Explore **San Francisco's Plant Diversity** with

BAYBLOOMS

UC Berkeley Information Visualization Final Project

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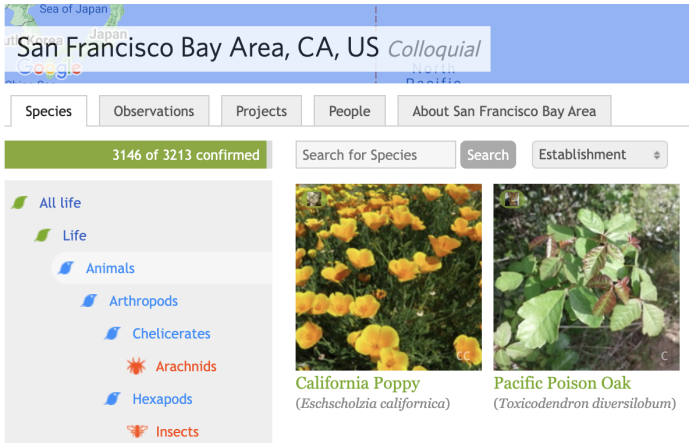
Project Goals

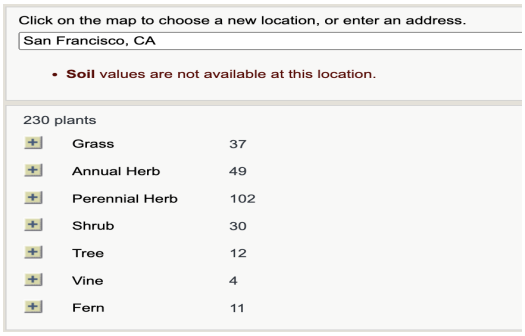
BayBloom (https://bayblooms.surge.sh/) is a scrolly-telly website that uses engaging interactive visualizations and descriptive text with the overall mission to educate and inspire individuals to protect native plant species in San Francisco. A major goal of BayBloom is to **educate people about microclimates and plant communities**. The map visualization displaying the various plant communities aims to accomplish this. A second goal is to **educate Bay Area and SF residents about some of the differences between native and exotic plants in California, and why native plants are beneficial to wildlife biodiversity**. We accomplish this goal through a proportional comparison visualization (filter options by plant type, size of plant, etc), and an infographic (made in Figma). Finally, we aim to **be a valuable resource for California residents to find similar native alternatives to exotic plant species**. The interactive adjacency matrix allows users to identify native plants similar to a given exotic plant. (similarity scores calculated based on: watering and sunlight needs, support provided to pollinators).

Related Works

iNaturalist is a mobile application started as a UCB I-School Capstone project that allows users to record their plant observations, learn about nature, and connect with scientists. This relates to our project by providing information on the location of California native plants and plant communities in San Francisco along with pictures and maps.



Calflora is a non profit organization and website that offers information about native California plants. It provides information including where to find California native plants in the wild. Calfora also gives suggestions on native plants to add to your garden based on geographical coordinates using iNaturalist. This relates to our project since both tools provide information on the location of California native plants in San Francisco.



Jepson Flora Project is an online database and out of print manual that provides information on the 6,500 plants native to California. The project started in 1883 with the recorded observations of California native plants by Willis Linn Jepson. It contains information on native plant locations along with native species such as pollinators that rely on the plant. This relates to our project because we used this information to cross reference against the dataset we used.

Convergence in the Mediterranean Floras in Chile and California: Insights from Comparative Biogeography is a book chapter in the book Ecological Studies. It concludes that Mediterranean climates support high species diversity and endemism. This relates to our project because our goal is to educate users about biodiversity in the Mediterranean climate of SF.

San Francisco Bay Area Inventory & Monitoring Service is maintained by the National Park Service, responsible for the different plant communities in San Francisco parks. The National Park Service tries to maintain a steady ratio of native vs. non-native plants. This website relates to our project because they provide advice on native plant alternatives to exotic plants

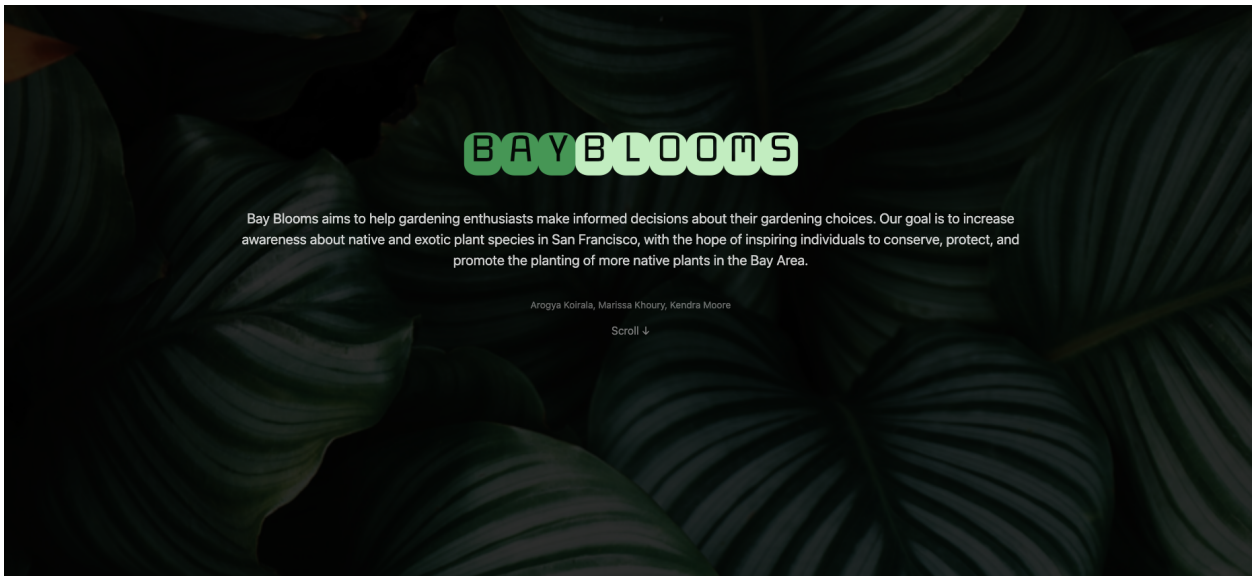
Restoring Presidio's native plants is painstaking process - Presidio is a San Francisco neighborhood and park that was restored using 1.9 million seeds. The park maintains a nursery of native plants used throughout the city. This website provides information on the dangers of exotic plants and also lists locations to get free native plant seeds. We used this to verify that the information in our dataset was accurate and up to date.

San Francisco Environment Department - lists of native, rare, and invasive plants to help you pick plants. This website also maintains a list of drought tolerant plants which we used to create our final visualization.

Local Patterns of Diversity in California northern scrub is a paper that studies Bay Area plant communities. The paper concludes that the highest levels of biodiversity was found near the coast. This information is confirmed in our first visualization (map of overlapping plant community zones). Along the coast in San Francisco plant communities converge more while in the center they converge less.

Terrestrial Vegetation of California is a book that surveys the different types of plant communities found in California. It offers detailed information including maps on the plant communities found in San Francisco.

Visuals



San Francisco Plant Communities

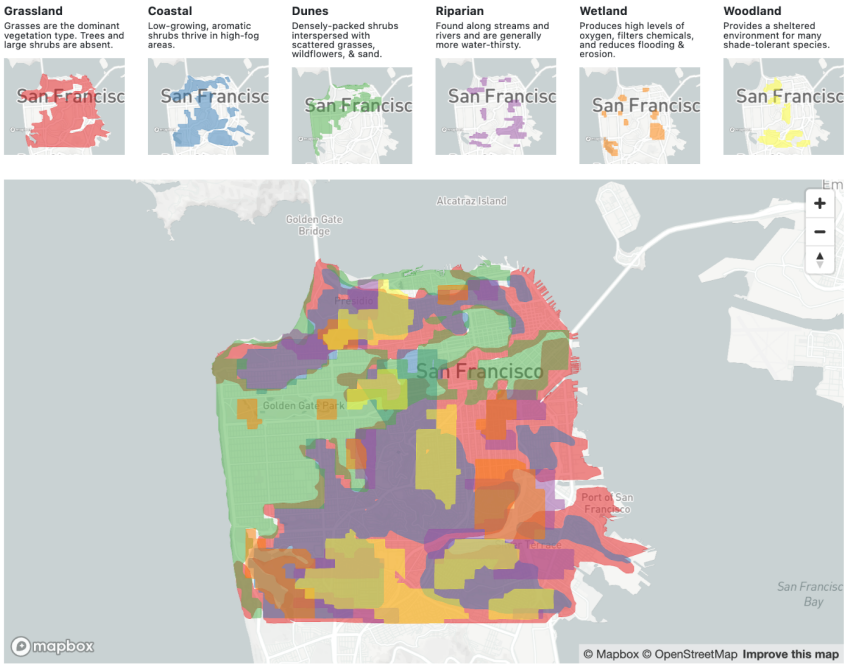
San Francisco, only seven square miles, has many microclimates within its city limits. With a rare Mediterranean climate and varied topography, the Bay Area is one of the most unique ecosystems in the world.

The Bay Area supports many different **plant communities** within a relatively small geographic area.

A **plant community** is an assemblage of plant, animal, and fungi species that have co-evolved within a specific geographic area over time. The characteristics of every plant community are influenced by the physical environment--including topography, geology, and microclimate.

Samll maps on the right show the distribution of different plant community zones in San Francisco. The large map shows how these zones overlap.

Keep scrolling ↓



Exploring San Francisco's exotic and native plant species

San Francisco is home to many plants, both native to the area, and exotic. Native plants are indigenous to California and are native to San Francisco. Exotic plants are not indigenous to California. They may be from the eastern United States or anywhere else on Earth.

Annuals: Annuals are plants that perform their entire life cycle from seed to flower to seed again within a single year. In other words, all roots, stems, and leaves of the plant die annually.

Perennials: Perennials refer to plants that live for more than one or two growing seasons.

Evergreen: Perennials refer to plants that live for more than one or two growing seasons.

Deciduous: Perennials refer to plants that live for more than one or two growing seasons.

Chart on the right visualizes different type of plants that can be found in San Francisco. Data: SF Plant Finder

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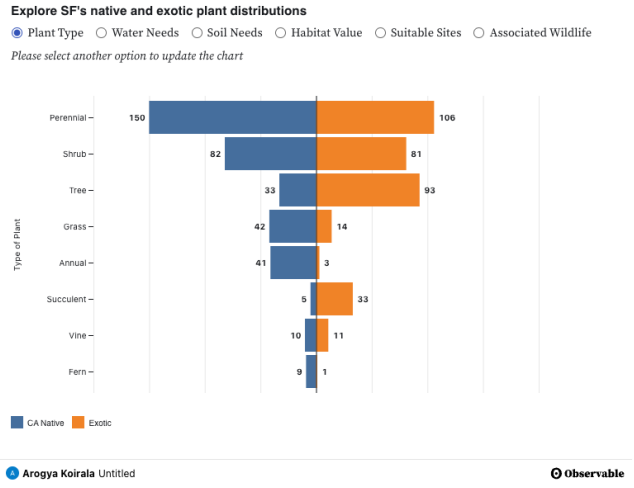


Dataset

The two datasets used for this project were taken from San Francisco Open Data. The goal of San Francisco Open Data is to make city departments more efficient and accessible to the public. The first dataset includes the coordinates of the different plant communities while the second dataset contains detailed information on the different plants.

Tools

To clean the data we used **pandas** and **NumPy**. To create the visualizations we used **Observable**, **D3**, and **Mapbox**. To create the website we used **React**.

Results

Visualization One Usability Test Observations: The hotspot map was difficult for participants to understand for several reasons. Participants assumed that the map related to microclimates rather than plant community zones. To correct this, we added the name of each individual plant community with a description on top of the map. We also gave each plant community a distinctive color.

Visualization Two Usability Test Observations: Upon viewing the pyramid chart, participants were keen on understanding what plants belong to each group (the first design didn't support that level of exploration). To facilitate this, we created a distribution chart that allows users to sort native and exotic plants based on six categories: plant type, water needs, soil needs, habitat value, suitable locations, and associated wildlife.

Visualization Four Usability Test Observations: The adjacency matrix worked really well in terms of communicating what was intended, however the inverse mapping between similarity score and opacity needed to be addressed. More specifically, this visualization currently uses a range that is inversely mapped to similarity (higher similarity = lower value) which participants found counterintuitive.That was changed and made the matrix easier for users to understand. Participants wanted the visualization to contain secondary information such as price, flowering vs. non-flowering, or animals the plant may attract to be included in the visualization. The dataset currently included that information about flowering and pollinators, so we added those features in our visualization.

Usability Test Observations

Contributions

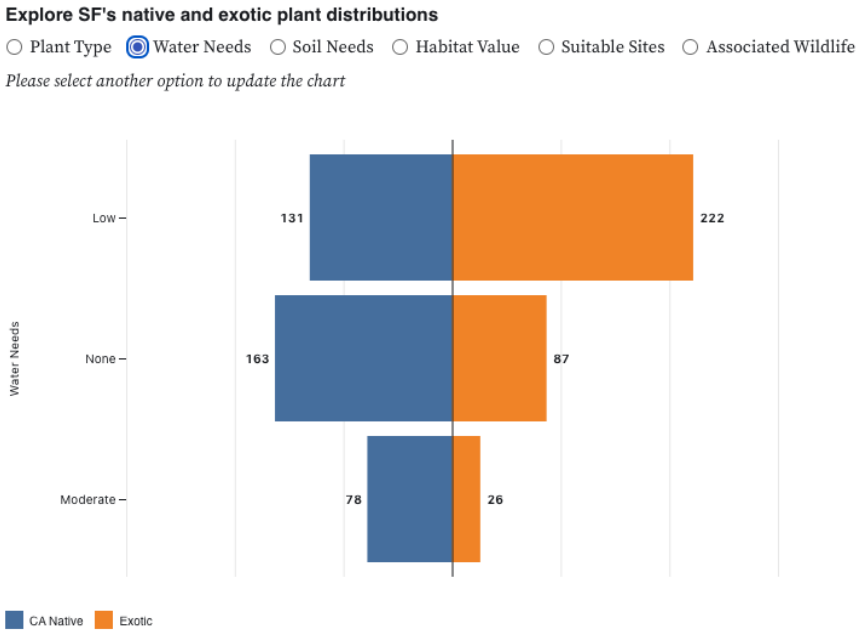
Components	Arogya	Marissa	Kendra
Data Sourcing	X	X	X
Data Cleaning	X		
Visual #1 (Map)	X		
Visual #2 (Barplots)	X		
Visual #3 (Matrix)	X		
Visual #4 (Figma)		X	
Prototyping website	X	X	
Usability Test Script		X	
Website Text		X	
Website Development	X		
User Testing		X	X
Report Writing		X	X
Related Works			X

Thumbnail

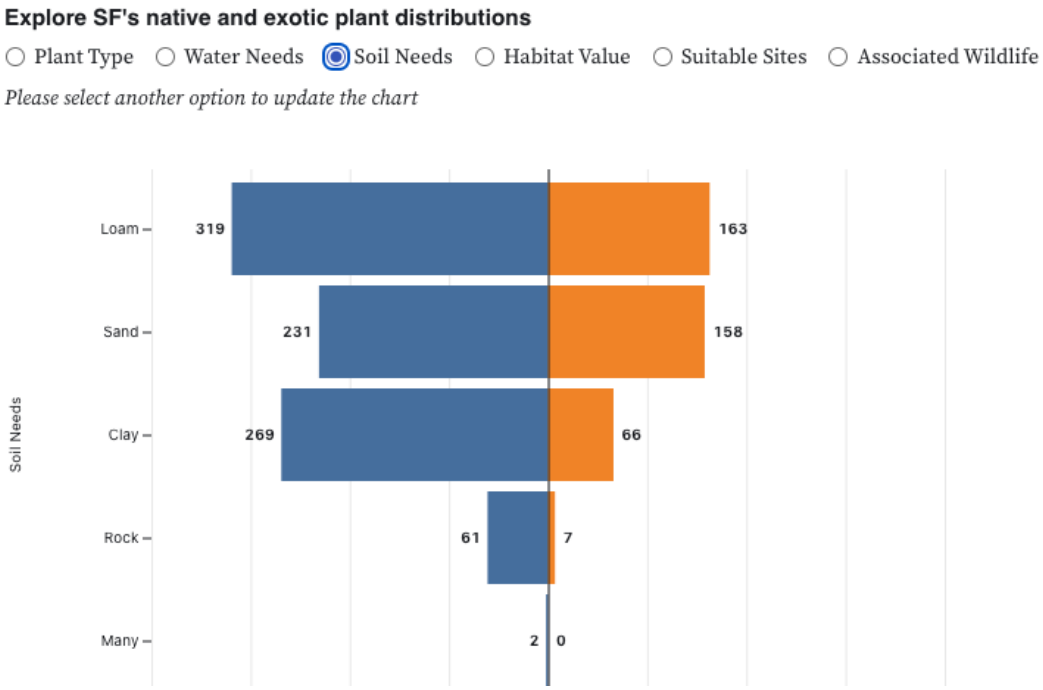
Software

Our website: https://bayblooms.surge.sh/
Prototype used for usability tests: prototype link
Github repository: bay-blooms

Appendix



<Visualization #2, Filtered by water needs>

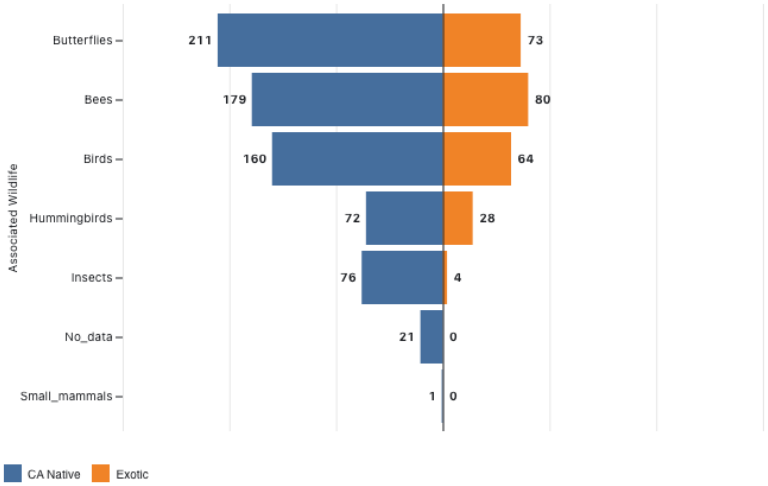


<Visualization #2, Filtered by soil needs>

Explore SF's native and exotic plant distributions

○ Plant Type ○ Water Needs ○ Soil Needs ○ Habitat Value ○ Suitable Sites ◉ Associated Wildlife

Please select another option to update the chart



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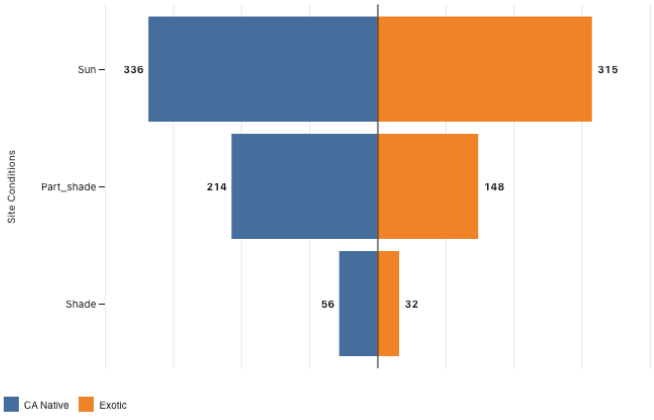

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