

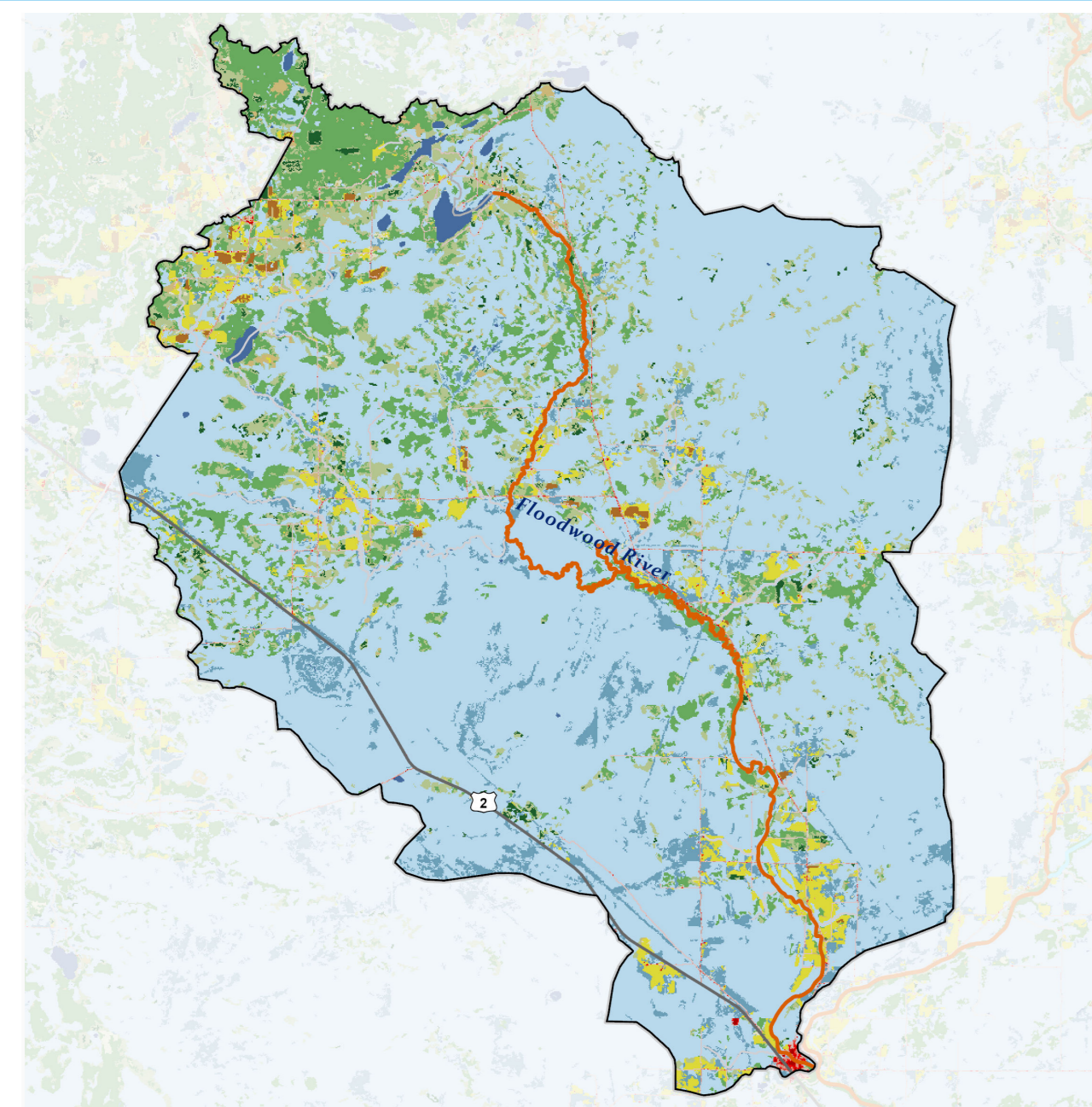
Map accessibility tips

Making information clear and accessible | Andrea Borich

Introduction

Making maps that are easy to understand is an important aspect of their design. One characteristic of an easy to understand map is accessibility, ensuring that everyone has access to the information being shared. However, accessibility is often overlooked. Data visualizations need to be accessible so that those who rely on screen readers or have vision impairments or other disabilities can interact with the information provided. Cartographers and others creating visualizations should follow accessibility best practices that have been evolving over time like the Web Content Accessibility Guidelines (WCAG) which started in 1999. The WCAG currently complies with both the Americans with Disabilities Act (ADA) accessibility guidelines and the Rehabilitation Act Section 508 accessibility standards. This poster provides insights into using some easily applicable accessibility guidelines and highlights available resources and tools for producing accessible maps.

Initial map



Here is an example of an inaccessible map with various overlapping layers. Let's first focus on making the map itself colorblind friendly and more accessible to visually impaired users.

This map shows the National Land Cover Dataset (NLCD) 2019 with its default color palette, an impaired water (the Floodwood River) in orange and highway 2 in gray.

Let's work through an accessibility check and make improvements!

Accessibility tips

Use San Serif
(Arial)

Use San Serif
Fonts
Verdana Arial

San Serif does not have strokes at the end of letters.

Times New Roman for water features is an exception to this tip.

Use sparingly
ALL CAPS
Bold

These can be great for calling out text but do not overuse.

Use white space

Do not overlap labels.

Minimum font sizes
label 6 pt +
good label 8 pt +
written/reading text 12 pt +

Twelve point is easiest to see - especially with a lot of text.

Use kerning
for large areas

Avoid using
italics
underlined text

These styles decrease readability.

Keep text rotated less
than 90 degrees

Text rotated over 90 degrees is not readable.

Halos

Be cautious with halo use they can be helpful but are not always necessary.

Use Monospaced Typefaces

Monospaced means all characters use the same amount of horizontal space.
Examples of monospaced typefaces:
Courier
Helvetica

Symbols - use multiple of the following to enhance accessibility:

Colors

Make sure colors are distinct. When colors are too alike and not contrasting they are not going to be distinguishable by all.

When possible, base colors off of reality, for example:
forest = green
water = blue

Sizes

When using multiple sizes for points each point size difference should be at least 2x. (ex: 2, 4, 8)

When using lines each line thickness should be at least 1 point difference. If portraying in multiple ways (for example using size and color) then 0.5 point is an acceptable difference of thickness.

Shapes

Use real world associations when possible, for example:
triangle = pine tree
square = building

Textures

Use sparingly

Apply textures to lines using line styles such as dashed or dotted.

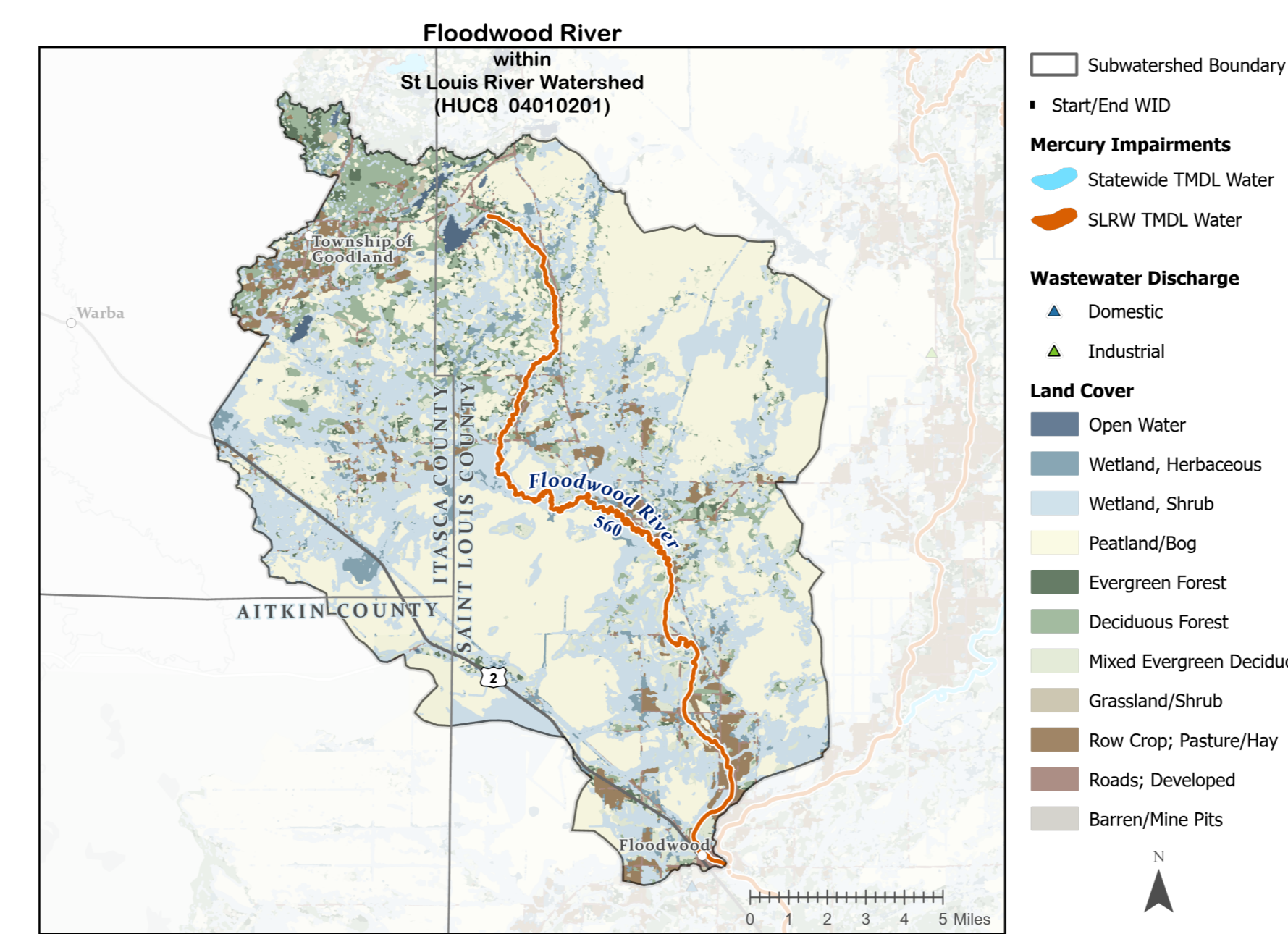
Example of improvements

Issue: poor visual hierachy

Possible solution: halos

Use halos to create more contrast between the river and the basemap, this works well for this map because the underlying NLCD layer includes many colors.

Add reference layers such as county boundaries, populated places, and point sources to help orient the user and provide geographical context.



Issue: lack of contrast within the land cover (NLCD) color palette.

Possible solution: combine categories and increase contrast

Combine NLCD categories:

Cartographers can create high contrast color palettes more easily with fewer categories, while also making them easier for readers to differentiate.

Original NLCD Land Cover Classification Legend (excluding AK specific items)	16 items	8 items
<ul style="list-style-type: none"> 11 Open Water 12 Perennial Ice/Snow 21 Developed, Open Space 22 Developed, Low Intensity 23 Developed, Medium Intensity 24 Developed, High Intensity 31 Barren Land (Rock/Sand/Clay) 41 Deciduous Forest 42 Evergreen Forest 43 Mixed Forest 52 Shrub/Scrub 71 Grassland/Herbaceous 81 Pasture/Hay 82 Cultivated Crops 90 Woody Wetlands 95 Emergent Herbaceous Wetlands 	→	<ul style="list-style-type: none"> Open Water Wetland Forest Peatland Grassland Barren Developed Agriculture

Check contrast:

ArcGIS Pro Color Vision Simulator (View tab > Accessibility group > Color Vision Simulator)

TPGi's Colour Contrast Analyzer 2.5 (Contrast checker and color vision simulator)

Normal/No simulation

Protanopia (red-green) simulation unable to distinguish between red/green with altered perceptions of red

Deuteranopia (red-green) simulation unable to distinguish between red/green with altered perceptions of green

Tritanopia (blue-yellow) simulation unable to distinguish between blue/green, purple/red, and yellow/pink

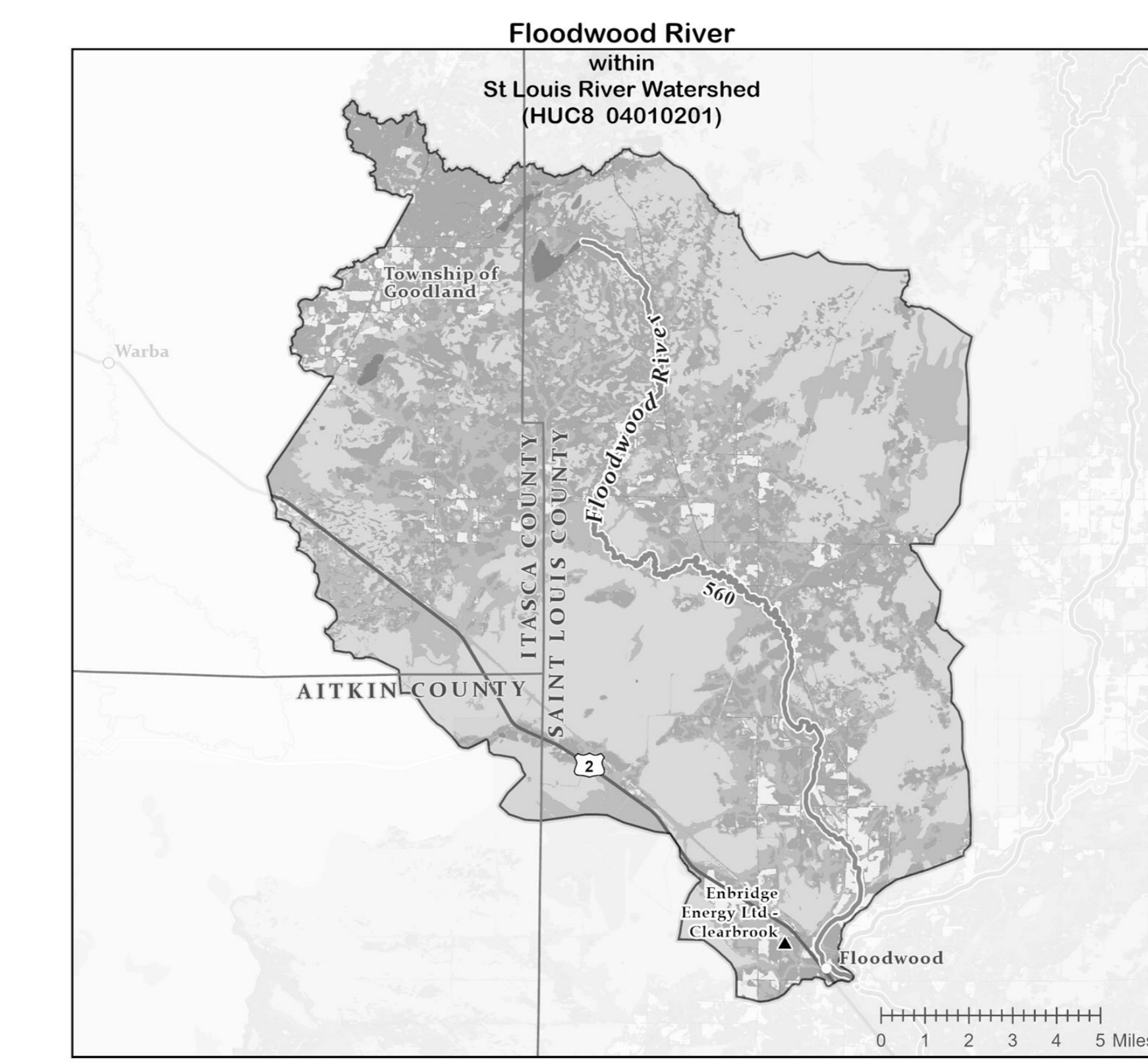
Cataracts simulation blurry vision

Grayscale simulation (monochromacy/achromatopsia) Unable to see any colors

Enhance contrast:

Color Contrast Optimizer Tool (Increase contrast using the grayscale simulation and review WCAG ratios within the tool)

Preferred colors palette	Color palette with updated contrast	Deutanopia	Protanopia	Tritanopia	Grayscale
Original	Updated Luminance				
Open Water	Wetland				
Forest	Peatland				
Grassland	Barren				
Developed	Agriculture				



Visualizing the grayscale of the map from the the Colour Contrast Analyzer simulates the map viewed by someone with limited color perception and is the best way to check the contrast between colors. Using the grayscale checked accessible color palette from the Color Contrast Optimizer Tool makes it easier to decipher the wetlands, from peatlands, and other NLCD grouped categories. Additional tips:

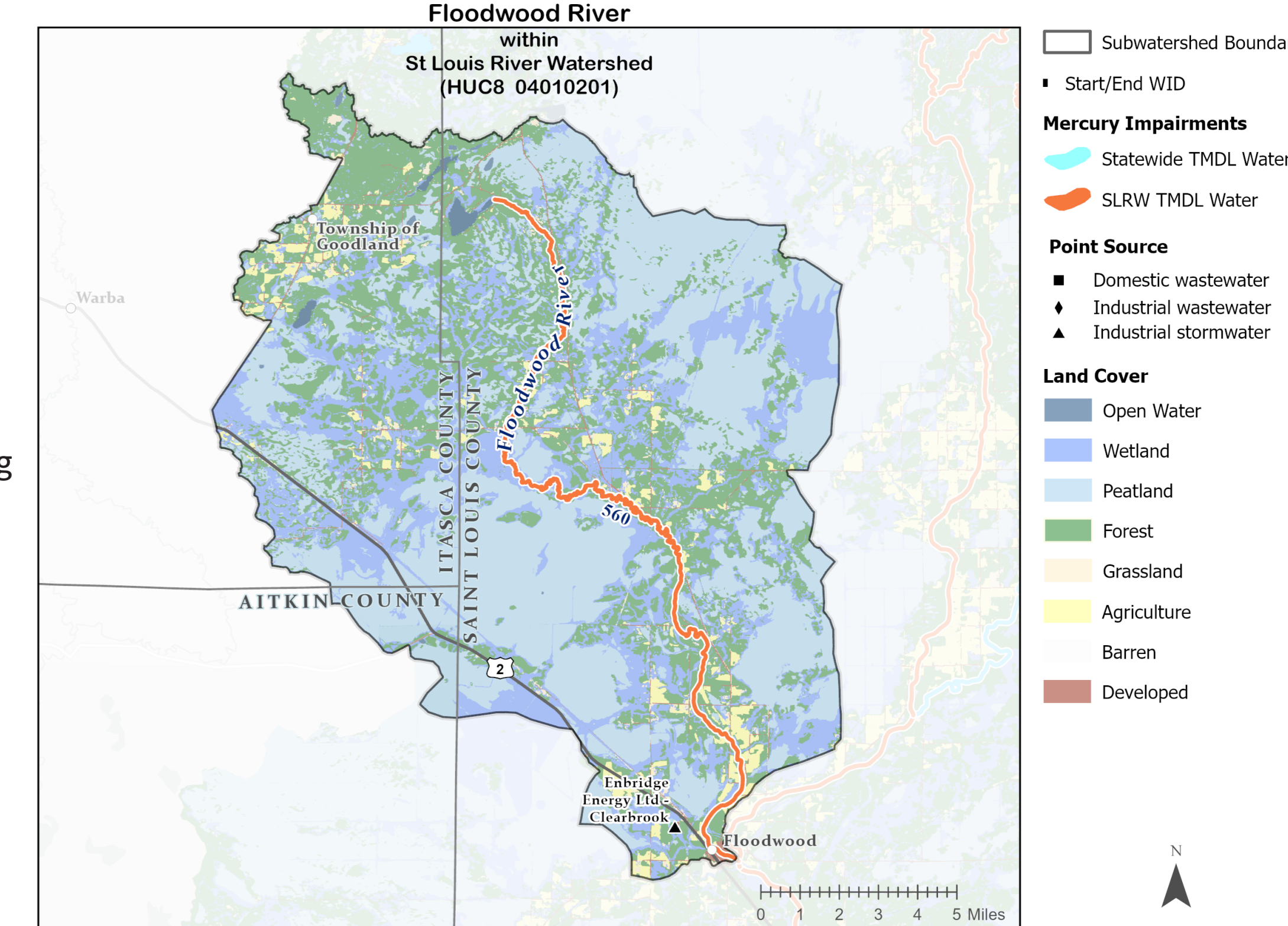
- Applying a transparency to a color palette will change the accessibility. Transparency reduces the grayscale contrast, so check the grayscale contrast for accessibility after adding transparency or making any adjustments to the color palette. You can see an example of this if you compare the high contrast between the Color Contrast Optimizer Tools's provided grayscale simulation shown previously and the grayscale map to the left.

- Review all text rotation. An example comparing text rotation is "Aitkin County" or "Township of Goodland" which have no rotation and are easy to read. While "Saint Louis County" and "Floodwood River" are rotated and do not read left to right which is more difficult to read.

To the right is the map with improved accessibility. As noted above there are still some tweaks to be made to improve its accessibility further.

There are multiple methods to make maps accessible, as is the case with most GIS tasks. The examples on this poster are just a few tips on how to start improving the accessibility of standard sized static maps. There are always additional pieces of accessibility to learn and improvements to be made.

If you have additional tips or resources to share please add a postie to the bottom of this poster.



Reminder: Accessibility for screen readers

Screen Readers are an assistive technology that is important to take into account when making maps accessible. The ArcGIS Platform (including ArcGIS Pro, StoryMaps, and Experience Builder) have the ability to add Alt Text and Accessibility Tags before exporting/publishing. The alt text and captions below make this map more accessible by making it screen reader friendly when used as a static map. If working with an interactive map additional accessibility needs should be taken into account such as key navigation to make your application accessible.

An example of alternative (alt) text for the map above:

A map focused on the area around the Floodwood River within the Saint Louis River Watershed. The Floodwood river is orange flowing down the center of the map, is labeled with its name and the water ID number 560. The area is primarily in Saint Louis County but also overlaps Itasca and Aitkin County. Highway 2 runs almost parallel to the area boundary running from the south to the west. Floodwood township is located at the southern most tip of the Floodwood River area along with Enbridge Energy Ltd - Clearbrook. The Township of Goodland is located at the north east side of the area. This all overlays the National Land Cover Dataset which shows the area to be primarily wetland and peatland with some Forest and Agriculture.

An example of a caption for the map above:

The Floodwood River (04010201-506) is a mercury impaired water with an existing Saint Louis River Watershed TMDL.

Additional accessibility resources

- WCAG Checklist (Accessibility standards) <https://www.w3.org/WAI/standards-guidelines/wcag>
- Minnesota Accessibility Website <https://mn.gov/mnit/about-mnit/accessibility>
- Color vision deficiency simulator <https://whocanuse.com>
- Access prebuilt color palettes: <https://colorbrewer2.org> and <https://carto.com/carto-colors>
- Color Contrast Optimizer tool: <https://aboricholololo.shinyapps.io/ColorOptimizer>
- Esri basemap accessibility tools: Vector Style Tile Editor - edit existing basemaps and Enhanced accessibility basemaps - prebuilt by Esri