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Layers of Accessibility in Open Source Software

August 23, 2023

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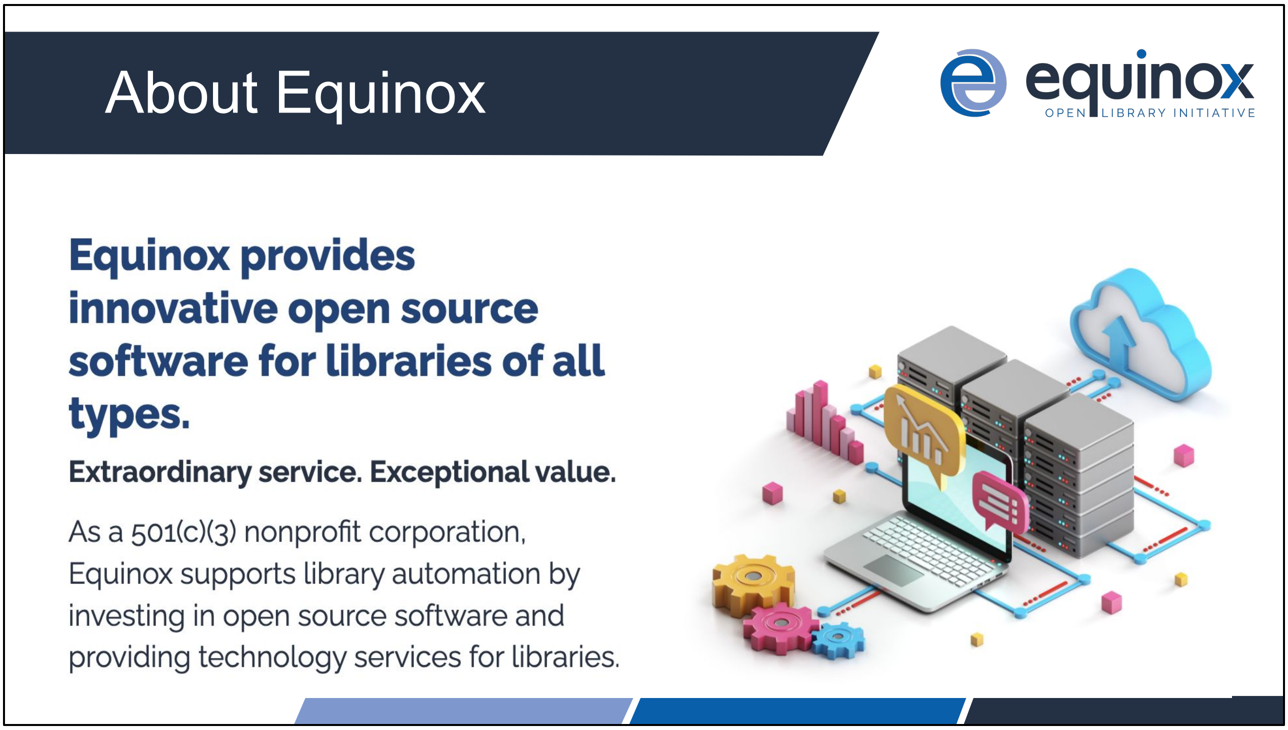

About Equinox

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Equinox provides innovative open source software for libraries of all types.

Extraordinary service. Exceptional value.

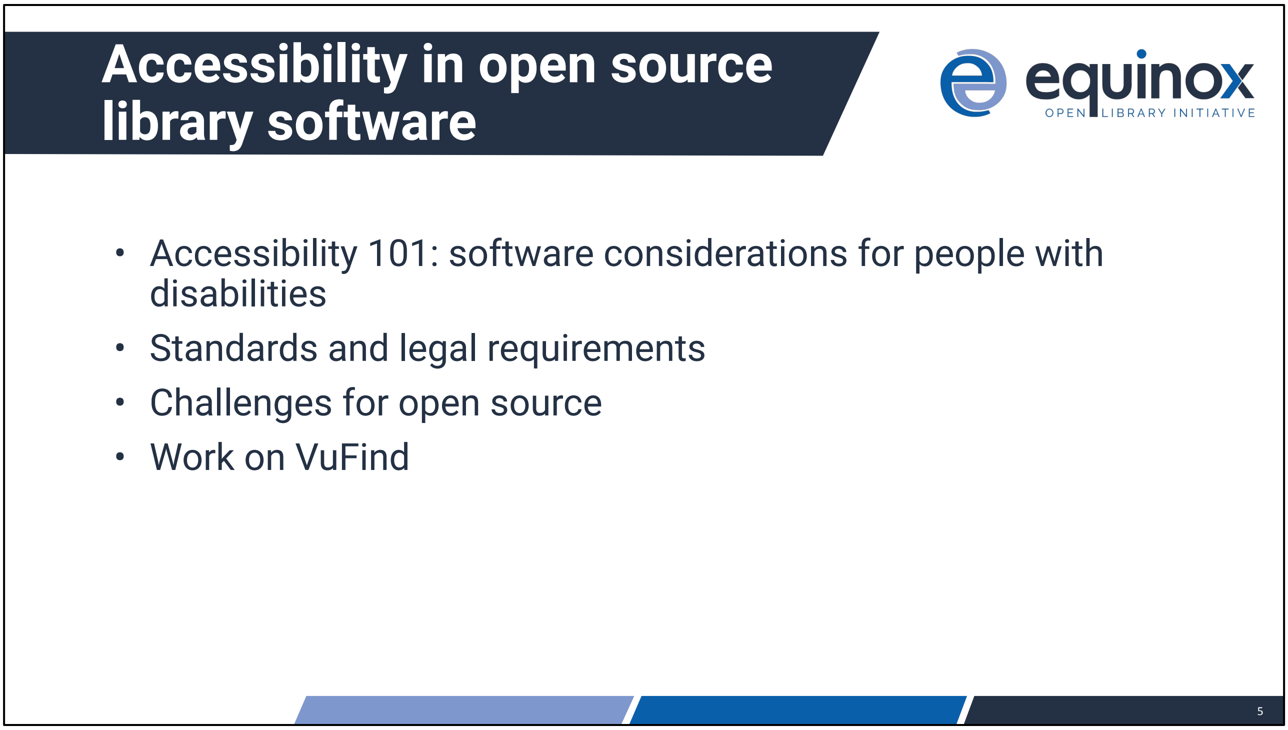
As a 501(c)(3) nonprofit corporation, Equinox supports library automation by investing in open source software and providing technology services for libraries.

Equinox Open Library Initiative is a non-profit organization that provides innovative open source software for libraries of all types.

Open Source Products

Equinox's roots are in supporting open source integrated library systems, like Evergreen and Koha. Equinox was founded by the original developers of the Evergreen ILS and over the years, our services have expanded to include support for a number of open source solutions, including VuFind.

We provide a full range of support services for libraries using open source software including: hosting and support, software development, implementation and data management, training, and consulting.



Accessibility in open source library software

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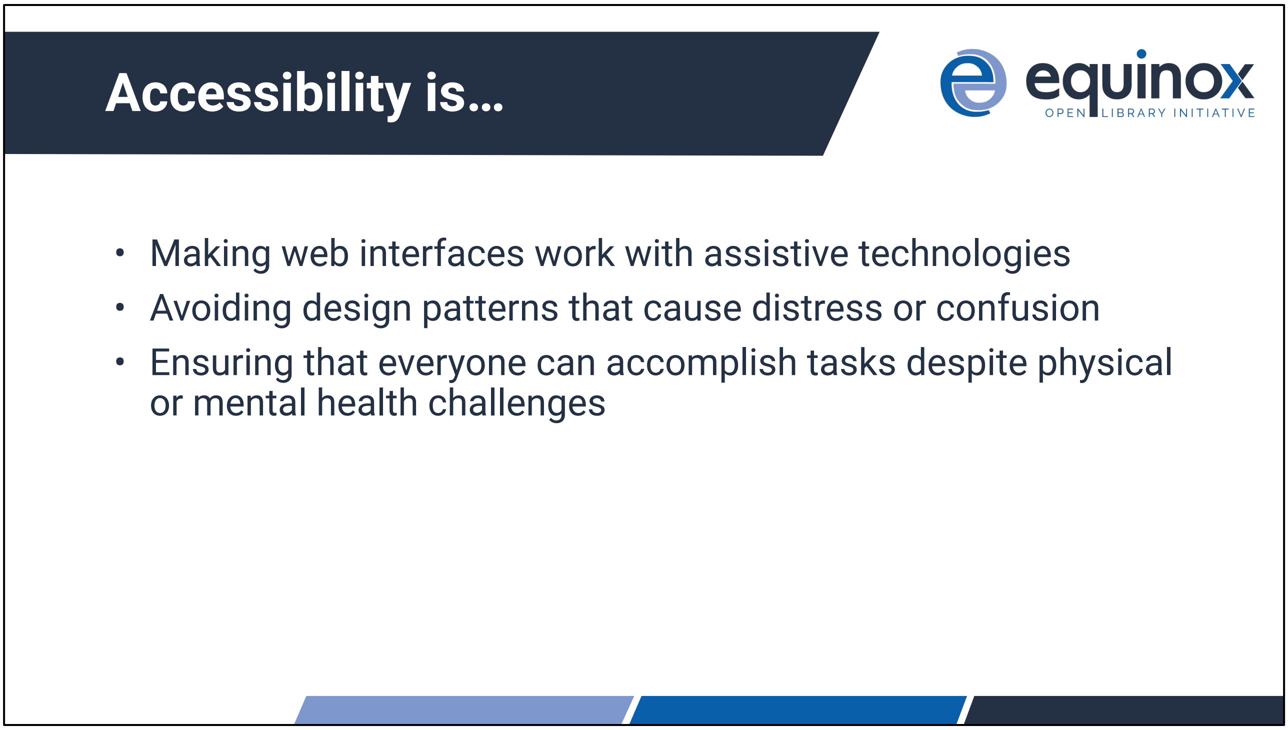
- Accessibility 101: software considerations for people with disabilities
- Standards and legal requirements
- Challenges for open source
- Work on VuFind

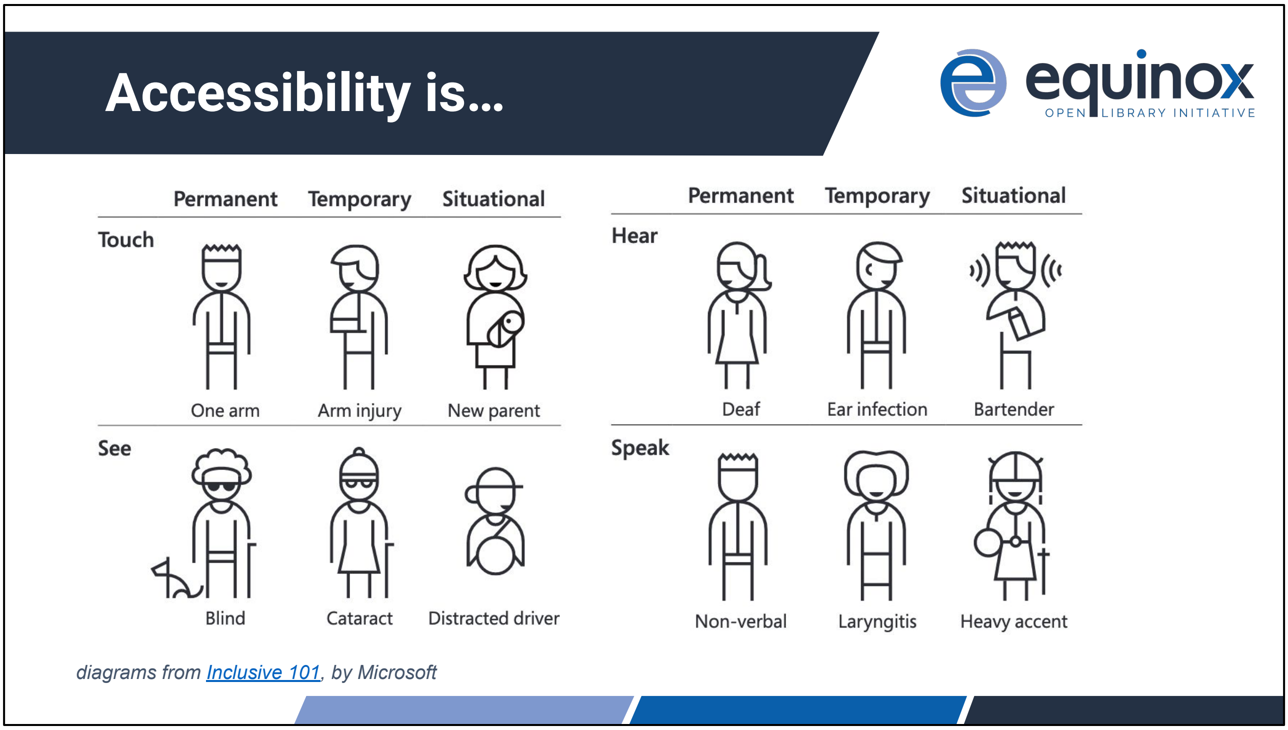
Here’s our agenda for today. I’m going to talk about accessibility *in general*: what it is, what kinds of problems people have when trying to get their assistive technology to work with web interfaces. I’ll talk about the standards that define how we should make software work for everyone, and what the legal requirements are for compliance with those standards. Open source communities can find it very challenging to work on accessibility, and I’ll talk about why that’s the case. And finally I’ll go over the recent work we’ve been doing at Equinox, and I’ll show off some work we’ve been doing on a theme VuFind and some contributions back to the default themes.



Accessibility is…

- Making web interfaces work with assistive technologies
- Avoiding design patterns that cause distress or confusion
- Ensuring that everyone can accomplish tasks despite physical or mental health challenges

Accessibility is often invisible; it has to do with making the code work right with lots of different assistive devices, which I'll describe more in a minute. But it also involves visual designs that avoid certain pitfalls, and I'll talk about those as well. The overall goal here is to make sure everyone can accomplish their tasks, whatever those are–patrons putting a book on hold, staff members updating settings in our software.



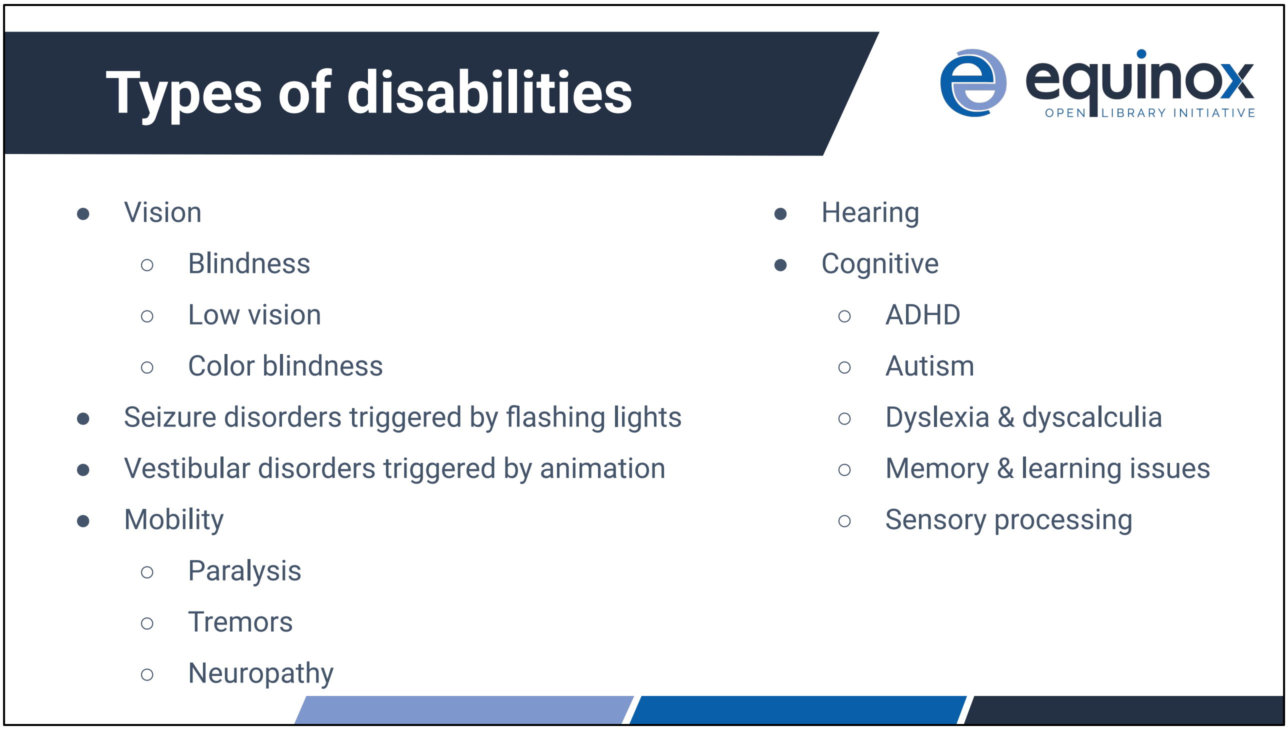
Accessibility is…

	Permanent	Temporary	Situational
Touch	One arm	Arm injury	New parent
See	Blind	Cataract	Distracted driver

	Permanent	Temporary	Situational
Hear	Deaf	Ear infection	Bartender
Speak	Non-verbal	Laryngitis	Heavy accent

diagrams from Inclusive 101, by Microsoft

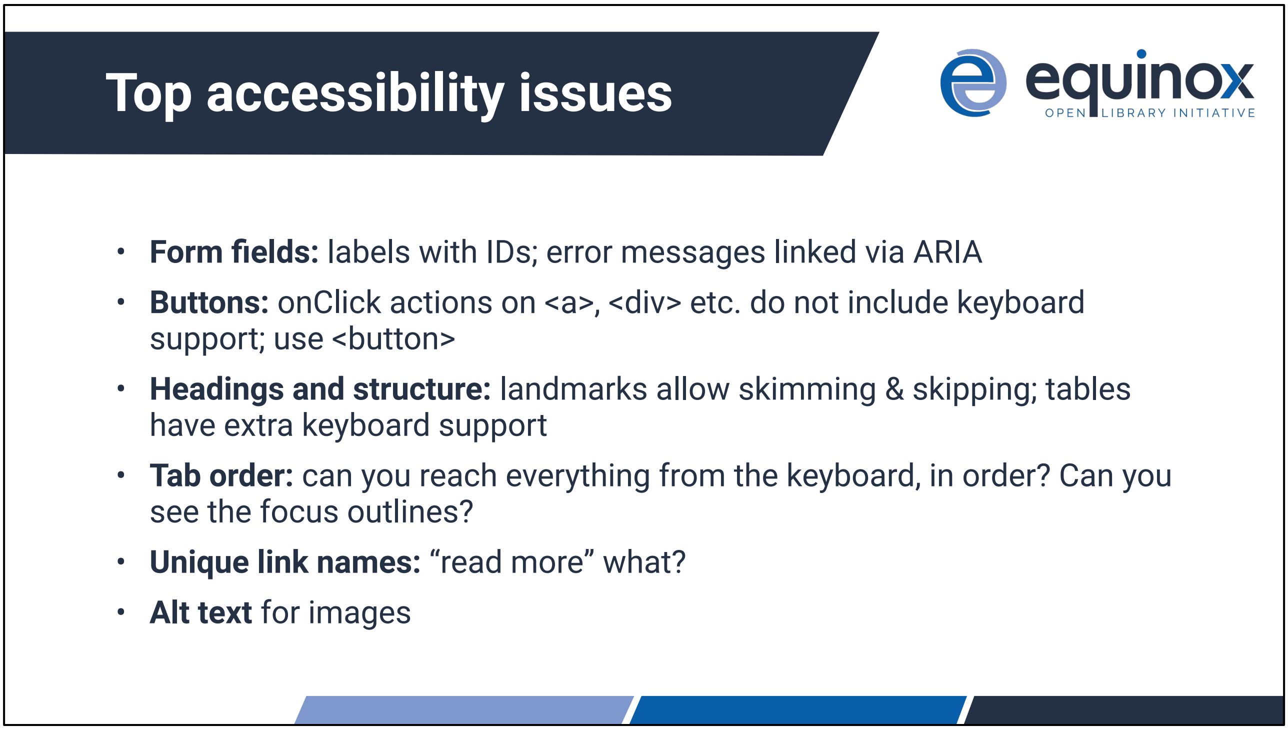
We tend to think of disabilities in terms of permanent, lifelong conditions, but in reality we all have our abilities impacted by temporary life events or environmental situations. If you don’t currently have a physical or cognitive impairment, you still want to know that your work environment will be supportive if something happens to you in the future.



Types of disabilities

- Vision
  - Blindness
  - Low vision
  - Color blindness
- Seizure disorders triggered by flashing lights
- Vestibular disorders triggered by animation
- Mobility
  - Paralysis
  - Tremors
  - Neuropathy
- Hearing
- Cognitive
  - ADHD
  - Autism
  - Dyslexia & dyscalculia
  - Memory & learning issues
  - Sensory processing

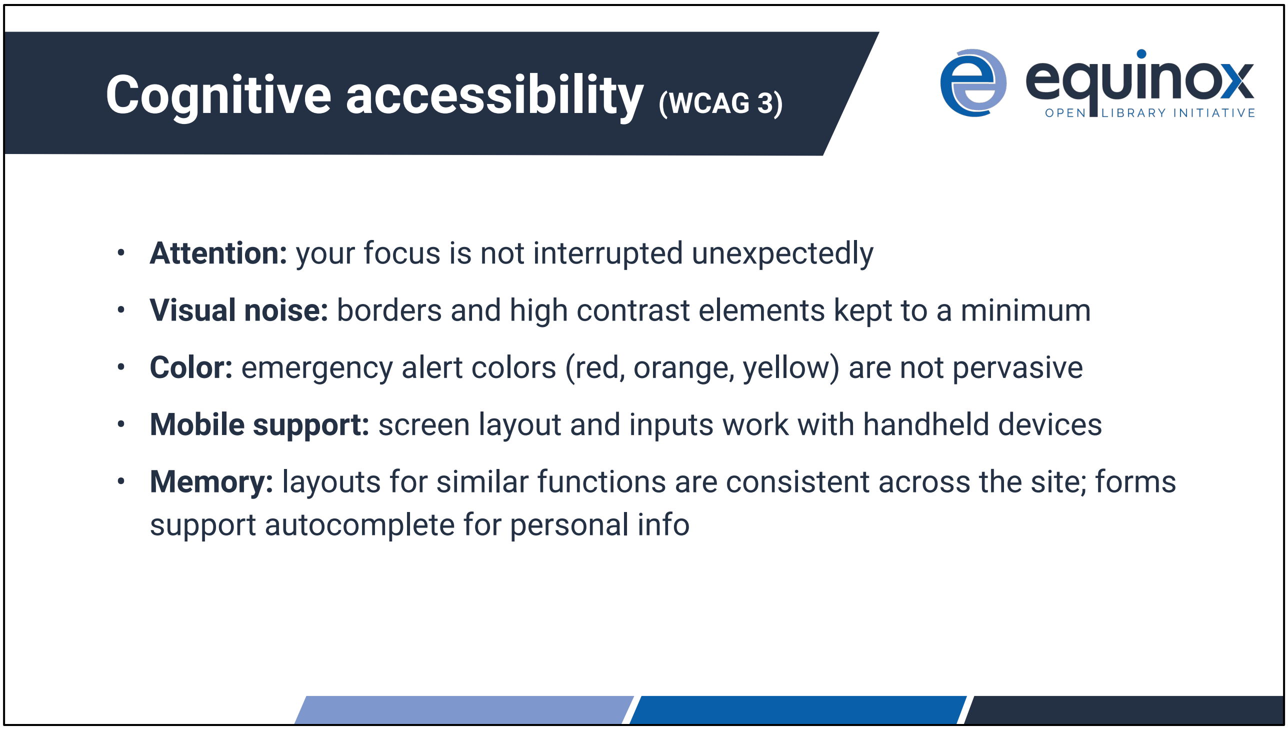
Obviously there are many types of disabilities, but these are the major categories that we think about in user interface design. Visual disabilities and physical conditions with visual triggers are a huge part of accessibility work, along with mobility impairments that might make it difficult to use a mouse or keyboard–this might be paralysis, or tremors that make your movements unpredictable. Cognitive accessibility is a relatively new addition to the field, and this is exciting because a lot of vague best practices will have more definitive and enforceable guidelines–and this group includes a huge number of people.



Top accessibility issues

- **Form fields:** labels with IDs; error messages linked via ARIA
- **Buttons:** onClick actions on <a>, <div> etc. do not include keyboard support; use <button>
- **Headings and structure:** landmarks allow skimming & skipping; tables have extra keyboard support
- **Tab order:** can you reach everything from the keyboard, in order? Can you see the focus outlines?
- **Unique link names:** “read more” what?
- **Alt text** for images

I’ve talked a little about mobility impairments. For this group, we make sure you can use the keyboard to move around and activate things on the page. We make sure that the item you’re focused on has a visible outline, so you can tell where you are. We make sure to support all kinds of pointers, including your fingers on a touch screen, and not just the mouse. We make hit targets bigger for links, buttons, form fields, that kind of thing. And lastly we try to make sure not to take focus away from you with notifications and pop-ups.



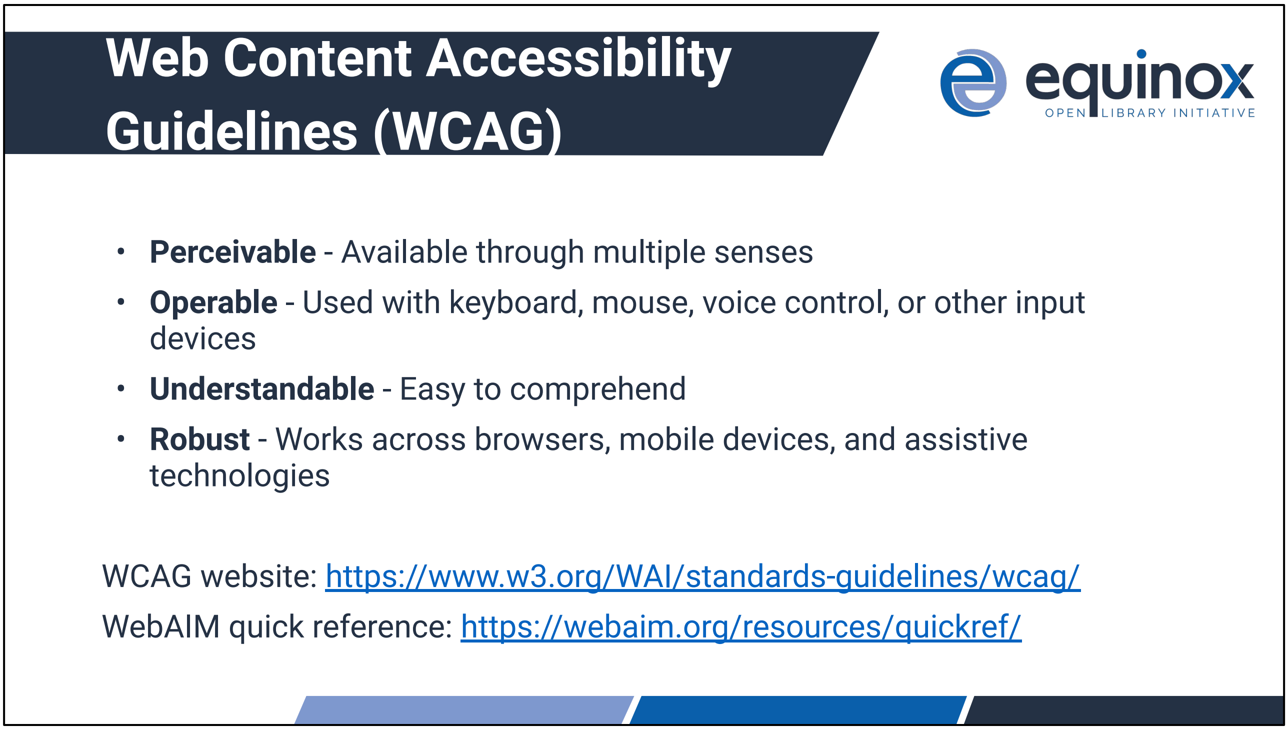
Cognitive accessibility (WCAG 3)

- **Attention:** your focus is not interrupted unexpectedly
- **Visual noise:** borders and high contrast elements kept to a minimum
- **Color:** emergency alert colors (red, orange, yellow) are not pervasive
- **Mobile support:** screen layout and inputs work with handheld devices
- **Memory:** layouts for similar functions are consistent across the site; forms support autocomplete for personal info

Cognitive accessibility is a very wide-ranging category, and this is relatively new in the field–the guidelines for it aren't even out yet. You may notice that while some of these areas overlap–interruptions are bad for people with ADHD and memory issues as well as those using switch devices and keyboard controls–others are in conflict with some things I mentioned earlier. Color contrast is one example…

Accessibility Laws

Fixing these things is becoming a little more urgent thanks to some changes in accessibility laws.



Web Content Accessibility Guidelines (WCAG)

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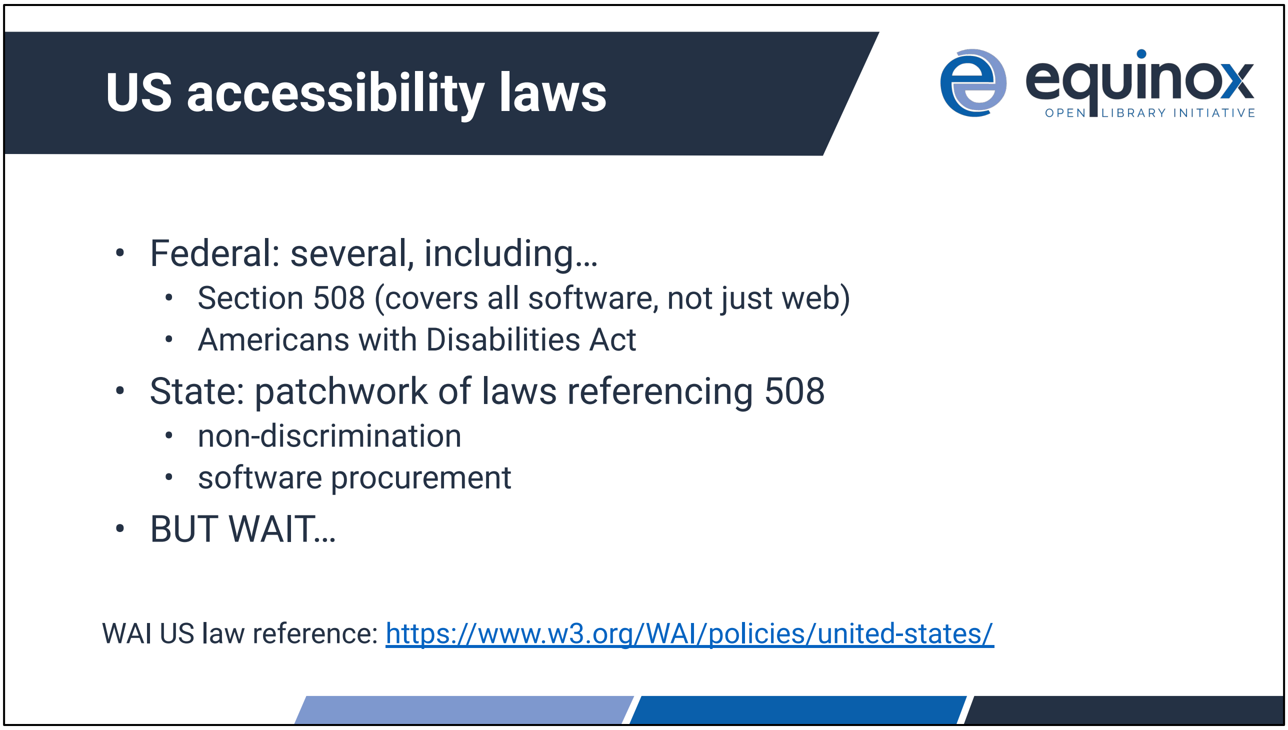
- **Perceivable** - Available through multiple senses
- **Operable** - Used with keyboard, mouse, voice control, or other input devices
- **Understandable** - Easy to comprehend
- **Robust** - Works across browsers, mobile devices, and assistive technologies

WCAG website: https://www.w3.org/WAI/standards-guidelines/wcag/

WebAIM quick reference: https://webaim.org/resources/quickref/

The good news is that laws everywhere are all based on the Web Content Accessibility Guidelines, or WCAG. These are the rules that govern web interfaces. Every state, provincial, or national law on web accessibility, no matter where you are in the world, is based on this set of guidelines or a translation of it. Some of them specify a version number, but it’s best to just use the most recent release, since they’re backward compatible, and those new rules are there for a reason. These guidelines are based on four principles, listed here. Web interfaces have to be perceivable: things can’t be available using only one sense; you have to be able to perceive them in multiple ways. Operable: you have to be able to operate it in multiple ways, using multiple types of input devices, which is the robust principle. And it has to be designed and written in a way that you can understand. I’ve linked the WCAG standard itself here, but it’s kind of a lot, so if you want a shorter checklist of the basic principles and requirements, the WebAIM quick reference is very helpful, and there are other checklists and guides on their site as well.



US accessibility laws

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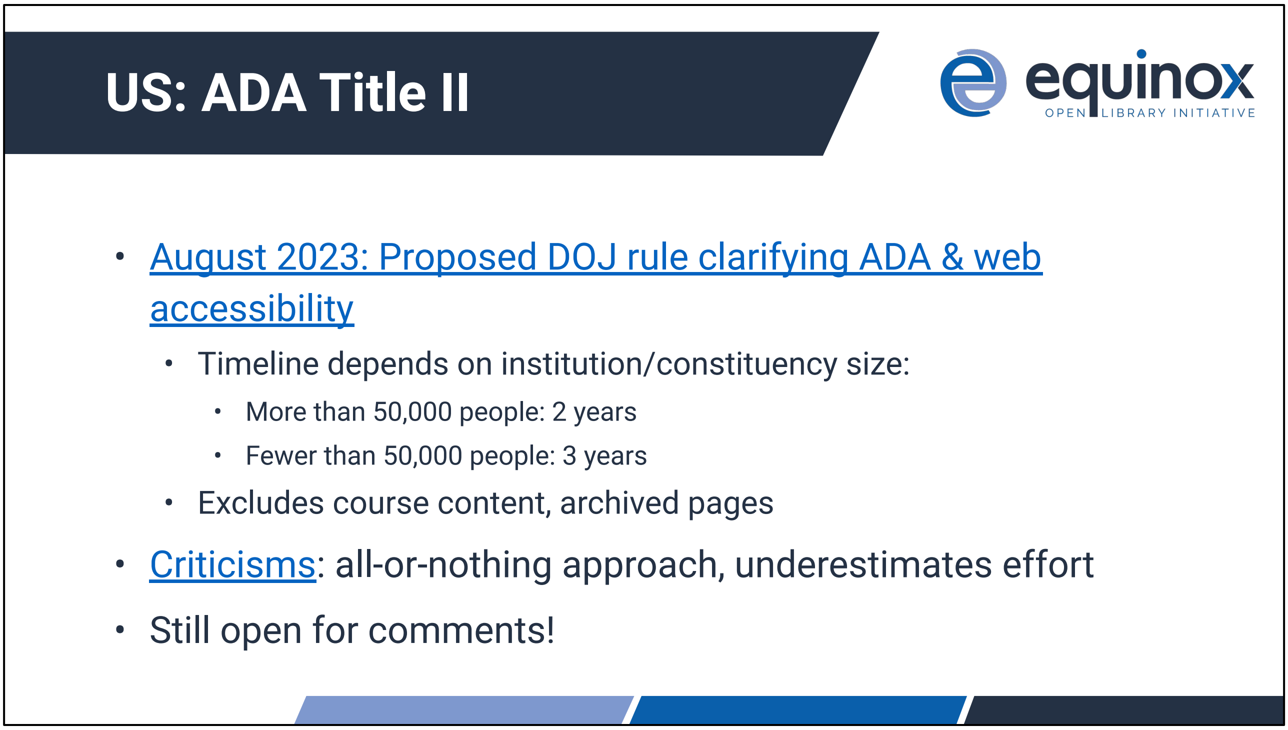
- Federal: several, including…
  - Section 508 (covers all software, not just web)
  - Americans with Disabilities Act
- State: patchwork of laws referencing 508
  - non-discrimination
  - software procurement
- BUT WAIT…

WAI US law reference: https://www.w3.org/WAI/policies/united-states/

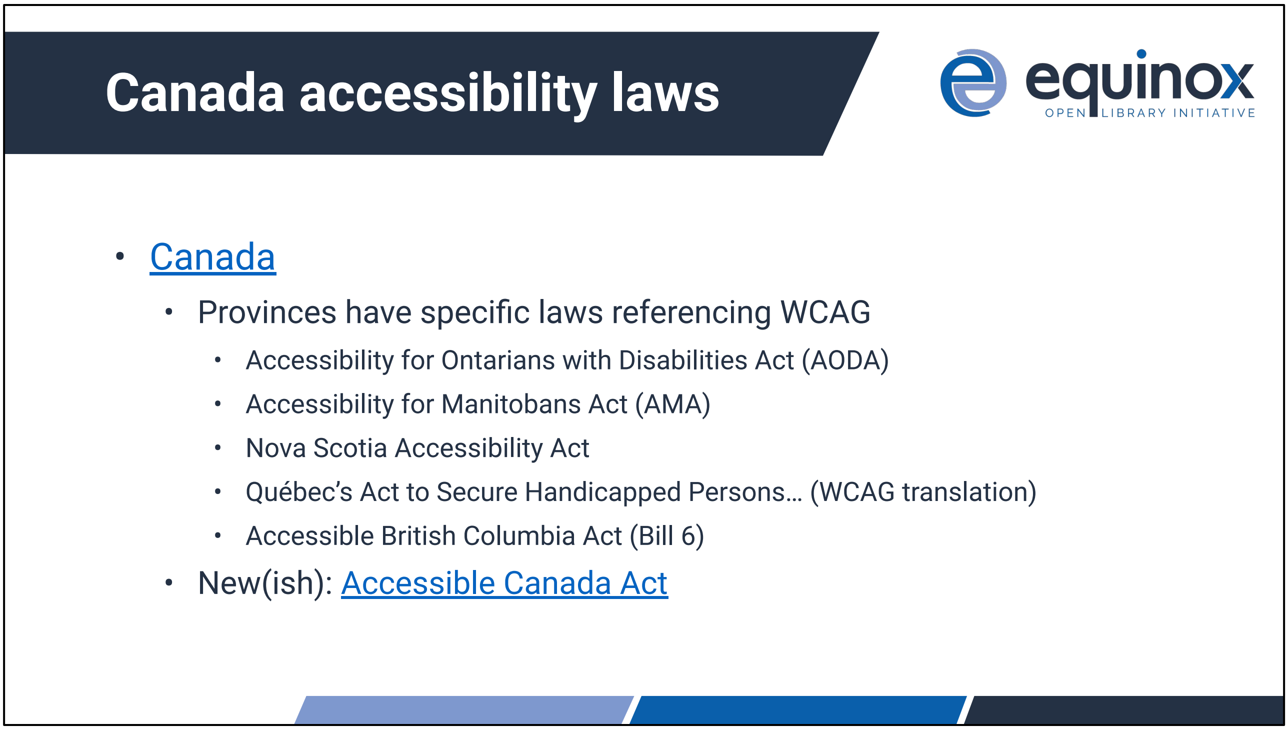
Web accessibility laws are kind of a mess. In the US, we have Section 508, a federal standard that includes WCAG as well as some other types of digital access besides the web, and a state-by-state patchwork of laws that reference either Section 508 or WCAG itself. In many states these are procurement guidelines–software purchased by a state-funded organization must meet WCAG standards, for example. In other places, web accessibility is lumped into non-discrimination laws for people with disabilities, which have been kind of nebulous–but this is changing!



US: ADA Title II

- August 2023: Proposed DOJ rule clarifying ADA & web accessibility
  - Timeline depends on institution/constituency size:
    - More than 50,000 people: 2 years
    - Fewer than 50,000 people: 3 years
  - Excludes course content, archived pages
- Criticisms: all-or-nothing approach, underestimates effort
- Still open for comments!

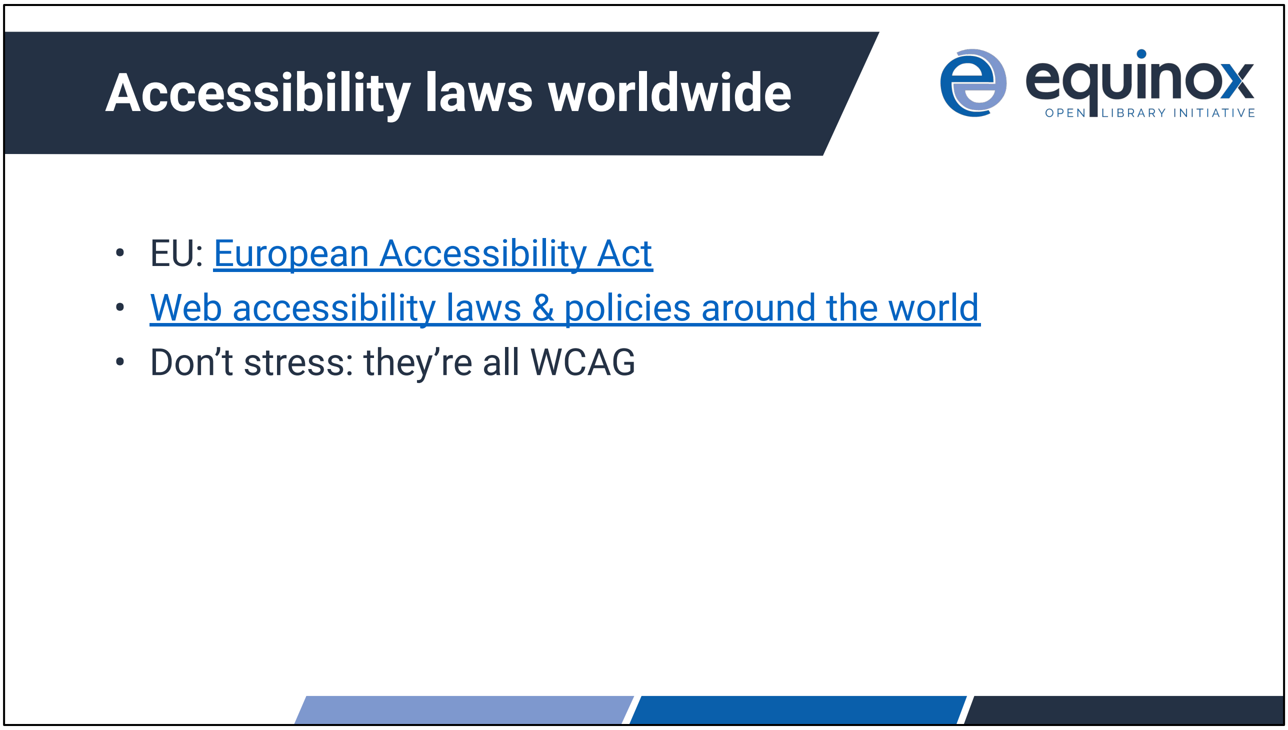
The Department of Justice has posted a request for public comment on a proposed clarification of the ADA that spells out our accessibility requirements and sets a deadline for compliance. This countdown doesn’t start until the comments have been collected and the final rule is published; there may be some changes.



Canada accessibility laws

- Canada
  - Provinces have specific laws referencing WCAG
    - Accessibility for Ontarians with Disabilities Act (AODA)
    - Accessibility for Manitobans Act (AMA)
    - Nova Scotia Accessibility Act
    - Québec’s Act to Secure Handicapped Persons… (WCAG translation)
    - Accessible British Columbia Act (Bill 6)
  - New(ish): Accessible Canada Act

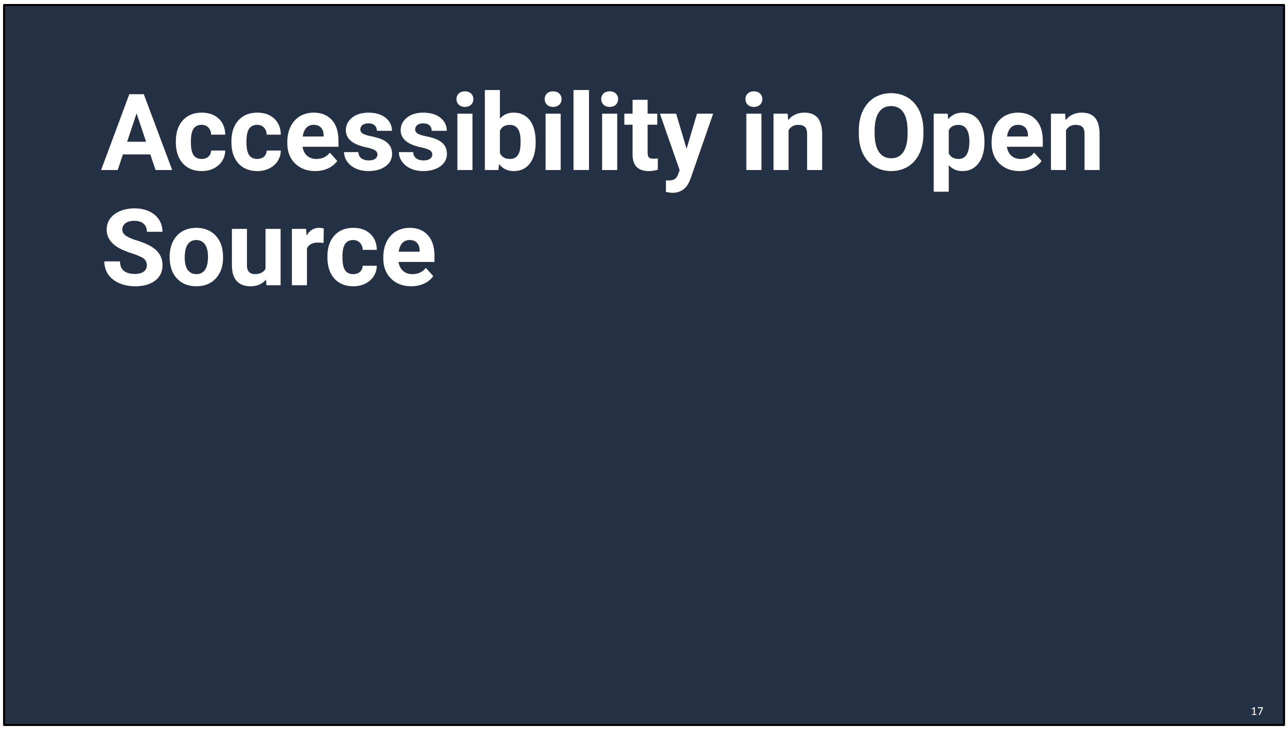
In Canada, there are also specific laws for each province, and Québec has its own translation of WCAG.



Accessibility laws worldwide

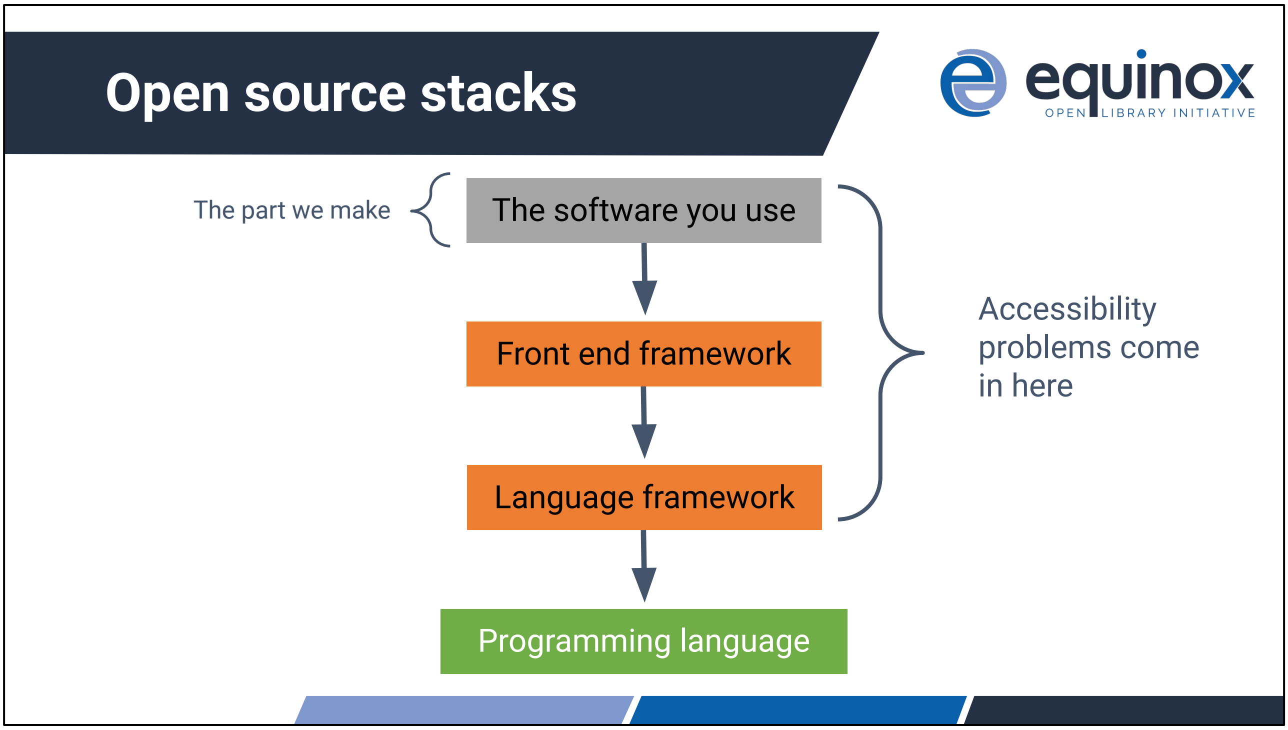
- EU: European Accessibility Act
- Web accessibility laws & policies around the world
- Don’t stress: they’re all WCAG

Elsewhere around the world, accessibility is usually covered under human rights laws. Fortunately, all roads lead back to WCAG, so there’s only one standard developers have to keep up with.



Accessibility in Open Source

Even though there’s just one standard, it’s still very hard for open source teams to keep up with accessibility. Why? Well…



Open source stacks

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The part we make

The software you use

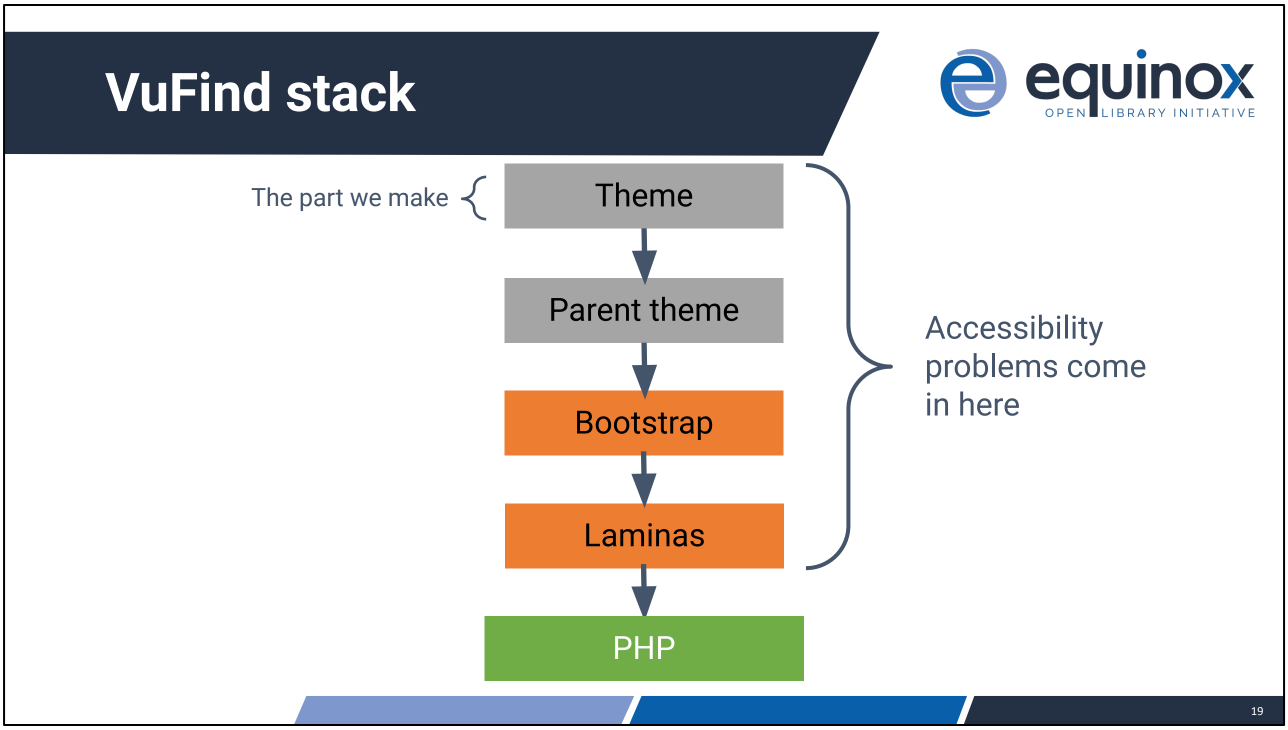
Front end framework

Language framework

Programming language

Accessibility problems come in here

Software developers don’t work in isolation; we depend on work that’s already been done by others. The programming language itself doesn’t create accessibility problems, usually, but any framework or user interface library added on top of that can come with its own problems. And this can be really hard to fix because we’re not in control of those other underlying open source projects.



VuFind stack

The part we make

Theme

Parent theme

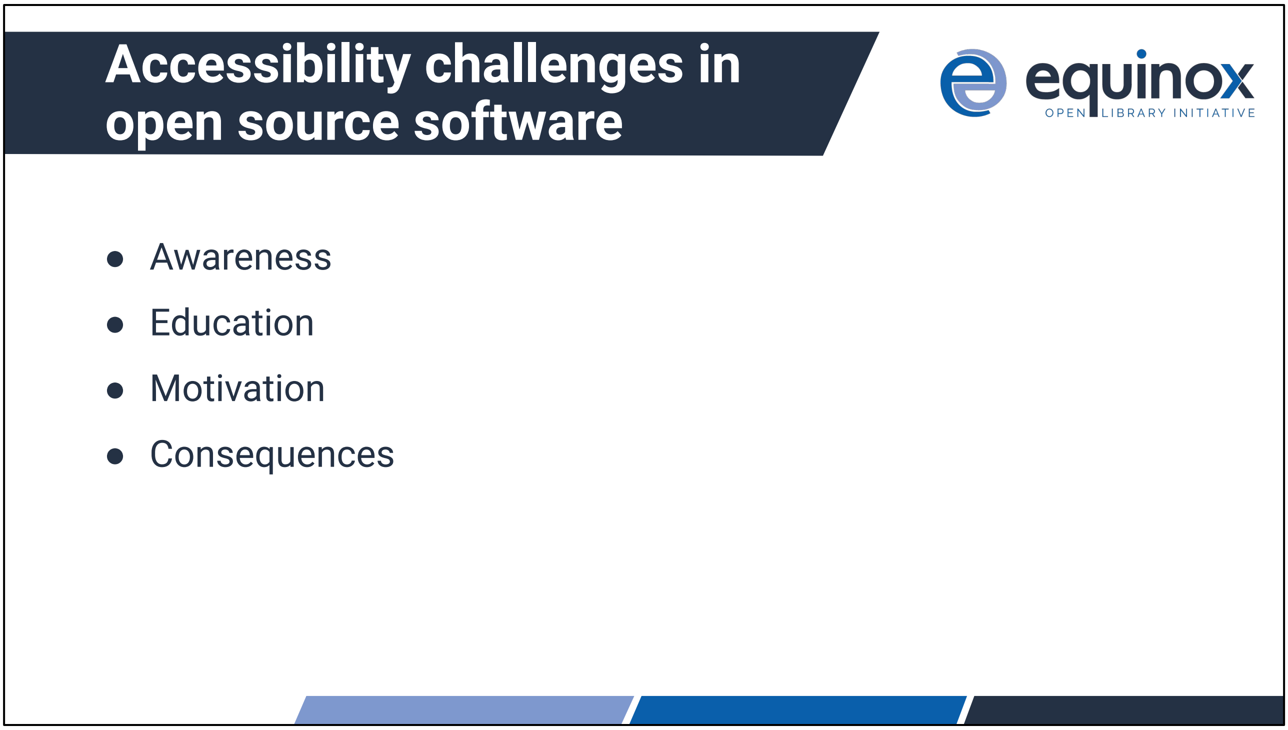
Bootstrap

Laminas

PHP

Accessibility problems come in here

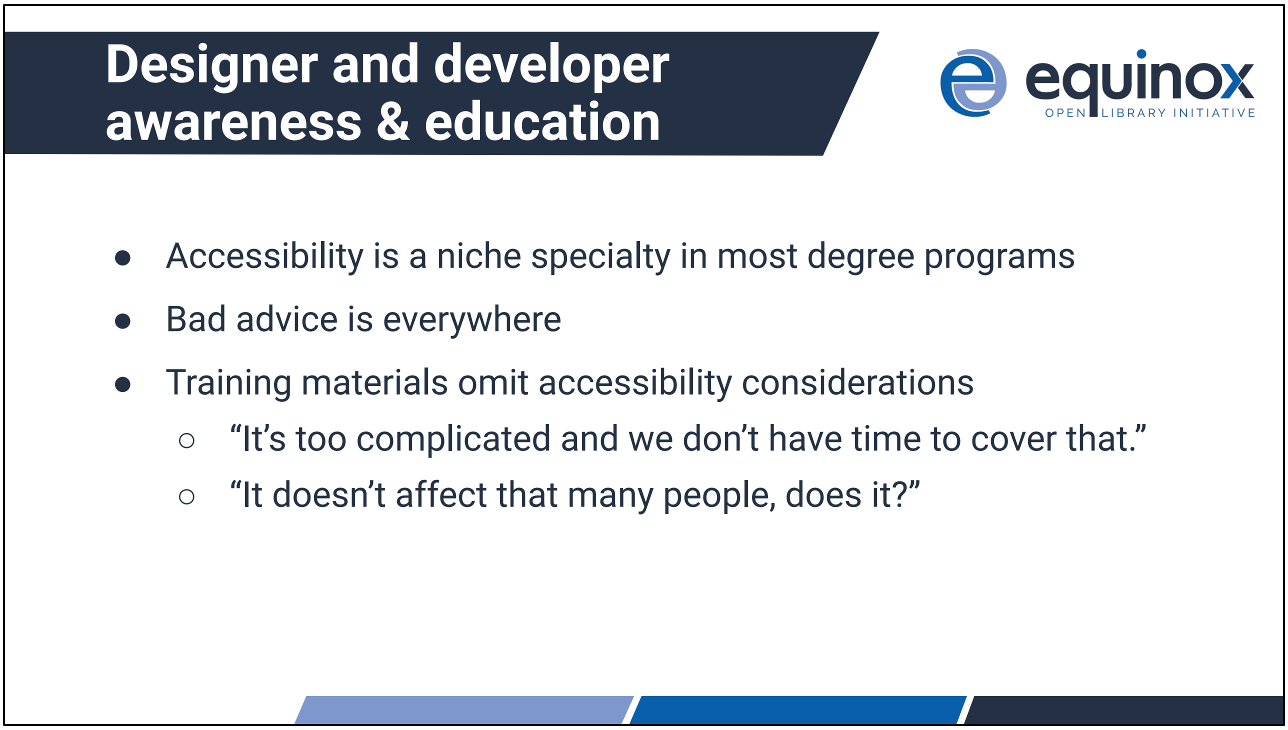
In VuFind, a lot of the accessibility issues come from Bootstrap–version 3 has a lot of issues, even with the PayPal accessibility library added–and in between, there's a parent theme developed by the VuFind team that the rest of us build our themes on top of. So there are several isolated teams at work here, and any of them can introduce accessibility problems that filter into our interfaces. VuFind is not at all unique in this! All open source teams have this same problem.



Accessibility challenges in open source software

- Awareness
- Education
- Motivation
- Consequences

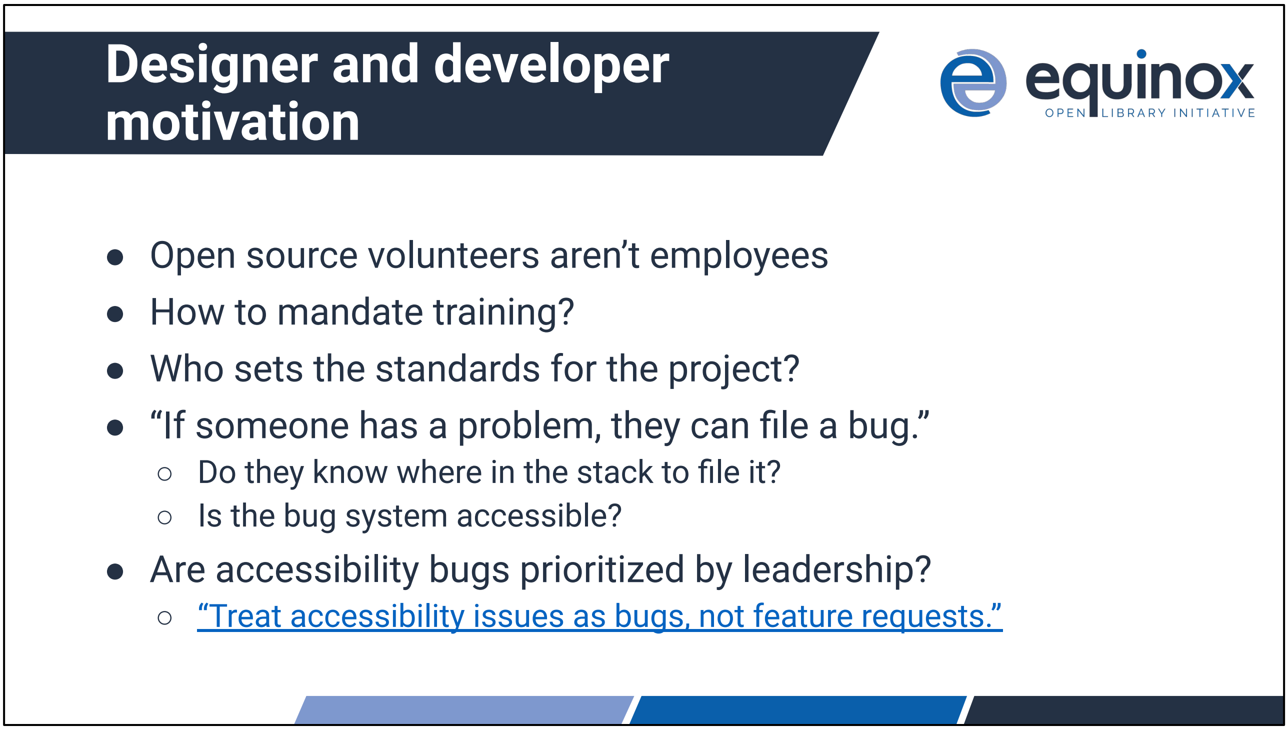
There are several challenges in getting open source designers and developers up to speed on accessibility.



Designer and developer awareness & education

- Accessibility is a niche specialty in most degree programs
- Bad advice is everywhere
- Training materials omit accessibility considerations
  - “It’s too complicated and we don’t have time to cover that.”
  - “It doesn’t affect that many people, does it?”

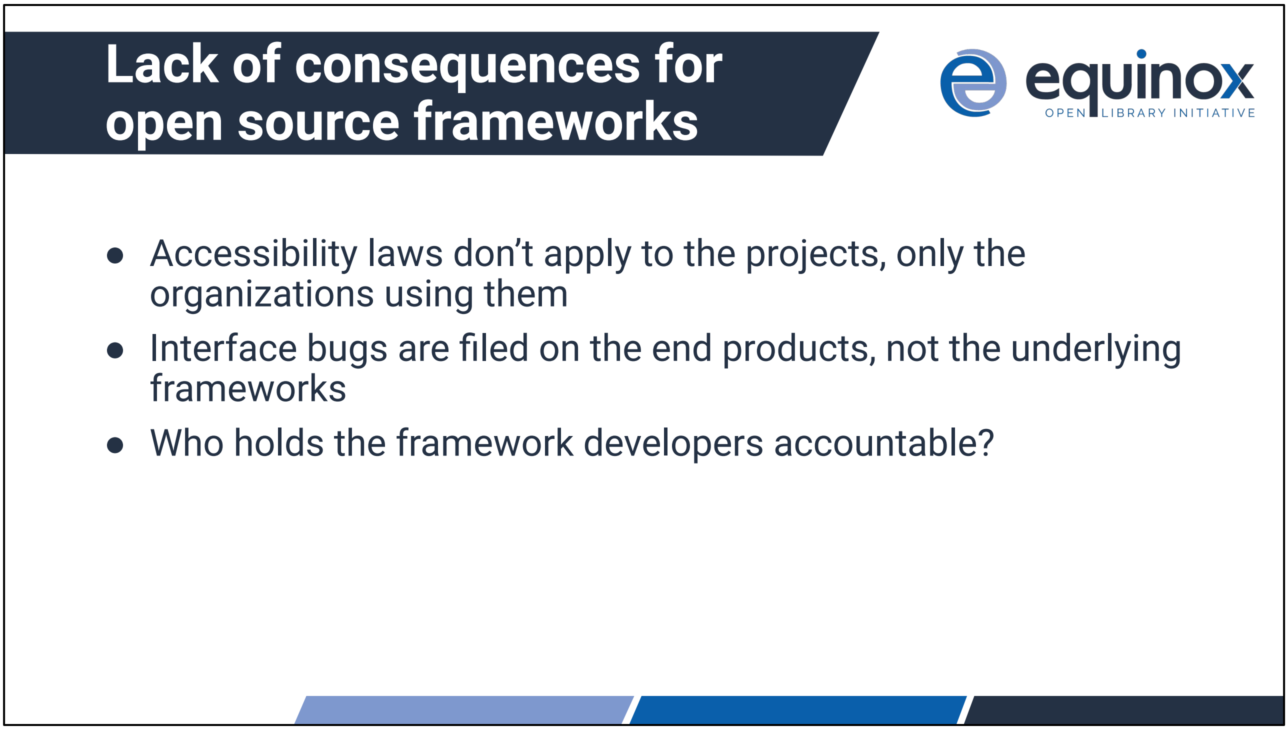
It starts with awareness and education. Most design and development degree programs and certificates don’t treat accessibility as a baseline requirement; it’s kind of a specialty field. The demos most people learn from were not designed with accessibility in mind, so people are usually working from bad examples.



Designer and developer motivation

- Open source volunteers aren't employees
- How to mandate training?
- Who sets the standards for the project?
- "If someone has a problem, they can file a bug."
  - Do they know where in the stack to file it?
  - Is the bug system accessible?
- Are accessibility bugs prioritized by leadership?
  - "Treat accessibility issues as bugs, not feature requests."

Open source developers are mostly volunteers. We can't really mandate that everybody go through an accessibility boot camp before they start contributing. And if the project leadership hasn't set accessibility standards–and remember that most of them aren't educated in this area!--then it's hard to get everyone in line. Damien and the rest of the VuFind team have been really great about prioritizing accessibility bugs; a lot of projects treat them like feature requests. GitHub recently published a great article on this aspect of project leadership.



Lack of consequences for open source frameworks

- Accessibility laws don’t apply to the projects, only the organizations using them
- Interface bugs are filed on the end products, not the underlying frameworks
- Who holds the framework developers accountable?

A lot of VuFind’s accessibility issues didn’t originate with the VuFind team! I get kind of angry about the state of things in big frameworks like React and Material Design and Bootstrap, because these projects came from big companies–really they were small projects spearheaded by a handful of people on one team, and then the companies pushed to get them adopted more widely–but they didn’t stop to test the code first, and there are no consequences for them, only for us, as consumers of those frameworks who are responsible to our end users for the overall accessibility. We need to be a lot louder in the larger open source communities and hold the framework developers accountable for the accessibility problems they’re passing down to us.

Accessibility in Bootstrap

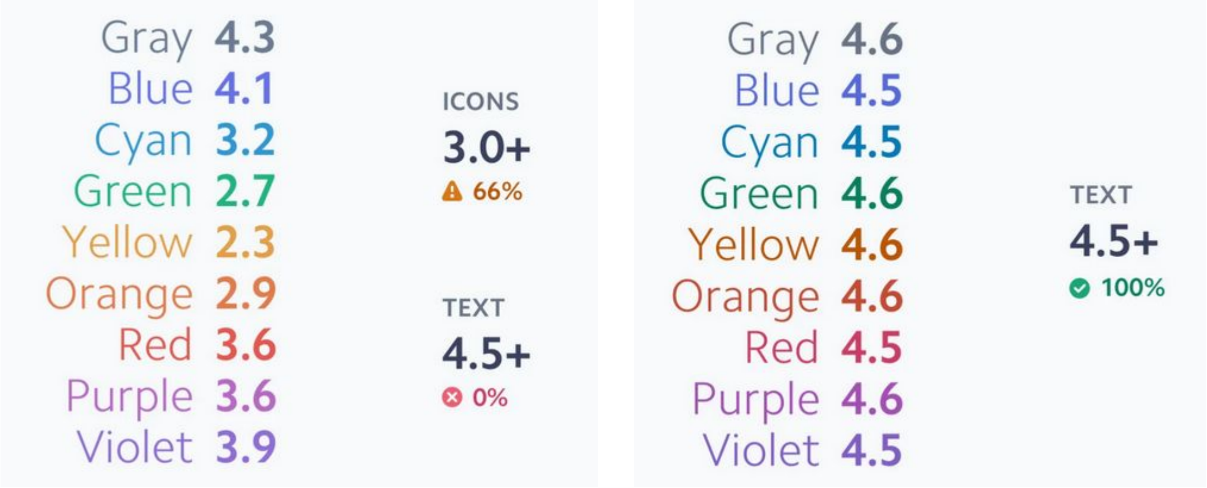
So let’s dive into some Bootstrap issues, since those affect VuFind, along with a lot of other software out in the world.

Bootstrap issues

- Color contrast
- Mouse-only interactive toggles
- Form examples without labels
- Incorrect ARIA roles

“Home pages in the sample that utilize the popular Bootstrap framework had 9.6 more accessibility errors on average…”
– WebAIM Million 2023 report

Bootstrap text colors



Gray	4.3
Blue	4.1
Cyan	3.2
Green	2.7
Yellow	2.3
Orange	2.9
Red	3.6
Purple	3.6
Violet	3.9

ICONS
3.0+
⚠ 66%

TEXT
4.5+
⊗ 0%

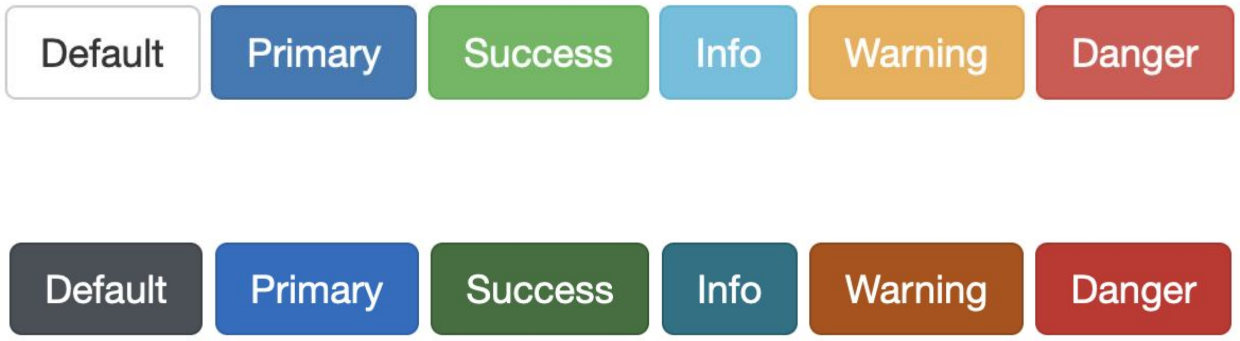
Gray	4.6
Blue	4.5
Cyan	4.5
Green	4.6
Yellow	4.6
Orange	4.6
Red	4.5
Purple	4.6
Violet	4.5

TEXT
4.5+
✓ 100%

From Stripe.com

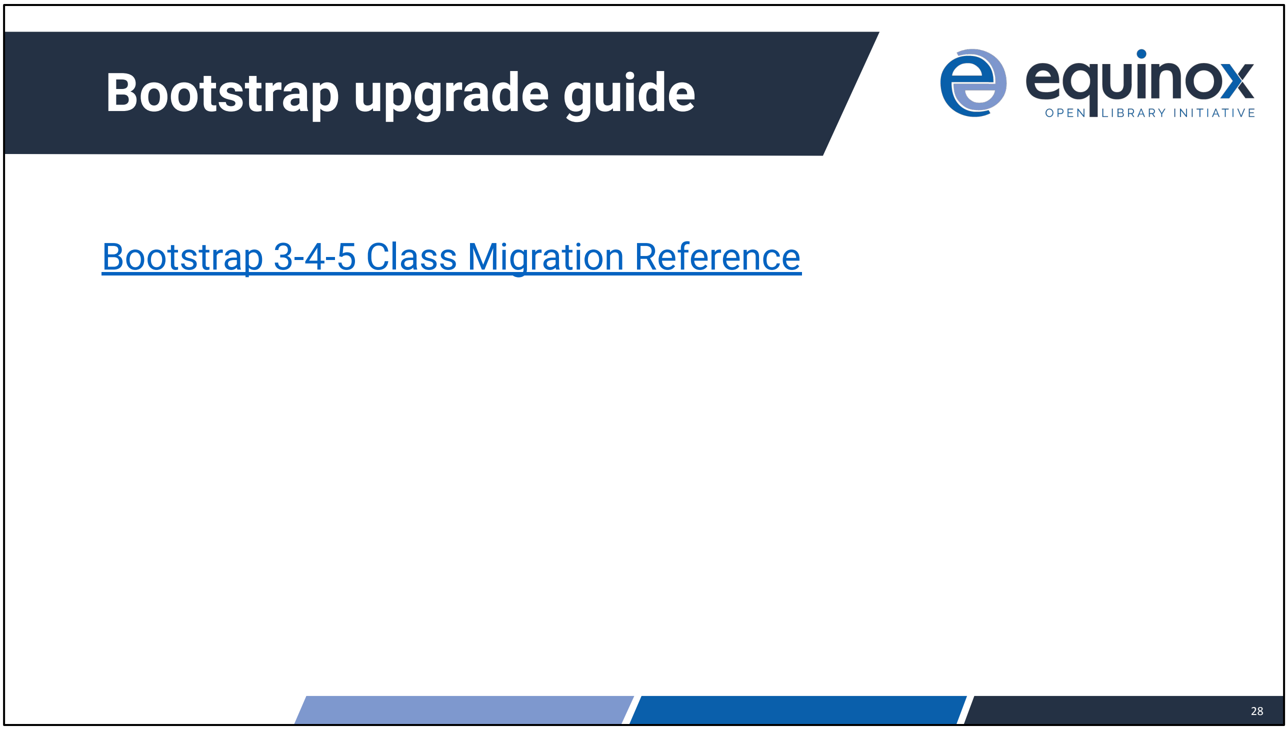
The color scheme wasn’t designed with contrast requirements in mind. None of the default colors in versions 3 or 4 meet the standard, and if you darken them until they do, you start to lose distinctions between them, especially the red-orange-yellow spectrum.

Bootstrap button colors



From *[Stripe.com]*

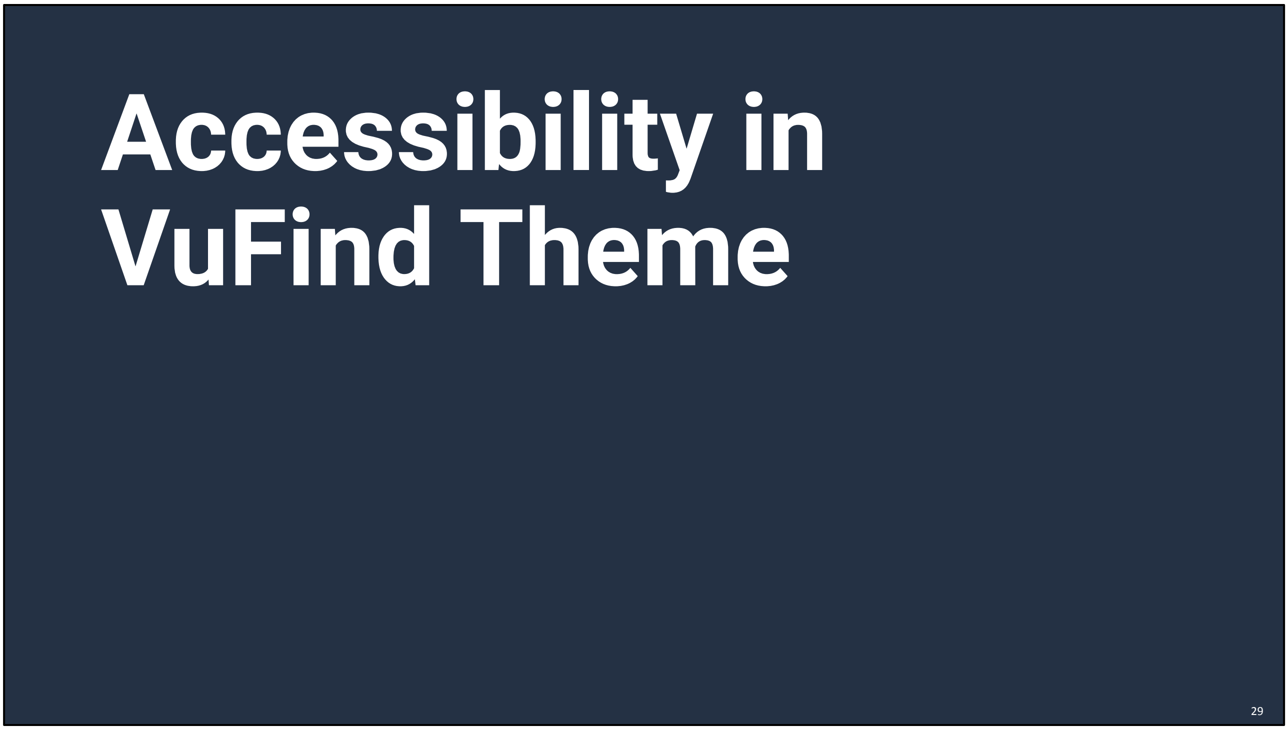
Yellow doesn’t even look like yellow anymore, and the overall feel is much darker and less cheerful. The colors are just one very visible example of how Bootstrap gets accessibility wrong. Now take *that much wrongness*, and apply it to the less visible problems like form labels and ARIA, and you get an idea of the scale of the problems in this framework.



Bootstrap upgrade guide

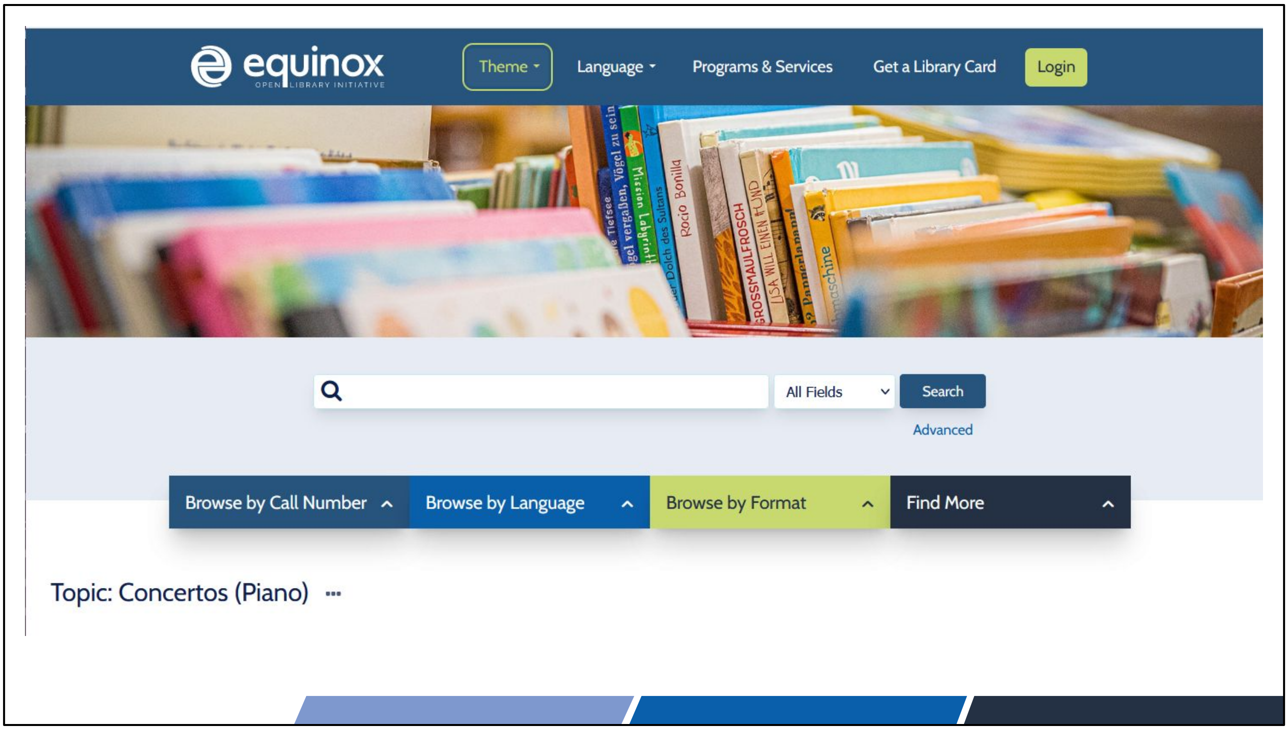
Bootstrap 3-4-5 Class Migration Reference

It is getting better, though! Version 5.3 has a lot of great accessibility improvements. VuFind's default theme is based on Bootstrap 3. I made a big spreadsheet of the class changes from versions 3, 4, and 5. If you are the right person to take on the project of upgrading, this reference is for you!

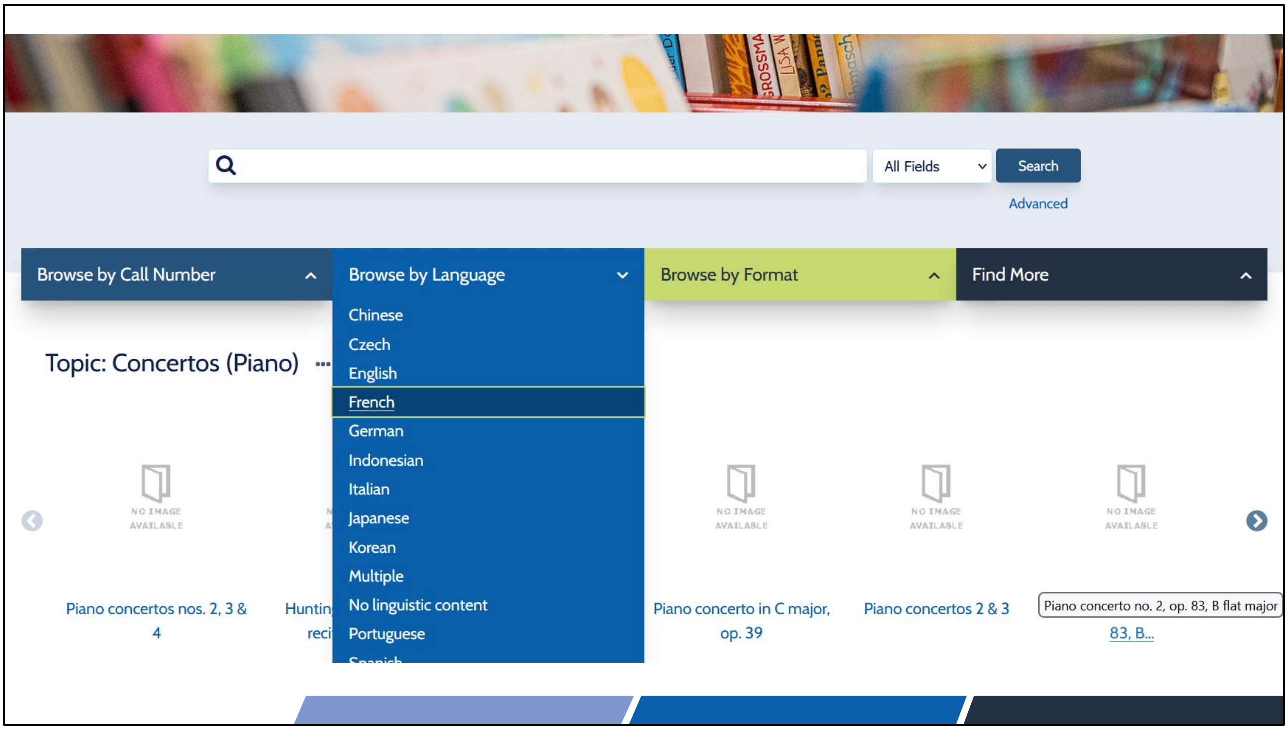


Accessibility in VuFind Theme

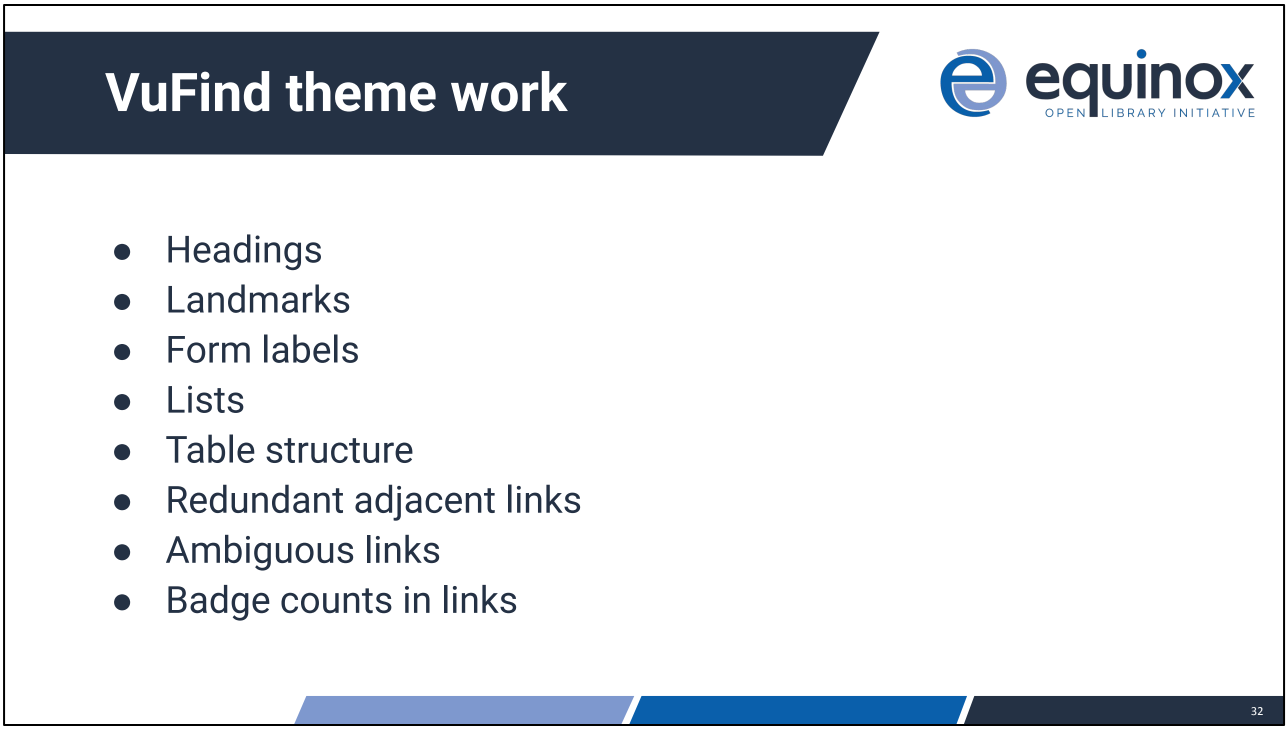
Earlier this year, Equinox released a new VuFind theme..



A lot of the changes I made from the default theme had to do with keyboard controls for dropdown menus and carousels. Here you can see that one of the dropdown menus next to our logo is highlighted after I've tabbed over to it using my keyboard. These menus and the Browse by…. sections below didn't work with keyboards because of a Bootstrap bug, and this version of Bootstrap also turned off the highlight borders for objects that are focused using the keyboard, so you couldn't tell where you were on the page as you moved around.



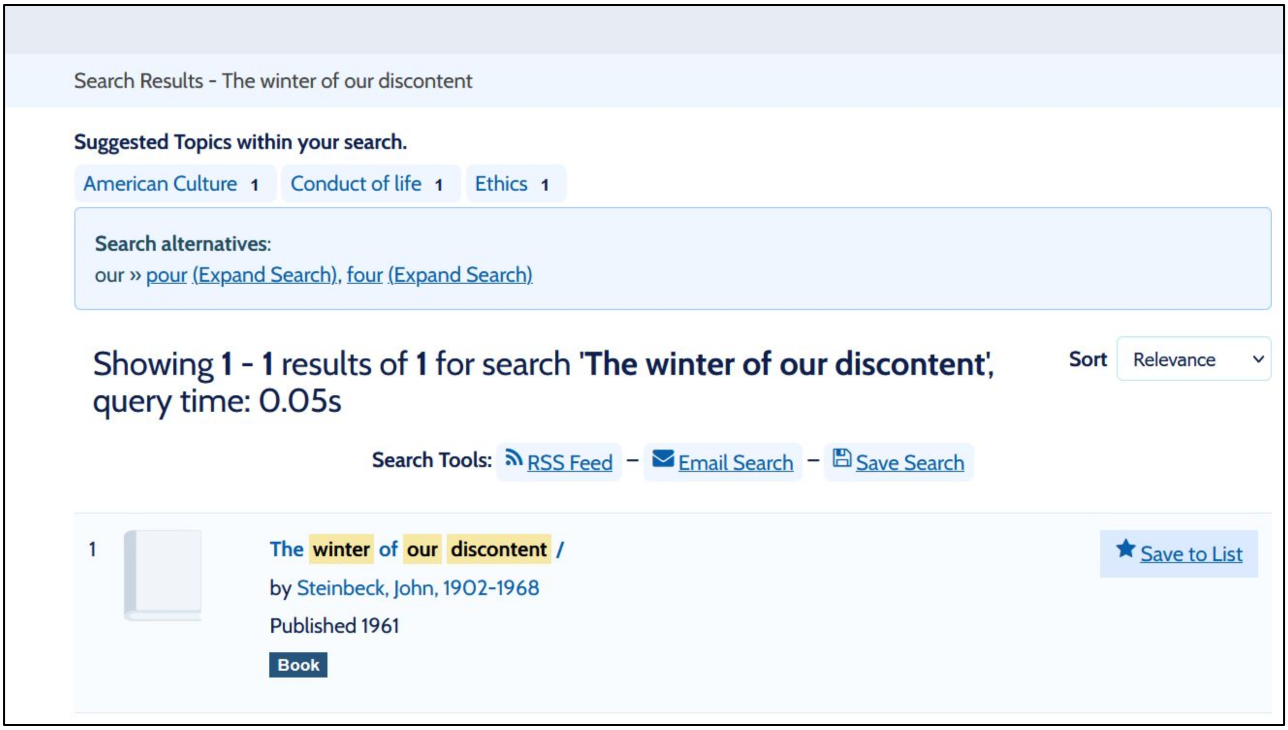
Any library interface has a lot going on, so having visible focus outlines is really important so that our keyboard users can tell where they are at all times.



VuFind theme work

- Headings
- Landmarks
- Form labels
- Lists
- Table structure
- Redundant adjacent links
- Ambiguous links
- Badge counts in links

There was a lot of other invisible work here on the underlying HTML structure of the search results and the account management screens, like saved searches and fines–making sure tables have headings and lists are marked up as lists. If I found myself replacing a default theme file only to fix accessibility problems, I’ve been submitting those issues to the VuFind repository and talking with the development team about the best way to resolve them.



Search Results - The winter of our discontent

Suggested Topics within your search.

American Culture 1 Conduct of life 1 Ethics 1

Search alternatives:
our » pour (Expand Search), four (Expand Search)

Showing **1 - 1** results of **1** for search **'The winter of our discontent'**, query time: 0.05s

Sort Relevance

Search Tools: RSS Feed – Email Search – Save Search

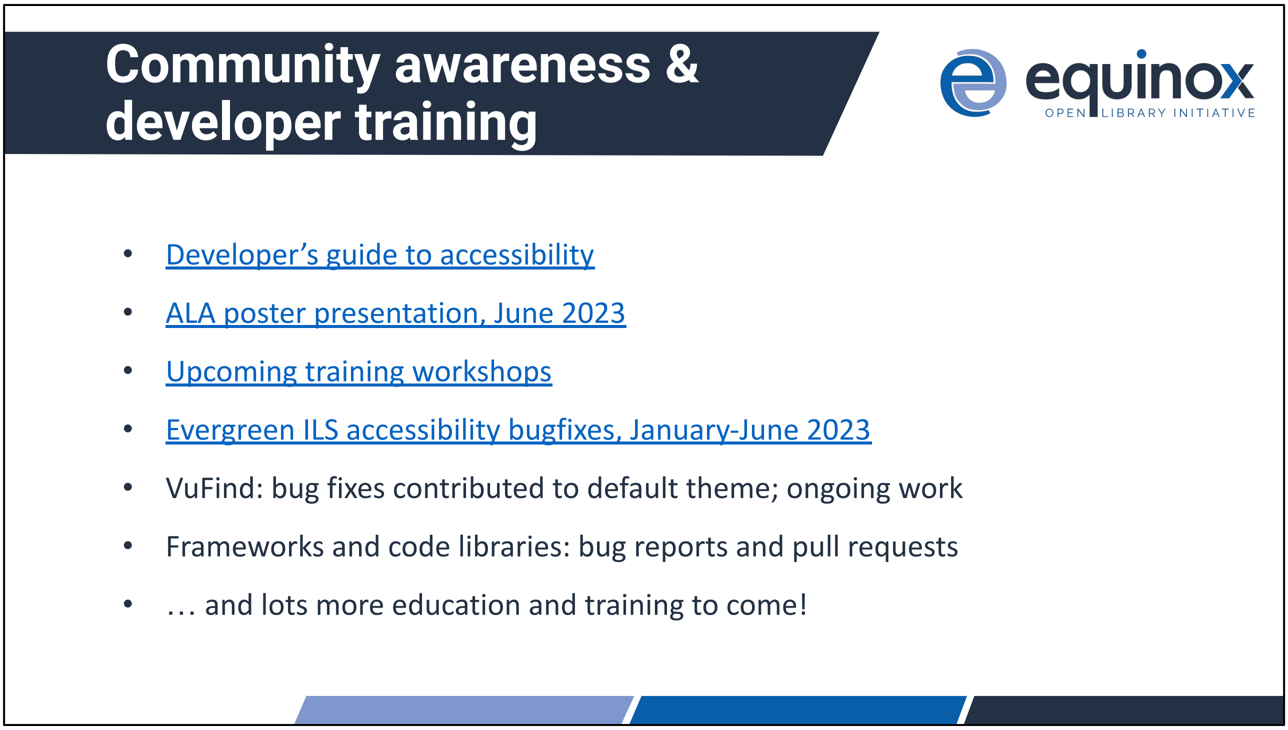
1 The winter of our discontent /
by Steinbeck, John, 1902-1968
Published 1961
Book

Save to List

The next thing I'll be tackling is this area above the search results. We have a lot going on here: breadcrumbs, suggested topics–and there can be a lot of these–then search alternatives, all before you get to the heading that tells you whether there were any search results. And then we have sort options and search tools links before we actually get to the first result. I'm thinking about how this area sounds when it's read out loud in linear order, and how we can use headings and landmarks to make this easier to skim.

Accessibility at Equinox Open Library Initiative

So that’s a little bit of what we’ve been doing.



Community awareness & developer training

- Developer’s guide to accessibility
- ALA poster presentation, June 2023
- Upcoming training workshops
- Evergreen ILS accessibility bugfixes, January-June 2023
- VuFind: bug fixes contributed to default theme; ongoing work
- Frameworks and code libraries: bug reports and pull requests
- … and lots more education and training to come!

We are working on resources for developers to make all of this easier. We have a new developer’s guide to accessibility, sponsored by our partners at the King County Library System. It’s not just for Evergreen; it’s a concise but comprehensive guide to accessibility with a focus on Bootstrap and ARIA. We did a poster at ALA in June; grab that for a quick reference on all the design considerations for different types of disabilities. Of course, we’re working on VuFind things; a couple of our fixes for the VuFind default theme have already been approved, and we’re talking through the solutions for a few more. And the same thing goes for Bootstrap and the other frameworks and third-party libraries we use–if the problem starts there, we are either working with that team to get it fixed, or finding an alternative that we can swap out, like the carousel plugin VuFind uses. We are just getting started; we have some training workshops on accessibility coming up this fall, and more developer resources in the works!

Questions?

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Equinox Mailing List

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