

To: Robert Van Rennes, Big Ten Academic Alliance
From: Grey L. Pierce, MSU Usability/Accessibility Research and Consulting
Subject: PLOS ONE High-Level Accessibility Evaluation for the Library Accessibility Alliance
Date: August 14, 2020

MSU Usability/Accessibility Research and Consulting (MSU UARC) conducted a high-level accessibility evaluation of the PLOS ONE platform to evaluate its conformance with WCAG 2.1 AA Criteria. This evaluation did not include all functionality or content of the site or all WCAG 2.1 AA Success Criteria.

During this evaluation, a number of issues were found that will make the site impossible to use for many individuals with disabilities and will make some site content difficult to use for many others.

Keyboard users, including screen reader users and users with dexterity impairments, will find it impossible to access or use a significant portion of site content. A variety of content throughout the site cannot be reached or operated via keyboard, making it impossible to use for those that rely on keyboard access. Focus order is incorrect in many places, increasing the difficulty of using the site with a keyboard, and many interactive elements lack a sufficiently visible focus indicator, making it difficult for many keyboard-only users to effectively use them, as they cannot determine when they have reached the correct element.

Individuals who rely on screen readers, including many users with visual, reading, and language impairments, will also have problems using the site. Some content is not read out or is not read correctly, and structural information (e.g., headings, lists, tables) is not appropriately conveyed to users, making it difficult or impossible to understand content and organization in places. Many form inputs are not appropriately labeled, making those inputs difficult or impossible to use for those that rely on screen readers. Custom elements do not correctly announce themselves to screen readers, making them difficult to understand and use. Many images have inappropriate alternative text, significantly impacting users with visual impairments.

The PDF has not been tagged for accessibility and no structural information is provided to assistive technologies, making it extremely difficult to use and navigate for users with disabilities. Additionally, no title or language is provided to assistive technologies.

Other issues were found that will make it difficult for users with a variety of disabilities to effectively use the system, including insufficient color contrast for text and meaningful visual elements, use of color alone to distinguish content, images of text being used instead of styled text, text not reflowing when the viewport or text size is changed, and inappropriate page titles.

To improve access for users with disabilities, MSU UARC recommends a full WCAG 2.1 AA evaluation and that the problems discovered be remediated.

Note: Results for "metagenome" were used as an example of a Search Results page and "Exploration of Noncoding Sequences in Metagenomes" was used as an example of an Article page.

For reference, screenshots of the Home page (wide, medium, and narrow viewport widths) at the time this evaluation was completed has been included at the end of this memo.

High-Level Findings

Document Structure

- Headings are not appropriately structured throughout the site. [[WCAG 2.1 SC 1.3.1](#)]
 - In the "PUBLISH" main navigation dropdown, "SUBMISSIONS", "POLICIES", and "MANUSCRIPT REVIEW AND PUBLICATION" should be tagged as headings
 - In the footer, "Publications" should be tagged as a heading (h2)
 - On the Home page, "PUBLISH WITH PLOS ONE" (at top of page) shouldn't be tagged as a heading
 - On the Home page, "Read the latest COVID-19 research" should be tagged as an h2, not an h3
 - On the Home page, "This Collection highlights content..." shouldn't be tagged as a heading
 - On the Home page, "Call for Papers" and "Meet our staff at conferences" should be tagged as headings (h2s)
 - On the Home page, "PUBLISH WITH PLOS ONE" (above "SUBMISSION INSTRUCTIONS") and "CONNECT WITH US" should be tagged as h2s, not h3s
 - On the Home page, "EveryONE" should be tagged as a heading (h2)
 - On the Home page, "Tweets" should be tagged as an h2, not an h1
 - On the Search Results and Article pages, "PLOS ONE" shouldn't be tagged as an h1
 - On the Search Results page, the h1 that describes overall page content is missing
 - On the Search Results page, "Filters:", "Journal", "Subject Area", "Article Type", etc. should be tagged as h2s, not h3s
 - On the Article page, figure and table headings should be tagged as headings
 - On the Article page, "Subject Areas", "Archived Tweets" should be tagged as h2s, not h3s
- In the footer, "Publications" should not be coded into the list that follows it. [[WCAG 2.1 SC 1.3.1](#)]
- On the Home page, the list under "EveryONE" is not coded as a programmatic list. [[WCAG 2.1 SC 1.3.1](#)]
- On the Article page, the lists under "Citation:", "Editor:", "Received:", etc. are not coded as programmatic lists. [[WCAG 2.1 SC 1.3.1](#)]
- In the Metrics tab on the Article page, "16.91 % of article views led to PDF downloads" should not be coded into the table. [[WCAG 2.1 SC 1.3.1](#)]
- On the Article page, content in Figure modals is not read out by screen readers. [[WCAG 2.1 SC 1.3.1](#), [WCAG 2.1 SC 1.3.2](#)]
- PDF is untagged, and provides no structural information or reading order information to assistive technologies. [[WCAG 2.1 SC 1.3.1](#), [WCAG 2.1 SC 1.3.2](#)]
- Main navigation dropdown items are incorrectly read out when not visible on screen. [[WCAG 2.1 SC 1.3.2](#)]
- On the Home page, article title headings should be read before the associated journal name or date. [[WCAG 2.1 SC 1.3.2](#)]

- On the Article page, figure names (e.g., " Figure 2. Sequence patterns defined." should be read before thumbnails and "Download:" sections. [[WCAG 2.1 SC 1.3.2](#)]
- The language of the PDF is not defined. [[WCAG 2.1 SC 3.1.1](#)]

Keyboard Support

- A variety of interactive content cannot be reached via keyboard. [[WCAG 2.1 SC 2.1.1](#)]
 - Cannot reach main navigation items ("PUBLISH", "ABOUT", and "BROWSE")
 - Cannot open main navigation dropdowns ("PUBLISH" and "ABOUT")
 - On the Search Results page, cannot reach "SEARCH ALERT" button
 - On the Search Results page, cannot reach "show more"/"show less" links
 - On the Search Results page, cannot reach page number buttons at bottom of page
 - On the Article page, cannot display "Save", "Citation", "View", or "Share" tooltips
 - On the Article page, cannot display author name tooltips
 - On the Article page, cannot reach any content in "Figures" section (figure image links, previous and next arrows, navigation dots)
 - On the Article page, cannot display reference tooltips (e.g., "[1]")
 - On the Article page, cannot reach most elements in figure popups (figure, thumbnails, "Reset zoom", "Previous", "Next", "All Figures", "show more", close button)
 - On the Article page, cannot control zoom slider in figure popups
 - On the Article page, cannot reach "Download PDF" options ("Citation", "XML"), "Print", or "Share"
 - On the Article page, cannot display "?" tooltip in "Subject Areas" section
 - On the Article page, cannot reach checkboxes in "Subject Areas" section
 - On the Article page, cannot reach "Reply", "Retweet", "Favorite", or "Load more" links in "Archived Tweets" section
 - In the Metrics tab on the Article page, cannot reach tooltips for "Cumulative Views" graph
 - In the Metrics tab on the Article page, cannot display Mendeley tooltip
- Focus order is incorrect in a variety of locations. [[WCAG 2.1 SC 2.4.3](#)]
 - Focus goes to items in main navigation dropdowns when they are not visible on screen
 - On the Home page, focus shouldn't go to article titles and images separately
 - On the Home page, focus goes to items in "Call for Papers" and "Meet our staff at conferences" that are not fully on-screen (i.e., moves to items regardless of what item is selected and breaks display)
 - On the Home page, focus goes to multiple invisible, non-interactive elements between graphic links at end of page
 - On the Search Results page, checkboxes and category titles shouldn't receive focus separately
 - On the Article page, "Download" links shouldn't receive focus separately (e.g., "PPT" and "PowerPoint slide")

- On the Article page, focus goes to page behind figure modals when they are open, and doesn't immediately go to modal
- On the Article page, focus goes to "Download:" buttons in figure modal in incorrect order
- On the Article page, changing tab incorrectly resets focus to top of page
- On the Home page, keyboard users are forced to move focus through all interactive elements in the "Tweets" section to reach the rest of the content on the page. This results in users needing to make hundreds of key presses to get past the section. [[WCAG 2.1 SC 2.1.1](#), [WCAG 2.1 SC 2.4.3](#)]
- Focus is not sufficiently visible for a variety of interactive content. [[WCAG 2.1 SC 2.4.7](#)]
 - Advertisement banners/images throughout the site
 - All items in the page header ("plos.org", "create account", "PLOS ONE", "PUBLISH", etc.) except "advanced search"
 - The main graphic (behind "PUBLISH WITH PLOS ONE") on the Home page
 - "READ MORE", "SUBMISSION INSTRUCTIONS", "SUBMIT YOUR MANUSCRIPT", and "SIGN UP" buttons on the Home page
 - Previous and next arrows in "Call for Papers" and "Meet our staff at conferences" sections on the Home page
 - Article titles under "EveryONE" on the Home page
 - Graphic links in the "Tweets" section and graphic links at end of page (e.g., "NEW COLLECTION...") on the Home page
 - Search button on the Search Results page
 - "Sort By" and "Results per page" dropdowns on the Search Results page
 - Checkboxes on the Search Results page
 - Next page button on the Search Results page
 - Tabs ("Article", "Authors", "Metrics", etc.) on the Article page
 - "Download PDF" on the Article page (it's covered by the bar at the top of the screen)
 - Dropdowns and "SEARCH" button on the Advanced Search page

Navigation

- Article page title doesn't include site name ("PLOS ONE"). [[WCAG 2.1 SC 2.4.2](#)]
- "Search Results" is not an appropriate title for the Advanced Search page. [[WCAG 2.1 SC 2.4.2](#)]
- The PDF is not titled. [[WCAG 2.1 SC 2.4.2](#)]

Forms and Data Submission

- On the Search Results page, the "Sort By:" and "Results per page" dropdowns are not programmatically labeled. [[WCAG 2.1 SC 3.3.2](#)]
- On the Search Results page, checkboxes and Publication Date inputs are not programmatically labeled. [[WCAG 2.1 SC 3.3.2](#)]
- In the Metrics tab on the Articles page, the dropdown under the "Cumulative Views" graph is not programmatically labeled. [[WCAG 2.1 SC 3.3.2](#)]
- On the Advanced Search page, the search input is not programmatically labeled. [[WCAG 2.1 SC 3.3.2](#)]

- On the Advanced Search page, operator dropdowns ("AND"/"OR"/"NOT") are not programmatically labeled. [[WCAG 2.1 SC 3.3.2](#)]

Images

- A variety of images have inappropriate or missing alternative text. [[WCAG 2.1 SC 1.1.1](#)]
 - Advertisement banners/images throughout the site
 - Search button in the page header
 - Image behind "PUBLISH WITH PLOS ONE" on the Home page (decorative and should have null alt attribute)
 - Article images on the Home page (decorative and should have null alt attributes)
 - Previous and next arrows in "Call for Papers" and "Meet our staff at conferences" sections on the Home page
 - Images in "Tweets" section on the Home page
 - Search button on the Search Results page
 - RSS feed icon on the Article page
 - Mail icon (next to "Pedro A. Moreno") on the Article page
 - Figures and tables on the Article page
 - "Exploration of Noncoding Sequences in Metagenomes" image in the "Supporting Information" section on the Article page
 - "Cumulative Views" graph in the Metrics tab on the Article page
 - "+" and "-" buttons on the Advanced Search page
- Images in the PDF lack alternative text. [[WCAG 2.1 SC 1.1.1](#)]
- Advertisement banners/images throughout the site are images of text, instead of styled text. [[WCAG 2.1 SC 1.4.5](#)]
- On the Home page, images in "Tweets" section are images of text, instead of styled text. [[WCAG 2.1 SC 1.4.5](#)]
- On the Article page, Figures and Tables are images of text, instead of styled text. [[WCAG 2.1 SC 1.4.5](#)]

Color and Visual Characteristics

- White text on teal background (e.g., "PUBLISH WITH PLOS ONE" on Home page), grey text on white (e.g., article dates, "Image credit", etc. on Home page; subnavigation contents, e.g., "Introduction", "Results", etc. on Article page; numbers and "Totals" in Views table in Metrics tab on Article page), light teal text on dark teal ("Submit your research..." in advertisement on Home page), yellow text on white ("Load more" in Archived Tweets section on Article page), and white text on grey ("Media Coverage" on Article page) have insufficient contrast. [[WCAG 2.1 SC 1.4.3](#)]
- On the Home page, grey symbols on white (arrows to navigate "Call for Papers" and "Meet our staff at conferences" sections) have insufficient contrast. [[WCAG 2.1 SC 1.4.11](#)]
- In the Metrics tab on the Article page, color alone is used to distinguish between PLOS and PMC data in the Cumulative Views chart. [[WCAG 2.1 SC 1.4.1](#)]

Custom Elements and Dynamic Content

- Throughout the site, text does not reflow when the viewport is decreased in size or text is enlarged, requiring users to scroll in two directions to read content. [[WCAG 2.1 SC 1.4.10](#)]
- On the Search Results page, no names are provided for buttons to remove filters. [[WCAG 2.1 SC 4.1.2](#)]
- On the Search Results page, content in "Publication Date" calendar modals is not read out properly by screen readers, and screen reader users are not notified when the modals appear. [[WCAG 2.1 SC 4.1.2](#)]
- On the Article page, roles and values (i.e., that they are tabs and whether they are selected) are not provided for tabs ("Article", "Authors", "Metrics", etc.). [[WCAG 2.1 SC 4.1.2](#)]
- On the Article page, value (i.e., whether it is selected) is not provided for the selected subnavigation item (e.g., "Abstract"). [[WCAG 2.1 SC 4.1.2](#)]
- On the Search Results page, screen reader users are not notified when filters (e.g., Publication Date) are applied. [[WCAG 2.1 SC 4.1.2](#)]

Disclaimer: This high-level evaluation was conducted for the Library Accessibility Alliance, and represents a good faith effort conducted within a limited time frame. It should not be assumed to be complete or free from error. No warranties or guarantees are implied. UARC is not responsible for direct, indirect, or incidental damages based on this work; its use or interpretation by any individual, group, or organization; or on conditions beyond our control.

Home Page Screenshots

Large Viewport

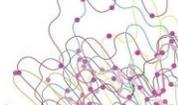
The screenshot displays the PLOS ONE home page layout. At the top, there is a navigation bar with the PLOS ONE logo, 'PUBLISH', 'ABOUT', 'BROWSE', 'SEARCH', and 'advanced search' options. Below the navigation bar is a large banner for a 'NEW SPECIAL COLLECTION' from the 'HRSA HIV/AIDS BUREAU'. The main content area is a grid of article teasers, each featuring a thumbnail image, a title, a brief description, and a 'READ MORE' link. The teasers cover various scientific topics such as 'CELL BIOLOGY', 'CARDIOVASCULAR BIOLOGY', 'BIOPHYSICS', 'MICROBIOLOGY', 'MACHINE LEARNING', and 'INFECTIOUS DISEASE'. On the right side of the grid, there is a 'PUBLISH WITH PLOS ONE' section with 'SUBMISSION INSTRUCTIONS' and 'SUBMIT YOUR MANUSCRIPT' buttons, followed by a 'CONNECT WITH US' section with social media icons and a 'Tweets' feed. At the bottom of the grid, there is a 'Get new content from PLOS ONE in your inbox' section with a text input field and a 'SIGN UP' button. Below the grid are three promotional banners: 'NEW SPECIAL COLLECTION HRSA HIV/AIDS BUREAU', 'CALL FOR PAPERS: Health and Healthcare in Gender Diverse Communities', and 'CALL FOR PAPERS: CITIES AS COMPLEX SYSTEMS'. The footer contains site information, including 'Publications', 'Home', 'Privacy Policy', and 'PLOS ONE is a nonprofit 501(c)(3) corporation'. The footer also includes a 'PLOS ONE' logo and the text 'PLOS ONE is a nonprofit 501(c)(3) corporation, registered in the State of California, USA'.

Narrow Viewport

CALL FOR PAPERS: Understanding Preventing Suicide
This collection is a special issue of *Research in Social Work Practice*, a peer-reviewed journal published by the American Professional Society on the Abuse of Children.

plus.org create account sign in

PLOS ONE



with you PUBLISH WITH PLOS ONE
Accelerating the publication of peer-reviewed science

Read the latest COVID-19 research
This collection highlights content published across the PLOS journals

CELL BIOLOGY 07/20/2020
An imageJ plugin for the high throughput image analysis of air-liquid interface wound healing assays
Suresh Arora and colleagues develop a plugin for imageJ to automate and streamline identification of air-liquid interface wound healing assays. The tool can use images from light field, phase contrast, and fluorescence microscopes and can analyze individual images or stacks.

BIOPHYSICS 07/20/2020
PLD2-PI4A/SP2 interactions in fluid phase membranes: Structural modeling and molecular dynamics simulations
Han and colleagues use template-based and ab initio modeling techniques combined with molecular dynamics simulations on a complex membrane to identify key protein-lipid interactions between phospholipase D2 and the lipid PI4A/SP2.

MICROBIOLOGY 07/20/2020
Interactions between functionalized silica nano-Pseudomonas fluorescens biofilm matrix: A focus on fluorescence resonance energy transfer, and their use applications
Dorris and colleagues explore the interactions of four types of functionalized fluorescent dyes with biofilms, and their use applications.

PHOTOCHEMISTRY 07/20/2020
A multi-parametric screening platform for phytochemical characterization of microalgae and cyanobacteria carbon limitation
The authors used a multi-parametric platform to enable simultaneous measurement of physiological and biochemical parameters that are indicative of the physiological status of two types of model organisms—cyanobacteria and microalgae.

INTERVIEW PLUS 07/20/2020
Building a home for the Physical Sciences at PLOS
Associate Editor Joseph Doolen discusses needs and new science.

DIAGNOSTIC DEVICE 07/12/2020
Nonlinear transmission mediated by asymptomatic family members in household
The authors find there is substantial spread within households of asymptomatic individuals.

CELL BIOLOGY 07/07/2020
The Cdk5 and KAP1 mutations are equivalent in suppressing kinase activity and targeting
Lilly and colleagues demonstrate that Cdk5 and KAP1 mutations interact with APT binding compound, supporting their hypothesis as a tool for identifying the role of APT.

Call for Papers
Understanding and Preventing Suicide: Call for Papers
To be considered for this Collection, authors must be submitted by October 30, 2020.

Meet our staff
Travel to rate
Following rate
Health advice
personnel or
and travel and

Get new content from PLOS ONE in your inbox

YOUR EMAIL ADDRESS

PLOS will use your email address to provide content from PLOS ONE Email. You can unsubscribe at any time by clicking the unsubscribe link.

SIGN UP

CALL FOR PAPERS: CITIES AS COMPLEX SYSTEMS
Submit by Sep 24, 2020

CALL FOR PAPER: Health Center Commu
Submit by Sep 24, 2020

Publications
PLOS ONE is a nonprofit
501(c)(3) corporation
477 Williamstown
Avenue, Cambridge, MA
02142, USA

Home
Blog
Careers
Get Feedback
LOCKSS

Privacy Policy
Terms of Use
Accessibility
Media Inquiries
Contact Us

PLOS ONE