COMMUNITY-ENGAGED SCIENCE:
AN INTRODUCTION TO *iNaturalist*

🐦 *iNaturalist*

OBJECTIVES

Completing this module will enable you to:

- Search biodiversity observations on iNaturalist, by location and species
- Understand how these observations are collected and uploaded to iNaturalist
- Upload your own observations
- Understand how data from the community are verified and shared with other global databases

INTRODUCTION

As we have seen in the **GBIF** and **Arctos** modules, online biodiversity data can be used in many areas of science and education. Take, for example, the treasure trove of well-curated, museum collections around the world. Scientists studying plant and animal diversity have documented and vouchered these specimens over hundreds of years. Specimens are available at physical museums but can also be accessed virtually with the click of a mouse.

What would happen if anyone could share observations of nature, from anywhere, simply by taking a picture?

iNaturalist is an online social network of **biodiversity enthusiasts** who share observations of nature and collaborate to correctly identify species. iNaturalist functions as a "crowdsourced" biodiversity documentation tool. iNaturalist users are **community scientists**, and more and more of them engage in the iNaturalist community every day. Posting your own observations on iNaturalist connects you to experts for species identification, allows you to contribute your own identifications, and includes you in a global community of biodiversity observers.

In this module, you will learn to use iNaturalist to **1)** explore crowdsourced biodiversity observations and **2)** contribute your own data to this ever-growing data set.

Figure 1. How iNaturalist connects community scientists.

Record your observations   Share with fellow naturalists   Discuss your findings
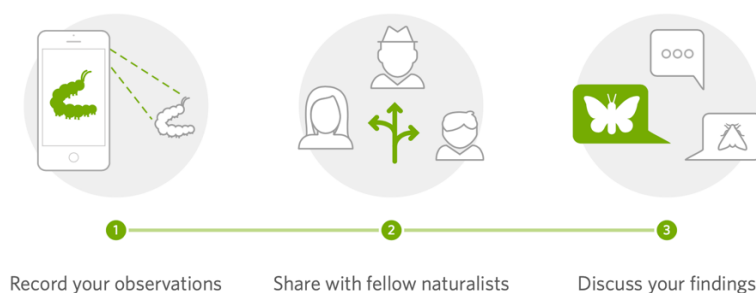
Let's start off our activity by making our own iNaturalist account. There is no cost or commitment. This will allow you to fully explore iNaturalist, comment on other's observations, and record your own observations of nature.

1. Go to the **iNaturalist** landing page: https://www.inaturalist.org. Follow the steps below to make an account in iNaturalist.

    a. In the top right-hand corner, click **Sign Up**.
    b. Enter your UNCG email and use your UNCG username as your username.
    c. Pick a password that you will easily remember.
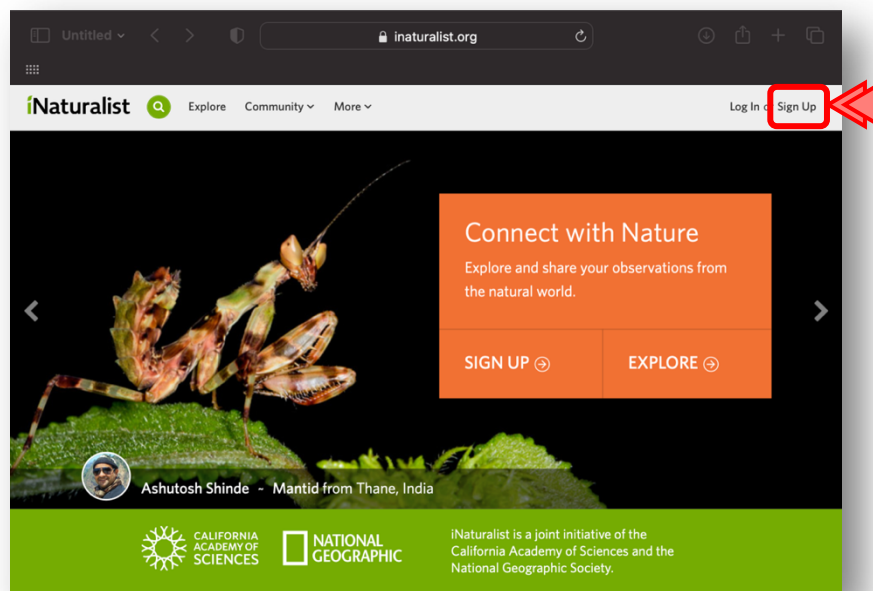
2. Once you've logged in, navigate to your **Profile**.

    a. Update your **profile picture** to include a photo (ideally, of yourself!).
    b. Update your **display name** to be your first name.
    c. **Add a Bio** that describes how you'll use iNaturalist (you can include the assignment for this class, as well as e.g., identifying things in your backyard, exploring biodiversity, etc.)
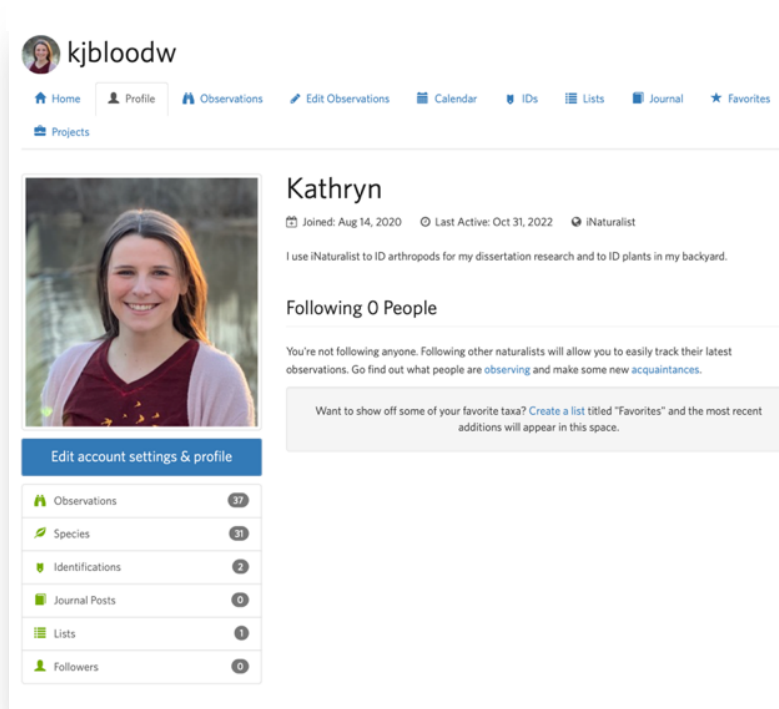
ACTIVITY 2: EXPLORE iNaturalist DATA AND FUNCTIONALITY

iNaturalist can be used to make *and* explore biodiversity observations. We will discuss making observations in Activity 4. For now, let's explore the millions of individual biodiversity observations already shared by naturalists around the world. You can learn about which organisms have been identified on our campus, in your hometown, or new places you may be traveling. Scientists also use iNaturalist data in their research.

Important caveat: When using iNaturalist, remember it is a non-regulated community tool, thus mistakes in identifications are possible. We will narrow our searches to only "**Research Grade"** observations (those identified as the same organism by two or more people). This can help us be more confident in what we are seeing within iNaturalist.

1. Go to the iNaturalist **Explore** tab. Note how many observations have been made (>*123 million*!!) and how many species have been identified (>*408,000*!!) since the platform was established in 2014.
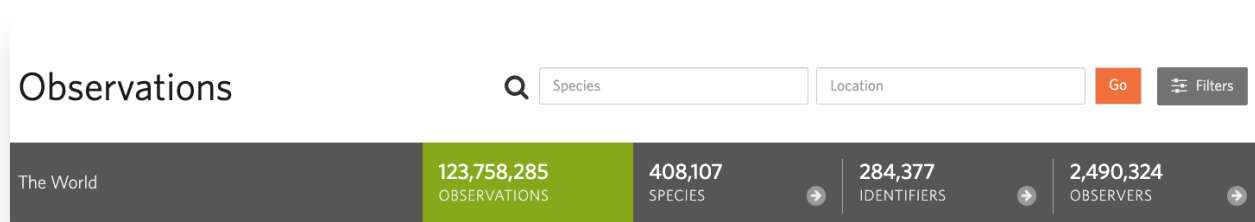
   a. Toggle between the **Map** setting, **Grid** setting, and **List** setting to familiarize yourself with the Observations page.

2. Now let's do a more targeted search. We will target a predefined cultural/geographic region and explore species that have been observed by the community there. You could use this for a research question, a social question, or even to explore biodiversity in a place you plan to visit.

3. In the **Location** search bar, type "Central Asia" and click **Go.**

   a. How many **total observations** are there in Central Asia?
   b. How many **species** have been observed in Central Asia?
   c. Click on the **Filters** button and check only "**Research Grade**" and update the search.
      i. Now how many observations are there?
      ii. How many species are there?

4. Next, in the **Location** search bar, type "western Europe" and click **Go.**

   a. How many more **total observations** have been observed, compared to Central Asia?
   b. How many more **observers** (i.e., community scientists) have participated, compared to Central Asia?

5. Let's narrow our search down *taxonomically*: in the **Species** search bar type "Eurasian Red Squirrel" (be sure to delete the location information before searching). Be sure to use only "**Research Grade**" observations.

   a. How many **total observations** do you see now?
   b. Navigate to the **Species** Tab and click on the Eurasian Red Squirrel species and click through some of the photos that have been added to see the colorful variety of this species.
   c. **When** was the *last observation*, from what *user*, and from what *part of the world*?

6. Finally, lets narrow down our search further, searching both taxonomically and geographically. Within the Eurasian Red Squirrel **Species** page, click **Filter by Place** in the top right-hand corner. Type in "Kazakhstan" and search (also, you may want to look up this country on a map!).


a. How many **total observations** are there now?
b. When was the **most recent observation**?
c. Which month has the most observations? Which month has the least observations? Is this pattern the same as above in the global search you did above?
d. Scroll down and look at the Map. Does Kazakhstan seem to be in their native range? or on the edge of their native range?

2. Remove the "Kazakhstan" filter and add a new location filter for "Germany".

a. How many observations are there now?
b. When was the most recent observation?
c. Which month has the most observations? Which month has the least observations? Is this pattern the same as above?

ACTIVITY 3: USING iNaturalist TO EXPLORE SPECIES BIOLOGY

Observations uploaded to iNaturalist by community scientists allow insight into various aspects of species biology. This is enabled by the global scale and sheer number of observations on the platform. However, while "pictures are worth a thousand words", some types of data are rare on iNaturalist because they cannot be extracted from photographs alone. Recall the richness of data that were associated with a single museum specimen in **Arctos**. In this activity, we will explore the data (and possible missing data) associated with a typical iNaturalist observation.

3. Return to the **Species** page for "Eurasian Red Squirrel" (or repeat the search again). Locate the interactive graph on this page and answer the following questions.

    a. Which month has the **most** observations?
    b. Which month has the **least** observations?
    c. Do you think this species is only active in the summer??
       (Remember that iNaturalist observations occur when humans photograph nature…)

4. Next, navigate to the **History** Tab of the interactive graph. Here you can view a summary of when all iNaturalist observations were made.

    a. In what year have there been the **most** observations?
    b. Is there a seasonal cycle in observations? **Why** do you think this is?
    c. Could seasonal changes in the number of squirrel observations lead you to think this species is less active in winter, when perhaps it is not?

Figure 4. Seasonal distribution of Eurasian red squirrel observations on iNaturalist.
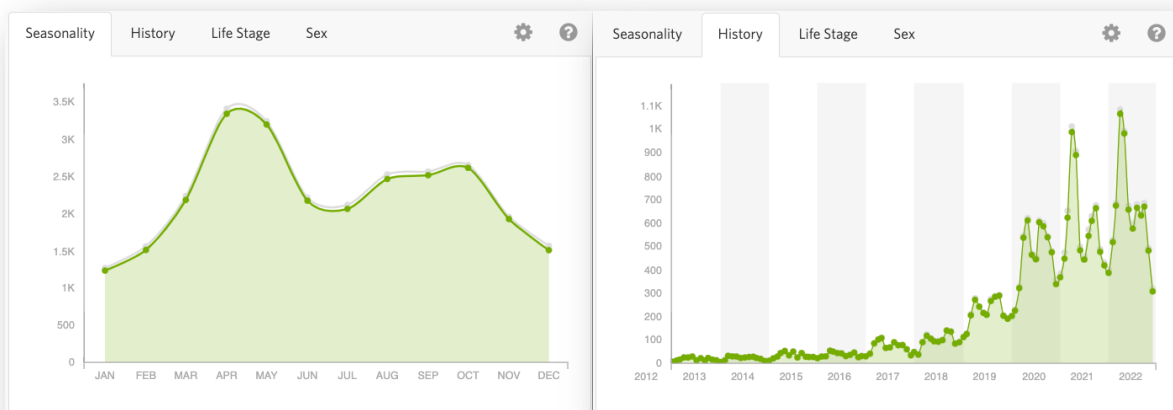
5. Find the **Life Stage** and **Sex** tabs of the interactive graph and answer the following questions.

    a. What **life stage** is most common in observations: adult or juvenile?

    b. Is it common to know the **life stage** or **sex** of this species?

    c. Note how most observers cannot discern either trait of the Eurasian Red Squirrel from photographs. In contrast, remember that data in GBIF and Arctos typically *DO* contain information about sex and life stage of the organism that we are looking at. Why do you think there is **less** information about sex and life stage in iNaturalist?

6. Finally, scroll down on the **Species** page and navigate to the **Status** tab. Here, you can explore information collated about the conservation status of this species – both globally and in specific countries.

    a. What is the Eurasian Red Squirrel's **Conservation Status** globally?

    b. Is the species threatened or endangered in any country?

    c. Which organization(s) does this information come from?

ACTIVITY 4: USING iNaturalist TO CONTRIBUTE OBSERVATIONS

You can explore iNaturalist observations because people like you (community scientists) make and upload observations. By contributing, you help everyone explore and learn more about the life history and distribution of organisms around the world. You can also help scientists, once your observations become "**Research Grade**". Remember that research grade observations are those on iNaturalist that have been identified as the same organism by at least two people.

For our last activity, as a class we are going to take a "nature walk" outside. Be on the lookout for plants, mammals, birds, butterflies or other insects, and more to take photos of and make observations on iNaturalist. If you'd like to do so, now would be a good time to download the iNaturalist App on your smart phone. That way you can directly upload photos as we walk. Alternatively, you can upload photos from your computer later, but make sure to write down all of the information that you think you might need to create an observation!

1. Find three different individual organisms to observe and take a photo of. This could be one tree or flower, one squirrel, and one butterfly or dragonfly. Write down all information that you feel is pertinent to this organism when you take the photo.
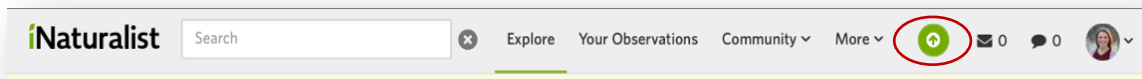
   a. Upload this onto iNaturalist using the green **<u>Upload</u>** button located in the top right-hand corner of the website
   b. Fill out the **date** and **location** that you found your specimen.
   c. Notice that you *do not need to know* the name of your organism. If you fill out the date and location that this organism was collected, then click on the species name it will give you a suggested organism. Click **View** before choosing an organism name to make sure that you agree with the identification given by iNaturalist.
   d. Repeat this for all three of your observations.
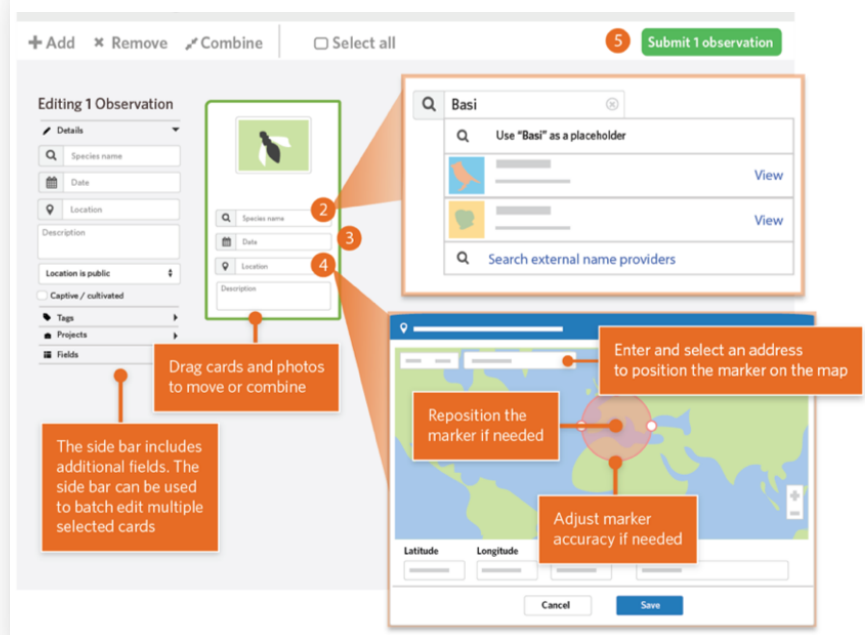
Great work! You've learned how to explore observations and create observations on iNaturalist! Next week we will start out class by looking back at the class observations and seeing if any identifications have been supported or if alternative identifications have been provided.

Section 1: Multiple Choice **(select only one answer!)**

1. Each of the following describes iNaturalist *except which one*?
    a. A place to read scientific papers related to biodiversity
    b. A place to record my own nature observations
    c. A place to explore nature observations that others have made
    d. A social network of people interested in nature

2. What qualifications do you need to upload biodiversity observations to iNaturalist?
    a. Bachelor's degree
    b. Doctoral degree
    c. Passed a competitive selection process
    d. Created an account online

3. What can you use iNaturalist for?
    a. Searching for species in your geographic area
    b. Uploading a picture of and receiving help identifying species you encountered
    c. Visualizing the approximate distribution of a single species of interest
    d. All of the above

4. Each of the following occurs when you upload observations to iNaturalist *except which one*?
    a. A species identification is proposed by the app
    b. A species identification is made and commented on by the community
    c. The confirmed observation may appear on other databases once it is "Research Grade"
    d. Nothing, iNaturalist allows me to add pictures for my own reference

5. What is a community scientist?
    a. A person with interest in science but no formal training or professional position
    b. A trained scientist helping the community
    c. People who have a background in science who don't currently have a job in science
    d. Volunteer participants in science, regardless of background

Section 2: Short Answer **(answer in complete sentences!!)**

1. Name 5 pieces of information that you could gain from a single observation within iNaturalist:

2. Think of and write out a research question that you could answer using iNaturalist. Describe in two to three sentences how you would answer the question using iNaturalist.