This Map is a Tunnel

Kaelyn Wraase

An intersection of cartography and environmentalism

exhibition and book design by Kaelyn Wraase

San José State University

BFA Graphic Design

Senior Thesis 2023

THIS Map IS A Tunnel

THIS *Map* IS A *Tunnel*

an intersection of cartography and environmentalism

exhibition and book design by Kaelyn Wraase

San José State University

BFA Graphic Design

Senior Thesis 2023

to Mom, Dad, and Alex

for your unwavering kindness
and support since the beginning

TABLE OF *Contents*

1 / INTRODUCTION

3 *Abstract*
4 *Research Questions*
5 *Thesis Statement*

7 / RESEARCH

9 *Locating the Thesis Range*
12 *People, Places, Things*
14 *Framing Reference*
16 *Bibliography*
22 *Repository of Insight*

29 / PROCESS

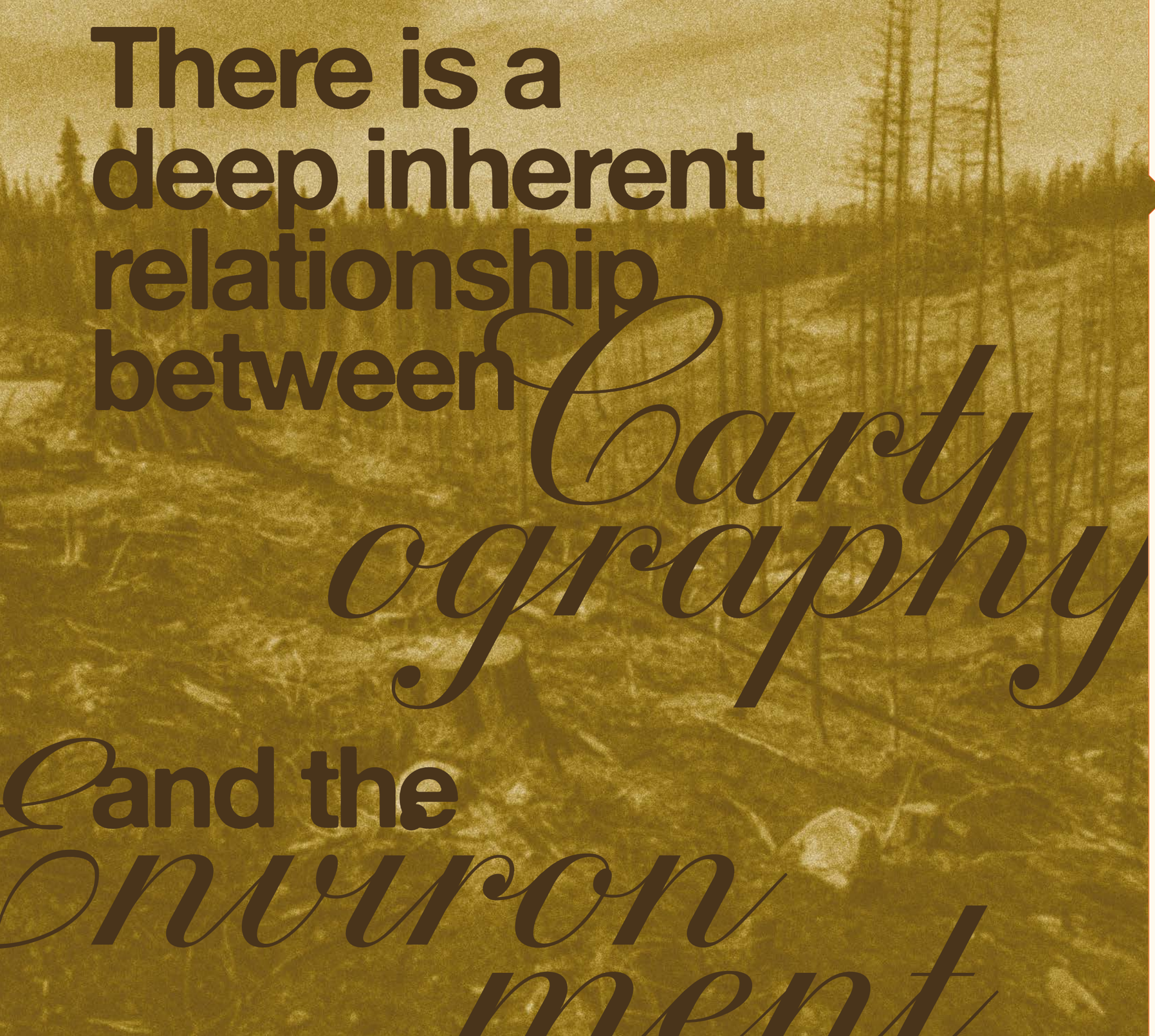
30 *Manifesto*
33 *Physical Creation*
47 *Final Exhibition*
81 *Closing Thoughts*
83 *Colophon*

Introduction

3 *Abstract*

4 *Research Questions*

5 *Thesis Statement*



ABSTRACT

Maps have always been composed of both their function and their storytelling. The earliest cartographers were just as dedicated to the accuracy of their designs as they were to the implicit meaning hidden in the frames, naming conventions, and illustrations that gave the map its character: the extra details have always been just as important as the physical data in imbuing a sense of the space that they represent. There is emotion in every map because they are made to make us feel, to make us look a little closer, to make us wander. They position us in the world and ask us to question what we actually know about it.

Is there a way, then, to strip out the existing data and leave the emotion? Can we apply it to information that isn't geographic, and that requires the attention and nuance that a map commands?

There is a deep inherent relationship between cartography and the environment, as mapping a space requires a respect for that space. Each of the exhibits featured in this exhibition create new geography based on real environmental data in an attempt to highlight issues from a new immersive perspective. This is not about geography. This is about using a map as a vehicle for communicating something else, and trying to bring the intricate details of an issue to the surface.

Every map is a transportive tunnel, with layers of meaning to explore. Does it matter if the space is literal?

RESEARCH QUESTIONS

one What is it about cartography that elicits the joy of wanderlust, and can it be harnessed to bring interest to data that is otherwise overlooked?

two Which types of visual data can globes and maps represent other than the geographical?

three How can spacial cartography be used to allow viewers to travel within a set of data?

THESIS STATEMENT

Map design has been considered the oldest form of data visualization, and its immersive power can surpass its traditional limitations to geographic data. The most successful way to showcase its many strengths is to highlight its relationship to the Earth using environmental data, and to test the boundaries of a map's z-axis with a physical exhibition.

Research

9 Locating the Thesis Range
12 People, Places, Things
14 Framing Reference
16 Bibliography
22 Repository of Insight

LOCATING THE THESIS RANGE

To begin narrowing down the topic of my thesis research, I spent some time pinpointing exactly what it was about design that piqued my interest so long ago. Unsurprisingly, the concept of travel and getting lost came up frequently. I further narrowed my possibilities to three topics.

one **Signs.** Road signs, motel signs, neon signs. How do they give a sense of the city they can be found in?

two **Liminal spaces.** Grocery stores in different towns, soft lighting, random places that feel like a dream. How could I recreate something like this?

three And finally: **Maps.** What makes a map so immersive? Why does it feel like we can travel to a place without taking our eyes away from the paper?

You can hold in your hands access to the world without ever leaving the room that you stand in. You can trace distant rivers with your fingertips, explore every city by its alleys and boulevards, climb mountain ranges. Nothing else can do this—nothing else can unlock such freedom of travel—but a map.

I decided to go with maps.

Based on the initial feedback from Professor Chang Sik Kim and Professor Randall Sexton, I feel that my intention with my thesis proposal was understood. Both professors agreed that cartography has the power to elicit strong emotion, which was the factor of my proposal that I thought would be the most difficult to convince others of. Throughout my research, I started to suspect that my obsession with maps is unique to me and would be hard to relate to a broader audience. However, the feedback today showed me that others will find common ground in the travel that a map allows for. I particularly appreciated both professors' interest in the contrast between an older style of map and modern information. I hadn't realized the impact of this juxtaposition before, and I can use it to help guide me in developing a visual style for my exhibition's marketing materials, branding, overall interior look and feel, and documentation. Pulling on people's nostalgia, curiosity, and general fascination with old things can be the hook that I use to get them interested in my thesis before hitting them with data about modern problems.

I also appreciated Professor Kim's advice to focus on figuring out how to keep the map designs concise and emotional. He brought up an important concern regarding the timeline of the project and the difficulty of cartography design but reassured me that complexity is not needed to make my point. I will keep this in mind as I delve into what makes a map look like a map: I always thought that the intricate details were an important visual aspect, but his observations now have me wondering if I can rely on their other characteristics to make the translation from cartography to data visualization.

PEOPLE, PLACES, THINGS

To help position this thesis among other topics and give myself a sense of the scope, I listed relevant people, places, and things.

I found this practice helpful in two ways: giving context to the art of cartography, and weeding out the expected associations to leave me with something unique.

/ PHYSICAL PLACES
library, printing press, national parks, capitol buildings

/ HUGE OBJECTS
atlas, globe, drafting table

/ TINY OBJECTS
compass, grain of sand, fingertips

/ ABSTRACT QUALITIES
space, elevation, wanderlust, journey, informational, intricate

/ PHYSICAL QUALITIES
paper, tangible/digital, textured, wood, hanging

/ JOBS THAT THESIS PERFORMS
park ranger, tour guide, environmentalist

/ RELEVANT ORGANIZATIONS
National Geographic, Library of Congress, Google Maps

/ HISTORICAL EVENTS
discovery of Imago Mundi map, invention of smartphone and personal GPS, introduction of Dungeons and Dragons

/ SUPERMARKET ITEMS
toy car, coffee, magnifying glass, spiral bound notebook

/ CURRENT EVENTS
The Washington Post's "Inside Al Mazrah, the new map for 'Warzone 2.0'" about digital video game maps, *Art in America*'s "Mapping the Past: Tiffany Chung at Davidson Gallery" is about an artist who creates handmade data visualization maps about the hidden histories of a location, *The Island*'s "GOP map maker acknowledges not using public input in first version" is about mapmaking and its relationship with gerrymandering

/ RELEVANT DESIGNERS
Paula Scher, Massimo Vignelli, Bellerby & Co Globemakers

FRAMING REFERENCE

Talking with an expert in cartography, Kären Wigen from Stanford University, strongly solidified for me that I chose the right topic. I was able to scour her brain for knowledge on all things cartography, and focused on these questions to ask her.

one Is there anything that you think early maps did well that current maps have lost? On the flip side, what do you think modern maps accomplish that old maps never could?

Modern maps have stripped out the decorative and the sentimental, but it wasn't all just purely decorative. The frames, the cartouches, there's meaning in those illustrations and it's all been stripped away for clean, user-friendly appeal. The ideology got buried deeper, but maps used to wear it right on their sleeve.

two Does the existence of the mapmaker's bias act as a wall between the viewer and the information, or a bridge that allows for a sense of humanness to peak through the data between the map's creator and its viewer?

If you can see that there's a human behind the map, that's the key. Understand that it can have flaws. The counter mapping phenomenon showed us that maps have taught us to see as birds do, that they can teach us how to see. Knowing that someone has control over that feature is key in sorting out the bias.

three Do you think the human element is at all lost when we introduce digital software to make the maps for us? And even if so, do you think there's any benefit in losing that human quality as it is connected to our bias?

Digital mapmaking is often a necessary crutch, but it is important to question whether or not it removes the human element. This goes back to the bias as well. There's plenty of meaning to be uncovered when the mapmaker leaves traces of themselves.

four Is there a common response of confusion, wonder, or passivity that people have when reading a map, or has there ever been a particularly memorable experience of someone else's that you've witnessed? What do you think maps mean to people?

People use maps to orient themselves in the world, to help them feel comfortable. When you flip that, or change something about an expected outcome, it completely changes their perspective and it can be quite jarring. People rely on maps to lead them properly, and there is a lot of power in giving them something unexpected. It really challenges their whole worldview and vantage point.

five Lastly, is there anything else you'd like to comment on regarding the history or culture of cartography, or anything you think I should look further into that we haven't touched on today?

There are other people doing a good job of showing the bad news. Mapmaking can give us a utopian vision of the future, and it may be valuable for you to figure out how you can achieve that in your exhibition. We don't always need to focus on the negative.

/ NATURAL EVENTS

To begin, I needed to figure out which recent events and issues in the environmental space had scientists and the public concerned. These sources provided me with a timeline that I could work with while I built up the body of my exhibition. From here I determined three main concerns: vandalism and disrespect in protected spaces, tragedy in the rainforests, and immense biodiversity loss. Understanding the scope of these issues allowed me to continue in my research and gave me a sense of direction moving forward with the design and research process.

Council on Foreign Relations. (n.d.). Timeline: Major environmental disasters. Council on Foreign Relations. https://www.cfr.org/timeline/ecological-disasters

Mark, J. (2021, December 20). The most important environmental stories of 2021. Sierra Club. https://www.sierraclub.org/sierra/most-important-environmental-stories-2021

/ GLOBAL TEMPERATURE

Most people are aware of climate change and the rising global surface temperature of the planet, so I wanted to make sure I acknowledged it. This source supplied me with reliable scientific data and temperature trends over the last one hundred and forty years. With this data I was able to craft the largest and most important globe in the exhibition, which is detailed in later pages, and could give my viewers irrefutable evidence of climate change over the years.

Lindsey, R., & Dahlman, L. A. (2023, January 18). Climate change: Global temperature. NOAA Climate.gov. https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature

/ FOSSIL FUELS

To pair with the above data, this source provided me with data on the carbon emissions from fossil fuels over the same period of one hundred and forty years. While this data is moving on its own, it becomes particularly poignant when compared to the global surface temperature. It was then used to craft the argument that the two sets of data are intrinsically linked.

CO2 emissions by fuel or industry. Our World in Data. (2022). https://ourworldindata.org/grapher/co2-emissions-by-fuel-line?time=1880..latest

BIBLIOGRAPHY BY CATEGORY

/ NEWS CYCLE

I was curious to know how quickly people may have moved on from the events listed in the articles to the left, and this set of sources helped me gauge what people tend to do with bad news. With information on the rapid news cycle, the span of time from beginning to end of a trend, and the phenomenon of fast reporting in today's media, these resources allowed me to form the basis of the idea that became the introductory title wall in the exhibition, which is detailed in later pages. It helped me form the argument that the effects of a natural crisis do not go away simply because we've stopped paying attention to it. The information persists.

Barthel, M., & Worden, K. (2023, January 9). Newspapers fact sheet. Pew Research Center's Journalism Project. https://www.pewresearch.org/journalism/fact-sheet/newspapers/

Ervin, M. (2020, April 15). The modern news cycle. Medium. https://medium.com/@mervin2/the-modern-news-cycle-3594b2a9795e

Kroeger, K. (2020, June 17). Why have Americans and the news media lost interest in the coronavirus pandemic? Medium. https://kentkroeger.medium.com/why-have-americans-and-the-news-media-lost-interest-in-the-coronavirus-pandemic-dc9ef5b9ab91

O'Neill, J. (2019, February 19). How long does a news story last? Vuelio. https://www.vuelio.com/uk/blog/how-long-does-a-news-story-last/

Owen, L. H. (2019, January 25). A typical big news story in 2018 lasted about 7 days (until we moved on to the next crisis). Nieman Lab. https://www.niemanlab.org/2019/01/a-typical-big-news-story-in-2018-lasted-about-7-days-until-we-moved-on-to-the-next-crisis/

Shaw, D. (1998, August 5). The pride and perils of fast reporting. Los Angeles Times. https://www.latimes.com/archives/la-xpm-1998-aug-05-mn-10375-story.html

Stafford, T. (2022, February 24). Psychology: Why bad news dominates the headlines. BBC Future. https://www.bbc.com/future/article/20140728-why-is-all-the-news-bad

Trussler, M., & Soroka, S. (2014, March 18). Consumer demand for cynical and negative news frames. Sage Journals. https://journals.sagepub.com/doi/10.1177/1940161214524832?etoc=

/ HYDROPOWER

To aid my understanding of hydropower generation over time and its impact on the environment, these sources detail what hydropower is and what it is capable of. I have used these sources to compare hydropower to other energy modes and determine its overall detriment or benefit to our planet and our way of living. Overall, these sources reinforce each other: hydropower has a lasting impact on biodiversity and is not a viable long-term form of energy. Its overuse of land and its need for dams that block migratory patterns, reproductive behavior, and accessibility for freshwater fish deem it a large threat to biodiversity.

Dorber, M., Arvesen, A., Gernaat, D., & Verones, F. (2020, December 11). Controlling biodiversity impacts of future Global Hydropower Reservoirs by strategic site selection. Nature News. https://www.nature.com/articles/s41598-020-78444-6

Fendt, L. (2021, March 2). Why aren't we looking at more hydropower? MIT Climate Portal. https://climate.mit.edu/ask-mit/why-arent-we-looking-more-hydropowe

Hydropower generation. Our World in Data. (n.d.). https://ourworldindata.org/grapher/hydropower-consumption?tab=chart&time=1970..2022&country=CHN~IND~BRA~USA~SWE~FRA~OWID_WRL

Ritchie, H. (2022, June 16). How does the land use of different electricity sources compare? Our World in Data. https://ourworldindata.org/land-use-per-energy-source

Simpson, D. (2019, January 15). Does hydropower harm biodiversity? CABI. https://www.cabi.org/environmentalimpact/news/65969

Turgeon, K., Turpin, C., & Gregory-Eaves, I. (2019, September). Dams have varying impacts on fish communities. Wiley online library. https://onlinelibrary.wiley.com/doi/epdf/10.1111/ele.13283

Wu, H., Chen, J., Xu, J., Zeng, G., Sang, L., Liu, Q., Yin, Z., Dai, J., Yin, D., Liang, J., & Ye, S. (2019, March 1). Effects of dam construction on Biodiversity: A Review. Journal of Cleaner Production. https://www.sciencedirect.com/science/article/abs/pii/S0959652619306845?via%3Dihub

Zarfl, C., Berlekamp, J., He, F., Jähnig, S. C., Darwall, W., & Tockner, K. (2019, December 6). Future large hydropower dams impact global freshwater megafauna. Nature News. https://www.nature.com/articles/s41598-019-54980-8

/ BIODIVERSITY

Working in tandem with the sources to the left, these sources fill in the gaps about biodiversity that the articles on hydropower do not cover. I needed to understand the specifics of why biodiversity is a negative, even if that seems obvious. These sources gave me a scientific foundation to rely on when considering how to approach the visual aspect of biodiversity loss, and helped me determine which species to focus on. With these sources in mind I decided to focus solely on the biodiversity loss of migratory fish using 1975 as a neutral model.

Gasparatos, A., Doll, C. N. H., Esteban, M., Ahmed, A., & Olang, T. A. (2016, November 25). Renewable energy and biodiversity: Implications for transitioning to a green economy. Renewable and Sustainable Energy Reviews. https://www.sciencedirect.com/science/article/pii/S1364032116304622#s0050

Living planet index. livingplanetindex.org. (2022). https://www.livingplanetindex.org/latest_results

What is the human impact on biodiversity?: Royal Society. What is the human impact on biodiversity? | Royal Society. (n.d.). https://royalsociety.org/topics-policy/projects/biodiversity/human-impact-on-biodiversity/

/ SOLAR POWER

In continuing my search to uncover the hidden issues of the various energy sources, especially the ones generally considered eco-friendly, I used these sources to focus my attention on solar power. They detail the amounts of solar power growth over time, how to create and recycle solar panels, and the effect that poorly handled panels can have on the planet. Equipped with this knowledge, I could begin to craft my argument that each energy source has its positives and negatives. In the case of solar power, I believe these sources were incredibly helpful in bringing to light an issue that most people do not know or consider when switching to this energy.

Crownhart, C. (2021, August 19). Solar panels are a pain to recycle. These companies are trying to fix that. MIT Technology Review. https://www.technologyreview.com/2021/08/19/1032215/solar-panels-recycling/

Environmental impacts of solar power. Union of Concerned Scientists. (2013, March 5). https://www.ucsusa.org/resources/environmental-impacts-solar-power

Heath, G. A., Silverman, T. J., Kempe, M., Deceglie, M., Ravikumar, D., Remo, T., Cui, H., Sinha, P., Libby, C., Shaw, S., Komoto, K., Wambach, K., Butler, E., Barnes, T., & Wade, A. (2020, July 13). Research and development priorities for silicon photovoltaic module recycling to support a circular economy. Nature News. https://www.nature.com/articles/s41560-020-0645-2

Stone, M. (2020, August 22). Solar panels are starting to die, leaving behind toxic trash. Wired. https://www.wired.com/story/solar-panels-are-starting-to-die-leaving-behind-toxic-trash/

/ E-WASTE

Paired with the information on solar power and the importance of recycling solar panels, this information on our growing electronic waste epidemic gives context and weight to the issue. With this information, I provide proof that e-waste is an accumulating problem on the planet and offset the data by twenty years—the lifespan of an average solar panel. These articles detail that a variety of technological materials contribute to e-waste and do not necessarily reference the materials found in solar panels. For this reason, these sources were used to give a broader context on e-waste numbers rather than specific data on what is contributed by solar power.

Chapter 2. (n.d.). https://ewastemonitor.info/wp-content/uploads/2020/10/Chapter_two_GEM_2020_def_july1.pdf

GEM 2020 - E-Waste Monitor. United Nations Institute for Training and Research. (2022, May 23). https://ewastemonitor.info/gem-2020/

Global E-waste reaches record high, says new UN report. TCO Certified. (2022, January 12). https://tcocertified.com/news/global-e-waste-reaches-record-high-says-new-un-report/

Tiseo, I. (2023, February 8). Topic: Electronic waste worldwide. Statista. https://www.statista.com/topics/3409/electronic-waste-worldwide/#topicOverview

/ NATIONAL PARKS

These sources frame my reference of what happens to our national parks and why. Overtourism leads to excessive waste, high amounts of traffic, increasing wildlife disruptions, and other issues that come with too many people in one location. While many of these dangers can be placated by an increase in funding or a cap on the annual amount of visitors, these efforts repeatedly get shot down by the public. While it is understanable that people are fearful of losing access to these beautiful national parks, something needs to be done about the current state of our protected spaces.

Buckley, R. C. (1990, May). (PDF) environmental impacts of tourism and recreation in national Parks ... ResearchGate. https://www.researchgate.net/publication/270511300_Environmental_impacts_of_tourism_and_recreation_in_national_parks_and_conservation_reserves

Photos, hiking, lodging, camping, roads and more. National Parked. (2022, December 2). https://www.nationalparked.com/

Simmonds, C., McGivney, A., Reilly, P., Maffly, B., Wilkinson, T., Canon, G., Wright, M., & Whaley, M. (2018, November 20). Crisis in our national parks: How tourists are loving nature to death. The Guardian. https://www.theguardian.com/environment/2018/nov/20/national-parks-america-overcrowding-crisis-tourism-visitation-solutions

/ DEFORESTATION

These sources on deforestation served as the entire basis for one of the exhibits in the final exhibition. Broken into five stages—where deforestation is happening, which industries contribute the most to deforestation, which countries participate in those industries, how much of the produce leaves the origin country, and which countries are importing the exports of those industries—the information found in these sources cover a broad range of data. I have used these sources for specific numerical data referencing acreage lost to agriculture in the tropics and subtropics in the five stages listed above.

Annual deforestation by region. Our World in Data. (n.d.). https://ourworldindata.org/grapher/commodity-deforestation-by-region

Annual tropical deforestation by agricultural product. Our World in Data. (n.d.). https://ourworldindata.org/grapher/deforestation-by-commodity

Hance, J. (2016, November 6). Beef, palm oil, soy, and wood products from 8 countries responsible for 1/3 of forest destruction. Mongabay Environmental News. https://news.mongabay.com/2014/10/beef-palm-oil-soy-and-wood-products-from-8-countries-responsible-for-13-of-forest-destruction/

Pearce, F., Langlois, J., & Lewis, A. S. (2021, April 15). Most Global Food Brands continue to have a dismal record on beef and deforestation. Yale E360. https://e360.yale.edu/digest/most-global-food-brands-continue-to-have-a-dismal-record-on-beef-and-deforestation

Pendrill, F., Persson, U. M., Godar, J., Kastner, T., Moran, D., Schmidt, S., & Wood, R. (2019, March 20). Agricultural and forestry trade drives large share of tropical deforestation emissions. Global Environmental Change. https://www.sciencedirect.com/science/article/pii/S0959378018314365#fig0010

Persson, M., Henders, S., & Kastner, T. (n.d.). Trading forests: Quantifying the contribution of global commodity. https://www.cgdev.org/sites/default/files/CGD-Climate-Forest-Series-8-persson-et-al-trading-forests_0.pdf

Ritchie, H., & Roser, M. (2021, February 9). Drivers of deforestation. Our World in Data. https://ourworldindata.org/drivers-of-deforestation

The least-studied mammal in Yellowstone is the most abundant: humans.

Dan Wenk
former Yellowstone superintendent

REPOSITORY

But today the pace of visitation has outstripped resources. Much of the National Park Service's infrastructure dates back to the Mission 66, a $1bn initiative undertaken in the 1950s and 60s, and wasn't built with modern crowds in mind. Environmental challenges are burgeoning—recent research has found national parks bear the disproportionate brunt of global warming—and years of wear and tear have seen park maintenance fall woefully behind. The current backlog of necessary upgrades to roads, trails and buildings stands at more than $11bn. Ryan Zinke's attempt to sharply increase entry fees at the busiest parks to pay for repairs proved so unpopular it had to be walked back in April.

Charlotte Simmonds, Annette McGivney, Patrick Reilly, Brian Maffly, Todd Wilkinson, Gabrielle Canon, Michael Wright and Monte Whaley
journalists

Regarding habitat loss, hydropower plants and dams can flood extensive upstream areas, thus fragmenting habitats (e.g. through island creation) and affecting ecosystems and the species they harbor. In some cases they can even disaffect natural reserves.

Alexandros Gasparatos, Christopher N.H. Doll b, Miguel Esteban, Abubakari Ahmed, and Tabitha A. Olang
sustainability scientists

About 8 million metric tons of decommissioned solar panels could accumulate globally by 2030. By 2050, that number could reach 80 million. Recycling these panels could provide a new source for materials that would otherwise need to be mined (potentially under unsafe or exploitative working conditions), making solar a more sustainable piece of the clean-energy puzzle.

Casey Crownhart
climate journalist

A map is not a highway. It is a meadow to wander through, and you are meant to take your time.

Kären Wigen
Stanford professor of cartography

The news cycles for some of the biggest moments of 2018 only lasted for a median of seven days.

Jake O'Neill
journalist

Every year the world loses around 5 million hectares of forest. 95% of this occurs in the tropics. At least three-quarters of this is driven by agriculture—clearing forests to grow crops, raise livestock and produce products such as paper. If we want to tackle deforestation we need to understand two key questions: where we're losing forests, and what activities are driving it. This allows us to target our efforts towards specific industries or countries where they will have the greatest impact.

Hannah Ritchie and Max Roser
data analysts

To walk attentively through a forest, even a damaged one, is to be caught by the abundance of life: ancient and new; underfoot and reaching into the light. But how does one tell the life of the forest?

Anna Lowenhaupt Tsing
author

OF INSIGHT

While there are no global warming emissions associated with generating electricity from solar energy, there are emissions associated with other stages of the solar life-cycle, including manufacturing, transportation, installation, maintenance, and decommissioning and dismantlement.

Union of Concerned Scientists
non-profit organization

A record 53.6 million metric tonnes of e-waste was generated worldwide in 2019, up 21 per cent in just five years, according to the UN's Global E-waste Monitor 2020, released today. The new report also predicts global e-waste—discarded products with a battery or plug—will reach 74 Mt by 2030, almost a doubling of e-waste in just 16 years. This makes e-waste the world's fastest-growing domestic waste stream, fueled mainly by higher consumption rates of electric and electronic equipment, short life cycles, and few options for repair.

Vanessa Forti, Cornelis Peter Baldé, Ruediger Kuehr, and Garam Bel
sustainability journalists

Four commodities produced in just eight countries are responsible for a third of the world's forest loss.

Jeremy Hance
journalist

The main direct cause of biodiversity loss is land use change (primarily for large-scale food production) which drives an estimated 30% of biodiversity decline globally. Second is overexploitation (overfishing, overhunting and overharvesting) for things like food, medicines and timber which drives around 20%. Climate change is the third most significant direct driver of biodiversity loss, which together with pollution accounts for 14%.

The Royal Society
non-profit organization

Make maps you *Love* and are *Passionate* about.

Create as if you are creating for yourself and I think the world will appreciate that the most.

JADE FENSTER
Bellerby & Co. Globemakers
in an email to me at the beginning of this process

REFLECTING ON ADVICE

The sentiment on the previous page became something that I carried with me throughout this entire process. As a designer, creating for yourself—for myself—becomes a bit of a foreign concept. My job is to communicate, and my own perception becomes far less important than the perception of my audience. However, reminding myself often that I care about these maps kept me pushing through the harder times. If I care about these maps, if I care about these issues, someone else will too. I just need to find the right people.

Make maps you are passionate about. Such a simple phrase remained on repeat in my head and became my mantra. It helped me decide what I'm passionate about, and kept me aware of how I was feeling throughout this journey. Every time I doubted my communication, I remembered my intention. When I worried my image making wasn't successful, I asked myself if I was proud of the work. And because the answer was always *Yes, I am proud of this work*, I kept going.

Process

30 Manifesto
33 Physical Creation
47 Final Exhibition
81 Closing Thoughts
83 Colophon

MANIFESTO

/ BE AMAZED BY EVERYTHING
Rejoice in inspiration and do not stifle awe.

/ STAND BEHIND YOUR IDEAS
Be thorough in your research, know what you want to do, and see it through to the end.

/ ALLOW CHANGE
Nothing is permanent until the end, and the road is long and unpredictable.

/ THINK OUTSIDE OF YOURSELF
Remember your audience. Evaluate your work as if you aren't a designer.

/ ACCEPT THAT THINGS TAKE TIME
Efficiency is not always the most important.

/ LET IT HAPPEN
Fall into the right decision, be natural, go with your instinct. Trust your process.

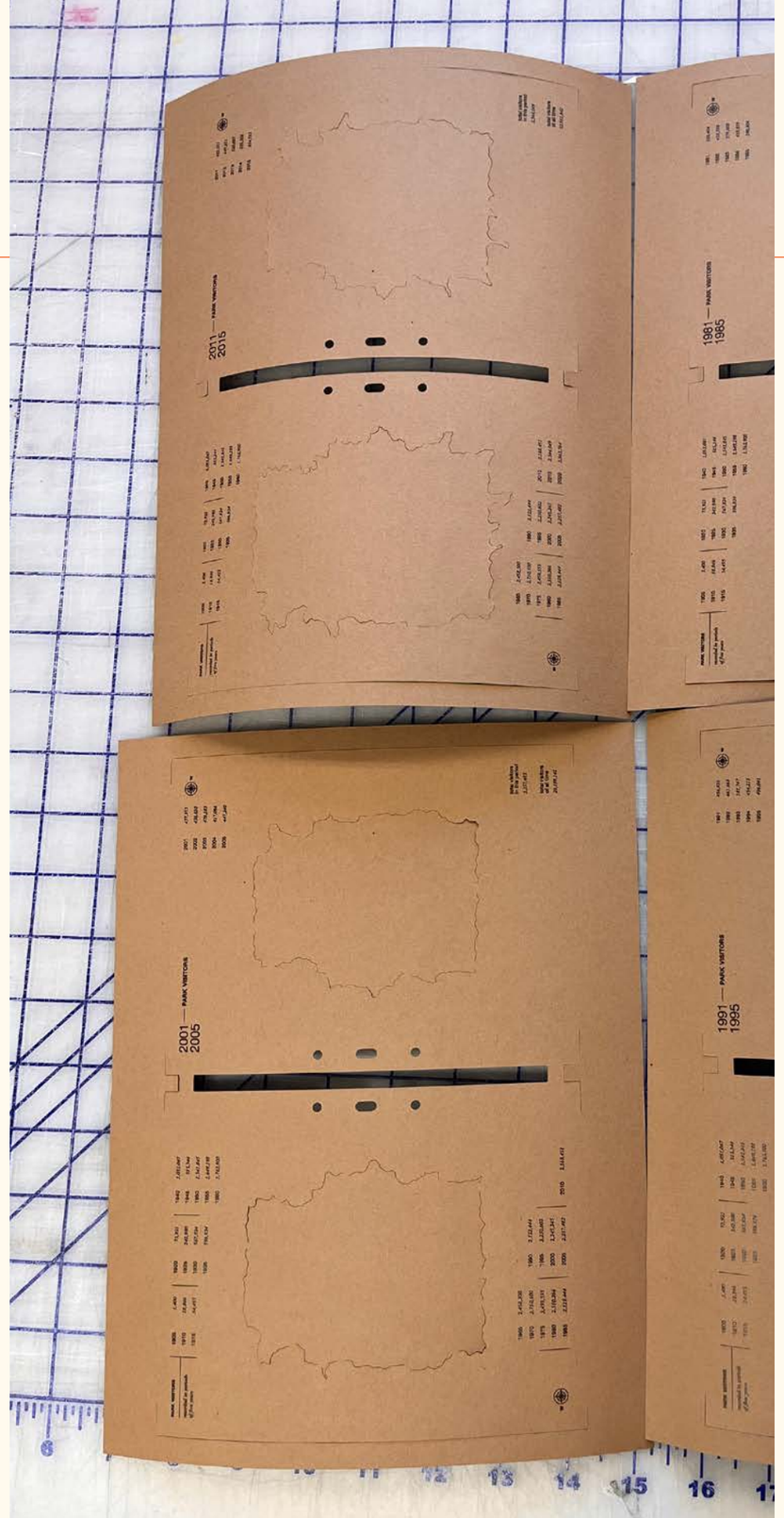
A map is a series of layers.

After completing my research, I began trying to build the artifacts that would be on display in the final exhibition.

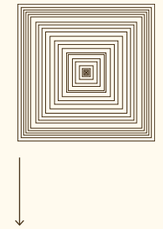
PHYSICAL CREATION

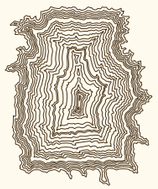
CREATING TOPOGRAPHY

For the national park maps, I began by calculating the total accumulated visitor amounts in periods of five years. I then created a series of concentric squares using that data as the area, and revealed a tree-ring-like pattern of visitation throughout the decades. With this pattern, I drew new topography of five national parks. In this way, the geography is created by the data and not the literal elevation.



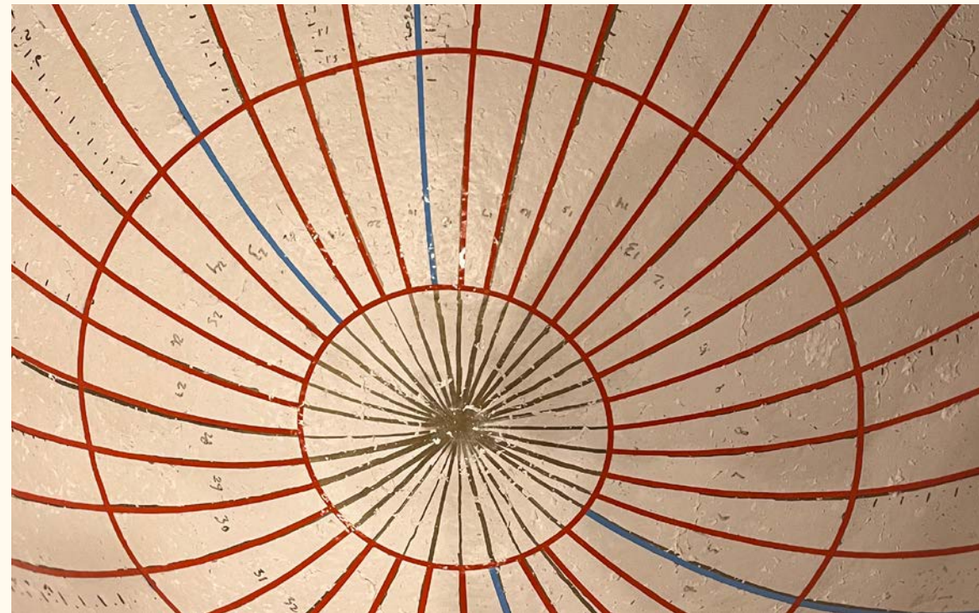
		square root		divide by 100		manufacture area
1905	*1,400*		*37*		*.37*	
1910	*20,246*		*142*		*1.42*	
1915	*54,701*		*234*		*2.34*	
1920	*128,622*		*359*		*3.59*	
1925	*371,602*		*610*		*6.10*	
1930	*939,426*		*969*		*9.69*	
1935	*1,536,360*		*1,239*		*12.39*	
1940	*2,587,427*		*1,609*		*16.09*	
1945	*3,102,771*		*1,761*		*17.61*	
1950	*4,644,616*		*2,155*		*21.55*	
1955	*6,293,814*		*2,509*		*25.09*	
1960	*8,056,714*		*2,838*		*28.38*	
1965	*10,515,014*		*3,243*		*32.43*	
1970	*13,225,114*		*3,637*		*36.37*	
1975	*15,684,669*		*3,960*		*39.60*	
1980	*18,194,935*		*4,266*		*42.66*	
1985	*20,323,369*		*4,508*		*45.08*	
1990	*22,445,813*		*4,738*		*47.38*	
1995	*24,696,415*		*4,970*		*49.70*	
2000	*26,941,660*		*5,191*		*51.91*	
2005	*29,199,142*		*5,404*		*54.04*	
2010	*31,367,593*		*5,601*		*56.01*	
2015	*33,911,642*		*5,823*		*58.23*	
2020	*37,475,406*		*6,122*		*61.22*	

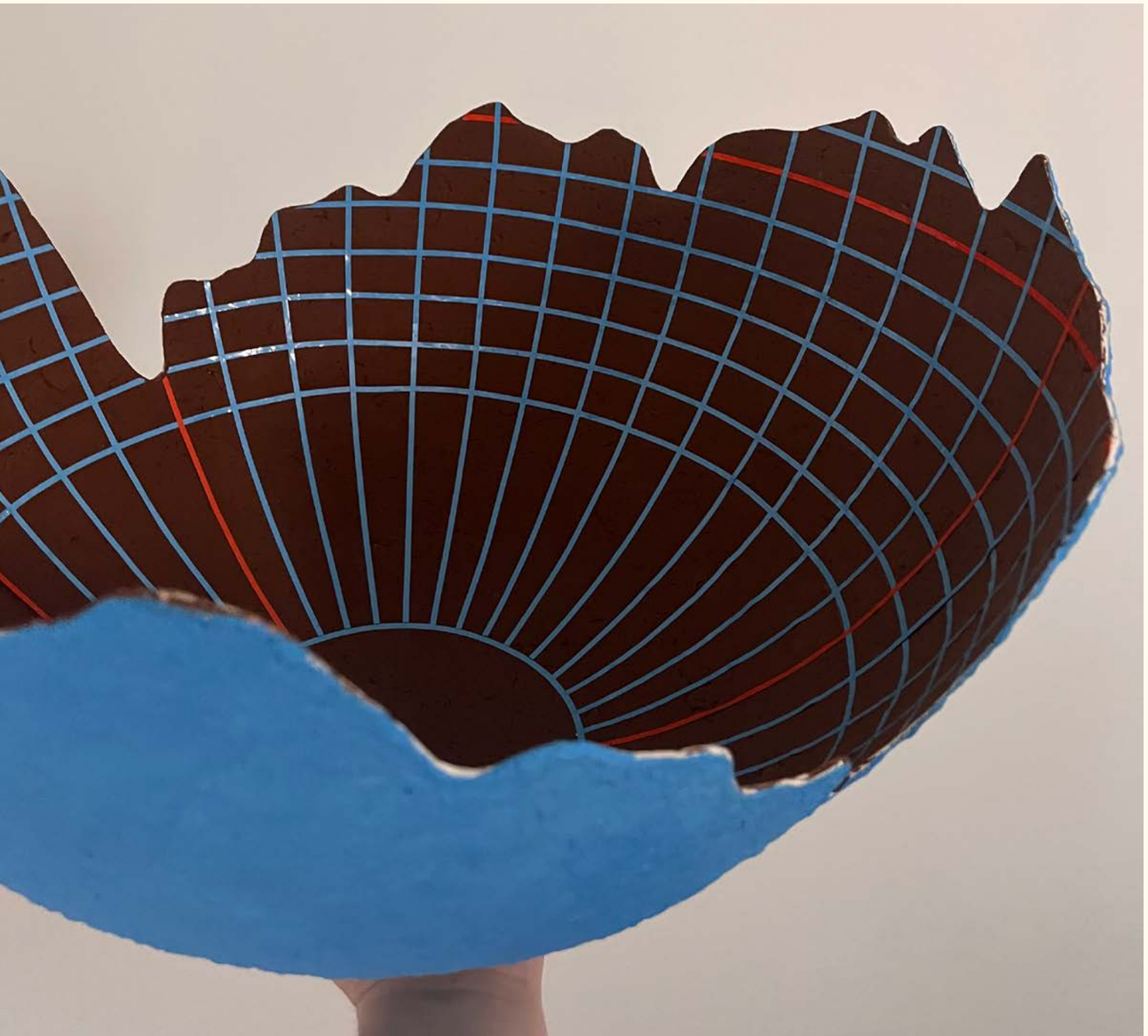




CREATING COORDINATES

Using a balloon and a ribbon, I re-imagined lattitude and logitude lines as the x- and y-axis of a graph. With six hemispheres in total, the graphs represent pairs of energy sources and their respective problems. Fossil fuels contribute to the rising global temperature, hydropower causes biodiversity loss, and solar power can lead to an abundance of e-waste.





TWO
BY TWO

The size of the hemisphere shrinks in relation to the prevalence of the problem that the energy source causes. Fossil fuels represent the biggest issue, and therefore gets the biggest globe. The problems caused by solar power, on the other hand, are quite manageable and are represented by the smallest globe.

CREATING ELEVATION

For the maps depicting deforestation, I explored more obvious means of 3D creation. Analyzing the data in a dimensional way by calculating surface area and volume, I determined how tall each wire structure should be and how it should work with the size of the island to equal the right amount.

/ IMPACT OF SOY

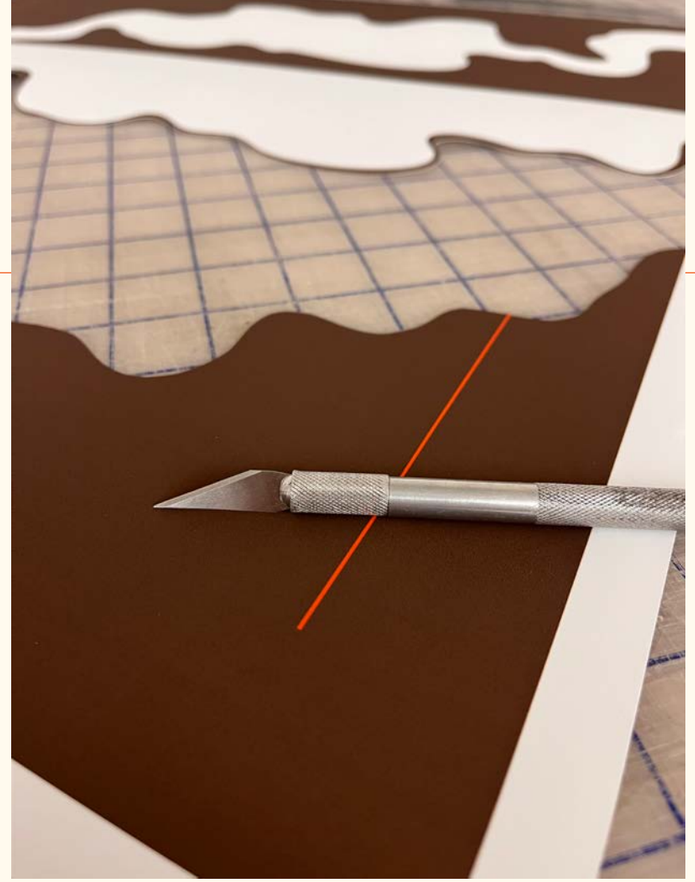
gross deforestation
in Mha over ten years

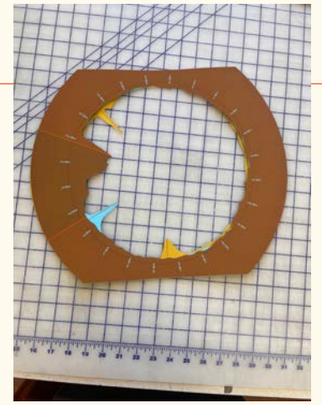
		surface area		divide by 6		multiply by 10		square root	
Brazil	2.73	→	11.72	→	1.95	→	19.5	→	4.42
Argentina	2.35		10.61		1.77		17.7		4.21
Bolivia	0.66		4.55		0.76		7.6		2.76
Paraguay	0.62		4.36		0.73		7.3		2.70

/ IMPACT OF PALM

gross deforestation
in Mha over ten years

		surface area		divide by 6		multiply by 10		square root	
Indonesia	2.67	→	11.55	→	1.93	→	19.3	→	4.39
Malaysia	1.27		7.04		1.17		11.7		3.42
PNG	0.04		0.70		0.12		1.2		1.10






APRIL
17–28
THIS Map
IS A


Map
Tunnel


THIS
IS A
Map
Tunnel


MADE IN U.S.A.
Map
Tunnel
THIS
IS A
Map
Tunnel

Progress becomes reality.

When the final artifacts were finished,
it was time to open the exhibition.

FINAL EXHIBITION

Senior Thesis Exhibition
Designed by Raelyn Wrasse

BFA Graphic Design
San José State University

An intersection of cartography and environmentalism

This Map is a Tunnel

Art Building 214

Art Building
Room 214

APRIL
17–28

8AM–6PM
Mon–Fri

An intersection of cartography and environmentalism

This is not about geography

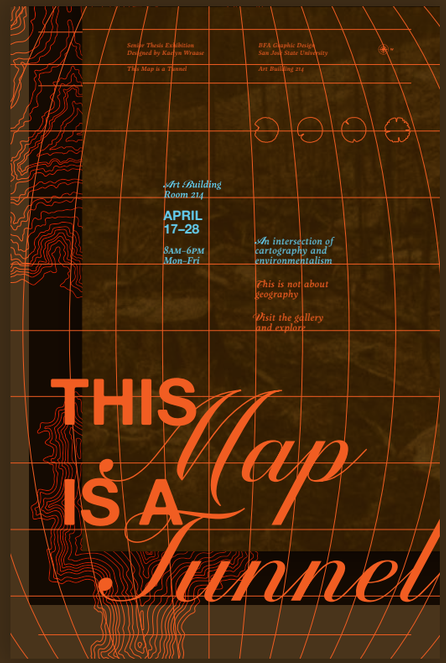
What is it about cartography that elicits the joy of wanderlust, and can it be harnessed to bring interest to overlooked data?

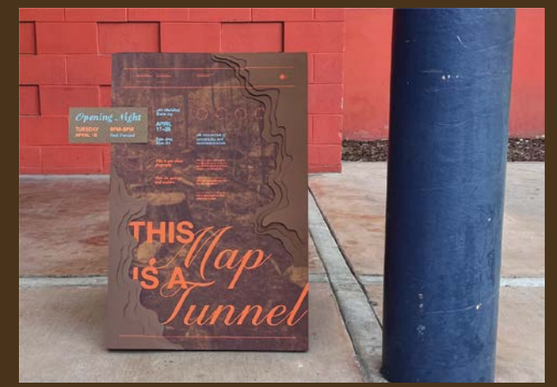
Visit the gallery and explore

Which types of visual data can globes and maps represent other than the geographical?

How can physical cartography be used to allow people to travel within a set of data?

THIS *Map* IS A *Tunnel*

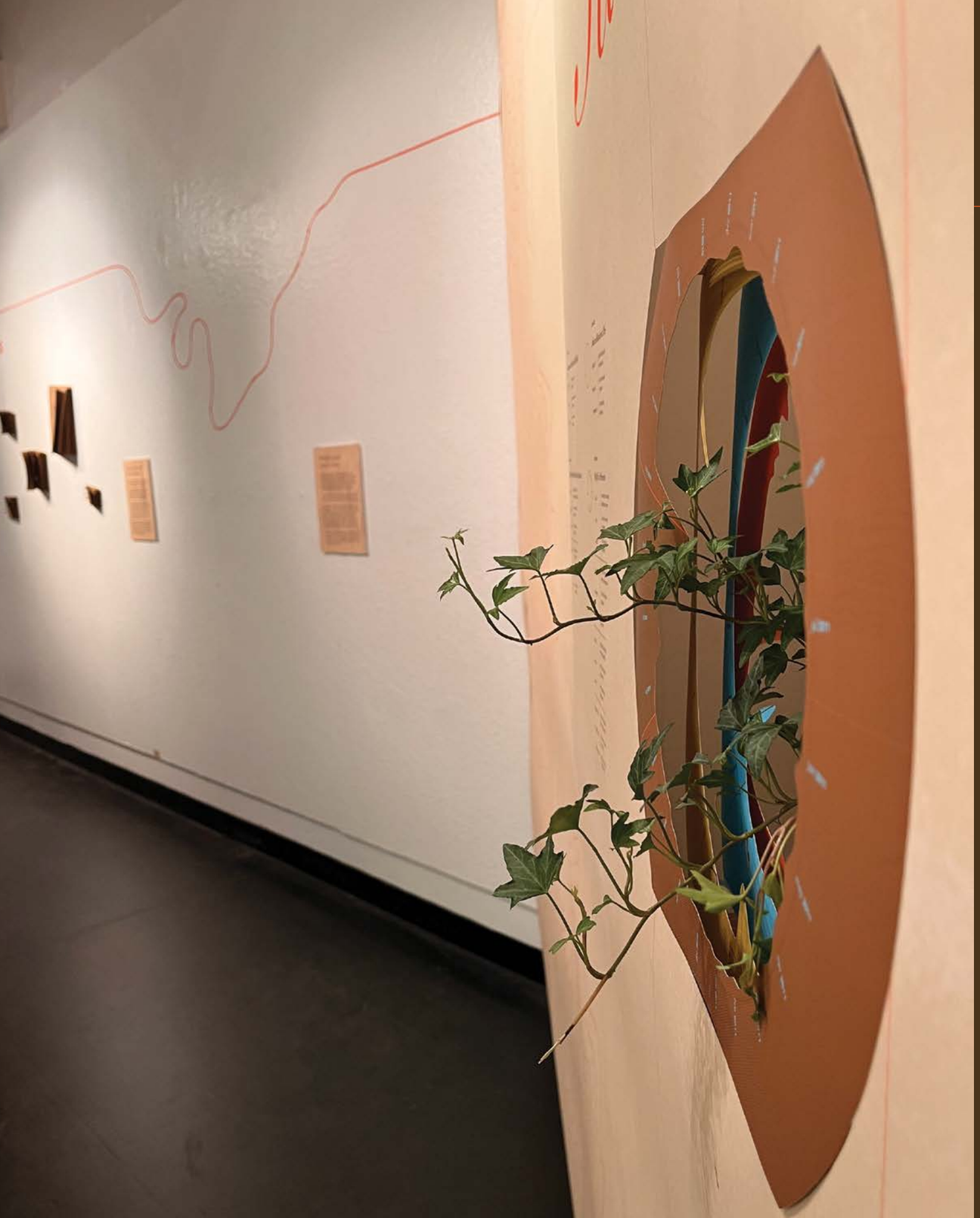




THIS Map IS A Tunnel

THIS *Map* IS A *Tunnel*

This is not about geography.



This is not about geography.

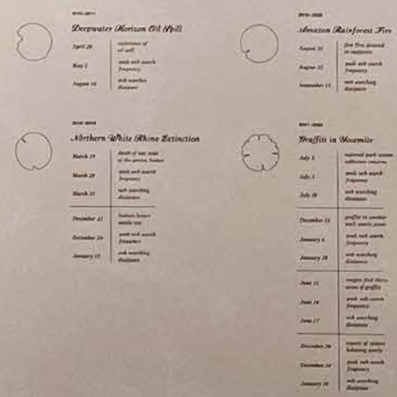
Maps have always been composed of both their function and their storytelling. The earliest cartographers were just as dedicated to the accuracy of their designs as they were to the implicit meaning hidden in the frames, naming conventions, and illustrations that gave the map its character: the extra details have always been as important as the physical data in imbuing a sense of the space that they represent. There is emotion in every map because they are made to make us feel, to make us look a little closer, to make us wander. They position us in the world and ask us to question what we actually know about it.

Is there a way, then, to strip out the existing data and leave the emotion? Can we apply it to information that isn't geographic, and that requires the attention and nuance that a map commands?

There is a deep inherent relationship between cartography and the environment, as mapping a space requires a respect for that space. Each of the exhibits featured here create new geography based on real environmental data in an attempt to highlight issues from a new immersive persepctive. This is not about geography. This is about using a map as a vehicle for communicating something else, and trying to bring the intricate details of an issue to the surface.

Every map is a transportive tunnel, with layers of meaning to explore. Does it matter if the space is literal?

THIS IS A *Map Tunnel*



This is not about geography.

Maps have always been composed of both their function and their storytelling. The earliest cartographers were just as dedicated to the accuracy of their designs as they were to the implicit meaning hidden in the frames, naming conventions, and illustrations that gave the map its character: the extra details have always been as important as the physical data in imbuing a sense of the space that they represent. There is emotion in every map because they are made to make us feel, to make us look a little closer, to make us wander. They position us in the world and ask us to question what we actually know about it.

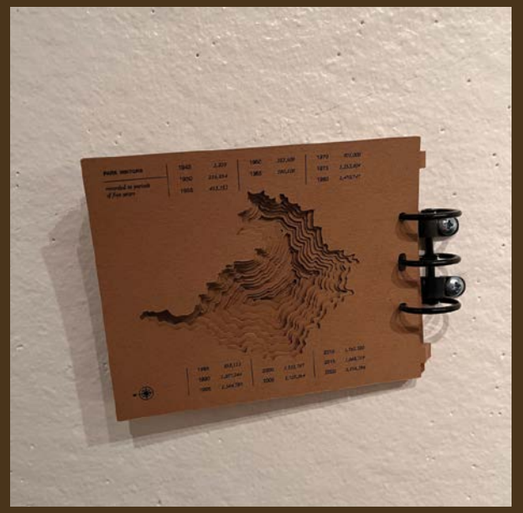
Is there a way, then, to strip out the existing data and leave the emotion? Can we apply it to information that isn't geographic, and that requires the attention and nuance that a map commands?

There is a deep inherent relationship between cartography and the environment, as mapping a space requires a respect for that space. Each of the exhibits featured here create new geography based on real environmental data in an attempt to highlight issues from a new immersive perspective. This is not about geography. This is about using a map as a vehicle for communicating something else, and trying to bring the intricate details of an issue to the surface.

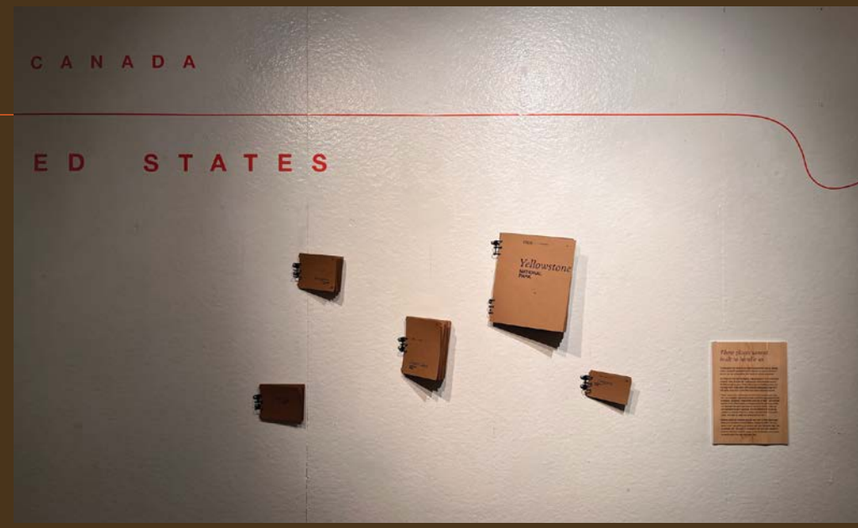
Every map is a transportive tunnel, with layers of meaning to explore. Does it matter if the space is literal?

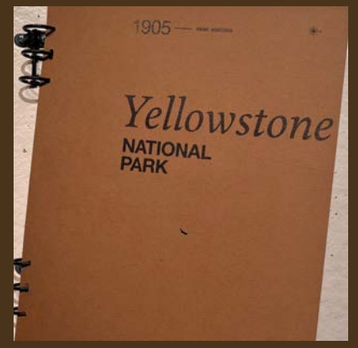

Voyageurs
NATIONAL
PARK


Big Bend
NATIONAL
PARK
1945 — PARK VISITORS




1955 — PARK VISITORS
Congaree
NATIONAL
PARK


CANADA
ED STATES
Yellowstone
NATIONAL
PARK


1905 — PARK VISITORS
Yellowstone
NATIONAL
PARK


1905 — PARK VISITORS
Crater Lake
NATIONAL
PARK

PARK VISITORS							
recorded in periods of five years	1905	1,400	1920	73,921	1940	1,051,067
	1910	18,846	1925	242,980	1945	515,344
	1915	34,455	1930	567,824	1950	1,541,845
			1935	596,934	1955	1,649,198
					1960	1,762,900

1965	2,458,300
1970	2,710,100
1975	2,459,555

1976 — PARK VISITORS
1980

1976	532,700
1977	558,300
1978	553,374
1979	410,749
1980	455,143

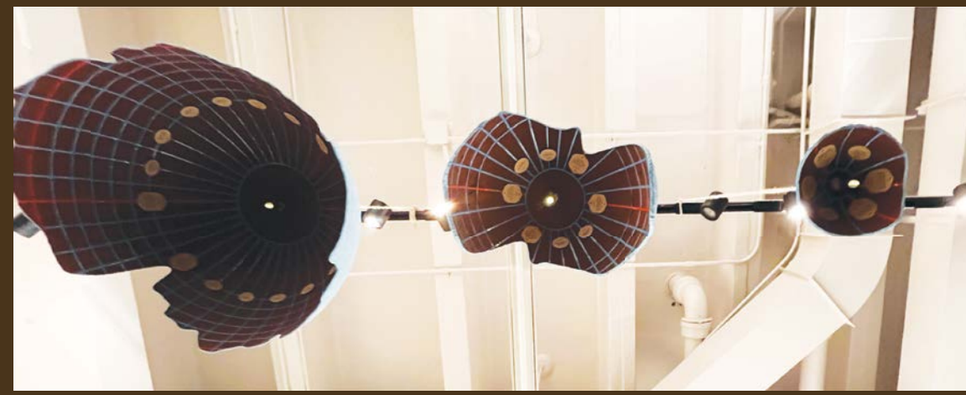
W

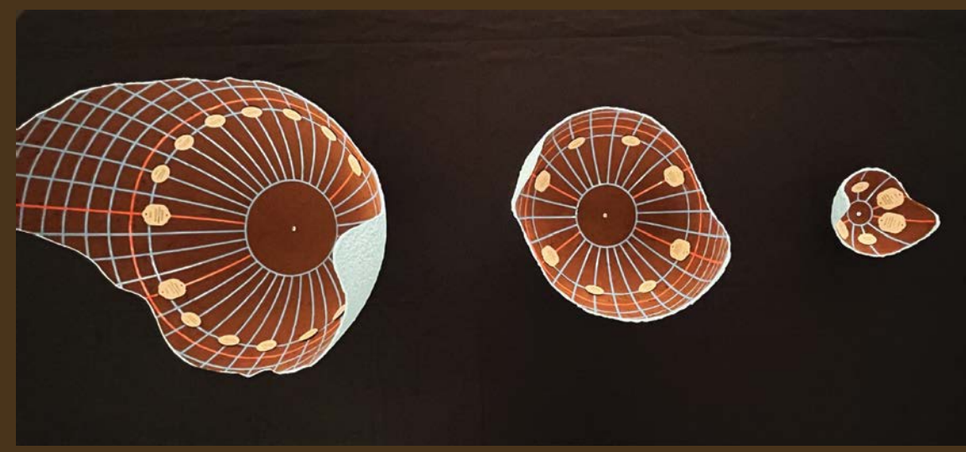
total visitors
in this period
2,510,266

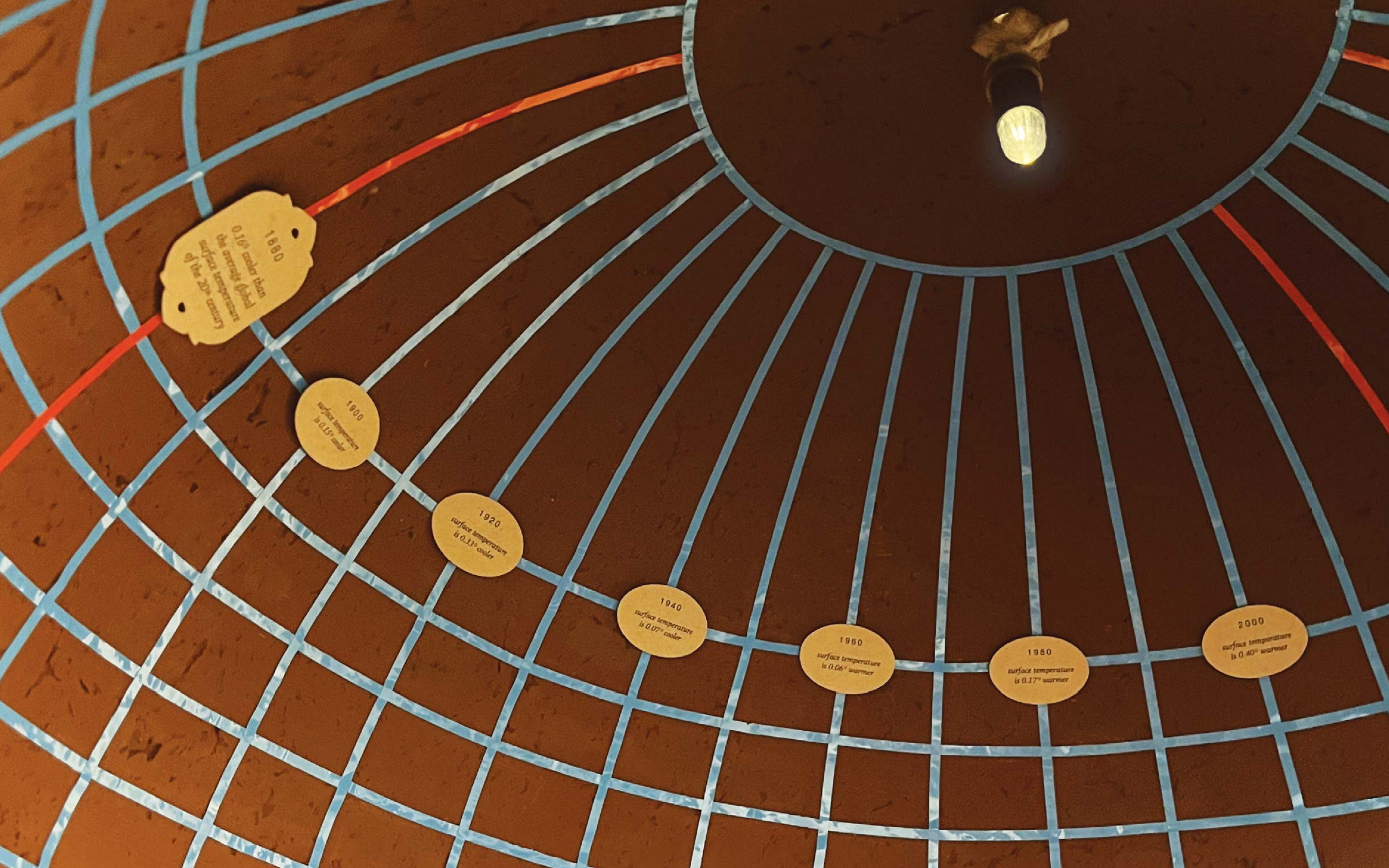
total visitors
of all time
18,194,935


THIS Map
IS A Tunnel


CANADA
UNITED STAT






1880
0.16° cooler than
the average global
surface temperature
of the 20th century
1900
surface temperature
is 0.15° cooler
1920
surface temperature
is 0.13° cooler
1940
surface temperature
is 0.07° cooler
1960
surface temperature
is 0.06° warmer
1980
surface temperature
is 0.17° warmer
2000
surface temperature
is 0.40° warmer

1880

853,869,363 tons of CO_2 emissions by fossil fuels

1900

1,952,208,040 tons of CO_2 emissions

1920

3,518,566,396 tons of CO_2 emissions

1940

4,819,999,340 tons of CO_2 emissions

1960

9,113,528,960 tons of CO_2 emissions


Regions that Suffer from the Highest Rates of Deforestation
BRAZIL
4,200,791
Tropics
acres of deforestation in one year in tropical and subtropical areas
ASIA AND THE PACIFIC
EXCLUDING INDIA AND INDONESIA
1,433,211
MEXICO
247,105
INDONESIA
1,779,359
AFRICA
2,223,948
AMERICAS
EXCLUDING BRAZIL AND MEXICO
2,644,028
INDIA
172,974
TROPICS
4,200,791 deforested acres in Brazil
1,779,359 deforested acres in Indonesia
172,974 deforested acres in India
2,644,028 deforested acres in the Americas
1,433,211 deforested acres in Asia and the Pacific
2,223,948 deforested acres in Africa
247,105 deforested acres in Mexico
1 PLATE ONE

Agriculture

acres of deforestation in one year due to the cultivation of goods

Industries that Lead to the Highest Rates of Deforestation

AGRICULTURE

5,213,924 deforested acres due to cattle farming

2,349,006 deforested acres due to oilseed farming

1,677,213 deforested acres due to logging

1,101,848 deforested acres due to cereal farming

937,150 deforested acres due to fruit and vegetable farming

711,332 deforested acres due to rice farming

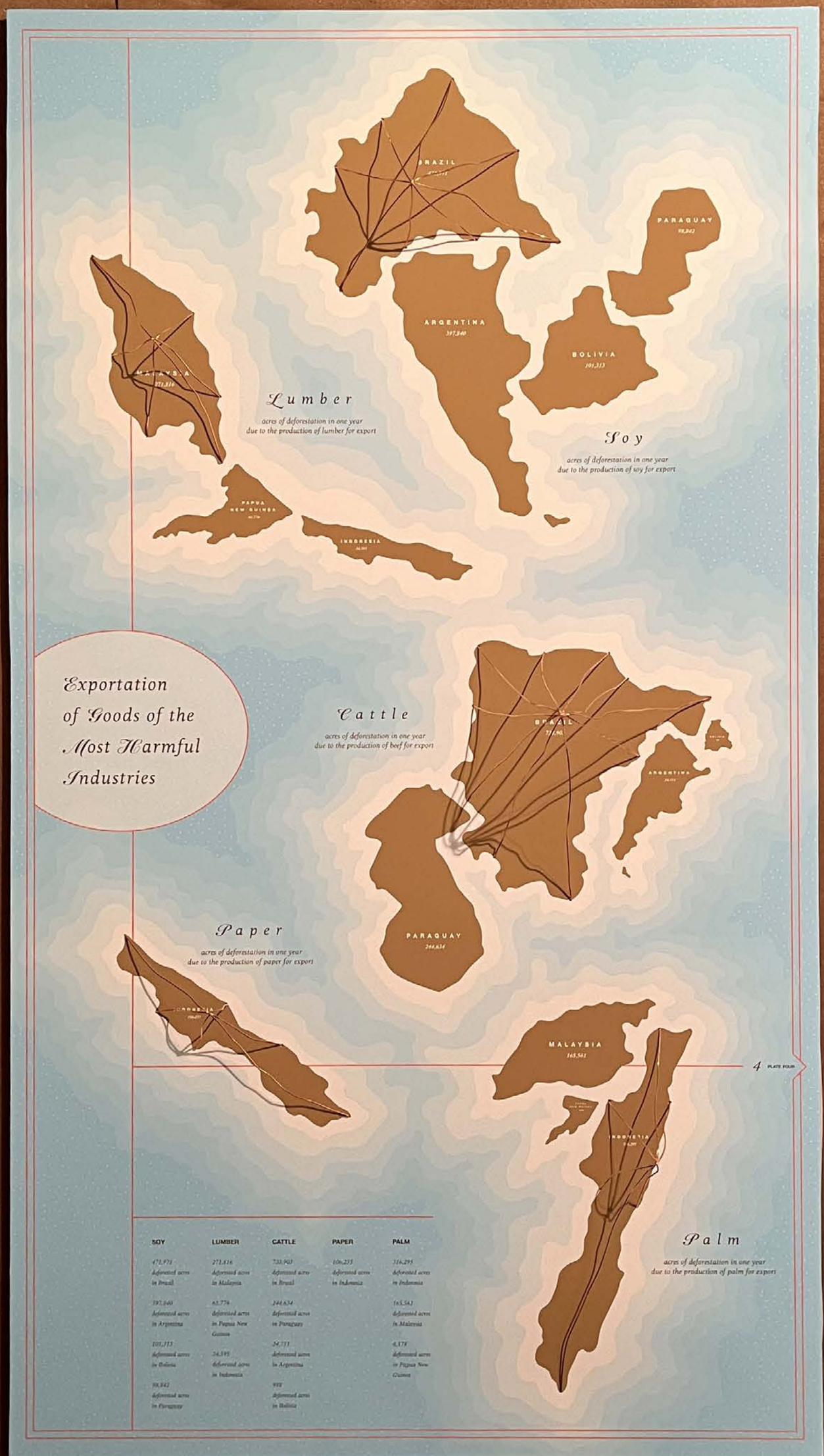
454,723 deforested acres due to farming other crops

142,817 deforested acres due to sugarcane farming

131,411 deforested acres due to wheat farming

62,510 deforested acres due to farming plant fibers

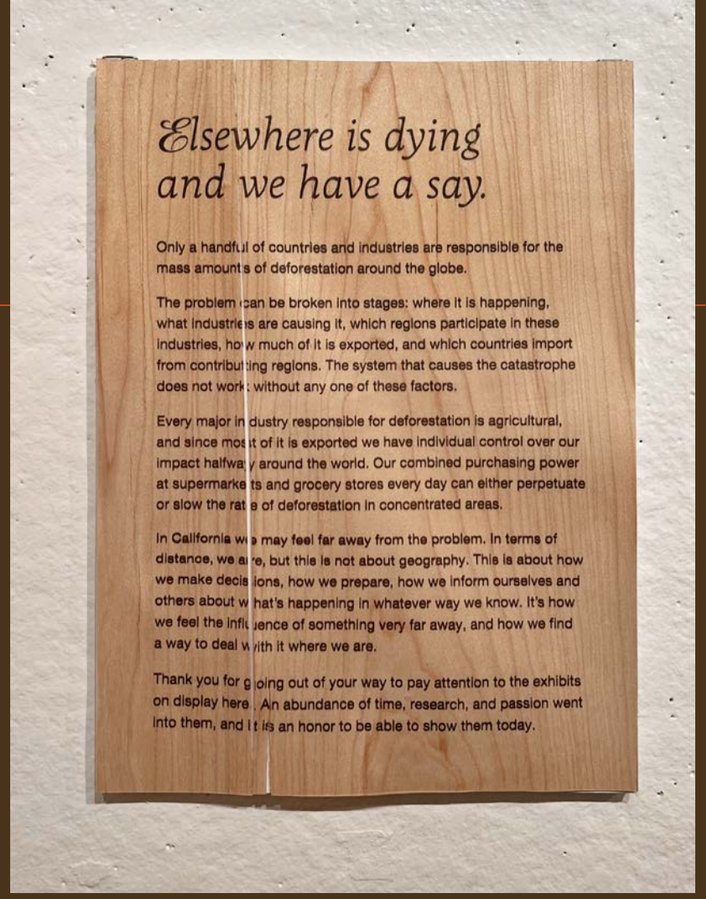
PALM	CATTLE	SOY	LUMBER	PAPER
6,397,733 deforested acres in Indonesia	55,598,710 deforested acres in Brazil	6,745,976 deforested acres in Brazil	3,978,396 deforested acres in Indonesia	2,421,632 deforested acres in Indonesia
3,338,218 deforested acres in Malaysia	5,040,949 deforested acres in Paraguay	5,806,976 deforested acres in Argentina	2,668,738 deforested acres in Malaysia	
9,884 deforested acres in Papua New Guinea	2,866,422 deforested acres in Bolivia	1,630,895 deforested acres in Bolivia	1,336,684 deforested acres in Papua New Guinea	
	1,853,290 deforested acres in Argentina	3,532,051 deforested acres in Paraguay		

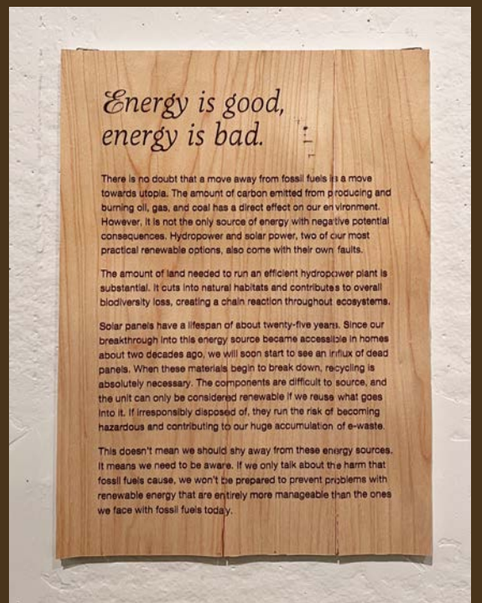


SOY	LUMBER	CATTLE	PAPER	PALM
473,971 deforested acres in Brazil	271,816 deforested acres in Malaysia	723,903 deforested acres in Brazil	106,235 deforested acres in Indonesia	316,295 deforested acres in Indonesia
397,840 deforested acres in Argentina	65,776 deforested acres in Papua New Guinea	244,634 deforested acres in Paraguay		165,561 deforested acres in Malaysia
101,313 deforested acres in Bolivia	24,595 deforested acres in Indonesia	34,711 deforested acres in Argentina		6,378 deforested acres in Papua New Guinea
99,842 deforested acres in Paraguay		988 deforested acres in Bolivia		


Countries with Demand for the Most Harmful Industries
Global
acres of deforestation in one year in other regions driven by importing goods
ITALY
87,250
RUSSIA
178,655
SOUTH KOREA
99,398
EGYPT
101,407
UNITED STATES
169,089
CHINA
667,614
BRAZIL
93,332
INDIA
273,479
JAPAN
190,956
GERMANY
91,340
5 PLATE FIVE
GLOBAL
667,614 deforested acres due to imports by China
178,655 deforested acres due to imports by Russia
99,398 deforested acres due to imports by South Korea
87,250 deforested acres due to imports by Italy
273,479 deforested acres due to imports by India
169,089 deforested acres due to imports by the United States
93,332 deforested acres due to imports by Brazil
190,956 deforested acres due to imports by Japan
101,407 deforested acres due to imports by Egypt
91,340 deforested acres due to imports by Germany


TATES
THIS Map IS A Tunnel





CLOSING THOUGHTS

Through the process of researching, building, mapmaking, and exploring, I've learned a lot about myself and our planet. Firstly, that I can accomplish hard things. This was not a smooth journey. More things went wrong than right, I had to reevaluate my plan every few days, and it was hard staying on top of four physical projects at once. But the end result has been one of the most fulfilling of my work in this program. I was able to learn about our environment while trying to educate others, and was opened up to a host of experiences and conversations that I never would have had otherwise.

It is wonderful to discover that a whole world orbits around something I have been quietly interested in for so long.

Updated as of May 2023.

Typefaces

Maecenas
Designed by Michał Jarociński
for Capitalics

Adobe Caslon
Designed by Carol Twombly
for Adobe Originals

Inglesa Script
Designed by Alejandro Paul
for Sudtipos

Special gratitude to my advisors

Connie Hwang
Professor, Graphic Design
San José State University

Joe Miller
Professor, Graphic Design
San José State University

Kären Wigen
Professor, Cartography
Stanford University

And to my teammates

Renee Edelman, Sasina Eunirankul, Ying Gao, Grace Kusuma, Richa Marathe, Eilaria Maryousef, Aram Mortazavi, Thy Ngyuen, Paula Piva, Ranelle Santiago, Maivi Tran, Sabrina Tran, Jazmine Walker, Nicole Wei, and Polina Zabrodska