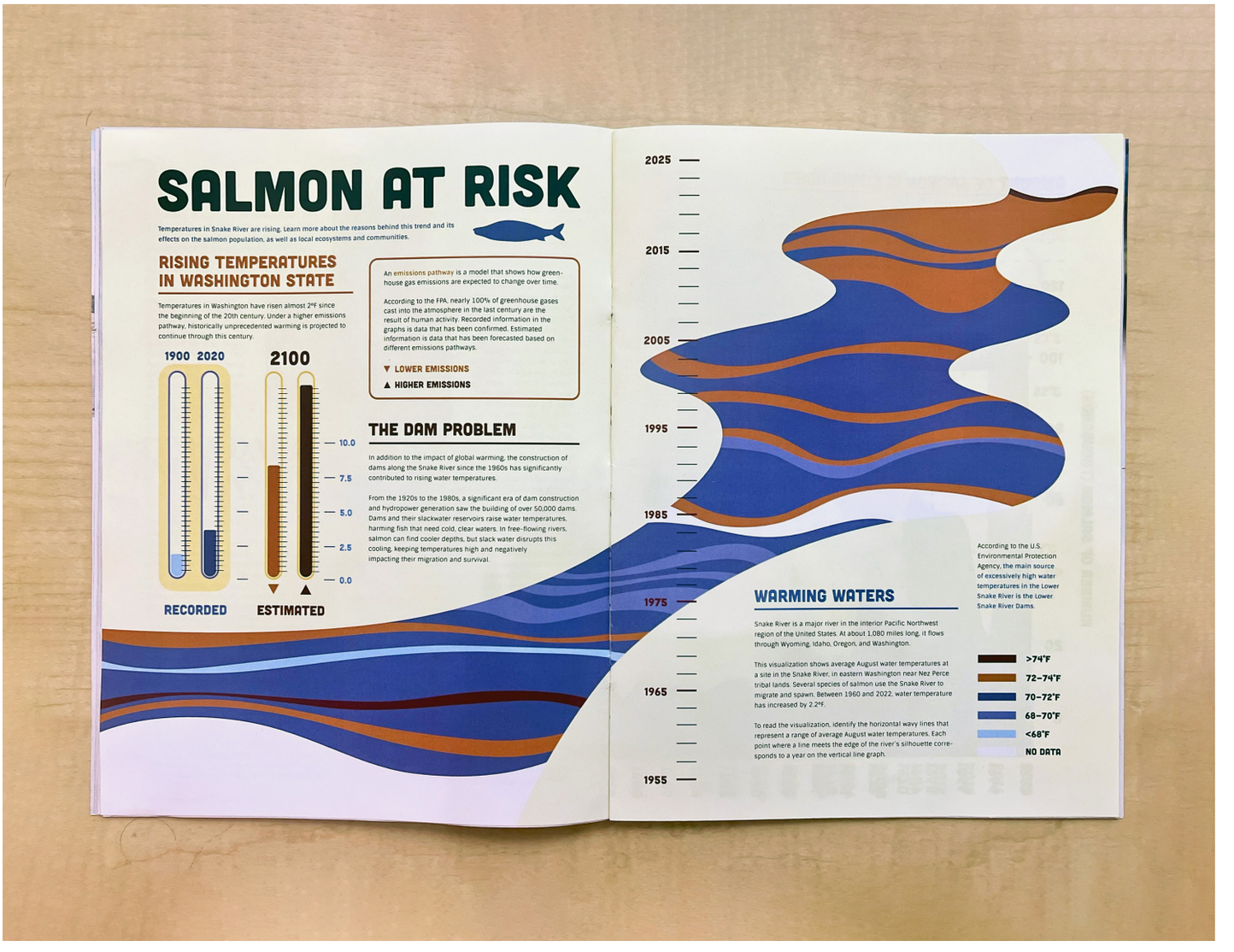
# VISUALIZING CLIMATE DATA: ECOSYSTEMS

## Process Book



# DATA WORKSHOP

For this assignment, we chose an article and a data set from the EPA site to create a data visualization editorial for a magazine. I chose the article “Tribal Connection: Trends in Stream Temperature in the Snake River,” and the data set “Average August Temperature in the Snake River, 1960–2022.”

One of the first activities we did for this assignment was a class data workshop that introduced us to different ways of analyzing and interpreting data.

1) Average August Temperature in the Snake River, 1960–2022

2) Questions
- Why is there a gap in the data?
- There used to be more river temperature variation, now there is less variation, how is climate change impacting this?
- What is the impact of the temperature rising on the indigenous community?
- How will warmer water impact the salmon?
- Does this graph imply that the river temperature will reach a constant, high temperature?
- What caused the dramatic fluctuations in river temperature in the past, and why would these be beneficial?

3) Trend: past 20 years: temperature generally increasing; before: fluctuating

4) Subcategories
- Importance of river to indigenous community as a food source
- Aspects of Nez Perce culture shaped by and sustained by the river
- Salmon’s reliance on river temperature for breeding and food
- Salmon population impact
- Impact on other local species
- Specific actions that are causing climate change

**Tribal Connection: Trends in Stream Temperature in the Snake River**

1) **Provided context:**
Climate change is continuing to warm waters
- River and stream temperature in the NW are expected to rise as average air temperature increases

Salmon play an important role in the diet, culture, religion, and economy of Native Americans in this region
- Salmon need cold water to successfully migrate and hatch eggs (warm water also makes them more susceptible to disease);

2) **Questions:**
- How has the life of Native Americans been impacted by the rising temperatures of Snake River?
- Historically, how have changes in river temperature affected life in the tribes?
- What is causing average air temperature to increase? Anything specific to the Washington region?

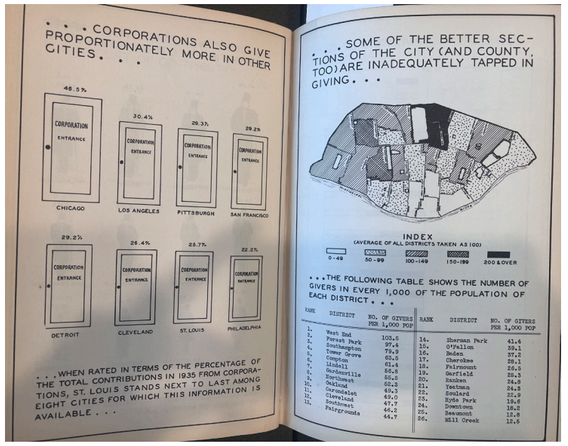
3) **Things noticed in data set:**
- There is a gap of 2-3 years where info was not recorded (around 1984-1986)
- There is a sharp drop and rise in 1969
- The temperature of the river used to fluctuate much more from year to year

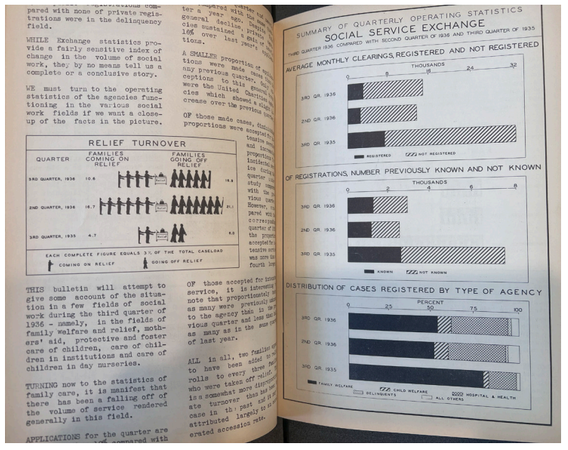
4)**Data set’s relation to contextual info:**
- Shows the average of lake temperature is rising
- Spans across a period of time large enough to see the temperature increase, particularly the last couple decades

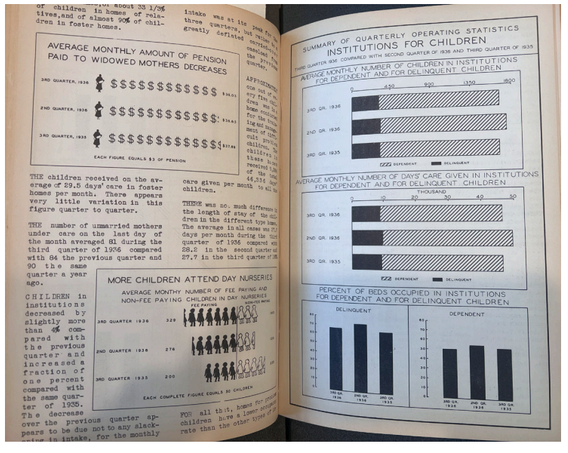
Through a close reading of the article and working through some targeted questions, I was able to better grasp some important ideas of the article that were not explicity stated, such as the relation of salmon loss to global warming. This activity also made it clear to me what extra information I might want to research for the content of my editorial, as well as what its overall narrative might include.

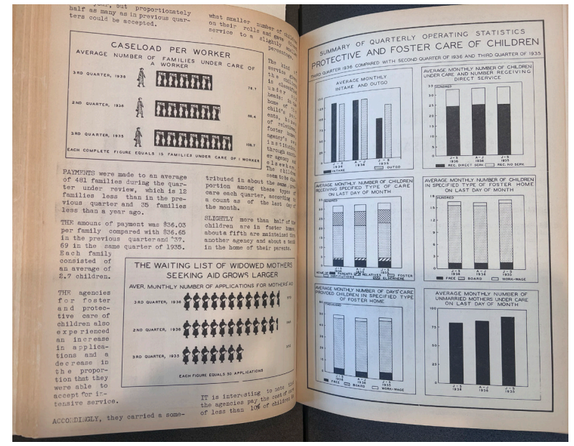


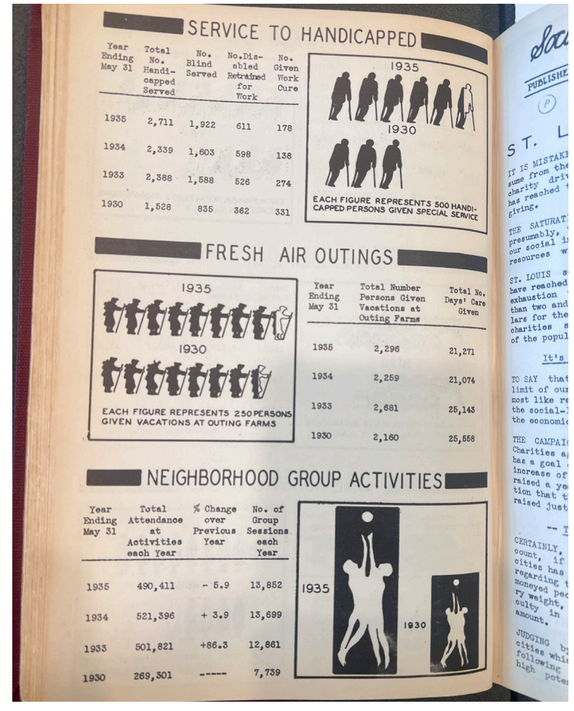
# FIELD RESEARCH




As part of our initial research, our class also visited Olin Library’s Special Collections to take a look at existing books with data visualizations. I thought that a lot of the books had very creative “twists” on common forms of data visualizations, and found that I enjoyed reading the ones that employed a bit more creativity with their visuals.

# MINDMAP AND DATA RESEARCH

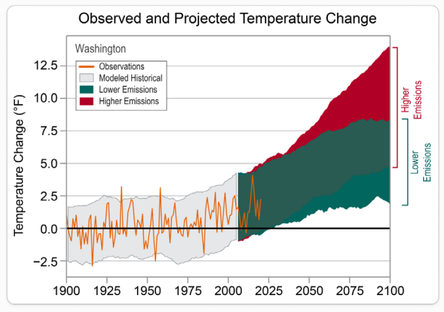
After our intial analysis and breakdown of the provided articles, I felt that it was necessary for me to do additional outside research in order to better understand many of the components that made up my selected data set. While the article provided adequate context to back up its claims, the information provided felt clinical in a manner that removed it from its audience and didn't feel personable enough to serve as content for an editorial on its own.

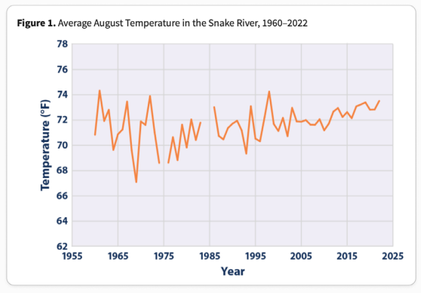
I was interested in the specifics of exactly how global warming might impact communities, and finding data to support these relationships.

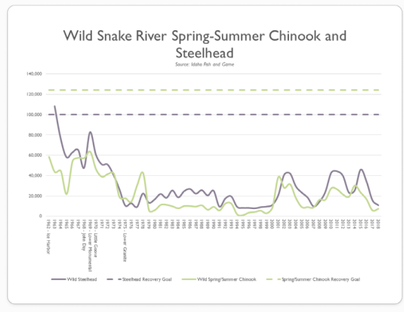
In order to build a cohesive set of data visualizations, I made a mindmap to establish the overall narrative of my three spreads. I decided to start broad by relating rising temperatures in Washington state to the rising temperatures in Snake River, then elaborating on how this affects salmon in the river.

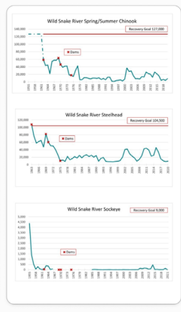
Finally, I would provide some context as to why the loss of salmon was an issue for the surrounding environments and communities that relied on it, which would add a sense of urgency to the topic and propose a reason for the reader to be invested in the issue.

Rising Temperatures in Washington State → Rising Temperatures in Snake River → Amount of Salmon in Snake River → Nez Perce's Reliance on Salmon

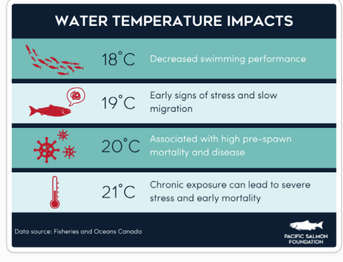


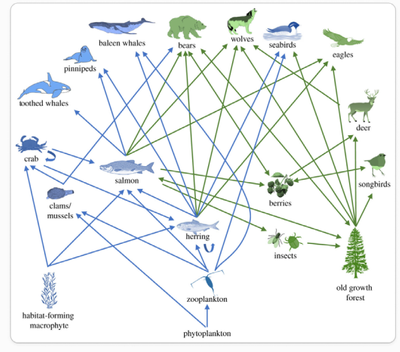



## Warm Water's Impact on Salmon




Disease & migration times

## Salmon as a Keystone Species





Sources

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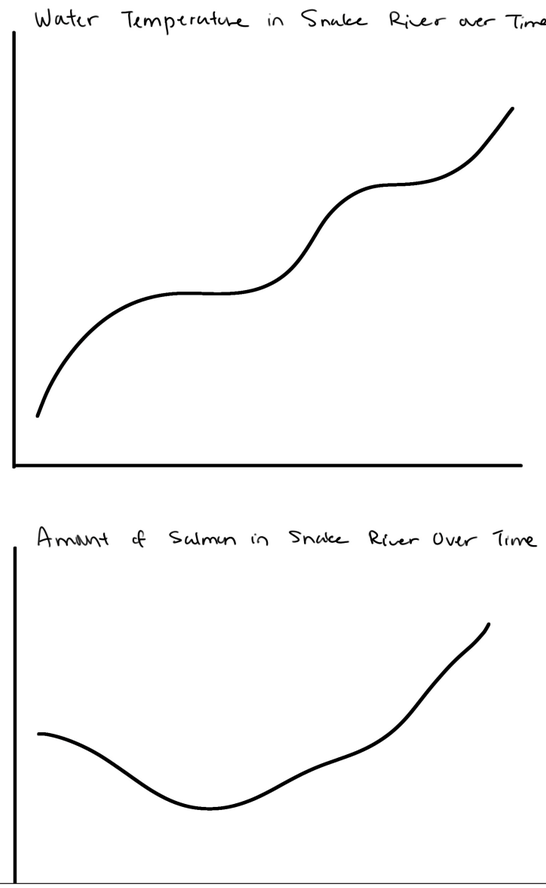
- https://sites.evergreen.edu/environmentalhealth/wp-content/uploads/sites/174/2016/03/Salmon-Paper.pdf
- https://nezperce.org/
- https://www.webpages.uidaho.edu/engl484jj/SalmonPeople001.pdf
- https://royalsocietypublishing.org/doi/10.1098/rstb.2021.0130
- https://www.nps.gov/nepe/learn/nature/fish.htm

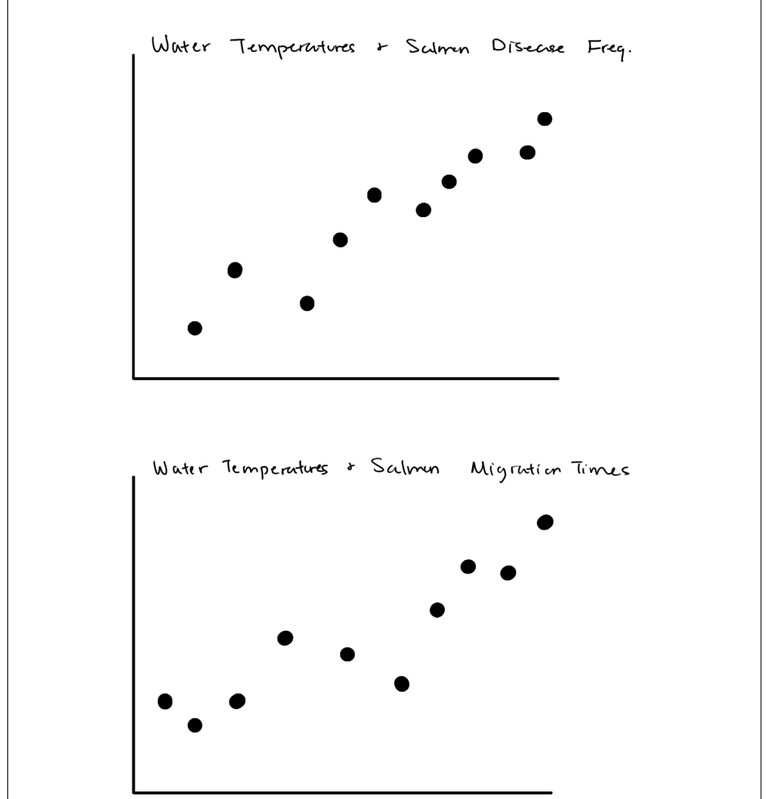
# DATA VISUALIZATION SKETCHES

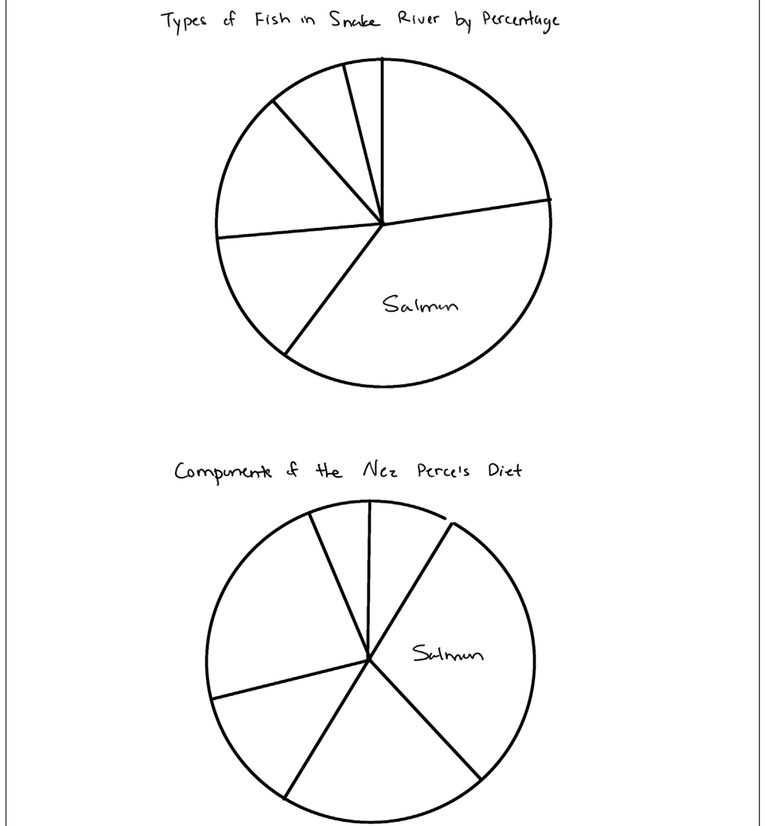
As I was compiling the data sets I intended to use in my editorial, I made some sketches to practice how different types of data visualization might be used to represent different types of data. Using the graphic provided to us in class as reference, I tested line graphs, scatter plots, and pie charts as means of showing data that I was planning to include.

As I was making these sketches, I realized that while they were conventional and therefore easy to read, the resulting visual form wasn't one that I was satisfied with, or one that I felt contributed to the editorial in any thematic way. In particular, I didn't like the use of the pie chart to show the importance of salmon to the Nez Perce; while the basic message of salmon's significance came across, the visual form of the pie chart felt constricting and worked against the encompassing nature of the issue at hand that I wanted to convey.

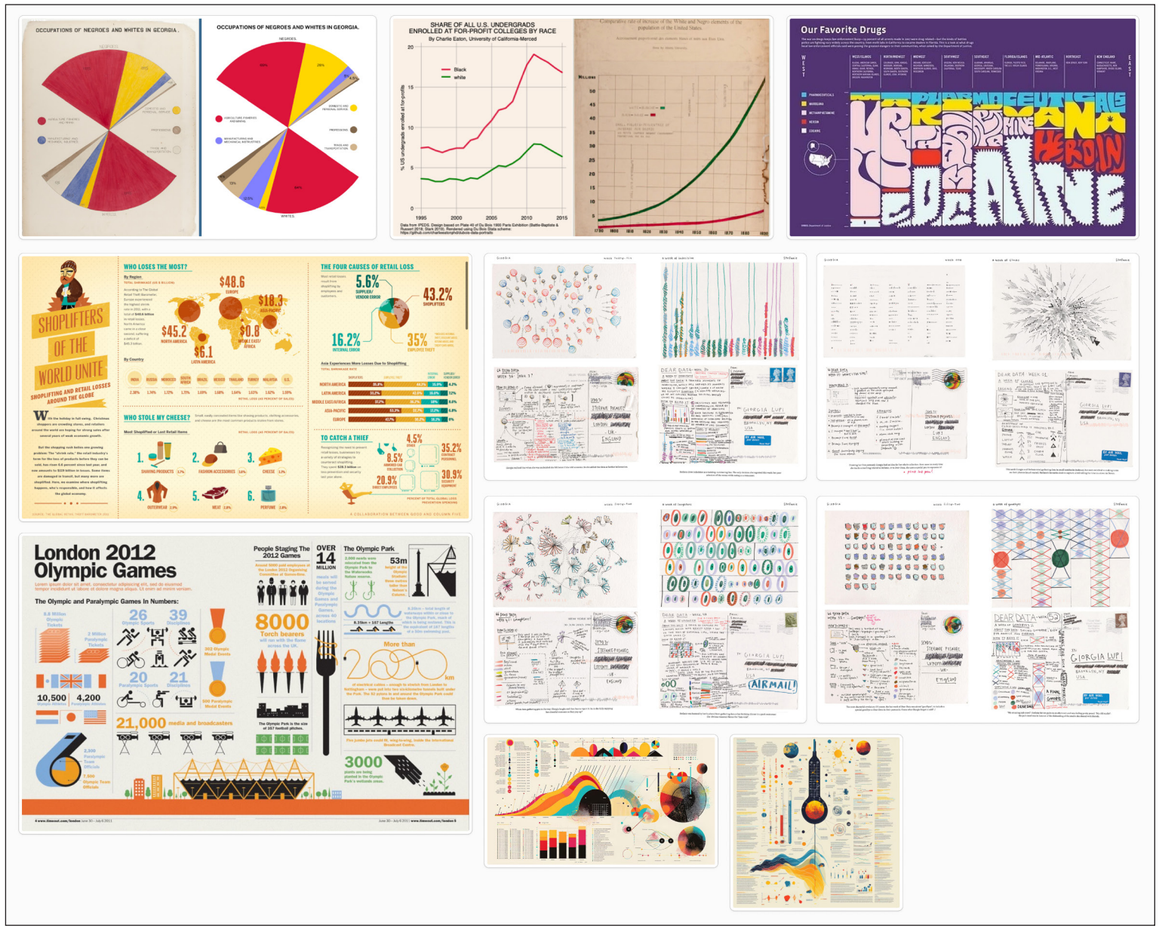
I came away from these studies wanting to find visual methods of representing data that might differ from strictly conventional means but have visual forms that align more with the main themes of my narrative. Some of these themes, which I began to flesh out through identifying what these sketches lacked, were nature, connection, flow, and expansiveness.



# IMAGE RESEARCH




Additionally, while planning my narrative, I also conducted contextual and design image research. For contextual research, I focused on finding examples of diverse visualizations that could be used to display information in a clear yet interesting manner.

Since I knew that my editorial would include multiple data sets, I specifically looked for references that had consistent visual styles applied across different types of information.

As I did my research, I found myself drawn to visuals that used larger blocks of color to help cut up otherwise dense sections of information. I also paid attention to the ways color and typographic hierarchies were used to establish reading order.



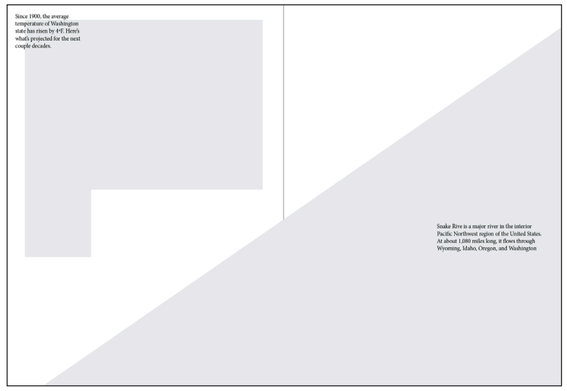
For design research, I looked at photographs of the Snake River and focused on specific aspects of salmon, like the texture. The tacticle and repetetive visual texture of salmon scales was very inspiring, as it related to my larger idea of many little variables contributing to a larger, complete story. I also really enjoyed the natural flow of the river's shape and felt it could serve as a reference in my design in order to create a sense of nature without including a direct photograph.

In addition to the design research I did pertaining to Snake River, I gathered some references of Nez Perce artifacts and artworks, as well as photographs of their cultural activities. With their tribe being such a crucial part of the story I want to tell, I wanted to incorporate their unique visual language into the design of my editorial as well.

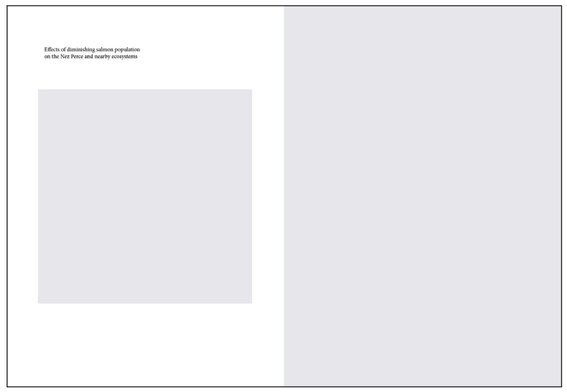
Two things in particular stood out to me in their cultural aesthetic: the colors, and the patterns. Their traditional colors are vibrant reds and oranges paired with less saturated blues, and they employ solid lines and distinct shapes in their textiles.

As a result of my contextual and design research, I began establishing a visual language for my editorial content and data sets that used a vibrant red-blue color palette with organic shapes, color blocking, and sections of text broken up by solid lines.

# FIRST ITERATIONS







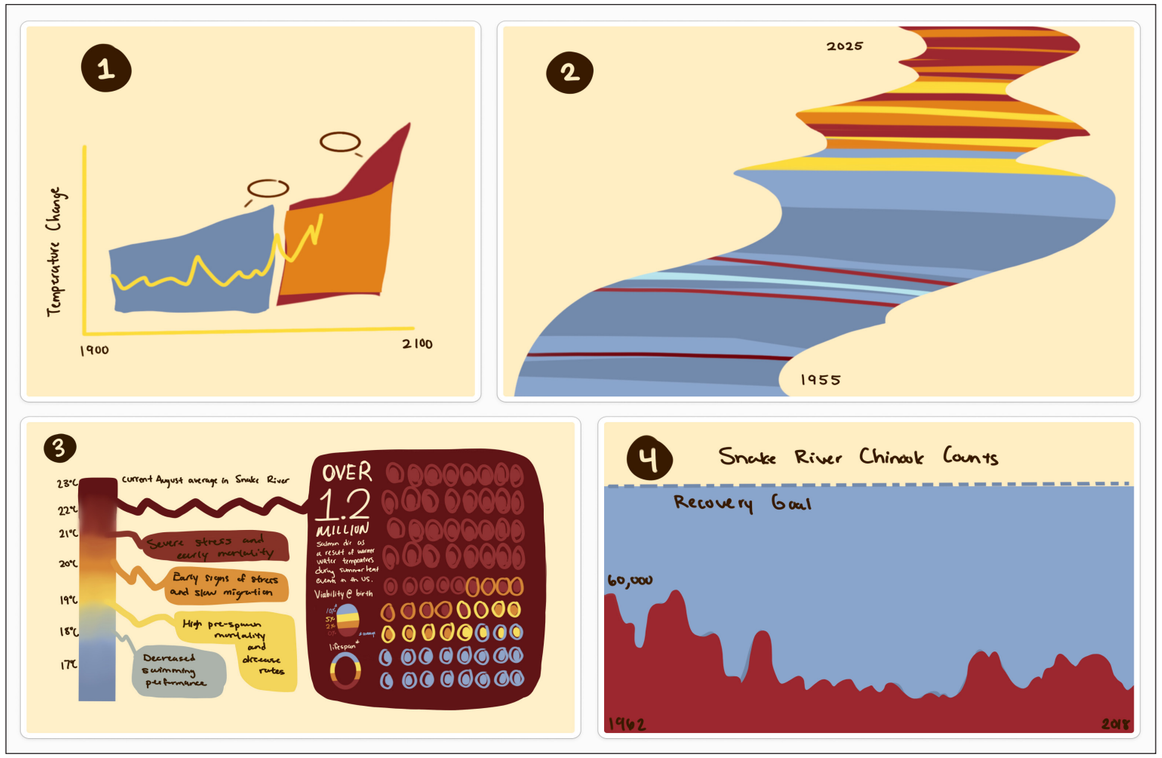

I began to lay out the three spreads of my editorial by blocking out sections for images and visuals and pacing out the sections of information that I planned to include.

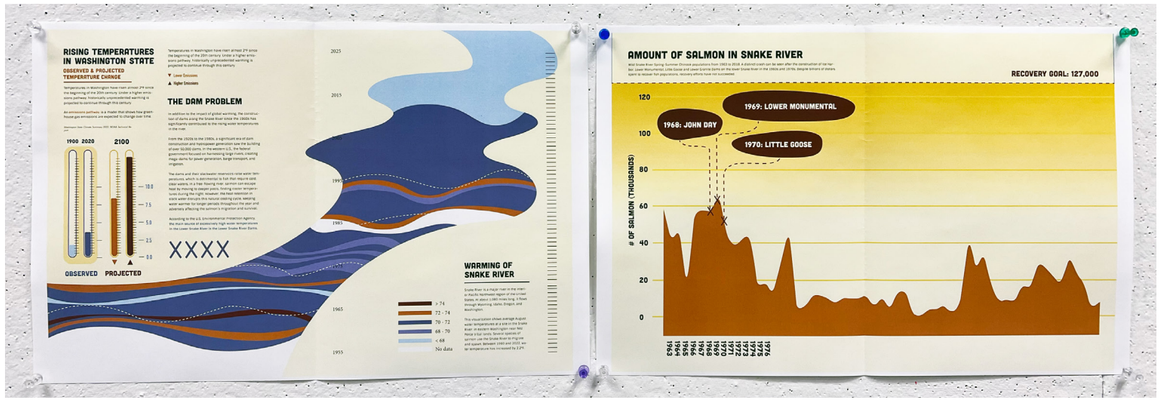
While creating my compositions, I paid careful attention to the balance of content and image on each page and spread, as I wanted to make sure the editorial felt balanced throughout and wasn't too front- or back-heavy with information. I also wanted to portray the dynamism of the river by activating the gutter in the layouts, and sought to contain some contents within one page while others spanned across the spread.

As I wanted my data visualization to maintain an organic feel, I first started drafting them on my iPad through illustration. I created a color palette based off of the Nez Perce's traditional colors, emphasizing their blues to tie into the river topic, and began ideating different visualization forms.

In particular, I experimented with data visualizations 2 and 3. For 2, I wanted the main message of the Snake River temperature data set to be how its average temperatures have risen over time. In order to do this, I flipped the axis of the original graph 45 degrees and employed a color-coded key to create a visually engaging texture that still conveyed the increasing overall temperature of the river as the "stripes" go from mostly blue to more and more warm oranges and reds. By framing the entire visualization within the Snake River's silhouette, it is immediately apparent to the reader what the data represents: the river getting warmer over time.

For visual 3, I struggled with how to format information that was not necessarily data: the effects of warm water on salmon. I felt

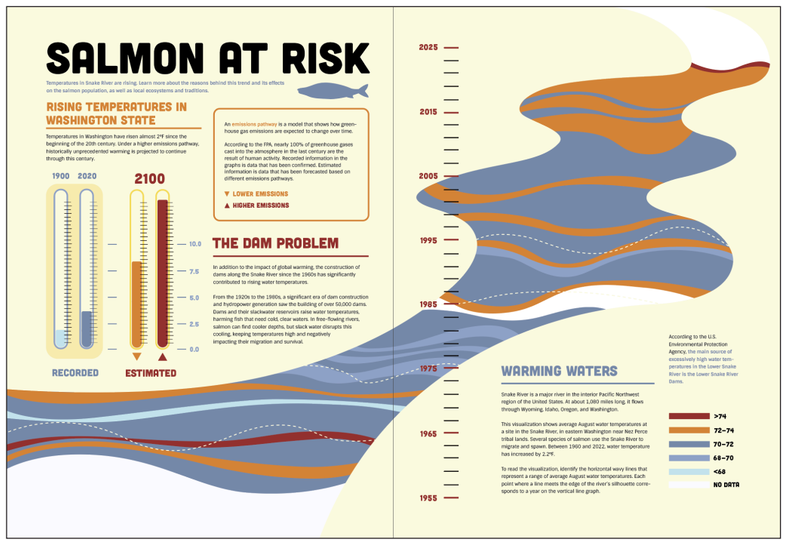


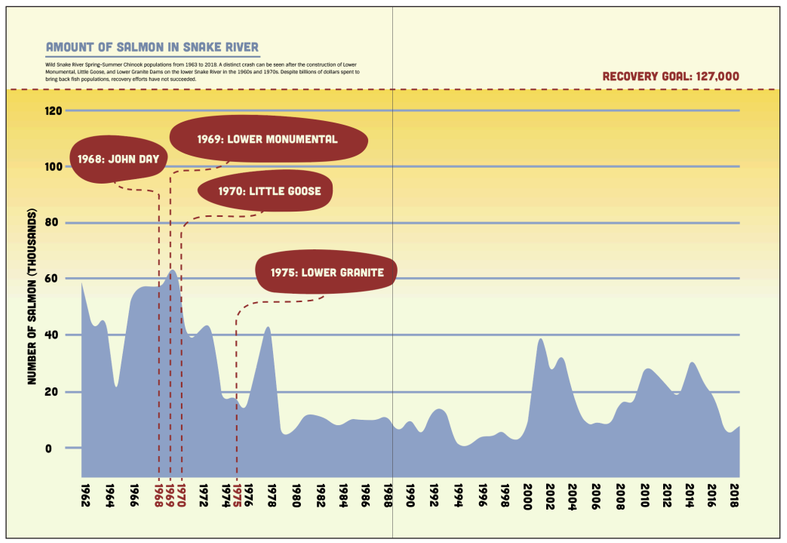



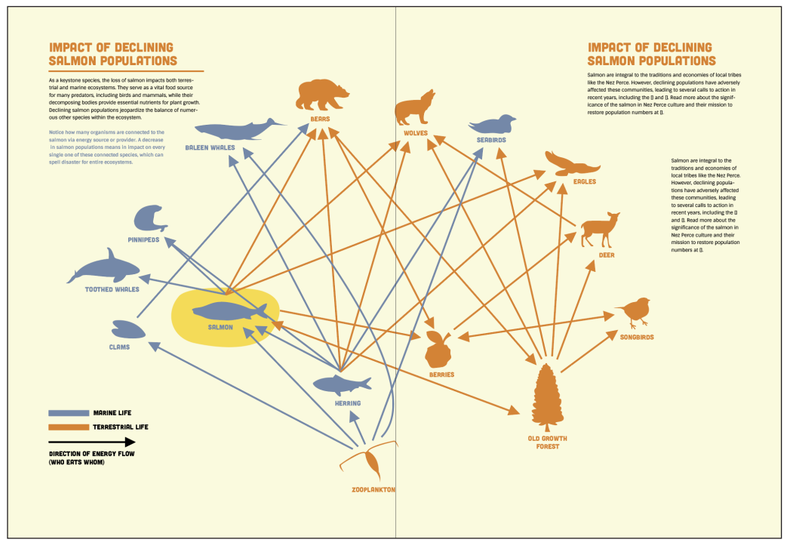

that this context was important for readers to understand how dire the situation was in Snake River. In the end, I landed on a combination of a simple temperature bar coupled with a closer look at what current temperatures in the Snake River mean for the salmon population. For this complementary section, I was inspired by the texture of salmon scales and eggs.

Additionally, just like for visual 2, I wanted to focus on the big picture view of the information: a lot of salmon are dying. As a result, I also used a color-coded key to keep the visual simple from afar and for readers that wouldn't want or need a closer read of the data.

# SECOND ITERATIONS



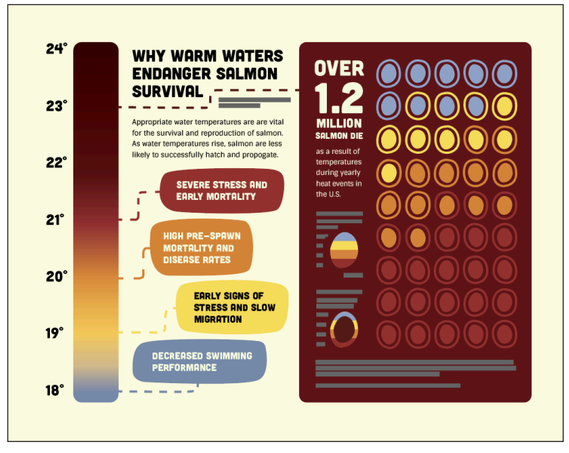




For my second iterations, I made the decision to start my spread on an interior page and have no front cover. The pacing of my content better suited this format. Additionally, I laid out most of the rest of my content and created my third spread, which used a food web to show the wide-reaching impact of salmon on its ecosystem.

On the first spread, I clarified the system of the visualization and added text instructions on how to read it, since the information is displayed in a more unique format. With the decision to start my editorial on the left side of the first spread, I also added a title and short description to intro-duce the reader to the purpose of this editorial.

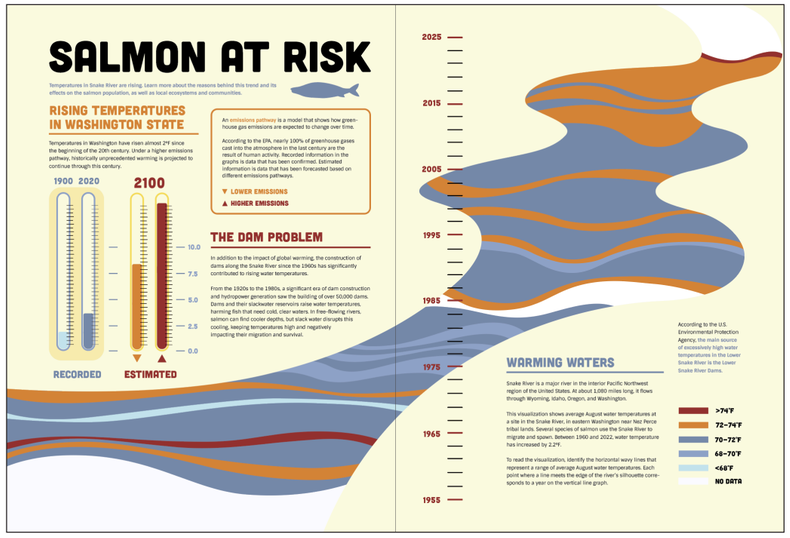
For the second spread, I diversified its color profile and adapted its contents to the grid system that I established.

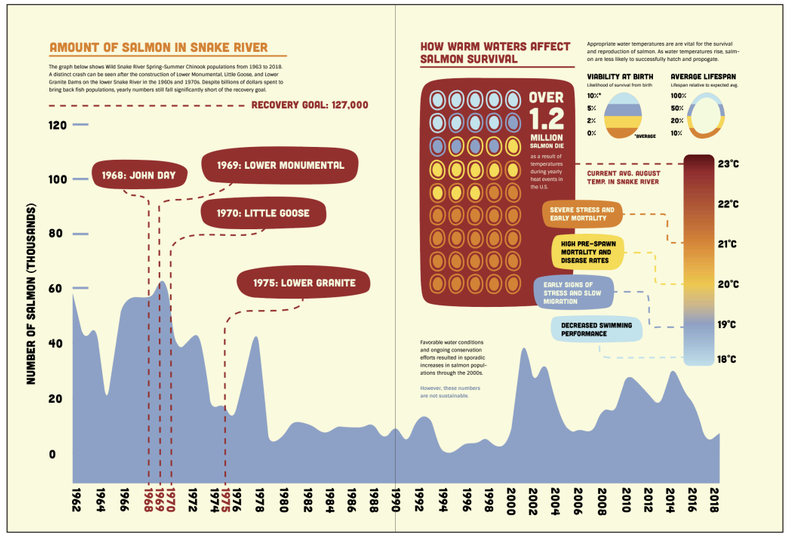


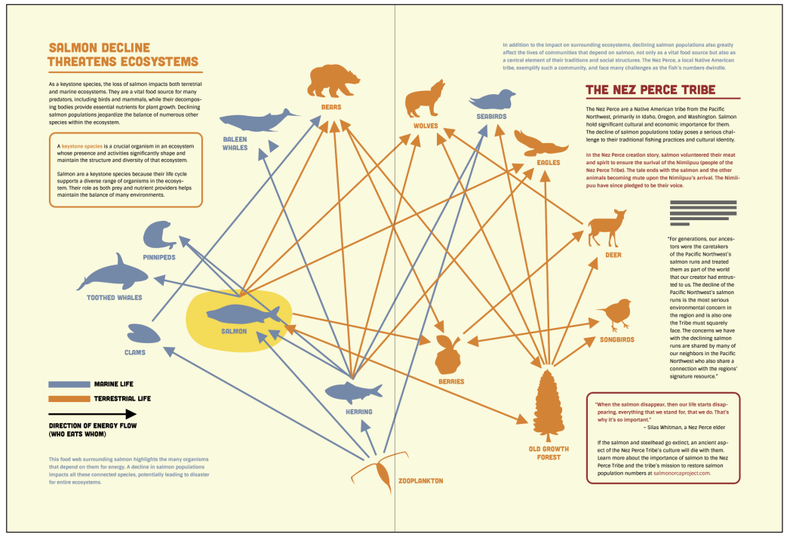

An element that I introduced in my second iteration was the creation of a “card” insert that contained information on how warm water affected salmon survival rates. This info was intended to complement the second spread’s data, which showed how salmon populations in the Snake River were decreasing over time.

While I was still uncertain on how the two data sets would interact in the editorial, for now I formatted the data to fit within a rectangular format and work as a visual on its own.

# FINAL EDITORIAL




My final editorial differs from my second iteration the most in the second spread. During critique, a common sentiment was that the card insert felt like an awkward workaround that didn't add anything to the editorial, and in fact took away from the flow of reading. Additionally, the physical card would block content as it was flipped and would also probably need something on the back, and my spreads were already packed full of information.

The second major feedback that I recieved during critique was that due to the large amount of information I had included overall in my editorial, my second spread felt a bit empty compared to my other two in terms of content and visual variety.

As a result, in order to resolve these two problems, I condensed the card insert and the second spread into one spread layout. By moving some elements around, I managed to figure out a balance that ensured all the new information was legible while the original data set on the spread remained clear. I also removed the gradient color fill, as I realized that was the only place where a gradient fade was used in the entire editorial. Removing the gradient background also helped with the integration of the additional information.

The first spread had minimal changes from the second iteration. I removed the dotted gridlines as they were misleading—reading as highlighted data points—and made some small adjustments to the positioning of content.

The third spread was filled out with information about the Nez Perce and their relationship to salmon. I added some context about the food web visual as well as a visually separate section that serves as a call to action for readers to learn more about the Nez Perce and their mission to save the salmon in the Snake River.

Finally, I went through all three spreads and made sure all the text sizes and line heights were standardized within their respective hierarchies, and that the visual balance of text and shape felt consistent throughout the spreads. Then, I printed out my spreads as a booklet, stapled them together, and taped them into my chosen magazine, a 2005 edition of the Smithsonian.

# OVERVIEW

This project taught me the importance of establishing a solid visual language early on in a design work, and the value of forming that visual language by referring to information relevant to your topic of choice. While I could have skipped the research and gone straight to developing the visuals purely based on styles I was familiar with, taking the time to go through my topic and learn about it in detail gave me a much better idea of what visual forms might serve this assignment the best, and resulted in a more cohesive outcome overall.

By basing my visual decisions on established themes and messages that were consistent throughout the editorial, I was able to make informed decisions all throughout the design process. Additionally, by solidifying the rules of my visual language early on (no photography, a strict color palette, use of solid and dotted lines for emphasis), it became much easier to create new data visualizations when necessary that fit the rest of the editorial.

If I were to do this assignment again, I would establish the relationship of my separate data visualizations to one another before fleshing out their visual details. While I did sketch my data visualizations first, I ended up focusing on their fully rendered aspects one at a time, and largely figured out how to place them together in a layout afterwards.

This way of working resulted in me needing to go back and change some visual aspects of the visualizations that may have been consistent but didn't feel balanced when placed next to one another. By establishing the relationships of the visualizations to each other first and then fleshing out the technical aspects, I think that the process would be faster, smoother, and result in an outcome that is even more balanced and cohesive.