

Playbook: Accessible Contrast & Color on Your Website

This playbook helps content authors ensure that their websites meet accessibility standards for contrast and color. It explains key principles and offers practical steps to make content perceivable.

The W3C [Web Content Accessibility Guidelines 2.1](#) (WCAG), level AA, serve as Web accessibility standards for the University of Minnesota. WCAG tells us to use sufficient contrast and prohibits the use of color alone to convey meaning. The [Final Rule \(PDF\)](#) issued by the US Department of Justice (DOJ) under [Title II of the Americans with Disabilities Act \(ADA\)](#) mandates that websites, such as the University's, conform to WCAG.

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Part 1. Contrast Principles & Requirements

What Is Contrast?

Contrast is the difference in brightness between 2 elements, such as text and its background or a graphic and its surrounding area. While the term “color contrast” is commonly used, it is technically inaccurate and not recognized in WCAG.

Colors that appear visually distinct, like red, green, and blue can have similar brightness levels, making them difficult to differentiate for some users. For this reason, WCAG measures contrast based on luminance (brightness), not color. This approach ensures that people with color vision deficiencies (sometimes called color blindness) can still perceive sufficient contrast and access content effectively.

Why Contrast Matters

Insufficient contrast is more than a design oversight. It’s an accessibility barrier. When contrast is inadequate, it can prevent people from accessing digital content, services, and opportunities. This issue goes beyond visual appeal. It directly affects accessibility, inclusion, and equity.

People with Low Vision & Color Deficiencies

When contrast isn’t sufficient, people with color deficiencies and low vision simply can’t read or perceive what’s on the screen. That can mean missing out on information, services, and communication.

Measuring Contrast

WCAG uses ratios to evaluate contrast. What is measured is light/dark independent of color. The difference is expressed as a ratio.

The ratio is a value ranging from 1:1 (no contrast, e.g., white text on a white background) to 21:1 (maximum contrast, e.g., black text on a white background).

What is Sufficient Contrast?

- **Normal text** (under 18 point (pt) or under 14 pt bold): Minimum contrast ratio of 4.5:1
- **Large text** (18 pt or 14 pt bold and larger): Minimum contrast ratio of 3:1
- **Graphical objects that convey meaning:** Minimum contrast ratio of 3:1 against adjacent colors. The term "graphical object" applies to stand-alone icons such as a print icon (with no text), and the important parts of a more complex image such as each line in a graph or each segment in a pie chart.
- **User Interface components:** Minimum contrast ratio of 3:1 against adjacent colors. These include form fields, links, buttons, and any visual cues that indicate their state. Drupal content authors typically shouldn't need to check these as their accessibility is already built into our templates.

Once you know about contrast ratio requirements, designing to meet them becomes straightforward, especially with the help of tools. They do the math for you.

Part 2. Testing Contrast: Tools & Techniques

The WAVE

The WAVE (Web Accessibility Visual Evaluator) can help you identify WCAG 2.1 Level AA contrast issues. Note: It can't automatically test the contrast in image files or text with an image or gradient background. This tool has a contrast tab where you can use a color picker to select any colors. It then gives you their contrast ratio.

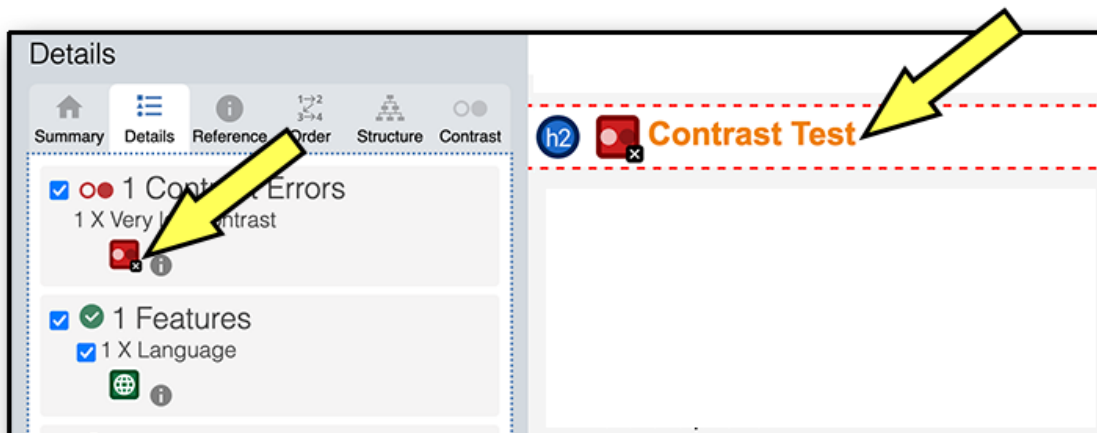
How to Use the WAVE to Test Contrast

1. [Install & Pin the WAVE Extension.](#)
2. Go to the page you want to test or pick colors from.

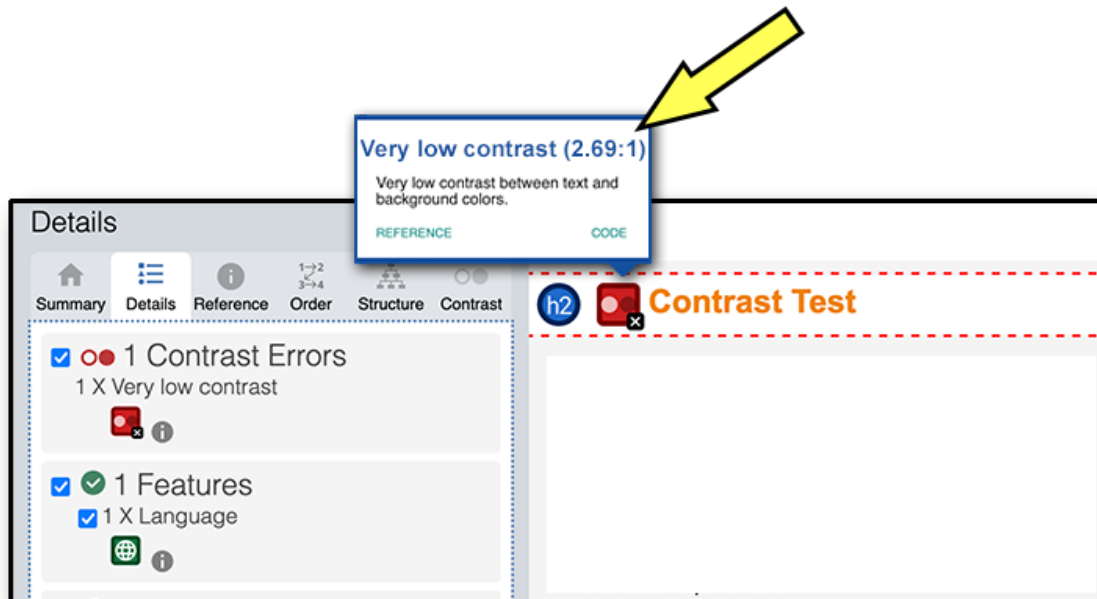
3. Select the WAVE extension.



4. In the WAVE's Details tab, select the low contrast icon to locate error(s). A red dashed outline will appear around problematic elements.



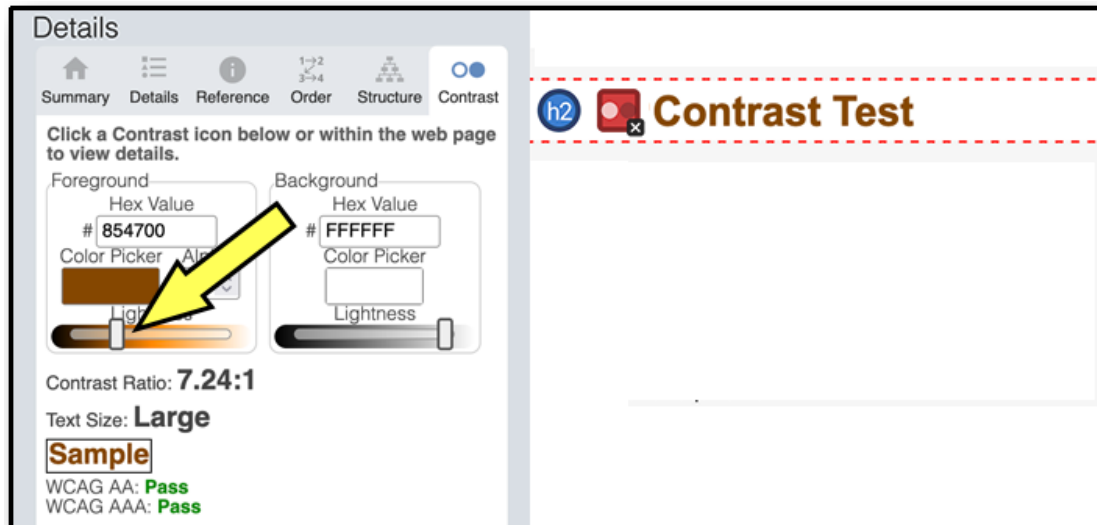
If you select the error icon on the page, a pop-up will appear and explain the issue.



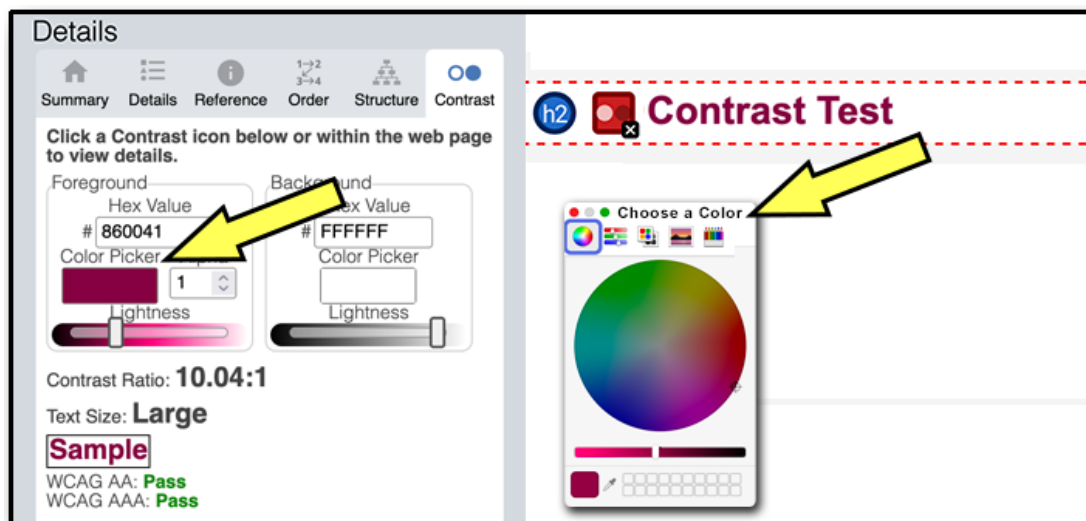
In this case it says, "Very low contrast (2.69:1). Very low contrast between text and background colors". The pop-up has a "Reference"

link that will explain the error further and a "Code" link that will display the HTML exactly where the error occurs.

5. In the WAVE's Contrast tab, use the sliders to find a value that passes the ratio.



6. Alternatively, you can pick a color on the page by selecting the color switch to use your browser's color picker and pick a color from the page.



WAVE Doesn't Test Complex Backgrounds

The WAVE's documentation states:

“Contrast is not tested when background gradients, transparency, etc. are present. A CSS background color that provides sufficient contrast must be defined when a background image is in place. This provides fall-back contrast in case images or CSS do not display.”

This means if an image fails and the browser only uses the container’s default background (often white), the text can become invisible. (e.g., White text over a failed white background.) The solution is to use the background-color CSS property as a fallback, high-contrast safety net beneath the background-image property. This ensures if the image fails to load the text displays clearly over a solid contrasting background color.

Colour Contrast Analyser (CCA)



The [Colour Contrast Analyser](#) is a free desktop application available for both Mac and Windows. It was developed in 2005 by Steve Faulkner and with programming by Jun Matsubayashi. Steve brought the tool to The Paciello Group (TPG), where it continues to evolve. Cédric Trévisan at TPG developed and maintained a multi-platform Electron version until mid-2025.

CCA can help you evaluate the contrast between two colors to ensure compliance with the Web Content Accessibility Guidelines (WCAG). The tool includes an eyedropper feature that allows you to select colors directly from **any area on your desktop**, making it ideal for testing contrast in:

- Websites
- Documents
- Images

Install CCA

1. Go to the [Colour Contrast Analyser homepage](#).
2. Select or click Download for Windows / Mac.

For Windows:

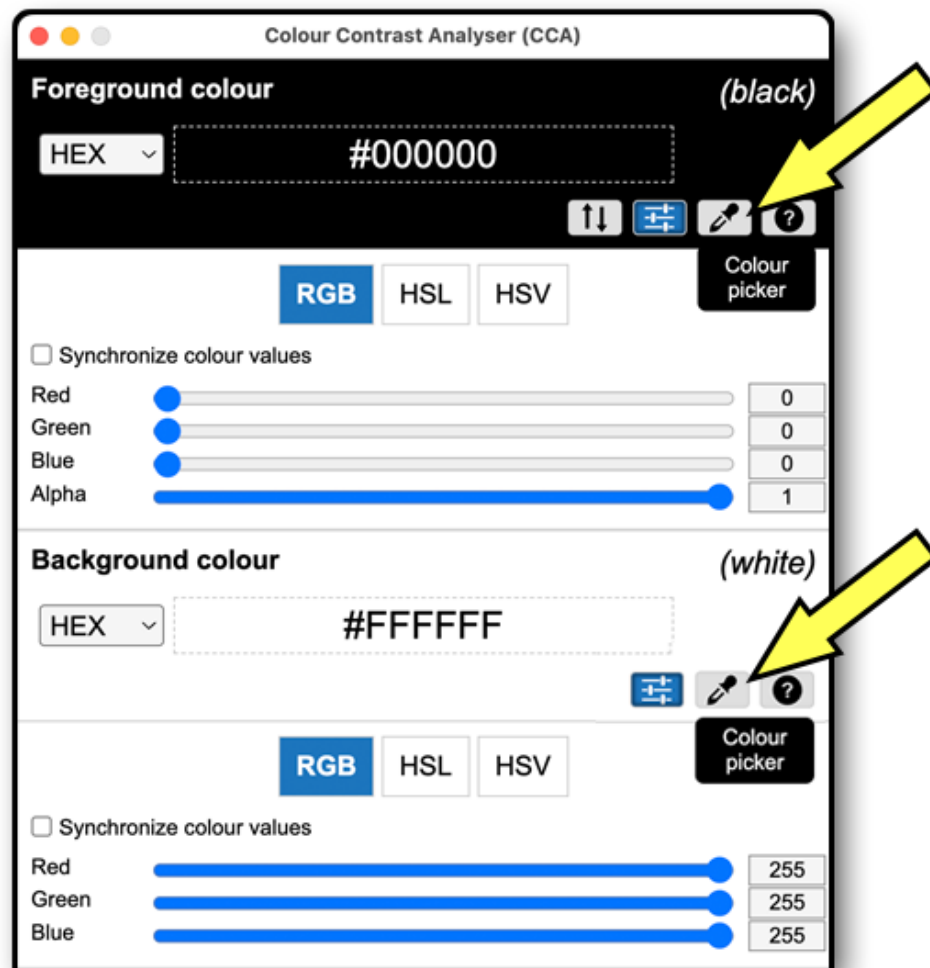
1. Locate the downloaded .exe file.
2. Double-click to launch the installer and follow the prompts.
3. Launch from the Start Menu or desktop shortcut.

For Mac:

1. Locate the downloaded .dmg file.
2. Open the disk image and drag the app to your Applications folder.
3. Launch the app. If prompted, approve it in System Preferences > Security & Privacy.

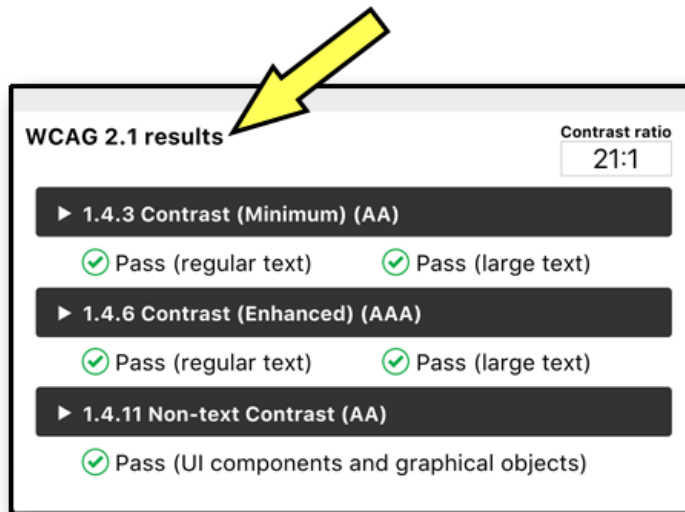
Use CCA

1. Select the colors to test.
 - Use the eyedropper tool next to the "Foreground Color" and "Background Color" fields to pick colors from anywhere on your screen.



- Alternatively, you can manually enter hex codes or RGB values.

2. View the contrast results:



- The tool will automatically calculate the contrast ratio.
- It will show whether the color combination passes or fails WCAG 2.1 standards for:
 - Regular text
 - Large text
 - Graphical objects and UI components

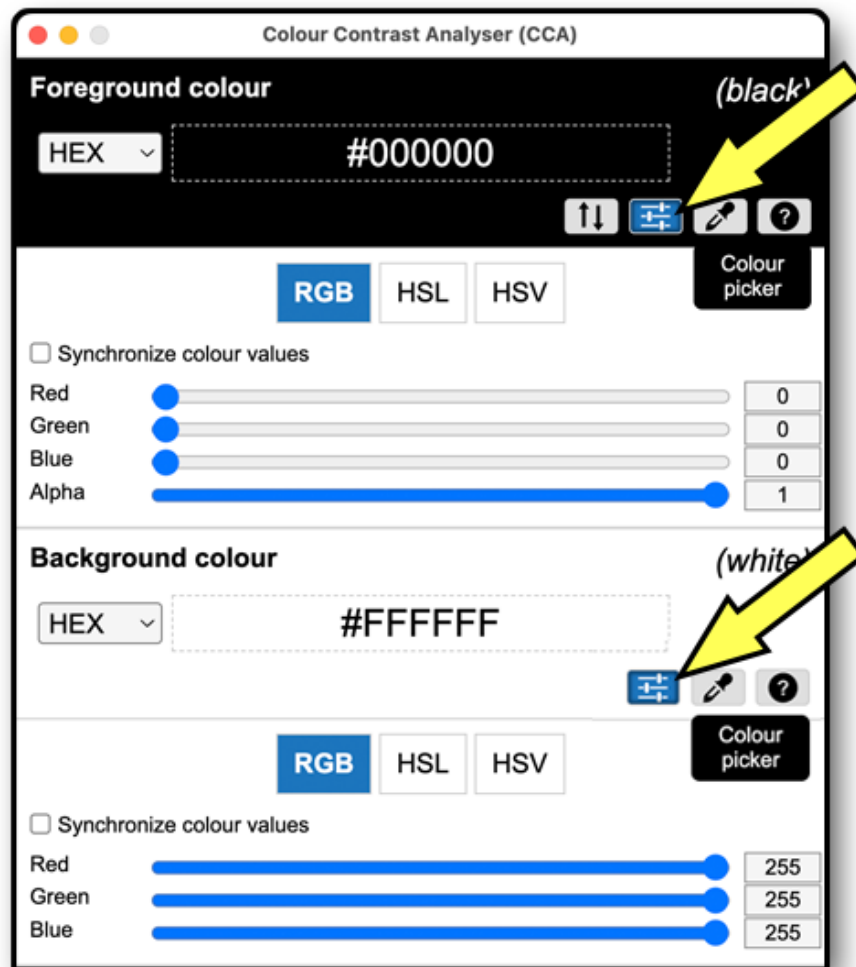
3. Adjust colors if needed.

- You can tweak the foreground or background color to improve contrast.
- The tool updates results in real time.

Finding Sufficient Contrast with CCA

If a color fails WCAG contrast requirements, adjust it:

1. Select the color, then select or click the sliders icon next to the color picker.



2. Choose the HSL tab.
3. Select or click the value next to the Lightness slider.
4. Use the arrow keys to adjust the lightness until the contrast ratio passes the threshold

Contrast and Text Over Images

Ensuring sufficient contrast is straightforward with solid backgrounds but more complex with irregular backgrounds such as:

- Photos
- Textured Images
- Illustrations

Challenges

- Text may pass contrast ratios in one area but not in another.
- Varying brightness and colors makes it hard to maintain consistent contrast.

Techniques for Text Over Images

When placing text over complex, irregular background images, designers face challenges in maintaining sufficient contrast and legibility. To address this, carefully evaluate text placement and use specific techniques like overlays, shadows, or strokes to guarantee sufficient contrast.

A key challenge is the dynamic nature of web design: consider how the text position might shift when a user's browser is resized or zoomed. If you can't guarantee a consistent, sufficient contrast background in all situations, the most reliable solution is to add a solid or semi-transparent backdrop directly behind the text. This technique provides a consistently dark (or light) area beneath the text, guaranteeing sufficient contrast regardless of which part of the background image it covers.

Semi-Transparent Backgrounds

To meet text contrast levels over busy, irregular images use semi-transparent overlays behind the text:

- Light overlays work best for dark text
- Dark overlays work best for light text

Example: 2 side-by-side images show the text "Accessible Contrast & Color" over a background of colorful paint blotches:

No Background



Semi-Transparent Background



- **No Background Image:** With no overlay behind the text, it is extremely difficult to read and fails contrast accessibility standards.
- **Semi-Transparent Background Image:** A light semi-transparent background is placed behind the dark text. The text is legible and meets contrast requirements.

Text Shadows

Adding a shadow behind text can improve contrast and legibility, especially on complex backgrounds.

Example: 2 versions of the phrase “Silver Lining” are shown over a photo of clouds:

No Text Shadow



Text Shadow

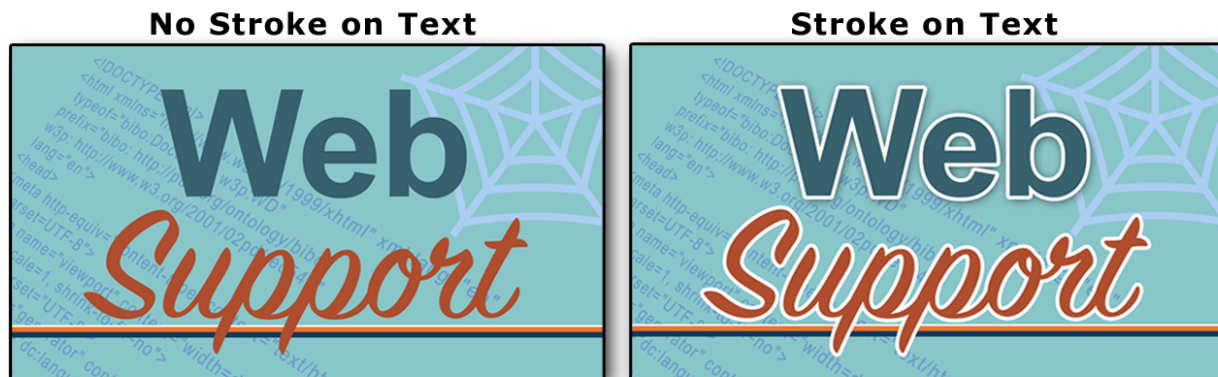


- **No Text Shadow Image:** The text blends into the background and fails the contrast requirements.
- **Text Shadow Image:** A subtle shadow is added behind the text, improving legibility and passing contrast standards.

Strokes (Outlines)

Applying a stroke or outline around each character helps separate the text from the background.

Example: 2 side-by-side images display the phrase “Web Support” over a background HTML code and a spider web:



- **No Stroke on Text Image:** The text is hard to distinguish and fails contrast requirements.
- **Stroke on Text Image:** The stroke around the text enhances visibility and meets accessibility standards.

Testing Text Over Images with CCA

The [Colour Contrast Analyser \(CCA\)](#) is a valuable tool for testing text contrast against complex, image-based backgrounds. Here's how to use it effectively:

- **Use the Eyedropper Tool:** Select the foreground color (the text) and the background color directly from the image using the CCA's eyedropper tool.
- **Test Multiple Points:** You must sample several points behind the text, focusing particularly on the darkest and lightest areas that the text crosses. This helps identify worst-case contrast scenarios.
- **Check Variational Placement:** Since text placement over an image can shift (for instance when a user resizes or zooms the browser), you must test common variations to confirm the text is always over a sufficiently dark or light region of the image to consistently meet WCAG contrast standards.

Part 3. Use of Color - Principles & Remediation

Color can be a powerful tool in web design, for instance when used in combination with clear labeling to distinguish pages, sections and categories of a web site. There are several compelling reasons to incorporate color thoughtfully into a website:

- Reinforce content and messaging
- Enhance the overall user experience
- Establish a visual tone and aesthetic
- Support brand identity and recognition

When used with accessibility in mind, color can enrich a website's visual appeal and usability. The key is to use color thoughtfully to avoid creating accessibility barriers.

Impact of Color Alone on People with Disabilities

People with Color Deficiencies

Imagine you're shopping online, excited to find a great deal, only to realize you can't tell what's on sale because the discounts are marked in red. For someone with red-green color deficiency, this isn't just inconvenient, it's exclusionary.

Red-green color deficiency is the most common form of color deficiency, affecting roughly 1 in 10 people, mostly men. Within this group, individuals with Protanopia struggle to perceive red light, while those with Deuteranopia have difficulty seeing green. For them, a red "Stop" button and a green "Start" button might look nearly identical.

To make content accessible, it's essential to pair color with text labels or symbols. A button labeled "Stop" in red and "Start" in green ensures clarity for everyone, regardless of how they perceive color.

There are also other forms of color deficiencies, such as Tritanopia, which affects blue and purple perception, and Achromatopsia, where individuals see no color at all. These users may interpret green as blue or orange as red or miss color cues entirely.

Accessible design isn't just good practice, it's essential. When information is only communicated through color, users with low vision or color deficiencies may be left out.

People with Low Vision

Color can have a significant impact on people with low vision, even though they may not have color deficiencies. It can make content nearly invisible to someone with reduced visual acuity. They may not perceive subtle color differences, especially if colors are similar in hue or saturation. Charts and graphs that rely solely on color to differentiate data points (e.g., pie charts with color-coded segments) can be incomprehensible. Users may struggle to interpret the data without labels, patterns, or legends that go beyond color.

Screen Reader Users

Screen readers don't communicate color information or by default stylistic information (such as bolding, italic) to the user. If information is only communicated through color or styling, most screen reader users will be left out.

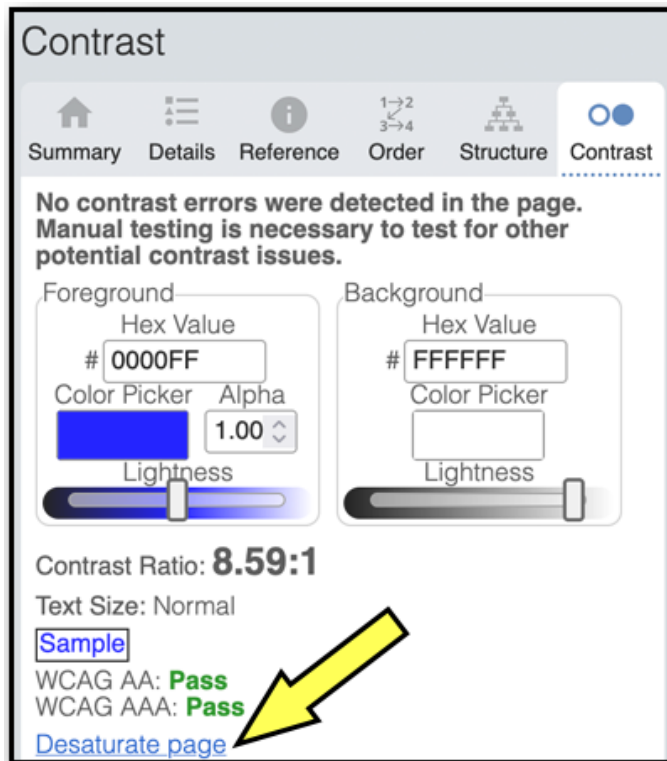
What's the Fix?

Ensure that color alone isn't used to convey information. The solution is to provide redundant emphasis using other, accessible methods, which differentiates elements providing additional identification. Make your content work in black and white.

Detect Errors with the WAVE

In the WAVE Contrast tab:

1. Select or click the "Desaturate page" link.



2. Your web page will appear in grayscale with all colors removed.
3. Examine the content and ask yourself, "is any important information lost?"

Try it Out

Desaturate the [Midterm Exam Answers](#) page. What happens if a person cannot perceive the color green? Is color alone used to communicate a message?

Detect Errors with the Gray Bookmarklet

The Gray Bookmarklet is a valuable tool for conducting quick visual accessibility checks by desaturating web pages.

1. **Navigate** to the [3 Simple Design Bookmarklets](#) page.
2. **Install the Bookmarklet:** Drag and drop the button labeled "Gray" directly onto your browser's bookmarks or favorites toolbar.
3. **Activate the Tool:** To apply the desaturation filter to the current page, simply click the newly added "Gray" bookmarklet in your toolbar.

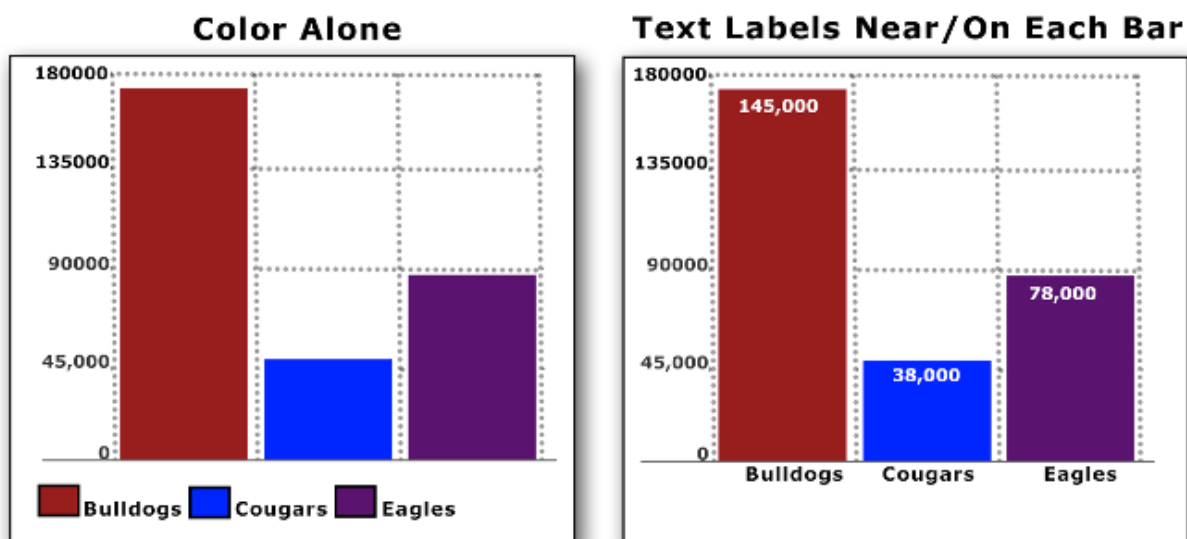
Remediate Color Alone Errors

Some techniques to resolve color-alone errors include incorporating text labels, patterns, icons, or shapes in addition to color.

Text Labeling

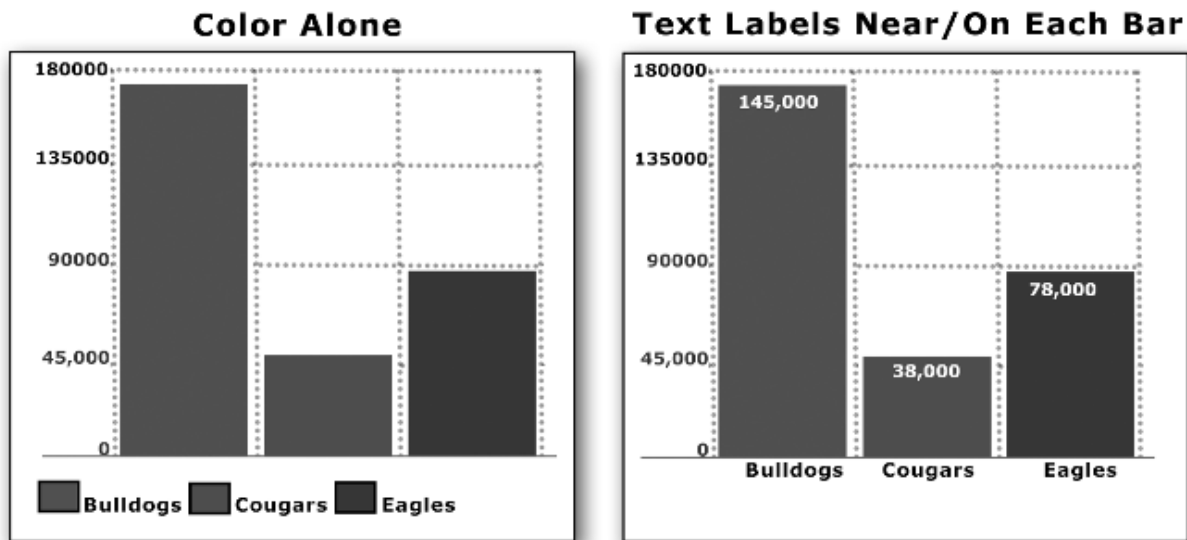
Use text to clearly label categories, statuses, or data values. Proximity matters. Labels should be positioned close to the element they describe.

Example: 2 side-by-side bar charts



- **Color Alone Chart:** Uses only a color key (legend) to differentiate categories (e.g., red for 'Bulldogs', blue for 'Cougars', and purple for 'Eagles').
- **Text Labels Near/On Each Bar Chart:** Uses text in close proximity to categories to associate labels and data.

Testing the same side-by-side bar charts in grayscale:

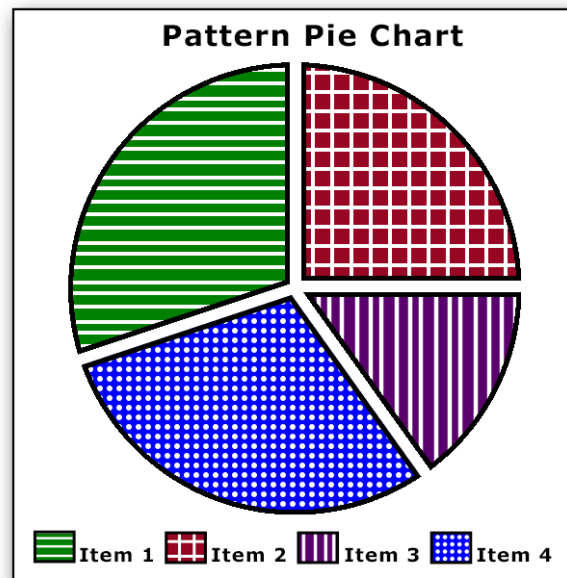
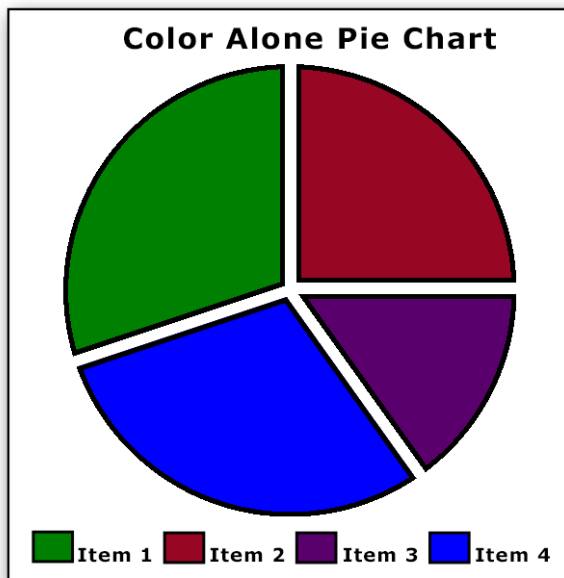


- **Color Alone Chart (Grayscale):** When color is removed it becomes impossible to distinguish which labels go with which bars in the first chart.
- **Text Labels Near/On Each Bar Chart (Grayscale):** Categories are clearly labeled and associated with values. The labels "Bulldogs," "Cougars," and "Eagles" are placed directly below each bar, while numerical values are displayed at the top of each bar. This close proximity ensures that each label is clearly linked to the data it describes.

Patterns

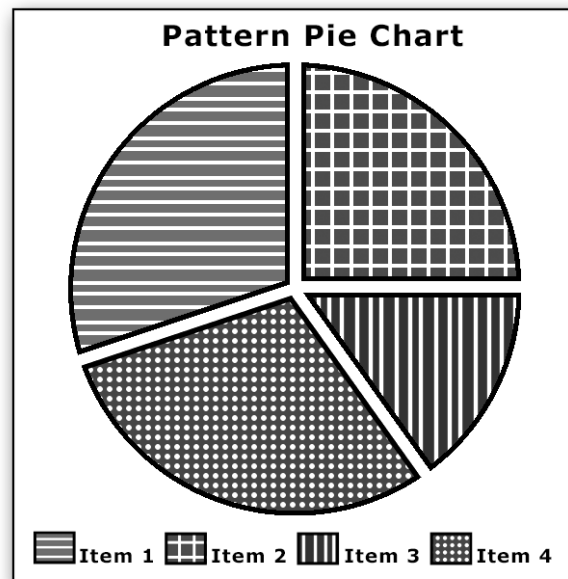
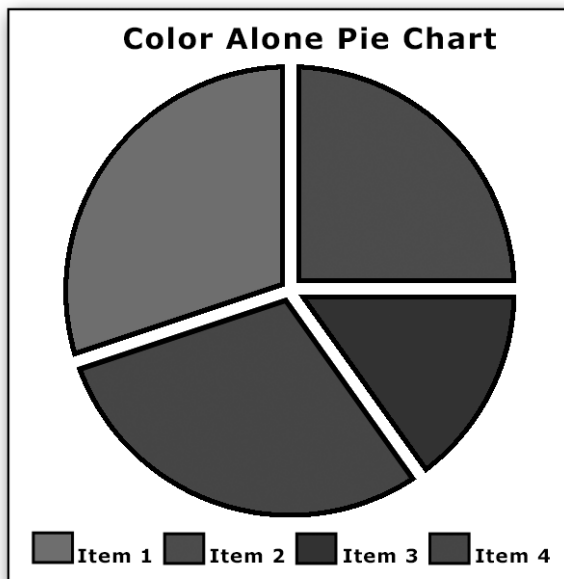
Use distinct patterns (e.g., stripes, dots, crosshatch) to clearly differentiate between data segments. This is especially useful in pie charts, bar graphs, diagrams, or maps.

Example: 2 side-by-side bar pie charts.



- **Color Alone Pie Chart:** Uses solid colors (green, red, purple, and blue) and a color key (legend) below the chart to indicate 4 item categories.
- **Pattern Pie Chart:** Uses 4 different patterns (green horizontal stripes, red crosshatch, purple vertical stripes, and white dots on blue) to indicate categories.

Testing the same side-by-side pie charts in grayscale:



- **Color Alone Pie Chart (Grayscale):** Solid-colored segments are impossible to distinguish.
- **Pattern Pie Chart (Grayscale):** The patterns are visually distinct regardless of color.

Shapes & Icons

Use different shapes or icons to represent categories or statuses.

Example: 2 side-by-side tables indicate Do and Don't categories.

Color Alone		Shapes	
	Meet or exceed contrast requirements.		Meet or exceed contrast requirements.
	Use color coding alone to convey info.		Use color coding alone to convey info.
	Test in grayscale.		Test in grayscale.

- **Color Alone Table:** Uses green and red colored circles to indicate categories.
- **Shapes Table** Uses a checkmark for 'Do' and an 'X' for Don't.

Testing the same side-by-side tables in grayscale:

Color Alone		Shapes	
	Meet or exceed contrast requirements.		Meet or exceed contrast requirements.
	Use color coding alone to convey info.		Use color coding alone to convey info.
	Test in grayscale.		Test in grayscale.

- **Color Alone Table (Grayscale):** Colored circles are impossible to distinguish.
- **Shapes Table (Grayscale):** Status of each statement is conveyed.
(Note: Text alternatives also need to be included for each image icon.)

Part 4. Checklist & Additional Resources

Checklist for Contrast & Color

- ☐ Confirm that text, graphical objects, and text over images or gradients [meet minimum contrast requirements](#).
- ☐ Ensure color is not the only way information is conveyed.
- ☐ Test in grayscale. Ask, “If I take color away from this page or image is any important information lost?”
- ☐ Combine color indicators with text, patterns, icons, or shapes.
- ☐ Avoid relying solely on stylistic information such as bolding, underline, or italics.

Pope Tech

[Pope Tech](#) can help make text contrast accessible. Pope Tech is an enterprise-level web accessibility dashboard and evaluation system available to website editors using Drupal. If you have a large site or many issues to mitigate, you may wish to request your own Pope Tech access to run your own reports. To request this access, complete the [Request Service form](#). Pope Tech reports accessibility errors and issues and is powered by the [WAVE](#) accessibility engine.

Pope Tech’s Low Contrast Error

Pope Tech’s [Very Low \(Text\) Contrast Error](#) typically shouldn't be triggered in Drupal’s content area unless you are using the “full html” editor and inline styles for setting colors. If you are using low contrast between text and background colors it will tell you to increase the contrast between the foreground (text) color and the background.

Failures Pope Tech/WAVE Can’t Detect

Manual testing is required for the following issues:

- Text that is part of an image
- Text over background images, gradients, transparency, etc.
- Use of color alone to convey meaning.

Use an eyedropper tool such as the Colour Contrast Analyser (CCA) to detect sufficient contrast and the WAVE to test in grayscale for those issues.

More Tools

- Color Simulators
 - [Color Oracle](#)
 - [Coblis - Color Blindness Simulator](#)
 - [Color Vision Deficiency \(CVD\) Simulator](#)
 - [Colorblind Web Page Filter](#)
 - [Sim Daltonism](#)
- Contrast Tools
 - [Colour Contrast Analyser](#)
 - [WAVE extension](#)
 - [WebAIM's Online Contrast Checker](#)

Resources

- [Contrast](#) - Office for Accessibility (ODA)
- [Color Contrast \(Video\)](#) - U.S. Department of Education's Office for Civil Rights (OCR)
- [Ensure High Contrast for Text Over Images](#) - Aurora Bedford
- [Handling Text Over Images in CSS](#) - Ahmad Shadeed
- [Use of Color Alone to Convey Information \(Video\)](#) - U.S. Department of Education's Office for Civil Rights (OCR)
- [High Contrast Mode Quick Accessibility Test \(Video\)](#) - TetraLogical
- [Accessibility Requirements for People with Low Vision](#) - Low Vision Task Force, W3C Web Accessibility Initiative (WAI)
- [Colors with Good Contrast](#) - WAI
- [Drupal Drop-in Accessibility Playbook & Slide Listing](#) - ITSS

Related WCAG Resources

The W3C [Web Content Accessibility Guidelines 2.1](#) (WCAG), level AA, serve as Web accessibility standards for the University of Minnesota.

Success Criteria

- [1.4.1 Use of Color](#) (Level A): Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.
- [1.4.3 Contrast \(Minimum\) \(Level AA\)](#) The visual presentation of [text](#) and [images of text](#) has a [contrast ratio](#) of at least 4.5:1, except for the following ...
- [1.4.11 Non-text Contrast](#) (Level AA): The visual presentation of the following has a contrast ratio of at least 3:1 against adjacent color(s) ... User Interface Components ... Graphical Objects that convey meaning ...

Techniques

- [F13: Failure of Success Criterion 1.1.1 and 1.4.1 due to having a text alternative that does not include information that is conveyed by color differences in the image](#)
- [F24: Failure of Success Criterion 1.4.3, 1.4.6 and 1.4.8 due to specifying foreground colors without specifying background colors or vice versa](#)
- [F73: Failure of Success Criterion 1.4.1 due to creating links that are not visually evident without color vision](#)
- [F78: Failure of Success Criterion 2.4.7 due to styling element outlines and borders in a way that removes or renders non-visible the visual focus indicator](#)
- [F81: Failure of Success Criterion 1.4.1 due to identifying required or error fields using color differences only](#)
- [F83: Failure of Success Criterion 1.4.3 and 1.4.6 due to using background images that do not provide sufficient contrast with foreground text \(or images of text\)](#)
- [G14: Ensuring that information conveyed by color differences is also available in text](#)

- [G18: Ensuring that a contrast ratio of at least 4.5:1 exists between text \(and images of text\) and background behind the text](#)
- [G148: Not specifying background color, not specifying text color, and not using technology features that change those defaults](#)
- [G174: Providing a control with a sufficient contrast ratio that allows users to switch to a presentation that uses sufficient contrast](#)
- [G195: Using an author-supplied, visible focus indicator](#)
- [G205: Including a text cue for colored form control labels](#)
- [G207: Ensuring that a contrast ratio of 3:1 is provided for icons](#)
- [G209: Provide sufficient contrast at the boundaries between adjoining colors](#)
- [G111: Using color and pattern](#)
- [G182: Ensuring that additional visual cues are available when text color differences are used to convey information](#)
- [G183: Using a contrast ratio of 3:1 with surrounding text and providing additional visual cues on focus for links or controls where color alone is used to identify them](#)
- [G111: Using color and pattern](#)

Glossary

- **Anti-aliasing:** A smoothing technique applied by your system to improve text appearance. It can distort text accuracy when using an eyedropper tool.
- **Color Deficiency:** A lack of the ability to discriminate between colors. Designs that rely on color alone to convey essential information will fail WCAG.
- **Contrast:** Difference in brightness. It is officially known as relative luminance in the Web Content Accessibility Guidelines (WCAG). The term "color contrast" is a misnomer. What is

measured is light/dark contrast. independent of color. The difference is expressed as a ratio.

- **Contrast Ratio:** A numerical value (e.g., 4.5:1) representing the brightness difference between foreground and background.
- **Desaturation:** Removing color from a page to test whether color alone conveys meaning.
- **Graphical Object:** A visual element that conveys meaning, such as icons or chart lines.
- **Level AA:** The University's target conformance level for WCAG, which requires sufficient contrast and other fundamental accessibility requirements.
- **Luminance (Relative Luminance):** A measure of the light or darkness of a color, independent of its hue, which is the basis for WCAG's contrast ratio calculation.
- **User Interface Component:** Interactive elements like buttons, links, and form fields.
- **W3C (World Wide Web Consortium):** The main international standards organization for the World Wide Web, which develops the WCAG standards.
- **Web Content Accessibility Guidelines (WCAG):**
(pronounced "whi-KAG"): A technical standard that serves a number of purposes, primarily functioning as the definitive technical reference gathering together information on web accessibility. WCAG are basically the rules to make web content more accessible to people with disabilities. [WCAG 2.1](#) serves as the accessibility standard for the University of Minnesota.