Accessible Infographic Approaches

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What is 'Digital Equity'

   Current data visualization trends rely heavily on infographics to convey meaning, but this method frequently creates unintended accessibility barriers. As a trainer and remediator I have seen countless infographics that are unapproachable or contain meaningless descriptions for people who rely on assistive technology or keyboard-only interaction. In my experience, content creators usually take an "accessibility at the end" approach to design. They design first and then try to figure out how to make that design accessible. Not everyone perceives all inputs equally. We must take additional steps to increase what I call Infographic Equity.

   Simply put, Infographic Equity is the attempt to provide an equal experience for all readers regardless of the methods they use to read or interact with a visualization.

   This handout provides 4 basic approaches to creating a more inclusive experience when it comes to non-text content and the user experience. My session presents ideas for creating richer experiences for people who use assistive technology such screen readers, text-to-speech software, or text-to-braille devices to interpret data visualizations.

   While this is not a step-by-step guidebook, it is my hope that it opens your mind to different ways of presenting graphics with increased digital equity.

Accessibility: When you start makes a difference

It is important to incorporate accessibility considerations at the earliest stage possible. The stage at which we consider accessibility directly impacts how long it will take to make the product accessible, what approach we use to do so, and ultimately how usable and informative the content is. If we start late, our goal of a single, equitable, accessible experience for everyone often fails because "there's not enough time" or "this has already been approved and we can't change it.".

When teams start designing with accessibility in mind from the beginning, there are more options to present a single, meaningful user experience. Depending on what stage you begin incorporating accessibility, you can increase or limit your ability to employ accessible design by affecting your timeline or your attachment to current designs.

Starting at the Concept Stage

In addition to obvious considerations like choosing an accessible color palette and choosing colorblind-friendly design colors and layouts, designing an interactive experience for accessibility starts with the most important question of all: **"What do I want the user experience to be?"** The answer to this question affects every aspect of your design and implementation. Without answering this question, most developers find themselves at the end of the project with several accessibility barriers they had not considered.

Listening to the image descriptions should also be part of your accessibility process. Mapping out the user experience will help identify how the information is presented and possible options for the user to interact with it while absorbing meaningful content.

Other considerations should include the following:

1. Am I using color alone as a way to understand content or interactions?
2. Am I providing keyboard-based navigation that offers important information and context?
3. Does my presentation method meet minimum contrast requirements?
4. Am I providing text alternatives for image-based data visualizations?

Considering accessibility in the concept stage allows the most freedom for change and has the least impact on schedule and development.

Starting at the Draft Stage

   If you are starting to consider accessibility once a draft has already been developed, you still have time to make more accessible design and implementation choices. Color palettes can be reviewed. Text alternatives and presentation methods can be evaluated with assistive technology for barriers and meaningful information. But any changes may be harder to implement at this stage. Those who approve the content may have already formed attachments to the draft colors and methods. The best way to shift sentiment at this stage is to provide solutions when encountering barriers. In my career, I have experienced overwhelmingly negative push back when my evaluations only surfaced accessibility failures without also providing solutions.

Starting at the Final Stage

   Even if you are starting at the end, there is still hope for creating an accessible product. With many visualizations, you can slightly darken colors to meet contrast thresholds, adjust alternate descriptions to be more meaningful, and modify tags or tag-only content to present a better user experience for those using assistive technology. But taking these steps is not always easy. Starting accessibility work after the project is fully developed is like baking an apple spice cake for someone who doesn't like apples and asking, "can't you just take them out?"

Accessibility Terms

- **Figure tag:** A structural marker given to a nontext object that identifies it and holds additional programmatic information about location, content type, and other properties.

- **Content key:** A property of the figure tag that holds descriptive text in accordance with PDF/UA requirements. However, this value is not currently being voiced by JAWS or NVDA, two of the major screen reader tools currently available.

- **Alt text:** Alternative description that describes the meaningful elements of a photo or graphic. This text cannot be paused when being read. Should be two to three meaningful sentences and avoid excessive punctuation.

- **Actual Text:** A one-to-one replacement for images of text (e.g. "Sale." for a photo of a banner that says 'SALE').

- **Expansion text:** Description meta-data for defining acronyms or abbreviations. (e.g. IAAP : International Association of Accessibility Professionals.

Typical Alt-text

If we consider this image of a complex sunburst diagram showing five different property types as an an exercise for writing alt-text, each data point has a numeric value attached to it.

How would we approach writing alt-text for this graphic?

1. Technically, alt text version one, *"Investment Property Sunburst Diagram"* would pass any accessibility checker, but it contains almost no meaningful data.

2. Version two has a single value and explains the main takeaway the author intended by including the chart. *"Sunburst diagram showing Investment Property by type. Rental unites make up the majority of the investment with 654."* Again, this is technically compliant, but is it an equitable experience given the other four missing data values?

3. The third version of alt text contains the full meaning of the chart with all values and associations, including the author's intent. *"Sunburst diagram showing Investment Property by type. Commercial at 256. Industrial with 521. 132 Vacant units and 356 Residential housing units. Rental units make up the majority of the investments with 654 units."*
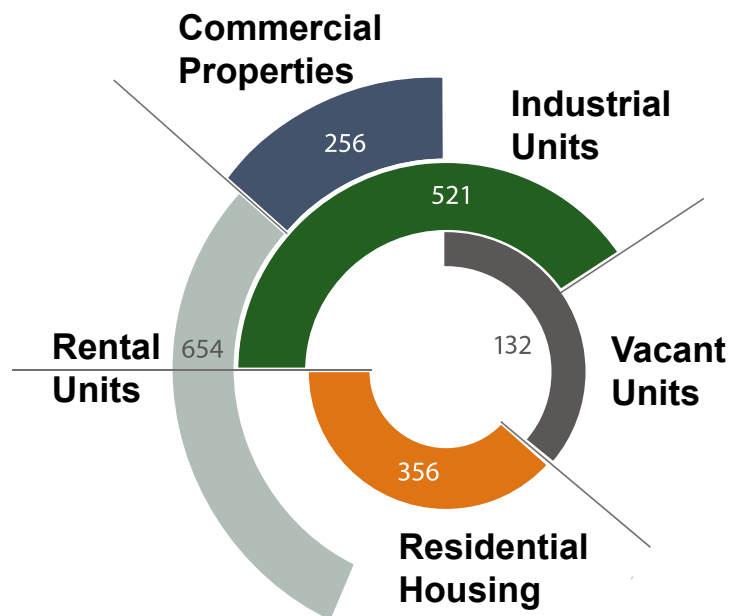

Figure 1: Sunburst diagram with three levels of alternative text.

But what should you do when you have a bar chart with 50 data points or a graphic with a complex story? This is where Digital Equity becomes important. How can we let the user explore the data in a way that suits them and gives them more independence?

There are several ways we can create a more accessible experience.

Alt-text Version 1:

Investment Property Sunburst Diagram

Alt-text Version 2:

Sunburst diagram showing Investment Property by type. Rental units make up the majority of the investment with 654.

Alt-text Version 3:

Sunburst diagram showing Investment Property by type. Commercial at 256. Industrial with 521. 132 Vacant units and 356 Residential housing units. Rental units make up the majority of the investments with 654 units.

The four basic approaches to richer infographics

In addition to alt-text, the following four approaches push the envelope for richer infographic presentations. I won't show all of the steps to add or edit these features, but these techniques can be a great starting point for you and your team to consider when building more accessible content into your PDFs.

Repurposing text labels for charts and graphs: Accessible bar charts, pie charts, and line graphs should include clear labels and data points for each meaningful element in the series. If we keep these objects as selectable text, we can target these elements as headings inside the tags tree (indicated with blue arrows in the next image) and apply Actual Text to include the repeating axis information along with the actual data value as shown in the Actual Text field. This approach allows the user to step through each data point at their own pace. Giving the user control over how they review the data is far better than presenting them with a generalized alternative text description that cannot be paused for data point review.

Alternatively, you can tag each bar as a figure and add alt text that includes the data point, axis labels, and any trends or meaningful correlations visually present. You can use the Content Panel in the PDF document to find each element and create a figure tag from each group. Any axis labels can be repurposed as headings.

The main difference of this approach would be that a person using a screen reader would hear "graphic" for each figure element before the alt text is read. Again, your approach is dictated by the question:

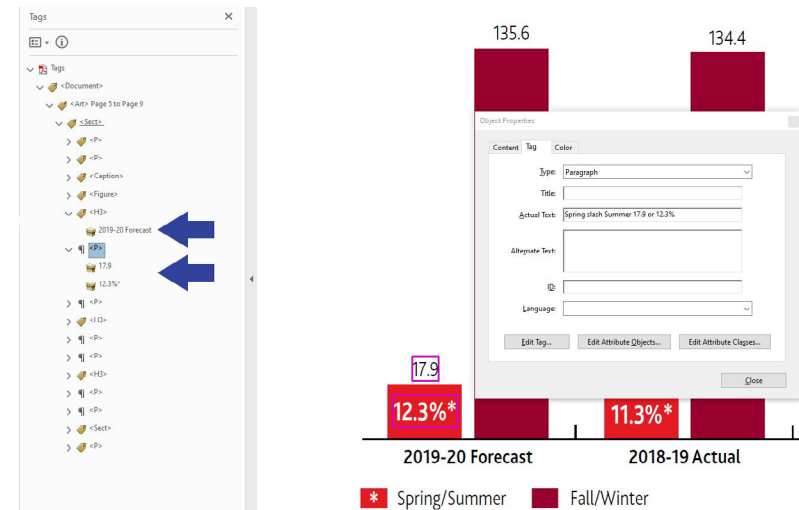**"What do I want the user experience to be?"**

 Figure 2: Bar chart example showing live text in a PDF tag tree with associated actual Text to incorporate repeating legend elements
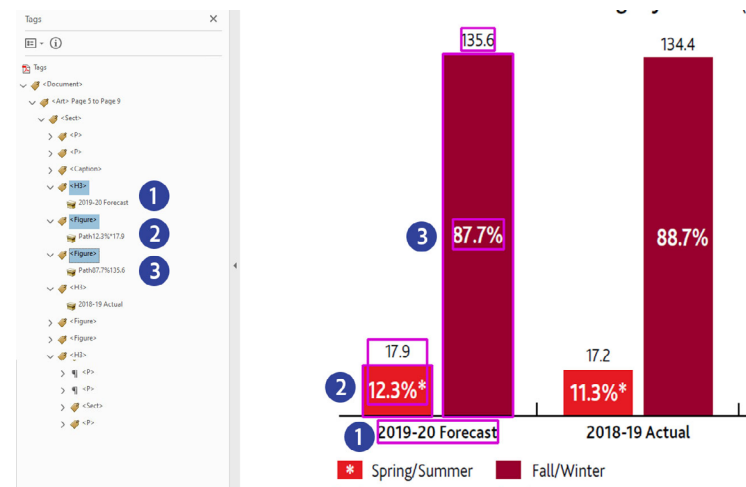

Figure 3: PDF tag tree highlighting three elements that represent the bars and labels in the bar chart.

Breaking up the pieces:

If you are a graphic designer, you should be familiar with the idea of slicing. This is an older method of presenting large graphics in web pages by cutting the image into several pieces that load more quickly on the site. In a PDF document, you can use alt text to employ a similar approach by presenting a series of images that tell a sequential story.

The basic approach is to start the series by introducing the series of graphs to the reader. In the image below, the first piece of alt text might say, "The following nine graphics illustrate the lifecycle of water. First, water evaporates from the ocean heated by the sun's rays." The number of slices is dictated by the depiction of the graphic. Then we apply appropriate alt text to each slice of the image to describe the process or data values as needed.

As the content creator, you will need to figure out how many separate thoughts are presented and ensure that you have sliced your images into enough pieces to tell the story. It is not critical that the visually represented slices are perfectly limited to the elements in the description. For screen reader users, the story being presented needs to represent the correct number of descriptions to tell the visual story.

But there is a balance to consider for those using assistive technology who also have sight. You should slice your images in a way that considers the user might try to draw correlations between the slice and the associated text. Be as close to logical as possible given the complexity of your graphic.
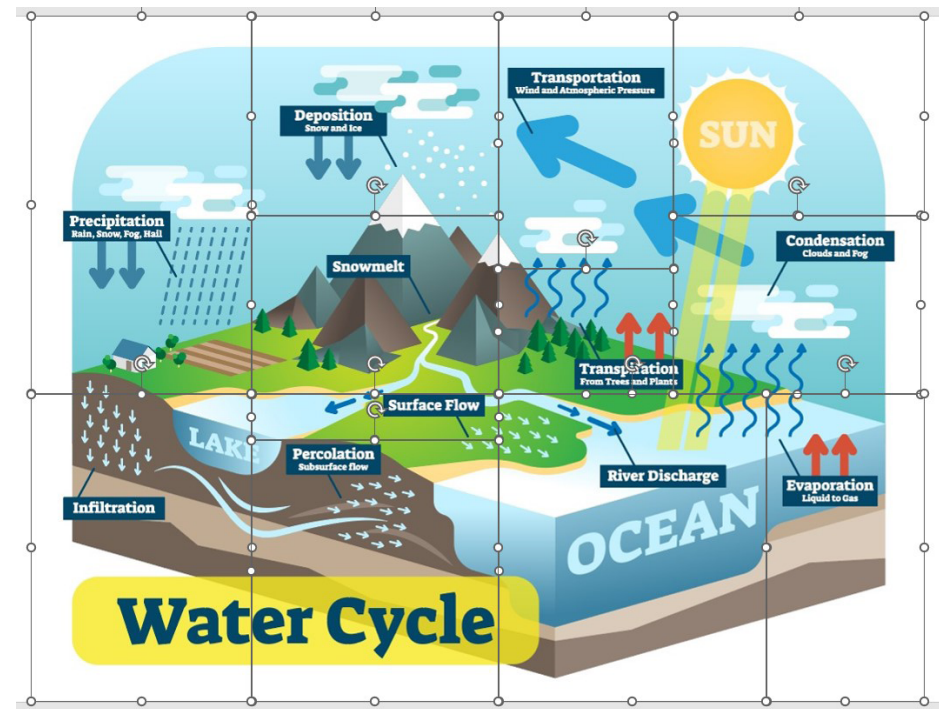

Figure 4: A sliced infographic allows complex stories to be told through a series of images and alt text rather than just one image.
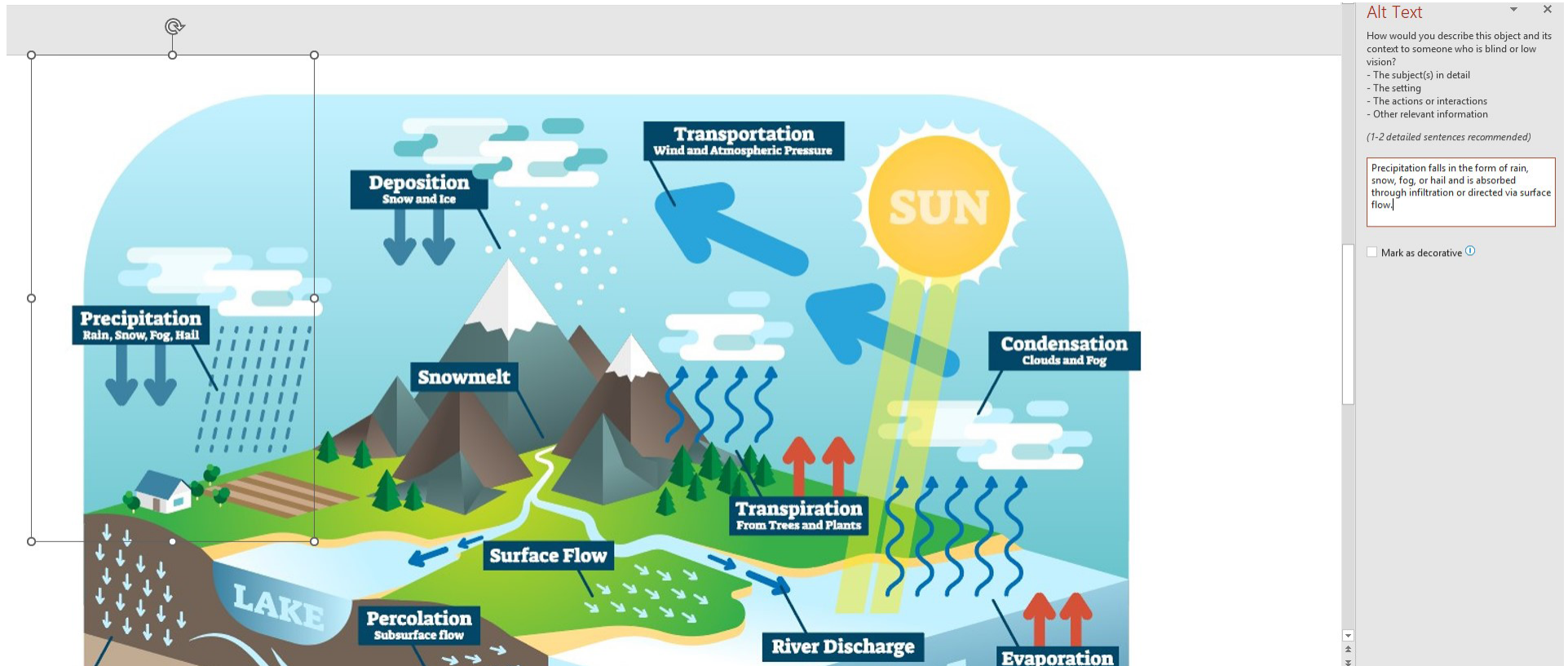
Figure 5: The water cycle graphic broken into several separate objects. The alt-text box enables the creator to insert meaningful descriptions for each element within the complex image.

Accessing Taggable or Live Content

This approach is similar to how we selected the bars in the first approach. If we keep our graphic vector-based (e.g., in Adobe Illustrator or Encapsulated PostScript file formats) and taggable, we can tell stories through these elements using a combination of imagery, symbols, and text rather than using a single raster-based graphic (e.g., JPEG and PNG).

Keeping elements separate and taggable allows us to create accessible experiences in the source document when using programs like Adobe InDesign or by tagging them individually in the PDF. How you tell the story is important so the user can step through the elements in a logical and meaningful way. This order will also determine the tag order.
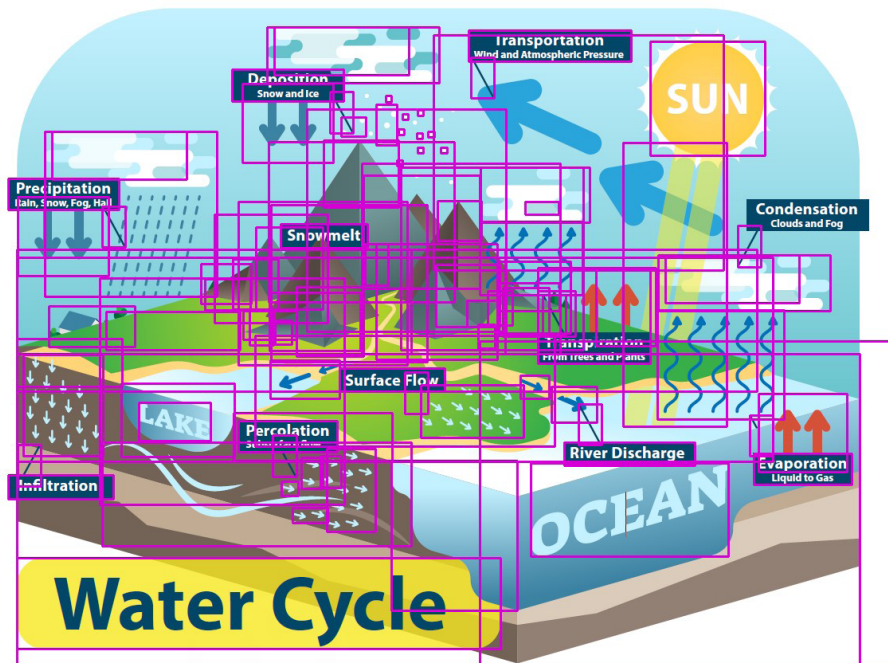

Figure 6: Creating Adobe Illustrator artwork with live text and individually accessible items allows us to access specific parts of the graphic and make a richer user experience.
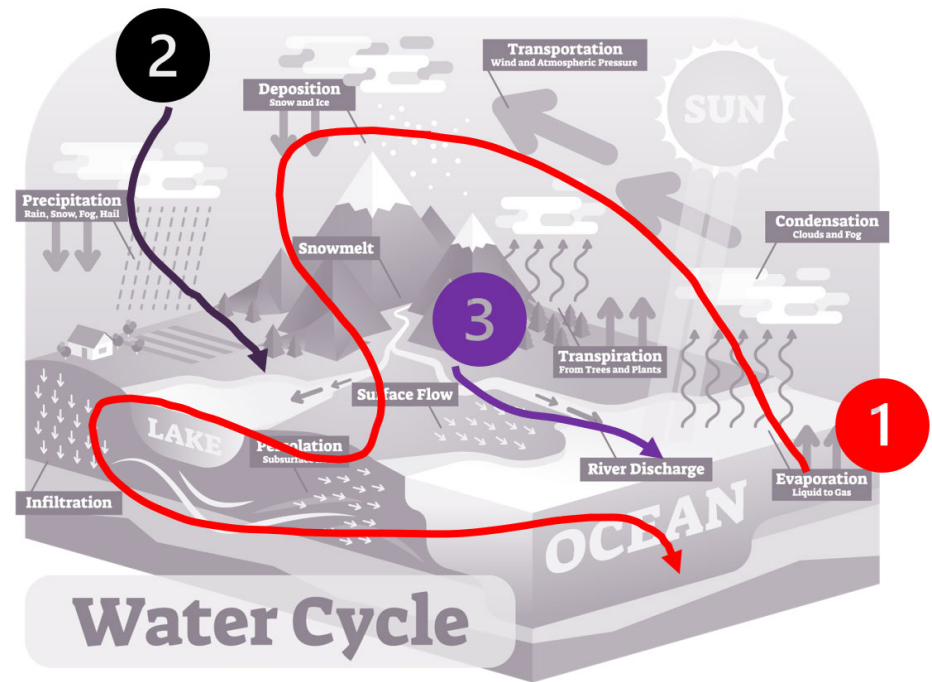

Figure 7: Understanding how you want to tell the story is a key step in determining the tag order.
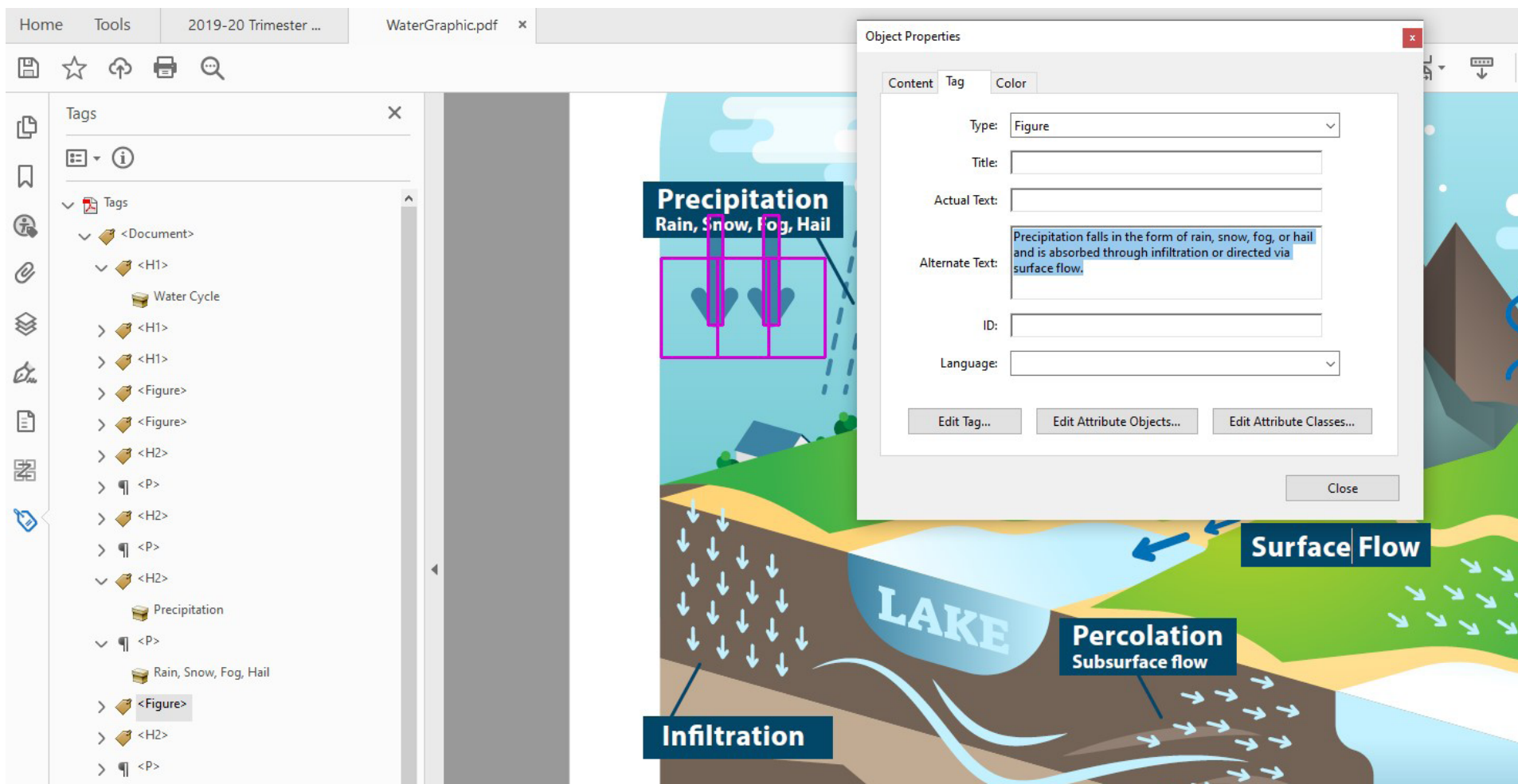
Figure 8: Elements of this illustration are live text with proper headings applied. Graphic elements are tagged as figures, allowing for an expanded description to be applied that describes the association or process not available in live text.

Using Layers:

One of the easiest ways to present a text-based alternative experience is by using Adobe Acrobat's ability to layer content. This feature is especially useful when we need to show things like organizational charts, process trees, or other text-heavy infographics.

The process of placing images on top of background text allows the visual reader to have the experience that they are used to and allows assistive technology users to access structured, meaningful, accessible descriptions. This layered approach is especially useful for organizational charts that can be presented with nested lists and headings to mimic the visual presentation. With flow charts, for example, the text equivalent can follow the same format.

If we evaluate this infographic, we can see there is a main title, descriptive text and six categories. We could use approach three and tag the live content if the graphic were placed in an Adobe Illustrator file. But if the graphic was a PNG or JPG image file, then using layers might be our best approach.

If we place a text-based list under (behind) the infographbic it will be accessible to people using assistive technology. This method is the most easy to implement when we have access to files where we can control the flow of text. It is also possible to add this list using Acrobat, but that process is much longer and requires individually creating a series of List Item (<LI>) tags and placing the text in each one. Again, designing with accessibility in mind saves time and presents a more informative user experience.

Figure 9: A simple infographic showing a split circle into 6 pieces. The center piece holds the title and descriptive text. We add a text box under the graphic and color the text white when neccessary. We can then simply artifact the graphic for screen reader users and just present the text and list structure as appropriate.