iNaturalist City Nature Challenge: Introduction to iNaturalist

Grades: 9-12   Time: 45 minutes   Location: Classroom

Big Ideas/Themes
- Biodiversity and Society
- Citizen Science and Open Science
- Science Practices and Skills

Essential Questions
- How does iNaturalist work and what are the key features?
- How do we add observations to iNaturalist?
- How can observations from the iNaturalist City Challenge contribute to open science and citizen science?

Objectives
- Students will **contribute** to the ongoing effort to discover and document biodiversity
- Students will **practice** how to filter, search, and organize observations in iNaturalist
- Students will **explore** the features of iNaturalist that are relevant for the CNC
- Students will **collaborate** productively in an online community
- Students will explore how

Materials
- Computers with internet access
- Smartphones
- Leaves, branches, flowers, or insects from outside (optional)

Abbreviations
- City Nature Challenge is abbreviated as CNC
- iNaturalist is abbreviated as iNat

Directions

Preparation for Teachers
iNaturalist (iNat) has an excellent Teacher's Guide to help you and your students make the best observations and get the most out of interacting with the iNat Community. Please take a moment to review the major points of this teacher's guide.

Preparation for Students
Students should be familiar with iNat from their "Introduction to Biodiversity" lesson. In this activity, students will create accounts and explore the different features of iNat in preparation for the City Nature Challenge (CNC).

This activity assumes that students have access to mobile devices and/or a camera and computer with internet. If students have access to computers in the classroom, have students work in small groups or individually for this activity. If students do not have computers but are able to use smartphones and/or tablets, demonstrate the features of iNat on the computer and have students use their mobile devices to create accounts and practice making observations. **A projector will be needed for the iNat demonstration.**

iNaturalist account setup

Have students download the iNat app at home before class to save time. Assign usernames to students so that you can identify them on iNat. Depending how you plan to use iNat, you can create a shared class account that all students use, or create individual accounts for students that you can ID (teachername_student# or teachername_studentlastname or schoolname_teacher_student). Or, you might have all students create their own accounts that they feel empowered to use personally as well. Children under the age of 13 cannot have their own account, but can use a class account.

Engage

See above for iNat account setup. Prior to activity, have students download the iNat app and create an account (or log into a class account). Consider which type of accounts would be best for you and your students. Go to iNaturalist.org and project on screen, or if students have computers, have students follow along with your demonstration.

So what is iNaturalist?

" **iNaturalist.org** is a place where you can **record** what you see in nature, **meet** other nature lovers, and **learn** about the natural world."

The iNat site is a global community of naturalists who share information about biodiversity. This effort is very powerful and demonstrates how citizens can help contribute a huge amount of meaningful scientific data that scientists may not have the resources to collect themselves.

Explore

Do a tour around iNat, showing students the features of the following tabs at the top of the page:

Observations: see the map of the world with tallies of
- Total number of observations
- Number of species identified
- Number of users

3,980,430 OBSERVATIONS	106,524 SPECIES	18,068 IDENTIFIERS	95,045 OBSERVERS

Image: Number of observations, species, identifiers, observers from Observations tab, collected 4/6/17

Species: search for a species in the species tab and highlight the graph and map features. You can toggle between information from the Encyclopedia of Life or Wikipedia. Pages also have links to other outside sources.
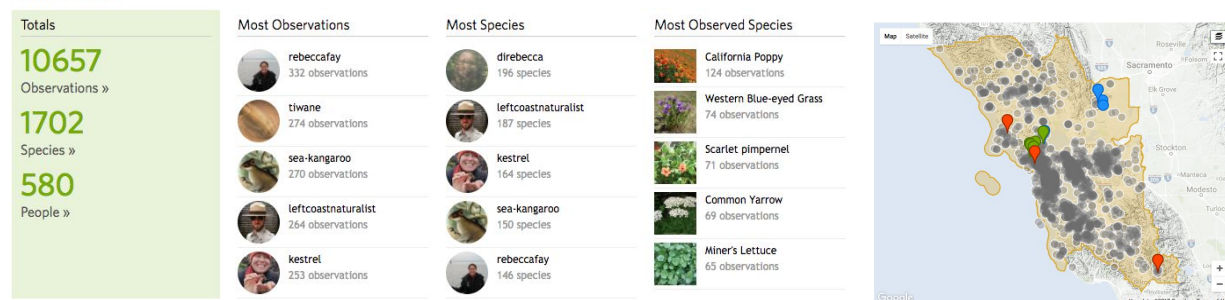

Example: Images, graphs of seasonality and observation history, observation map from iNaturalist species page for Red-tailed Hawk.

Projects

- Show the results from last year 2016 City Nature Challenge: SF vs. LA. This is where all of the observations from the 2016 San Francisco CNC were shared (see images below)
- Show City Nature Challenge 2017: Boston Area project. This one is empty (if you view it before April 14, 2017), but you can see the map of thearea for the CNC.
- **Have students search for and join the** City Nature Challenge 2017: Boston Area project **from their smartphones or computers**.

Event Stats

Totals	Most Observations	Most Species	Most Observed Species
10657 Observations »	rebeccafay 332 observations	direbecca 196 species	California Poppy 124 observations
1702 Species »	tiwane 274 observations	leftcoastnaturalist 187 species	Western Blue-eyed Grass 74 observations
580 People »	sea-kangaroo 270 observations	kestrel 164 species	Scarlet pimpernel 71 observations
	leftcoastnaturalist 264 observations	sea-kangaroo 150 species	Common Yarrow 69 observations
	kestrel 253 observations	rebeccafay 146 species	Miner's Lettuce 65 observations

Images: Results from the 2016 CNC - San Francisco vs. Los Angeles, shows total number of observations, species, and people; and top 5 observers, identifiers, and most observed species. The map shows the spread of observations within the CNC San Francisco area boundaries during the event.

Places

- Search for "Greater Boston"
- See the different features of this view: species list, observations, and projects
- We will use the "Greater Boston" place later when we learn how to filter and search
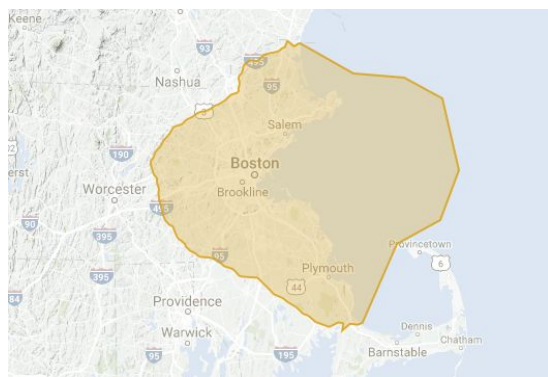
Image: Map of eastern Massachusetts with 2017 City Nature Challenge: Boston Area boundaries highlighted in orange. The area includes terrestrial and freshwater ecosystems within the I-495 corridor, from New Hampshire state line to Cape Cod canal. The area also extends out to include Massachusetts' important marine habitats, from salt marshes to Boston Harbor to Stellwagen Bank National Marine Sanctuary.

Explain

After the CNC, we will compare and contrast the results from participating cities. To do that, we need to learn how to search and filter. This is a really neat tool anyone can use to explore data! Students will **need access to desktop computers** for this exercise. If no computers available, demonstrate to students using projector.

First, demonstrate the basics: In the "Observations" tab:
1. Demonstrate how to navigate observations. Show students how to toggle between the different views of observations: map, grid, and list.
2. Introduce students to the **search filter**.
   a. Show students how to **search for a taxon and a place**. Review taxon group icons and checkboxes for threatened and introduced species.

b. Show students an example of filtering for a particular group, for example birds, then click "Update Search" to show all birds in the results.

c. Show students some of the data that each of these observations hold. Click on one of the bird observations and point out the location, timestamp, identification, sometimes specific information (male/female, age, etc.).

d. Show students how to zoom in and out on the map and click "redo search in map" to update results.

Let's use an example of a question you might use iNaturalist to address: How many species of **invasive plants** have been observed in the **Greater Boston** area?

1. On the Observations tab, click the "Filter" button next to the search bar. First, assure that the "verifiable" box in the upper left side is selected.

2. **Filter for Place**: Click the "More Filters" link on the bottom left corner to display additional fields. Type in "Greater Boston" in the Place field and select from the drop-down menu. This will limit all observations to within the Greater Boston area, the same area as the Boston CNC.

3. **Filter for plants**: Click the plant icon and "Update Search" to display the number of observations and species for that taxon in Greater Boston region.

4. **Filter for invasive species**: Select the "Introduced" box in the upper left corner.

5. Click "Update Search"

6. You should see something like this:
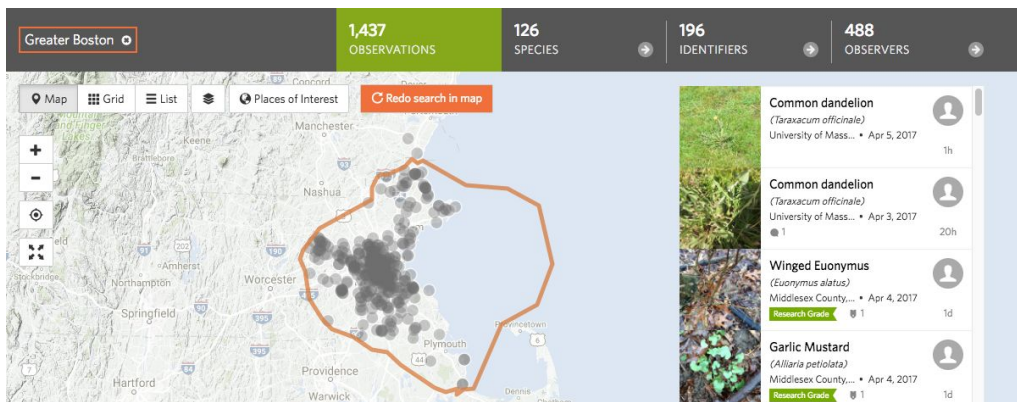
Try another on your own: What are the seasonal migration patterns of Blackpoll Warbler as observed by iNaturalist users?

1. Filter for Blackpoll Warbler observations during each month of the year. Look at the map and observe where the birds have been reported throughout the year. You will need to uncheck each month before you check the next month in the filter box.
2. Refer back to the [eBird Blackpoll Warbler Occurrence Map](#). Do iNaturalist observations display similar migration patterns to the looping migration from the eBird Blackpoll Warbler map? Why do you think this is?
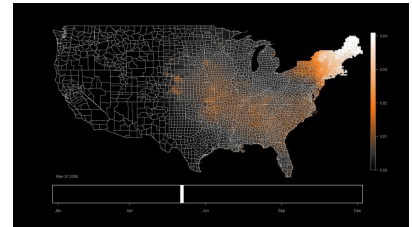
Elaborate

Visit the "[Getting Started](#)" page on [iNaturalist.org](#) to read and watch tutorials about [how to make and upload observations on smartphones](#) and [how to take good photos](#).

Make an observation and upload with mobile devices. First, demonstrate how to upload an observation. Then have students practice using leaves or insects collected from outside. If possible, bring students outside for 5-10 minutes to practice in the field.

Demonstrate to students how to "tag" an observation with a taxon - either the species name if they know it or a higher level if they do not. For example, if you photograph pine needles, students can "tag" the observation to Pines, or higher level like Conifers or Plants. Tagging an observation is important for others in the iNat community to help find, identify, and verify observations to research grade quality.

Evaluate

So far we have learned about biodiversity, citizen science, how to participate in the CNC, and how our observation data will flow from iNaturalist to open science resources such as Global Biodiversity Information Facility ([GBIF](#)) and Encyclopedia of Life ([EOL](#)). Now it is time to get ready to go out and make some observations! From our previous activities, discuss the following:

- What taxon group are they most interested in studying?
- What groups do they think is under-represented in the area?
- What groups do they think will be the easiest to find, and the hardest? The easiest to identify, the hardest?

Have students formulate a question they might like to investigate for the CNC. Here are a few examples:

- What are the seasonal patterns of Gulf Fritillary butterflies as observed by iNaturalist users?
- What percentage of plants observed in Massachusetts are invasive or introduced?
- What are the differences in vertebrate species abundance observed in Boston vs. Los Angeles?

Encyclopedia of Life (EOL) Extensions

Have students research a local species of interest using the [Encyclopedia of Life (EOL)](#), an open biodiversity resource. Students can design an [EOL Species Card](#) from a [blank template](#) for the organism.

- In iNaturalist.org Places tab, search for Greater Boston. Browse the species guide or search for a taxon group of interest (birds, reptiles, insects etc.).
- Choose a species and record the common name and scientific name.
- Go to eol.org and type the scientific name in the "Search" box in the center of the page. Click "Go." This will go either directly to the taxon page for that species, or will provide a list of search results. Choose the taxon page that looks correct.
- The taxon page has several sections to gather information. The "details" tab has information about species physical description, habitats, life history, even molecular biology. Trait data can be found in the Data tab; photos, videos, and founds can be found in the Media tab, and so on.

Example of the Overview tab of a taxon page for *Ambystoma maculatum¸* Spotted Salamander. Navigate to other tabs for more information, media, trait data, maps, and names.

Visit eol.org and enter "iNaturalist images" into search bar, or go directly to the EOL iNaturalist Images Collection. Scroll through to see all of the images that have flowed from iNaturalist into EOL. As of April 2017, nearly 423,000 images of 19,880 taxa have been added to EOL from iNaturalist.

Resources
- Getting Started with iNaturalist
- iNaturalist Video Tutorials
- iNaturalist Teacher's Guide
- City Nature Challenge Webinar Presentation

Massachusetts Science, Technology, and Engineering Standards

LS2 - Ecosystems: Interactions, Energy, and Dynamics

- HS-LS2-6. Analyze data to show ecosystems tend to maintain relatively consistent numbers and types of organisms even when small changes in conditions occur but that extreme fluctuations in conditions may result in a new ecosystem. Construct an argument supported by evidence that ecosystems with greater biodiversity tend to have greater resistance to change and resilience.
- HS-LS2-7. Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.

Science Practices (MA STE)

- Asking Questions and Designing Problems
- Analyzing and Interpreting Data

Next Generation Science Standards

Performance Expectations

- HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
- HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

Science and Engineering Practices

- Asking Questions and Defining Problems
- Analyzing and interpreting Data

NGSS Nature Of Science Principles (Appendix H)

- Scientific Investigations Use a Variety of Methods
- Scientific Knowledge is Based on Empirical Evidence
- Scientific Knowledge is Open to Revision in Light of New Evidence
- Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena
- Science is a Way of Knowing
- Scientific Knowledge Assumes an Order and Consistency in Natural Systems
- Science is a Human Endeavor
- Science Addresses Questions About the Natural and Material World