4

Data Collection

DATA COLLECTION PROCESS

Group Project

Initially during training the project will be carried out in groups with ASDM staff supervising data collection. After these group outings, volunteers can choose to be part of a small group that works together to monitor specific sites.

For organized, small group outings, one volunteer will check out the resource kit from ASDM which will include a GPS unit, a digital camera, a handheld pc and other resources to aid with identification and data collection. Only one GPS, camera, and handheld pc is needed per group outing. One person from the small group will be in charge of uploading data files into the web-based data form after returning from the field. The data record will include the names of all participants in the small group.

Individual Project

Volunteers may choose after initial training to work individually either at assigned sites or on personal hiking/camping/birding outings. Volunteers choosing this method should still have a companion with them in the field for safety reasons.

Monitoring Sites

The INVADERS Team at ASDM is putting together a network of local partners involved in invasive species prevention, monitoring, control, and eradication. Monitoring sites will be chosen based on recommendations and requests from these local partners. In some cases, this may be an agency or organization requesting help with surveys in previously unmonitored areas. For cactus moths, volunteers will monitor nurseries, gardens, and other areas as requested by the Arizona Department of Agriculture. Other sites may include areas that underwent eradication previously and the purpose of monitoring will be to determine eradication success. It is our goal to target areas that are most in need of monitoring.

We also encourage volunteers to collect data when out in the field on recreational outings. It is important that you be aware of the rules regarding public vs. private property and various agency requirements for data and specimen collection. These are outlined later on in this section of the handbook.

SAFETY IN THE FIELD

Due to the field-oriented nature of the INVADERS Program, your work will present you with the inherent physical risks posed by walking in a natural environment and getting to field sites in Museum and/or personal vehicles. We recommend you follow these suggested safety precautions:

- Do not walk where you cannot see your feet. Thick vegetation may hide venomous animals or uneven terrain from view.

- If searching for species patches from a vehicle, always go in teams. Vehicle drivers should pay attention to the road, and passengers can look for target species.

- When surveying on roadsides, pull vehicles far 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.

- Do not hike alone.

- Carry a topographic map or trails map of areas in which you are hiking.

- Inform someone not in your party of where you are going and when you plan to return.

- Bring a cell phone (but be aware that many remote areas in our region are out of service range).

- Bring sufficient water and sun protection.

- If you have known allergies or other medical conditions that might require that you take medications in the field, bring your medications with you.

We will not ask you to perform a service that is beyond your comfort level, so please be direct if you are ever concerned about field conditions and the nature of our work on any outing.

INVADERS PLANT DATA COLLECTION

Preparation for site visit

Prior to visiting your field site for data collection make sure you have **good maps** and directions for getting to your site. Do not forget to fill up your vehicle's gas tank and bring extra water, particularly if you are traveling far from inhabited areas. If you plan on working far from trails and roads, you should also have topographic maps of your area with you. **Make sure that you have permission** to be in that area. If you are not sure if collecting data in a particular area is permissible, you can contact a member of the ASDM Invaders Team to verify or check into the status of that particular site.

Make sure that you **let someone know where you will be going and when you expect to return.** This is important to do even when you are with a group of people. You should always **have a companion when working in the field**.

Check the weather before you head to the field site. You should not work in adverse weather conditions such as thunder and lightning storms. Be aware of the danger of flash floods particularly if you are working in riparian areas, washes, or flood prone areas. While it may be sunny and clear where you are working, precipitation in higher elevations can produce flash floods that are swiftly carried down washes to areas away from the center of the storm.

Make sure you bring **plenty of water, sunscreen, a hat, appropriate clothing and footwear, and a first aid kit**. Many of you will be walking off trails and roads into desert areas so shorts and sandals are not recommended. If you have a cell phone, bring that with you. Keep in mind that you may be in remote areas where you are out of service range. This is why it is so important to let someone know where you are going and when you will be back. If you have known allergies or other medical conditions that might require that you take **medications** in the field, make sure you put those medications in your field pack.

Check your field equipment before you leave. Turn on your GPS units and cameras to make sure they are working properly and have good batteries in them. Bring extra batteries with you just in case. Make sure your pencils are sharpened and that you have sufficient blank data sheets for the number of areas you plan on visiting. Check that you have a sticky note pad, your field notebook, a working sharpie pen, a thermometer, the Invaders ID cards, and your Invaders handbook. If you feel that the handbook is too bulky for the field, make sure you bring the most important components with you: data protocols, datasheet definitions, GPS and camera instructions, and the information letter for curious landowners or others.

When you arrive at your field area…

Once you have reached your destination, you will want to make sure that you bring all needed items with you in a pack, particularly if you are leaving your vehicle behind. Many unfortunate hikers and researchers carefully bring their cell phones, enough water, and notebooks only to leave them in the vehicle and then find themselves in need miles away. Make sure your vehicle is parked in a safe place – far enough from the road that it does not impede traffic and do not block roads, driveways, etc. After strapping on your backpack and locking your vehicle you are ready to enter the exciting world of scientific data collection.

Be aware of your surroundings. Venomous animals can be found throughout Arizona. Do not walk where you cannot see your feet. Thick vegetation can hide venomous animals or uneven terrain from view. Be comfortable with the area you are working in. If you are leaving roads and trails, make sure you have good maps, a compass, and feel confident with map navigation.

Where is your search site/route?

The first thing you need to know is where you are going. Will you be looking for invasive species along a trail or road, following a wash, searching a large area thoroughly? After you answer this question, you will be able to plan your approach to the site. If you will be working in the same area as other volunteers and will need to let them know what sections you have already searched, you should use your notebook to describe your route and add coordinates if possible. You will be able to post these notes online for other volunteers to see. If you will be covering whole parks or trails, you can put that information online as well. Make sure you keep track of which species you searched for. It will be important for others to know what species you did not find in a particular area.

You found an invasive species. Now what do you do?

When you reach a site with an invasive, non-native species you should do a visual survey of your surroundings by walking around the area to assess the extent of the infestation. After this initial assessment, you will decide whether the invasive species patch you are defining is a point, or polygon (a linear patch is a polygon).

Point: Technically speaking, most patches are polygons unless you have a single plant. However, when your patch is less than about 5 meters wide, you will call it a point and take one set of GPS coordinates. The reason for this is that your GPS unit will be unable to define the outline of a polygon in a patch this small due to the accuracy limitations of the equipment.

Polygon: When the patch is a polygon of some shape larger than 5 meters wide or a linear polygon, you will designate the patch a polygon and take multiple sets of GPS coordinates to define the area.

There will be occasions where you are unable to walk around a patch of an invasive, non-native species due to steep terrain, dense vegetation, etc. In these cases, you will need to be innovative in the field providing coordinates as close to the patch as possible and create expanded notes describing the location, shape, and size of a patch. Your notes will be important additions to required data fields and should provide land managers and other interested parties with enough information to assist them with determining whether a return trip to that site is required for a more detailed survey.

If you have questions, concerns, or suggestions related to data collection, we want to hear from you. Let us know what situations you come across in the field that we can address in our resource kit to make it more beneficial for volunteers, scientists and managers, or other institutions that want to implement this program in their local areas.

Arizona Sonoran Desert Museum
Pocket PC Units with Integrated GPS units
HGIS Version 8

Fundamentals

Turn unit **on and off** by pushing the power button once (on the key pad for Trimble units and on the top front of the Garmin unit).

Always **SAVE** data before turning the unit off. See instructions on saving data below. **To recharge** the unit you will need its power cord and a power source. The cord plugs into the bottom end of the unit. You can view current main and back-up battery levels by going to **Start – Settings – Systems Tab (**at bottom of screen)**– Power Icon.**

Programs

Your handheld unit is equipped with several programs that may be of use in the field. For mapping exotic plants you will use **HGIS software** in conjunction with an **internal Global Positioning System (GPS) unit**. These two programs will work together allowing you to record the exact locations of the exotic plants you find as well as delineate the exact area and densities of the infestations. During certain projects you may also make use of **Word** to take notes about an area or **Excel** to collect non-spatial data. All screens can be closed either by hitting the **X** or **OK** that will be in the top right corner.

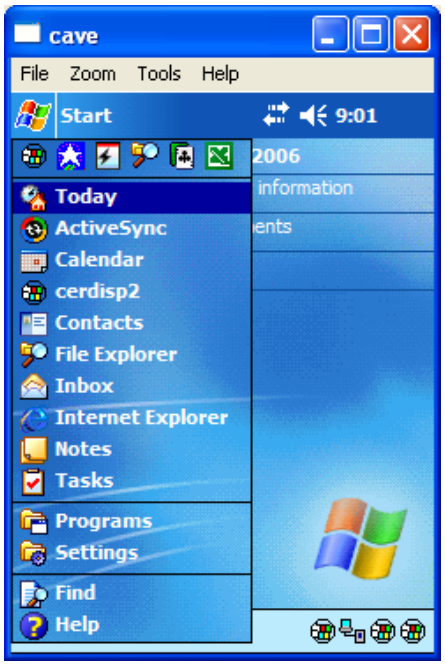
How to begin mapping

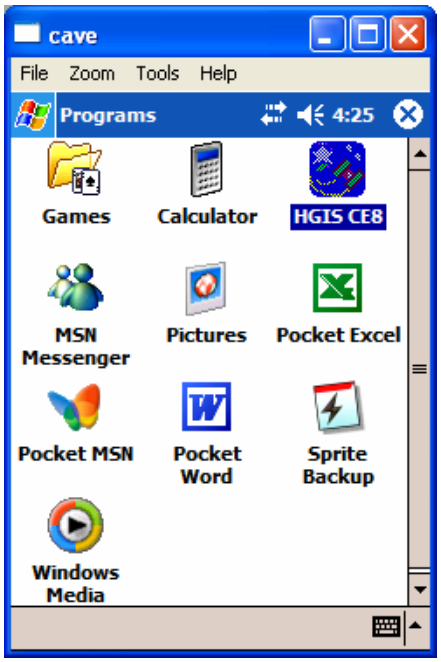
Step 1: Turn on your handheld computer

- Take out your unit and turn it on.

Step 2: Open the HGIS CE8 mapping program

- On the start up screen, tap on **START**, this will open a drop down list of programs.
- Choose **Programs**
- Then choose **HGIS CE8** by tapping on the icon





- On the first screen chose **HGIS_Pro_1** from the drop down
- Choose **Start GPS**
- Open GPS Port screen will appear. Here you should make sure that:
  - **Down list** = Serial NMEA
  - **Port** = COM2
  - **Baud** = 4800
  - **Drop**

Step 3: Open background maps if available

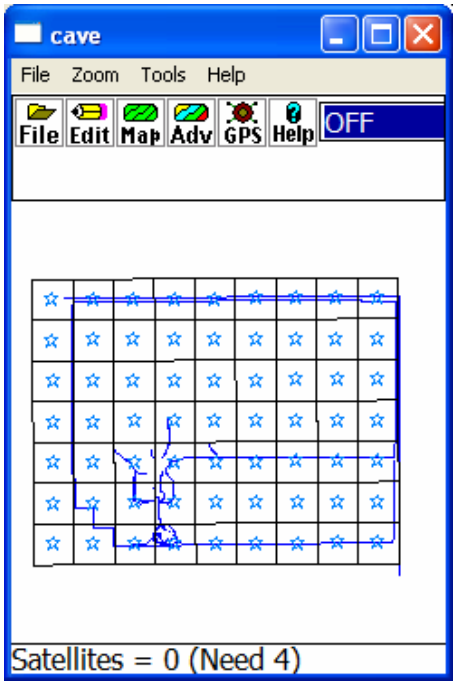
If you are working on a project with a prepared set of background maps, click on **File** and then **Open Project (*When you first open HGIS, this dropdown is already showing on the screen*).** Choose your current project (e.g. **FOBO_EPM, SAGU_TMD_EPM)** from this screen. This file is a project file that will open all base maps (files) needed for orientation during mapping.

NOTE: If there are base files for your project and none of the above files appear, check that under the **Open Project** window:

- Folder = All folders or templates
- Type = HGIS Project (HGS)

They should then appear.

- Tap on desired project, HGIS screen with layers open will appear.



(Example from Casa Grande).

- In some cases, a project will not be set up for the area you will be working in. In that case, you can open a general background map by choosing **Open Layer** and then clicking on the map file for your area. If there are no map files for the area you are working in, you can still collect data. You will not be able to see a background map, but the GPS unit will still tell the handheld computer where the invasive species patches are. The data you collect will then be mapped on a topographic map after you upload your files into the ASDM web site.

To clarify, you can still collect data even if you do not have a background map visible on your handheld screen. As you map invasive species patches, you will see your points and polygons show up on your white screen.

Now you are ready to begin mapping! Your GPS unit is turned on and the mapping software is open. It may take a few minutes for your GPS unit to acquire satellites; you will know when it is ready when an **X** appears on your screen. A warning screen will also advise you if there are too few satellites. If you are having trouble getting a fix on your location, move away from buildings or other structures. Move to higher ground if you are not getting a fix in a canyon.

How to open and close background maps:

Depending on where you are working, different files may now be open on the unit screen that show boundaries, roads, trails or water features. Additional files may be open that show **grid squares**, **grid centre points** or rectangles that represent sample locations if those have been set up for your current project. These files can be closed and re-opened if you would like to customize the background on your screen.

To open layer files with project open

- Go to File → Layer → Open Layer → Select desired files from list
- Only one file can be opened at a time, so you must repeat as necessary.

To close layer files with project open

- Go to File → Layer → Close Layer → Select desired files from list
- Only one file can be closed at a time, so you must repeat as necessary.

To open layer files without project open

- Go to File → Open Layer → Select desired files from list
- Only one file can be opened at a time, so you must repeat as necessary.

To close layer files without project open

- Go to File → Layer → Close Layer → Select desired files from list
- Only one file can be closed at a time, so you must repeat as necessary.

Step 4: Create new layer files for each day of work.

Two files should be created for each field day; one for any point data you will collect and one for polygon data. The **naming convention** for these files is as follows

Your initials, Date (MMDDYY format), park name or area name, point (pt) or polygon (py)

Example: SS031006CAGRpt or SS031006IRONWOODpy

Special templates have been loaded onto your unit for use when mapping exotic plants. When you are ready to create your field files described above you will use this template.

If you have a project open:

- Go to File → Layer → New from Template

If you do not have a project open:

- Go to File → New from Template

❖ Select the template named **Exotics_2006_ASDM – this file contains all of the**
data fields you will need for the INVADERS program
❖ Type in file name as described above (e.g. SS031006CAGRpt)
❖ Select the icon that corresponds to the file type (point or poly)
❖ Hit **OK**
❖ Repeat these steps for second file, either point or poly, whichever has not yet
been created. You will now go to File → Layer → New from Template whether
you opened a project initially or not. Then you can select the
Exotics_2006_ASDM template and create your file name and type.
❖ Hit **OK**

Step 5: Mapping set-up.

When you encounter the first invasive species to be mapped you need to make sure you are entering your data into the correct file. This means you have to be in edit mode in the point or polygon file depending on whether you need to record a single plant or a large infested area. To see which file you currently have open, go to

- **Map → Layer Properties**
- This screen will show all layers (files) that you have open
- Click next to **edit** under the appropriate file you wish to add data to (point or poly). This will cause a check to appear next to **edit** for that layer. Only one file can be edited at a time.
- Close this screen**.**
- You will need to go back and forth between your point and polygon files as you collect data in the field.

Step 6: Create Points and Polygons and record data.

Mapping criteria

- Q1). When should you draw a point verses a polygon?

  Points should be used for individual plants or patches that are 5m across or less. The GPS units are only accurate to this level. If you encounter an area less than 5m across with 2 or 3 species present, record one point for each species. Anything larger should be recorded as a polygon. The template makes it possible to record up to five species for each polygon described.

- Q2). What should I do if there are more than five species in one polygon area?

  If you encounter more than five species in an area you need to create a new

polygon for those extra species. This may mean you have a polygon with only one species in it, or as many as five or more. In this case you may find that the polygons are different shapes and sizes as the species distribution could be quite different.

- Q3). What else is there to consider, if possible, when mapping an area?

  If possible be aware of natural breaks in the landscape such as similar plant communities, similar aspect, or slope. Try to delineate roads, pathways, trails, or disturbed areas from construction, fire or grazing, i.e. map around these things using one polygon.
  But the primary goal is to describe the infested area as precisely as possible (which will often cross natural breaks or be smaller than the continuous similar area).

  NOTE: It is not possible to record a point at the same time as drawing a polygon. If you encounter a single plant when traversing a polygon take note of its location either on paper or mentally and return to it after you have finished the polygon, to make a point.
  NOTE: When drawing polygons it is important to not double back on yourself and to avoid criss-crossing the lines you have already drawn, as this confuses the spatial area.

Recording a point. Remember a point is a single plant or a an invasive species patch that is smaller than 5m wide.

- Go to Map → Layer Properties
- Check the box next to the appropriate file you wish to add data to (point)

Now you are ready to record data. To begin, go to the drop down list located in the top right corner of the screen (tools menu). It is the box that says **OFF** before you choose a tool. When you click on **OFF**, you will see the drop down list of tools.

- From this tool menu list in upper right corner, choose **GPS draw.** A new row of icons will appear at the top of your screen
- To record a **point location** hit the **Star** symbol. This will automatically record your current location and a point will occur on your screen. Make sure you are standing at the location of the invasive plant before you mark your point.
- The first point you make will prompt the system to begin Auto numbering.
- Hit **OK**.
- Once the point is made, hit **OFF** in the tools menu.
- Go back to the tool drop down and choose **SELECTOne**

- Double tap on the point just recorded
- The template for the point will come up allowing you to enter data on the species in question. For a single plant (point location) you need only enter a name under Species1, no cover class is necessary. Hit the arrow to the right of the Species1 box. Choose a species. Scroll down to access other fields to be filled out using drop down lists; slope, aspect, meters to road/water, water type, disturbance, extent, and surveyor name. (See details below on filling in data fields)
- **NOTE**: For fields where you need to type in words you will need to bring up the keyboard. Do this by tapping the "keyboard" tab at the top of your screen. Close it by tapping it again
- Close this window using the **X** in the top right corner.

Continue to make as many points as necessary in this manner.

NOTE: If you try to put a point into a polygon file (or vice versa), a warning message will appear asking you if you want to continue; say no.

Go back to Map – Layer properties, and make sure you have the correct file in edit mode.

Recording a polygon. Remember a polygon is an invasive species patch larger than
5 m wide.

If you are describing an area infested with one or many exotic species

- Go to Map → Layer Properties
- Check the box next to the appropriate file you wish to add data to (poly)
- Hit **OK**
- From the right hand drop down tool menu choose **GPS draw.**
- Choose the green filled **polygon shape,** labeled **Bound.**
- The first polygon you make will prompt the system to begin Auto numbering.
- Hit **OK**.
- You are now ready to begin walking around the area you wish to describe.

  (When you are actively drawing an area you will see a rectangular bar rotating next to the green filled polygon shape).
- Try to return back to where you began your polygon without overlapping your lines. When finished Hit **OFF**. After drawing the polygon, you should go back and walk through the entire polygon to as accurately as possible estimate the plant cover.

- ❖ Go back to the drop down tool menu and choose **SELECT**
- ❖ Double click on the edge of or within the polygon you just created. The template for the polygon will come up allowing you to enter data on the invasive species in the polygon.
- ❖ You can record up to five species per polygon. For each species, an associated cover class is recorded, representing the density of each species in the area. (<1%, 1-5%, 5-25%, 26-50% etc).
- ❖ Scroll down to access other fields to be filled out using drop down lists; slope, aspect, meters to road/water, water type, disturbance, extent, and surveyor name. (See details below on filling in data fields)

  NOTE: For fields where you need to type in words you will need to bring up the keyboard. Do this by tapping the "keyboard" tab at the top of your screen. Close it by tapping it again.
- ❖ Close this window using the X in the top right corner.

NOTE: If you try to put a point into a polygon file (or vice versa), a warning message will appear asking you if you want to continue; say no.

Go back to Map – Layer properties, and make sure you have the correct file in edit mode.

Data fields in the template

1. **Auto ID:** This field will automatically be filled in. HGIS will number your points and polygons as you create them.

2. **Longitude and Latitude:** These fields will also automatically be filled in. The internal GPS unit automatically records a longitude and latitude for the point you created. For polygons, you will also see a longitude and latitude in these fields even though the locational data for your polygon is based on more than one coordinate.

3. **Altitude:** This field will already be filled in. The GPS unit automatically records an elevation in this field.

4. **Area Acres:** This field will also be filled in automatically. In point records, it will read 0.000 since a point does not have an area. For polygons, the program automatically generates a size for your invasive species patch.

5. **Distance_meters:** An automatic calculation of perimeter distance shows up in this field if the feature is a polygon. For a point, it will read 0.000.

6. **GPS Date/Time:** These fields are also automatically filled in with a date and time that the internal GPS unit reads from satellites.

7. **Species1-5:** For each point you create, you should record only one species. If you have more than one species at the same location, you should create a separate point for each species. You will notice that in your point file, it gives you the option of recording more than one species. That is because you use the same template to create each type of file. You should still only record one species per point. You may record up to 5 species for each polygon. If there are more than 5 species, then you should create another polygon in the same location to record data on the extra species. Use the drop down list to find the species. All species names are scientific names. Please bring along species lists to help you identify the correct scientific name.

8. **Percent Cover:** You will be assigning a percent cover measurement to each species in a polygon. Remember that for a point, there is no area, so you will not use a percent cover. For points, leave this field blank. For polygons, percent cover is based on the total amount of cover the invasive species canopy occupies in a patch. Canopy cover is determined by the total amount of ground covered by invasive species vegetation in the patch when examining the patch from an aerial view. Data categories are: <1%, 1-5%, 5-25%, 26-50%, 51-75%, 76-95%, 96-100%.

9. **Notes:** Use this field for any notes you need to take in the field. If possible, put all notes related to that particular record in this note field. Since it can be cumbersome to use the handheld keyboard for lengthy notes, you may want to carry along a notebook to record notes in. Be sure to write down the auto id number for each point and polygon you create notes for. When you upload your data, you will have the opportunity to attach more notes to your file. When you enter these notes in the computer, write the auto id number and designate point or polygon next to the appropriate note so that they can be matched with the correct species record.

10. **Slope:** Use the drop down menu to choose a slope category (Flat, Gentle, Moderate, Steep, Cliff).

11. **Aspect:** Choose the direction your slope faces from the drop down list. You only need to record aspect if you are on a hillside. While even gentle sloping areas have an aspect, we are primarily interested in verifying that the GPS coordinates show up on the correct side of a hill.

12. **Distance to water – distance to road:** Estimate the number of meters your site is from the nearest water and road. You should choose the nearest edge of your

invasive species patch when determining distance to water and road. You may need to clarify your information in the **Notes** field. If you are nowhere near water or roads, you can leave this field blank and mention it in your notes.

13. **Vegetation types/ Water/Riparian Types/ Landform/Disturbance:** These four fields are for describing the ecosystem in which you are working. Choose a type in the drop down menu in each of these fields based on the definitions in your Invaders handbook.

14. **Extent:** In this field you will be choosing isolated, localized, extensive, or overrunning. These categories are defined on the back of your datasheet. These qualifiers should describe the overall infestation. Look across the landscape beyond the main part of the invasive patch to determine the extent of area the invasive species is occupying.

15. **Your Name:** Record your name in this box. After you have typed it once, it will appear in the drop down menu.

16. **Soil Crust:** If soil crusts are present at your point or polygon, you can choose yes or you may type in a percent of the soil covered by these biological crusts. If no soil crusts are present, choose no from the drop down menu.

When you have completed all data fields, close the data entry window by touching the X in the top right corner.

Step 7: Saving data.

It isn't necessary to save your data after every point or polygon recorded but it should be done every hour or so to prevent data loss should the battery fail.

To save data go to

- Layer → Save Layer → highlight the file you wish to save.
- Select the following
  - **Folder** = None,
  - **Type** = Map: SHP + SHX + DBF,
  - **Location** = Storage Card
- Hit OK
- You must select what datum to store the file in
- Chose **UTM, Zone 12** and from drop down select **World WGS84**
- Repeat this for the other layer (point or poly) if appropriate.

General Saving : Back-up to the removable memory card.

When collecting a lot of data it is important to periodically save to the flash memory. This will prevent data loss in the event of battery failure or damage to the unit. To do this tap: START/ Programs/ Sprite Backup.
It takes less than a minute to finish and will return you to the programs screen automatically.

If you ever experience a hard reset on the unit you can restore your data from your last backup by tapping: START/programs/ sprite backup/restore now
It will prompt you for permission to do a soft reset once complete.

General Digital Camera Instructions

You may use your own personal camera or the cameras provided in the ASDM Invaders field kit. For specific instructions on the cameras provided in those kits, see those sections.

Digital images will be used to document your species observations. These photos will be stored in the database along with the text and location data to allow a species expert to verify your submission.

Before you leave
Ensure the camera memory card is blank. This will help prevent confusion about the invasive species data to which this set of pictures belongs. You should also have a fresh or fully charged set of batteries.

In the Field

You will need to take species photos when using your handheld PCs to verify your data records. To make sure that the correct species are associated with the corresponding photo, you will need to write notes in your field notebook. It will be critical to enter your data as soon as possible after returning from the field so that your notes are still fresh in your mind.

Species photos: Since you will be working with a large number of species, these photos are crucial. Keep in mind our procedures for taking species photos including using proper photography techniques (macro mode, proper background, lighting issues, etc. – See more information on camera use in the equipment section) and photographing the part of the plant that will best facilitate identification by our experts. You will also now be taking multiple photos for each point and polygon if there are multiple species recorded in it.

- Use the back of your notebook to photograph the plant part and the point or polygon number with the letter a, b, c, d, or e corresponding with the 1st, 2nd, 3rd, 4th, and 5th species in that point or polygon (ex: PY1-A, PY1-B, etc.).
- In your notebook, write the photo number and letter followed by the name of the species you believe it is. You will need this when you upload your photos during data entry.
- If you feel that the photograph alone will not be enough to identify that particular species, you should collect a specimen in a plastic bag (remember our rules for transporting invasive species) and label the bag with the point or polygon number and letter, the species name, your name, the park name, and the date.
- When you download your photos, you should rename the species photos to help you in the upload process (ex: PY5B_brassica_tournefortii.jpg). If you go to multiple parks in one day or have multiple park pictures on the same camera card, you should use the naming scheme: Ironwood_species_PY5B_brassica_tournefortii.jpg).

Photo Tips

Ideally the sun will be at your back, but this may wash out the LCD screen on the camera if your camera has one. In this case you may want to use the viewfinder instead. Turning off the LCD screen will also extend battery life

When taking a close-up picture for species id, use the back of the clipboard as a solid background. Do not use a white or black background to ensure better definition. Write the record number on a sticky note or attached white board. It is essential that you can associate the image with the correct plot when you are ready to enter your data on the computer. It is unwise to rely solely on the camera's automatically assigned image name. The record number will aid in tying the image to your data collection sheets.

	
Overview of abundance	*Close up of Species*

If your close-up shot is less than ~40cm from the item you should use the Macro mode.

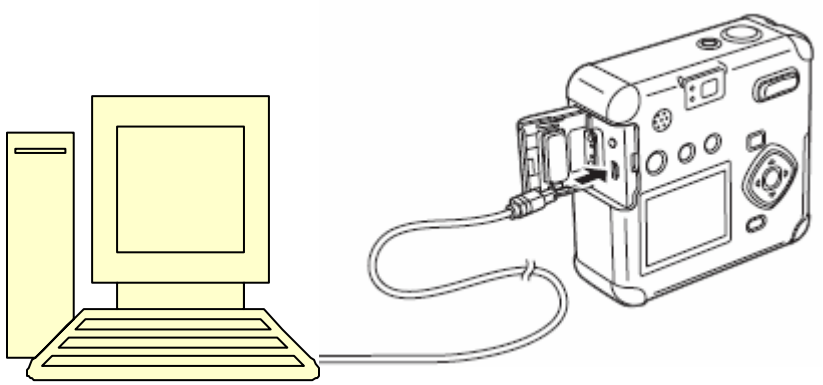
Don't use the digital zoom feature; it degrades image quality.

Getting the pictures off the camera

When you return from the field and are ready to enter your data, you will first need be able to browse to your pictures with "My Computer", "Windows Explorer" or the "Finder"

Method 1
Connect the camera via a built in USB port to the computer.

When they are connected and you turn on the camera, your computer will recognize it as another drive and allow you to view the pictures.
Note: this uses the camera's batteries, so be sure to turn the camera off when not in use.



Method 2
Take the card out of the camera an insert it into the card reader.
The reader plugs into a USB port on your computer. If your computer is Windows 2000 or XP, or Mac OS X, the reader will be automatically recognized and show up as another drive.
For Windows 98 or ME, or Mac 9.x, you may need software that is available from ASDM.

An image file will have a default name of "IMGP00*xx*.JPG"
If you have taken more than the required number of photos, you should select the best ones prior to going on-line so the data entry process is not interrupted.

You should enter your data into the database as soon as possible after your field visit, while the information is fresh in your mind. The image filename will be renamed to link it to your specific survey information during the upload process.

Once you have entered your data and uploaded the pictures, be sure to reformat the card in preparation for the next user or field survey.

Species Verification Methodology

Photos: You will need to take at least one and sometimes more photos at each invasive species patch. These photos will allow an expert to verify your species record. Sometimes one photo will be sufficient to identify a plant and other times you may have to take a close up of an inflorescence as well as an overall plant photo. When you have advanced to the **EXPERT** level for a particular species, you will no longer need to include an identification photo for that species.

See the section on "Using the digital camera in the field" for specific information on photo protocols and tips.

Specimen Collection: In some cases, it might be beneficial for you to collect a specimen of the invasive plant. If a photo does not correctly represent the species or if the plant lacks easily identifiable characteristics such as reproductive structures or seeds, you should collect a specimen to bring back to ASDM for verification of species. There are some specific rules and protocols for collecting invasive species specimens.

1. Be aware of where you are collecting. On some lands, it may not be legal for you to collect plant specimens without a permit. See the section on private and public land research issues to learn more.

2. Always use a ziplock bag or tie off a larger bag when collecting specimens. We do not want to spread the seeds of invasives during our collection efforts. Carrying loose material across landscapes, in your vehicles, at your homes, or at ASDM will allow them to spread more quickly.

3. Bags should be labeled with the date, your name, the site name and gps coordinates or the auto id number and point or polygon designation. Also put the name of the suspected species on the bag.

When your field day is complete

At the end of your data collection trip:

- Make sure your data are saved and turn off your cameras, handheld computers, and GPS units to save batteries. Store them in a safe place in your vehicle to protect them from damage.

- Before leaving the site, make sure to clean your socks and boots to make sure that you are not transporting invasive plant seeds with you. This is something you should do between sites as well.

- Return the equipment and Resource Kit to ASDM and enter your data as soon as possible. It is important to enter data promptly after field work in order to remember details that will help you associate photos with corresponding data records.

Congratulations! You have collected scientific data and entered it into our database. Your efforts as a citizen scientist will go a long way towards assisting managers and scientists with the fight to “Stop the Spread” of invasive species in the Sonoran Desert Region.

INVADERS DEFINITIONS

VEGETATION TYPES

Chihuahuan Desert: Shrubby desert in southeastern AZ with no saguaros or palo verdes (or any trees at all except in arroyos).

Mohave Desert: Shrubby desert in northwestern AZ with no saguaros or palo verdes. Devoid of trees except for Joshua trees above 3000 feet. Below 3000 feet it is very difficult to distinguish Mohave Desert from Lower Colorado River Valley Sonoran Desert.

Arizona Upland Sonoran Desert: Rocky mountains and narrow valleys with saguaros and foothill palo verdes growing on slopes.

Lower Colorado River Valley Sonoran Desert: Broad valleys and widely-spaced mountains. Palo verdes and other trees grow only along drainages. Saguaros are mostly on valley floors and lower bajadas, or may be absent.

Chaparral: Hilly terrain covered with impenetrable layer of shrubs (open after fires). Interior chaparral is mostly shrub live oak and manzanita.

Coniferous forest: Conifers (pines, firs, spruce, etc.) are the dominant trees.

Oak Woodland: Open parklike landscape (tree canopies do not overlap). Land between oak trees may be mostly grasses or shrubs.

Oak-pine woodland: Mixture of pines and oaks. In woodland tree canopies do not overlap (there are sunny gaps between trees). If most trees are conifers and canopy is nearly continuous, call it coniferous forest.

Grassland: Flat to rolling terrain dominated by grasses. There may be a fair number of shrubs, yuccas, and chollas present (desert grassland). If there are more than a few oak trees per acre, call it oak woodland.

Definitions continued:

WATER/RIPARIAN TYPES

Marsh-oasis: Perennially wet lowland or palm canyon with water-loving plants.

Lake/reservoir: Natural or artificial body of permanent water.

Temporary water: Dries up part of the year, e.g., stock ponds filled by runoff, roadside ditches.

Stream/river: Permanent or nearly-permanent flowing water (could be just below the surface).

Spring: A small area where water is at the surface, permanent or seasonal. A larger and permanent area of open water is an oasis or marsh.

LANDFORM

Ridgetop or mesa: A ridgetop is a narrow, linear mountaintop that falls off steeply on both sides. A mesa (table) is a wide flat area on a summit.

Rocky slope: A steep hillside of exposed bedrock.

Rocky slope with cliff: Same but with a nearly vertical slope.

Rocky slope with talus: Talus is a layer of loose, unstable rock on a very steep slope.

Canyon: A steep-sided narrow cleft in the mountains. There may or may not be a stream at the bottom.

Upper bajada: The upper portion of the outwash (alluvial) slope just below the bedrock mountain slopes. An upper bajada has a distinct slope and the surface is usually rocky.

Lower bajada: The lower outwash slope between the upper bajada and valley floor. The slope of a lower bajada is gentle to barely detectable, and the surface is usually gravelly or silty.

Definitions continued:

LANDFORM CONT'D:

Valley floor: Valley floors appear virtually flat and level to the eye.

Rocky or gravelly: Uncommon unless covered by a lava flow.

Sandy or silty: Fine-textured soils.

Floodplain: The first terrace above the stream channel that is flooded during heavy streamflow times. Often support bosques of mesquites or saltcedars and dense shrubs. Riparian trees may grow near the modern stream channel or along old, cutoff channels.

Wash: A linear feature on bajadas or valley floors that carries water for brief periods following heavy rains.

Shallow or no banks: Shallow sloping sides less than six feet tall, easy to climb out of. Washes with no banks (no obvious channel) can be difficult to discern except for a ribbon of denser or taller trees; best seen from above. No-bank washes merge into sheet-flood areas near valley floors; distinguished by a broad band of desert trees without clear outer boundaries.

Deep/steep banks: Steep sides more than six feet tall, difficult to climb out of.

Sand dunes or flats: Loose sand that can blow around in the wind. Dunes are obvious and are nearly devoid of vegetation. Sand flats may have fairly dense vegetation that impedes blowing sand.

DISTURBANCE

Recent fire: Revealed by sparse vegetation and evident charcoal.

Flood: Indicated by flattened and/or torn out vegetation; scouring of ground after severe floods.

Cleared: Bulldozed or plowed; no mature woody vegetation.

Urbanized: aka Asphalt Scrub

Roadside: The area between the edge of the pavement and the limit of regular maintenance, which is usually the right-of-way fence. Includes medians of divided highways.

SLOPE

Flat: Level or barely detectable slope.

Gentle: Slope apparent to eye, but little sensation of whether walking uphill or downhill.

Moderate: Definite slope; can tell if you ’re walking uphill or downhill, but not difficult to walk.

Steep: Difficult to walk even short distance up or down.

Cliff: Nearly vertical slope that most people would not try to climb.

Definitions continued:

PATCH TYPE

Point: A point can be a true point with one or a few plants, but it will also be used for polygon patches that are less than 5m wide and not linear in nature. The general shape (i.e. square, circle, oval, rectangle, etc.) and size should be given if point is the chosen patch type.

Line: A linear patch of invasives that is <5m wide will be considered a line. A line need not be straight, but can follow along meandering roads, trails, or washes. The width of the linear patch on average should be given when line is chosen as the patch type.

Polygon: Except for a single plant, technically all patches will be polygons. For purposes of these invasive species protocols, a polygon will be any patch larger than 5m wide of any shape. When a patch is designated as a polygon, the general shape of the patch should be given on the data sheet.

EXTENT

Isolated: No other specimens visible beyond plot.

Localized: Other specimens or few patches beyond plot.

Extensive: Many more plants/patches visible, but not dominating landscape.

Overrunning: Weed is abundant/dominant over widespread area.

PERCENT COVER

Percent cover is the estimated amount of ground covered by the vegetation of the targeted species when viewing the patch from an aerial position.

Categories are: <1%, 1-5%, 5-25%, 26-50%, 51-75%, 76-95%, 96-100%.

PUBLIC AND PRIVATE LAND ISSUES

The goal of the Invaders of the Sonoran Desert Region Program is to have many eyes and ears detecting and reporting invaders in as many places as possible. However, we have to be mindful of both public land rules and regulations and the rights of private landowners.

Public Land

Some agencies do have very strict rules concerning collection of data and specimens and require permissions. The National Park Service requires permission for these activities and we are working with local parks to create partnerships for this program. Arizona State Trust Land, Arizona State Parks, and USFWS Refuges are examples of other lands subject to permits as well. The ASDM Invaders Team is working with local, state, and federal agencies to forge these partnerships for this Program. When in doubt about the public ownership of a property you plan to survey or the rules of that particular agency, contact a member of the Invaders Team for more information.

Private Land

It is important that we respect the rights of private landowners and do not trespass on their land without 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. This handbook includes a letter that you can present to landowners or the public should you receive inquiries while doing your fieldwork. This letter expresses assurance that our research project will not be conducted on their private property without their express permission and summarizes the goals and purpose of the Invaders of the Sonoran Desert Region Program.

Invaders Citizen Scientists Combat Invasive Species

Invaders of the Sonoran Desert Region

January, 2007

To Whom It May Concern,

The holder of this letter is a volunteer citizen scientist working on behalf of the Arizona-Sonora Desert Museum's Invaders of the Sonoran Desert Region program. He/she is helping to track the distribution of invasive species of plants and animals in our region. Invasive species are organisms that are non-native to the ecosystem in consideration and cause or are likely to cause economic or environmental harm or harm to human health.

The volunteers have been trained in identification and field techniques and have been provided with a set of equipment to collect data on particular species' locations and abundance and the environmental conditions in which they are found. They are monitoring areas designated by the Invaders Program and using protocols that will help paint a picture of invasive species spread in both urban and wild land areas.

Once volunteers have completed field surveys, their data will be uploaded to a web-based database and made available to resource management entities and the general public. Their investigations are part of a national effort to map target invasive species and assist land managers in their control and eradication. You can find out more at www.desertmuseum.org/invaders. Feel free to contact the Invaders program coordinators listed below if you have further questions.

Thank you,

The Invaders Program Team

Tani Hubbard
Invaders Program Manager
Arizona-Sonora Desert Museum
2021 N. Kinney Rd.
Tucson, AZ 85743
(520) 883-1380 ext. 133
thubbard@desertmuseum.org

Yajaira Gray
Invaders Program Volunteer Coordinator
Arizona-Sonora Desert Museum
2021 N. Kinney Rd.
Tucson, AZ 85743
(520) 883-
ygray@desertmuseum.org

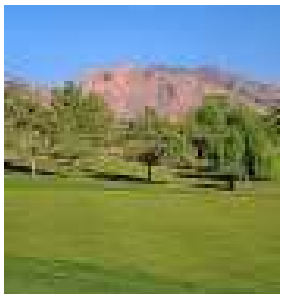
ARIZONA SONORA DESERT MUSEUM

RED IMPORTED FIRE ANT
DATA COLLECTION PROTOCOL

Where is your site?

We will be sending you out to specific locations to collect data per requests from the Arizona Department of Agriculture. These locations will likely be plant nurseries and public gardens, but may also include truck stops, parking lots, warehouse sites, golf courses, and parks.

Red imported fire ants require a permanent water supply and shelter from extreme temperatures. When you are surveying a site, extra care should be taken to survey an entire area, especially around asphalt roads and cement pads, pallets, bricks, mulch and edges of plastic tarps, or weed barriers. The ASDM Invaders Team will provide extra on-site training when we begin doing these surveys.

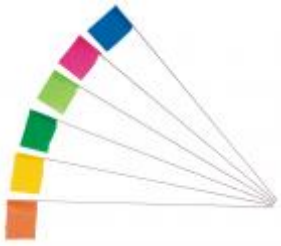


When will we be surveying?

Red imported fire ants can be surveyed from spring through fall. They are only inactive in the colder winter months. We will be alerting all volunteers when we begin these surveys and those interested will be provided an additional training prior to commencing surveys.

What do I need to bring to the field?

We will put together field kit materials for these surveys that will include empty film containers with lids, bait (bags of potato chips), surveyor flags, name and sample labels, plastic bags, clipboards, sharpies, paper, pens and pencils, and ice chests for samples.



Working in Groups

When you are sent out to survey a site, you will work in groups of at least 4 to be able to complete the survey in a timely manner.

Data Collection

Sites should be surveyed prior to the temperature reaching 100º F. During summer months, surveys should begin by 6 am in order to complete the task in time.

1. One person on the team will be assigned the task of supervising the project and laying out the general grid for the others to place flags and bait and collect samples. This team leader will also be responsible for setting up the labeling scheme for the sites and will work with other members of the team to assure that samples are labeled properly. Upon arriving at a survey site, the team leader should make contact with site personnel (i.e. nursery managers, property owners, etc.) to coordinate the activities.
2. Once it has been determined how the site will be laid out, flags should be placed in the ground no less than 20 ft apart in a grid across the site (flags can lay on the ground sticking out of a film container if the ground is too hard).

3. Place a film container, with the lid removed, at each flag. Each film container should have bait (potato chips) inside and be laid on its side for easy ant entry.

4. Wait approximately ½ to 1 hour after placing all bait stations. If you wait too long, ants often feed and then disappear, especially if it gets hot out. It is best to start collecting sooner, rather than later, but if still cool, wait until it warms up and ants begin foraging.

5. Remove bait containers, bait, and flags where no ants are found.

6. When ants are found in the bait containers, collect the ants by placing a cap on the container. Place a label with the sample number written in sharpie pen on all sample containers. Place all samples in plastic sealable bags and put them in the ice chest. Multiple samples can be placed in the same bags. Make sure that container lids are secure and will not come off during transport.

7. Before leaving the field site, ensure that all flags, bait, containers, and any other materials are removed from the area. Be respectful of the needs and concerns of the site manager or owner.

8. Bring all samples back to ASDM and put in a refrigerator or freezer. If you cannot go back to ASDM that day, you may put them in your refrigerator or freezer at home and bring them to ASDM at your earliest convenience.

What happens to the samples now?

Robin Kropp and Tani Hubbard will be providing the initial screening of the ant samples at ASDM using microscopes. When they find samples they believe may be red imported fire ants, those samples will be packaged, labeled, and mailed to the Arizona Department of Agriculture for a taxonomist to verify. If red imported fire ants are verified, the Department of Agriculture will revisit that site to determine the extent of the infestation and then will apply control measures to eradicate the animals from the site. So far, the Arizona Department of Agriculture has been 100% successful at eradicating all red imported fire ant infestations in the State of Arizona. As an Invaders volunteer you will be assisting them with keeping a perfect record.

ARGENTINE CACTUS MOTH
SURVEY PROTOCOL

Trap Set Up

1. One wing-trap will be set up at each site (nursery). Wing-traps will either hang from a tree near prickly pear plants or will sit on top of a pole when a tree is not available. We will choose sites together at each nursery.

2. At each site, complete the top section of the data sheet designated for that location. This includes the name of the nursery or garden, the contact person and telephone number, the date the trap was first installed, the temperature, the humidity, the name of the citizen scientist setting up the trap and the GPS coordinates.

3. Fill out the Site note sheet on the inside of the Site Folder. Take photos of the trap and its location.

Invaders of the Sonoran Desert Region
Early Detection and Reporting Data Sheet
Cactus Moth

Site Name: _____ Site Contact: _____ Phone: _____

Setup Date: _____ Temperature: _____ Humidity: _____ Researcher(s) Name: _____

GPS coord: Lat-N _____ ° _____min _____sec Long-W _____ ° _____min _____sec

Date	Time	Temp.	Humidity	Lure Changed	Trap Collected/ Replaced	Notes	Researcher Name

4. If the nursery or garden has a thermometer and hygrometer in an accessible location, you may use that information for the data sheet. Otherwise, you may just take the temperature with an ASDM or your own thermometer.

5. Set up a wing-trap and record the site name and date on the sticky plate. Attach the trap to the tree or pole. Attach the pheromone lure with a pushpin into the trap. Do not touch the lure with your fingers. Make sure the lure is all the way on the pushpin. Check that the trap is secure.

Trap Monitoring (Make sure you bring a thermometer, new sticky traps, fresh lures, and the site folder)

1. When you arrive at a site for monitoring, first announce your arrival to the site contact person or to whoever is in charge that day. Let them know how long you will be there and what you are doing if you have not met that person before.

2. Remove the sticky part of the wing-trap, fold over, and secure with a rubber band. Attach a new sticky plate with the site name and date written on it. Remove the old pheromone lure and replace it with a fresh one. Do not touch the lure with your fingers. Hang the trap back up or place it back on the pole. Make sure the trap is secure.

3. If any other part of the trap needs replacing or there are any other problems, contact Robin or Tani.

4. Complete cactus moth data sheet including monitoring date and time, temperature and humidity, your name, and any notes. Check off the boxes under lure changed and trap collected when you have completed that. For each site visit, you will be filling out one full row on the data sheet.

Invaders of the Sonoran Desert Region
Early Detection and Reporting Data Sheet
Cactus Moth

Site Name:_____ Site Contact: _____ Phone: _____

Setup Date: _____ Temperature: _____ Humidity: _____ Setup Researcher Name(s): _____

GPS coord: Lat-N _____ ° _____min _____ sec Long-W _____ ° _____min _____ sec

Date	Time	Temp.	Humidity	Lure Changed	Trap Collected/ Replaced	Notes	Monitoring Researcher(s) Name

5. Return all traps and site folders to the Desert Museum. Make sure that all traps collected are labeled properly and folded and secured so that they don't get crushed. Traps should be placed in the designated refrigerator or freezer.

Invaders of the Sonoran Desert Region

Early Detection and Reporting Data Sheet

Cactus Moth

Site Name:_____ Site Contact: _____ Phone: _____

Setup Date: _____ Temperature: _____ Humidity: _____ Setup Researcher Name(s): _____

GPS coord: Lat-N _____ ° _____min _____ sec Long-W _____ ° _____min _____ sec

Date	*Time*	Temp.	*Humidity*	*Lure* Changed	Trap Collected/ Replaced	Notes	Monitoring Researcher(s) Name

Date	*Time*	Temp.	*Humidity*	*Lure* Changed	Trap Collected/ Replaced	Notes	Researcher(s) Name