Map Accessibility

JoAnn Rautio, CSM
Business Analyst / Accessibility Coordinator

Kim Wee, CPWA
Agency Webmaster / Accessibility Coordinator
Map Accessibility Agenda

I. Digital Accessibility 101
II. Cartographic Best Practices
III. Static Map Accessibility
IV. Interactive Map Accessibility
V. Resources
Digital Accessibility 101

- **Accessible design** is a design process that considers the needs of people with disabilities.

- **Think about accessibility from the start** in the design phase. Avoids rework (saving time and $$$).

- **Creating accessible information shouldn’t be an exception** to the rule, it should be there when people need it and not by request.
Minnesota Standards and Expectations

- **Section 508** of the U.S. Rehabilitation Act
- **Web Content Accessibility Guidelines (WCAG) 2.0**, level A and AA
- Supplementing the standard are statutes on public records (363A.42) and continuing education (363A.43)
Cartographic Best Practices
• Beyond cartographic design standards, we also include design that assists those with Low Vision and/or Color Vision Deficiency.
Ask yourself some questions before you start:

• Choose colors based on **information hierarchy**.

• Basemap information should be muted back by use of transparency or muted colors. **Contrast** is important!

• **Is the map being printed?** CMYK (ink) vs. RGB (onscreen)
The MN Map Design Guide has color scheme resources to help
A map should tell a story.
Map Considerations

• What is the **purpose** of the map?

• Is a map really needed?

• Can the information be portrayed with a **table** and/or **graph**?
Too Much Information

• Don’t get lost in the weeds.
• Too much information can confuse your reader.
Map Size and Scale

Wild River State Park 11 x 17 map example:

- Large park area (scale 1:74,500)
- Seasonal activities (summer trails/winter trails) almost same physical size as full park overview (scale 1:29,550)
Some considerations for **good design and accessibility** that can make your map easier to read:

- In print **ideal size is 8-10 point.**

- **Do not** use *underlined text*.

- **Do not** overlap labels.

- **Do not** place labels upside down.

- **Do not** use shadow text.
If the symbol doesn’t intuitively represent the feature then we can **add text**, or a **map label** to the object to provide context.
• **Limit use of patterns to 1 to 2 non-hierarchal pieces.** Patterns are very distracting and difficult to distinguish with elements on top of them.

• Ensure the pattern is placed below the primary map information in the order list.

• Try adding a transparency to the pattern to avoid overwhelming the viewer.

• **Never** put dashed/dotted lines on top of opaque patterns!
Subtle, or transparent patterns are effective in designating a large area, while still providing enough contrast to separate from other features.
• Be creative! Lines styles should be **distinguishable**.

• Aim for no more than **6-7 style types** for hierarchal information lines.

• This map pushes the boundaries!
• If you can produce a map in color, your options open greatly. Focus on **high contrast colors**.

• This map features a mixture of color and line patterns, allowing for higher map readability.
• All symbols should be represented in the legend.
• Legend symbols should be the same size as the map symbol.
• Larger legends can group items by category and symbol type.
Parting Cartographic Thoughts

• Balance map items on the page.

• White space is okay! Less clutter is an easier to read map.

• Important Accessibility Information
  ▪ Web
  ▪ PDF
  ▪ Word or print via InDesign
Static Map Accessibility
Static Map Examples

Four Examples:

1. Map with description & data
2. Map with description
3. Map with links
4. Map linking to website (with additional description)

Source: https://commons.wikimedia.org/wiki/File:Babylonianmaps.JPG
1. **Map with description & data**

**Geographic Differences in Disabilities**

Across Minnesota’s 87 counties, the percentage of the population with a disability varies from 6.1% in Carver County (lowest) to 18.3% in Aitkin County (highest). 2 Because disability is strongly associated with aging, counties with higher percentages of older adults have higher percentages of residents reporting disabilities. In addition to Aitkin, the rural counties of Koochiching, Wadena, Clearwater, Traverse, Big Stone, and Cass all have an estimated disability prevalence of 16% or more of the civilian, noninstitutionalized population. However, because these counties are not very populous, fewer than 15,000 total persons with disabilities live in these seven counties in total. More than seven times as many persons with disabilities—about 110,100—live in Hennepin County alone, the county with the largest number. Unsurprisingly, other highly populated counties are also home to large numbers of persons with disabilities, including Ramsey (about 88,000 people), Dakota (33,400), Anoka (30,900), St. Louis (27,500), Washington (19,700), Stearns (15,200), and Olmsted (12,500). All other counties in Minnesota have fewer than 10,000 persons with disabilities apiece residing there.

**MAP 1**

**Number of People With Disabilities by County, 2010–2014**

![Image of a map of Minnesota with counties colored according to the number of people with disabilities, ranging from dark blue to light blue, with a scale bar indicating the number of people. The map highlights the variation in disability prevalence across the counties.]

---

**APPENDIX**

**TABLE 3**

**Number and Percent of People With Disabilities, by County, Minnesota, 2010-2014**

<table>
<thead>
<tr>
<th>Counties in Minnesota</th>
<th>People with a disability (highest to lowest)</th>
<th>People with a disability: Margin of error (±2)</th>
<th>Percent with a disability</th>
<th>Percent with a disability: Margin of error (±2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hennepin</td>
<td>110,150</td>
<td>2,150</td>
<td>9.4%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Ramsey</td>
<td>57,900</td>
<td>1,400</td>
<td>11.2%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Dakota</td>
<td>32,300</td>
<td>1,020</td>
<td>6.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Anoka</td>
<td>30,900</td>
<td>1,120</td>
<td>9.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>St. Louis</td>
<td>27,400</td>
<td>830</td>
<td>13.9%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Washington</td>
<td>19,740</td>
<td>860</td>
<td>8.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Stearns</td>
<td>15,330</td>
<td>700</td>
<td>10.1%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Olmsted</td>
<td>12,300</td>
<td>650</td>
<td>8.6%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Wright</td>
<td>9,440</td>
<td>660</td>
<td>7.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Scott</td>
<td>8,990</td>
<td>570</td>
<td>6.7%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Crow Wing</td>
<td>8,910</td>
<td>410</td>
<td>14.3%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Sherburne</td>
<td>7,570</td>
<td>760</td>
<td>8.6%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Otter Tail</td>
<td>7,500</td>
<td>390</td>
<td>12.3%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Itasca</td>
<td>6,990</td>
<td>450</td>
<td>15.7%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Clay</td>
<td>6,140</td>
<td>560</td>
<td>10.3%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Chicago</td>
<td>5,930</td>
<td>480</td>
<td>11.3%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Blue Earth</td>
<td>5,880</td>
<td>400</td>
<td>9.2%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Carver</td>
<td>5,770</td>
<td>450</td>
<td>6.1%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Beltrami</td>
<td>5,450</td>
<td>450</td>
<td>12.2%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Winona</td>
<td>5,310</td>
<td>350</td>
<td>10.4%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Rice</td>
<td>5,310</td>
<td>350</td>
<td>8.4%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Kandiyohi</td>
<td>4,890</td>
<td>350</td>
<td>11.7%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Mower</td>
<td>4,800</td>
<td>370</td>
<td>12.6%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Benton</td>
<td>4,830</td>
<td>360</td>
<td>12.5%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Goodhue</td>
<td>4,740</td>
<td>340</td>
<td>10.4%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Cass</td>
<td>4,530</td>
<td>220</td>
<td>16.0%</td>
<td>0.6%</td>
</tr>
<tr>
<td>H凿tah</td>
<td>4,370</td>
<td>290</td>
<td>11.5%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>
2. Map with description

Pollution sensitivity of near-surface materials

Methods

The sensitivity to pollution of near-surface materials is an estimate of the time it takes for water to infiltrate the land surface, travel through the unsaturated zone, and reach the water table, which is assumed to be 10 feet below land surface. The first 3 feet is assumed to be soil and the next 7 feet (3–10 feet) is assumed to be surficial geological material. If there is no soil data, the transmission rate is based on 10 feet of the surficial geologic unit.

The transmission rate of a soil or surficial geologic unit will vary depending on the terrain. In general, coarse-grained materials have faster transmission rates than fine-grained materials. The two primary inputs used to estimate transmission rate are the hydrologic soil group and the surficial geologic unit texture. Attributes of both are used to estimate the time of travel (Table 1) (USDA-ARC, 2012; Part A, Plate 4). Further details are available in Methods to estimate near-surface pollution sensitivity (USW, 2016b).

The time of travel through the near surface is from hours to approximately a year.

- Areas with a relatively short travel time (≤ 1 day) are rated medium sensitivity (Figure 16).
- Areas with a longer travel time (>1 day or ≥1 week) are rated high sensitivity.

Results

High sensitivity conditions dominate the < 190 core area of the most common surficial materials is sand and gravel. Moderate sensitivity is common category where sandy loam till occurs. A large area of mostly moderate sensitivity to south of Zeeland through most of the lake. Small areas of mostly moderate to north of Zeeland and along the northern border. One area of mostly low sensitivity exists at the northern county border west of Princeton.

Figure 19. Pollution sensitivity of near-surface materials

This pollution sensitivity model assumes a 10-foot deep water table and vertical travel of possible pollutants through unsaturated, near-surface materials. Map modified from Adams, 2016a.
3. Map with links

Public Libraries within Arrowhead Library System

Arrowhead Library System

Aurora
Babbitt
Baudette
Bovey
Buhl
Calder
Carten
Chisholm
Cloquet
Coleraine
Cook
Duluth
Ely
Eveleth
Gilbert
Grand Marais
Grand Rapids
Hibbing
Hoym Lakes
International Falls
Keele
Klerk
Martin
Moose Lake
Mt. Iron
Mt. Royal (Duluth)
Silver Bay
Twin Harbors
Virginia
West Duluth Branch
4. Map linking to website

There are a number of public parking options for those visiting the Minnesota State Capitol Complex. A blue P symbol indicates available public parking space in parking lots and ramps. See the tabs below for complete information on parking. More parking maps can be found on our Maps page.

Public Parking

There are a number of public parking options for those visiting the Minnesota State Capitol Complex. A blue P symbol indicates available public parking space in parking lots and ramps. See the tabs below for complete information on parking. More parking maps can be found on our Maps page.
Interactive Map Accessibility
Interactive Map Accessibility Solutions

Top Five

1. Focus on the map’s intent/purpose
2. Don’t rely on color alone
3. Consider the reading order
4. Consider text layout
5. Recognize technological constraints
1. Focus on the map’s intent/purpose

• Focus on the map’s purpose.
• Start with the foundational cartographic principles.
• Provide controls where possible that don’t rely on map interaction.
• **Present the data.** Most maps have an accompany set of tabular data. It can be helpful to present that data as an alternative to viewing the map.
2. Don’t rely on color alone

- Provide good color contrast.
- Color cannot be the only way information is conveyed.
- Underline links.
- Use shapes and/or texture.
Color + Texture Example

https://arcgis.dnr.state.mn.us/gis/pdf
Color + Texture Example, continued

- **Agassiz**
  - Off-highway vehicle map

- **Beltrami Island - Faunce Campground**
  - State forest campground map

- **Blazing Star**
  - State trail map

- **Bear Head Lake**
  - State park map

- **Hallock**
  - Recreation map
3. Consider the reading order

- The visual hierarchy should match the keyboard order.
- Ensure elements can be accessed via the keyboard.
- Use Focus Indicators (CSS) to highlight keyboard focus.
4. Consider text and layout

• Keep simplicity in mind.
• Use clear semantics and remember line length.
• Use a minimum of 12-pt font
• Use true text (HTML text)
• Refrain from using ALL CAPS.
5. Recognize technological constraints

• Research assistive technologies.
• Research mapping libraries.
• Use accessibility tools.
• Use people and conduct a usability study.
ARIA – Accessible Rich Internet Applications

• ARIA is a set of attributes to help enhance the semantics of a web site or web application to help screen readers make sense of certain things that are not native to HTML.

First Rule of ARIA: Don’t use ARIA

• Use Semantic HTML elements in place of an ARIA attribute wherever possible.
• Should be used only to fill in gaps for screen reader users.
aria-live Example
Color

- WebAIM Color Contrast Checker (website)
- Colour Contrast Analyser (software)

Google Chrome extensions

- aXe (also Firefox)
- WAVE
- Colorblinding
Questions?

Presenters

Kim Wee, CPWA  Kim.wee@state.mn.us
JoAnn Rautio, CSM  joann.rautio@state.mn.us