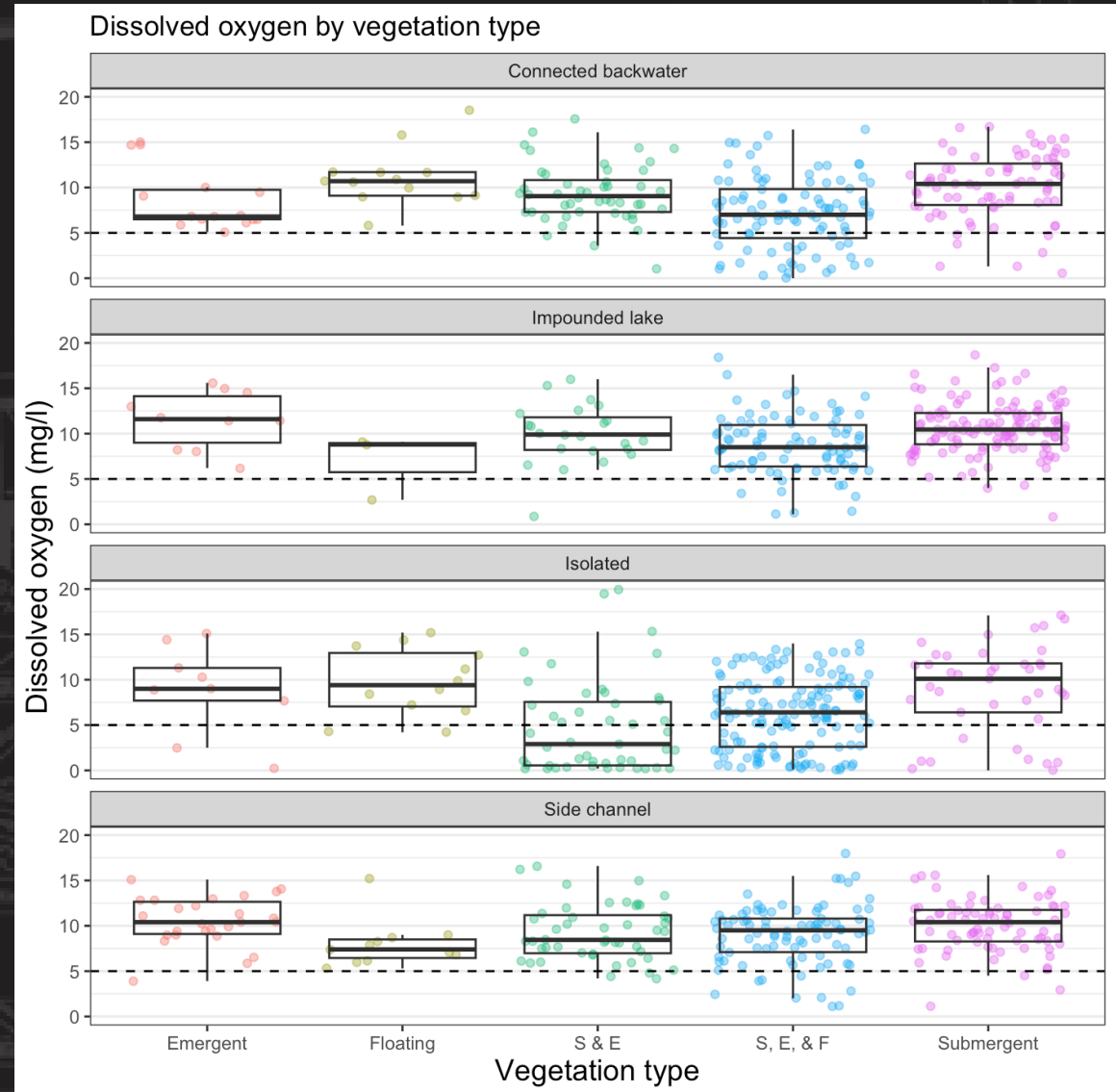


DATA VISUALIZATION IN R USING ggp1ot FOR ECOLOGICAL MODELING

Edward Stowe, PhD

Environmental Lab

EMRRP Webinar
March 25, 2026



U.S. ARMY



US Army Corps
of Engineers®



ERDC
ENGINEER RESEARCH & DEVELOPMENT CENTER



OVERVIEW



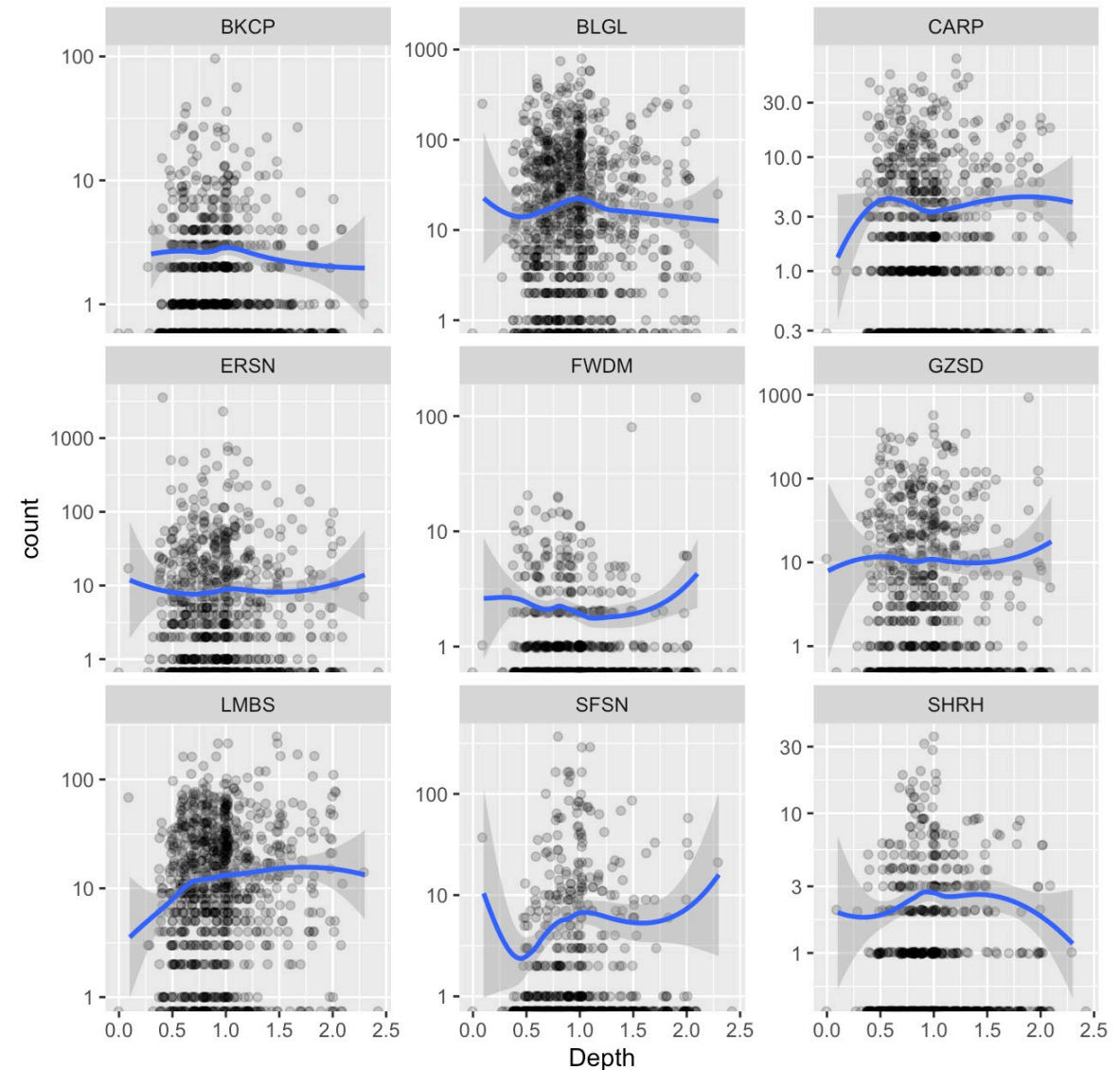
- Data visualization background
- *ggplot2* background
- Tutorial



DATA VISUALIZATION APPLICATIONS

Exploratory data analysis

- Scatter plots
- Histograms
- Correlation heatmaps



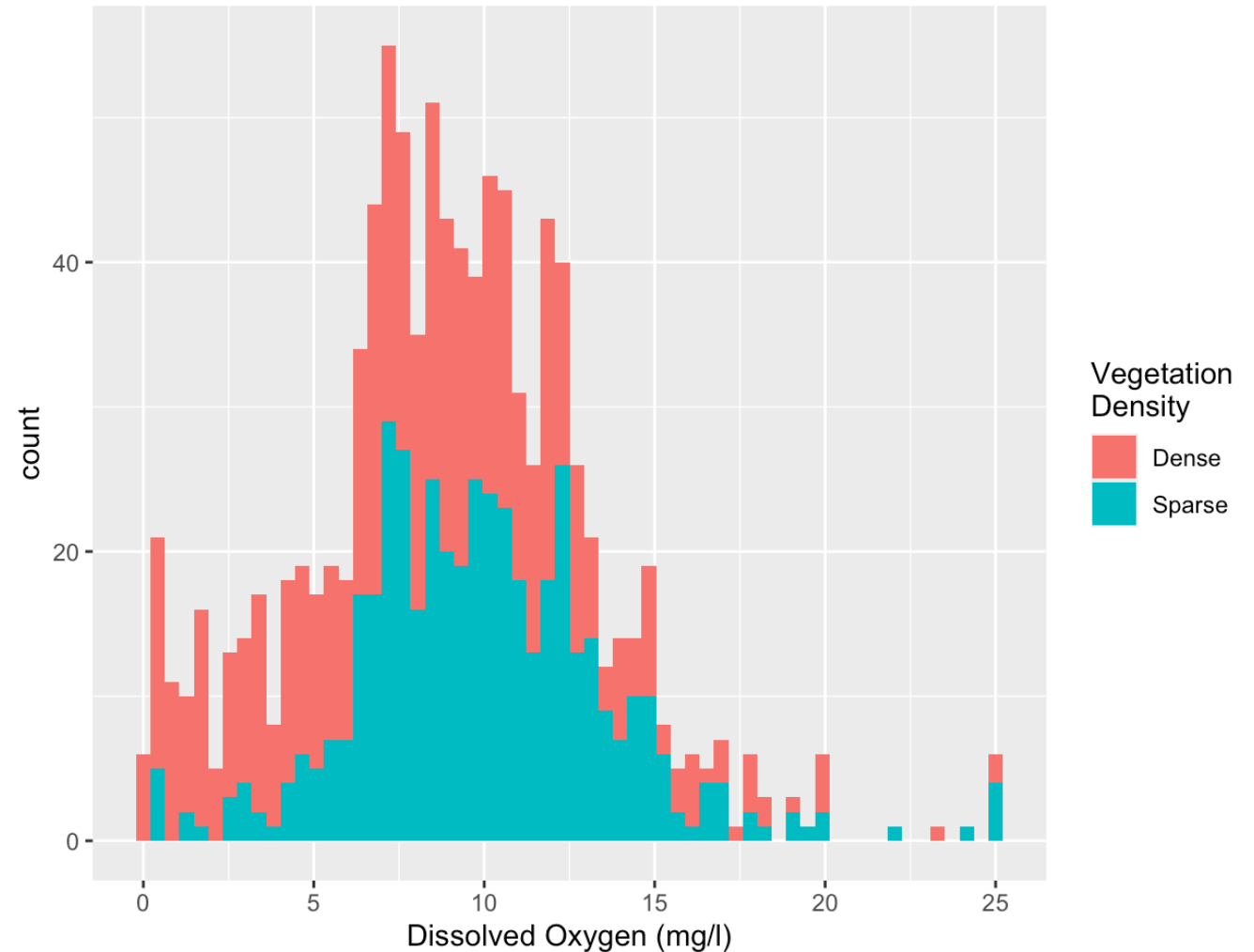


DATA VISUALIZATION APPLICATIONS



Exploratory data analysis

- Scatter plots
- Histograms
- Correlation heatmaps

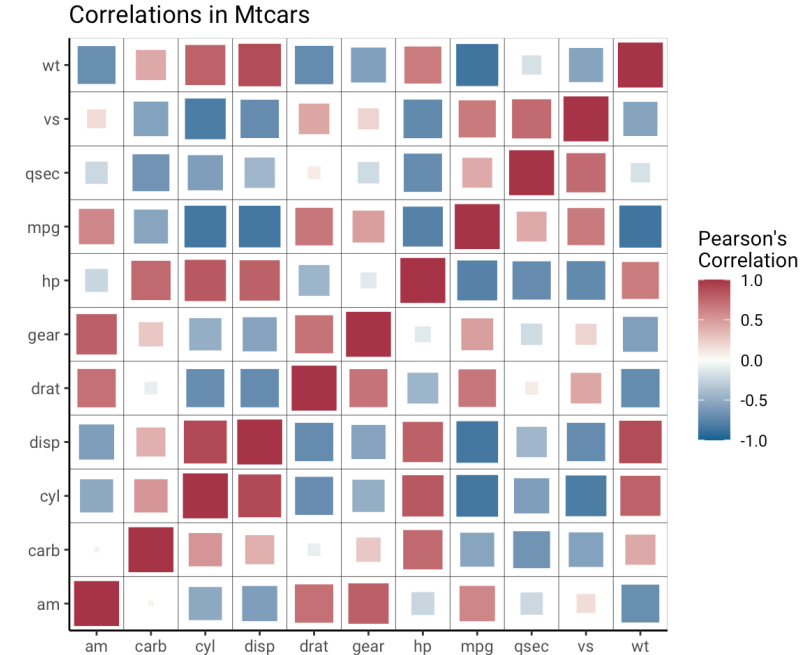




DATA VISUALIZATION APPLICATIONS

Exploratory data analysis

- Scatter plots
- Histograms
- Correlation heatmaps



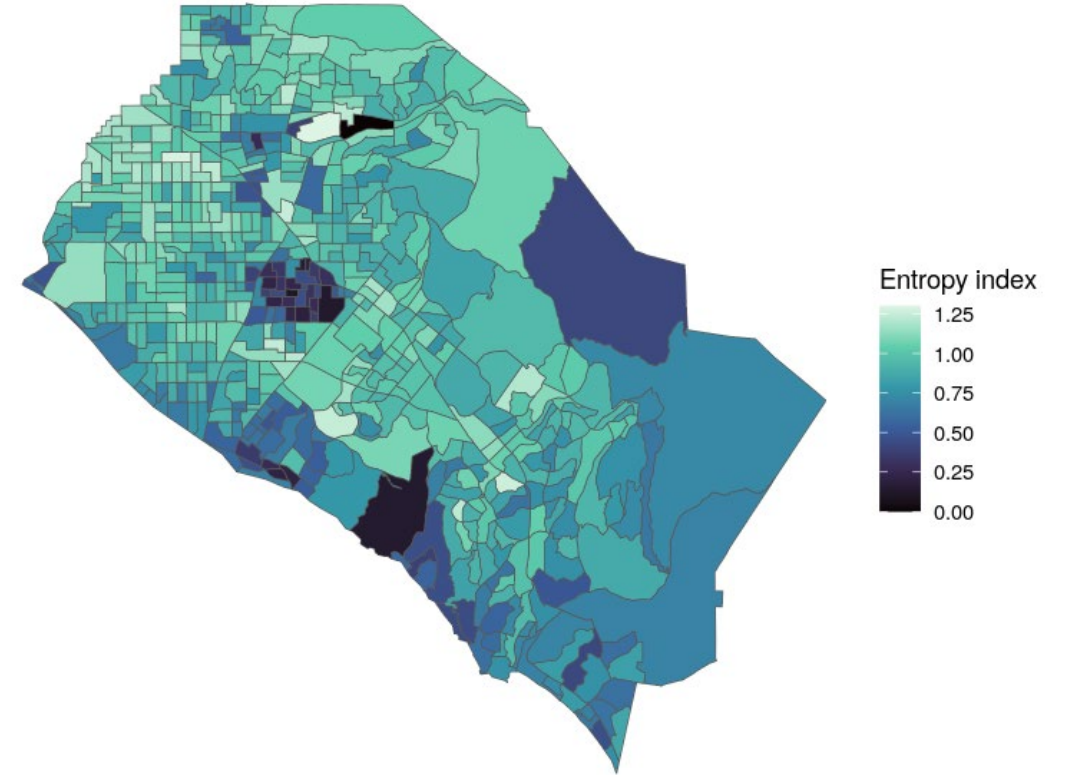


DATA VISUALIZATION APPLICATIONS

Exploratory data analysis

- Scatter plots
- Histograms
- Correlation heatmaps

Examine spatial data





DATA VISUALIZATION APPLICATIONS

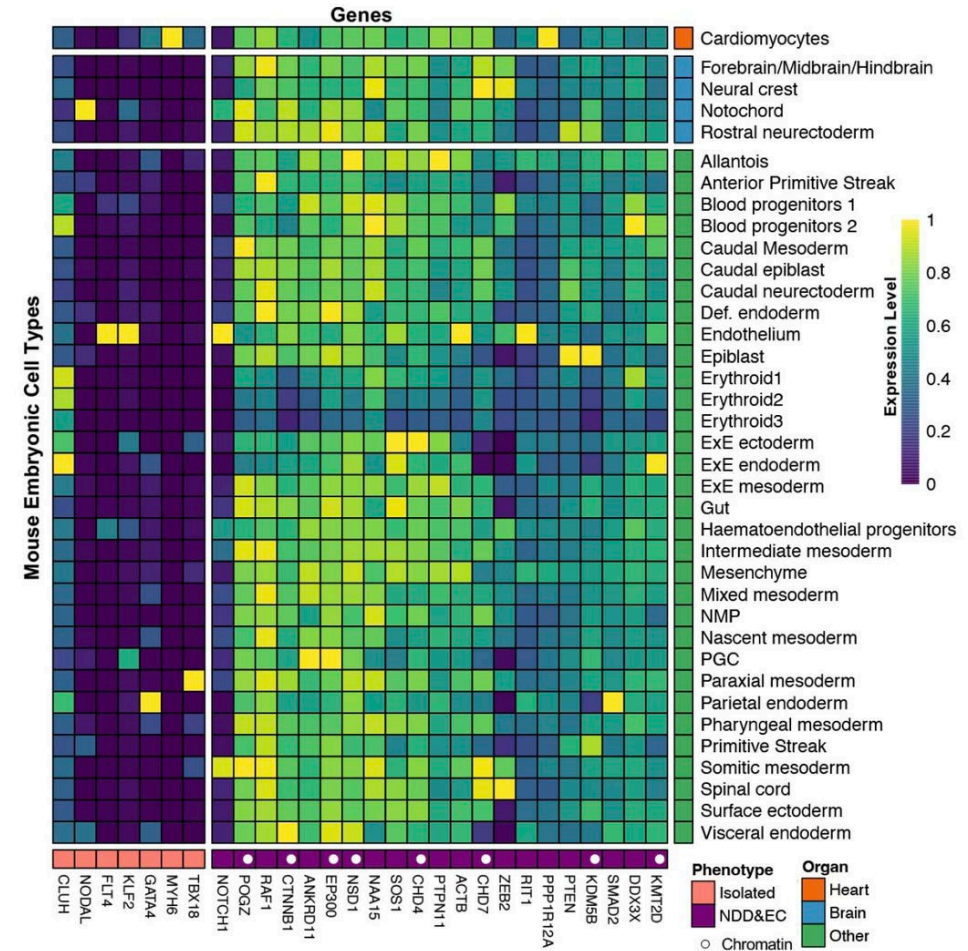
Exploratory data analysis

- Scatter plots
- Histograms
- Correlation heatmaps

Examine spatial data

Communication

- Formal
- Informal





DATA VISUALIZATION APPLICATIONS

Exploratory data analysis

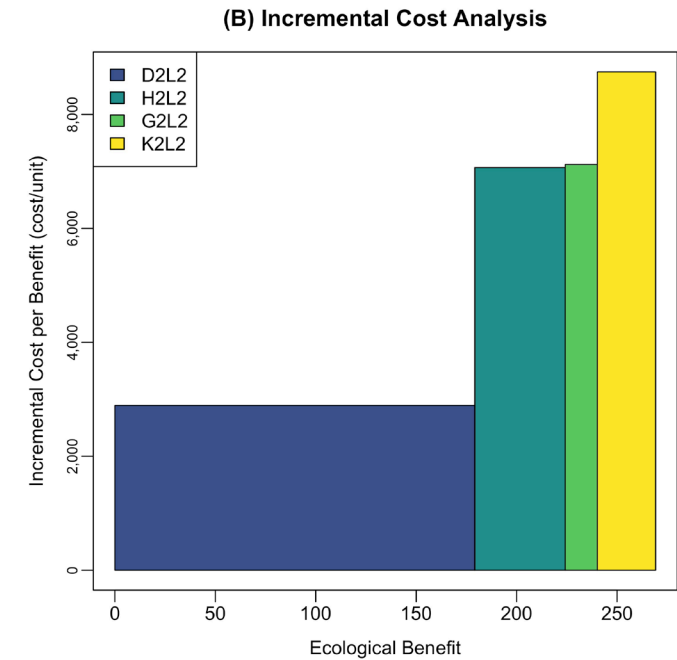
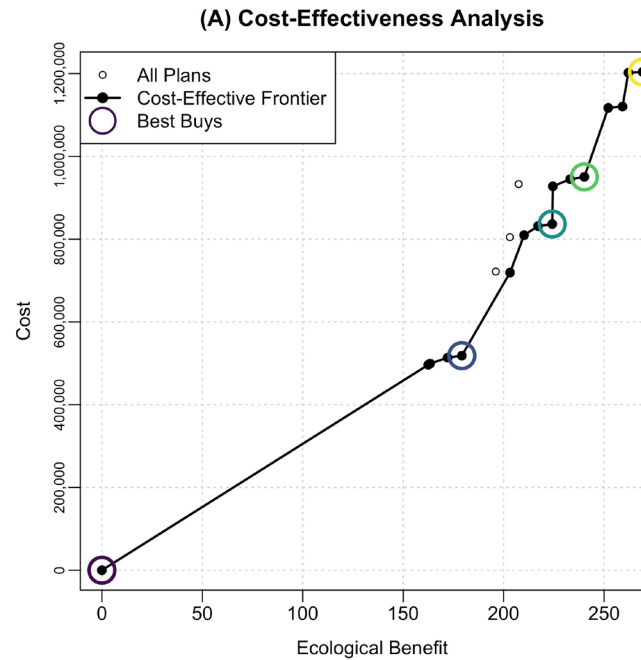
- Scatter plots
- Histograms
- Correlation heatmaps

Examine spatial data

Communication

- Formal
- Informal

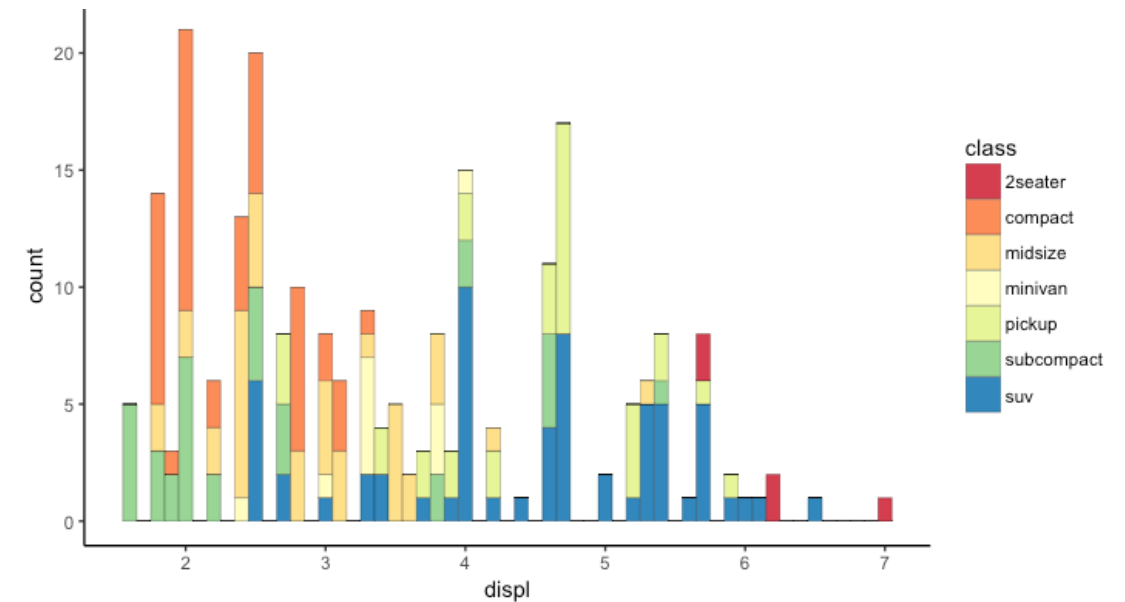
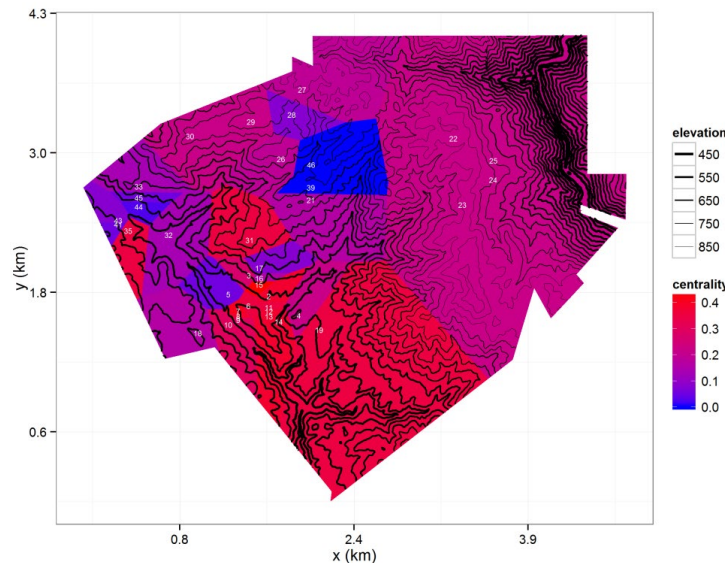
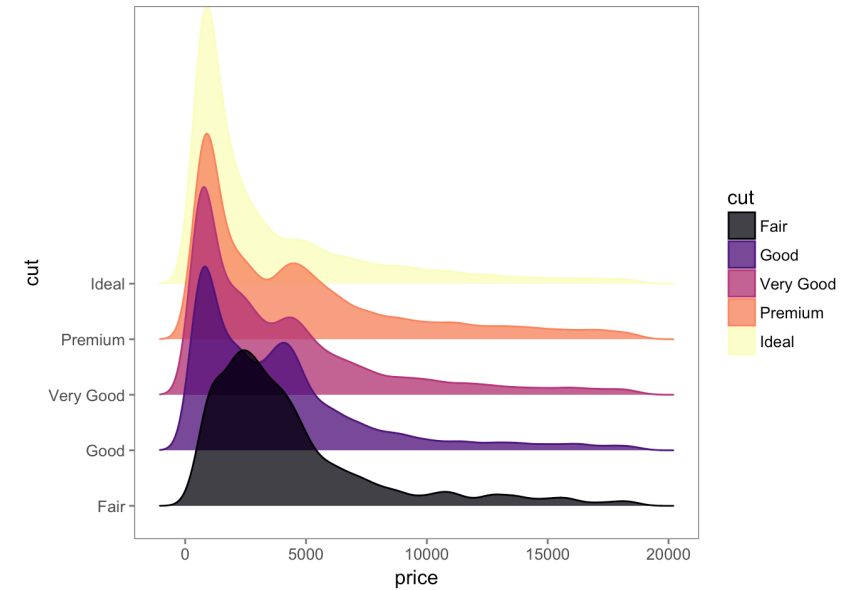
Decision-making





WHY PLOT IN R?

- Reproducibility and version control
- Automation and scalability
- Customization and flexibility
- Statistical integration
- Publication-quality graphics
- Interactive and dynamic visualization




 ggplot2

- Grammar of graphics
- Consistent vocabulary to create numerous, variable plots
- Small code changes = big changes plot changes
- Plots are built step-by-step by adding new layers
- Part of tidyverse package
- Data in “long” format





GGPLOT TEMPLATE



```
ggplot(data = DATA,  
       mapping = aes(VARIABLES))+  
geom_function()
```



GGPLOT TEMPLATE



```
ggplot(data = DATA,  
       mapping = aes(VARIABLES))+  
geom_function()
```

```
ggplot(data = mpg,  
       mapping = aes(x = cty, y = hwy))+  
geom_point()
```

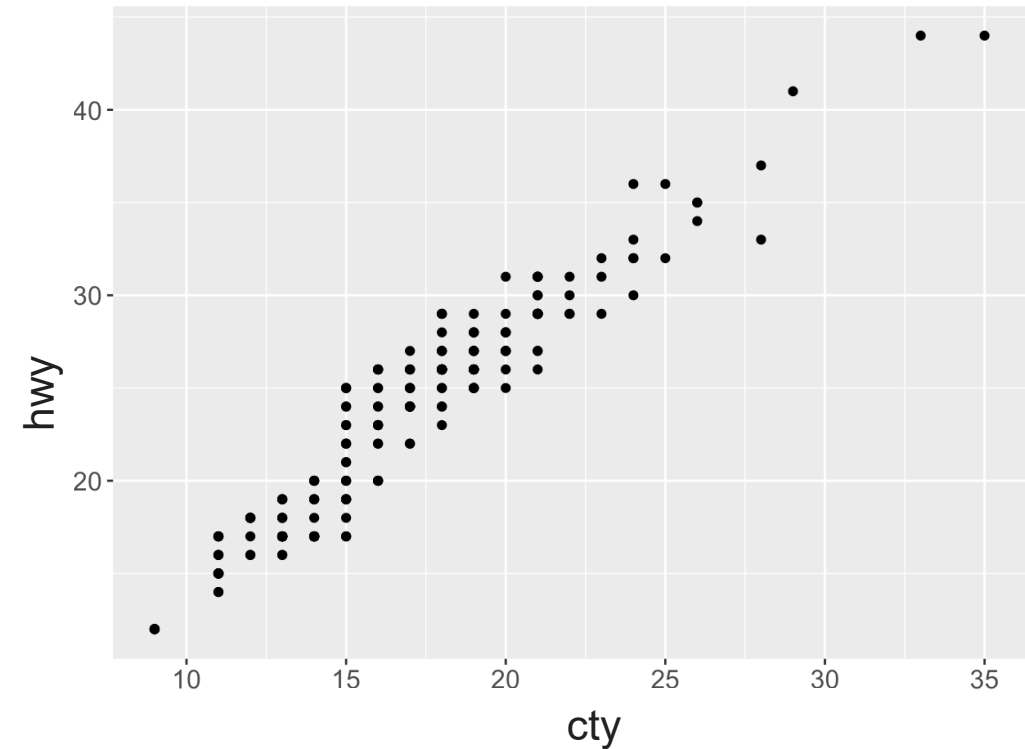


GGPLOT TEMPLATE



```
ggplot(data = DATA,  
       mapping = aes(VARIABLES))+  
geom_function()
```

```
ggplot(data = mpg,  
       mapping = aes(x = cty, y = hwy))+  
geom_point()
```



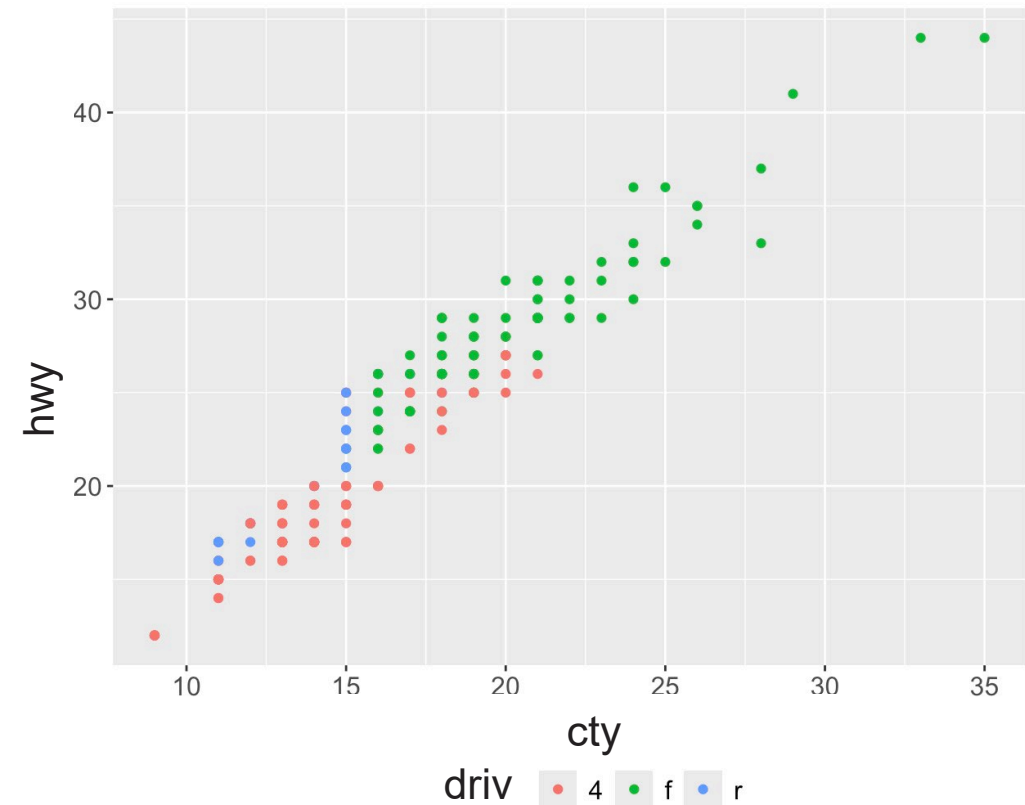


GGPLOT TEMPLATE



```
ggplot(data = DATA,  
       mapping = aes(VARIABLES))+  
geom_function()
```

```
ggplot(data = mpg,  
       mapping = aes(x = cty, y = hwy,  
                    color = driv))+  
geom_point()
```





GGPLOT TEMPLATE

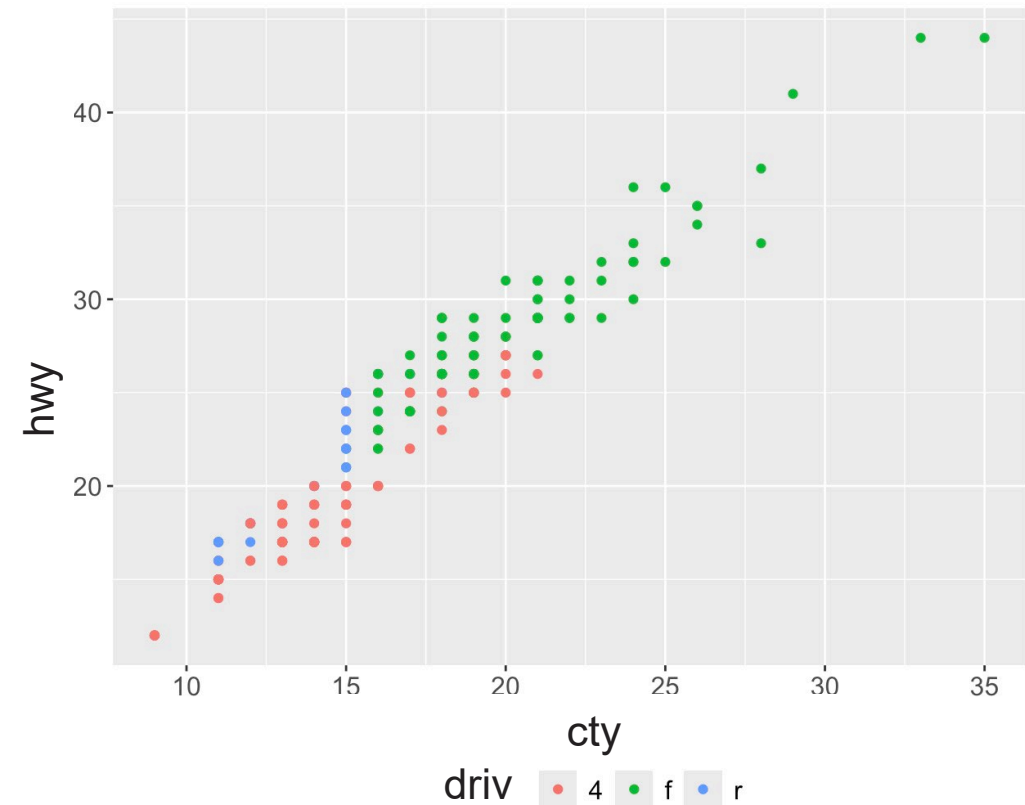


```
ggplot(data = DATA,  
       mapping = aes(VARIABLES))+  
geom_function()
```

```
ggplot(data = mpg,  
       mapping = aes(x = cty, y = hwy,  
                     color = driv))+  
geom_point()
```

Key aesthetics

- x
- y
- color
- fill
- size
- shape
- linetype





GGPLOT TEMPLATE



```
ggplot(data = DATA,
       mapping = aes(VARIABLES))+
geom_function()+
Scale +
Facet +
Theme
```





TUTORIAL OBJECTIVES



- Conceptually understand how to build a plot with ggplot2
- Produce various plot types
- Represent data variables with plot components.
- Iteratively build and modify plots by adding layers.
- Change the appearance of existing plots using themes.
- Describe what faceting is and apply faceting in ggplot2.



SUMMARY



- The `ggplot()` function initiates a plot
- `geom_` functions add representations of your data
- Use `aes()` to map a variable from the data to a part of the plot
- Use premade `theme_` functions to broadly change appearance, and the `theme()` function to fine-tune
- Use faceting for powerful plotting
- Start simple and build your plots iteratively
- Let Rstudio help you!



ACKNOWLEDGEMENTS



Research funding

- Ecosystem Management and Restoration Research Program (EMRRP)



Contact info

Ed Stowe, PhD

Athens, GA

Edward.S.Stowe@erdc.dren.mil

Current web location

<https://usace-wrises.github.io/USACE.EcoMod.Training>