

# designing for **shared ecological understanding** planet-centered communication through interactive & information design

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THESIS

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DAVIS

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## abstract

*How can design help people better understand ecological systems they already live beside?*

Ecological understanding is shaped not just by scientific research but by also the tools and media through which that research is communicated. For most people the current mediums of communication remain out of reach, often buried in paywalled academic research and journals. These barriers make current ecological research misunderstood and often invisible. This thesis investigates how interactive and information design can make local ecological systems more accessible, participatory, and emotionally resonant for public audiences by using the Yolo Basin as a central case study. The Yolo Basin is a 59,000 acre seasonal floodplain three miles from Davis, that functions simultaneously as flood infrastructure, agricultural land, and a critical migratory bird habitat and path for the Pacific Flyway. Drawing from site observations and visits, spatial and seasonal mapping, photography, environmental data collection, and a literature review spanning across design methodology and floodplain systems, this research outputs into a multidisciplinary and multimedia project around three key systems at the basin: flood, flight, and food. The project uses a planet-centered design framework that treats local ecological systems as primary presences rather than a background context. The outputs include an interactive website, risograph posters, hand embroidered aerial maps, a physical exhibition, and a series of literature review zines. No single medium can communicate the complexity of this living landscape, and the multimedia approach with this project demonstrates that. This thesis contributes to the emerging discourses of planet-centered design, arguing that interactive and information design can foster ecological awareness, participatory engagement, and emotional connection to places we live near and within.

**keywords:** information design, interactive design, ecological design, planet-centered design, data visualizations, floodplain, migratory habitat, pacific flyway, environmental communication, Yolo Basin, wildlife reserves, citizen science



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# 1. introduction

The Yolo Basin is a floodplain site that sits three miles from Davis, California. It is visible from Interstate 80 (I-80) to anyone driving between Davis and Sacramento. Most people have passed by it hundreds of times without stopping to look at the landscape. At first glance it looks like just wetlands, flat and easy to overlook, however the Yolo Basin is one of the most ecologically and infrastructurally active landscapes in the Central Valley. Every winter it is intentionally flooded to protect the backyards of Sacramento and Davis residents from overflowing in the Sacramento River. When these lands evolve and it becomes flooded due to winter rains it becomes an important habitat for hundreds of thousands of birds migrating through the Pacific Flyway to stop over. When the floods recede as the warmer summer months come then the land shifts to agricultural land, growing a large portion of the California Valley's rice crops. This is a cycle that has been repeating continuously without fail since 1917. The basin is flood infrastructure, a wildlife habitat, and agricultural land all at the same time and it requires one another to survive as a system. Each season at the basin is an identity. What makes the basin significant however is unfortunately invisible to the people who live closest to it.

Much of the current in-depth research is conducted at UC Davis by skilled teams of scientists who publish their findings in the mediums (usually though scientific literature and pay-walled academic journals) they already know, this however only reaches an audience of like minded individuals who probably already know about the basin and its importance. This thesis takes on the position that design has an important role to play in that gap. Rather than using design for crisis messaging and urgency we can use design to bring curiosity and storytelling to create an emotional connection that comes from understanding a place on its own terms. Terminology to refer to this specific landsite will be called the "Yolo Basin" or shortened to "the basin". My usage of the term within this thesis of the "Yolo Bypass" (also known as the Yolo Bypass Wildlife Area) refers to a subsection of the basin owned by the Yolo Basin Foundation that is accessible to the public.

## 1.1. research questions and motivation

I grew up just 15 minutes away from the Yolo Basin, and had no idea that it existed for over twenty years! This project stems from my personal experience of discovering the space and learning about the gap between proximity and awareness. If you have known about this site for a while and have visited the basin

then I am incredibly jealous! However I know that this gap is not unique to just me, in fact many Davis and Sacramento residents pass by the basin on their daily commutes or have seen the landscape without having even visited it. Many do not know what it does, what lives there and what it would mean to lose this space. The currently existing communication spaces about the basin rely on research papers, agency reports, occasional interpretive signs, and is largely inaccessible to non-expert audiences, and is rarely designed to generate emotional connection or a sense of stewardship to the land. Work that does touch into this space of citizen communication relies on the work of foundations like the Yolo Basin Foundation and appeals mainly to bird watchers and bat enthusiasts, however these groups of people often already know about how incredible the space is. I found myself in the space where none of this information reached me, as someone who does not consider themselves a birder, bat fan, and scientist. I highly misunderstood the space when I passed by on the causeway.

This thesis asks: **how can interactive and information design make ecological systems more visible, understandable, and emotionally resonant for public audiences?** More specifically, I want to explore what happens when design treats an ecological system not as a subject to be explained but as the primary presence to be experienced and how to use design mediums that already reach people where they spend their time, rather than expecting them to seek out scientific information on their own. The Yolo Basin is used as a central case study for this thesis that could be applied to other natural and reserved land sites.

## 1.2. design research contributions

The aim of this thesis is to make three primary contributions to the fields of design and the natural sciences. The first is its aim to further develop and apply a planet-centered design framework within environmental communication and extend the current discourse on the currently more popular design method of human-centered design towards a practice that centers ecological systems as the primary subject rather than as a backdrop. The second is to demonstrate that a multi-modal design strategy is effective for public ecological communication. These methods can be within interactive digital media, print, textiles, and even physical exhibitions, as no single medium is sufficient enough to reach a full range of audiences who live besides landscapes like the Yolo Basin. The third, and final contribution, is to produce a body of design work that is grounded in field research done from a personal explorative approach. These bodies of work come

from seven site visits, spatial and seasonal mapping, environmental data collection spanning from 2018-2025, and material sourced in collaboration with the UC Davis Map Archive Room, UC Davis Archives and Special Collections, and the UC Davis Museum of Wildlife and Fish Biology. Together all three of these contribution goals would offer a replicable, but also customizable, model for other conservation organizations and designers working within this intersection of ecological research and public communication. This model prioritizes curiosity and connection over urgency, and place-based understanding over abstract data.

## 2. related works

There is a great deal of research and projects that inspired this project in the following areas: citizen science and ecological communication, interactive and information design, and planet-centered and ethical design frameworks. Together these bodies of work helped establish an intellectual foundation for a unique practice of my own that treats design as a tool for making ecological systems visible, participatory, and emotionally resonant to general audiences. As an approach to gaining an understanding through literature, I created my literature review as a series of zines, one for each book read. Most literature reviews hide away educational knowledge behind barriers of entry which I find to be the wrong way to increase literacy in fields like ecology, design communication, and history. Below in this section you will find a small written documentation of my literature review however I do encourage readers to check out the series literature review zines I made through [zahrabaxi.com/thelitreviewproject](http://zahrabaxi.com/thelitreviewproject) <sup>7</sup>.



the series of twenty literature review zines



a selection of a couple zines from the series

Each zine dives into the topics of the book as well as my personal thoughts and interpretation. You can read each of them through the gallery in the website or download and print them on your own by following the folding instructions on the site. This is my current approach to making academic literacy more accessible, approachable, interactive, and engaging to public audiences.

## 2.1. citizen science and ecological communication

Mary Ellen Hannibal's *Citizen Scientist* (2016) argues that meaningful ecological protection and connection depends on heavy collaboration between trained researchers and everyday people who can bring in their local knowledge, time, care, and perspective into the work.<sup>1</sup> The framing that Hannibal introduces is foundational in this thesis, the Yolo Basin is heavily researched and monitored through government data collection and UC Davis scientific researchers however it remains largely invisible to Davis and Sacramento residents who pass by the site daily. Callaghan et al. (2022) further extend this argument through their study of the crowdsourcing platform iNaturalist, which demonstrates how non-expert observation when properly structured and verified can bring meaningful contribution to scientific datasets.<sup>2</sup> Vance-Chalcraft et al. (2024) talk about a similar case within education settings showing that citizen science initiatives like USE Cit Sci can open up conservation discussions within students across

<sup>1</sup> Hannibal, M. E. (2016). *Citizen scientist: Searching for Heroes and Hope in an Age of Extinction*. The Experiment.

<sup>2</sup> Callaghan, C. T., et al. (2022). The benefits of contributing to the citizen science platform iNaturalist as an identifier. *PLOS Biology*, 20(11), e3001843. <https://doi.org/10.1371/journal.pbio.3001843>



disciplines who may otherwise never engage within ecological fieldwork.<sup>3</sup> The book *Braiding Sweetgrass* (2013) by Robin Wall Kimmerer offers a different yet complementary perspective that draws from Indigenous botanical knowledge to argue that ecological knowledge and understanding is inseparable from emotional relationships and reciprocity for the land around us.<sup>4</sup> Reciprocity is a mode of knowing that scientific publications themselves cannot alone transmit and requires a more hands on and tactile form of communication to learn and understand. *Beloved Beasts* (2021) by Michelle Nijhuis covers similar topics from a more historical perspective on conservation with human storytelling, showing that the species and landscapes we protect are those we have learned to care about, not just having studied.<sup>5</sup> Together these sources all argue that ecological literacy is not only a matter of access to information but also about connection to a space, that connection requires communication strategies that go further beyond scientific paper spaces.

## 2.2. interactive and information design

In this thesis there is the constant question of how to translate complex data into accessible and emotionally engaging experiences, and the answer is in rich information design. Edward Tufte's *The Visual Display of Quantitative Information* (1983) looks at the core principles of clarity, precision, and eliminating visual noise in data presentations.<sup>6</sup> *Dear Data* (2016) by Giorgia Lupi and Stefanie Posavec looks in a different direction through personal observational data that can be rendered as hand-drawn artifacts that invite emotional engagement.<sup>7</sup> *Information is Beautiful* (2009) by David McCandless further extends both *Dear Data* and Tufte's work into public facing work that shows how visual design can make larger more complex datasets legible and compelling to non-expert audiences.<sup>8</sup> *This Is a Picture of Wind* (2018) is a project case study that also directly shaped this work where it takes the poetry work of J.R. Carpenter layered with meteorological data

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<sup>3</sup> Vance-Chalcraft, H. D., et al. (2024). Bringing global ecological research to undergraduate students through citizen science. *The Bulletin of the Ecological Society of America*, 105(3), e02169. <https://doi.org/10.1002/bes2.2169>

<sup>4</sup> Kimmerer, R. W. (2013). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge, and the teachings of plants*. Milkweed Editions.

<sup>5</sup> Nijhuis, M. (2021). *Beloved beasts: Fighting for life in an age of extinction*. W. W. Norton & Company.

<sup>6</sup> Tufte, E. R. (1983). *The visual display of quantitative information*. Graphics Press.

<sup>7</sup> Lupi, G., & Posavec, S. (2016). *Dear data*. Princeton Architectural Press.

<sup>8</sup> McCandless, D. (2009). *Information is beautiful*. Collins.

and maps.<sup>9</sup> This work is made using HTML, CSS, and JS which are all web design coding languages which inspired me to add another dimension to the project to allow people to access my work in different mediums and times. Citizen science platforms like eBird, iNaturalist, and more specifically Xeno-Canto (2005), a site where users can upload bird sound recording which get turned into spectrograms (meaning visualized audio which are graphed based on time and pitch) were instrumental in showing me how platforms like these can demonstrate how ecological data can become participatory but also have multiple use cases for researchers but also designers by using uploaded content by attributing the work and following creative commons licensing.<sup>10</sup> I researched a lot about these platforms and ended up using eBird and Xeno-Canto within my own work to visualize data. While my project does not go into board game territory, I was also inspired by the game *Wingspan* (2019) which is beloved by many birders and families. It is yet again another approach showing how ecological data, specifically ornithological data about hundreds of species, can be embedded into an interactive format that can create genuine curiosity and recall.

## 2.3. planet-centered and ethical design frameworks

The design methodology itself within this thesis draws mostly from the works of Victor Papanek and Donna Haraway through looking at how design has ethical obligations to address ecological and social needs rather than serving commercial interests, a key point in planet-centered design frameworks.<sup>11</sup> More specifically with Haraway's work from *Staying with the Trouble* (2016) the main argument is that designers, scientists, and citizens must learn to think and act in relation with other species and systems rather than positioning humans and the central subjects of concern.<sup>12</sup> This thesis takes this argument seriously, positioning the Yolo Basin as not a background or a resource to be managed but instead as a primary presence whose seasonal cycles, ecological relationships, and infrastructural roles are the key subjects for design work. When considering which outputs this thesis should produce, Sasha Costanza-Chock's *Design Justice* (2020) helped me think about the different communities to engage with, thus why

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<sup>9</sup> Carpenter, J. R. (2018). *This is a picture of wind*. Penned in the Margins.  
<https://thisisapictureofwind.com>

<sup>10</sup> Vieillot, B., & Planqué, R. (2005). *Xeno-canto: Sharing bird sounds from around the world* [Digital Platform]. <https://xeno-canto.org>

<sup>11</sup> Papanek, V. (1972). *Design for the real world: Human ecology and social change*. Pantheon Books.

<sup>12</sup> Haraway, D. J. (2016). *Staying with the trouble: Making kin with the Chthulucene*. Duke University Press.

I went in a multimedia route. Costanza-Chock's book addresses the community dimension, that design for public audiences must look at who is included and excluded in both the process and outputs.<sup>13</sup> For the case of this thesis a website may be more engaging and accessible for some while the same might be true for a museum exhibit instead.

### 3. the yolo basin



the yolo basin, photo taken on fujifilm x-t3

The Yolo Basin is a 59,000 acre seasonal floodplain located between Davis and Sacramento, in California.<sup>14</sup> It is visible and most popularly known from Interstate 80 to anyone who has made the drive between the two cities. Most people have passed by it hundreds of times without stopping. At this site there are many distinct zones such as the Yolo Bypass Wildlife Area, the Fremont Weir Wildlife Area, and thousands of acres of privately owned farm land. The Yolo Bypass is an engineered floodway in this area that is the heart of the basin. The bypass stretches 41 miles and is managed between state and federal agencies, private land owners, and conservation organizations including the Yolo Basin Foundation. The foundation was established in 1990 to advocate for the wetlands and support public education about the site; they also host multiple very popular bat tours around the summer months.<sup>15</sup> Despite these infrastructures and institutional

<sup>13</sup> Costanza-Chock, S. (2020). *Design Justice: Community-led practices to build the worlds we need*. MIT Press.

<sup>14</sup> Sacramento Area Flood Control Agency. (n.d.). Sacramento Weir and bypass. Retrieved June 2026, from <https://www.safca.org/projects/sacramento-weir-and-bypass/>

<sup>15</sup> Yolo Basin Foundation. (n.d.). The Yolo Bypass Wildlife Area. Retrieved June 2026, from <https://yolobasin.org/ybwa/>



presences, the basin remains largely unknown to the general public, including many long-term Davis and Sacramento residents.

### 3.1. timeline

The current form of the Yolo Basin is a product of over 170 years of overlapping decisions on water, land, and infrastructure. Below follows a timeline of key events that have shaped the basin we know today.

In 1851, the town of Fremont which was the first county seat of Yolo County in 1850 was flooded and ended up being largely abandoned.<sup>16</sup> This resulted in outcomes with the land we know today where the town no longer sits but now hosts the Fremont Weir Wildlife Area to allow intentional flooding. This big flood in 1851, along with the Great flood of 1862 which inundated the entire Central Valley prompted several conversations about regional flood management.<sup>17</sup> The 1862 event was the largest flood in California's recorded history, submerging the Sacramento Valley under water for weeks, and displaced more than thousands of residents. Coordinated legislative action did not follow until 1911 when the California Flood Control Act was established for a large-scale intervention, nearly fifty years later<sup>18</sup>. This delay was in part by competing land ownership interests, the cost of building a large-scale infrastructure, and ongoing debate over which jurisdictions would hold responsibility for flood control.<sup>19</sup> Construction on the Sacramento River Flood Control Project began shortly after the Flood Control Act was established.<sup>20</sup> The Yolo Causeway, the elevated roadway of the I-80, opened on March 18th 1916 stretching 3.1 miles.<sup>21</sup> The opening of the causeway was celebrated with a four day event.<sup>22</sup> The Sacramento River Flood Control Project was formally completed in 1917 which marked the beginning of the Yolo Bypass as

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<sup>16</sup> Noehill California. (n.d.). Historic sites and points of interest in Yolo County. Retrieved June 2026, from <https://noehill.com/yolo/>

<sup>17</sup> NOAA Physical Sciences Laboratory. (n.d.). Recreating the Great California Flood of 1862. Retrieved June 2026, from [https://psl.noaa.gov/data/20thC\\_Rean/CA\\_flood\\_1861-1862/](https://psl.noaa.gov/data/20thC_Rean/CA_flood_1861-1862/)

<sup>18</sup> NOAA Physical Sciences Laboratory. (n.d.). Recreating the Great California Flood of 1862. Retrieved June 2026, from [https://psl.noaa.gov/data/20thC\\_Rean/CA\\_flood\\_1861-1862/](https://psl.noaa.gov/data/20thC_Rean/CA_flood_1861-1862/)

<sup>19</sup> Kelley, R. (1989). *Battling the inland sea: Floods, public policy, and the Sacramento Valley*. University of California Press.

<sup>20</sup> Sacramento Area Flood Control Agency. (n.d.). Sacramento Weir and bypass. Retrieved June 2026, from <https://www.safca.org/projects/sacramento-weir-and-bypass/>

<sup>21</sup> Yolo Basin Foundation. (n.d.). Story Map. Retrieved June 2026, from <https://yolobasin.org/story-map/>

<sup>22</sup> Yolo Basin Foundation. (n.d.). Story Map. Retrieved June 2026, from <https://yolobasin.org/story-map/>

a designed floodway system to divert overflow from the Sacramento River away from the city.<sup>23</sup>

In the 1980s and 1990s the function of the basin shifted from flood infrastructure and farmland to a land site where its ecological value was beginning to be recognized. In 1949 the Sacramento Christmas Bird Count had been established making the basin a significant site but it was not until 1990 that the Yolo Basin Foundation was founded to advocate formally for wetland conservation.<sup>24</sup> In 1991 the U.S. House approved funding for the Yolo Basin Wetlands Project which led to the opening of the Wildlife Area in 1997.<sup>25</sup> The Nigiri Project, launched in 2011 through collaborations with UC Davis and the Department of Water Resources showed that these flooded fields could sustain rice crops and serve as a salmon habitat which reframed the relationship of the site between agriculture and ecology.<sup>26</sup> The most recent project as of writing this thesis paper is the Big Notch Project completed in 2025 which aims at restoring salmonid habitats and adding a fish passage through the Yolo Bypass.<sup>27</sup> While so much has been happening on this land it still remains largely invisible to the public driving past the I-80 causeway.

### 3.2. the three systems

The Yolo Basin operates through three key interconnected systems that overlap across seasons and share the same land. This thesis organizes the research and its design outputs around the three systems: **flood, flight, and food** - these three because together they capture the full complexity of what the basin does and why it matters.

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<sup>23</sup> Yolo Basin Foundation. (n.d.). Story Map. Retrieved June 2026, from <https://yolobasin.org/story-map/>

<sup>24</sup> UC Davis Archives and Special Collections, Yolo Basin Foundation Records, D-611.

<sup>25</sup> UC Davis Archives and Special Collections, Yolo Basin Foundation Records, D-611.

<sup>26</sup> UC Davis Center for Watershed Sciences. (n.d.). Nigiri Project: Growing rice and salmon on a floodway. Retrieved June 2026, from <https://watershed.ucdavis.edu/project/nigiri-project-growing-rice-and-salmon-floodway>

<sup>27</sup> California Department of Water Resources. (2025, November 21). DWR launches operations at Big Notch Project, expanding critical salmon habitat. Retrieved June 2026, from <https://water.ca.gov/News/News-Releases/2025/Nov-25/DWR-Launches-Operations-at-Big-Notch-Project>



flood, flight, and food diagram

**Flood** centers on the basin's primary function as a seasonal floodplain that occurs every winter when the Sacramento rises beyond its banks. That water is diverted through the Fremont Weir into the Yolo Bypass. **Flight** focuses on the basin's critical role as a habitat along the Pacific Flyway, the major north to south migratory corridor that runs along the western coast of North America. There are over 200 bird species that use the basin annually peaking around winter during the flooding as the shallow water creates ideal foraging conditions for waterfowl, wading birds and shorebirds.<sup>28</sup> **Food** focuses on the basin's agricultural function in primarily rice production. This landscape of agriculture is dominant in the late spring through the harvesting season in autumn. Yolo County is one of California's major rice producing regions. These three systems do not operate in sequence but instead in constant overlaps. These fields hold floodwater in January, grow rice in July, and feed birds all year. To understand the basin means understanding how these three systems depend on and enable one another.

## 4. design strategy and process

This project looks at design through a planet-centered framework. This framework is a mode of practice that treats ecological systems as primary presences rather than background context or resources to be managed. Human-centered design, the more popular form of design today popularized by groups such as IDEO, asks who the user is and what they need. Planet-centered design asks what the ecosystem is doing and how design can make that visible and meaningful to the humans who share it. This shift in orientation is necessary for this thesis, the Yolo Basin is not a problem to be solved or a cause that needs to be advocated for as it

<sup>28</sup> Yolo Basin Foundation. (n.d.). Yolo Bypass Wildlife Area. Retrieved June 2026, from <https://yolobasin.org/ybwa/>



This thesis follows a research through design methodology, where design is a form of inquiry. Field observation was the primary research method within this. Seven site visits were conducted between January through May 2026. I documented the basin through multiple recording technologies: a Canon EOS Elan 35mm camera with Fuji Film 200 film, a Fuji Film Mirrorless Digital XT3 camera, a Polaroid Onstep 600, and a FujiFilm Discovery 35mm with Portra 400 film. Analog film produces images that are a bit more material, and time based that digital photography can often flatten. The digital Fuji Film camera used in this thesis also acts as a film camera but has video capture capabilities as well and shoots in high resolution. Field notes are written on each visit to document conditions, species observed, sounds, weather, and personal observations about the land, especially from someone without ecological training. Sites visited include the Levee Road main entrance, the Tule Trail within the Yolo Bypass Wildlife Area, the Yolo Bypass Wildlife Area Auto Tour, The Davis Wetlands, and the UC Davis Museum of Wildlife and Fish Biology. Spatial and seasonal mapping was also completed to understand the space's flood patterns and shifts in land use. These were based on aerial photography sourced from Google Earth and the UC Davis Library Map Room. Archival research was also conducted at the UC Davis Archives and Special Collections on historical material from the Yolo Basin Foundation.

## 5. outputs

This thesis produces five main design outputs, each of which address different audiences, contexts, and modes of engagement with the Yolo Basin. Together these form a multi-modal communication system that centers the three systems of flood, flight, and food.

### 5.1. interactive website

The interactive website, Floodplain Futures ([floodplainfutures.github.io](https://floodplainfutures.github.io) ↗) is the most data dense output from this project and is the primary digital presence. This site is built from scratch in Visual Studio code using HTML, CSS, and JavaScript and is hosted for free and version controlled using GitHub Pages. It is freely accessible without logins, paywalls, or institutional affiliations. HTML structures content, CSS controls visual presentation, and JavaScript handles interactivity. All three of these web development coding languages are foundational and are used on every website we interact with. I chose to build from scratch rather than using



a website builder like Webflow or Squarespace. Website builders impose templates, structure, and visual design logics that often feel generic. These builders do allow for "accessibility" in a way, you can make a website without learning how to code, however there is the typical catch of needing to pay to display the website on the web. Creating from scratch allowed for displaying my idealized website for free with zero limitations. In fact, learning how to code can be accessible with incredible tools like W3Schools and Mozilla that offer tutorials for free to teach you the basics. Coding a website from scratch meant every layout decisions, animation, and interaction was made intentionally and for this specific landscape and for these specific datasets. This website is designed to be an output that can reach anyone, anywhere, at any time. A visitor does not need to be in Davis or at the Manetti Shrem Museum where the kiosk is located.



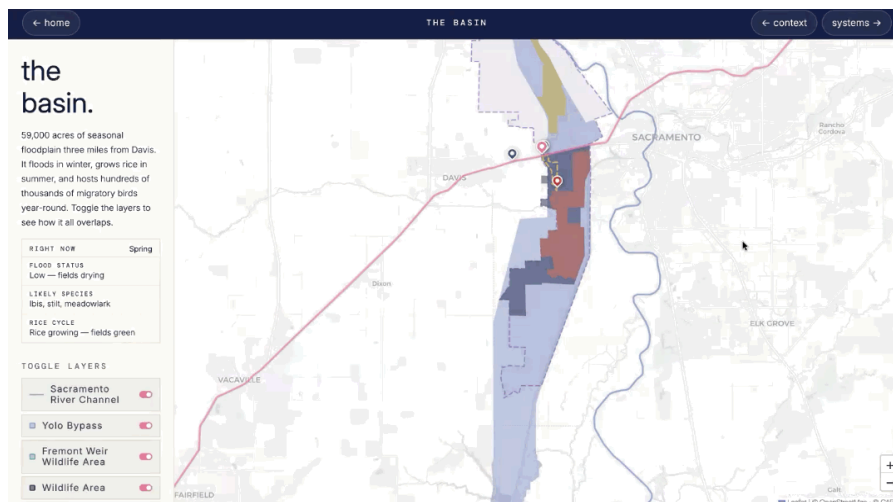
screenshot of the website's home page



website kiosk at the shrem museum



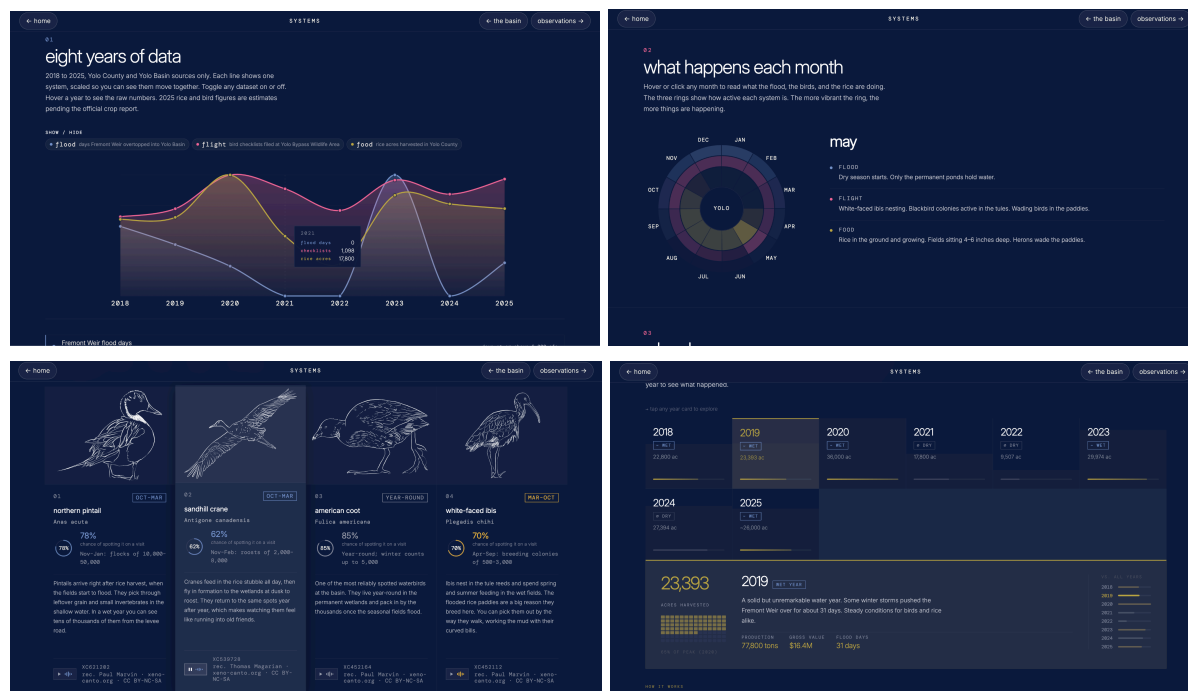
The website is organized into four sections: context, the basin, systems, and observations. The context page provides background information to people unable to visit the museum and who want to learn about my thought process on why I chose the Yolo Basin as my landsite of preference. The Basin section centers on an interactive map that is built from spatial data gathered from Google Earth Engines to find layers based on historical data, ArchGIS for layers based on government data, QGIS an open source mapping software for compiling all layers together, GeoJSON to map out coordinates for polygon layers, and Leaflet an interactive JavaScript map to hold all the layers together and allow for usability. Visitors can toggle between geographic layers such as the Sacramento River Channel, the Yolo Bypass boundary, and the Fremont Weir Wildlife Area. A panel on the side allows for users to learn about real time updates such as flooding conditions, likely bird species and the rice cycle stage.



website screenshot of the map (those with gif access will see the map in its interactive state)

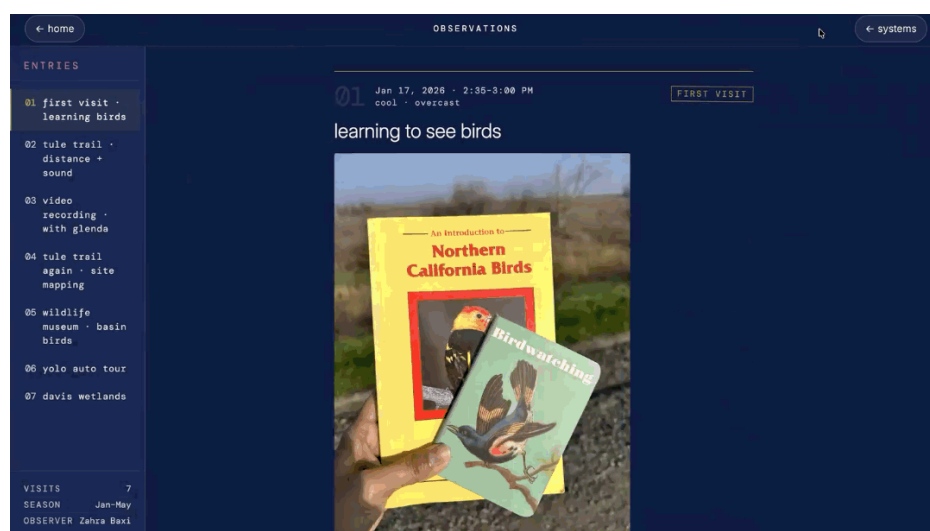
The systems section of the website is data heavy but also highly interactive for visitors to get a chance to understand deeper how the space of flood, flight, and food layers depend on one another. It contains four interactive visualizations. The first is eight years of data based flood, flight, and food from 2018 to 2025. The second is on what happens each month, a radial diagram is organized by month to show the activity levels of each system broken down and is averaged based on the data from the first chart. The third is based on who shows up based on 10 popular bird species that are found at the basin. This chart has illustrations I made of each bird, eBird data on how often this bird is found, information about the species, and audio sourced from xeno-canto. The fourth and final visualization is

focused on agricultural data sets based on water levels and how much rice is produced from that year.



website screenshots of the systems data page

The observations section is a field journal documenting my seven site visits made during this project with photographs, written notes, and weather conditions. To me it is the most personal section as it records my non-expert learning on the landscape. It especially forces the learning curves within the space.



website screenshot of the observations page (those with gif access will see the observations page being scrolled by a user)

Making a website at this full scale was originally a big learning curve however ended up being incredibly rewarding. I really had to sit and understand how to work with data in a creative way. Typically when working with maps and data there are several java script libraries that can ease the process of coding however I really wanted full customization with my project and learn how to work without libraries for myself. Creating code from scratch without libraries and without templates really allows for a different layer of data interpretation and interactivity within the web that I would have not experienced if I relied on outside resources for code.

## 5.2. risograph poster series

The risograph poster series consists of three tabloid posters each addressing the basin's three systems of flood, flight, and food. These posters were printed in emerald green and fluorescent pink on the Risograph at the UC Climate Action Arts Network at UC Davis. Black ink was added on top from the UC Davis Design department's printer.

The risograph machine was first introduced by the Riso Kagaku Corporation in Japan during the 1980s as a low-cost, high volume duplicator for spaces like offices and schools.<sup>29</sup> It was gradually adopted by independent publishers, zine makers, and activists because of its low per-print cost and because it uses soy-based inks making it more environmentally friendly than standard offset printing. Each color in a risograph print is run through the machine separately, you load in one ink drum at a time rather than a standard printer having four inks at one time blending together.<sup>30</sup> Because it runs through the machine separately, each layer rarely aligns perfectly, a quality we call misregistration however has become one of its most highly defining visual characteristics that is embraced and enjoyed within the riso community.

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<sup>29</sup> Riso Kagaku Corporation. (n.d.). Side story. Retrieved June 2026, from <https://www.riso.co.jp/english/company/history/sidestory.html>

<sup>30</sup> RISOTTO Studio. (n.d.). What is risograph printing? Retrieved June 2026, from <https://risottostudio.com/pages/what-is-risograph-printing>



poster series at the shrem museum

Each poster works as a set but also independently. The flood poster is titled *Some Places Flood So Others Don't* and shows an aerial view of the I-80 causeway crossing a flooded state of the basin. It depicts how human infrastructures cut through the ecological infrastructure of the floodplain and allows for thought on why the land functions the way it does. The flight poster is titled *Migration Depends on Places Like These* and shows birds in flight over the patchwork like geometry of the basin's field and focuses on the role of the basin for the Pacific Flyway. The food poster called *This Land Feeds the Valley* shows figures biking on the edge of a rice field showing that this same place that hosts flood and flight also grows our largest rice crop productions and that we often interact within this space without even knowing just like the highway showing up in the first two posters.



poster series to take home at the shrem museum



The choice to use risograph posters was chosen due to the accessibility, reproducibility and quality that risograph machines allow for. Each print is unique as it may have slightly imprecise registration, ink coloration, and texture which sets them apart from commercial printing. Working with these unique features was incredibly fun to learn and embrace in the printing process. Designing with text to deal with registration issue was at first the most difficult process of the design process as I wanted text to be readable and the QR code to be readable, using the black ink on top allowed for text to be readable even if the pink and green have a bigger misregistration issue. I'd love to continue exploring using risograph machines for graphic design, exploring different types of paper, inks, and content.

### 5.3. embroidered aerial maps

There are three embroidered hoops which were created for this thesis which translate aerial maps of a part of the Yolo Bypass Wildlife Area into textiles. They render the basin in three seasonal stages: summer in agriculture, winter in flood, and autumn during its transition state. These were based off of three Google Earth images found over the three seasons and together the hoops show a seasonal sequence of the same location of green fields, blue floodwater, and gold harvests. It communicates the basin's looping transformation across the year through color and texture over data and text.



the three embroidery hoops, lush green, flooded, and agricultural

Embroidery has a long history as a medium associated with women's labor and domestic space, a categorization that has both constrained it as a design practice and preserved it. For centuries it was one of the few art forms women were allowed to practice, which also meant it was systematically excluded from the realm of "fine arts".<sup>31</sup> In today's world of art and design contemporary textile artists have reclaimed this history as part of the medium's meaning and use embroidery to comment on labor, attention, and gendered politics of making. The work of artists like Victoria Rose Richards, whose embroidered maps I encountered in *Uppercase* magazine, was a direct influence on this series.<sup>32</sup> The work of Richard's helped me understand that embroidery could be both cartographic, personal, and emotional. I also wanted to work with embroidery because of the realization that not everyone connects with data visualization or interactive media. The basin's landscape is also a physical and material quality, texture from tule reeds, seeing the surface of flooded fields, geometry from rice paddies when looking above, this is all something a screen cannot fully convey. Using embroidery made the geography tactile and it also took a lot of time, each hoop required many hours of slow attentive work which mirrored the same way one needs to observe the basin in order to understand it.

## 5.4. the exhibit

At the physical exhibit at the Manetti Shrem for the MFA Arts and Humanities Graduate Exhibition open for the class of 2026 from June 4th to June 20th contained the website in a kiosk format with a keyboard, mouse, and touch screen accessible format, the risograph posters on display and to take home, the embroidery hoops and 20 of my literature view zines on display. Also included was a bulletin board made in collaboration with groups such as UC Davis Museum of Wildlife and Fish Biology, UC Davis Library Map Room, and UC Davis Archives & Special Collections for photos, maps, postcards, and other material to ground the site to users. These show the birds commonly seen at the basin, site locations I visited, history on the basin and archive material from the Yolo Basin Foundation.

The bulletin board format was a deliberate design method. Using the pinned surface to organize archival material and photographs allows for ongoing inquiry rather than finished conclusions. The space functions like a researcher's wall or

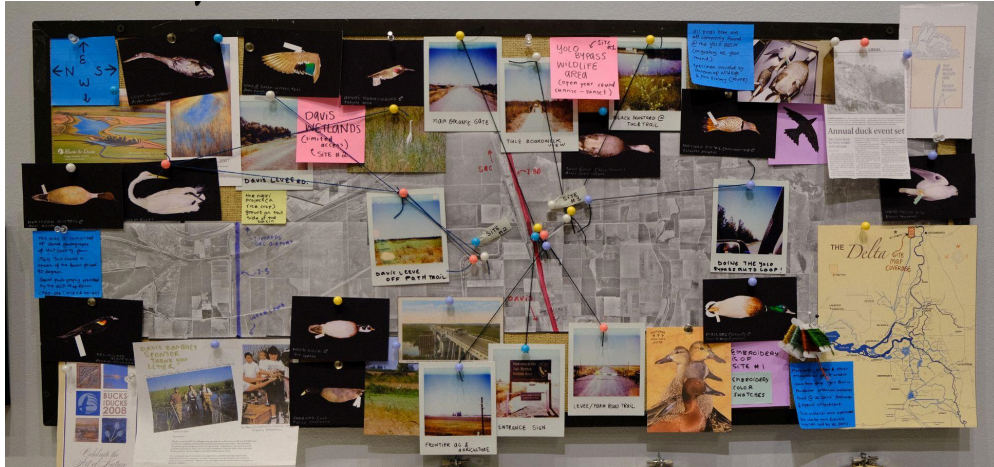
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<sup>31</sup> Parker, R. (1984). *The subversive stitch: Embroidery and the making of the feminine*. The Women's Press.

<sup>32</sup> Vangool, J. (Ed.). (2024). *UPPERCASE*, 61(April–June). UPPERCASE Publishing Inc.



traveler's map. Visitors can look across it non-linearly and linger on anything that sparks their interest, which can build more connections based on the surrounding material strung together.



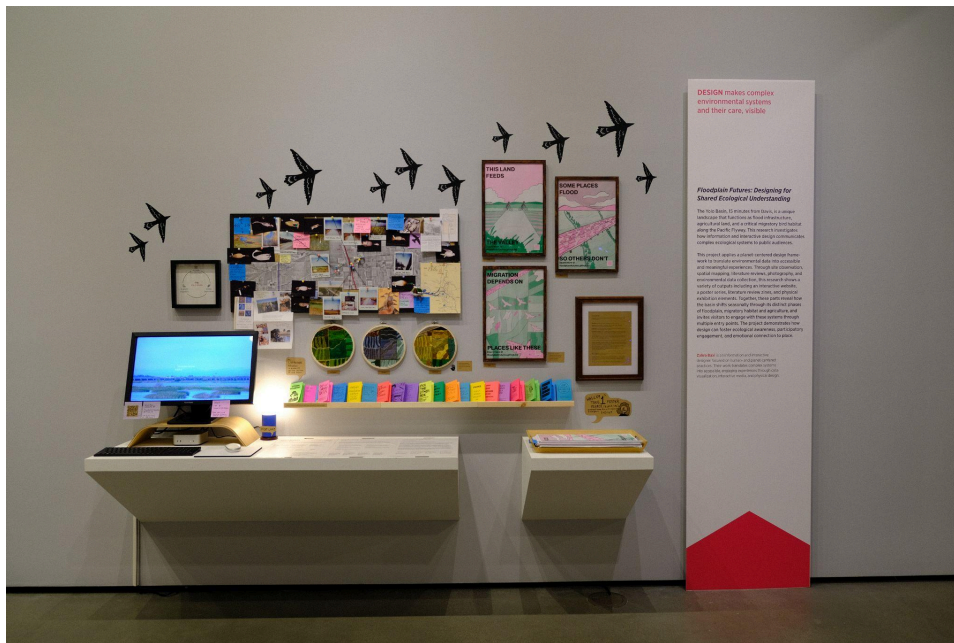
the bulletin board at the shrem museum

On the wall there is also a graphic displaying the three interconnected systems of flood, flight, and food to match the framed material on display. On the wall there are also a flock of cut vinyl of black bird silhouettes installed on the wall above the display, drawing the eye and referencing the migratory birds that move through the basin.



angled view of the shrem museum exhibit

Each of these pieces in the museum are zoned, first with context with the framed flood, flight, and food diagram, and kiosk machine. The next zone is the bulletin board and embroidery hoops, to allow visitors to engage with material at a slower pace away from the kiosk display. The third zone are the posters, and a colophon (text describing each piece and person involved in the making process) framed with posters in a tray below. Below this zone, that also extends into the second zone, are the literature review zines for visitors to pick up and read and put back down for others to enjoy.



whole view of the shrem museum exhibit

Coming from a background in primarily digital design, I had never worked in a physical exhibition space officially, making and curating content on my own. It was a fun and exciting learning curve, learning to highlight my work and make it cohesive for people to engage with. I had to learn how to zone work so the space wouldn't get cramped and crowded while still looking cozy. I wanted my work to seem personal in the ways that I engaged with the space, and heavily mimicked the way I designed my own living spaces, bringing in my own personal frames from home, and thrifting materials. Exhibit spaces seemed daunting at first as I felt a need to conform with what were actually non-existing standards about exhibit design, thinking they needed to be cold and minimal highlighting only the work. Bringing in my own furnishings from home warmed up the space.

## 6. reflections, limitations and next steps

I had to learn how to approach the basin as a non-expert, as someone who was learning to identify birds for the first time, learning about flood infrastructure, and looking at aerial maps trying to understand what everything meant. These ways of learning shaped all the design decisions in this project, learning how to engage other non-experts like myself. Writing field journal entries on the website, using zines, and embroidery slowed down the process and helped me engage with a landscape I did not originally understand.

What surprised me the most during this project was how much of the design process became its own research method. Embroidered aerial maps of the basin over many hours gave a different kind of spatial understanding than any amount of reading or data analysis had. Walking the Tule Trail where I could no longer hear the sounds of cars on the causeway, helped deepen an understanding of the wildlife that interacts with this site that would have not come from looking at a map. Making zines about books like *Braiding Sweetgrass* helped me understand how to distill arguments like Robin Wall Kimmerer's in just 8 panels of a folded sheet of printer paper, focusing on the main parts of the book. Research through Design, in practice, meant to me that making could never be separated from the thinking process.

It was incredibly rewarding to see afterwards when the Manetti Shrem exhibit opened how people interacted with the space. There was something for everyone and I was able to prove my argument that no one single medium reaches everyone just by observing visitors interacting with the exhibit. Some people were drawn at first to the embroidery, others the zines, and for most the idea of getting to take home a free poster. There were also many excited to spend time analyzing the bulletin board.

### 6.1. limitations

Working on this project for only a year after many pivots within this MFA program, I recognize there are some significant limitations that are worth naming directly.

The first is the absence of formal user testing. This project was tested in conference settings and with people who collaborated on gathering material; however these design strategies together were not tested in one space up until



the exhibit opening day. While seeing the opening night help confirm that these design methodologies were the right approaches to getting my central point of my thesis across, a more rigorous testing of the website, zines, and even posters would have allowed for implementations that would have made a stronger well rounded thesis. I hope to explore more about how people have interacted with the museum installation to see what people enjoyed and what could be improved upon.

The second limitation was the scope of collaboration. I would have loved to have worked with more organizations. This project worked closely with the UC Davis Library Map Room, Archives and Special Collections, and Museum of Wildlife and Fish Biology who were essential to the quality of research and authenticity of the outputs. What is missing is direct collaboration with the ecologists, hydrologists, and conservation researchers who study the basin professionally. While the current format was using public citizen science resources, giving these researchers a platform within my work would have further been in line with my thesis' overall argument of breaking down academic literature barriers. Collaborations could have also occurred more with the citizen science community as well as bird watchers and even hunters that utilize the space. These conversations with people who use the space and have had a deeper connection to the land than me would have strengthened the storytelling aspect of this project through in-depth and creative approaches to interviewing.

The final limitation is the fact that this project used a framework on only one landscape with one designer. The planet-centered design framework here should be a replicable model but it has only been tested once in a single context. Whether this approach can translate to other reserve sites, other ecological systems, or even other regional communities remains an open question that I would love to explore further.

## **6.2. next steps and future directions**

Next steps for this project include formal user testing where users can offer feedback on the website's structure and evaluate its effectiveness on interactive data visualization. One layer this project did not reach is the pre-colonial history of the land itself. The Yolo Basin sits within ancestral territory of the Patwin people, one of the groups of the broader Wintun-speaking peoples of the Sacramento

Valley.<sup>33</sup> In future iterations of this project, I aim to engage seriously with that history and with living Patwin communities and scholars. Braiding Sweetgrass was formative in making it clear to me that ecological knowledge cannot be fully separated from Indigenous ways of knowing, and that absence in this project is one worth naming directly.<sup>34</sup>

Other avenues to continue with this project also are working with the Yolo Basin Foundation, UC Davis' Center for Watershed Sciences, and the California Department of Water Resources are all organizations that are actively engaged with the basin. These organizations are just the few of many that I think would deepen and greatly improve the reach of this project. Working with other designers from other fields would also be exciting. The third direction is formalizing the framework and testing it on other land-sites such as the UC Nature Reserves or other local sites that I often missed before diving into the world of ecology during my time here in UC Davis. A longer, more ambitious contribution for this project is accepting public contributions and making the site its own public citizen science platform for the Yolo Basin. All of these ideas excited me and I would love to continue this project beyond just my time in the MFA project.

You can follow more about this project and its evolution and updates @ [zahrabaxi.com/projects/mfathesis.html](http://zahrabaxi.com/projects/mfathesis.html) ↗.

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<sup>33</sup> Whistler, K. W. (1977). Patwin folk taxonomies. *Journal of California Anthropology*, 4(2), 216–249.

<sup>34</sup> Kimmerer, R. W. (2013). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge, and the teachings of plants*. Milkweed Editions.



## 7. colophon and acknowledgements

### 7.1. colophon

*Designing for shared ecological understanding: planet-centered communication through interactive & information design* was produced in Davis, California between September 2024 and June 2026 as a Masters of Fine Arts thesis in Design at the University of California, Davis

The interactive website was built from scratch in Visual Studio Code using HTML, CSS, and JavaScript. It is version controlled using Git and hosted publicly via GitHub Pages at [floodplainfutures.github.io](https://floodplainfutures.github.io) <sup>7</sup>. Environmental data was drawn from Yolo County and Yolo Basin public sources spanning from 2018 to 2025. These include flood day records, bird checklists from eBird, rice acres harvested from Yolo County government pdfs.

The risograph poster series was printed in emerald green and fluorescent pink on the Risograph at the University of California Climate Action Arts Network at UC Davis. Black ink was added on top using the UC Davis Design department printer. Each poster is tabloid sized and there are only 100 editions of each design.

Three embroidery hoops in 8.25 inches diameter size were hand-embroidered using DMC Mouline Special six strand cotton embroidery floss. The base fabric is DMC Charles Craft cotton Monaco fabric primarily used for cross stitch and hardanger. The embroidery hoops and material were sourced from the craft store Michaels.

The literature review zines consist of twenty zines, each folded on single standard sheets of randomized AstroBrights multicolored 8.5 x 11 printer paper 24 lb. They were printed on a Canon Mega Tank printer in black ink. These zines are available as free downloads for home printing with folding instructions on [zahrabaxi.com/thelitreviewproject](https://zahrabaxi.com/thelitreviewproject) <sup>7</sup>.

Field photograph was taken across seven site visits between January and May 2026 using the following digital & analog cameras: Canon EOS Elan 35mm (1991) w/ FujiFilm 200, Fujifilm X-T3 (2018), Polaroid OneStep 600 (1983) and Fujifilm Discovery 35mm (1994) w/ Portra 400.

The bulletin board consists of the following: 1964 Aerial Photography sourced from UC Davis Library Map Room from a Yolo County Stereo Photoset under the box and volume ABB 2EE. The call number from the library to access these maps is G4363.Y6A4 1964. U61. Photos of bird specimens come from UC Davis Museum of Wildlife and Fish Biology. They are taken on the Fujifilm X-T3 with a black velvet backdrop. These photos were edited in Adobe Lightroom and Adobe Photoshop lightly to remove distractions. The archival material comes from UC Davis Archives Special Collections from the Yolo Basin Foundation Records boxes. The call number to access them are D-611 and Boxes are 18, 19, and 20. See permission of use in appendix.

This thesis was typeset in Inter at 12 point, 1.15 spaced, on standard letter paper. It was formatted using Google Docs.

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## 7.2. acknowledgements

The Yolo Basin sits within the ancestral and unceded territory of the Patwin people, one of the Wintun-speaking peoples of the Sacramento Valley, who have lived in relationship with this land and its waters for thousands of years. This thesis engages with the basin's ecological and infrastructural history, but that history did not begin in 1851.

This project would not exist without the amazing generosity of several people and institutions at UC Davis who opened their doors for collaboration, allowing me to use their collections, and share their expertise. I am so grateful they trusted me as a designer to work with their materials.

Thank you to Irene E. English at the UC Davis Museum of Wildlife for access to the museum's bird specimen collection, and to Kevin Wu for helping identify and gather specimens for photography and for checking taxonomy. The work from this museum has been used on the website and at the exhibition and I am grateful for their patience and knowledge.

Thank you to Michele M. Tobias at the UC Davis Library Map Room for helping me locate the aerial photography that became the basin of the site maps in this

project. Also thank you so much to John Pike for scanning these maps on such a short timeframe. These maps are heavily at the center of this project and I learned a lot about the history of the space and how the site shifted in use just by looking at these.

Thank you to the UC Davis Archives and Special Collections for providing archival material from the Yolo Basin Foundation, including the postcards, news clippings and event posters that appear on the research bulletin board at the exhibition. It was fun seeing how many local events have occurred during my time living in the area and how many I can expect to get a chance to attend in the future.

Thank you to the UC Davis Climate Action Arts Network for access to the Risograph and making the poster series possible.

Thank you to my thesis committee: Glenda Drew, Brett Snyder, and Thomas Maiorana. Their questions and feedback helped sharpen and redirected my thesis when it really needed it. A special thank you to Glenda Drew for all her support since I have known her in high school and believing in me during this thesis when I struggled to believe in myself. Her support & mentorship over all the years I have known her is a large part of why I pursued this path at all.

Thank you to my MFA cohort for giving their feedback and helping me iterate and shift ideas without judgement and being a kind ear during stressful times. Thank you for making graduate school feel like a breeze (now that I am able to look back at it with some reflection!) and for your collaboration and friendship.

And last but not least, thank you to my family for everything before and everything after, I truly could not have done this without you all.

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## 9. appendix

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| D-611.18:25 | Duck Days map & ads & News clippings |
| D-611.18:24 | A project Guidebook                  |
|             |                                      |
|             |                                      |

**Description of publishing project**

Author(s): ZAHRA BARI

Title of project: FLOODPLAIN FUTURES

Publisher: SELF

Place of publication: MANGITI SHREE MUSEUM

Expected date of publication: JUNE 2012

**Type of project:**

☐ Book ☐ Article ☐ Video, DVD ☐ Website  
☒ Exhibition, short term ☐ Exhibition, long term  
☐ Commercial use ☐ Film crew ☒ Other THESIS

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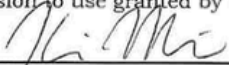
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| D-611 D folio 8 | Yolo Basin Foundation Posters 2007<br>2016 |
|                 |                                            |
|                 |                                            |

**Description of publishing project**

Author(s): ZAHRA BAXITitle of project: Floodplain FuturesPublisher: SelfPlace of publication: Manetti Shrem MuseumExpected date of publication: June 4th

**Type of project:**

[ ] Book [ ] Article [ ] Video, DVD [ ] Website  
☒ Exhibition, short term [ ] Exhibition, long term  
 [ ] Commercial use [ ] Film crew ☒ Other THESIS

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