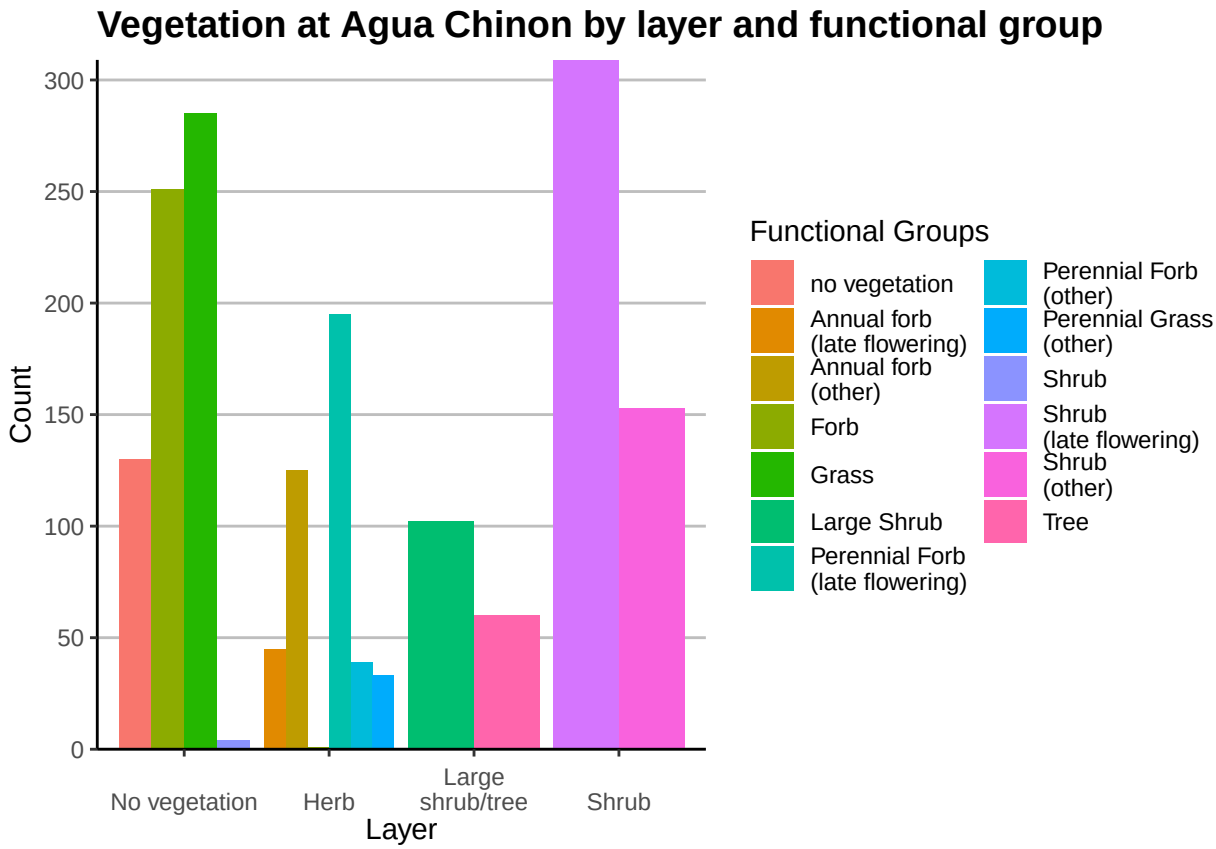
```
plot7g <- plot5c +
  theme(axis.text.x = element_text(angle = -90))


plot7h <- plot1 +
  theme(axis.text.x = element_text(angle = -90, hjust = 0, vjust = .3))

plot7a
```



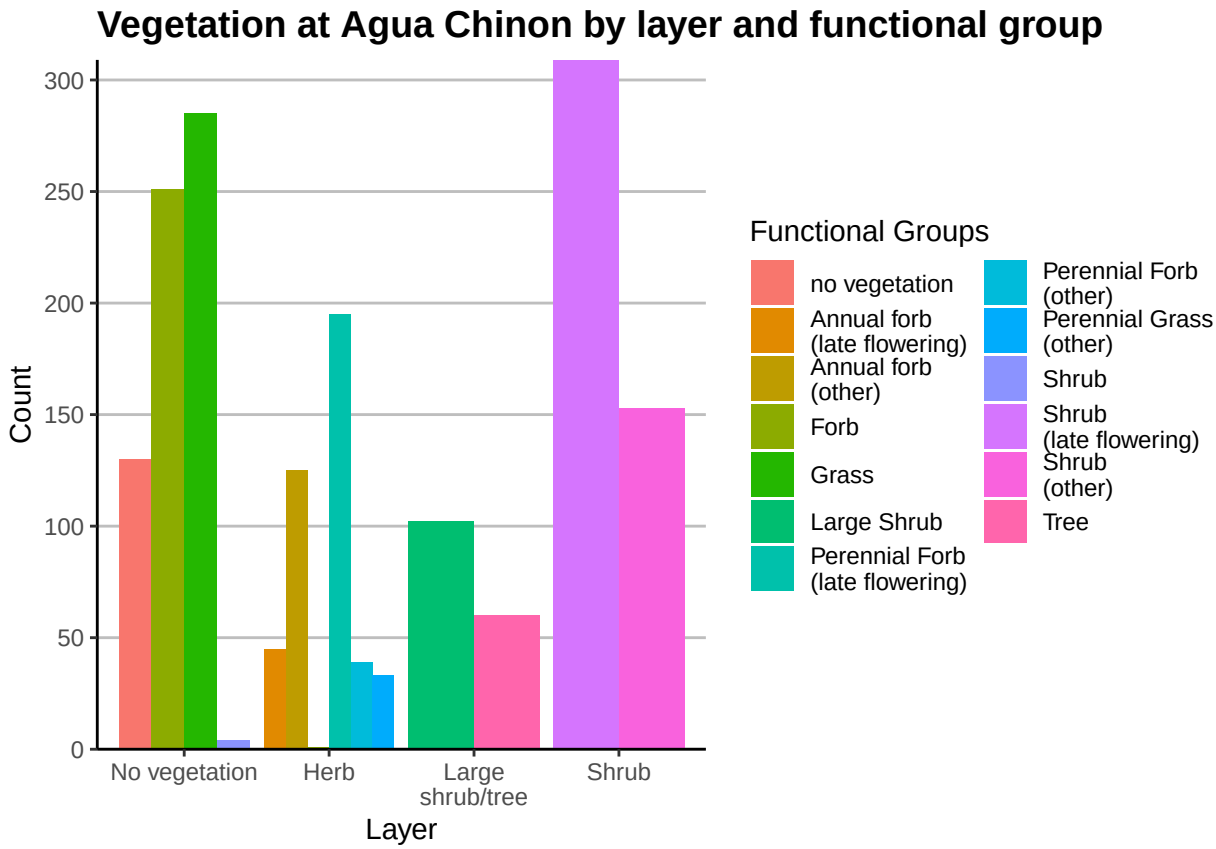

```
plot7b
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

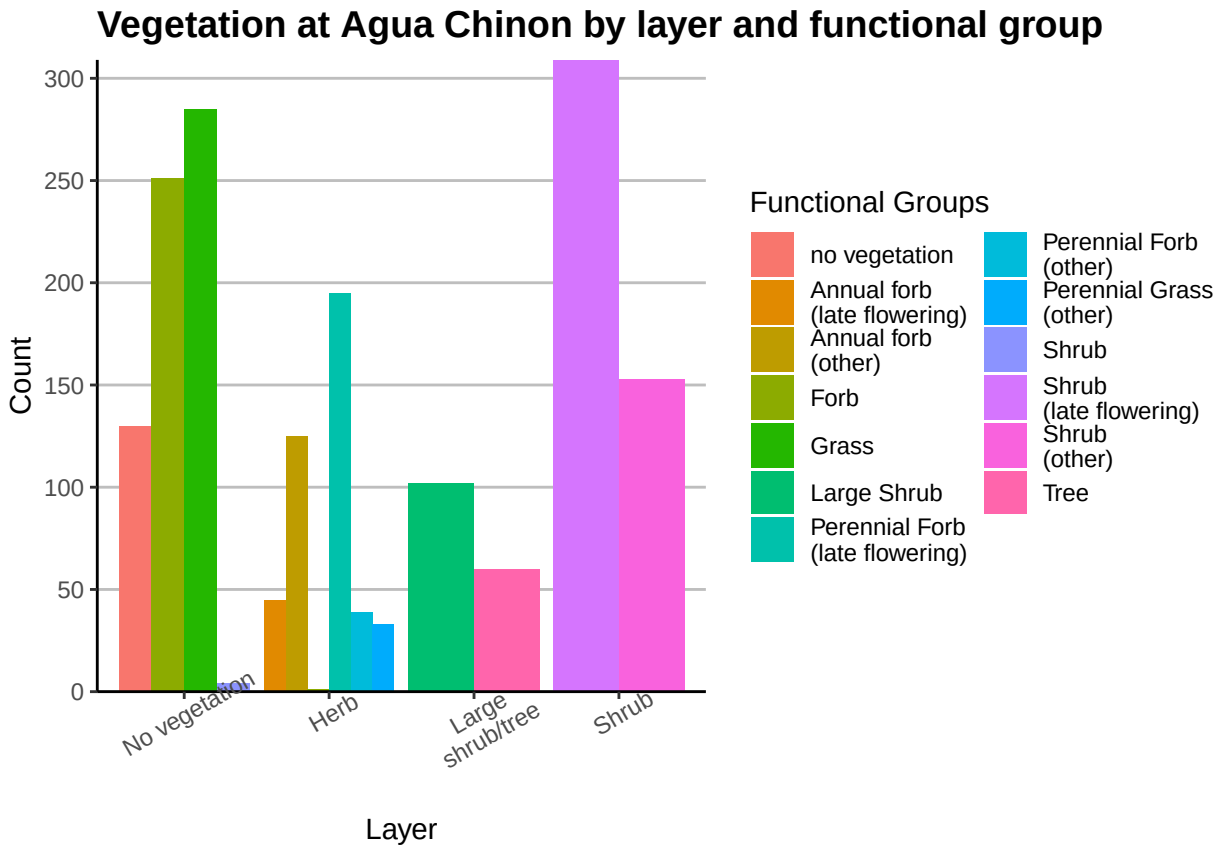
```
plot7c
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

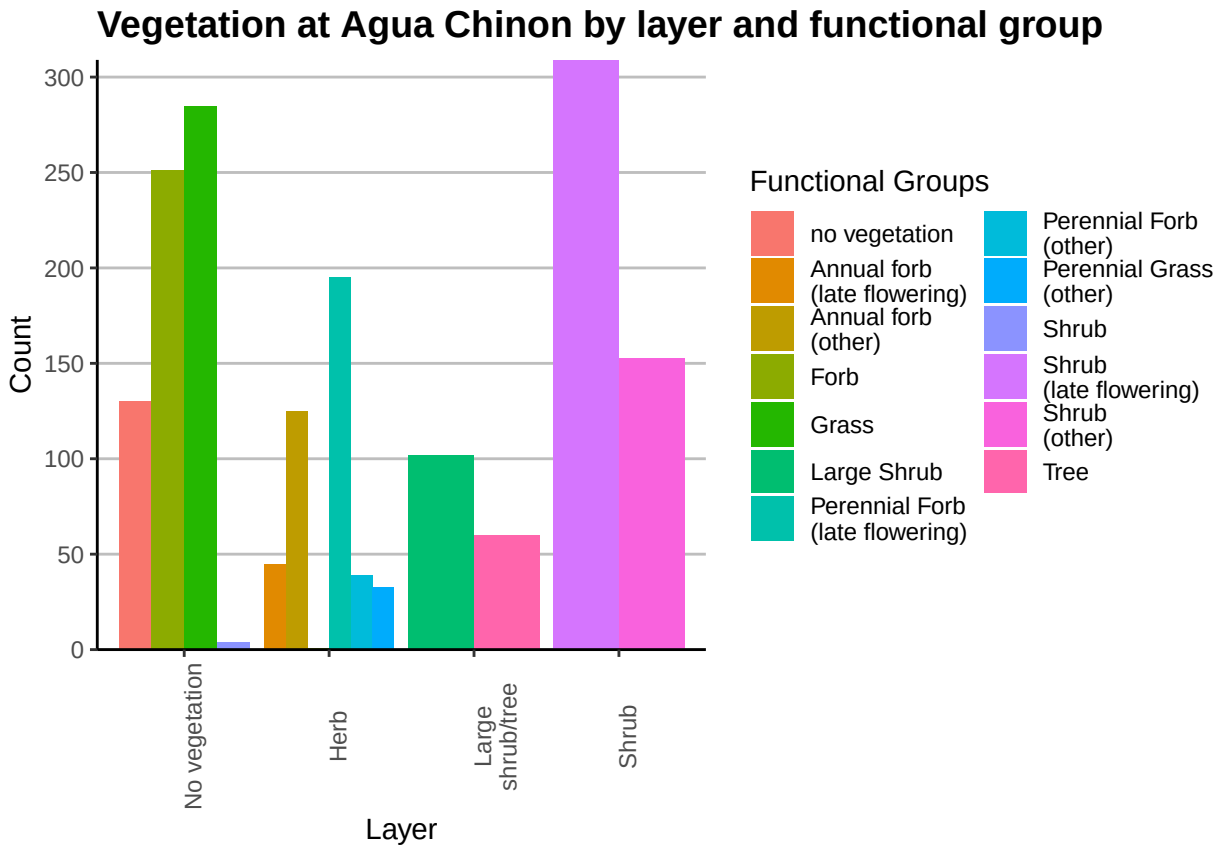
```
plot7d
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

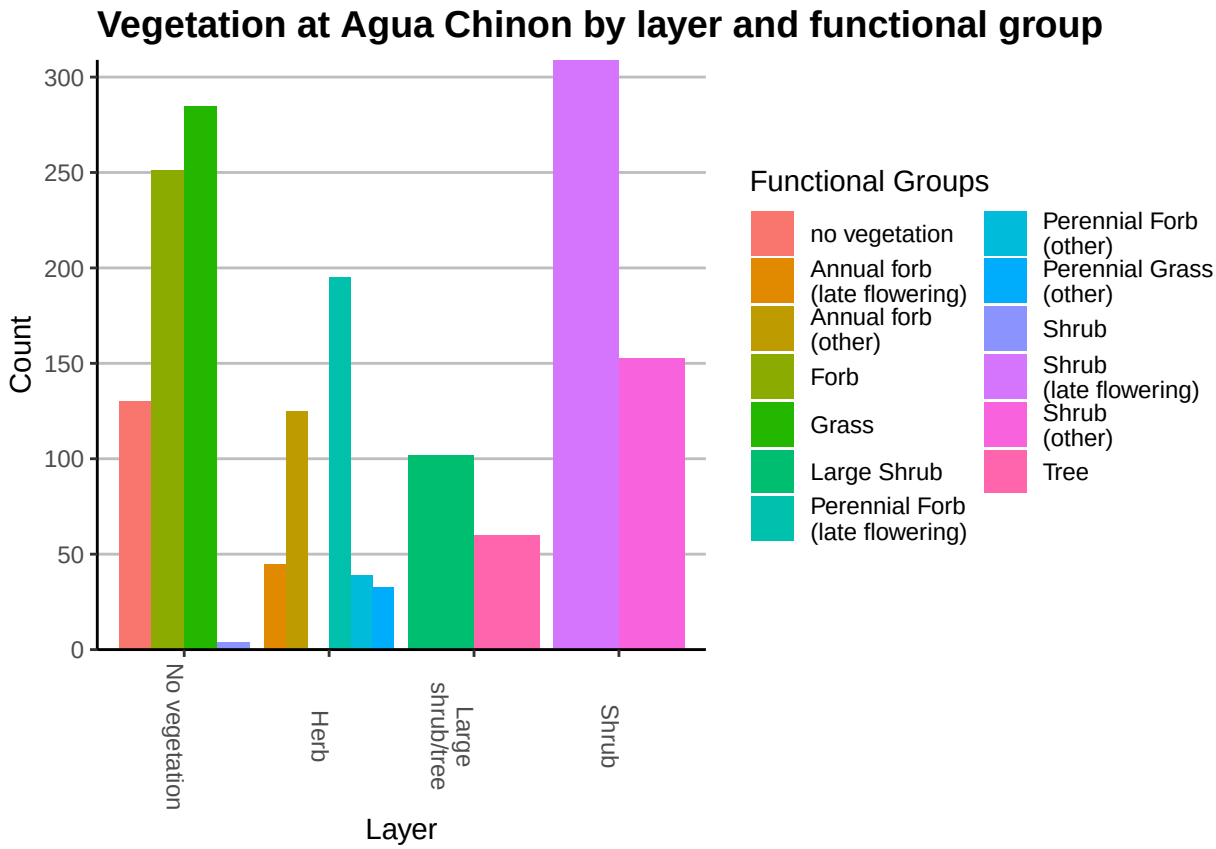
```
plot7e
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

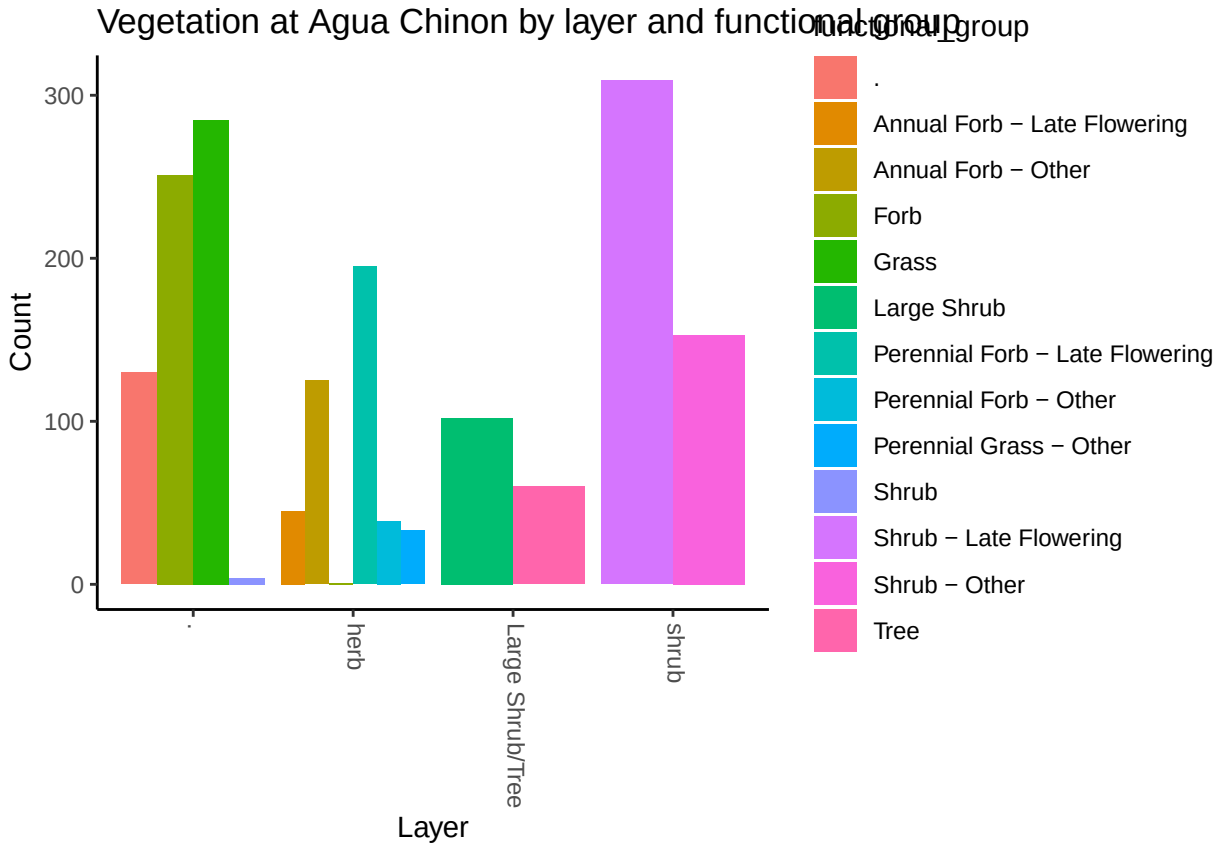
```
plot7f
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

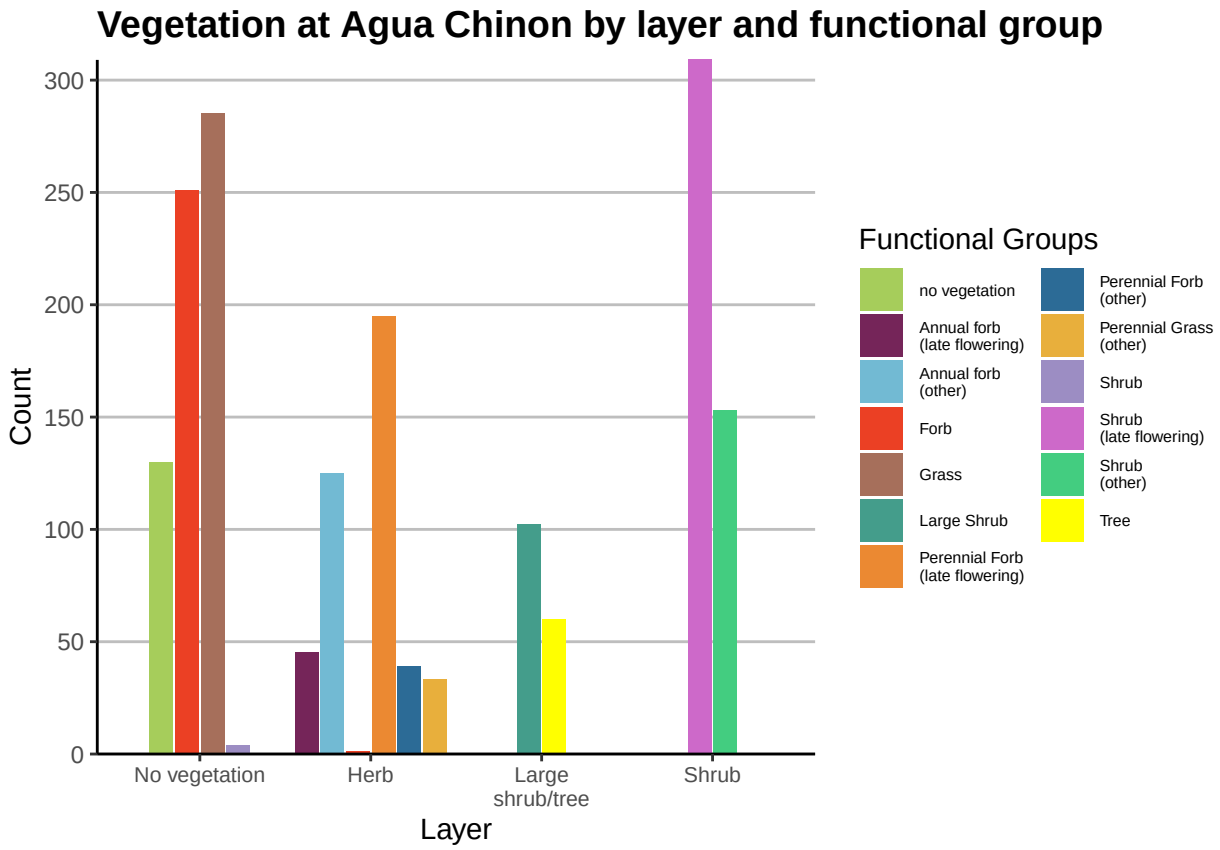
```
plot7g
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree

```
plot7h
```




```
# Notice I added a code to even out the column width under geom bar

plot_final <- ggplot(ac_data, aes(layer, fill=functional_group)) +
  geom_bar(position = position_dodge2(width = 0.9, preserve = "single")) +
  xlab("Layer") +
  ylab("Count") +
  ggtitle("Vegetation at Agua Chinon by layer and functional group") +
  scale_x_discrete(expand=c(0.2,0), labels = c("No vegetation", "Herb", "Large\nshrub/tree", "Shrub")) +
  scale_y_continuous(expand=c(0,0), breaks=seq(0, 350, by = 50)) +
  theme_classic() +
  theme(plot.title=element_text(face="bold", size = 14),
        axis.text.x = element_text(size = 8),
        legend.text = element_text(size = 6),
        panel.grid.major.y = element_line(colour = "grey")) +
  scale_fill_manual(name="Functional Groups",
                    labels = c("no vegetation", "Annual forb\n(late flowering)", "Annual forb\n(other)"
                    values = c("#a6cd5b", "#752559", "#72bad3", "#eb4024", "#a66f5b", "#449d8b", "#eb893
  guides(fill=guide_legend(nrow=7))

plot_final
```


Vegetation at Agua Chinon by layer and functional group
Count
300
250
200
150
100
50
0
No vegetation
Herb
Large shrub/tree
Shrub
Layer
Functional Groups
no vegetation
Annual forb (late flowering)
Annual forb (other)
Forb
Grass
Large Shrub
Perennial Forb (late flowering)
Perennial Forb (other)
Perennial Grass (other)
Shrub
Shrub (late flowering)
Shrub (other)
Tree