

Static digital maps are used as PDFs or images. Properly design them accessible to a wide range of those using assistive technology.

For the complete Map Design Accessibility Quick Card, visit [mn.gov](http://mn.gov).

Follow these best practices to create maps that are well designed and accessible.

Best practices to create well designed and accessible custom web mapping applications. For the complete Web Map Design Accessibility Quick Card, visit [mn.gov/mnit/accessibility](http://mn.gov/mnit/accessibility).

# Pathway to Accessible Digital Maps for All

State of Minnesota – Minnesota IT Services

**CATEGORY:**  
Cross-Boundary Collaboration & Partnerships

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**INITIATION DATE:**  
March 2016

**END DATE:**  
December 2019



## Executive Summary

Maps produced by the state of Minnesota reach millions of Minnesotans and visitors to Minnesota annually. It is vital that these maps convey Minnesota's message in a clear and accessible manner. The statewide Maps Community of Practice (MCOP) was a key driver in this effort to implement well-designed and accessible maps. In 2019, the MCOP team produced and shared guidance, which helped staff work through problems of accessible cartographic map design and static and interactive web map accessibility. The MCOP team consists of members across 15 of Minnesota's state agencies.

The MCOP team implemented a first-of-its-kind in the world set of online resources, guidance documents, tip cards, and web content for making digital maps accessible. The tools and solutions span across multiple disciplines in the cartographic and geospatial communities ranging from cartographic map design, static web maps, and interactive web maps. Digital maps are a key output of government, and benefit all citizens by creating more equitable access to government digital services.

While exact data is not available, it is estimated that staff time alone on the project exceeded 5,400 hours at a conservative cost of \$189,000.

The tools and resource guides have been made available for wide distribution on the publicly available [Minnesota IT Services website](#). The website, documents, and content implemented by the team are being leveraged internationally by the cartographic, geospatial, and accessibility communities in the public and private sectors. The resources have also been presented at local and national geospatial, cartographic, and accessibility conferences. Since its implementation in October 2019, the map accessibility resources have been accessed by 5,700 unique visitors across 46 states, 3 provinces of Canada, 37 countries, and has seen over 4,000 downloads of the resources.

In addition to enabling the state to fulfill its legal mandate of providing accessible information that can be used by everyone, this project generated tremendous value in cost avoidance. Prior to creating these best practices and resources, considerable staff time was spent fielding calls to answer questions for people who could not read the available online resource as well as creating alternative documents when requested.

Many maps are created using specialized software. MCOP members regularly communicated with software vendors to report bugs, submit feature requests, and provide expert guidance to help the vendors improve their support for accessible map creation.

Finally, in addition to providing a benefit to state agencies and citizens, the free, publicly available, resources benefit other states.

## Exemplar

The project was groundbreaking in that no other state or organization in the world had tackled or solved the accessibility issues surrounding digital maps. As a result of the team's efforts, maps produced by the state of Minnesota are more usable to Minnesotans, and reach a broader audience. In addition to their efforts, the MCOP team's strategies and approaches have been used as a model for similar efforts focused on solutions across Minnesota's state agencies.

The project started conversations and collaboration across multiple state agencies – the MCOP team is comprised of staff from the Minnesota Department of Natural Resources, the Minnesota Department of Health, Minnesota Department of Transportation, Minnesota Pollution Control Agency, the Office of the Secretary of State, the Minnesota IT Services staff who partner with those and other agencies, the Minnesota Geospatial Information Office (MnGeo) the Office of Accessibility, and other agencies. The team members have professional experience in geography, cartography, digital accessibility, graphic design, and web development, making this a strong interdisciplinary effort. As a result of the team's diverse expertise, they were able to work across boundaries between Minnesota's state agencies, and also across different professional disciplines.

When the MCOP began looking for existing best practices and guidance for producing accessible maps, the team found the information scattered or altogether non-existent. The MCOP team determined the need to create original guidelines. The team conducted extensive research and discussions to develop standards and best practices for producing accessible, usable static and interactive web maps. In addition, the team took a hard look at map design. They created cartographic best practices for fonts, labels, color, symbology, and software-specific importable styles that assist state employees in making maps more usable for all audiences.

Traditionally, maps had not been considered in the conversation about accessible content. The general assumption after Minnesota passed an accessibility law was that all maps would require an exception to the state [digital accessibility standard \(PDF\)](#). Minnesota's Office of Accessibility, which is charged with implementing the state digital accessibility law and standard across all executive branch agencies, initiated the conversation with an inquiry into existing practices for accessible digital maps.

A small group of map creators and geospatial information services (GIS) experts took the initiative to do a comprehensive search for existing solutions. They pulled together a cross-functional team to address the various types of maps and their usage within Minnesota state government. Maps may be stand-alone single products, as part of larger documents, static maps, interactive maps, and what are called "wayfinding" maps such as a state highway or state park map. The state of Minnesota's Office of Accessibility sponsored the effort, which was never classified as a formal project. There was no central budget; agencies supported the project by allowing staff to contribute time, and the Office of Accessibility and Minnesota IT Services' communication team provided the collaboration site and public website.

As a result of the team's efforts, the project exemplifies leadership and innovation by creating new industry best practices where none existed. The solutions implemented from the project serve an integral role in how government functions in our digital world, in particular maps for digital distribution made with popular information technology products. The MCOP team created strategies and methods which took into account commonly used mapping software and products that map and data publishers turn to when trying to make

maps accessible to a broader audience. Solutions also included mobile mapping practices, and static and interactive web maps on mobile devices. For example, using these accessible map resources, Minnesota IT Services and Minnesota Department of Education staff have implemented accessibility to over 1,000 static maps and eight interactive web maps, including [District/Charter school locations](#), [Library maps](#), and the [Education Mapper](#) that had over 7,000 visitors in 2019.

## Concept

Maps are a common method that the state of Minnesota uses to convey a wide variety of information. Minnesotans use maps as a means to navigate Minnesota state parks, identify what school district they reside in, understand their legislative districts, assess roadway construction projects around their community, and visualize public health across the state. For example, in 2019 the Minnesota Department of Natural Resources maps were viewed or downloaded at least 2.9 million times by Minnesotans and visitors around the world.

Maps have unique accessibility concerns because of the amount of visual information they convey—in some cases this can impact safety. For example, agencies will use maps to alert citizens to weather dangers such as flash floods or locations of emergency shelters. It is imperative to take steps to make them usable for individuals with low or no vision, those with learning or cognitive disabilities, and even to make maps more universally understandable across multiple cultures.

Initial efforts to find existing guidance highlighted the need. Members of the MCOP team met with national leaders in accessible maps, but nearly all their work was in tactile maps. The efforts of the MCOP team were the first of its kind in the country, with limited to no guidance from outside Minnesota.

The MCOP's efforts were measured in conjunction with the [State of Minnesota's accessibility statute 16E.03 subdivision 9](#), [Federal law Section 508](#), and the [Web Content Accessibility Guidelines \(WCAG\) 2.0](#). In turn, solutions were created and tested using a combination of trained users and common automated tools such as Web Accessibility Evaluation Tool (WAVE) and aXe's accessibility browser extension. Manual testing included keyboard and color contrast, and assistive technology (AT) testing, primarily magnification tools and screen readers.

In addition to their effort, the MCOP team leveraged Minnesota's geospatial community through the Minnesota GIS/LIS Consortium, one of the more organized and active geospatial communities in the country with a strong history of leadership, sharing information, tools, techniques, and collaboration across all sectors and disciplines. The MCOP team worked with Minnesota's geospatial community to further their work in making maps accessible. As other states became increasingly aware of map accessibility, they sought out members of the MCOP to duplicate the team's efforts, resources, and solutions.

The MCOP team also developed a communication and training plan to disseminate guidance to fellow staff and the GIS and digital accessibility communities. The MCOP has presented nationally at the California State University National Accessibility Conference (CSUN), to state staff on the State's GIS Training Day, multiple presentations at the Minnesota GIS/LIS Consortium Conference, and at the Minnesota IT Symposium.

# Significance

The MCOP team’s efforts have benefitted Minnesotans, geospatial professionals, state and local governments, private industry, and nonprofit organizations. The Office of Accessibility promotes an extensive and robust set of resources on digital accessibility for Minnesotans employees and map developers/designers on the [Minnesota IT Services public website](#). (See Figure 1 below.) As a result, the state of Minnesota is now recognized by other states, geospatial technology vendors, and the geospatial community as a leader in map accessibility. All of Minnesota’s constituents are able to access the state’s mapping solutions effectively and without barriers.

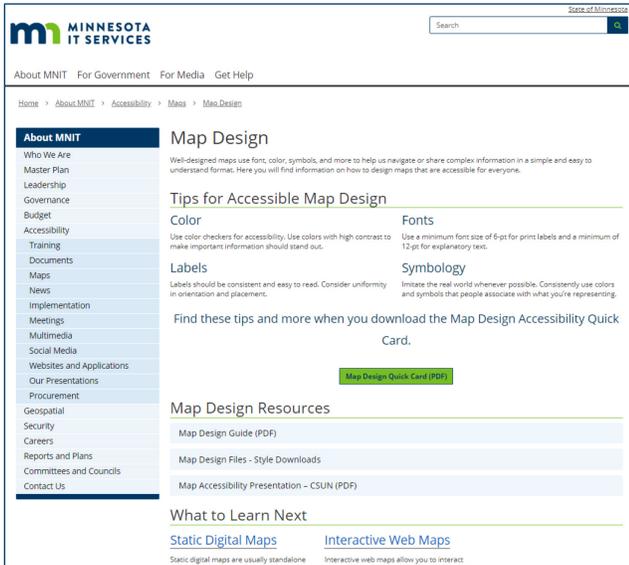
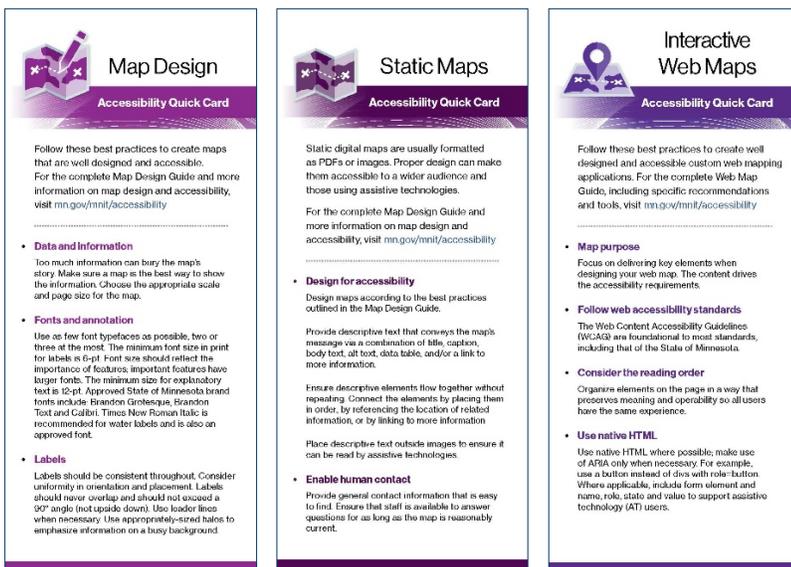


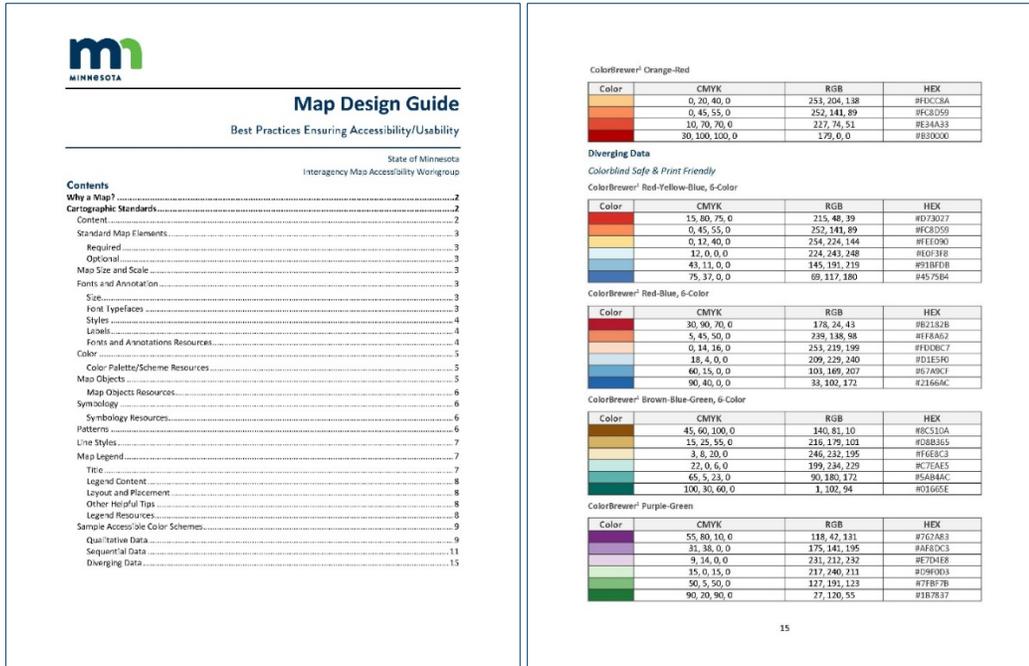
Figure 1: Accessible Maps web page

The MCOP team created two core tools for each mapping category (map design, web static maps, and interactive web maps) including detailed guidance and quick reference cards (see Figures 2-4 below).



Figures 2, 3, and 4: Accessible Map Design quick cards for each category.

The team worked to socialize these tools throughout Minnesota’s geospatial organizations and agencies that typically create maps. The state of Minnesota’s Office of Accessibility hosts these tools on the [Minnesota IT Services website](#). (See Figures 5 and 6 below.)



Figures 5 and 6: Pages from the Map Design Guide.

The work of the project team is ongoing as they continue to maintain documentation and communicate training materials to state employees on how to apply the core principles to maps. As a result, state of Minnesota staff know how to make maps accessible to a wider audience and are spreading knowledge to other public, private, and non-profit organizations across Minnesota.

The results of this collaborative effort speak for themselves: high quality accessible and usable maps for the state of Minnesota. Even vendors hired through state of Minnesota contracts have relied on the documentation to produce high-quality accessible mapping products. The MCOP tools also help those using the maps instead of just creating them. For example, staff that are using a pre-produced map in a report know exactly how to insert the map into their own document and properly tag it with alternative text, or if a map is present that includes data that can be distributed in tabular format, staff will add an accompanying table to a static web map, or an interactive web map.

Another key example is from the Minnesota Department of Health and Minnesota IT Services staff which implemented an innovative series of accessible interactive and static web maps as part of the Minnesota Public Health Data Access Portal including [comparison environmental health maps](#).

## Impact

This initiative makes digital maps usable for people with disabilities, particularly people with low or no vision, who have cognitive issues, or who need a universal cultural understanding.

Benefits from the MCOP's solutions have been substantial, ranging from innovative and accessible mapping solutions across Minnesota's state agencies, initiating new conversations across Minnesota's state agencies, increasing awareness and adoption of accessibility across interdisciplinary fields, and working with Minnesota's vendors to ensure mapping solutions are accessible and vendors are held accountable while providing context and awareness.

Before these solutions were implemented and adopted, many staff and vendors would ignore accessibility and suggest that visual solutions like maps did not need to meet accessibility requirements because the standards and solutions did not exist. In some cases, the Minnesota Office of Accessibility were involved only after projects and solutions were deployed and worked with staff and vendors to incorporate accessibility after projects were finalized. Some of these efforts were costly because staff and vendors never factored accessibility into their budgets or timelines.

Today, state staff and vendors are keeping accessibility in the forefront of requirements analysis and consulting these resources and tools to implement and deploy a standard across mapping solutions to Minnesota's citizens and beyond. Now Minnesotans are getting more usable and accessible mapping solutions, projects are staying on budget, and accessibility professionals are engaged and focused on new innovative approaches to accessibility which will benefit even more Minnesotans in the future.

More recently, team members with this expertise have been able to focus on creating more usable workflows and improving accessible mapping solutions, as more content has been deemed accessible and fewer individual requests require responses. For example, the Minnesota Department of Natural Resources had no accessible maps before the project's inception. The agency has converted and implemented accessibility into over 150 internal and external mapping solutions resulting in over 900,000 unique views of accessible interactive web maps and over 1.1 million users of accessible web static maps in 2019.

State agencies also experience fewer accessibility requests for alternative content, decreasing staff time needed. For example, since the implementation of this project, Minnesota IT Services and the Minnesota Department of Natural Resources reorganized their site navigation and [maps page](#) so Minnesotans could access maps in a meaningful and accessible manner. Subsequently, the page saw over 100,000 visitors.

Lastly, the state's vendors have widely strengthened the accessibility support of their products, benefiting customers and constituents across the globe. Several vendors consult the state of Minnesota's resources and MCOP team when planning or rolling out features and updates. In addition, members of the MCOP continue to promote efforts to the larger community of public and private organizations outside Minnesota.

A conservatively estimated investment of \$189,000 in staff time has resulted in dramatically increased accessibility and usability of Minnesota information services, from state health data to emergency information to park trails. The digital map software industry has been pushed forward to provide better authoring tools for accessible maps. Other state and local governments are actively seeking the resources to improve their own services.