**Usage Notes:**

Log In/Create an Account:

To use the app, start by selecting it on your iPhone’s springboard (home screen which displays all of your apps). Once it launches you will see a Log In screen. If you already have an account, you can enter your credentials and sign in, and if you don't have an account, you can select either Create An Account or Continue as Guest. After doing one of these three things, the app will display the main menu screen, with your account email displayed in the top left corner. If you select the guest option, the app will have limited functionality. You will still be able to view the field guide, glossary, and about page, but will not have access to the Add Observation or My Observations functionality. This screen will not display if you are already signed in.

Main Menu:

On this screen you will have four options: Field Guide, My Observations, Glossary, and About. Selecting any of these will display the corresponding view. If you are signed in, this screen will display your email in the top left and a Log Out button on the top right. If you selected Continue as Guest, it will display, “Guest” in the top left and, “Sign In” on the top right.

Field Guide:

After selecting this option you will be presented with a screen with three buttons, corresponding to the main types of plants in the Niwot area: Graminoids (Grasses), Forbs (Flowering Plants), and Tree & Shrubs. Selecting either Graminoids or Trees and Shrubs will offer you a few more exclusive filters, which when selected, will display a table view of all of the species. Forbs doesn’t have an additional set of exclusive filters and will immediately display the table when selected. The table includes the species names, their common names, and their photos. From here, you can select a species or you can select the Filters button on the top right to filter the list of species that are displayed, based on their physical characteristics. This is a great way to identify a cool plant that you find, when you don’t know it by name. When you select a plant in the list, a new screen with all of the species’ info will be displayed. From here you can either return to the Field Guide by hitting the Back button on the top left, or you can take an observation photo of the species by hitting the camera button on the top right. If you select the camera icon, a camera screen will be displayed, where you can take a picture of the plant. After that, you will be presented with a review screen to review your photo, add any additional comments to your observation, and submit the observation. You can also hit Retake Observation to return to the camera screen. If you select Add Observation, the app will navigate to the My Observations screen where your new observation will be displayed in the table. Note that the observation will not upload to the Niwot database, until Sync is pressed on this screen. The appeal of this, is that you can (and should) wait until you have cell reception or wifi before uploading.

My Observations:

This screen displays all of the observations you have made in a table. It displays the species name, date, sync-status, and the photo for the observation. If you select an observation, a new screen with the observation’s photo and information will be displayed. If you hit the Sync button, all of your un-synced observations will be uploaded to the server and their red Not Synced label will change to a green Synced label. It is important to only do this when you have an internet connection.

Glossary:

Selecting this option will display two buttons: Forbs and Graminoids. Selecting one of these will display a table of all of the glossary terms for that specific selection, as well as their corresponding photo. Selecting one of the glossary terms will display a screen with a larger version of the image.

About:

Selecting this screen will simply display some information about the app, developers, photo credits, etc. There is a tab at the bottom which includes a How To option, which will display a brief description of how to use the app.

Troubleshooting Note:

There’s a chance that the app could hang up if it is opened for the first time without internet connection. I have tested it to make sure that it works without a connection, and it does. That said, it is a good idea to poke around in the app (view the 6 Field Guide Tables and open up the camera) before taking it out in the field, just so it has a chance to grab all of the species information and user information while it still has access to the internet. That only has to be done once. From then on, all data is persistent, and internet connection won’t be necessary again.

**Design Notes:**

This app is written in Swift 3.0, Apple’s proprietary iOS and MacOS development language, and developed in the Xcode IDE. A lot of the design is fairly standard for Xcode, in terms of dragging view controllers, buttons, labels etc. into the storyboard, so I’ll focus on some of the more interesting/obscure parts of the app.

We used a service called Firebase for our back-end. Firebase is a database tool developed by Google, which has a very user-friendly front-end, and is set up and populated from a web browser on a computer. Therefore, all of our species data is actually hosted online, and thus the trickiest/obscure part of our app involves receiving and managing all of the data. To learn how to import firebase into an Xcode project, go to <https://firebase.google.com/docs/> , where they have really good and straight forward documentation. Essentially, we used firebase for authentication, database, storage, and gps. Each of these is a different Cocoa Pod that must be installed separately. To retrieve information from Firebase programatically, we wrote in Firebase references and snapshots, which allow us to retrieve all of the information in our desired section of the database, and store it locally. One of the beautiful things about Firebase is something called persistence, which allows the app to continue running well, even when internet connection is lost.

For each table in the Field Guide, a different reference to Firebase is made, and all of the data is pulled and saved to a local dictionary, which is then used for all future operations. Because a new reference is made on each of these screens (and the camera screen as well), these screens must be viewed at least once while connected to the internet, in order for all data to be loaded and have their persistence be enabled.

The My Observations page is interesting in the way that it works. Typically, what you’d want to do for local storage would be to use Core Data, which is a choice you have to make when you first create the project in Xcode. The reason for this, is that the app is reloaded every time you open it, and thus any persistent data is lost if you don’t enable it. We didn’t enable it at the start, so we had to find a work around. Xcode offers something called User Defaults, which is a method of data persistence. This is typically used to store user settings, and the most complicated object it will store is a list. So, we used User Defaults to store lists of each metadata item. So the order of the lists is crucial, and shouldn't be messed with. All photos are saved to the app’s documents folder, and just their name is stored with user defaults.

**Expandability Notes:**

The only real expandable part of the app would likely be the field guide. All you have to do for that is update the database in the Firebase Console in a web browser. The app will take care of the rest, as it is pulling directly from Firebase. It is also clever enough to detect that there has been a change, and reset the data persistence. See our other doc on Firebase to learn how to update it.