Rare Care Conservation Mobile Application Design

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Link to Video: ***https://youtu.be/BmtblCwEAb8***

Design Space

The 'Rare Care Conservation' program at the University of Washington-Seattle is an initiative by the Center for Urban Horticulture(CUH) which currently involves training citizen scientists to piece together clues from reports and head into the field to locate, count and map native rare plants(UW CUH, 2017).Rare Care's research program supports the restoration of species listed under the Endangered Species Act to their native habitats. Since 1998, Rare Care has provided opportunities in the lab and in the field for University of Washington graduate students (UW CUH, 2017).

The current process of collecting information about the rare plant conservation involves training volunteers by inviting them to the Center of Urban Horticulture for a one-day training program as a part of volunteer onboarding process.

A text snippet from the CUH site explains some of the activities:

"Rare Care trains volunteers to monitor rare plant populations to assess growth trends and determine population threats across Washington. Monitoring is an essential component of conservation. It addresses the question, "What is needed to preserve species, communities, and ecological systems?" Monitoring provides for the acquisition of information to assess the status of biological populations and communities for the purpose of developing and directing management actions. This information is gathered as a critical first step in the conservation of rare plant species.

Volunteers are the backbone of this undertaking. The program relies heavily on volunteers to collect status information on rare plant populations. Volunteers engage in individual assignments and group monitoring projects. Rare plant monitoring training is offered each year in the spring in Seattle and in response to demand in other parts of the state."

Here is a representative image of the volunteering program and the various aspects involved in the rare care program:

In the current process, the volunteers look up rare species sites data on websites provided by Center of Urban Horticulture and find places where rare plant species are found. For the next step, they carry a paper-based map, their back-pack which consists of items essential for a site, depending on the weather conditions there, some paper-based forms to fill the information of rare plant species under study or observation, found at the visited site.

In summary, typically, volunteers navigate around the site while looking for the plant species, count the number of species in a particular region, take pictures of plant under observation, or record various characteristics of the plant species by carrying a physical map and filling physical forms. The data gathered in these forms is manually entered into the system and sent for approval to the manager of the program.

Contextual Inquiry Findings

Explicit Information:

1. Akshay, who belongs to millennial generation mentioned that he likes to undertake such initiatives in groups.

2. To get information about the sites where rare plant species are found, he relies on information from website or experienced people in the group.

3. To identify plants, he uses a handbook (for now, since he is an amateur).

4. He collects pictures sometimes and sometimes takes a specimen back with himself.

5. To record his observations, he checks the growth habitat of species i.e. either the plant species is a Tree or a shrub or a vine or an herbaceous.

6. Furthermore, the plant's growth duration- is the plant annual, biennial, and perennial.

7. Then he goes on to check the leaf arrangement – i.e. are the leaves arranged in alternate fashion or opposite or whorled or all basal, or in some cases if no leaves are present at all.

8. Plant habitat is recorded- i.e. whether the plant is found in Forest areas or Freshwater wetlands, or in Saltwater beach or in distributed are i.e. on field/ roadside

9. Color of the flower and flowering period is also recorded for the species under observation.

Implicit:

1. I gathered that he likes this activity when it is done in a group setting.

2. He carries with himself a map of biodiversity rich spots although I am not quite sure if he uses only the paper-based maps or also the digital maps for navigational purposes.

3. He mentioned use of handbook, he is associated with for volunteering and their objective is to collect data only about the plant species mentioned in the handbook. Otherwise Akshay would have simply used a website to find about the plant.

4. He sometimes struggles to recall information learned in training sessions.

5. Although he is not proficient in botany, he has a basic knowledge about the terminologies

Description of the people who live or work within the design space

Direct Stakeholders:

- Volunteers involved in the citizen science initiative
- The program manager
- The project coordinators
- The data engineers involved in managing and cleaning all the data.
- Engaged botanists who train the volunteers

Indirect Stakeholders:

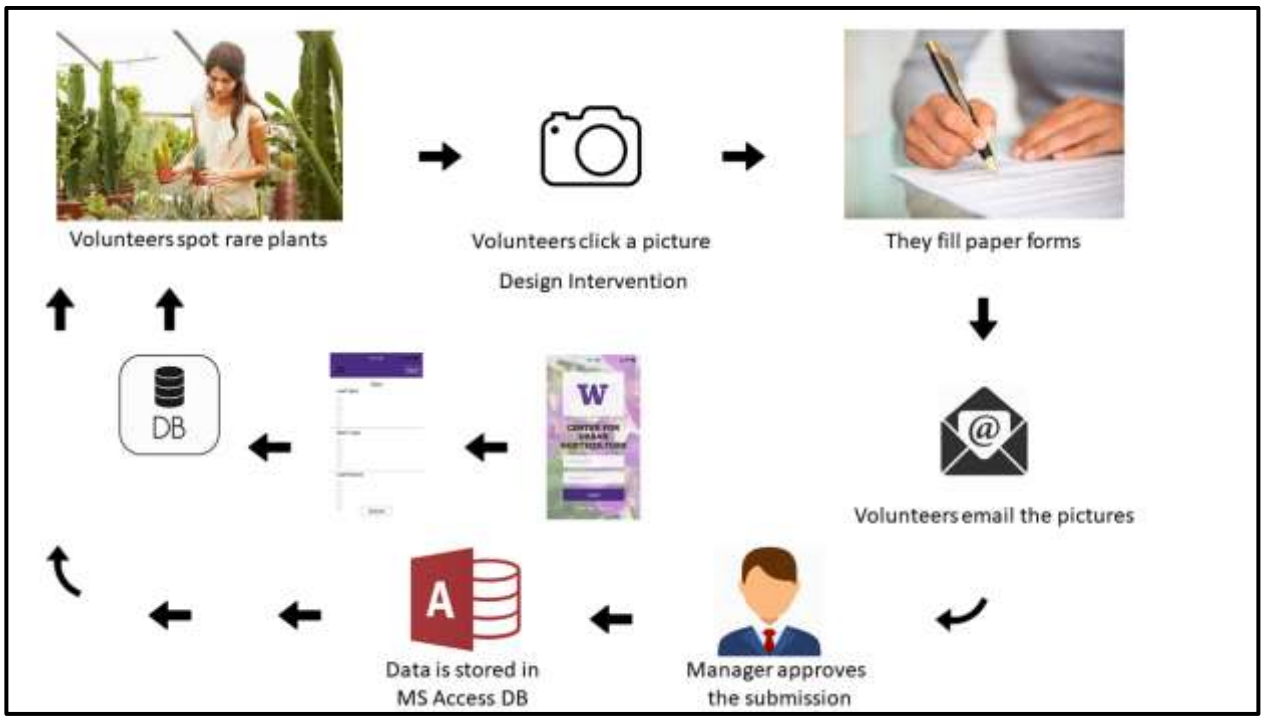
- Organizations associated with this program of Rare Care Conservation such as Washington National Heritage Program(WNHP) who consume the data gathered from rare care conservation initiative
- Government agencies related to the program
- Private land owners
- Forest Department

Problem Statement:

The problem space is that the volunteers already carry a lot of items with them- to protect themselves from the weather conditions and other dangers. On top of it, they must reach to a place to find their target species, collect pictures, specimens and do data gathering. Instead of having to manually write down everything on paper and then come back home, send out images as email attachments, carry out the process of manually entering data into the system is cumbersome. As of now they are supposed to carry plant identification manuals which are bulky and inconvenient. To solve these problems, we are making a design intervention into the space and designing a mobile application which they can use to

find out their real time location, which has in-built information about various plant species based on its leaf type and flowers and has other capabilities such as interfacing with Volunteer Support help line in case of emergencies.

Visual Representation of the system:



Where is the design intervention?

In the design space of Rare Care conservation, we see a potential to enrich the experience of volunteers while engaging in this activity of rare care conservation program. We identified some of the existing problems, such as:

1. Volunteers navigate around the area with the help of physical maps. (Shown in representative image)
2. Volunteers record their observation on a paper-based form.
3. Once they are back home, they enter the data manually into the system given by CUH.
4. Volunteers undergo training at the start of the program. They may want to refresh their knowledge gained in the training process. As of now, they might need to visit Center for Urban Horticulture and again attend a day's worth of training.

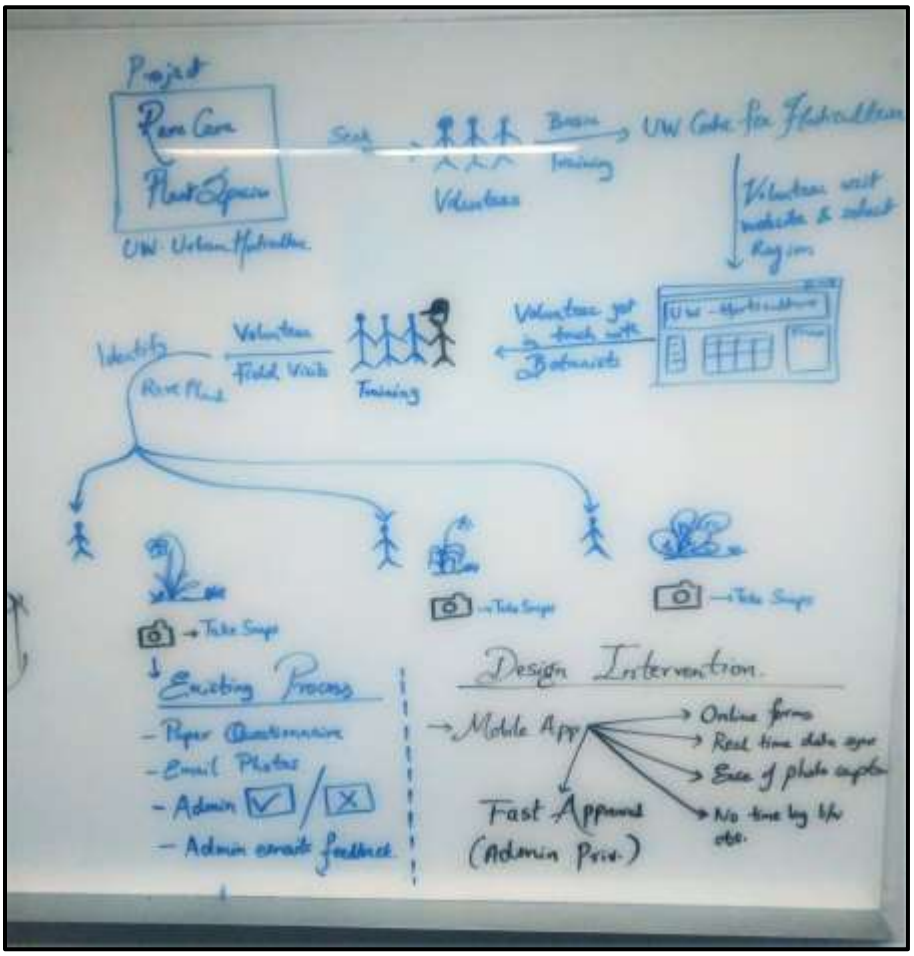
Our design intervention: we are proposing a better way to provide navigation capabilities and real time data availability, data gathering by volunteers and availability of learning material.

What is our design intervention?

Our design intervention in this information space is: instead of volunteers having to move around the site with the help of a physical map and recording data on paper forms, we think providing a mobile application which helps them navigate around the area as well have the capability to store information related to plant species under rare care conservation program.

The application will not only have the ability to add new information but also access previous data, or data entered by someone else for a given site, at a given period of time.

Our design intervention also makes the learning material handy to the volunteers. Tutorials embedded in the application make the learning easy and flexible.



The data gathered and stored in the application can be used to derive visualizations around how the landscape of rare care species is changing and how the efforts be channeled towards conservation.

Design Decisions and Rationale:

Based on our contextual inquiry and understanding of the process involved we came up with following design decisions.

Design Decision 1: Creating a mobile application versus a web application

Rationale: The rationale behind this decision was that since users need a tool to record data when they are out in the field so having a mobile application would be better than a web application.

Design Decision 2: Login Screen

Rationale: The Center for Urban Horticulture screens applicants and selects people who have a passion for botany or relevant background so that the data they gather is quality data. We designed a login screen so that only authorized members and volunteers can contribute data towards the initiative.

Design Decision 3: The application opens with a map with the current user location

Rationale: Our idea of the process, during the first iteration, after login the user is shown the map so that he is able to record his observation. Our objective behind this was to capture latitude and longitude where the species was found.

Design Decision 4: Other functionalities under the hamburger item

Rationale: To keep the application design sleek, we added supporting features such as Call a Mentor, Chat Now, Tutorials under a hamburger menu item. They are accessible by users and yet does not deviate them from the main objective of the application.

Design Decision 5: Forms have radio buttons instead of text fields

Rationale: Since it is cumbersome to type on mobile devices, we've provided radio buttons to the users to record their information to avoid any spelling mistakes and overall enhance the user experience.

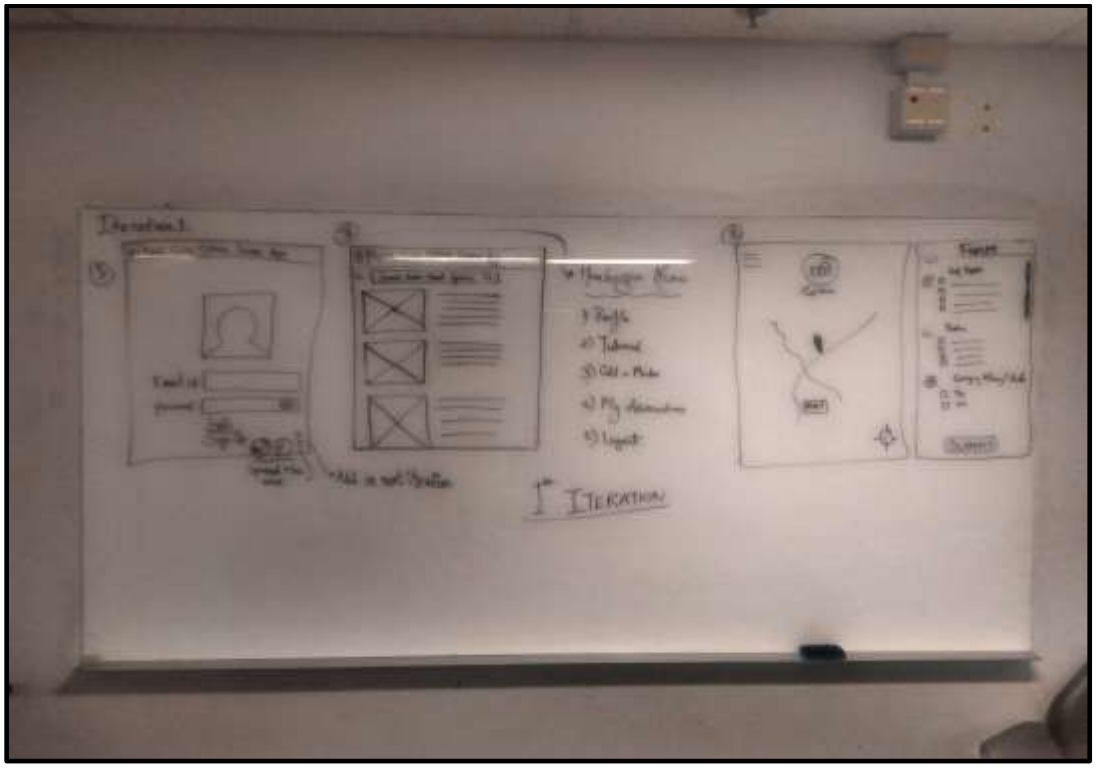
Design Decision 6: Data can be filled and stored offline

Rationale: Since the users will go to locations where network availability might be an issue, the application is designed to store data on the app and send it to a server/cloud as soon as it finds data connection.

Build a proof-of-concept prototype

Based on our contextual inquiry about how the process currently works, we decided of coming up with an initial mock-up of how our system will help the user. Providing mapping abilities inside our application to navigate to a given location where rare care species are found using a mobile device versus paper-based maps, a way to capture images, a way to record and submit data about the species under study real time using mobile device.

The first iteration of prototyping:



1st Iteration

The following were the things that came up in the brainstorming session for the first iteration:

1. We identified the necessary user data that we need to store in our system.

2. Identified the flow and navigation from home page to other pages

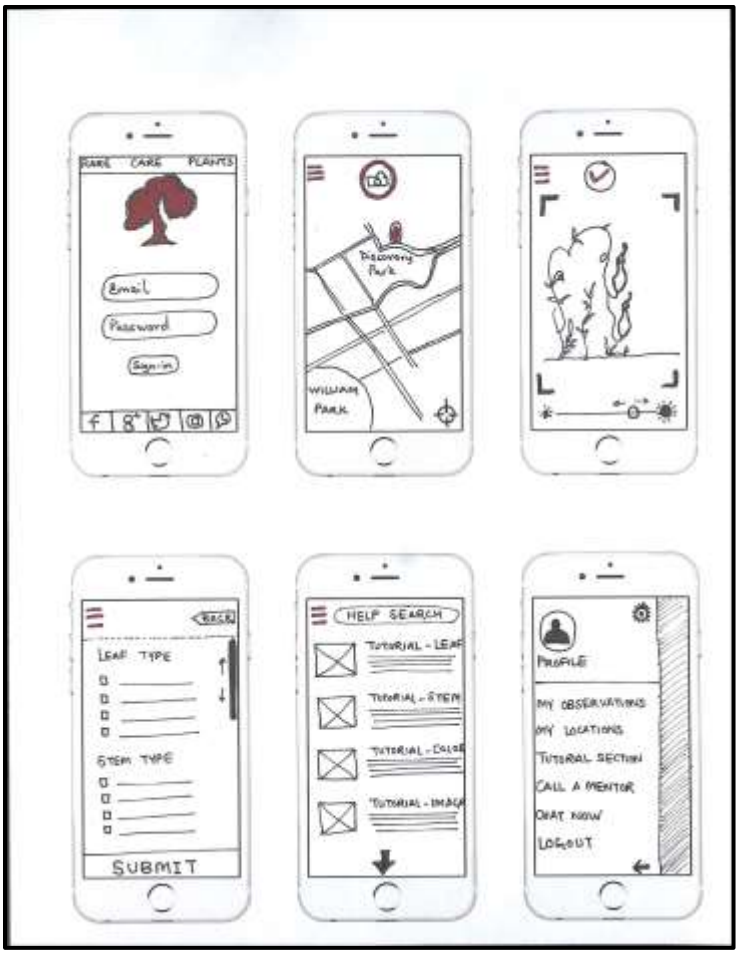
3. Came up with features such as navigation, capturing photos, tutorials about various aspects involved in plant identification.

4. What data should the user be able to view- previous submissions or someone else's submissions.

5. Designed the first iteration of form which a user has to submit by adding his observations.

On analyzing, we realized, in the first prototype, we randomly placed features and navigation was not so intuitive so we decided to work on it further to refine our prototypes.

Iteration 2:



2nd Iteration

In the second iteration, we ironed out a few wrinkles,

Once the user logs in successfully, he lands on a screen which allows him to start capturing pictures of the plant species. Next step, the user is presented with a form which allows him to enter data about the species under observation.

Once submitted, the details are populated in the temporary table in the database. Once the submission is approved the data is copied into the permanent table where all the data about all the approved submissions is stored.

There is a help section which has all the tutorials related to leaf, stem, color identification which is the data that the volunteers typically record.

The application also has the capability to call a mentor and ask for help and messaging facilities to anyone who is a user on the app.

The user journey flow (Expected navigation):

Scenario 1: User wants to enter information when he/she during a site-visit to rare care species

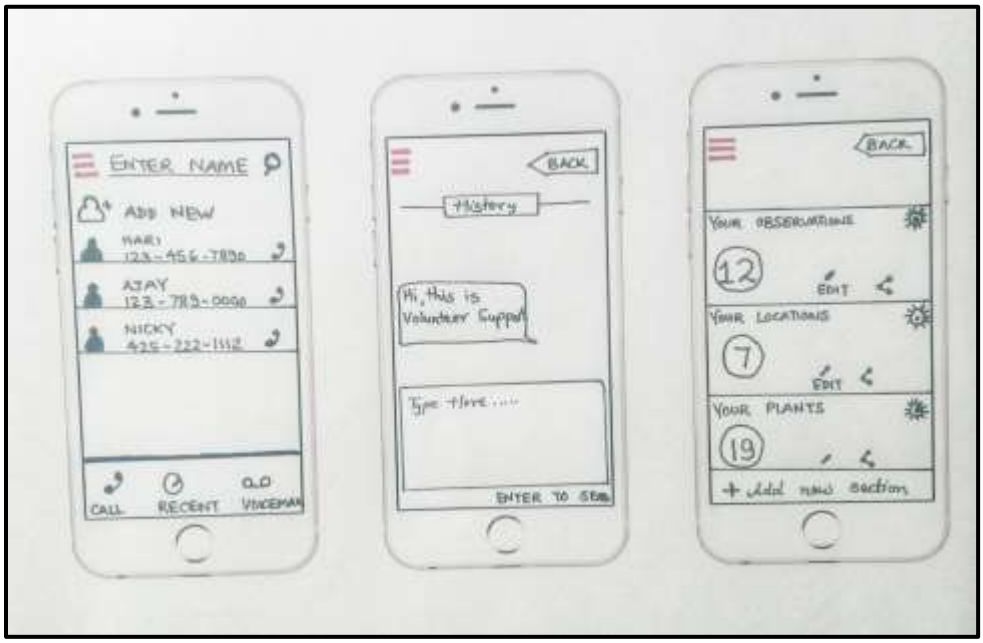
1. Login Screen
    1a. Create an account

    1b. Sign in to an existing account

2. Capture Screen
3. Fill the form
4. Submit for approval

Scenario 2: User wants to learn leaf, stem, color identification process or wants to know how to click pictures

1. Login Screen - Sign in required
2. Go to 'Tutorial Section'
3. List of all the tutorials to browse and watch

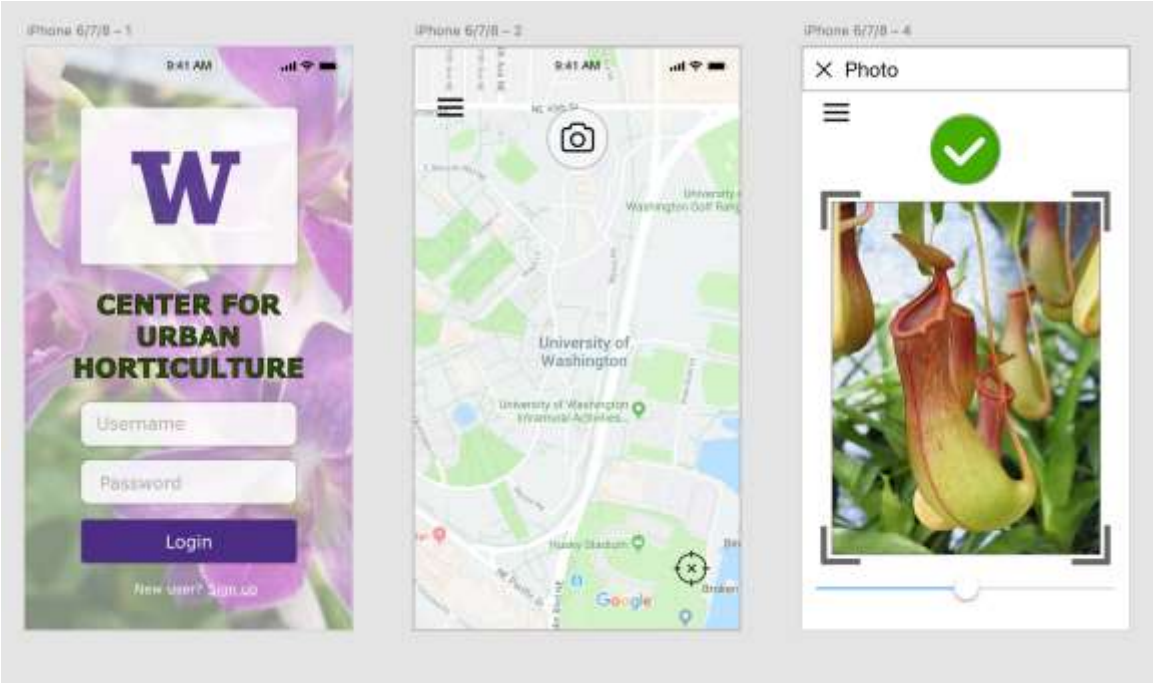


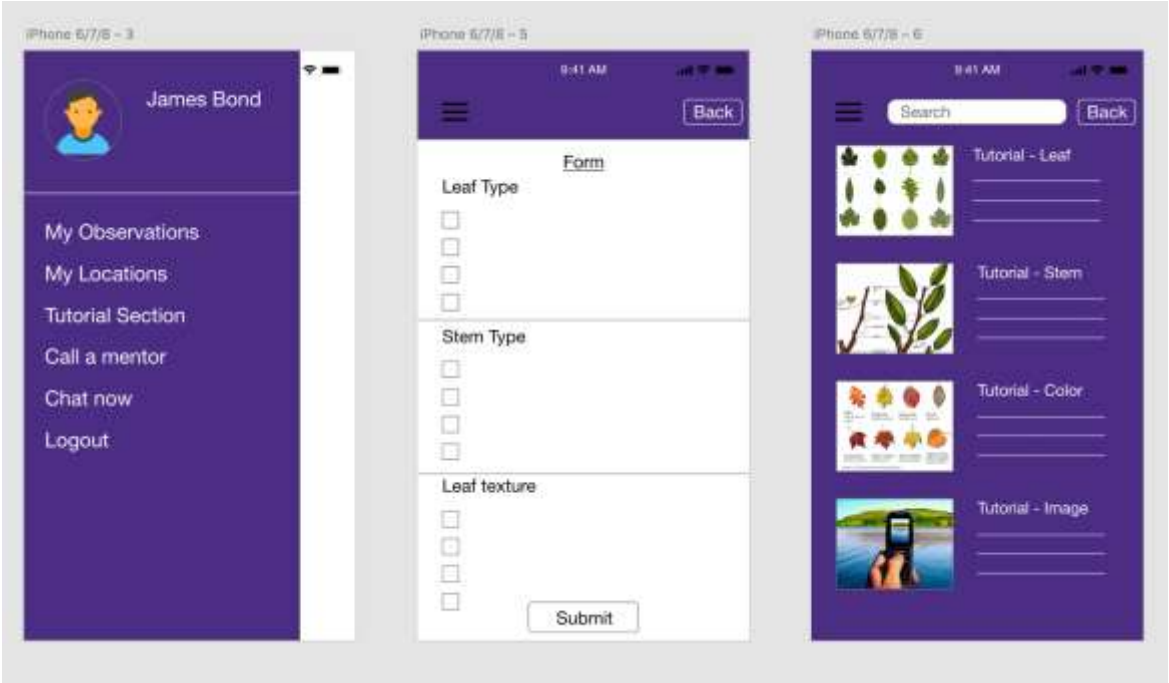
2nd Iteration

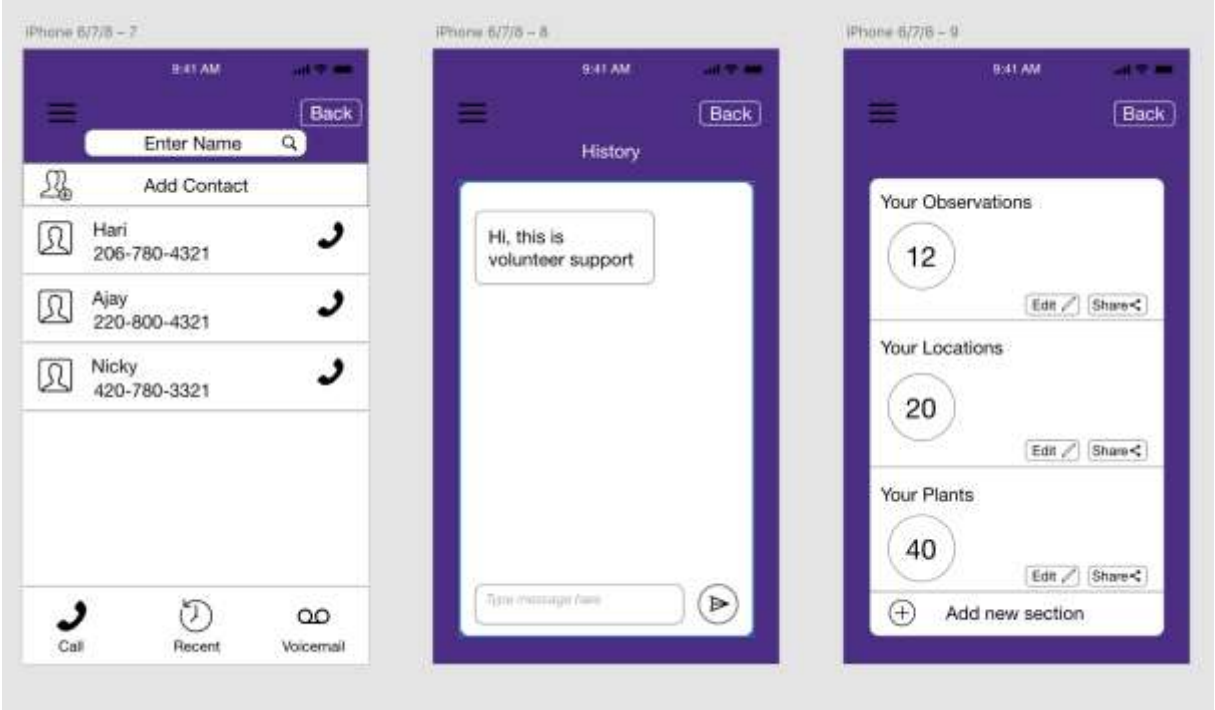
Scenario 3: User needs some assistance from a fellow volunteer/manager/volunteer support

1. User signs in
2. Selects - 'Call a Mentor' or 'Chat Now'
3. Based on the option selected- user is taken to the Phone Book to make a call or in Chat now- an embedded chat window from inside the application appears on the screen.

High Fidelity Prototype of 2nd Version







Testing Plan:

Objective	Evaluate the usability of the application (icons, sections, navigation, scope)
Questions	Are the users able to record their observations from the filed into the app directly? Do users find the navigation intuitive? Do users find the process of data entry in the form easy? Do users find this process of data gathering and entering more fun than the existing one?
Method	Usability testing
Participants	Program Manager, Center for Urban Horticulture Volunteers involved in this citizen science initiative Washington Natural Heritage Program Director
Qualitative Data Capture	From these tests, we plan to gather qualitative data about the features that we have built. Is the existing design intuitive for the users? Are the UI elements identifiable? Is the user flow appropriate? Are the tutorials findable? Does the form cover all the data which a user thinks is necessary while recording an observation? Are maps able to navigate the user to appropriate spot?
Quantitative Data Capture	How much time does a user have to spend on recording one observation from login to submit?

	How many errors occur during the use of one feature? How much time does a user spend to find the tutorial he is looking for? How much time does a user spend to locate a particular previous submission?
Data Analysis	Affinity Diagrams for qualitative data Bivariate analysis/Chi sq. test for quantitative data analysis

Evaluation and User Testing

Usability Testing

Based on our testing plan (presented in Table 1), our evaluation process consisted of conducting usability testing with Wendie Gibble, Program Manager. Walter Fertig, Rare Plant Botanist. Stacy, Director of Outreach for Rare Care Conservation, 4 volunteers who were present at the training. We conducted usability testing with the above-mentioned stakeholders and realized some of the design modifications that will further enhance the application.

1) After user is done recording an observation- like clicking picture, filling up the form and submitting it, he is taken back to the map screen which confused the users. To tackle this, in our final prototype, we have added a button saying on the landing screen which says 'Record a new Observation' when the user is done submitting the form.
2) Another change we uncovered from usability testing was- as of now our form has radio buttons which can be hard to use. Walter mentioned he would rather prefer drop downs.
3) Overall, the design, colors, layout, icons were well recognizable and easy to use for the users, so we kept them as they are for our final iteration as well.

User Survey

After making the first iteration of our high-fidelity prototype, we went back again to 5 more people for the sole purpose of testing and allowed them to navigate through the application and recorded some observations from them through means of a simple questionnaire, where we asked them following basic questions as asked them to elaborate their responses to the below questions

- Were you able to locate where to take photo through the app?
- Were you able to find tutorial through the navigation options, was their anything else that you specifically would like to mention about navigation?
- Were you able to find the help section?
- Were you able to fill the form easily or if you have any comments on ease/difficulty?
- Did the navigation flow helped you in automatically landing you to the form or you needed to search it yourself?

Based on the above questions these were the kind of responses we got:

	Task1: Snapping photo	Task2: Finding tutorial and navigating	Task3: Reaching out for help layout	Task4: Finding app form	Task 5: Filling information for plants
Tester 1	√	√	X	√	X
Tester 2	√	X	√	√	√
Tester 3	√	√	√	√	X
Tester 4	X	√	√	√	X
Tester 5	√	√	X	√	√

Qualitative feedback we received:

- "Forms seem to be lengthy all in one screen", "You could revise it under section headers and split it into multiple screens", "Incorporate drop downs, this will be easier to navigate"
- "Give some option to user to select if he wants to record a new observation of just visiting app either to find his previous observation, chatting with mentor, etc."

Based on the feedback we received from Usability Testing and User Survey, we modified a few things:

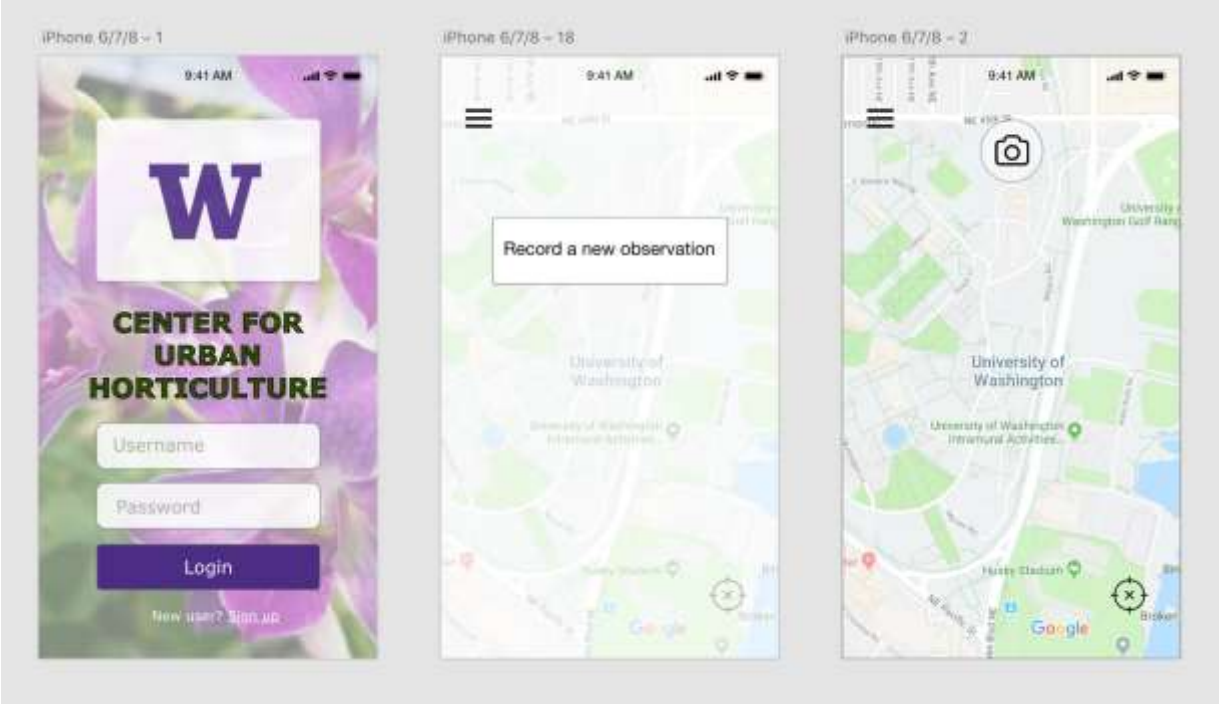
1. Added a 'Record a New Observation' and disabled the map so that hamburger icon is clearly visible.

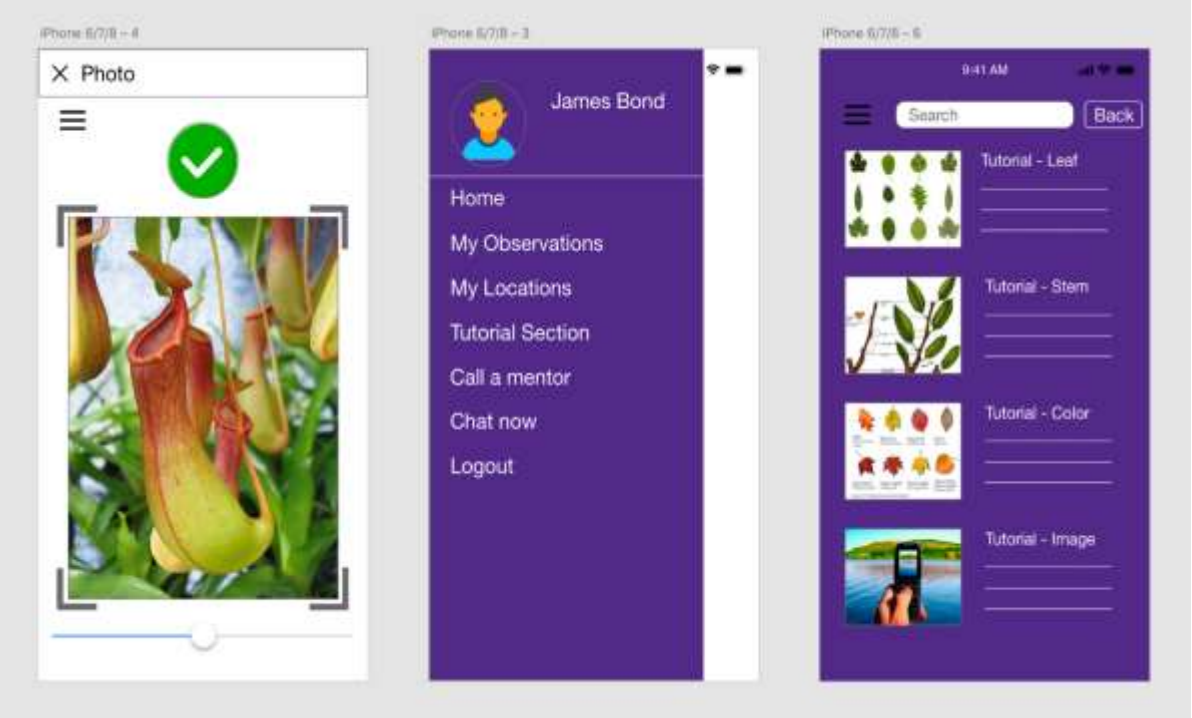
2.Changed radio buttons to drop downs

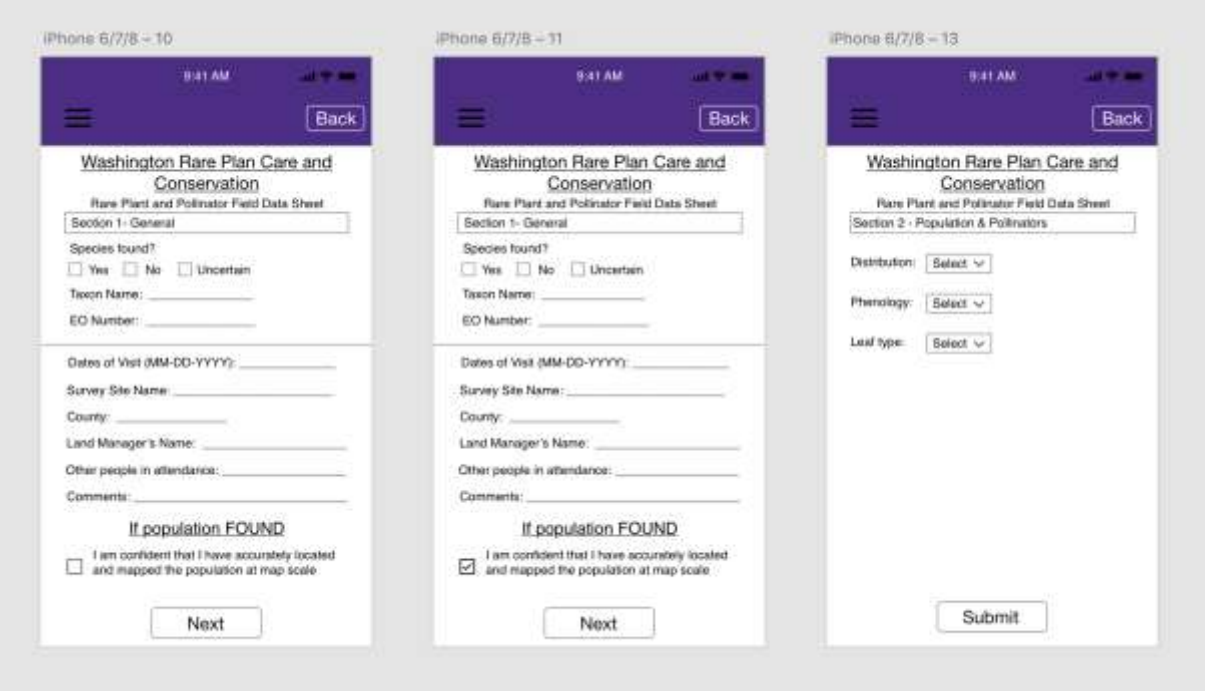
3.Added Home button under the hamburger menu item

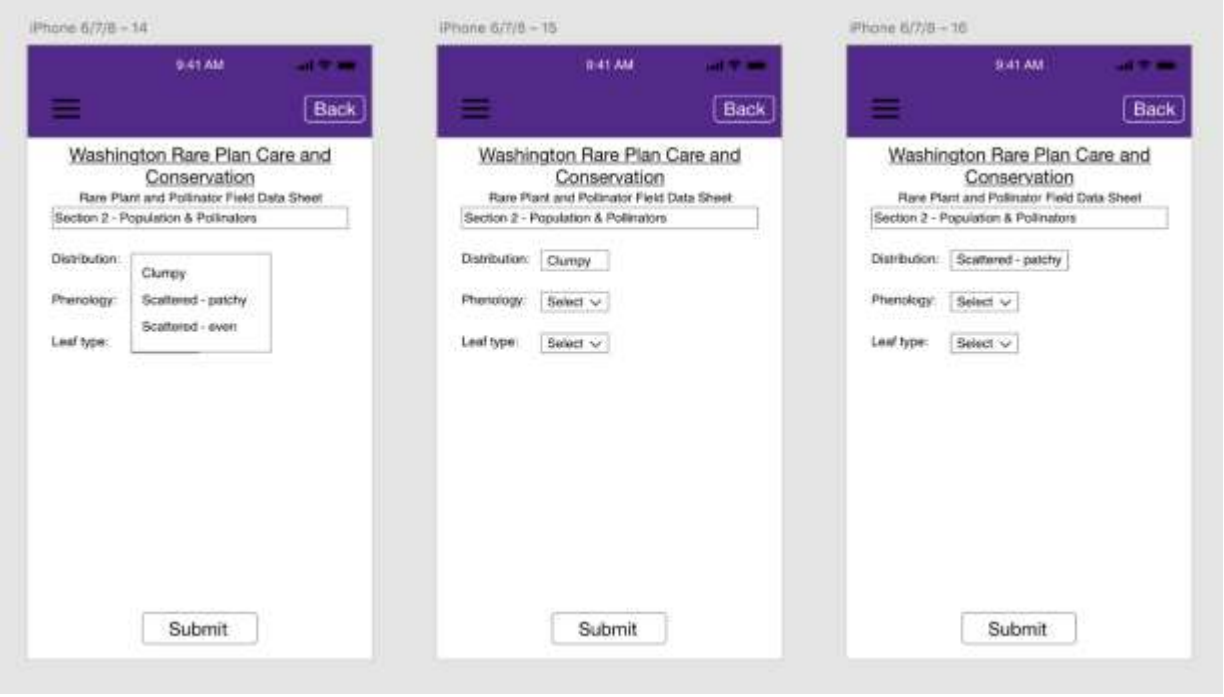
Refined Prototypes after incorporating feedback from usability testing in Iteration 3 on next page:

3rd Iteration:









We conducted usability testing with 5 users with the 3rd iteration of prototype and found that the navigation, data entry into forms was much easier now as compared to previous iterations. The findability of hamburger button and the ability to go to Home screen easily was something that made the users happy.

Interactive Prototypes on marvel app(Before Usability testing): https://marvelapp.com/7jchhjh/screen/38651712

Prototypes on Adobe xD (Before Usability testing): https://xd.adobe.com/view/1bf40dd5-2566-4823-938a-9e91fe0bbcb0

You-tube link to the interactive prototype: (Before Usability testing): https://youtu.be/QWpxUDsiFT0

Prototypes on Adobe xD (After Usability testing): https://xd.adobe.com/view/1bf40dd5-2566-4823-938a-9e91fe0bbcb0

References:

UW CUH, 2017. Retrieved from: https://botanicgardens.uw.edu/science-conservation/rarecare/researchandprojects/