Maps for All! – Designing for Accessibility

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MINNESOTA

The Background

- 2010 – State of Minnesota was given a mandate to make everything online “accessible”
- Nothing in Section 508 about map accessibility. I contacted several organizations working with people with visual impairments, no one could tell us what makes a map accessible
- 2015 - Small group of Department of Natural Resources staff gathered, led by department Web and Accessibility Coordinators to discuss
- Recognition of the need for a larger, state-wide group to convene
- 2016 – First state agency-wide meeting of the Accessible Maps Community of Practice.
- As of 2025, it is a 75+ member strong group with participation from every state agency and some non-state groups. Led by Minnesota Office of Accessibility

Initial Findings

- We found many staff were trained in “running the software” but not in **how to make a good map**.
- Needed a decision on what we meant by an “**accessible**” map.
- Good guidance on PDFs from Adobe, and Web Content Accessibility Guidelines (WCAG) with online interactive maps.
- **Picking colors** was the #1 difficulty for those polled.
- Recommendations and **easy access** were needed to encourage staff to make their **maps more accessible**.

First Steps

Nothing can be **100% Accessible** to ALL people!

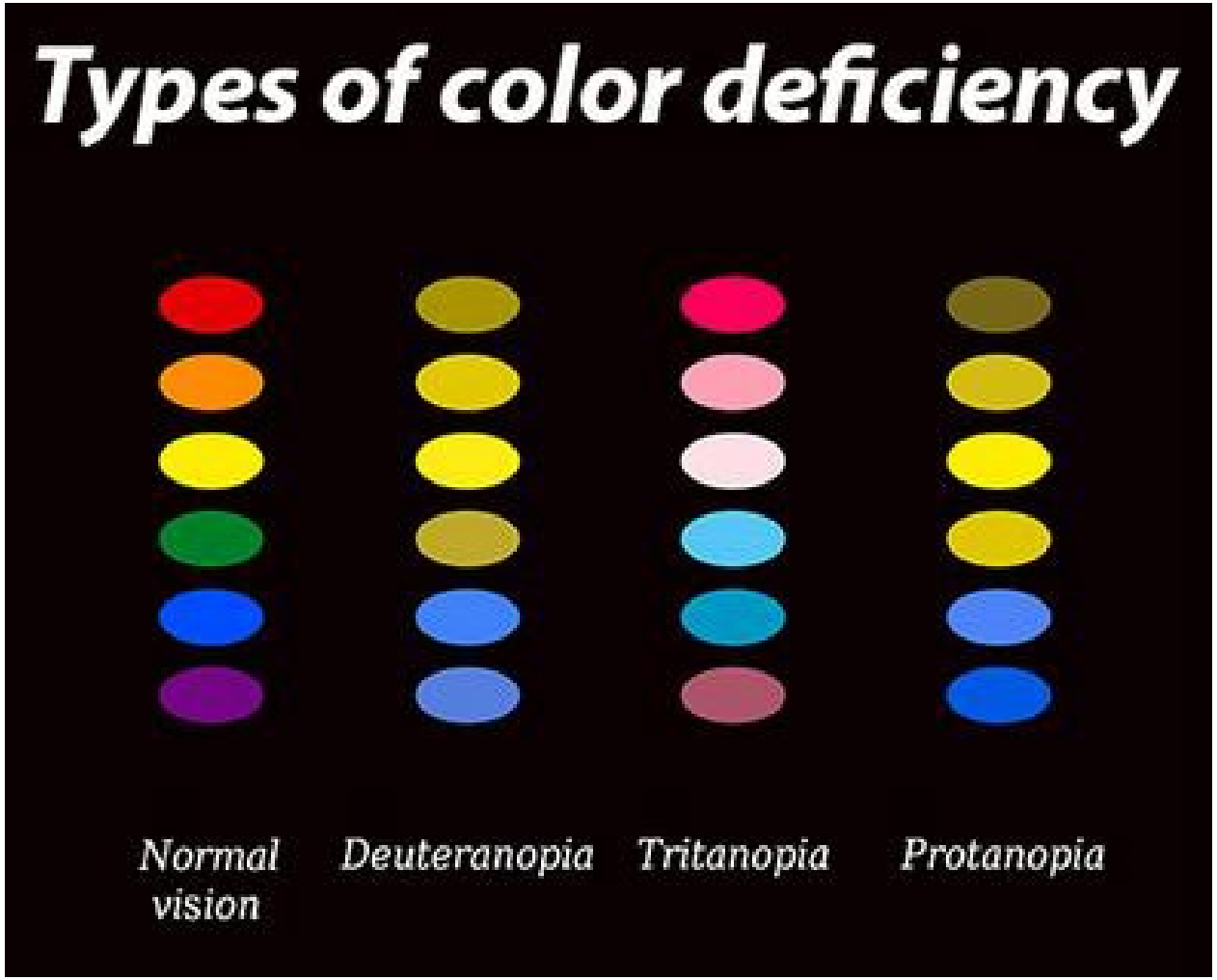
Alternative formats **may be needed.**

We can design for:

Visual impairments: Blindness (in conjunction with assistive technologies), Color Vision Deficiency (a.k.a. Color Blindness) and Low Vision

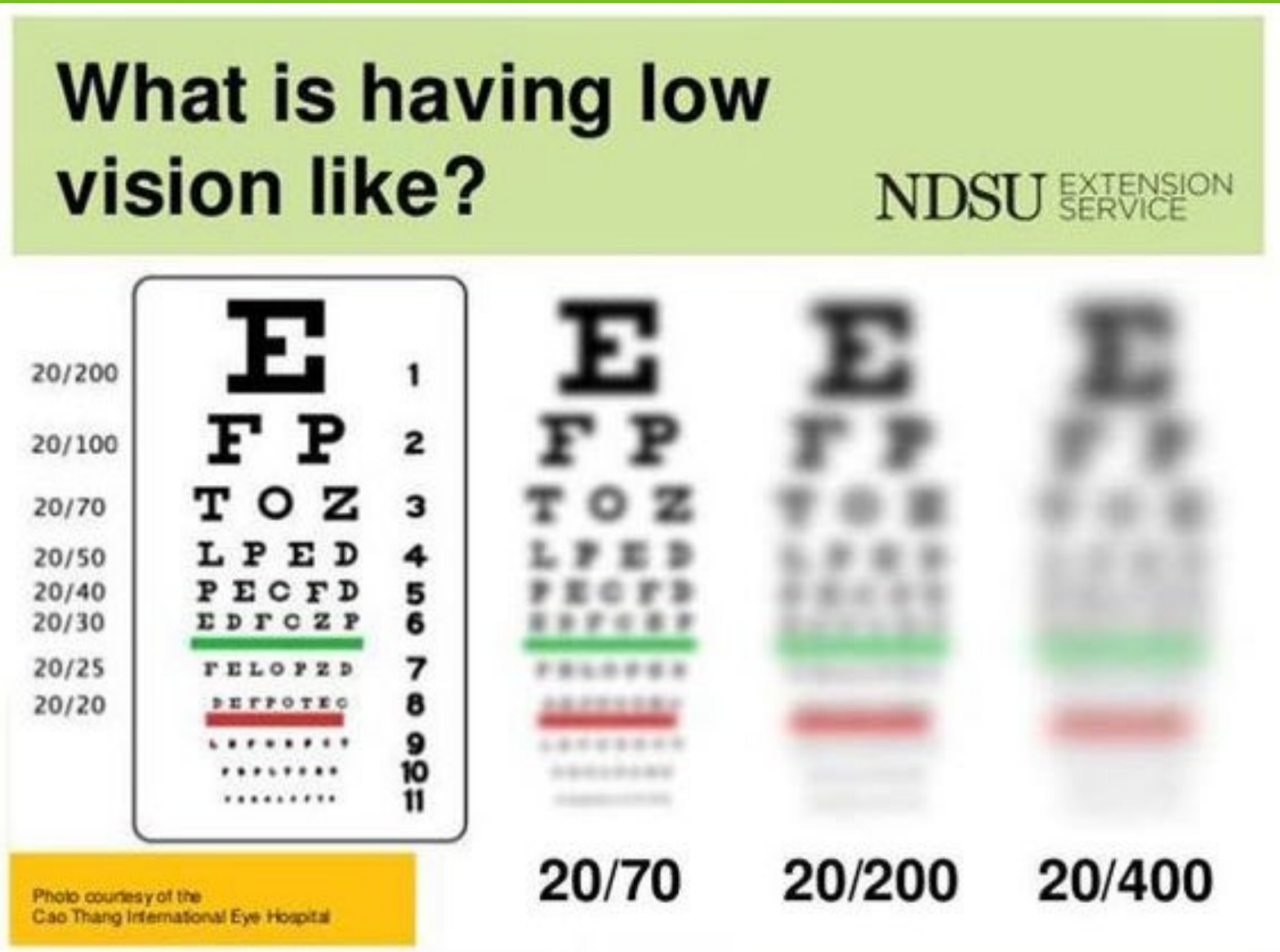
Motor and Cognitive impairments

Color Vision Deficiency

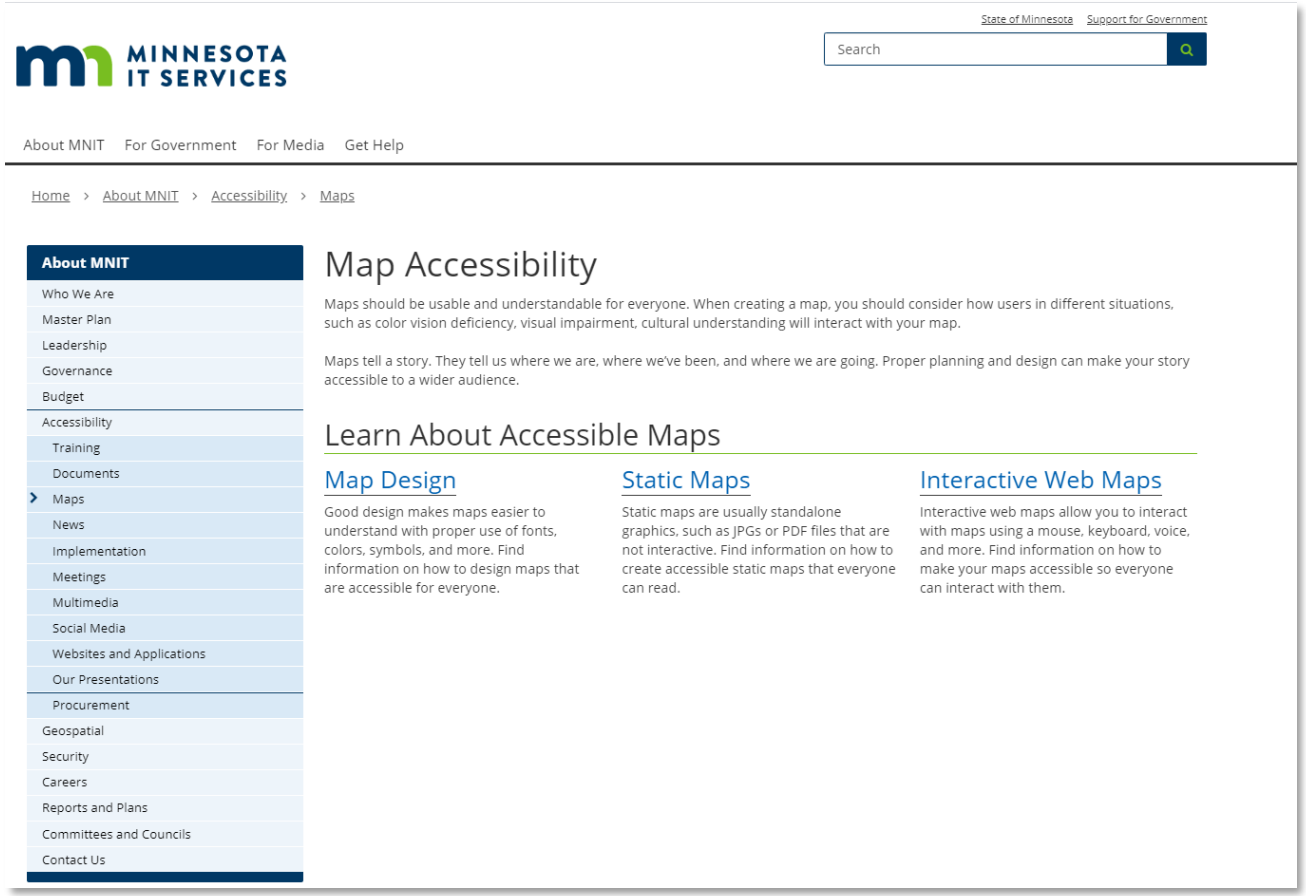


Source: American Optometric Association

What Low Vision Looks Like



State of Minnesota Resources



mn.gov/map-accessibility

Perception - What Color Is It?

Out of our control?

57%, Black/Blue

30%, White/Gold

11%, Blue/Brown

2%, Something else

Perceptions:
Age, Gender, Assumptions of daylight versus blue light and illumination.

Source: https://www.livescience.com/50842-dress-debate-color-perception.html

Recommendations – Map Design

Why a Map?

What is the **purpose** of the map?

Can the information be **better portrayed** in another way?

Maps should tell a story…don't get lost in the weeds with too much information!

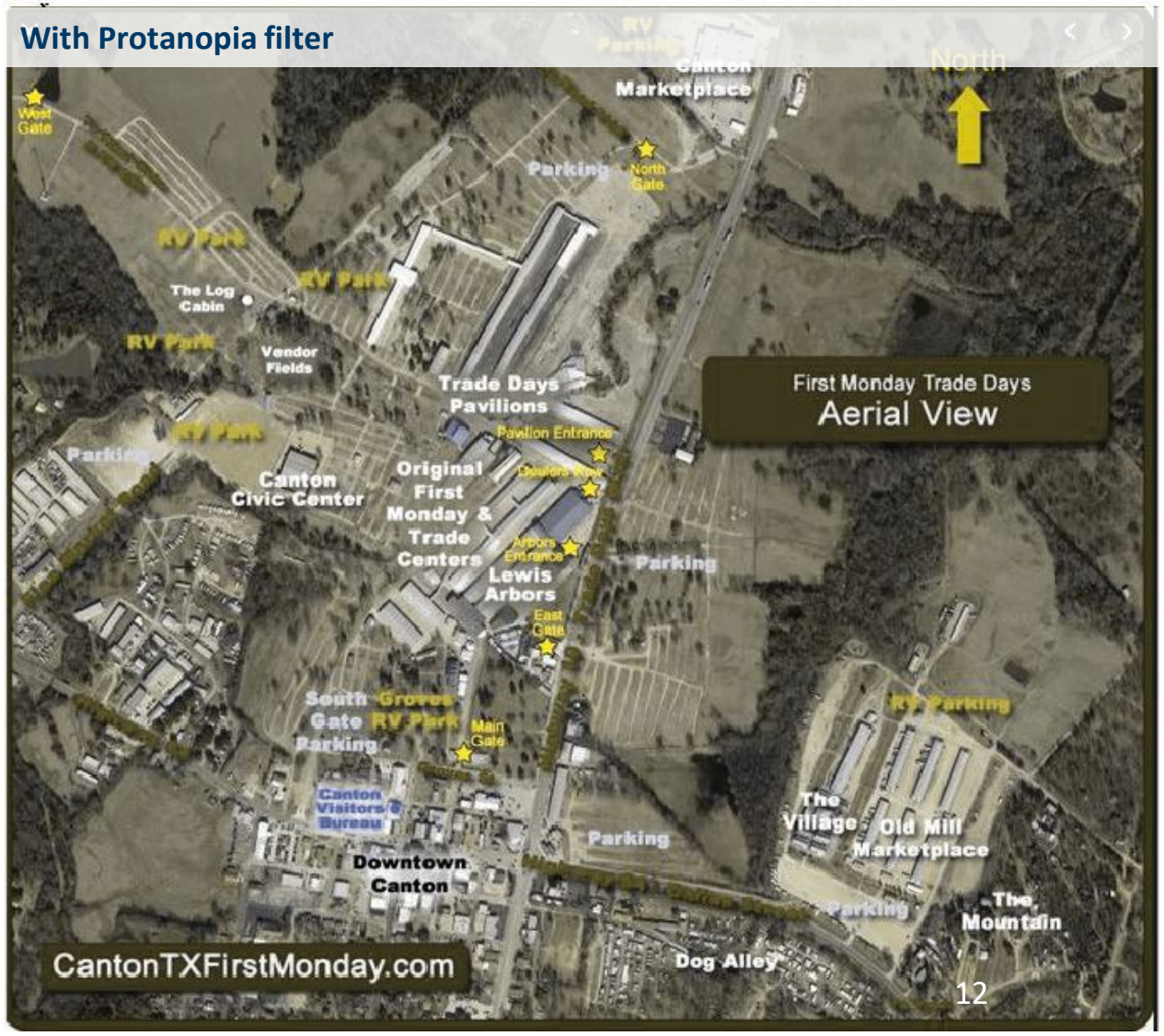
Best Practices in Color in Accessibility

- Choose color based on **information hierarchy**.
- Basemaps should be muted through transparency or use of muted colors. **Contrast is imperative*!***
- If possible, **do not rely on color alone** to communicate your information.
- Is this being printed? RGB (on-screen lights) vs. CMYK (ink on paper) matters!

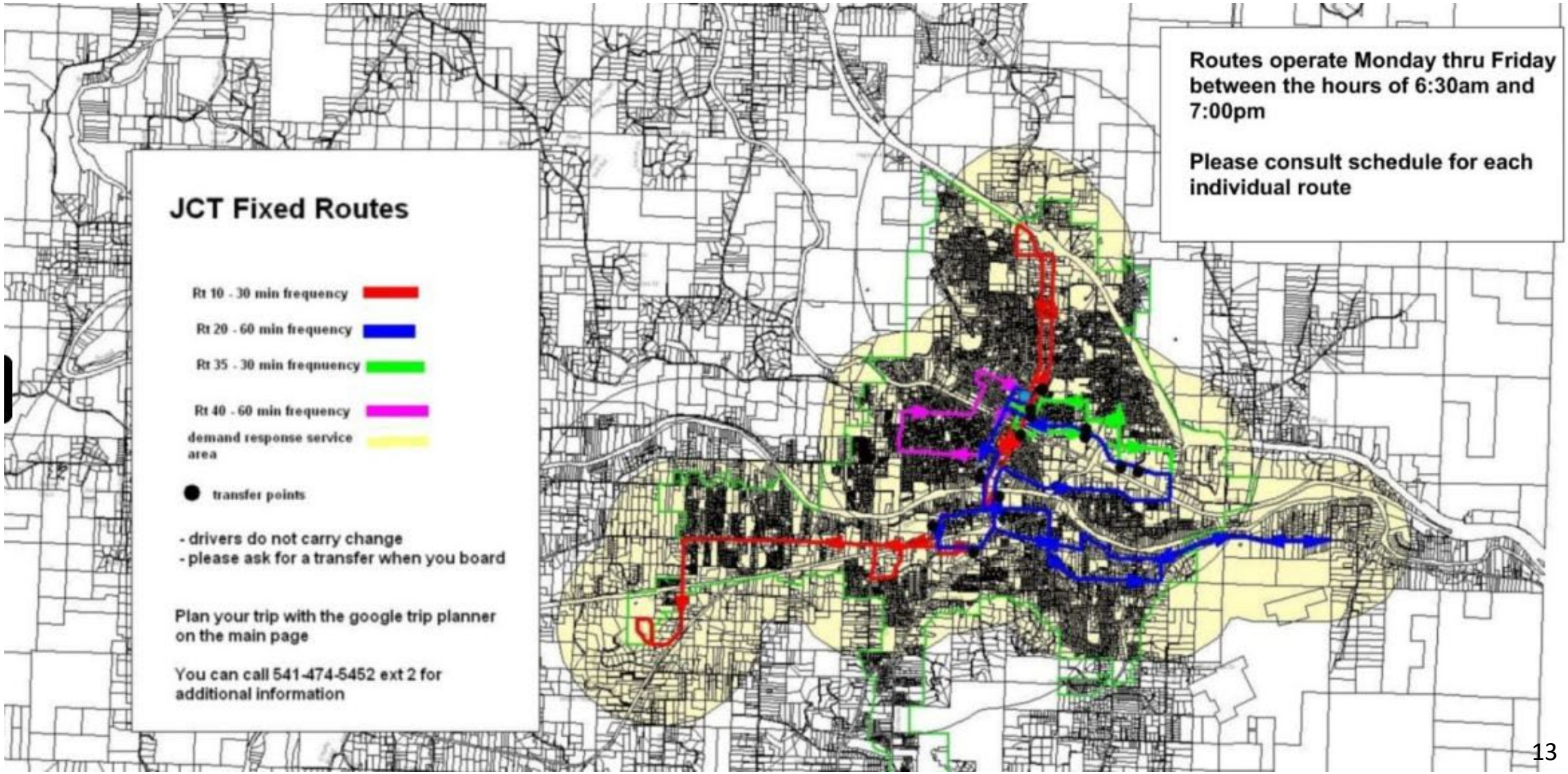
Background Imagery

Without filter

With Protanopia filter

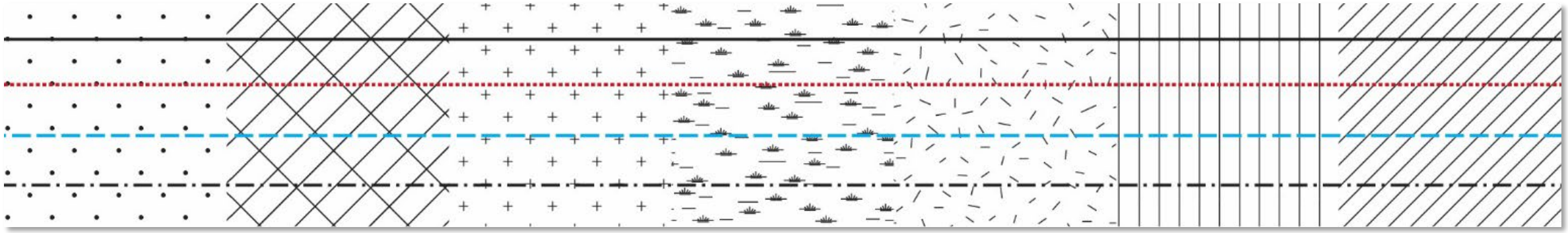


Scale


JCT Fixed Routes
Rt 10 - 30 min frequency
Rt 20 - 60 min frequency
Rt 35 - 30 min frequency
Rt 40 - 60 min frequency
demand response service area
transfer points
- drivers do not carry change
- please ask for a transfer when you board
Plan your trip with the google trip planner on the main page
You can call 541-474-5452 ext 2 for additional information
Routes operate Monday thru Friday between the hours of 6:30am and 7:00pm
Please consult schedule for each individual route

Patterns and Lines

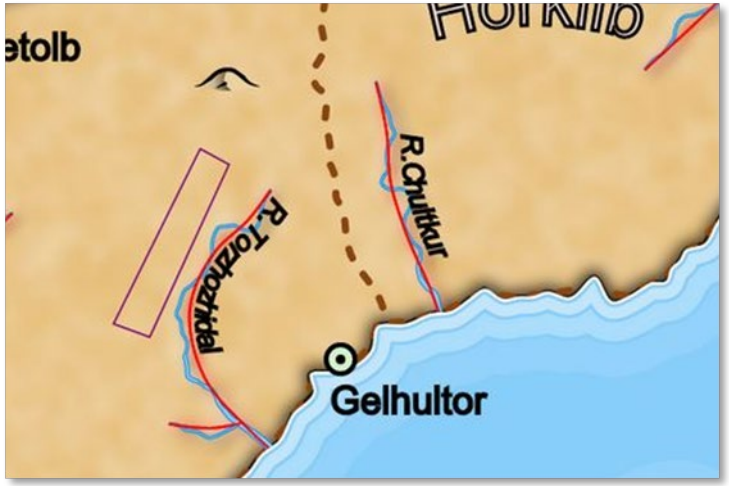
- **Limit use of patterns** Patterns are very distracting and difficult to distinguish with elements on top of them.
- **Add transparency to the pattern**, to avoid overwhelming the viewer.
- **Try not to use** dashed/dotted lines on top of fully opaque patterns!



Additional Considerations for Low-Vision Users

A few cartographic best practices for low-vision:

1. Do not use underlined text.
2. Do not overlap labels. Keep white space around objects. Remove unnecessary multiples.
3. Do not place labels upside down or squished.
4. Do not use shadow text.



Static Digital Maps

Export Usable Formats

- Export flattened PDFs (without layers) with as few attributes as possible or items may disappear when applying accessibility.

Enable Human Contact

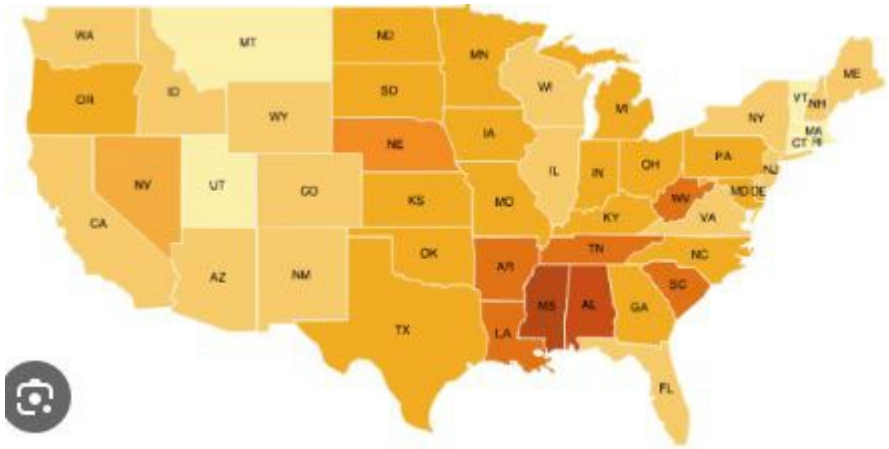
- Provide general contact information that is easy to find and ensure that staff is available to answer questions.

Tag Your Map

- Tag everything in your map as one figure or image. Add a brief alternative (alt) text to flow with the document's other text elements.

Simple vs. Complex

Maps should fall into 2 categories:



Simple - any map information that can also be shown in another format, like a table or a pie chart (i.e. choropleth maps that use color saturation to represent numbers)

- Simple maps should meet contrast ratios online, per WCAG standards. A quantitative format should accompany the graphic.

Complex - more than 3 graphical data points (i.e. wayfinding, soils, etc.)

- Complex maps should be treated as a graphic, be converted to an image and use alt text, rather than tagging items in the map that won't make sense to visually impaired individuals.

What are web applications?

Well structured HTML

- Header, navigation, main, headings, content, and lists.

Web forms

- Forms have their own workflows and auto fill functionality.

Web applications

- Your web application could do anything from a search that's using the device location to flipping through a gallery of images.
- We make this brave new world discoverable by building on previous experiences, standards, and conventions.

Web Application Focus Flow

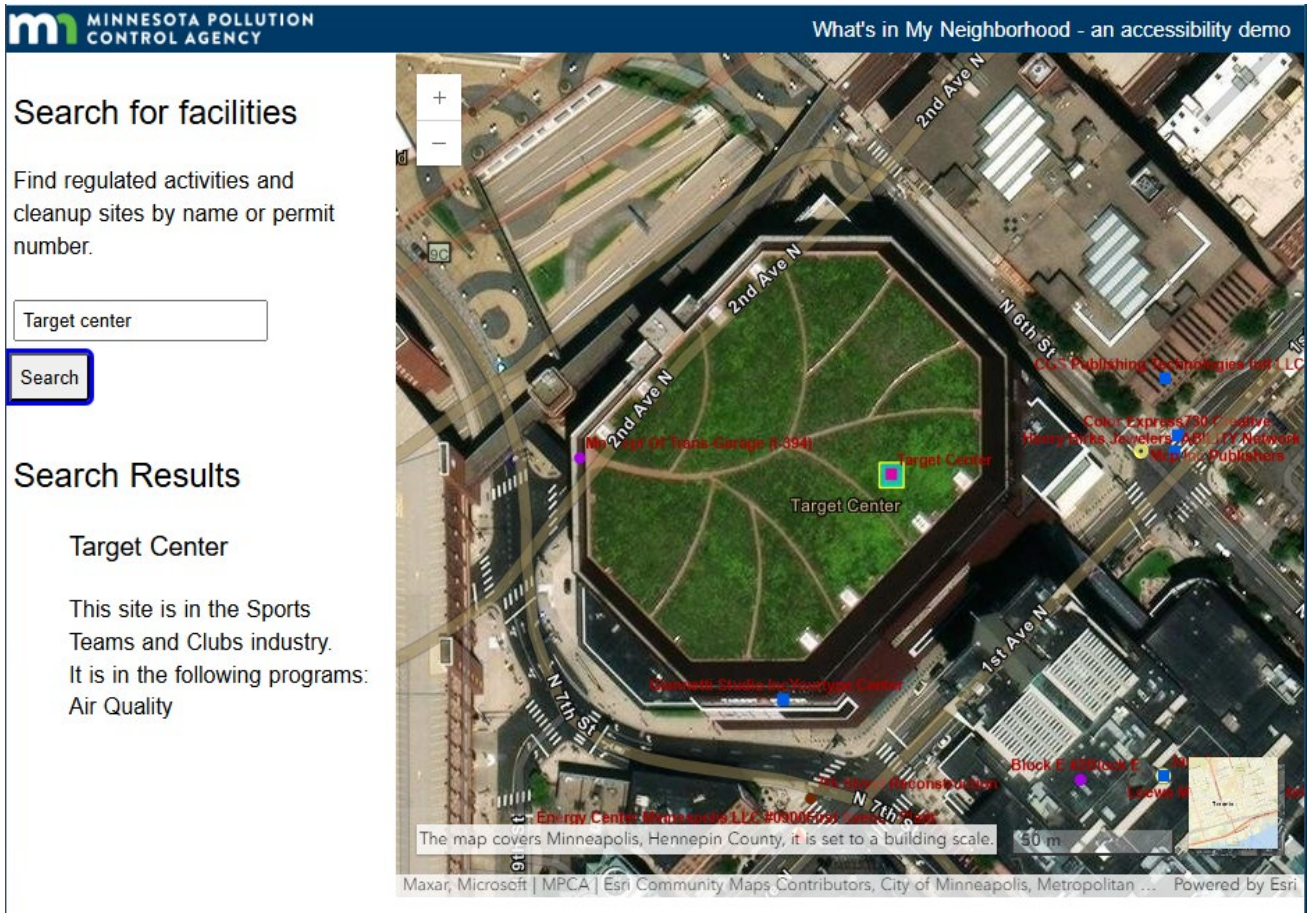
Application flow

- Why am I here?
- What happens next?

Web Application Keyboard Navigation

Keyboard navigation

- Standard map navigation
  - Plus & minus
  - Arrow keys (north is up, right?)
- Limit hotkey scope
  - The map's hotkeys are only available when the map canvas is in focus.
  - This should be true for custom hotkeys as well.



Web Applications and Screen Readers

What does a web map sound like?

- Screen readers let us listen to our applications.
- Using all the tools and data available to us, we can build useful descriptions of or map content.

Listen to your maps demonstration

Web Application Review

Reuse common patterns and be descriptive.

- A web application can do almost anything so please reuse common patterns.
- Create a logical element flow. search > results > map
- Insert dynamic content into the natural focus order or use an ARIA live region.
- Use custom keyup events and map buttons carefully.
- Use titles, labels, alt text, and semantic HTML elements.

Web Application Resources

Resources

- ARIA Authoring Practices Guide
- MNIT Interactive Web Map accessibility resources
- Esri's a11y map repo
- Esri's "Build accessible web maps" a 2023 blog post
- Esri's "Build Accessibility into your Web Maps" a 2024 blog post
- ARIA, Accessibility APIs and coding like you give a damn! - Léonie Watson
- "Text descriptions and emotion rich images" - Léonie Watson
- Science Friday, "A blind inventor's life of advocacy and innovation" - Joshua Miele