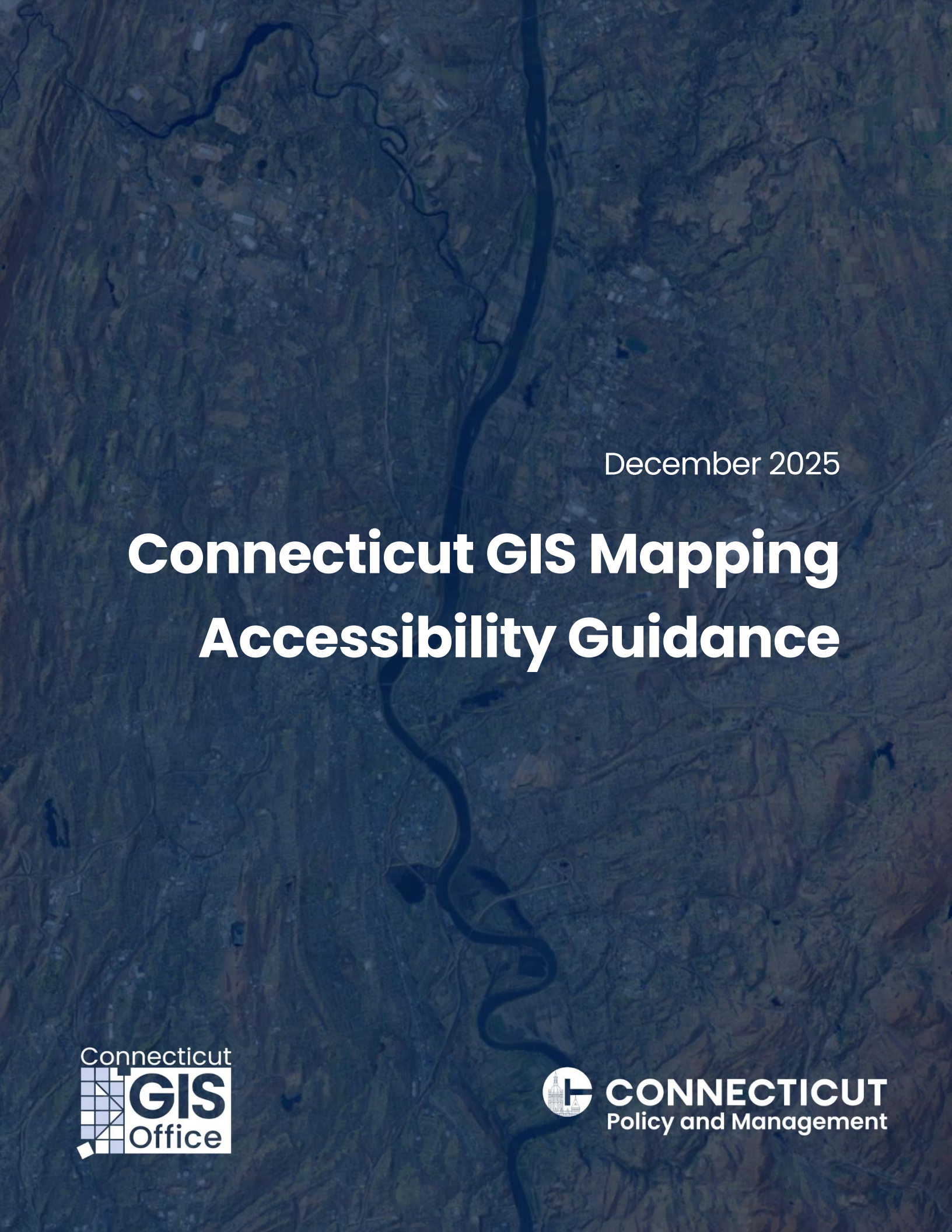

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Connecticut GIS Mapping Accessibility Guidance

Connecticut GIS Office

CONNECTICUT
Policy and Management

Connecticut GIS Mapping Accessibility Guidance

1 Introduction

1.1 Purpose and Scope

This document provides guidance for ensuring that Geographic Information System (GIS) maps and applications (apps) produced by the State of Connecticut and its partners are accessible to all users, including individuals with disabilities.

Accessible GIS mapping supports the State's commitment to transparency and open access to information. Following these guidelines when producing maps and mapping products ensures that the products are developed to serve the largest possible audience. This effort supports equitable public access to information, transparency, and compliance with federal and state accessibility requirements.

This guidance applies to both interactive web maps and static map products that are shared publicly or used in official communications. It also serves as a best-practice resource for other GIS professionals seeking to create inclusive and user-friendly mapping content.

This document complements Connecticut's existing web and data accessibility policies. It aligns with state IT accessibility initiatives and builds on existing GIS data standards to ensure consistency, interoperability, and inclusiveness in mapping.

1.2 Audience and Applicability

This guidance is intended for:

- Connecticut State agency (and partners) GIS professionals developing or managing GIS mapping applications or products.

- Members of the public, researchers, and private-sector professionals looking to incorporate accessibility into GIS and mapping workflows.

2 Policy Foundations

It is important that GIS data products and visualizations remain accessible to all individuals, including those with disabilities. Accessibility ensures that everyone can engage with, understand, and benefit from geographic information. To support this goal, a framework of federal and state laws, policies, and technical standards provides rules and expectations for inclusive design. These legal and policy foundations help guide the development of accessible digital products and ensure that accessibility is not an afterthought but a core requirement. The following sections outline the key laws and policies that shape accessibility in GIS mapping.

2.1 Federal Laws and Guidance

Americans with Disabilities Act (ADA): A landmark civil rights law that prohibits discrimination based on disability. Under Title II, state and local governments are required to ensure that all public services and information, including digital content like GIS maps, are accessible to individuals with disabilities. This includes providing alternative formats, accessible technologies, and accommodations that enable equal participation.

On April 24, 2024, the Department of Justice finalized new ADA regulations that expand accessibility requirements to include web content and mobile applications. These updates establish clear standards that state governments, such as the State of Connecticut, must follow. By April 24, 2026, all public-facing digital services must meet these requirements. After that

date, agencies are responsible for maintaining ongoing compliance to ensure continued accessibility for individuals with disabilities.

Section 508 of the Rehabilitation Act: This federal law requires that all electronic and information technology developed, procured, maintained, or used by federal agencies, or by any agency that receives federal funding, be accessible to individuals with disabilities. State agencies are expected to align their web and technology practices with these federal standards and best practices, ensuring that public-facing digital services, including GIS platforms, are usable by all residents.

WCAG 2.1 (Web Content Accessibility Guidelines): Developed by the World Wide Web Consortium (W3C), WCAG 2.1 defines a set of internationally recognized standards for making web content more accessible. GIS maps, whether static or interactive, fall under these standards when they are used to communicate essential public information or support decision-making in government programs.

2.2 State-Level Policy in Connecticut

State of Connecticut Accessibility & Inclusivity Policy for Websites and Digital Assets: This policy establishes clear expectations for agencies to ensure all digital content is accessible to individuals with disabilities. The policy aligns with WCAG 2.1 Level AA standards and requires agencies to integrate accessibility into design, development, and procurement process. It outlines responsibilities of staff, encourages ongoing training, and promotes inclusive digital content across all public facing platforms.

2.3 Risks of Non-Compliance

Non-compliance can result in:

- **Inefficient communication:** When maps are not accessible, they limit how diverse audiences can engage with data. By designing with accessibility practices from the start, organizations reduce risk and expand usability for all.
- **Legal exposure**: Failure to meet accessibility standards may lead to challenges under laws such as the Americans with Disabilities Act (ADA) and Section 508 of the Rehabilitation Act.
- **Reduced public trust:** Residents who are unable to use our maps effectively may lose confidence in public services if digital resources are not inclusive or usable.

3 Technical Guidelines for Accessible GIS Mapping

Universal Design is the practice of creating products and environments, such as web content and interactive maps, that are usable by all people, to the greatest extent possible, without the need for adaptation or specialized tools. Rooted in the principles of flexibility, simplicity, perceptibility, and tolerance for error, universal design ensures that accessibility is built in from the start. In the context of GIS, this means designing maps and spatial applications that are intuitive, inclusive, and functional for users of all abilities. In this section, we'll explore how to apply these principles to GIS mapping, with a focus on making interactive maps more accessible through thoughtful design and configuration.

3.1 Creating a Map

3.1.1 Why a map?

Before creating a map, it's important to pause and ask: What is the purpose of this map? A well-designed map can be a powerful tool for storytelling, analysis, and communication, but only when it's the right fit for the information you're trying to share.

Start by considering:

- What question are you trying to answer?
- What story are you trying to tell?
- Who is your audience, and what are their needs?

Not all information needs to be shown spatially. In some cases, a summary, chart, or data table may be more effective and easier for users to understand, especially for those using assistive technology. The goal is to be intentional about when and how you use maps to convey information. If a map is the most effective format, think about how you can also summarize its key message so that users who can't interact with the map still understand the information it presents.

When the purpose is clear, the map becomes more focused, easier to interpret, and more accessible to everyone. A clear purpose leads to a clear design, which benefits all users.

3.1.2 Color

Color plays a central role in map design, helping users interpret data, distinguish features, and navigate content. However, relying on color alone can create barriers for users with visual impairments, including those with Color Vision Deficiency (CVD).

To ensure your GIS content is accessible to everyone, including people with different types of color blindness or low vision, follow these best practices:

- **Don't rely on color alone to convey meaning**. Always pair color with other visual cues such as shapes, patterns, text labels, or size differences to help users distinguish between features [WCAG 1.4.1].
- **Maintain sufficient contrast** between map elements and their backgrounds. For example:
    - Text that is 14pt bold or 18pt regular and larger must have a minimum contrast ratio of 3:1.
    - Smaller text must meet a contrast ratio of at least 4.5:1 [WCAG 1.4.3].
    - Non-text elements like icons, lines, and symbols should also meet a minimum contrast ratio of 3:1 against adjacent colors [WCAG 1.4.11].
- **Use high-contrast basemaps** to ensure that overlays and data layers remain visible and distinguishable [WCAG 1.4.3].
- **Use color blindness simulators and contrast checkers** during the design process to test how your maps appear to users with different types of vision. There are many free online tools available for this purpose such as x and y (see Appendix X for resources).
- **Ensure that map layers are distinguishable from the basemap**, especially when using transparency or overlapping features.
- **Select color schemes thoughtfully**. Consider using color palettes that are designed for accessibility, such as ColorBrewer or other CVD-friendly palettes.
- **For web maps, use RGB color model** to ensure accurate digital display. **For printed maps, use CMYK color model** to maintain color fidelity in print.

3.1.3 Symbology

Symbology refers to the visual representation of data on a map, such as points, lines, shapes, and icons, that helps users interpret geographic information. These best practices ensure that the selection of symbology enhances the visual representation of a pattern or activity displayed in a map:

- **Use more than just color to differentiate symbols**. Combine color with shapes, patterns, size, or labels to ensure that users who cannot perceive color differences can still interpret the data [WCAG 1.4.1, 1.3.3].
- **Ensure symbols are intuitive and meaningful**. Whenever possible, use symbols that mimic real-world objects or concepts (e.g., a tree icon for a park, a water droplet for a water source). This helps users quickly understand the map without needing to decode abstract symbols.
- **Clearly explain all symbols**. Include a legend or direct labels on the map to define what each symbol represents. Any time symbols are used, consistent alt text should be included on each image for ease of recognition [WCAG 2.5.3].
- **Maintain a clear size hierarchy**. When using size to represent different data values, ensure that the difference is visually distinct. A good rule of thumb is to double the size between levels. For example, if one circle has a radius of 0.1", the next should be 0.2", then 0.4", and so on. This helps users perceive differences more easily.
- Whenever possible, **avoid requiring complex gestures to interact with symbols**. If your map includes interactive symbols (e.g., tapping or dragging), ensure that all functions can be performed with a single pointer and without requiring path-based gestures [WCAG 2.5.1].

3.1.4 Typography

Typography plays a key role in how users read and interpret map content. Clear, legible text ensures that labels, legends, and descriptions are accessible to users with a wide range of visual and cognitive abilities. Good typography enhances overall usability.

- **Use simple, readable fonts**. Stick to two to three typefaces at most to maintain clarity and consistency. Sans serif fonts like Tahoma, Calibri, Helvetica, Arial, Verdana, and Times New Roman are widely recognized as accessible choices.
- **Use font size and emphasis to reflect importance**.
    - Important features should be labeled with larger or bold text.
    - Descriptive text should be at least 12pt.
    - Map labels should be no smaller than 10pt for web or 6pt-9pt for print.
    - Avoid decorative or overly stylized fonts that may reduce legibility.
- **Ensure sufficient contrast between text and background**.
    - Normal text must have a contrast ratio of at least 4.5:1.
    - Large text (defined as 14pt bold or 18pt regular and larger) must meet a minimum contrast ratio of 3:1 [WCAG 1.4.3].
    - Use halos around text to improve contrast.
- **Allow users to resize text without loss of content or functionality**. Text should remain readable and usable when zoomed up to 200% [WCAG 1.4.4].
- **Maintain accessible text spacing**. Confirm that line height, letter spacing, and word spacing can be adjusted without breaking the layout or readability of the map content [WCAG 1.4.12].
- **Avoid using images of text**. Whenever possible, use real text rather than embedding text in images. This makes sure that screen readers can access the content and that text remains crisp when zoomed [WCAG 1.4.5].

- **Keep styles simple**. Avoid underlining text unless it's a hyperlink and use italics sparingly. For example, italicizing water features is a common and helpful convention in cartography, but in other contexts it can be harder to read than non-italic text.

3.1.5 Emphasize Area of Interest

Visually highlighting the most important part of a map helps users quickly understand what to focus on. Use filters, layer effects, or bold outlines to make the area of interest stand out from the rest of the map.

Reducing background detail or dimming less relevant layers can make the key information easier to see at a glance for all users.

- Add emphasis by highlighting your area of interest

3.1.6 Static Maps

Static maps are typically shared as PDFs or image files (e.g., PNG, JPEG) and do not offer any user interaction. Because they function as images, they must be accompanied by text-based descriptions to ensure that users who rely on screen readers or other assistive technologies can understand the map's message.

- **Provide meaningful text descriptions**. Since static maps cannot be explored interactively, their content must be explained through accessible text. This can take the form of:
    - A caption or body text that describes the map's purpose and key takeaways.
    - A data table or list that presents the information shown on the map.

    - A link to more detailed information or a contact person who can provide assistance [WCAG 1.1.1, 3.3.2].
- **Use alternative text (alt text) appropriately.**
    - Alt text should be short since screen readers cannot pause alt text readouts. it should never include full URLs, "picture of", or "image of".
    - If the map is explained elsewhere in the document, the alt text can be brief, such as “Choropleth map of Connecticut population density. See caption for details.”
    - If the alt text must stand alone, it should clearly describe the main message of the map, including key patterns, trends, or features [WCAG 1.1.1].
- **Ensure logical reading order**. Arrange content in a way that makes sense when read by assistive technologies:
    - A good order is: text first, then the map, followed by any tables.
    - In PDFs, use the tag tree to adjust the reading order if needed [WCAG 1.3.1].
- **Avoid redundancy**. Each element should contribute unique information. Repeating the same content in multiple places can be confusing for screen reader users [WCAG 3.2.4].
- **Export maps into accessible document formats.**
    - When possible, insert maps into programs like Microsoft Word or Adobe InDesign, which support accessibility features.
    - Avoid embedding important text (like titles or labels) inside the image itself. Instead, type this text directly into the document so it can be read by assistive technologies [WCAG 1.4.5].
- **If exporting directly to PDF:**
    - Export the map as a flattened image (no layers).
    - Use software (like Adobe Acrobat Pro) to apply accessibility:
        - Tag the map and legend as a figure and add alt text.
        - Tag captions and titles as text.

        - Tag tables properly and define header rows [WCAG 1.3.1, 4.1.2].
        - Ensure the PDF includes a logical structure tree, which defines the document's reading order and content hierarchy. This structure allows screen readers to navigate the document correctly and improves overall accessibility [WCAG 1.3.1].
        - ArcGIS Pro (2.8+) supports creating accessible PDFs
    - If converting from another format into PDF, always use 'Save As PDF' and never 'Print PDF'. Enable 'options' to preserve tags, when available.
- **Clean up unnecessary elements**.
    - Tag decorative or repetitive items as background so they are skipped by screen readers.
    - If multiple similar elements exist (e.g., repeated icons), describe the group once and tag the rest as background [WCAG 1.1.1, 1.3.1].
- **Review the final reading experience.**
    - Does the content make sense without the map?
    - Can users find more information if needed?
    - Is there a clear contact for assistance? Providing a human contact ensures users can get help if the description doesn't meet their needs.

3.2 Building Interactivity

Interactive web maps allow users to explore spatial data in real time. They can zoom, pan, toggle layers, select features, or enter information using a mouse, keyboard, voice, or other input methods. These features can improve usability and engagement, but they also add complexity when it comes to accessibility. The purpose and content of the map should guide which

interactive elements are included. It is important to ensure that all users, regardless of ability, can access and understand the map's content.

3.2.1 Popups

Popups are a common feature in interactive web maps. They display information about selected features and help users understand the data in context. When popups are not formatted clearly, especially when they contain long lists of field names and values, they can be difficult to interpret.

- **Keep content clear and organized**. Use headings, short text, or bullet points to make information easier to read [WCAG 1.3.1, 3.3.2]
- **Make popups accessible**. Ensure they can be opened, closed, and navigated with a keyboard, and that screen readers can read the content in a logical order [WCAG 2.1.1, 2.4.3, 4.1.2].
- **Allow enough time to read**. Popups should stay visible until the user dismisses them and should not disappear too quickly [WCAG 1.4.13].
- **Maintain keyboard focus within the popup**. When a popup is open, users should not be able to tab out of it and interact with the background page. The popup must be dismissed before returning to the main content [WCAG 2.1.1, 2.4.3].
- **Provide a clear way to close the popup**. Include a visible "Close" button and ensure the Escape key can be used to dismiss the popup [WCAG 3.2.1, 1.4.13]

3.2.2 Buttons and Links

- **Links** should use clear, descriptive text. Avoid vague phrases like "click here." Ensure link color meets contrast requirements and is visually distinct from surrounding text [WCAG 2.4.4, 1.4.1, 1.4.3].

- **Buttons** must be at least 24 by 24 CSS pixels to be easily clickable, especially on touch devices [WCAG 2.5.8].

3.2.3 Alternative Text

- **Images should include meaningful alt text** that describes their purpose or content. This helps users who rely on screen readers understand visual information [WCAG 1.1.1].
- **Text should not be presented as an image**. Use real text elements instead of embedding text within images to ensure it can be read, resized, and translated by assistive technologies [WCAG 1.4.5].
- **Any element that requires user input** (such as text fields, checkboxes, or dropdown menus) must have a label or clear instructions to explain its purpose [WCAG 3.3.2, 4.1.2].
- **Non-obvious interactive elements** should be labeled or explained using tooltips, on-screen text, or guidance elsewhere on the page [WCAG 3.3.2].

3.2.4 Zoom Tools

- Content should remain readable and functional when **zoomed to 200% or 400%** with no loss of functionality and without requiring horizontal scrolling [WCAG 1.4.4, 1.4.10].
- Tooltips should close when the pointer moves away and should not require a click to dismiss [WCAG 1.4.13].

3.2.5 Navigation

Accessible navigation ensures that all users, including those using keyboards or assistive technologies, can move through your map or app with ease.

- **Embedded maps or apps** placed in an iframe must be fully navigable using a keyboard. Users should be able to move into and interact with the content inside the iframe [WCAG 2.1.1].
- **Links should open in the same window** unless opening a new tab or window is necessary to preserve a multi-step process, such as filling out a form [WCAG 3.2.5].
- **Keyboard navigation** must be supported throughout the app. Users should be able to move through all interactive elements using the Tab key and see a visible focus indicator as they do so [WCAG 2.1.1, 2.4.3, 2.4.7].
    - Use a high-contrast focus style so users can easily see where they are on the screen.
    - Try the #NoMouse challenge to test your app using only a keyboard. See more information at this link.
    - See keyboard navigation shortcuts below.
- **Dragging movements** should not be the only way to perform an action. If dragging is required (such as drawing a rectangle), provide an alternative method when possible (such as using a keyboard operable lasso tool or single-click selection) [WCAG 2.5.7].

Keyboard Navigation Shortcuts

Action	**Keys**
Move focus through interactive elements	Tab (next), Shift + Tab (previous)
Activate checkboxes, buttons, dropdowns	Space bar
Follow links, activate buttons or autocomplete	Enter/Return

Close popups or dialogs	Esc
Navigate within dropdowns, sliders, or menus	Arrow keys (Up, Down, Left, Right)

3.2.6 Orientation

Do not lock maps or other content to a single orientation (portrait or landscape). Some users rely on fixed-orientation devices or may need to switch orientations to improve visibility. Always allow the user to choose their preferred orientation unless a specific one is essential for functionality [WCAG 1.3.4].

3.2.7 Map Alternatives

While maps are powerful tools for visualizing spatial data, they are ultimately images and may not be fully accessible to everyone. Providing alternative formats ensures that your content is usable by a wider audience.

- **Be clear about the map's purpose**. As noted in Section 4.1.1, understanding what the map is meant to show helps guide whether a map is the best format and how to support it with alternative content.
- **Include the data in another format**. Tables, summaries, or lists can help users who cannot interact with the map. These alternatives should be easy to navigate using a keyboard and include proper headers and row structures [WCAG 1.3.1, 2.1.1]
- **Support understanding with descriptive text**. Provide a summary of the map's message in the surrounding content or as a caption. This helps users who rely on screen readers or prefer text-based formats [WCAG 1.1.1]
- **Offer a human contact**. If users need help interpreting the map or data, include contact information so they can reach out for assistance.

3.2.8 App Platforms

Many web mapping platforms, such as Esri StoryMaps, Experience Builder, and Dashboards, include built-in accessibility features. However, these tools vary in how much control they give creators over accessibility settings. Visit the tool's website to learn about the accessibility support they offer.

- **Accessibility is not automatic**. It is the responsibility of the content creator to ensure that the final product is accessible. Some templates and components are more accessible than others, so choose carefully.
- **Use platform-specific accessibility options**. Many apps offer settings or components designed to improve accessibility. Take advantage of these features when available.
- **Test throughout the process**. Regular testing helps identify accessibility issues early and ensures that your app works for all users.

See appendix X.X for recommended resources on meeting accessibility standards within specific apps.

3.3 Metadata

Provide clear and descriptive metadata for all map layers and content. This includes:

- **Alt text** for images and non-text elements
- **Programmatically determinable labels** for form fields, buttons, and interactive elements
- **Descriptive titles and summaries** for datasets and layers

Well-structured metadata improves accessibility for screen reader users and enhances overall usability by making content easier to understand and navigate [WCAG 1.1.1, 1.3.1, 4.1.2].

3.4 Testing and Validation

To ensure your interactive maps are accessible, perform the following checks:

- **Keyboard Navigation**: Verify that all interactive elements can be accessed and operated using only the keyboard {WCAG 2.1.1].
- **Screen Reader Compatibility**: Test with screen readers to confirm that labels, descriptions, and navigation are announced correctly [WCAG 4.1.2].
- **Color Contrast**: Use a contrast checker to ensure text and UI elements meet minimum contrast ratios [WCAG 1.4.3, 1.4.11].
- **Open Links in Same Window**: Configure links to open in the same window to avoid disorienting users. If opening a new window is necessary, provide a clear warning. This may be appropriate when preserving user progress on a page (such as during form completion) or when users need to reference a checklist or guide while completing a task in another window. [WCAG 3.2.5].
- **Reflow**: Set your browser to 1280×1024 and zoom to 400%. All content should remain visible and functional without requiring horizontal scrolling [WCAG 1.4.10].
- **Text Spacing**: Ensure that increasing line height, letter spacing, or word spacing does not break layout or functionality [WCAG 1.4.12].

4 Testing for Accessibility

Accessibility should be considered throughout the process of creating maps and building mapping applications. Testing is an essential step, and there are many free tools available online to help evaluate accessibility. These tools can assist with checking header structure, screen reader compatibility, color contrast, and other key elements.

To get started, we recommend using Accessibility Insights for Web, a browser extension available for Chrome and Edge. It provides step-by-step instructions, examples, and references to help assess websites and dashboard interfaces. While it is the responsibility of the creator or tester to ensure compliance with WCAG 2.1 AA standards, tools like this offer built-in support to make the process easier.

Below are additional resources we recommend for testing specific aspects of accessibility:

- WebAIM Contrast Checker - Helps verify color contrast between text and background.
- ANDI Accessibility Tool - A browser-based tool for evaluating web content.
- Windows Color Filters to review grayscale - Useful for reviewing grayscale and visual contrast.
- Complex Images on W3.org - Offers best practices for describing complex images for screen readers.
- NVDA Screen Reader - open-source screen reader for Windows. If using NVDA, it is recommended to read instructions and understand keyboard shortcuts before installing.
    - NVDA Official User Guide
    - NVDA Keyboard Shortcuts from Deque University

5 Appendices

5.1 Esri Applications

Esri's web application builder platforms are designed with accessibility in mind, but creators still need to make intentional choices to ensure their applications are fully accessible. While the platforms continue to evolve, not all components meet every WCAG standard by default.

Creators should consult the platform's Accessibility Conformance Report (ACR) and related Esri blog posts to understand current limitations and best practices. The ACR evaluates each WCAG criterion and indicates whether the platform fully supports, partially supports, or does not support it. For any features marked as "partial" or "does not support," additional steps may be required to address accessibility gaps within your application.

As a best practice, test your application early and often using keyboard navigation and screen readers. Follow the general accessibility guidelines outlined in this document, and provide a contact for users who may need assistance.

5.1.1 Experience Builder (ArcGIS Online)

- Use full-screen or scrolling pages
- At the bottom of the screen, enable A11Y > Auto-calculate element tab orders in fixed layouts
- Enable accessibility settings for each widget
- Add accessible labels for screen readers
- Enable "Skip to" when available

- Ensure the app works on different screen sizes and in both landscape and portrait orientations
- Default themes and fonts are accessible; follow contrast guidelines when using custom themes
- Avoid using animation between elements

Resources:

- Accessibility—ArcGIS Experience Builder | Documentation
- Accessibility best practices for ArcGIS Experience... - Esri Community

5.1.2 Survey123

- Avoid or provide alternatives for: Map, Signature, and Ranking question types (not accessible; require mouse interaction)
- Default themes and fonts are accessible; follow contrast guidelines when using custom themes

Resources:

- Web accessibility best practices for Survey123 authors

5.1.3 StoryMaps

- Provide alternative text for all media, including images (such as logos), videos, maps, and embedded content
- Use a contrast checker to ensure text is legible when customizing themes or text colors in a story

Resources:

- Writing accessible ArcGIS StoryMaps content
- Create a theme—ArcGIS StoryMaps | Documentation
- Accessibility and supported languages—ArcGIS StoryMaps | Documentation
- Adding Alternative Text in ArcGIS StoryMaps - Esri Videos: GIS, Events, ArcGIS Products & Industries

5.1.4 Dashboards

- Use headings properly (e.g., H1, H2, H3); screen readers rely on heading structure to navigate content
- Fill out the accessible name or description for each element
- Use a default theme that meets contrast requirements; follow contrast guidelines when using a custom theme

Resources:

Improving the accessibility of your dashboard

Navigating ArcGIS Dashboards with a keyboard

5.1.5 Instant Apps

- Include a descriptive map summary when adding a map to the app
- Enable the keyboard shortcuts menu
- Verify color contrast using the theme editor
- Avoid interactive controls that cannot be operated with a keyboard; if used, provide accessible alternatives

Resources:

- Enhance web app accessibility with Instant Apps
- Are instant apps accessible?

5.2 Change log/revision history

Version	Date	Description
1.0	12/22/2025	Initial document published