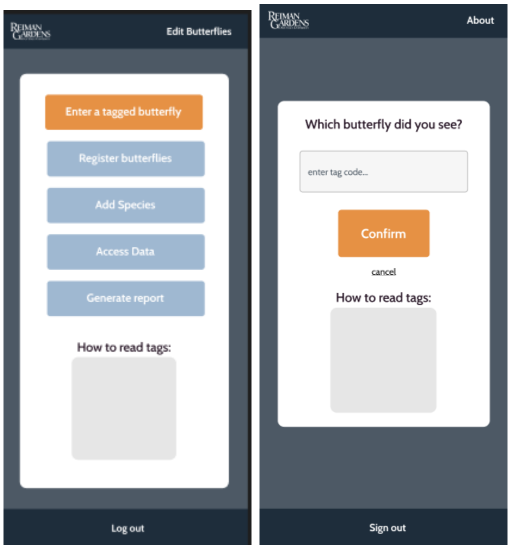
2. Requirements, Constraints, And Standards

2.1 Requirements & Constraints

Functional Requirements

1. **User Authentication**
   a. The website must allow administrators to create accounts, log in, and log out securely
      i. Implement password recovery and reset functionality
      ii. Users should be able to register using an email address and password
2. **Support User Group Hierarchy**
   a. The website should handle different user types according to their permissions
      i. **Guest user**- needs to be able to submit the butterflies that they see during their visit within the web application because it updates butterfly information
      ii. **Docent**- needs to be able to easily insert butterfly sightings while maintaining a high level of credibility through secure credentials
      iii. **Exhibit Admin** - Needs to be able to view data from their site because they want to be able to use the data from their site for research
      iv. **Super Admin** - Needs to be able to view all data because they want to be able to use the data for research



Images display contrast between admin view (left) vs guest user view (right)

3. **Create Reports from Queried Data**
   a. The website must be able to properly calculate statistics based on the data, and the admins request
      i. Must be able to calculate the average lifespan of specific butterfly types and all butterflies from one exhibit
      ii. Must be able to calculate the time since the last sighting of an individual butterfly
      iii. Must be able to calculate the number of sightings made on a single butterfly
      iv. Must be able to calculate the total number of butterflies from a specific species that are currently in the exhibit.
4. **Quick Response and Querying times**
   a. The website must be able to respond quickly to user requests, as well as provide data in a timely manner to admins.
      i. Page load time must be under 2 seconds (**constraint**)

        ii. Interactive elements will respond within 100 milliseconds from click time **(constraint)**
        iii. Fetching data should be performed in under 2 seconds **(constraint)**
        iv. Generating reports must be performed in under 3 seconds **(constraint)**

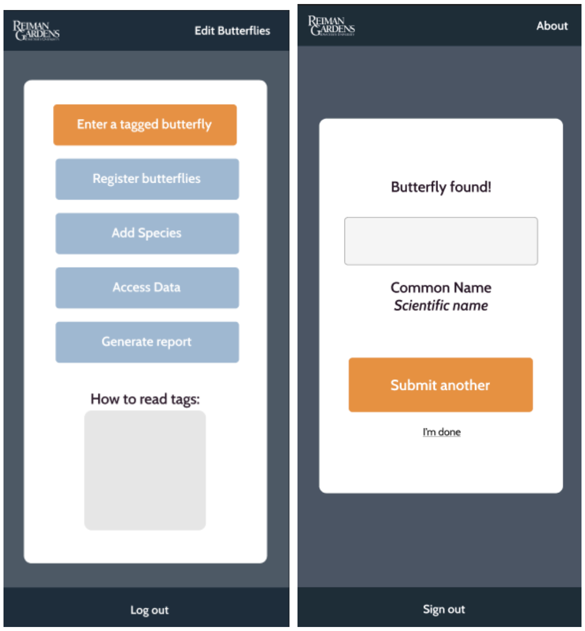
5. **Portability**
    a. The website must be able to be adapt and perform on all devices and web browsers **(constraint)**

Resource Requirements

1. **MongoDB Database**
    a. The system will use MongoDB as its database in order to efficiently query, store, and retrieve data
2. **AWS Hosting Services**
    a. The system will use AWS for hosting the website to ensure reliability and security to users
3. **Cost Efficient Upkeep**
    a. The website should run for no more than $500 per month while maintaining a high level of performance **(constraint)**

Aesthetic Requirements

1. **Color Scheme**
    a. The website will use a consistent color palette throughout the website **(constraint)**
    b. The website will have sufficient contrast between text and background for readability **(constraint)**



Images from our website design that display color theme characteristics

2. **Typography**
    a. The website will use web-safe fonts that are easy to read **(constraint)**
    b. The website must have adequate line spacing and margins for readability **(constraint)**
3. **Images**

    a. All images used in the website will be high-resolution images and graphics that are related to the content **(constraint)**

User Experiential Requirements

1. **Ease of Navigation**
    a. The website's layout should be intuitive and have a clear, logical structure, making it easy to navigate **(constraint)**
    b. The website will include navigation elements to assist the user **(constraint)**
2. **Accessibility**
    a. The website will provide alt text for images **(constraint)**
    b. The website will be available to use on all mobile devices **(constraint)**
    c. The website can be easily accessed by anyone with internet access **(constraint)**

Database Requirements

1. **Data Integrity**
    a. Implement validation rules to ensure data accuracy and reliability
    b. Ensure data remains consistent throughout with the use of constraints **(constraint)**
2. **Scalability**
    a. The database must be able to upkeep performance as the amount of data grows **(constraint)**
    b. The database will be able to scale and handle different exhibits being added to the system
3. **Performance**
    a. The database must be able to complete queries in under 500 milliseconds **(constraint)**
    b. The database must be able to complete GET, POST, PUT, and DELETE operations in under 500 milliseconds **(constraint)**
4. **Design**
    a. The database must be designed in a way that will connect all collections efficiently in order to maximize performance

2.2 Engineering Standards

Engineering standards are crucial in everyday life because they ensure consistency, safety, and quality in countless different technology areas and products. These guidelines allow products from many different manufacturers to work together without needing to put in extra effort for each individual product. This promotes more innovation as it offers a clear framework for companies to aim for. This also reduces duplication of effort and ensures that technologies are both safe and efficient. Standards that are aimed towards safety are also of utmost importance. When engineering equipment is used in ways that could either aid or hurt a human, it is important to ensure safety in all systems. Consistency also allows for safety, ensuring random anomalies stay out of everyday situations and systems.

Here are three standards we have identified through research. We include how we define the standards as well as why they are important and applicable to our project.

- ISO 639 - Language Code - This standard refers to using language codes rather than the name of the language for identifiers. Language codes with two or three letters have many benefits, including being more identifiable to native speakers based on culture and some languages with similar names.

  This code was chosen because our team had not thought about the opportunity of non-english speakers utilizing the software and web app. Although the standard does not directly apply to an application offering multiple languages, it is something for our team to think about, consider, and incorporate to better the guest user experience.

- ISO/IEC 27001 - Information Security Management Systems - This standard defines that any company or application must put systems in place to mitigate risk related to the security of data owned or handled. This is important because it ensures that the management system is continuously being managed as new threats become apparent as time goes on.

  This code was chosen as we want to focus on security in our project especially for the user data and facility data that will be held. Since this project will be advertised to other facilities for their own use, it is very important to give them a safe and secure application for all users. they will be using this product as their own, and, therefore will need a secure application.

- ISO/IEC 25059 - Systems and Software Quality Requirements and Evaluation - This standard defines how software products and systems are crucial to stakeholders and users. Most notably, it mentions how AI is being used to replace human decision-making, and be based on incomplete data, which leads to a lesser quality of product. Defining the quality of a deliverable product ensures that it is of high standard and will not be dramatically vulnerable in practice.

  This code was chosen as it gives a general definition of quality for a software product. It also defines why high-quality software is important to a client or a user. Notably, the use of AI could lead to a lesser quality product or could be more vulnerable when used in practice. Ensuring we follow quality guidelines and do not replace human decision-making within the product's design is highly important.

Each team member chose a set of standards while researching.

All the standards chosen are different, as there are standards for many different topics and categories. Notably, the ISO/IEC 9797 gives security standards based on Multi-factor Authentication, specifically Message Authentication Codes, and using block ciphers and dedicated hash-functions. This is an extremely important and in-depth set of standards specifically focused on a single version of multifactor authentication. This standard was not chosen for the above as we feel our web app will not need a multi-factor authentication system implemented; however, this standard is something each of us is exposed to almost daily. Another chosen standard was ISO/IEC 19772, which is about authenticated encryption and information security. This is similar to the information security management system standard we listed above but is much more specific. Particularly, this standard emphasizes the quality of encryption and the need for encryption when handling user data and sending it from one place to another. This could very well be important to our project for encrypting user authentication and facility authentication to limit its vulnerabilities against attackers who may be analyzing network traffic.

Potential design modifications to incorporate the standards mentioned above:

First, we already have an emphasis on the importance of security for the application. The most notable change is to recognize that the application will be advertised to and used by other facilities. In these cases, other facilities will be treating the application as their own property, meaning that any vulnerability could mean a vulnerability to the facility itself. This means there needs to be a strong emphasis on the vulnerability scanning of the application to mitigate risk in the future. We may also need to look into more longevity for security in the case that the application is being used a few years down the road. This goes along with understanding the standard for authentication encryption and ensuring that we properly handle users' personal information. Language barriers are also something that we had not previously thought of for project requirements, which could vastly change the design of the application. Sitting down with the client and understanding the value a bi-lingual application may bring is an important step towards creating a better deliverable. In the case we do decide to add additional languages to the application, we can follow the above standard for language codes. Lastly, we need to shift our development process to incorporate quality standards and understand the risk of using AI during development. As long as all team members understand the risk to the project quality that comes with using AI during development, we can still keep human decision-making and high-quality for the deliverables.