



**Department of
Environmental
Conservation**

Invasive Species Research Project

For middle and high school classrooms

Day 1: Introduction to invasive species



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Day 1: Project introduction

What is an invasive species?

Objectives:

1. Brainstorm
2. Introduction video
3. Project introduction
4. Research



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Day 1: Project introduction

What is an invasive species?

Think – Pair – Share

- What you know about invasive species?
- Where you have heard this term?
- Do you know of any examples?



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Day 1: What is an invasive species?

Videos:

- [The threat of invasive species](#)
- [Preventing the introduction and spread of invasive species in New York](#)



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Day 1: Student groups

Day 1: What are you doing in your research groups?

- Each group will be conducting their own research to develop a scientific poster.
- This research will be done over the next two weeks of class.
 - Including field research (the class going outside to collect data)
- Each day groups will be working on different parts of the scientific poster. These parts include:
 1. Introduction.
 2. Methods.
 3. Results.
 4. Conclusion.
- At the end of the unit, each group will present their research in a poster session.
 - Poster sessions are like a science fair where people walk around and discuss their research.



Day 1: Research poster example

Invasive Species
Research Poster

Introduction

This area of the poster students will conduct research in the first two days of the unit. This research will focus on what invasive species, how they spread and how to prevent the spread.

Methods

This area of the poster, students sill summarize what the group did in their field work.

Results

Groups will summarize their data in charts, diagrams and/or graphs.

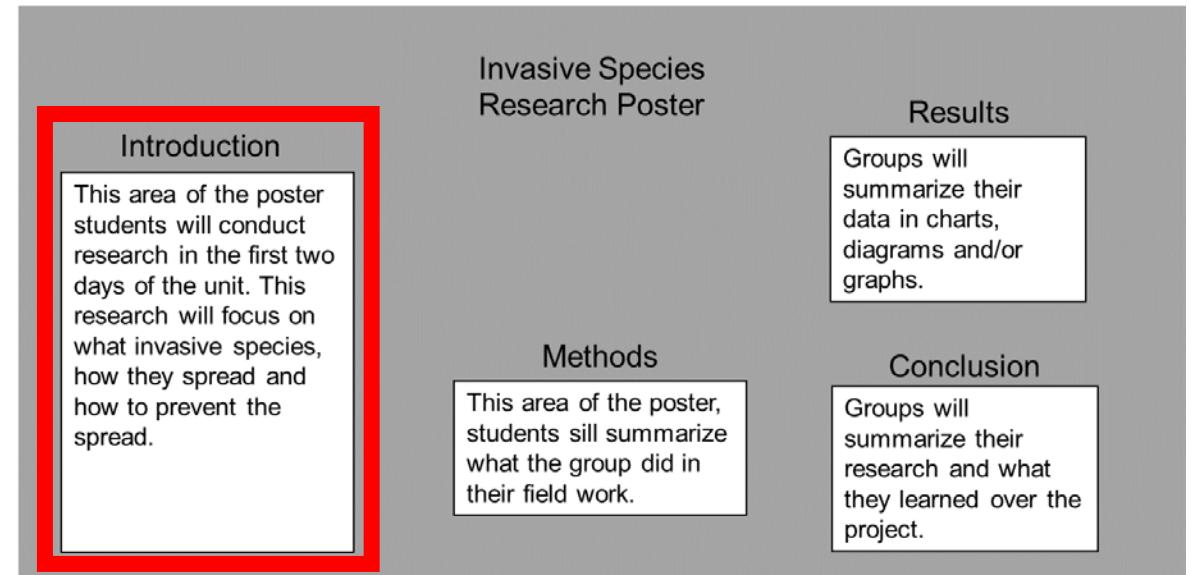
Conclusion

Groups will summarize their research and what they learned over the project.



Day 1: Research poster

- **Introduction:**
 - This part of the poster is to introduce the reader on the background of your project
 - **Research questions:**
 - What is an invasive species?
 - How do invasive species impact our lives?



Day 2: Risk of spread



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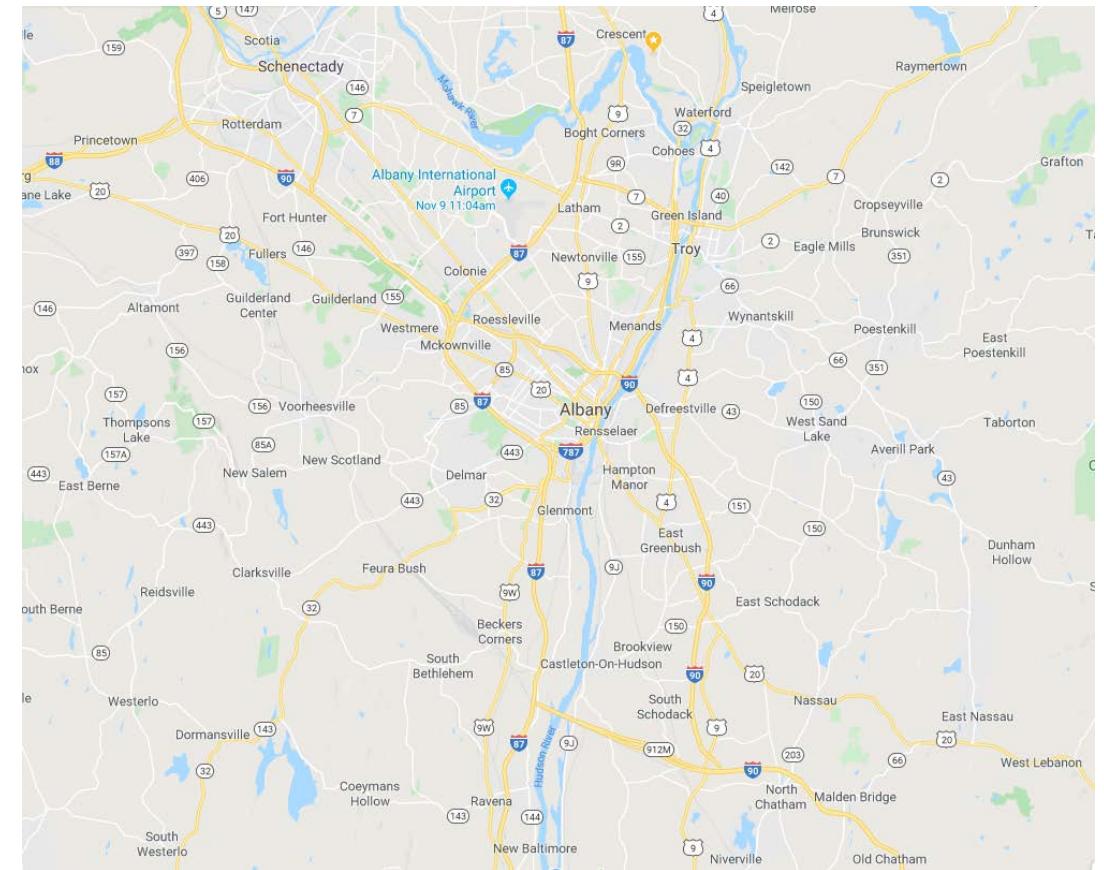
Day 2: Risk of spread

Objectives:

1. Map analysis
2. Research
3. Introduction writing

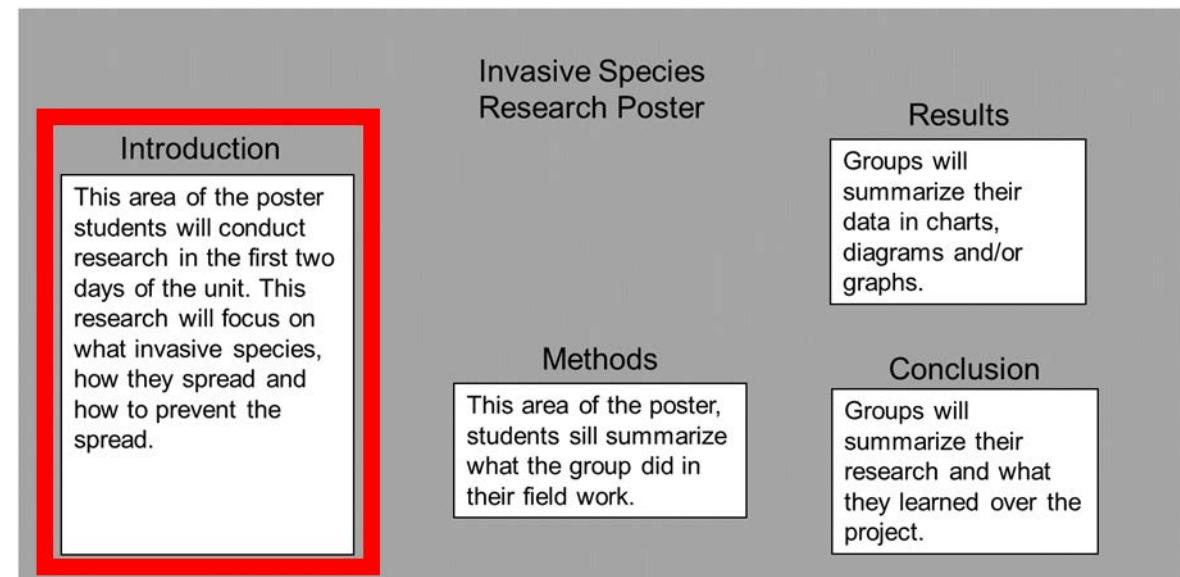
Day 2: Map exploration

- Use Google maps or paper maps to observe the different natural and man-made transportation pathways.
- Predict different “hotspots” that invasive species are likely to be found



Day 2: Research poster

- Continue writing the introduction of your research poster
- Research questions:
 - What is an invasive species?
 - How do invasive species impact our lives?



Day 3: Plant identification



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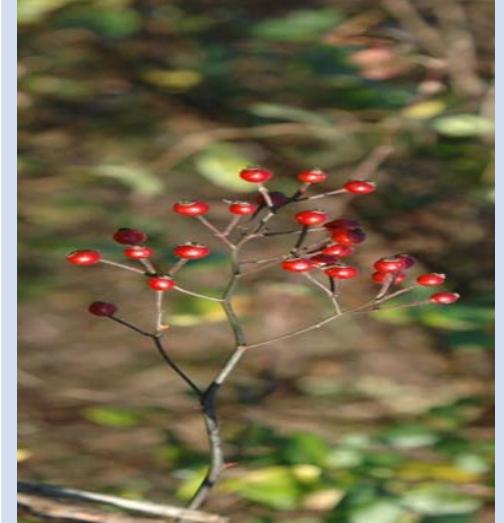
Day 3: Plant identification

Goals:

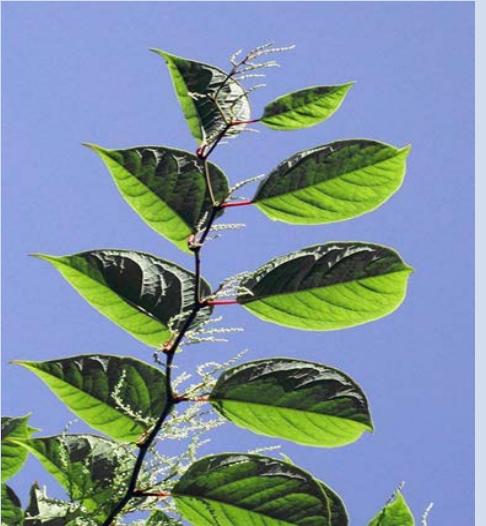
1. Invite speaker or teacher lead discussion
2. Plant identification workshop
3. Student observation



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Name	Leaves	Stem	Flower	Fruit
Multiflora rose (<i>Rosa multiflora</i>)	<ul style="list-style-type: none"> - Compound leaves* - 5-11 leaflets with jagged, saw-like edges 	<ul style="list-style-type: none"> - Smooth - Green - Thorny 	<ul style="list-style-type: none"> - White - 5 petals 	<ul style="list-style-type: none"> - Red "hips" - Produced late summer 
Common reed (<i>Phragmites australis</i>)	<ul style="list-style-type: none"> - Alternately arranged* - >1 ft. in length - Smooth and lance shaped 	<ul style="list-style-type: none"> - Hollow - Rough texture 	<ul style="list-style-type: none"> - Feathery texture 	<ul style="list-style-type: none"> - Grayish seeds; appear fluffy due to the silky hairs that cover each seed 

Name	Leaves	Stem	Flower	Fruit
Oriental bittersweet (<i>Celastrus orbiculatus</i>)	<ul style="list-style-type: none"> - Alternately arranged* - Teardrop shaped 	<ul style="list-style-type: none"> - Young growth is green - Old growth is brown - Climbs along other plants and trees 	<ul style="list-style-type: none"> - Small and green - 5 petals - Clusters of 3-7 	<ul style="list-style-type: none"> - Form clusters of 1-3 along the stem - Bright red - Can persist through winter 
Japanese barberry (<i>Berberis thunbergii</i>)	<ul style="list-style-type: none"> - Alternately arranged* - Paddle-shaped - Various colors 	<ul style="list-style-type: none"> - Gray/brown bark - Sharp thorns along the stem 	<ul style="list-style-type: none"> - Pale yellow - Forms small clusters 	<ul style="list-style-type: none"> - Shiny red egg-shaped berries 

Name	Leaves	Stem	Flower	Fruit
Japanese knotweed (<i>Fallopia japonica</i>)	<ul style="list-style-type: none"> - Alternately arranged* - Broad shield-shaped leaves with a flat base 	<ul style="list-style-type: none"> - Zig-zag shaped - Green and speckled with purple coloration 	<ul style="list-style-type: none"> - Creamy white in color - Form clusters of spikes along the stem 	<ul style="list-style-type: none"> - Small winged fruits - Seeds are triangular, shiny, small ~2.5 mm long 
Common buckthorn (<i>Rhamnus cathartica</i>)	<ul style="list-style-type: none"> - Alternately arranged* - Oval shaped and deeply veined 	<ul style="list-style-type: none"> - Gray - Stem tips often crowned with sharp thorns 	<ul style="list-style-type: none"> - Yellow-green in color 	<ul style="list-style-type: none"> - Produces many round shiny purple-black berry-like fruits in Aug. & Sept. 

Name	Leaves	Stem	Flower	Fruit
Mugwort (<i>Artemisia vulgaris</i>)	<ul style="list-style-type: none"> - Alternately arranged* - Oval shaped - Deeply lobed* 	<ul style="list-style-type: none"> - Greenish-white in color - Smooth 	<ul style="list-style-type: none"> - Greenish in color - Not easily visible 	<ul style="list-style-type: none"> - Small - ~1 mm in diameter 
Honeysuckle (<i>Lonicera spp.</i>)	<ul style="list-style-type: none"> - Oppositely arranged* - Oval shaped 	<ul style="list-style-type: none"> - Hollow stem with shredded bark 	<ul style="list-style-type: none"> - Fragrant delicate flowers are typically white, yellow or light pink 	<ul style="list-style-type: none"> - When fruiting, many small red berries are produced in pairs along the stem 

Name	Leaves	Stem	Flower	Fruit
Garlic mustard (<i>Alliaria petiolata</i>)	<ul style="list-style-type: none"> - 1st year: small rosette of hoof shaped leaves with scalloped edges; 2nd year: heart shaped leaves with toothed edges 	<ul style="list-style-type: none"> - Smooth and green 	<ul style="list-style-type: none"> - Rounded cluster at the top of the plant - 4 small white petals per flower 	<ul style="list-style-type: none"> - Thin pods that extend outward; contain black seeds - Produced in the second year form 
Purple loosestrife (<i>Lythrum salicaria</i>)	<ul style="list-style-type: none"> - Oppositely arranged* or in whorls* - Lance shaped; small hairs 	<ul style="list-style-type: none"> - Green - Stiff and square in shape 	<ul style="list-style-type: none"> - Stems end in a bushy flower spike; 5-7 petals each 	<ul style="list-style-type: none"> - Small – less than 1 mm in length 

Day 3: Plant identification

*Key definitions:

- **Compound:** A leaf whose leaflets are attached to a single stem but have their own stalks.
- **Alternately arranged:** Leaves are attached to the stem singly and alternate sides along the stem.



Day 3: Plant identification

*Key definitions:

- **Oppositely arranged:** Leaves are attached to the stem in pairs that are directly across from one another.
- **Whorls:** Multiple leaves or branches growing from a node.



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Day 3: Plant identification

*Key definitions:

- **Lobed:** Leaves with distinct protrusions, either rounded or pointed.



Day 3: Observation instruction

- Groups will divide the species examples, in the classroom, up between group members. Each member will become an “expert” on the chosen species.
- Students will record the name of the species and draw a leaf, stem and flower (if available) on the observation sheets.
 - **Observations are detailed drawing of a specimen. This does not require for you to be an artist however each drawing should take time and be detailed.**
- When students are finished with their observations, group members will share their observations with their group.



Day 4: *iMapInvasives* introduction

Day 4: iMapInvasives introduction

How do you report an invasive species?

Goals:

1. iMap database and mobile walk-through
2. Field work introduction
3. Methods writing



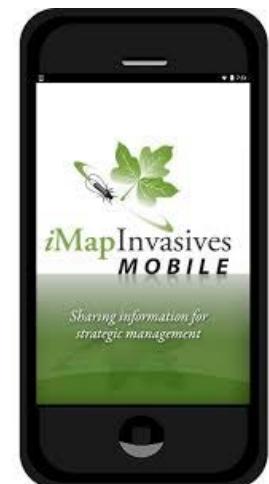
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Day 4: iMapInvasives introduction

- iMapInvasives is New York's invasive species database and mapping tool
- It is used to document and share invasive species observations
- Website: <https://www.nyimapinvasives.org>
- Mobile app: Download app from Google Play or iOS AppStore(search for “imapinvasives”)



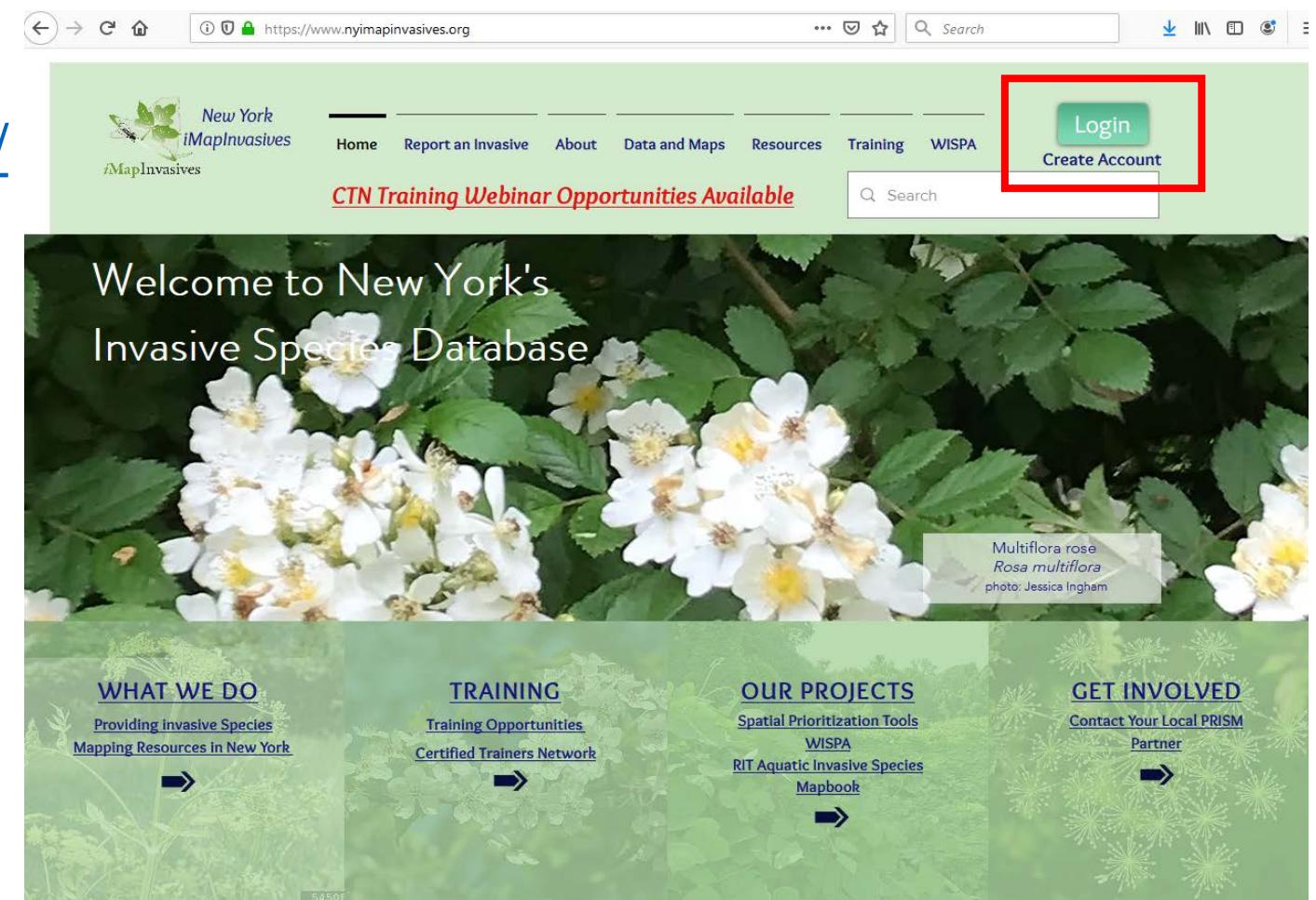
iMapInvasives



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Day 4: How to log onto iMapInvasives

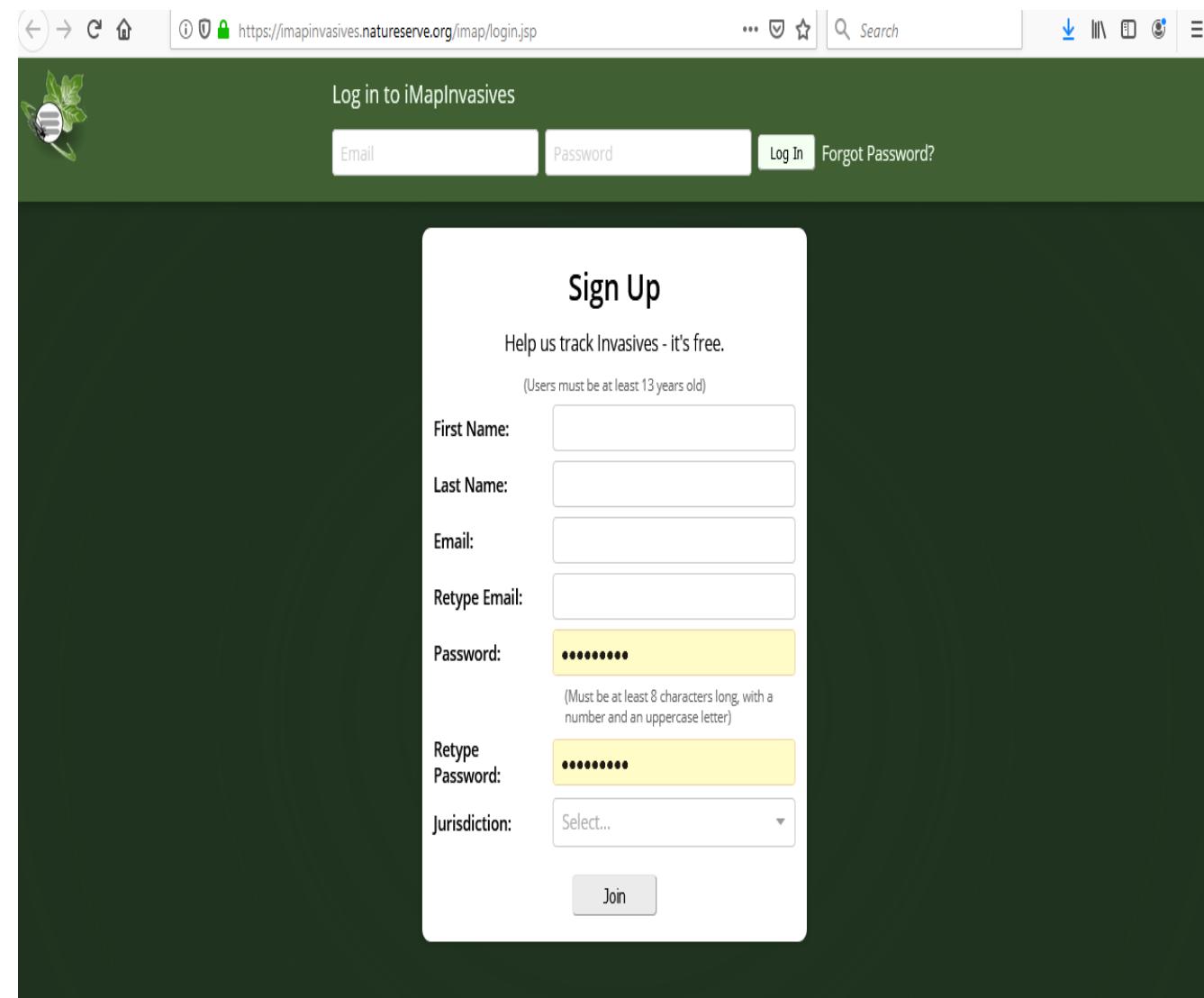
- Go to
<https://www.nyimapinvasives.org/>
- Press the login button in the upper right



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Day 4: How to log onto iMapInvasives

- Login with the email and password that your teacher provides
 - If over the age of 13, you may create your own account



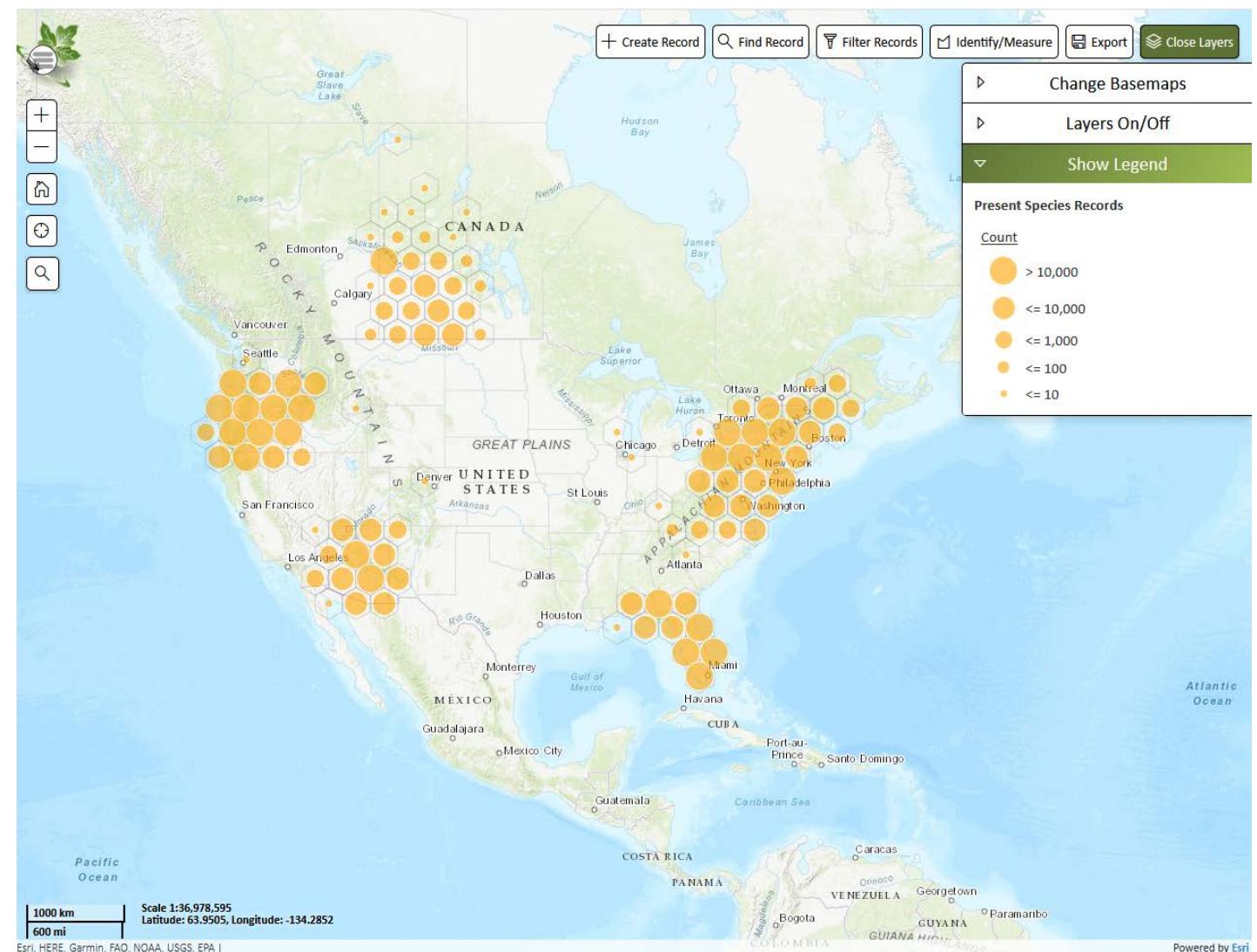
The screenshot shows a web browser window with the URL <https://imapinvasives.nature reserve.org/imap/login.jsp>. The page title is "Log in to iMapInvasives". On the right, there is a "Sign Up" form with the following fields:

- First Name: (input field)
- Last Name: (input field)
- Email: (input field)
- Retype Email: (input field)
- Password: (input field, highlighted with yellow background)
- Retype Password: (input field, highlighted with yellow background)
- Jurisdiction: (dropdown menu, currently set to "Select...")

Below the "Password" and "Retype Password" fields, there is a note: "(Must be at least 8 characters long, with a number and an uppercase letter)". At the bottom of the form is a "Join" button.

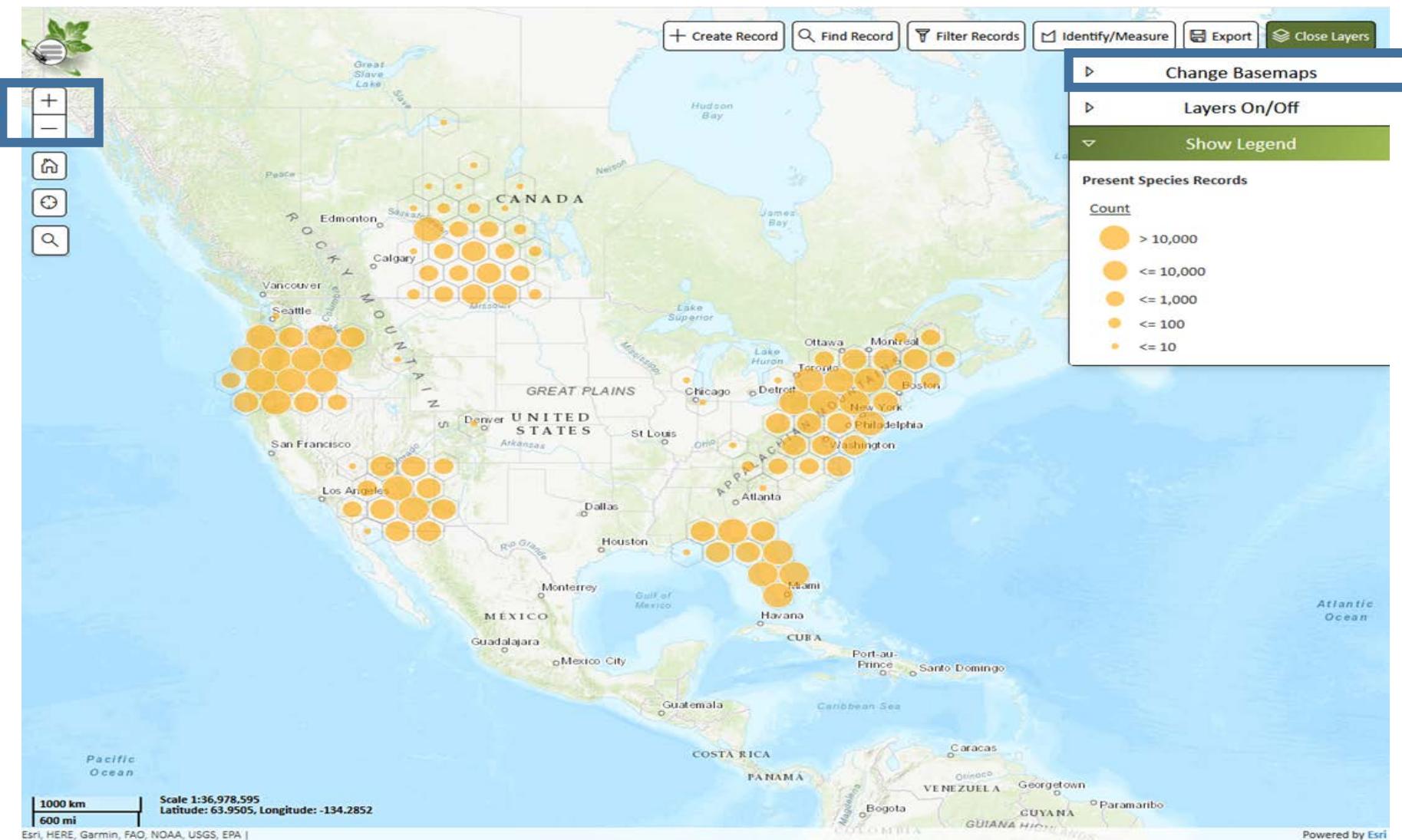
Day 4: How to log onto iMapInvasives

- Once logged in, you will see the screen on the right



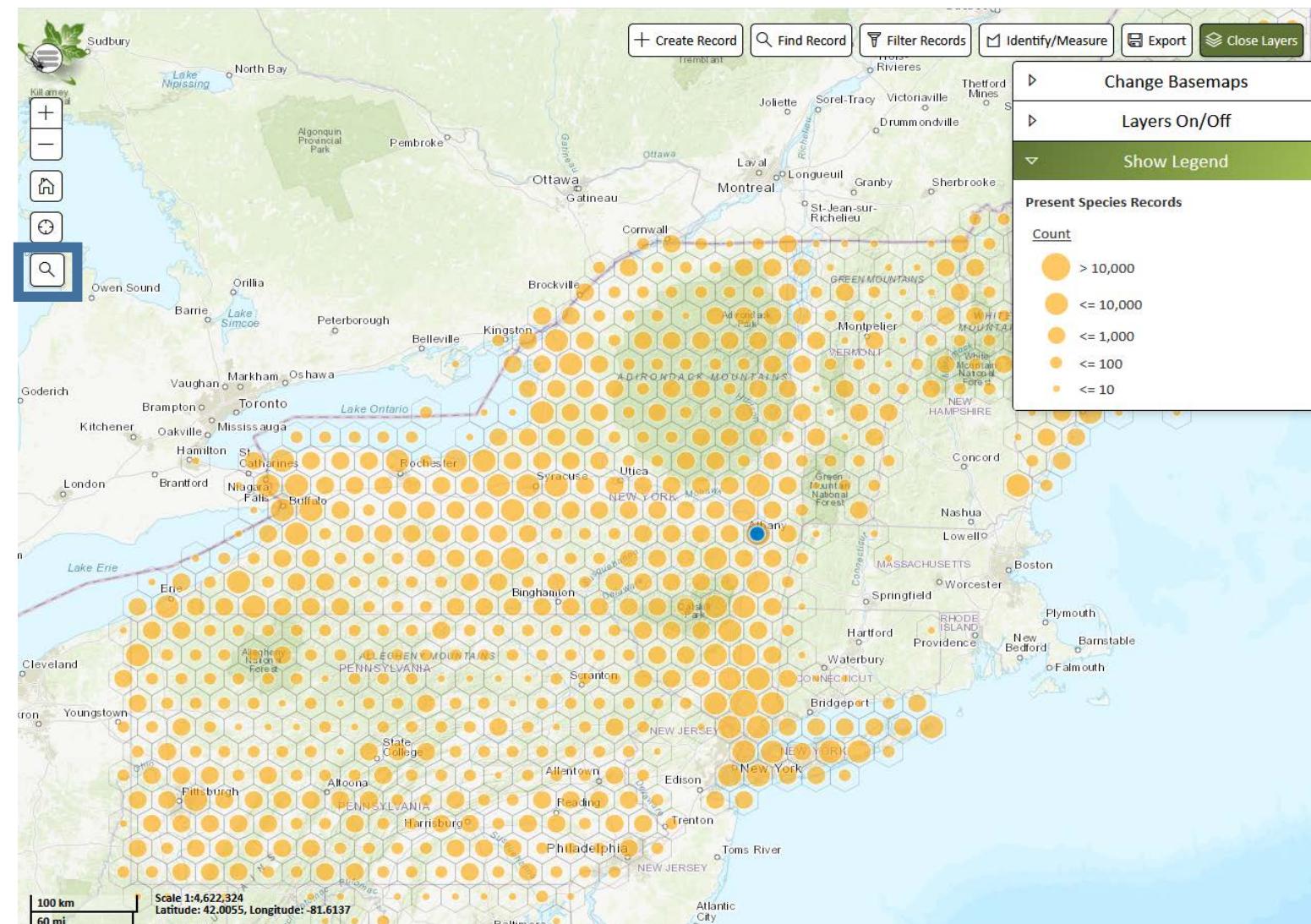
Day 4: How to use the online map

- Zoom in or out using the + or - buttons
- You can change the base maps to topographic, satellite, etc.



Day 4: How to use the online map

- You can search for a specific location by entering an address or GPS coordinates by using the 'magnifying glass' tool



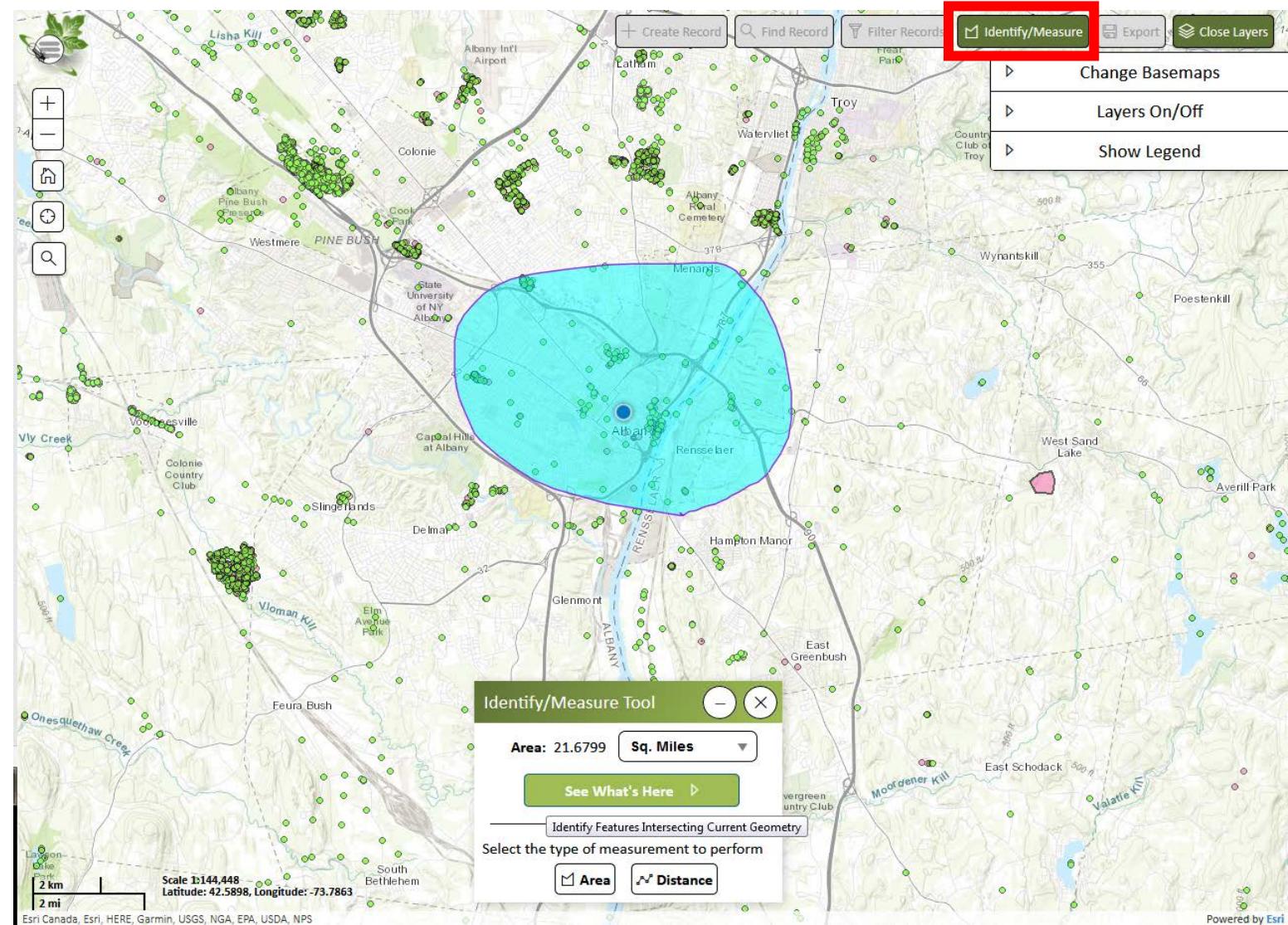
Day 4: How to use the online map

- You can input data by pressing the 'Create Record' button
 - If you want to test creating a record, try using the 'Fake species (for testing)' option!

The screenshot shows a map interface with various tools at the top: Create Record, Find Record, Filter Records, Identify/Measure, Export, and Close Layers. A dropdown menu is open, showing options like Change Basemaps, Layers On/Off, and Show Legend. Below the map, a modal window titled 'Presence Record Details' is displayed, containing fields for Present Species (set to 'Fake Species (for testing)'), Observer, Date (10/17/2019), and Tagged Projects.

Day 4: How to use the online map

- The lasso tool allows you to click and draw a boundary around features you want to ID.
- Click the 'Identify/Measure' button and draw a boundary. Double-click to close the boundary and click 'See What's Here' to open a list of all the invasive species found in that area.



Day 4: How to use the online map

The map interface includes the following controls:

- Basemap:** Aerial, Satellite, Hybrid, Street View.
- Search:** Find Record, Filter Records, Identify/Measure, Export, Close Layers.
- Layers On/Off:** Change Basemaps, Layers On/Off, Show Legend.

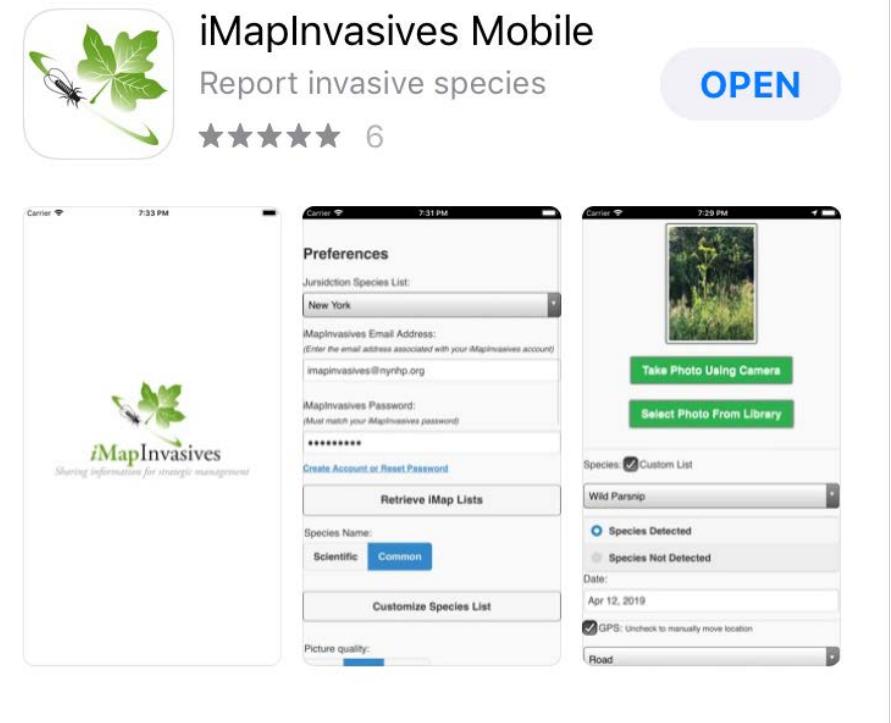
Measure/Analyze Results by Layer: Includes a button for "Include Hidden Layers" and a result count of 3296.

Present Species	Unconfirmed Present Species	Approximate Present Species	Not-Detected Species	Treatments	Searched Areas	County/District	Waterbodies	Con...
Presence ID	Scientific Name	Common Name	Observation Date	Observer Name	Organization Name	Details	Tasks	
1 531974	Acer platanoides	Norway Maple	Sat, Oct 06, 2018	Deana Gonzales - 10619	Cornell University	Details	Tasks ▾	
2 1024495	Acer platanoides	Norway Maple	Wed, Aug 08, 2018	Elizabeth-Ann Jamison - 9...	Capital Mohawk PRISM	Details	Tasks ▾	
3 449681	Acer platanoides	Norway Maple	Thr, Aug 20, 2015	Steve Young - 2192	New York Natural Heritag...	Details	Tasks ▾	
4 491334	Acer platanoides	Norway Maple	Sun, May 22, 2016	Timothy Howard - 2056	New York Natural Heritag...	Details	Tasks ▾	

1,000 result(s)

Day 4: How to use the mobile app

- Search “imapinvasives” on your phone’s app store
- Download is FREE
- Android Users- Play Store
- iPhone Users- App Store



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Day 4: How to use the mobile app

During download:

- Allow iMap to access your location
- **iPhone Users:** Settings-Privacy-Location Services (camera)- iMapApp
- **Android Users:** Settings- Privacy & Safety- Locations- On



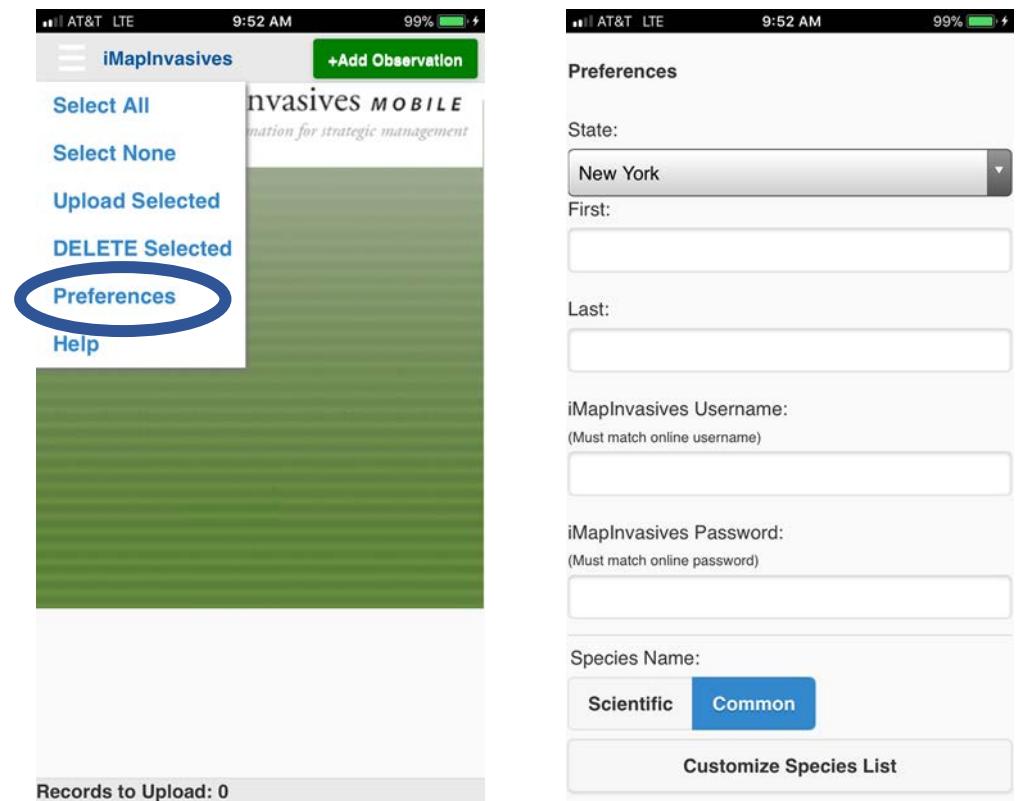
Day 4: How to use the mobile app

- Once the app is downloaded you will see a welcome screen similar to the one pictured



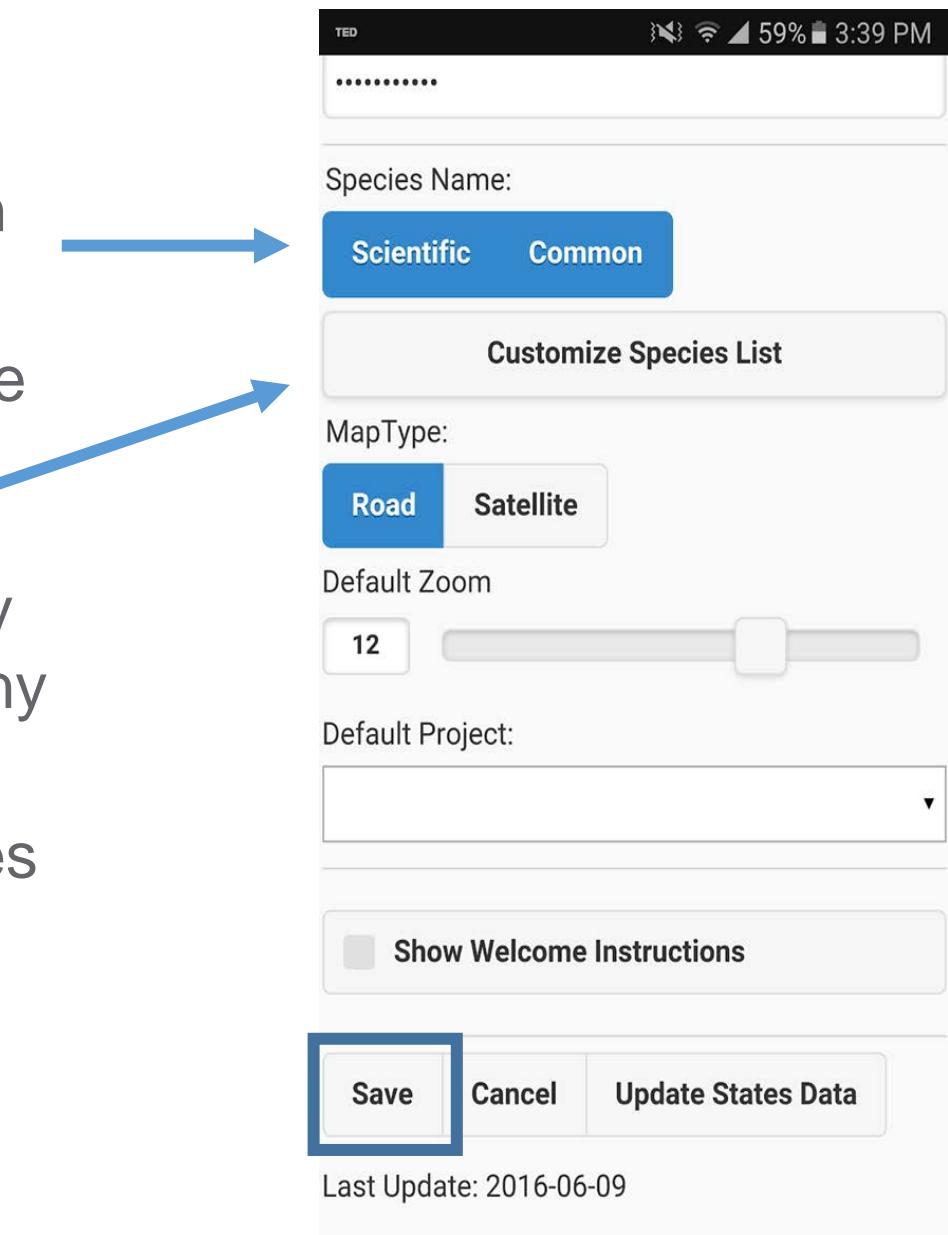
Day 4: How to use the mobile app

- The first thing you will need to do before using the app is to set your preferences
- **Set Preferences (Required):**
 - Main Menu- Preference
 - State = New York
 - iMap Username and Password



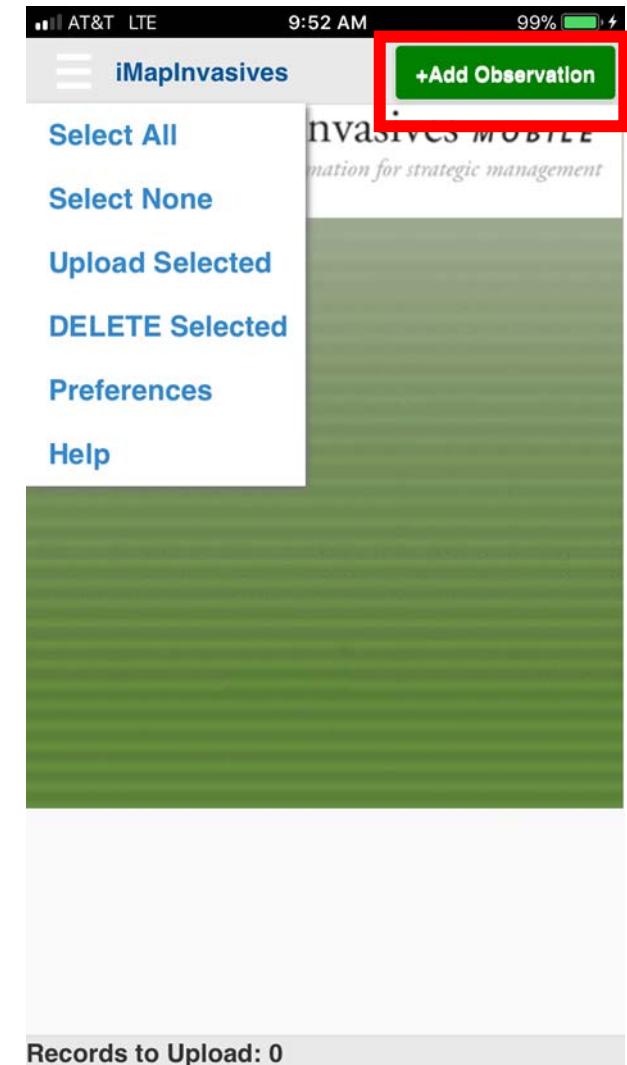
Day 4: How to use the mobile app

- Change how the species names are displayed in your app. You can select either one or both.
- **Customize Species List:** Allows you select to the species with which you'll be working with most often. This can be time efficient as you will not have to scroll through the entire species list every time you enter a point. This can be changed at any time.
- Always hit “Save” after you’ve made your changes to lock them in.



Day 4: How to use the mobile app

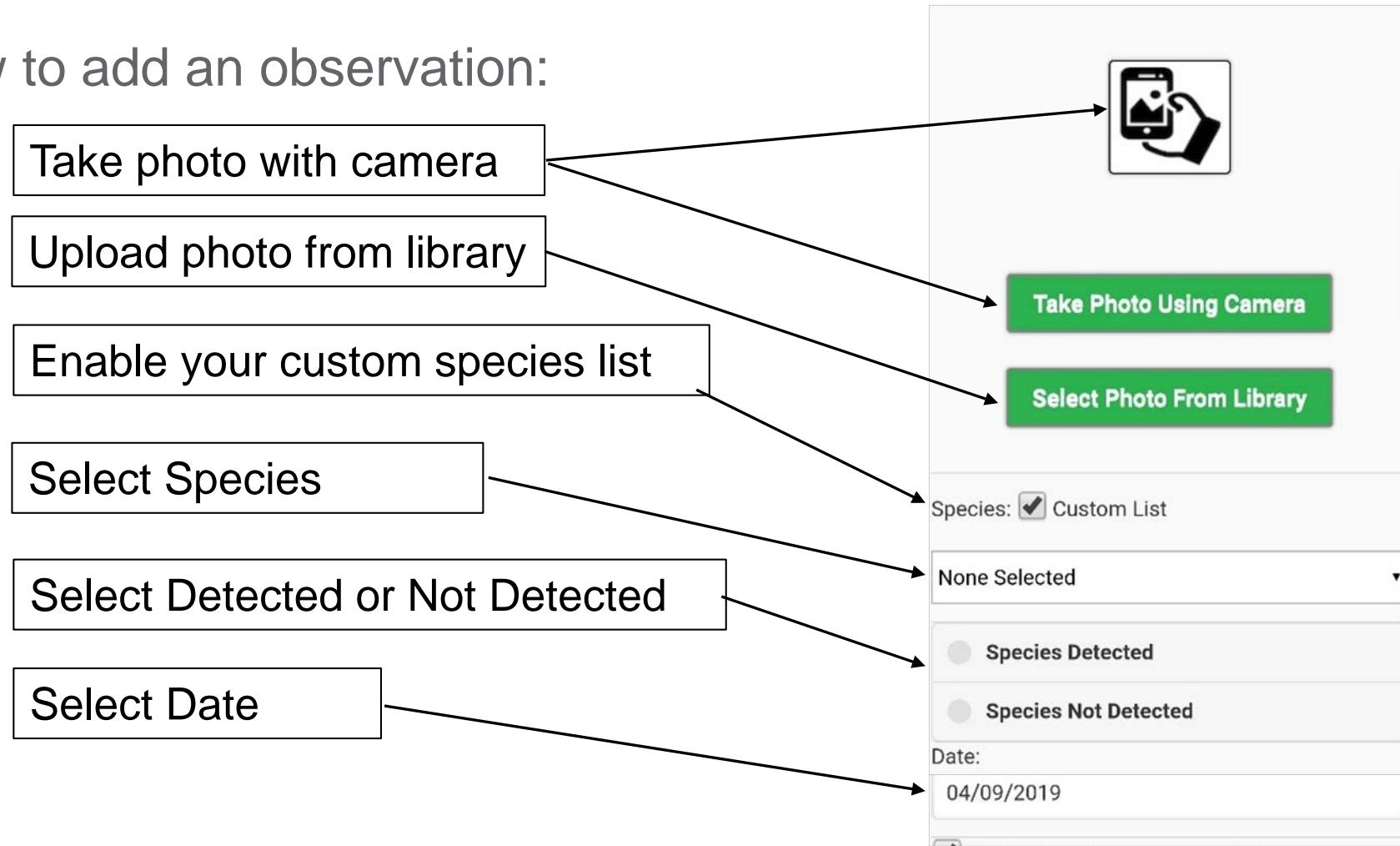
- How to add an observation:
 - Make sure your phone's GPS is on and able to interact with the app



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Day 4: How to use the mobile app

- How to add an observation:

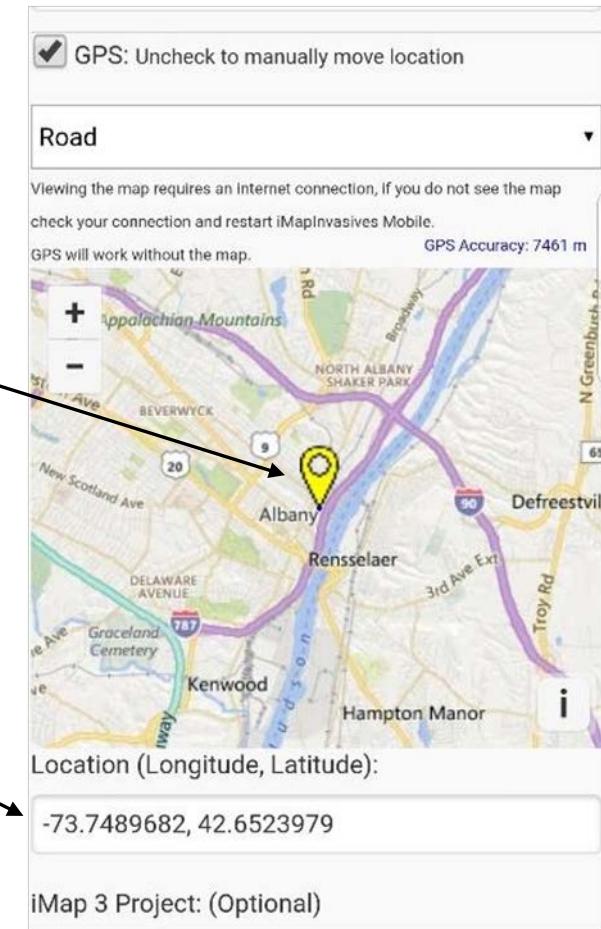


Day 4: How to use the mobile app

- How to add an observation:

Your location

Your coordinates: If 0,0 is displaying in the Location box, make sure your GPS is enabled on your device



Day 4: How to use the mobile app

- How to add an observation:

Enter the approximate time you were searching for invasive species

Add any comments that may enhance the quality of your observation report

Don't forget to save your changes!

iMap 3 Project: (Optional)

iMap 3 Organization: (Optional)

Time Searched (in minutes):

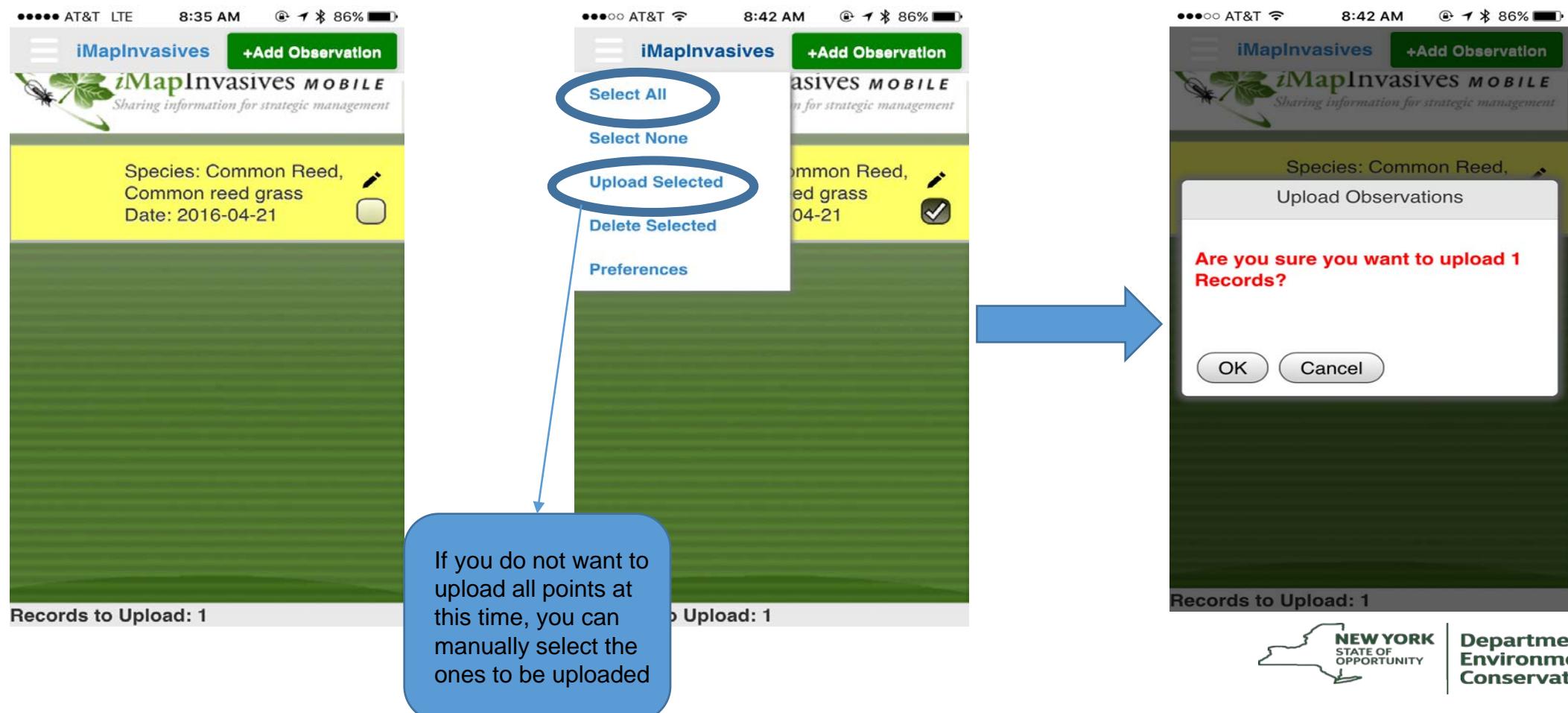
Observation Comments:

Save Cancel



Day 4: How to use the mobile app

Uploading your observations:



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Day 4: Field day procedure

- Each student group will have the following materials:
 - Clipboard with field form
 - Pencil
 - Hand lenses
 - One smart device with *iMapinvasives* downloaded and set preferences.
- All students will move outdoors to the class survey section.
- Each group will stay together to collect data. Groups will survey the area and find one invasive species to add to the *iMapinvasives* database. After adding the data, groups will fill out the information on the field sheet to be used the next day for analysis.
- Class groups should spread out over the designated area to find different infestations.



Day 4: Field day procedure

- **Each student group should only plot one invasive species on the iMapinvasives app.** This is to ensure the iMapinvasives team is not overloaded with the same or similar data.
- It is also important to share with students that they should be certain with species identification and define the density. Multiple points in the same area are not as effective as defining the infestation as is inputting one point that describes the density and size.



Day 5: Field work



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Day 5: Field day

What invasive species are on the school campus?

Goals:

1. Field review
2. Field work
3. Upload data



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Day 5: Tools each group needs:

- Clipboard
- Field sheet
- 10 common invasive species sheet
- Student observation (from plant ID day)
- Hand lenses
- Pencil
- One Smart Device



Day 6: Data analysis



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Day 6: Data analysis

What did groups find?

Goals:

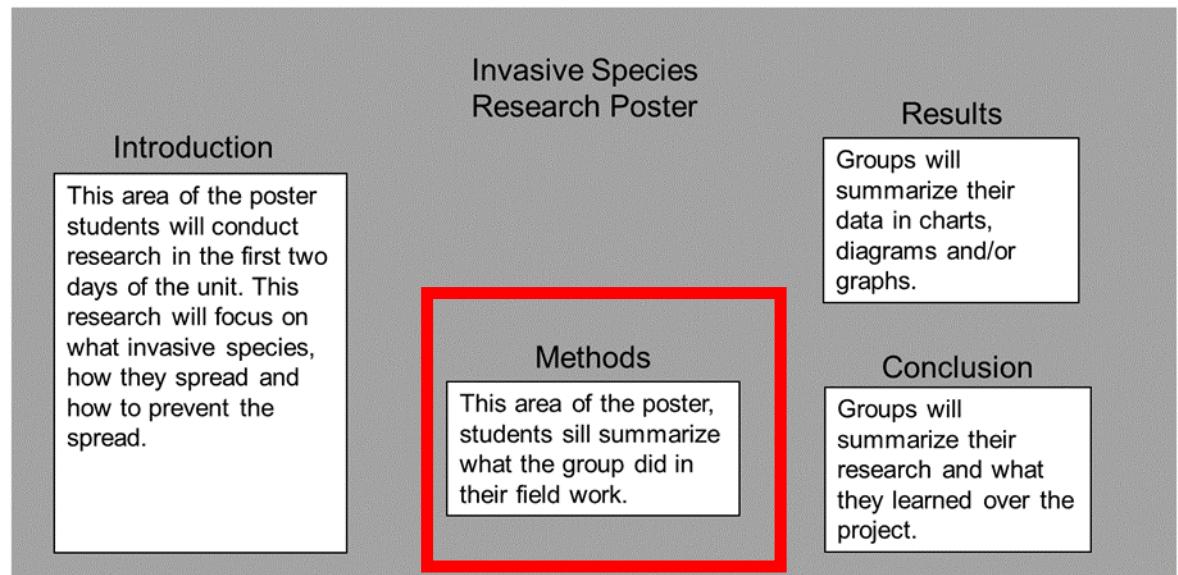
1. iMap observations
2. Field sheet data summary
3. Methods review



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Day 6: Data analysis

- Student groups should start their analysis by logging on to iMapInvasives and review the class observations.
- Following, groups will review their data and create a chart or graph for the research poster.
- After data is added to the poster, students should review the methods and finalize.



Day 7: Optional field trip



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Day 8: Big picture

Day 8: Big picture

What are scientists and natural resource professionals doing about invasive species?

Goals:

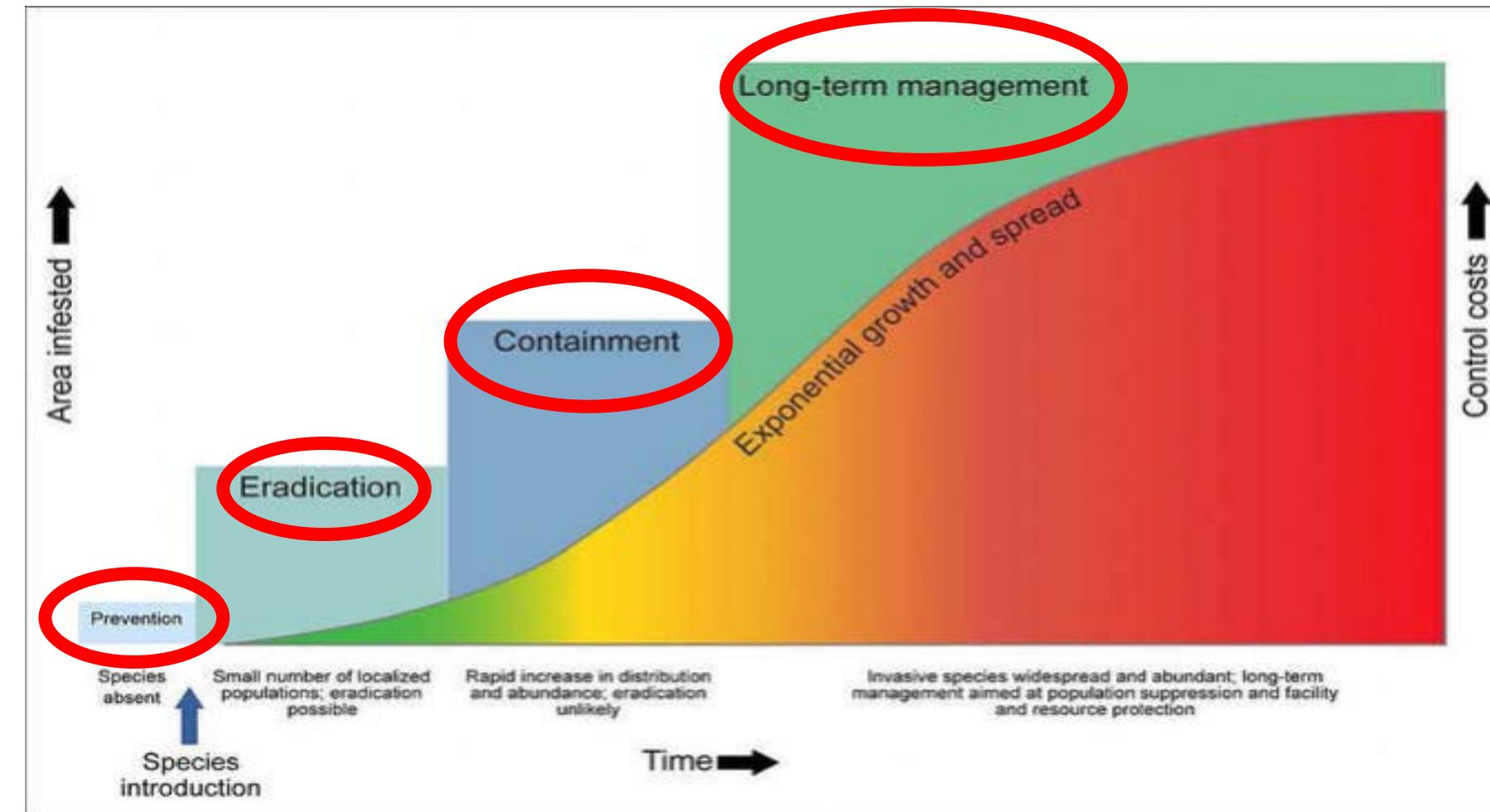
1. Invasion curve
2. Current management
3. Project summary writing



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Day 8: the invasion curve

Prevention: Low-cost way to stop the establishment of small infestations allow for early detection and removal. However, containment of this phase begins when the species invades. Long-term management area restrictions on the spread of plants and animals occurs when the invasive species is prevalent (a full state). Methods are developed and tested to decrease the time it takes to contain the infestation and limit the number of invasive species in an area. This is done to prevent species extirpation. This is done to protect resources and native species. It becomes aware.



The invasion curve shows how time continues, without intervention, invasive species will increase in infested area and how much they will cost to control (axes)

Day 8: What are scientists doing to manage invasive species?

- Mile-a-minute pull
- Removal of giant hogweed – NYS DEC
- Purple loosestrife biocontrol (release 1997)



Day 8: Project conclusion

- What did the group learn?
- What are some prevention strategies the school, and students, can take to prevent invasive species from spreading?



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Day 9: Poster session



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Day 9: Poster session

- What did the group learn?
- What are some prevention strategies the school, and students, can take to prevent invasive species from spreading?

Goals:

1. Poster session set up
2. Gallery walk and talk
3. Clean up



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Day 9: Poster session prep

- Groups set up poster around the classroom. Posters should not be right next to each other.
- Groups need to set up an order to stay with the poster and present to audience members.



Day 10: Action/service-learning day (optional)

Day 10: Action/service-learning day (optional)

Goals:

1. Assist natural resource professionals in invasive species management process
2. Reflect on experience



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Day 10: Action/service-learning day (optional)

Management strategies:

- **Prevention:** protecting what sites have not yet been infected by invasive species
 - Less expensive than management for an infested area
 - Case study: spotted lanternfly (*Lycorma delicatula*)



Day 10: Action/service-learning day (optional)

Management strategies:

- **Eradication:** practiced when an invasive species is present in an area, but the infestation is small or all individual plants or animals can be removed.
- For eradication to be successful, the invasive species must be found soon after its release or after it was first found in the ecosystem
- Case study: Asian longhorned beetle (*Anoplophora glabripennis*)



Day 10: Action/service-learning day (optional)

Management strategies:

- **Containment:**
 - Containment is practiced when eradication is not possible and management switches from trying to get rid of an invasive to keeping it from spreading to other locations.
 - Containment is successful when invasive species are kept from spreading beyond a designated containment area. Monitoring is important to ensure that the infestation is not spreading.
 - Case study: Mile-a-minute (*Persicaria perfoliata*)



Day 10: Action/service-learning day (optional)

Management strategies:

- **Long-term management:**
- When eradication or containment of an invasive species is no longer possible, long-term management to protect the ecosystem is the last option. Though management is used for places where the species will never be eliminated, it's important to continue prevention for other areas that have not been infected
- Management usually involves biocontrol, management that uses other organisms or insects to attack the problem invasive species. Biocontrol requires extensive research, so a new pest is not created
- Case study: Purple loosestrife (*Lythrum salicaria*) & biocontrol insects (*Galerucella calmariensis*, *G. pusilla*, *Nanophyes marmoratus* and *Hylobius transversovittatus*)

