

# Data Visualization

Displaying patterns in data, emphasizing aspects we think are important, conveying our results.

# Cartography

The study and practice of making maps.

- Why do we make maps?
  - To transmit spatial information to a map reader.
- Data/Analyses are meaningless, unless conveyed in an understandable way.
  - Decide what you want to communicate and to whom.

## Good Maps

- Accessible to target audience
- Clean and easy to read
- Can be quickly interpreted
- Aesthetically pleasing

## Bad Maps

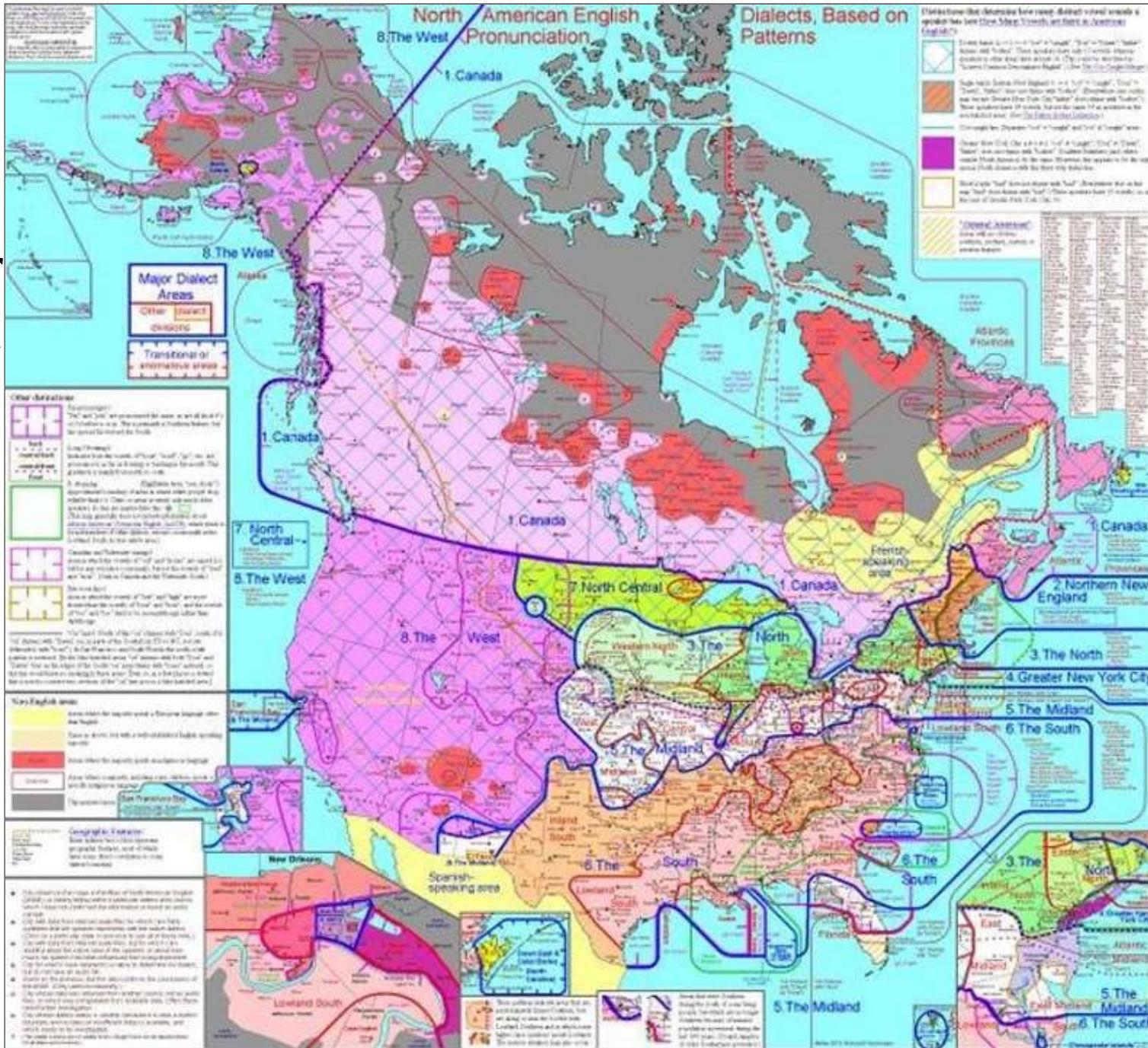
- Misses target audience
- Cluttered and ineffective
- Easily misinterpreted
- Ugly

## A Bad Map

Excellent example of a bad map showing really interesting information.

- Too much information
- Too many colors
- Text is way too small

# A Be tter Ma p



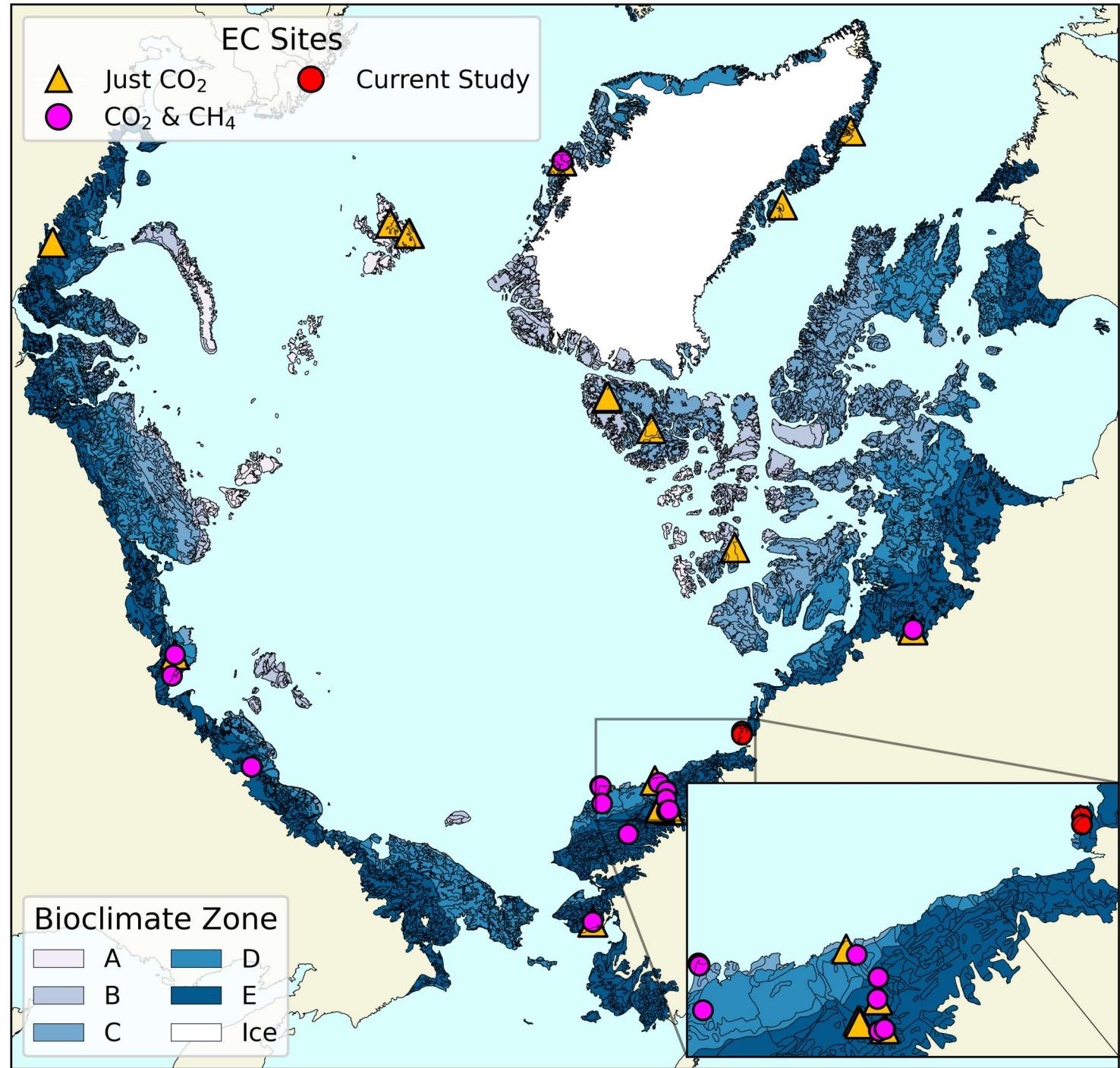
Cleaner, less complex presentation

- Distinguishable features
- Less information
- Suitable fonts

## Design Principles

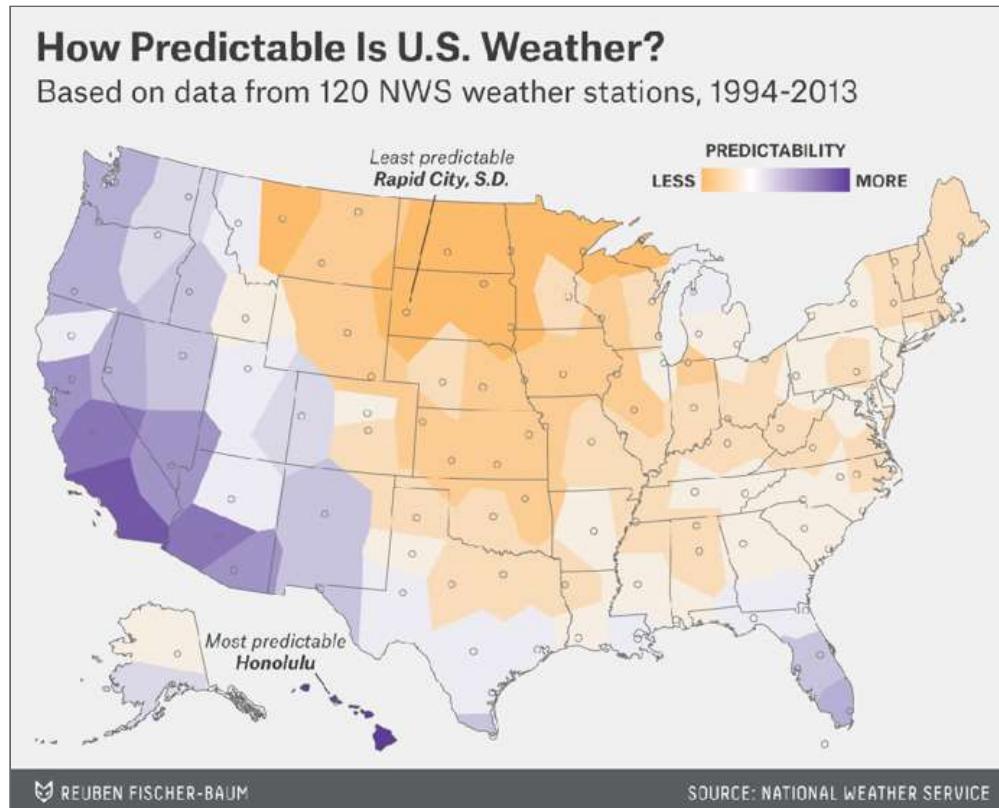
Give the viewer the most information in the shortest time with the least ink in the smallest space.

- Complex ideas communicated with clarity, precision, and efficiency.
- Maximize data-to-ink ratio (i.e. more data, less other stuff).
- Erase non-data ink, within reason.



# Design Principals

The best maps can be interpreted quickly and easily.



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## Data Symbolization

The shapes, characters, colors, lines we use to represent information on a map.

- The choices we make will convey aspects of the data.
- Some colors/sizes/shapes lead to assumptions.

# Data Symbolization

Ask yourself: Discreet or Continuous?

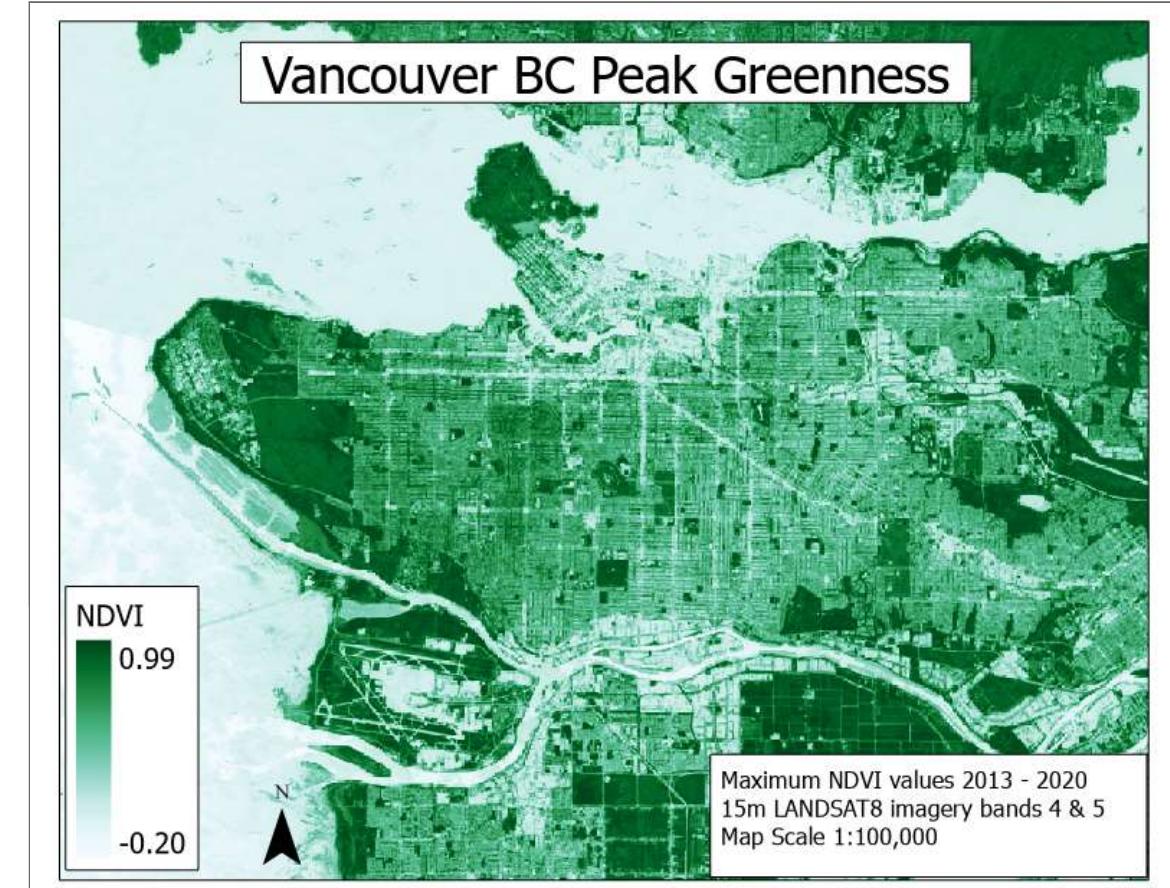
CONTINUOUS

- Surfaces, contour lines
- Different shades/intensities

DISCREET

- Points/Lines/Shapes
- Different Hues (colors)





# Data Symbolization

Ask yourself: What measurement scale?

## NOMINAL

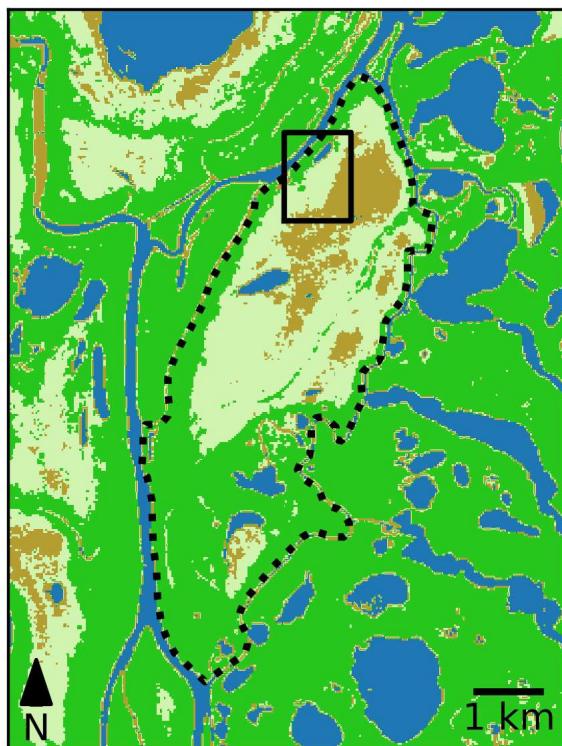
- Dashes, Shapes
- Different Hues (colors)
- **Do Not** choose colors or sizes that imply a difference in magnitude.

## ORDINAL/INTERVAL/RATIO

- Different shades/intensities, graduated symbols
- **Do Not** choose colors or shapes that imply a difference in category.

# Fish Island Landscape Classification

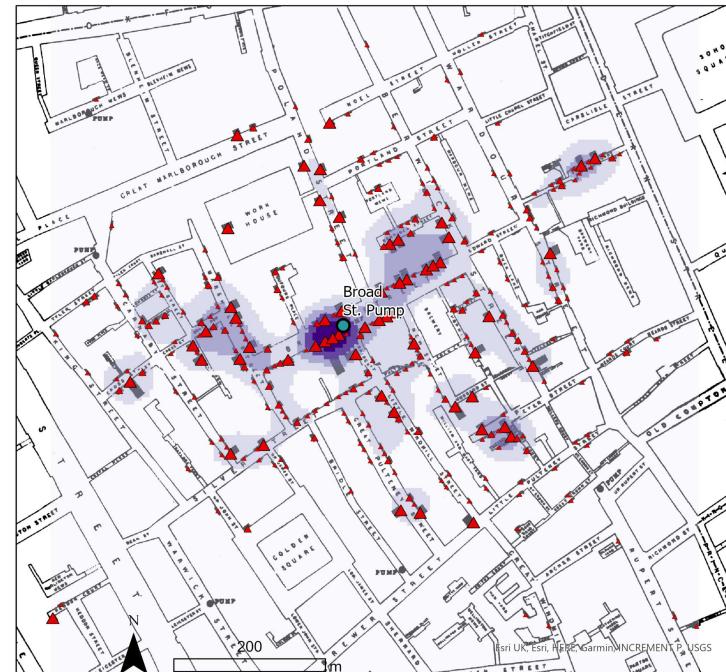
a.



## Landscape Class

- Degraded Polygons
- Low Center Polygons
- Shrub Tundra
- Open Water
- Extent Indicator (b.)

# London Cholera Outbreak 1854



Deaths

per Household

- 1
- 2
- 3 - 15

Kernel Density

Deaths / Hectare

- 0.000001 - 18.875304
- 18.875305 - 37.750607
- 37.750608 - 56.625911
- 56.625912 - 75.501215
- 75.501216 - 94.376518

Data Source: Dr. John Snow  
Created by: June Skeeter  
Date Created: 9/5/2021

.... Fish Island

— · 90% Footprint

○ Eddy Covariance Station

△ Automated Weather Sation

★ Taglu Tower

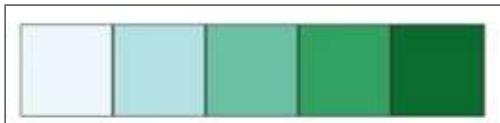


# Color Choice

It is important to choose the right kind of color map.

- **Sequential:** Gradation of shades one hue (color).
- **Diverging:** Gradation of shades opposing hues, from a central point.
- **Qualitative:** Different hues of the same shade.

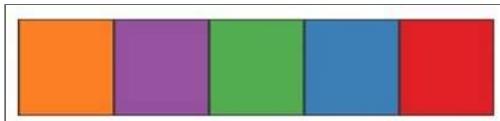
Sequential: Ordinal/Ratio



Diverging: Interval



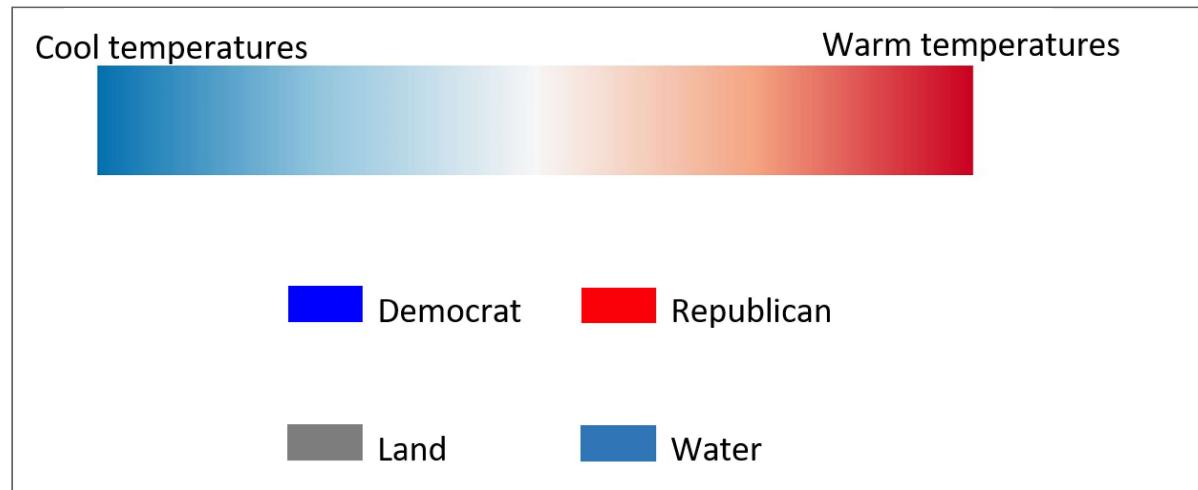
Qualitative: Nominal





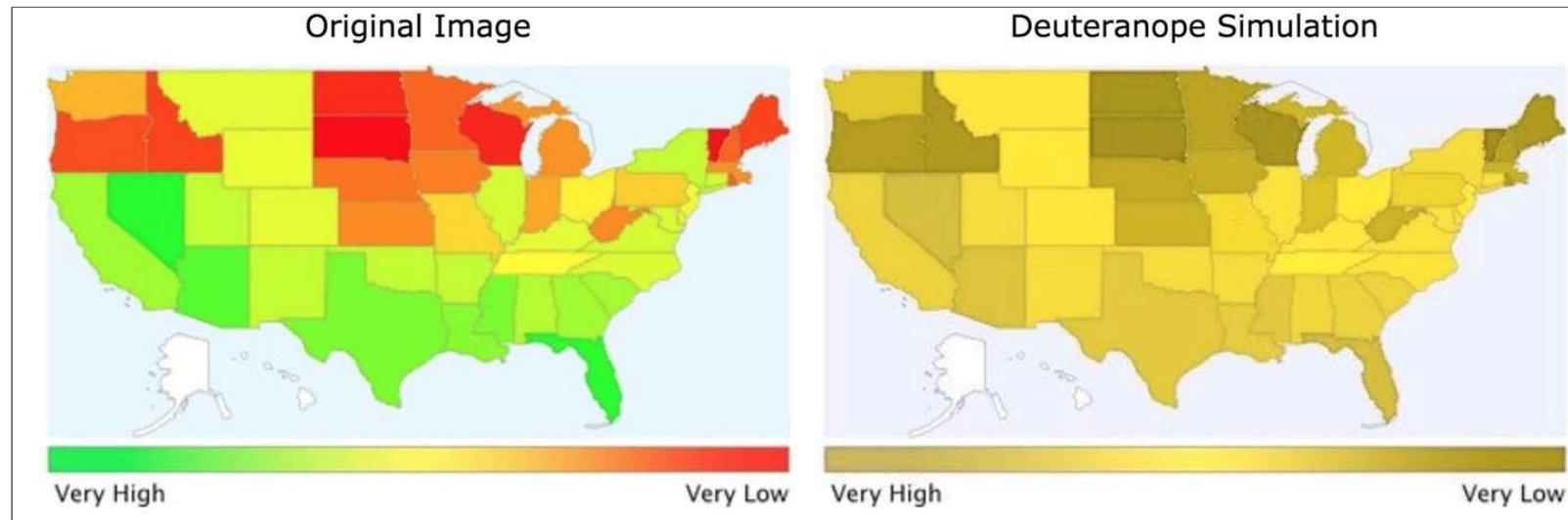
# Color Choice

Some colors have implicit assumptions depending on the context.



# Color Accessibility

About 4.25% of people are colorblind, red-green is the most common.  
Color Brewer is a great resource.



# Visual Hierarchy

Our perception is influenced by the order in which we see things. The relative importance of features is implied by the layout & size.

## Placement

- Center first
- Top to bottom
- Left to right

## Font Size

- Large
- Medium
- Small

## Shade

- Light
- Medium
- Dark

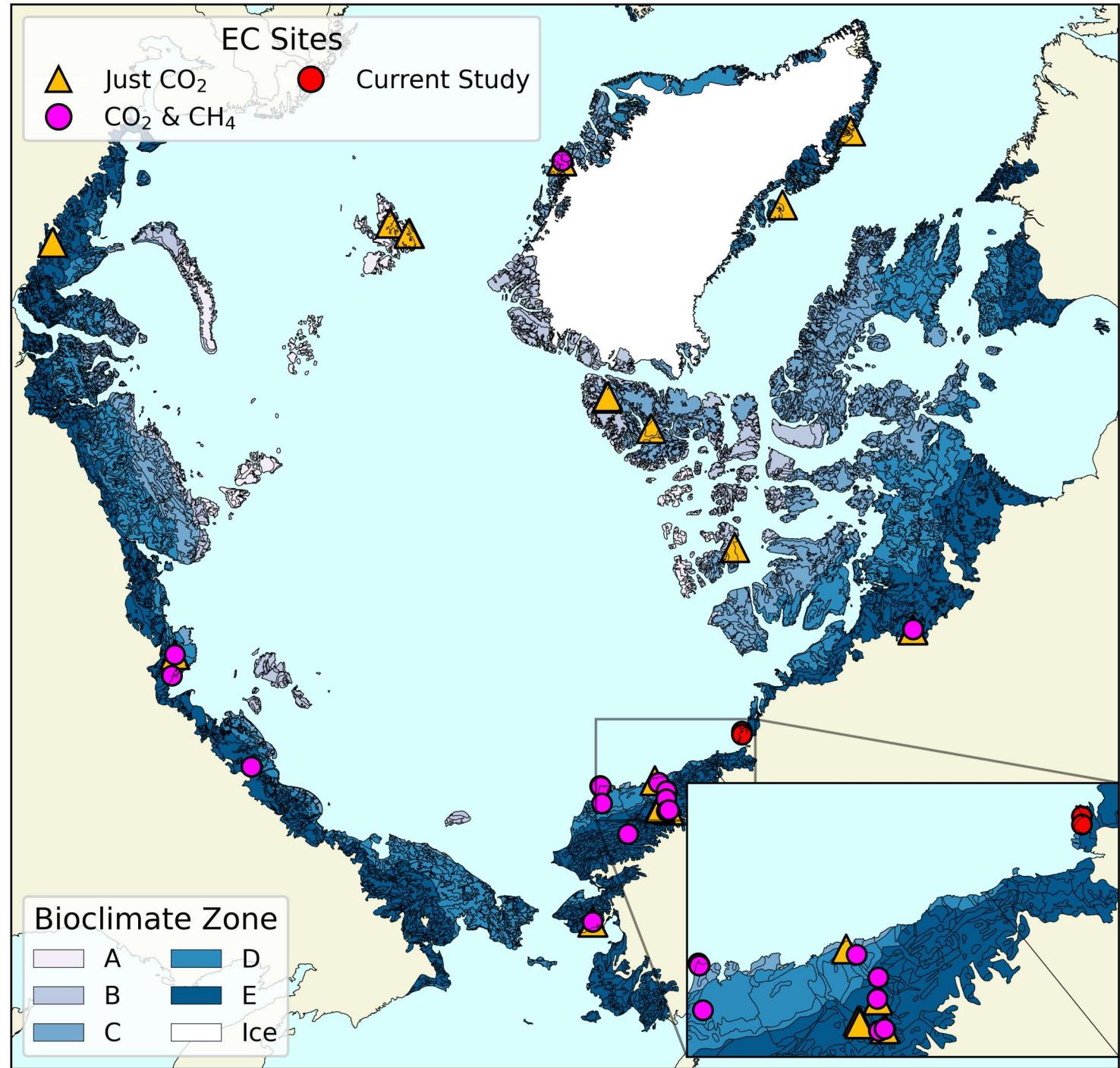
# Stylistic Guidelines

- Clear labeling to prevent ambiguity and confusion.
  - Minimize assumptions about your audience.
  - Proof your map text.
- Consider if all map elements are necessary.
  - Scale bars, North arrows, etc.
  - Minimize “chart junk”
- Use appropriate color schemes.
  - Colorblind friendly
  - High contrast
  - Suited for data type

# Stylistic Guidelines

## North arrows scale bars

- North arrow - doesn't work in circumpolar area, not needed if its a familiar region
- Scale bar - not needed if its a familiar region, unless navigation is important, scale text can often suffice



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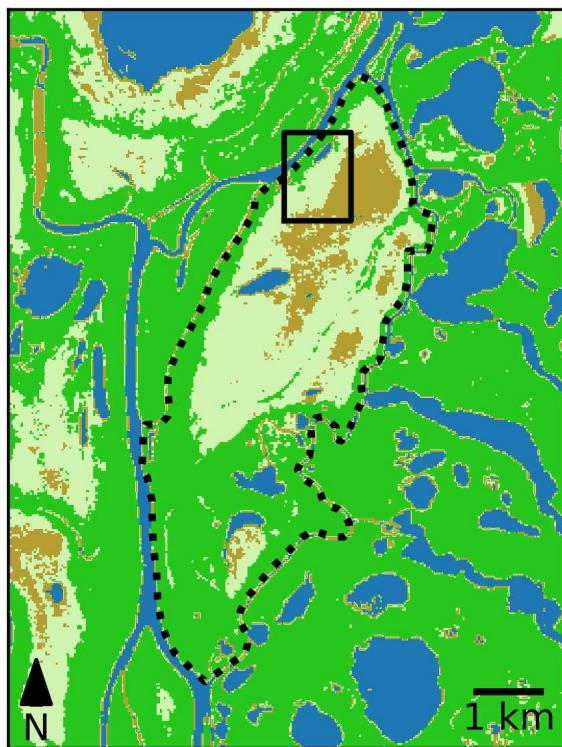
## Stylistic Guidelines

### North arrows scale bars

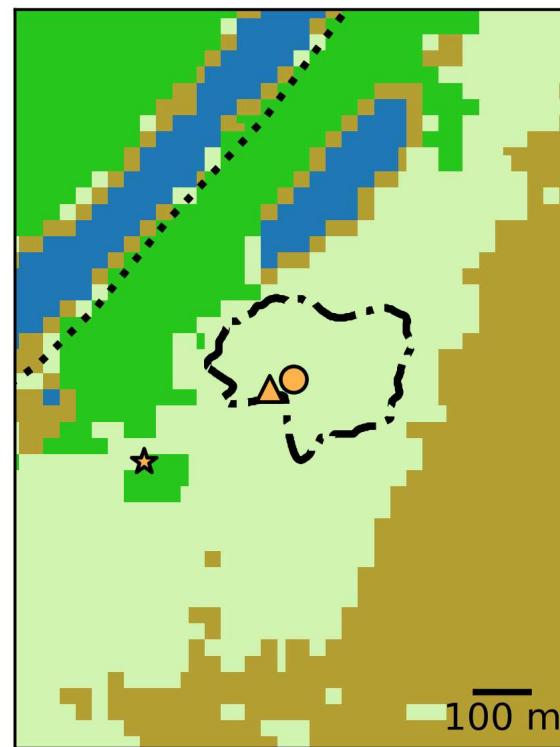
- North arrow - needed if it's not a familiar region or if north is not up
- Scale - needed if it's a familiar region or if multiple maps are at different scales

# Fish Island Landscape Classification

a.



b.



## Landscape Class

- Degraded Polygons
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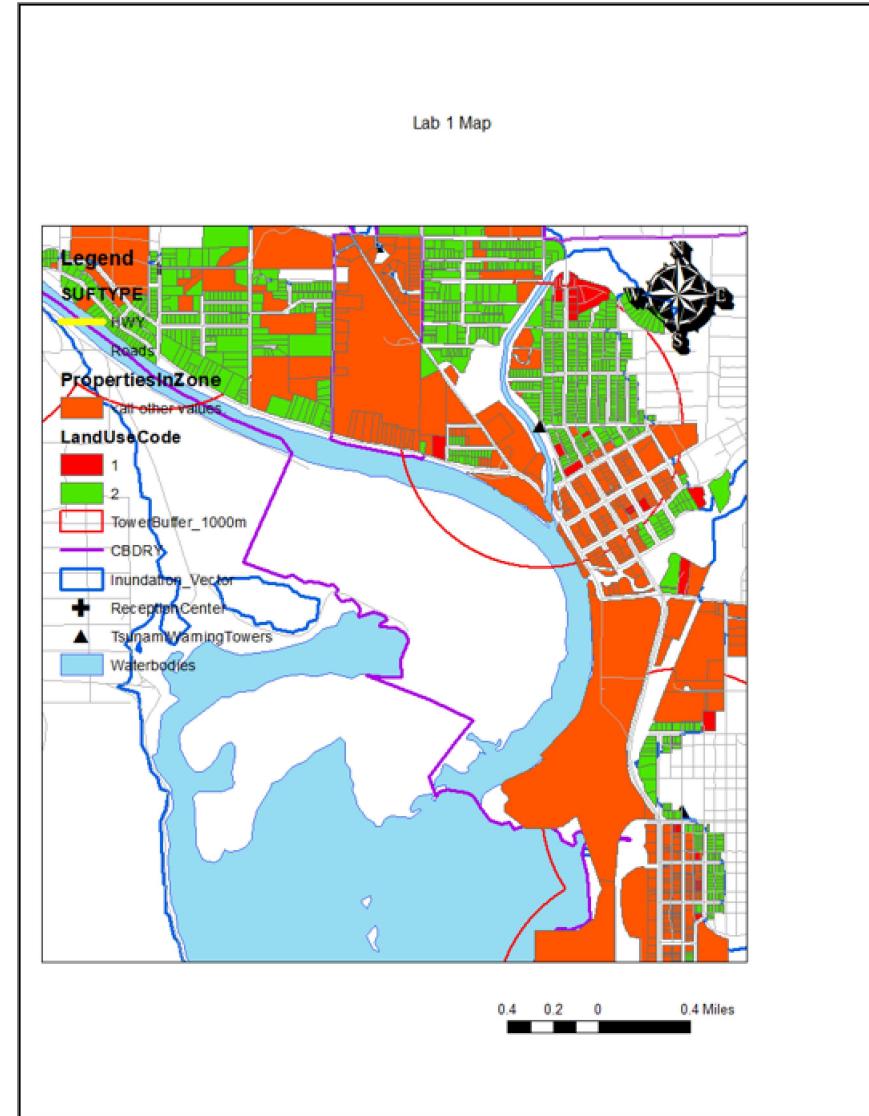
## Points of Interest

- ..... Fish Island
- 90% Footprint
- Eddy Covariance Station
- △ Automated Weather Station
- ★ Taglu Tower

So Many Mistakes!!

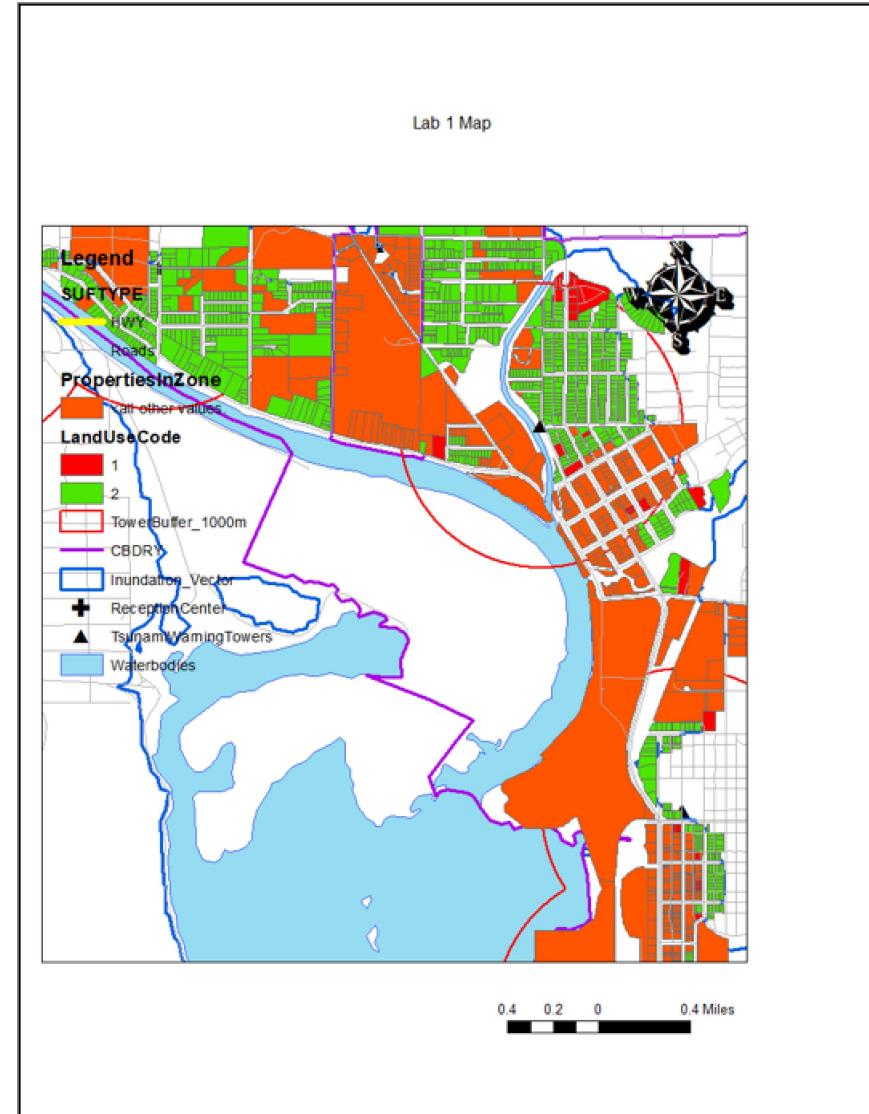
- Poor use of map space, wasted white space, not centered
- Poor color choice
- Not all map elements are visible
- Text/font issues
- North arrow - placement/size
- Scale bar - wrong units!

# So Many Mistakes!!



- Legend issues
  - Avoid unnecessary text
  - Get rid of underscores, make sure entries are meaningful
- No name, affiliation, source

# Cleaner presentation



- Area of interest takes up most of the map space.
- Name, affiliation, source.
- More meaningful legend entries.
- Proper sizing/placement of map elements.

- More pleasing color choice, easier for colorblind people to read.

## Stylistic Guidelines

These are just guidelines!

- Cartography is an art, there are no steadfast rules.
  - Just best practices.
- Play around with styling, just be able to justify your choices.
- Not all spaces “want” to be mapped, sometimes you need to make aesthetic compromises to make an effective map.

