EDDMapS

Invasive Species Mapping Handbook

The University of Georgia
Center for Invasive Species and Ecosystem Health
Warnell School of Forestry and Natural Resources
College of Agricultural and Environmental Sciences

Front Cover:

First Detector Training, Skidaway Island, 2015. Photo Credit: Sarah J. Swain, University of Georiga, Bugwood.org

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All images can be found in the Bugwood Image Database System at images.bugwood.org.

EDDMapS

EDDMapS, the **Early Detection & Distribution Mapping System**, is an innovative web-based mapping tool which can be used to document the distribution of invasive species across the United States and help identify leading edges of new infestations. Professionals and Volunteers learn how to collect data on invasive species and enter the data into the EDDMapS through a web-based data entry form or the EDDMapS smartphone app. The intent of this volunteer training is to empower the public to become actively involved in effectively slowing the spread of harmful invasive species and to reduce their environmental and economic damage.

EDDMapS was originally designed as a tool for State Invasive Species Councils (ISC), Invasive Plant Council (IPCs) Exotic Pest Plant Councils (EPPC), Cooperative Weed Management Areas (CWMA) and Cooperative Invasive Species Management Areas (CISMA) to develop more complete local, state, and regional level distribution data of invasive species. Identification of leading edge ranges of new invasive threats allows implementation of EDRR (Early Detection & Rapid Response) programs. Invasive species lists and management priorities can be updated regularly as new data are recorded. Your participation in this initiative will contribute both to state mapping efforts and to national efforts to map the distribution and spread of invasive species.

Even if you are new to the identification of invasive plants and animals, you will probably already be familiar with several, if not all, of the invasive species in your area. Many volunteer groups have a 'Top Ten Most Wanted' or a 'Dirty Dozen' list of invasive species on which they focus data collection and reporting. Check with the Exotic Pest Plant Council or Invasive Species Council in your area for trainings on identification of invasive species. Information on invasive species is available at the Invasive Plant Atlas of the United States. It can be found at www.invasive.org. Information on all taxa can be found at wiki.bugwood.org.

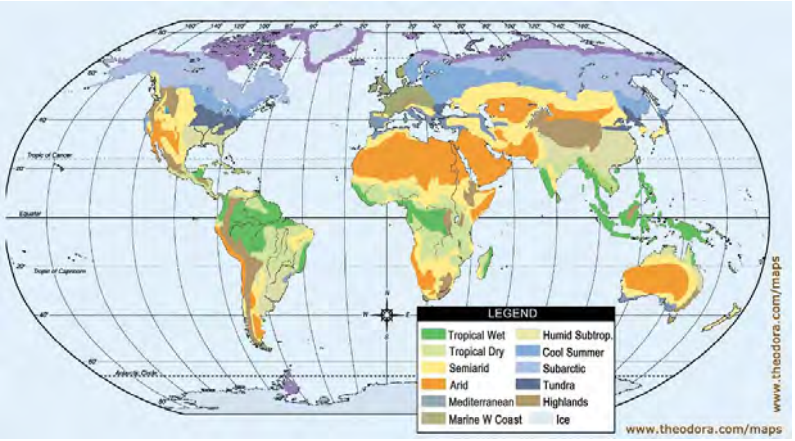
S. Dewey, USU

N. Loewenstein, AU

What is an Invasive Species? An invasive species is any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem; and whose introduction does or is likely to cause economic or environmental harm or harm to human health. This definition is based on the definition of invasive species as written by the USDA National Invasive Species Information Center and Executive Order 13751.

K. Rawlins, UGA

Where Do They Come From? Species which have become invasive often come from areas which have climates similar to our own all over the world.



How Did They Get Here? Some species were introduced accidently in packing material, as crop contaminants, in shipping containers or from the cargo holds of ships. However, many invasive species have been brought here deliberately. We grow non-native species for food, as ornamentals in gardens, for their usefulness in feeding wildlife, or controlling our environment in some way.

Why Do Species Become Invasive? Not all exotics are invasive. Exotic or non-native species are considered to be invasive only when they cause harm. Of agricultural crops grown in the US, 98% are not native to the regions where they are grown. Predicting which species will become invasive is difficult. Scientists are still trying to discover why a plant can suddenly become an invasive problem after many years. Insects, other animals, and pathogens can spread slowly or very rapidly. As an example, the two lists here show that many of the characteristics prized in an ornamental plant are the same characteristics which increase the likelihood of a non-native plant becoming an invasive problem.

Invasive

- Habitat generalist
- Out-competes other plants
- Reproduces easily
- Abundant seeds
- Dispersed seeds
- Not affected by native pests/diseases

Ornamental

- Hardy
- Easy to grow and propagate
- Abundant flowers
- Fruits to attract birds
- Disease and pest resistant

K. Rawlins, UGA

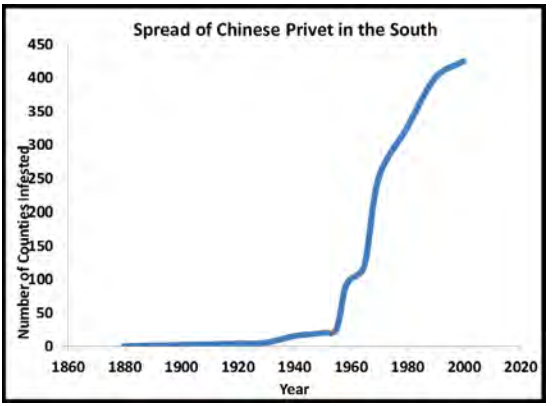
Many invasive plants were initially introduced for landscaping

The longer a nonnative species is present, the better chance it has of escaping into natural areas, naturalizing and increasing its population. Multiple introductions also increase the risk of a species becoming an invasive problem. Often humans add to the likelihood that a species will be introduced repeatedly. Examples are wild hogs released for hunting, domestic hogs escaping captivity, and nonnative privets being used as hedges in many home landscapes across America.

Leah Bauer, USDA

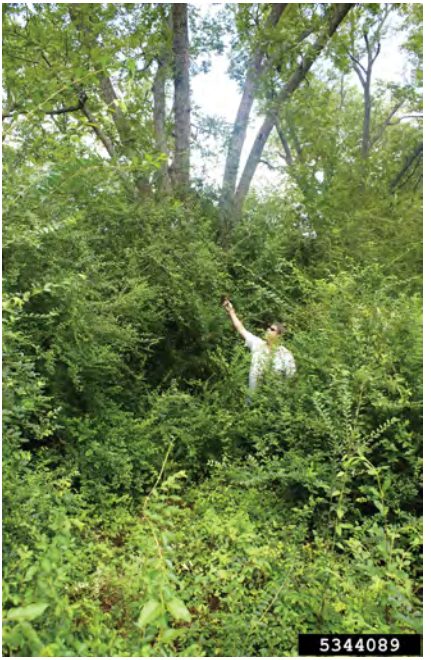
Leslie J. Mehroff, University of Connecticut

Some non-native species were used here for many years before they became an invasive problem. One explanation for this is 'The Lag Phase' which refers to the period of time after a plant has been introduced, escapes, and naturalizes but before the population reaches the point at which it begins to increase rapidly, even exponentially. The lag phase can last for many years, even decades. This is one of the reasons why it is important to track populations of non-native plants which have escaped and naturalized, even though they may not actually be invasive at this time. Tracking non-native species populations is especially important for species which have been shown to be an invasive problem in other regions, states or countries.



EDDMapS.org

The graph on this page represents the actual lag phase experienced with Chinese privet. Control measures would have been both more effective and much less costly had they started in 1960. Early Detection & Rapid Response programs attempt to identify problem species in the early stages of infestation, so that control measures can be taken before their populations become so large that control is difficult. Nonnative insects and pathogens cause millions of dollars in damage to trees both in forests and urban areas.



D. Moorhead, UGA

Why Do We Care? The attempt to control invasive species can be costly in time, effort, and money. Invasive species are directly responsible for the extinction of many native species. As the number of invasive species increases the amount of damage they cause to our native ecosystems and to the environment increases as well.

Ecological Impact

- 50,000 nonnative species in the U.S.
- 25% of the Eastern Deciduous forest in North America contained chestnut trees before they were attacked by chestnut blight

Economic Impact

- At a minimum, $120 billion/year in environmental damages, control, and losses
- Removal of Elm trees cost $100 million/year due to Dutch elm disease
- Weeds in gardens, lawns, and golf courses cost $1.5 billion/year

C. Bargeron, UGA

The biological pollution caused by invasive species is extremely challenging, even if no other non-native species is imported, the ones already invading native ecosystems will continue to grow and spread.

Why is it Important to Report an Invasive Species Sighting?

A key component in an invasive species Early Detection & Rapid Response (EDRR) program is the development of species distribution maps. Entering and tracking locations of invasives within and between states can identify the “leading edge” of invasive species heading our way. Implementing EDRR programs to stop or minimize the spread of an invasive species, allows land managers and agencies to prioritize control needs and strategies while populations are still small.

EDDMapS is a web-based mapping system for invasive species distribution that is fast and easy to use and doesn’t require GIS experience or software.

Using standardized online data forms, specific information about the infestation and images will go to a database that aggregates data from other mapping projects and cooperators to display invasive species distribution at county, state, and national level scales.

Gathering the information is as simple as taking pictures of the invasive species and noting the location. Location information can be determined by taking the GPS coordinates on-site, by using the EDDMapS online map functions to locate the point of the infestation, or by downloading and using the free smartphone app for your area, from the Bugwood accounts on the Google play store (Android) or iTunes store (iOS). Links to the apps are also available on www.apps.bugwood.org.

Step-By Step Instructions for Reporting an Invasive Species Sighting in EDDMapS

Basic information required:

- Who collected the data
- What species you are reporting
- Description of invasive species infestation
- When and Where you collected the data
- Images of the invasive species

First time only: Register as an EDDMapS user.

1. Go to the EDDMapS website (www.eddmaps.org)
2. Select “Report Sightings” from the menu bar.
3. Click the “Sign up” button.
4. Fill out the form with your name, email address, etc.
5. Click the “Submit” button. Your information can be easily changed or updated any time from your My EDDMapS page.

Once you have registered for EDDMapS, just sign in to report an infestation from the website or smartphone app!


C. Evans, River to River CWMA


Joseph Scopino, Bugwood.org


D. Moorhead, UGA


C. Bryson, USDA ARS


U.S. Geological Survey


Craig Hicks, Bugwood.org


W. Ciesla, FHMI

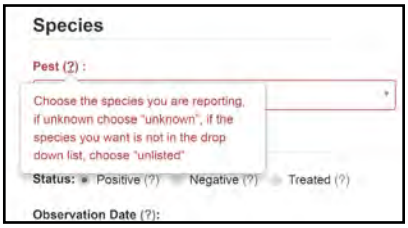
Who collected the data - Reporting on the EDDMapS website

From the EDDMapS website (www.eddmaps.org)

1. Select "Report Sightings" from the menu bar.
2. If you are not currently logged in, complete the prompt to log in or sign up. You are now ready to begin the reporting procedure.
3. Select the state for which you are reporting an infestation.
4. Select the type of species that you are reporting.

You will now see the reporting form with a number of fields.

Note: *If you place your cursor over a (?) at the end of a field on the form you will get a definition or more information about filling out that field. This information answers the questions most often asked about filling out the form. Most of the fields have arrows for drop down menus with a list of possible choices for that field.*



Description of invasive species infestation

1. Pest Species: Click on the arrow on the right side of the screen to see a drop-down menu with a list of invasive species. As you type in the scientific or common name of the species you wish to report, suggestions will begin to be offered and you can either continue to enter the name or scroll through to find what you are looking for. If the species you are reporting is not listed, type in "unlisted" or "unknown" and select the type of species it is (e.g. plant, animal, etc.) and add the name of the pest in the Location Description text box. If you are not sure what the species is, choose Unknown.

Note: *Species are listed in alphabetical order by scientific name, although the common name is also listed.*

2. Host Species: Insects and Diseases may be observed living on or within a host plant or animal. In some cases identifying the Host species helps you identify the Pest species. As with the Pest Species, begin to type in the host scientific or common name and an autosuggest box will appear with options.

3. Pest Status: Reports may fall within three different types: Positive, Negative, and Treated. Positive - You observed the species. Negative - You surveyed for the species and did not find it. Treated - You observed the species and performed an action to control the pest (e.g. removed the organism, applied a pesticide, cut or mowed the plant, etc.)

4. Gross Area: Perimeter of entire area of invasive species present may contain significant parcels of land not occupied by invasive species. You can enter Gross Area for plants, insects, diseases, and wildlife. You can either draw the gross area by clicking on the little blue marker next to "Gross Area" and drawing a polygon of the area. This will automatically add the sq. feet or acres to the form. You can also manually enter the estimated area and choose the unit area from the drop-down menu as acres, hectares, square feet, or square meters

5. Infested Area: Area of land within the Gross Area that estimates the area actually covered by the invasive species. You can enter Infested Area for plants, insects, diseases, and wildlife. An infested area of land is defined by drawing a line around the actual perimeter of the infestation as defined by the canopy cover of the invasive plants, excluding areas not infested. Areas containing only occasional invasive plants per acre do not equal one acre infested. It is highly recommended that only a single invasive plant species be entered for each infested area. Infested area can be entered by using the map to draw a polygon or polyline, which will automatically enter the infested area. If you choose to enter the area manually, your choices from the drop down menu are acres, hectares, square feet, or square meters.

Note: *The definitions for infested and gross area are taken from the North American Invasive Species Management Association Invasive Species Mapping Standards*

In the example on the right, a field is infested with cogongrass. The gross area is the whole field. The cogongrass in the example is outlined in yellow and would be considered the infested area.

F. Price, FNAI

6. Habitat: From the drop down menu, choose the description that best describes the habitat within which the invasive species occurs. If the appropriate habitat is not listed, choose "Other" and add any clarification needed in the Location Description text box.

7. Canopy Closure: Canopy closure is a way to estimate the amount or severity of an invasive plant infestation. Area tells you the extent of the population across the landscape. Canopy closure tells how that weed dominates the vegetation within that area. The greater the canopy cover the more the invasive plants there are.

D. Stephens, Bugwood.org

Note: *Insects and Disease reporting forms contain fields for estimating the 1) Type of Damage to Plants, 2) Percent Damage Severity (plant damage severity evaluates one or a selected few to ascertain the amount of damage to the individual plants), 3) the Stand/Polygon Damage Severity in Area (percent of affected hosts of all the plants affected in the area), 4) Stand/Polygon Pattern of Damage.*

8. Abundance/Density: Choose the most appropriate answer from the dropdown menu. Options are Single Plant, Scattered Plants, Scattered Dense Patches, or Dense Monoculture.

9. Species Description: Check each description which applies at the time you gather the data. Plant choices are: in flower, in fruit, seedlings/rosettes, seeds, dormant/dead, bolting, and unknown. Insect Life Stage choices are: Adult(s), Egg(s), Larva(e), Nymph(s), Cocoon(s)/Pupa(e), Damage, Unknown and Wildlife Life Stage choices are: Adult, Juvenile, and Unknown Insect forms contain the field Sex for reporters to note if the observed species was Male, Female, or Unknown. Wildlife forms contain Life Status as Dead, Alive, or Unknown.

When you collected the data

1. Observation Date: Enter the date you observed the pest species in the format mm/dd/yyyy.

Note: *If the date is entered in different format it may cause an error message to appear.*

Where you collected the data

1. County: Choose the county where the invasive species was observed from the drop down menu.

2. There are two ways on EDDMapS to add coordinates to your report. Latitude/Longitude: Enter the Latitude and Longitude coordinates. Remember to put the negative sign in front of the Longitude coordinate to

place your entry in the Western hemisphere. After adding the coordinates manually, you can click “Place marker at position” to add the point to the map to make sure that the location looks correct.

Note: *You can find the coordinates using a GPS unit at the site when you collect the data. Make sure you set your GPS unit to NAD83 or WGS84 and to decimal degrees. If your coordinates were recorded as degrees minutes or degrees minutes seconds, you can us the “lat/long conversion tools” to convert from one format to another.*

Or……..

You can select a location using the map on the form. Choose the normal map view or a satellite image.

Increase the magnification of the map on the web forms by clicking the plus (+) sign in the lower right hand corner of the map or by holding the CTRL button and scrolling until you have zeroed in on the site where the infestation was found. On the smartphone apps, zoom in and out by using a pinching motion with two fingers on the maps.

Options for denoting an infestation spatially on the website include: point, polyline, and polygon, the smartphone apps only allow for point and polygon drawn shapes. For infestations that are small or singular, select the point icon and click on the map where the pest was observed. The point can be moved by either clicking in new locations or clicking and dragging the point. For infestations that appear to be linear (e.g. following a fence line, roadway, railroad line, stream bank, etc.) choose the polyline icon and click the shape of the line, double click the last point/segment to end the line. For polygons, select the polygon icon and click at the corners of the infested area. Do not let the lines/sides of the polygon cross each other.

3. Ownership: From the drop-down menu, select the ownership type for the property on which the invasive plant was found. If you include coordinates or a shape on the map, but do not want the general public to know the exact location, set the Private field to “Yes” to hide the coordinates. This will allow the report to only show to the public at a County level, but will allow the reporter to know the exact location when viewing the report on their My EDDMapS -
Reports page.

Note: *Remember, you need permission from landowners to be on private property.*

4. Location Description: Add any information that would aid in relocating the infestation or to clarify any other entry.

Images of the Invasive Species

You can also upload images of the species through the smartphone or web form. Clear images are important and allow an expert to validate your entry by making a positive identification of genus and species.

1. Image: Click Choose File and navigate to the picture on your computer. Click Open and the image location will be entered for you. You can upload up to five images. Images are automatically resized for uploading. From the smartphone app tap on the camera icon, choose to take a picture to upload or choose an image from your gallery.

2. Caption: Add a caption to describe each image. Provide as much detail as possible. Include the photographer's name if someone else took the photo.

Note: *Image recommendations include any identifying characteristics. Examples for plants might be leaf shape and arrangement, flowers, fruit, roots, and unique features like thorns. Whole plant images showing the habit of the species are also appropriate when included with close-up images. Use a tripod when needed. Take photos with the sun behind you. For other types of species, it may be different views/angles of the insect or animal, close up images of skin patterns, etc, and for diseases and insects, images which include damage to host, mature life stages and fruiting bodies.*

This is a good example showing the flower and leaf shape in one image

R. Wallace, Bugwood.org

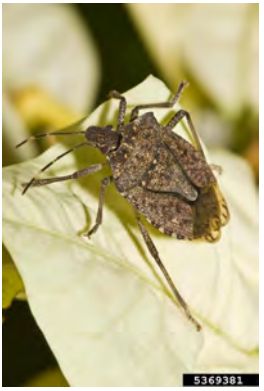
Leaf shape and arrangement can be seen in this image.

K. Rawlins, UGA

This image helps show the extent of this infestation of *Hedera helix*.

C. Bargeron, UGA

Close up images show details which allows positive identification of insects



Susan Ellis, Bugwood.org

Herbarium Specimen

The next section of the online form allows you to provide information when you collect an herbarium specimen of an invasive plant.

1. Additional Information:

a. Comments: Add any additional comments about the site, the infestation, or management plans here.

b. Identified by: Enter the name of the expert (only when it is someone other than yourself) identifying the specimen.

c. Voucher Specimen Made: If a voucher specimen was created from this sighting click Yes. (*The default setting is 'No'*)

d. Herbarium: Enter the name of the herbarium where the specimen is housed.

Note: *See www.eddmaps.org/tools/ for information on how to collect, prepare and submit an herbarium specimen. Although herbarium specimens are NOT required, they can add validation to records, especially first reports of a species in a county or state.*

The last step is to click Report. (In the smartphone app click Save as the last step at the end of the reporting form. To save your battery you can wait to upload all the data you have collected once you get back to a Wifi source.)

The data is now entered into EDDMapS and your images are uploaded. Congratulations! You have successfully completed an entry into EDDMapS. The record will be publicly available once an expert verifier has reviewed the report and determined that it is a correct identification. To see who may be reviewing your reports, visit www.eddmaps.org/tools/verifierlookup/. To learn more about the verification process or if you are a verifier, visit the Tools and Training page and click on How to Verify a Record.

Be sure to go to your My EDDMapS page. This is where you can keep track of 'Your Stats,' view, revisit or edit the data you have entered, view or edit your profile, as well as set up and manage alerts for invasive species you want to track.

The Tools & Training page has a section on Bulk Data Resources which provides instructions and templates on how to collect and upload data files into EDDMapS. The uploaded files are sent to the EDDMapS Data Manager for formatting and evaluation. They are uploaded into the database where they will then go through the same record review process as individual records. To upload Bulk Data, you can also go to My EDDMapS and click on My Uploads, the resources are also available there.

Revisits:

Revisits allow you to show change over time in an infested area. You can use Revisit to document changes in the infestation as well as management plans and results. To add a revisit to a report, click on My EDDMapS and then Reports. You can search or sort to find the original report by ID, species, location, or date. Once you have found the report you need, click on Revisit in the Manage section to open the report. The revisit form has many of the same options as the original reporting form. You can also use the map to draw any changes in the size and shape of the infestation due to management or other factors. When the form is completed, you will click "Save this Revisit". The original report and its revisits will always be linked together.

Collecting data on Invasive Species

GPS

GPS stands for Global Positioning System. It is a satellite-based navigation and positioning system which works 24 hours a day, anywhere in the world. Vertical and horizontal imaginary lines form a grid which allows us to find a single point anywhere on the earth.

Latitude/Longitude

Latitude is expressed as degrees north or south of the equator (Southern Hemisphere is denoted by a negative). One degree of latitude covers about 69 miles. Latitude lines begin at and are parallel to the equator. The equator is at 0° latitude, the North Pole is at 90° North latitude and the South Pole is at 90° South latitude.

K. Rawlins, UGA

Longitude lines are called meridians and are expressed as degrees east or west of the Prime Meridian which is at 0° longitude (Western Hemisphere is denoted by a negative sign). Longitude lines meet at the poles. One half of the world is measured in degrees of east longitude up to 180°, and the other half in degrees of west longitude up to 180°.

A GPS unit can give latitude and longitude in different formats. Decimal degrees is the format used in EDDMapS. The same coordinate system with different ways of expressing it:

32° 45' 12" x - 84° 35' 57" DD/MM/SS (Degrees, minutes, seconds)
32° 45.2000' x - 84° 95.00' DD/MM.MMM (Degrees, decimal minutes)
32.75333° x - 84.59917° DD.DDDDD (Decimal degrees)

Datum

Use WGS84 (World Geographic System) or NAD83 (North American Datum of 1983) which are ground based mapping systems that match coordinates and helps ensure accuracy, since the earth is not a perfectly shaped ellipsoid.

How does GPS work?

GPS measures the time difference between signals sent from a satellite with a known position to a ground receiver. Four such signals will very accurately determine the position of the receiver. Twenty-four satellites, each circling earth twice every day (with three more extras) constitute the heart of the system.

Setting Up Your Receiver

You will need to set up your receiver to display geographic coordinates in decimal degrees. GPS receiver menus often have this setting in the Units tab. Check the manual of the model you choose for specific instructions. GPS receivers generally now have 12 or more channels, which indicate how many satellites, can be monitored at one time.

Note: *Remember you can also use the mapping function in the web reporting form and your smartphone will automatically collect the GPS coordinates for you and add them to the reporting form.*

P. Bolstad, UMN

Choosing a GPS Receiver

Many different types of GPS devices are available today. A basic handheld unit is all that is needed to collect data for EDDMapS. If you are doing a lot of field work, be sure the unit you choose is waterproof. Smartphone applications with GPS are available as well. GPS units are available from a wide variety of local and online sources. Choose the GPS unit that best fits your particular needs and budget.

R. Anderson, USFS

K. Rawlins, UGA

Images

A key component of EDDMapS is providing images in digital format. Being able to use photographs to identify the species adds validity to the data collected and entered into EDDMapS. This module addresses general photography topics, including types of photographs, tips for taking quality photographs, and an introduction to digital photography. Information on uploading images is addressed in the 'How To Report' section.

Identification

Nearly all field guides and identification keys rely on illustrations. Seeing a picture or drawing of an organism greatly aids in the correct identification. These pictures may be of the whole organism or a specific characteristic/feature important for distinguishing that organism. For instance, a picture of an exotic plant infesting a natural area can help demonstrate the invasive potential of that plant. This type of picture can lend credibility to statements made by the photographer or user of the image. Familiarize yourself with the characteristics commonly needed for identification and take several pictures of the subject's diagnostic characteristics to ensure that identification is possible. The image below demonstrates an identifying characteristic of the tree-of-heaven. Clear photographs can also add validity to documentation of certain events, such as the first occurrence of a species in a county. Herbarium records have the highest validity, so consider collecting a museum or herbarium specimen for the first reported occurrence of an invasive species in a region or county. For insects, animals or pathogens it might not be possible to collect a specimen. Taking and submitting pictures with reports on these organisms, where possible, may be the best option.

With a person to give scale to the picture it becomes clear just how large these plants are

C. Bargeron, UGA

C. Evans, River to River CWMA

Tallowtree

The following section briefly explains basic techniques and gives tips for taking useful photographs. To fully understand your camera's options, refer to the user manual.

Framing

Frame the subject for the intended purpose.

- Panoramic photographs give context to the subject; for example showing the extent of an infestation.
- Midrange shots illustrate the presence and effects of specific species.
- Close-ups provide details for identification of a species of interest.

Focus

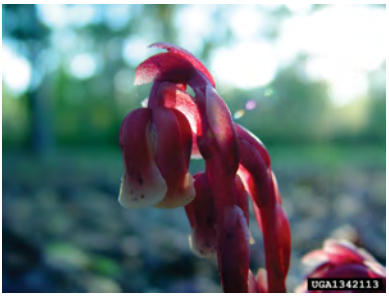
Attention is naturally drawn to the area of the photograph that is in focus. For landscape scale photographs, most of the scene should be in focus. For subjects closer in, the photographer should be sure the most important part of the photograph is in focus. Set your camera to auto-focus (or auto) if you would like focus to occur automatically.

Light

The type, direction, and intensity of the light can affect the color and texture of an image. Hard light on a sunny day or from a direct flash emphasizes shadows, highlights, and textures. Soft light in early morning, late evening, or cloudy days minimizes shadows and highlights and brings out color and detail. The direction of a light source will also influence the photograph. Front light (the light source is in front of the subject) highlights colors while eliminating shadows and textures. Backlight creates silhouettes or illuminates translucent subjects. Sidelight highlights both texture and color of a subject.

W. V. Evans, Bugwood.org

Front light



W. V. Evans, Bugwood.org

Back light

Background

Backgrounds which contrast to the main colors of the subject help make the subject stand out in the photograph, while backgrounds similar to the main colors of the subject make the subject blend in more. A busy background can be distracting and make viewing the subject difficult. Try changing the background by changing the angle of the camera or by placing something behind the subject. It can be as simple as a white or black sheet of paper behind a leaf to help it stand out more clearly.

Digital Cameras

Digital cameras are recommended for collecting data for EDDMapS. Because of the large storage capacity of digital cameras, you can take several pictures of each subject. Choose the best images to upload with your data. Digital cameras also allow you to easily upload images from your camera or computer directly to EDDMapS. Smartphone cameras can take excellent pictures, so if you are using one of the EDDMapS smartphone apps to collect invasive species data, you won't need to carry heavy camera equipment.

There are two basic types of digital cameras: point & shoot and single-lens reflex (SLR). Point & shoot digital cameras are essentially automatic, with limited ability to adjust settings. The advantages of point & shoot cameras are their lower cost (compared to SLR cameras), small size, a few automatic settings, and light weight. SLR digital cameras are more expensive and larger, but offer the photographer a suite of automatic settings in addition to the manual setting and through-lens focusing and framing. With SLR cameras, interchangeable lenses enhance zoom and macro features. Zoom lenses allow the photographer to take "close-up" photographs at a greater distance from the subject. This is advantageous when the subject is an animal that might become scared or leave if approached. Lenses with adjustable zooms also allow for easy manipulation of the framing of a photograph. Wide-angle lenses provide a wide field of view and can be very useful for landscape photography. Macro lenses allow for close up photography and can be used to capture small subjects or minute details necessary for identification. Images should be taken at the largest size and best quality settings available on your camera. Send the least edited, least compressed file available.

Flowers and leaves

K. Rawlins, UGA

Roots

L. Mehrhoff, UCONN

Know the diagnostic characteristics

R. F. Billings, Texas A&M Forest Service

Image Types

JPEG uses a compression scheme that degrades the image each time it is saved: consequently, it is important to avoid repeatedly editing and saving the file before submission. If editing, cropping, or enhancing the JPEG photo using image editing software (such as Adobe Photoshop) is necessary, perform all operations in one editing session and save the edited image at the highest quality (least compressed) possible. Retain a copy of the original file from the digital camera in case the editing process has to be repeated.

The EDDMapS web form and smartphone apps allow as many as five images to be uploaded with each record entered. With each revisit, three additional images can be added. Examples of possible subjects for plants include the following:

- Site view showing extent of infestation, one invasive plant, or many
- Flower shape, size, color, and arrangement
- Leaf shape and arrangement (opposite, alternate, or whorled attachment)
- Fruit shape, size, color, and arrangement
- Bark, trunk, or stem
- Roots, rhizomes, or stolons

As you can see there are more than five possible characteristics to choose from, so pick the five which are MOST helpful in identifying the species you are working with. Invasive Ligustrums have many characteristics in common with several native shrub species; however the flower, fruit, or other distinguishing characteristics can help to you tell them apart.

Forestiera pubescens

K. Rawlins, UGA

Ligustrum sinense

R. Billings, TFS

Remember:

- To reduce shake, use a tripod when possible
- Take multiple photographs of the same subject and choose the best for uploading with your data
- Look for the unique features of an invasive species, such as pointed rhizomes on cogongrass or glandular notches at the base of tree-of-heaven leaflets.
- Position yourself so the sun is over your shoulder to get the best light (Front lit image) for sharper details
- Automatic settings on digital cameras work very well for most situations
- Digital cameras usually have a macro setting for close-ups

Images submitted will be used to validate reports to EDDMapS and quality images can make all the difference.

J. & K. Hollingsworth, USFWS

R. Wallace, Bugwood.org

J. Miller, USFS

M. Pingleton, University of Illinois at Urbana-Champaign

C. Evans, River to River CWMA

J. Randall, TNC

Field Preparation

Group Projects

R. F. Billings, Texas A&M Forest Service

During training and for several outings after the initial training, we suggest the project be carried out in groups with designated leaders supervising data collection. For small group outings, you will need at least one field kit (GPS unit, digital camera, or smartphone with the EDDMapS app downloaded). Only one GPS and camera is needed per group outing. One person from each group should be in charge of entering the data into the web-based data form after returning from the field. The EDDMapS app allows you to upload the data automatically. The data record should include the names of all participants of the group.

Individual Projects

You may choose after training to work individually either at assigned sites or on personal hiking/camping/birding outings. Choosing this method, an individual should have a companion with them in the field for safety.

Local Networks

Stakeholders can form a network of local partners for invasive species prevention, monitoring, control, and eradication. Monitoring sites may be chosen based on recommendations and requests from these partners. In some cases, an organization may request help with early detection in previously unmonitored areas or in areas which have been treated previously to determine eradication success. The goal should be to target areas that are most in need of monitoring.

R. Westbrooks, USGS

It is important to be aware of the rules regarding public vs. private property and various agency requirements for data collection.

Public and Private Land Issues

The goal of the EDDMapS is to have as many eyes detecting and reporting invaders in as many places as possible. However, be mindful of both public land rules and regulations and the rights of private landowners.

Public Land - Some agencies have very strict rules concerning collection of data and specimens on public property. For example, the National Park Service requires researchers to obtain permits for these kinds of activities. When in doubt about the public ownership of a property you plan to survey or the rules of collecting data on public lands, contact the agency responsible for the management of that property. Most public land managers will be supportive of efforts to detect invasive species on publicly held lands.

Private Land - It is important that we respect the rights of private landowners and only collect data on their land with their specific permission. Keep in mind that Public Rights of Ways (ROW) like roads are not considered private land. Many of your surveys will be along these ROWs.

R. Wallace, Bugwood.org

Field Safety

Due to the field-oriented nature of the data collection, there are inherent physical risks posed by walking in a natural environment while getting to field sites and collecting data. Always follow safety precautions when in the field. Listed here are some good examples of precautions you can take. However you will know your own limitations or challenges and the potential dangers inherent in the natural area you are entering, so please plan accordingly:

- Avoid walking through areas where you cannot see your feet. Thick vegetation may hide venomous animals or uneven terrain from view. Be aware of your surroundings
- If searching for invasive species patches from a vehicle, always go in teams. Vehicle drivers should pay attention to the road. Passengers can look for target species.
- When surveying on roadsides, pull vehicles well off the road, taking care to park on a firm surface. Be aware of passing traffic and stay clear of traffic lanes while collecting data.
- Bring a cell phone if possible (but be aware that remote areas may be out of service range), and carry a topographic map or trails map of the area in which you are hiking.
- Always hike with at least one partner and inform someone at home, a neighbor or friend of where you are going and when you plan to return.
- Bring sufficient water and sun protection.
- Wear appropriate clothing and footwear
- If you have known allergies or other medical conditions that might require you to take medications in the field, then bring your medications with you.
- Check the weather before you head to the field site. It is dangerous to work in adverse weather conditions such as thunder storms.

A well-equipped field kit should include the following:

- Backpack
- Camera memory card
- GPS Unit
- Blank data sheets
- Seed removal brush
- First Aid kit
- Species ID cards
- Cellphone/Smartphone
- Camera
- Extra batteries
- Clipboard
- Maps
- EDDMapS handbook
- Pencils, pens, and/or markers
- USB card reader and cable

Developing Invasive Species Programs:

1. Establish a state EDRR coordinating committee

a. Develop a committee work plan
b. Identify committee members; develop an EDRR target list
c. Develop a clear communications structure with protocols for reporting, id and vouchering, data archival, rapid assessments, and rapid response initiatives

2. Develop and train a state Early Detection and Reporting Network (EDRN)

a. Agency field personnel (Department of Natural Resource biologists, Nature Conservancy land stewards, county extension agents, county weed supervisors, Department of Ag inspectors, etc.)
b. EDRN volunteers (Native Plant Society members, friends, groups, civic club members, master gardeners, fishermen, scouts, 4-H, FFA, etc.)

3. Identify, survey, and monitor important natural and managed resources that are at risk from biological invasion.

a. Conduct weekend bio-blitzes for new weeds at selected parks, forests, refuges, etc.
b. Monitor high hazard sites where new invasive species may become first established (e.g., maritime ports of entry, international airports, bonded warehouses, free trade zones, inland intermodal shipping terminals)

4. Develop a state Invasive Plant Atlas

a. Archival of field data records submitted by the EDRN
b. 'Real-time Distribution Information on EDRR Target Species – Beneficial for:
    i. Creating Distribution Maps of EDRR Target Species
    ii. Ecological Niche Modeling Research
    iii. Planning Invasive Plant Control Programs

N. Rees, USDA ARS

J. Miller, USFS

5. Rapid Assessment - conduct rapid assessments of newly reported species that are not already regulated within a state (regulated species generally don't require a new assessment).

a. Identify an appropriate lead agency to address a particular new invasive plant problem

OR –

b. Recommend the establishment of an invasive plant task force to address a new invasive plant problem that cannot be address by a single agency.

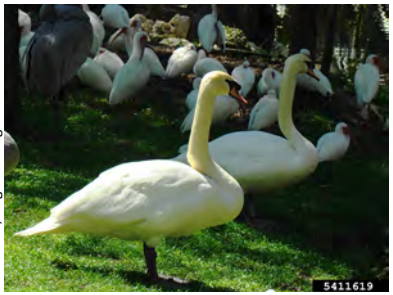
6. Rapid Response – develop a rapid response plan to address specific problems.

a. Assist the designated lead agency in addressing a new invasive plant problem

OR –

b. Establish an invasive plant task force to address the problem – as appropriate.

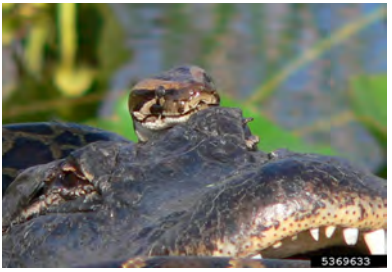
7. Take the message to others, especially young people. Volunteer to talk about invasive species and what each of us can do to help at a local school or scout group.



R. Wallace, Bugwood.org

J. Miller, USFS

J. Randall, TNC



L. Oberhofer, National Park Service

GLOSSARY

Canopy Closure: Estimate of the percent of the ground is covered by the foliage of an invasive species of interest.

Collection Date: The date the weed infestation was observed in the field. It does not refer to the date information was entered into the computer.

Datum: A model of the earth's shape. Geodetic datums define the size and shape of the earth and the origin and orientation of the coordinate system used to map the earth.

EDRR: Early Detection and Rapid Response refers to programs whose goal is to locate and manage invasive pests before they infest an area so large that eradication or control becomes extremely difficult and expensive, if not impossible. Addressing the problem early greatly decreases the damage caused by these infestations.

Geodesy: The scientific study of the size and shape of the earth.
GIS (Geographic Information System): A computerized system for the collection, storage, management, retrieval, changing, modeling, analysis and display of spatial data used to create a representation of the real world.

GPS (Global Positioning System): A global navigation system based on a system of high orbiting satellites. The GPS receiver uses at least 4 satellites to calculate position.

Gross Area: This field is intended to show general location and population information. Like Infested Area it is the area of land occupied by an invasive plant species. Unlike Infested Area, the area is defined by drawing a line around the general perimeter of the infestation not the canopy cover of the plants. The gross area may contain significant parcels of land that are not occupied by invasive plants. Gross area is used in describing large infestations. When a value is entered for gross area, the assumption is that the area within the perimeter of the invasive plants population (area perimeter) is an estimate or the product of calculating the area within a described perimeter. It is not a measured value. If a value for Gross Area is entered a value for Infested Area must still be entered. The value for Infested Area is derived from estimating the actual or percentage of land occupied by invasive plants.

Infested Areas: Area of land containing one or more invasive plant species. An Infested Area of land is defined by drawing a line around the actual perimeter of the infestation as defined by the canopy cover of the plants, excluding areas not infested. Areas containing only occasional invasive plants per acre do not equal one acre infested. Generally, the smallest area of infestation mapped will be 1/10th (.10) of an acre or 0.04 hectares.

Latitude: The angular distance (distance measured in degrees) north or south of the equator. Latitude is 0 degrees at the equator, 90 degrees at the north pole and -90 degrees at the south pole. Latitude is also described by direction north or south of the equator instead of + or -.

Longitude: The angular distance (distance measured in degrees) east or west of the prime meridian. Longitude is 0 degrees at the prime meridian, and is measured +180 going east and -180 going west. Longitude is also described by direction east or west of the prime meridian instead of + or -.

Map: A general representation of the real world.

Meridian: A meridian is one half of a great circle on the globe connecting all points of equal longitude; all meridians connect at the North and South poles. The Prime meridian is the reference meridian for longitude. For UTM designations, each UTM zone has a central meridian from which Eastings are measured. For the Township and Range System (PLSS), the principal meridians are selected north-south lines from which land was divided into parcels.

Prime Meridian: A great circle passing through the north and south pole and through Greenwich, England. Its longitude is 0 degrees.

Topographic Map: A map that displays both the horizontal and vertical positions of the features represented. It uses contours or other symbols to represent mountains, valleys, and plains.

Universal Transverse Mercator (UTM) Coordinate System:
UTM Coordinate System defines two dimensional, horizontal positions using a grid system. The UTM grid is divided into UTM zones that designate 6 degree longitudinal strips extending from 80 degrees South latitude to 84 degrees North latitude. Each zone has a central meridian.

EDDMapS data collection form contains all the information needed to fill out the online form. Find forms at www.eddmaps.org/tools/.

EDDMapS
Early Detection & Distribution Mapping System
www.eddmaps.org

Data Collection Form

Species_____ **Date**_____

State_____ **County**_____ **Lat.**_____ **Long.**_____

Infested Area_____ **Acres Hectares Sq. Feet Sq. Meters**

Gross Area_____ **Acres Hectares Sq. Feet Sq. Meters**

Canopy Closure (percent covered by invasive plant):

Trace (less than 1%) Low (1.0 - 5.0%) Moderate (5.1 - 25%) High (25.1 - 100%)

Habitat:

☐ Edge: Upland / Wetland	☐ Forest: Conifer	☐ Wetland: Marsh
☐ Edge: Field / forest	☐ Forest: Hardwood	☐ Wetland: Swamp
☐ Edge: Lake	☐ Forest: Mixed	☐ Wetland: Bog
☐ Edge: Roadside	☐ Dune	☐ Streambank
☐ Open Field	☐ Beach	☐ Yard / Garden
☐ Old Field	☐ Park	☐ Ag. Field
☐ Right-of-way	☐ Rocky Outcrops	☐ Abandoned lot / homesite
☐ Other		

Abundance:

☐ Single Plant ☐ Scattered Plants ☐ Dense Monoculture ☐ Scattered Dense Patches

Ownership:

☐ Federal Lands ☐ State Lands ☐ Private ☐ Unknown

Location Description:

Comments:

Voucher specimen made? ☐ Yes ☐ No **Herbarium holding specimen**_____

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www.eddmaps.org

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