



Early Detection of Invasive Plant Species Monitoring Plan

Standard Operating Procedure #7B: Using ArcCollector for Offline Data

Version 1.2 (6 June 2017)

Change History

New Version	Revision Date	Author	Changes Made	Justification
1.0	6/25/2015	E. Edson, S. Wakamiya	Developed.	Original see citation below.
1.1	5/25/2017	S. Kichman	Appended for PACN surveys.	Specific data collection traits added.
1.2	6/6/2017	A. Ainsworth	Modified for PACN ED data surveys.	Corrected survey aspects and formatted.

Only changes in this specific SOP will be logged here. Version numbers will be incremented by a whole number (e.g., Version 1.3 to Version 2.0) when a change is made that significantly affects requirements or procedures. Version numbers will be incremented by decimals (e.g., Version 1.6 to Version 1.7) when there are minor modifications that do not affect requirements or procedures for publication in the series.

Based on: Edson E. and S. Wakamiya. 2015. Using ArcCollector for offline data collection.

Purpose

This SOP explains how to use ArcCollector on a mobile application to collect survey data within Pacific Island Network (PACN) parks as part of the Early Detection of Invasive Species Monitoring Plan (Ainsworth et al. 2017).

Introduction

ArcCollector is a product from ESRI that is designed for use on a mobile device such as smart phone or tablet, to compliment ArcGIS Online. The purpose of the Collector app is to enable faster data collection in the field with geolocation and offline capability, and to reduce the amount of post processing time needed in the office.

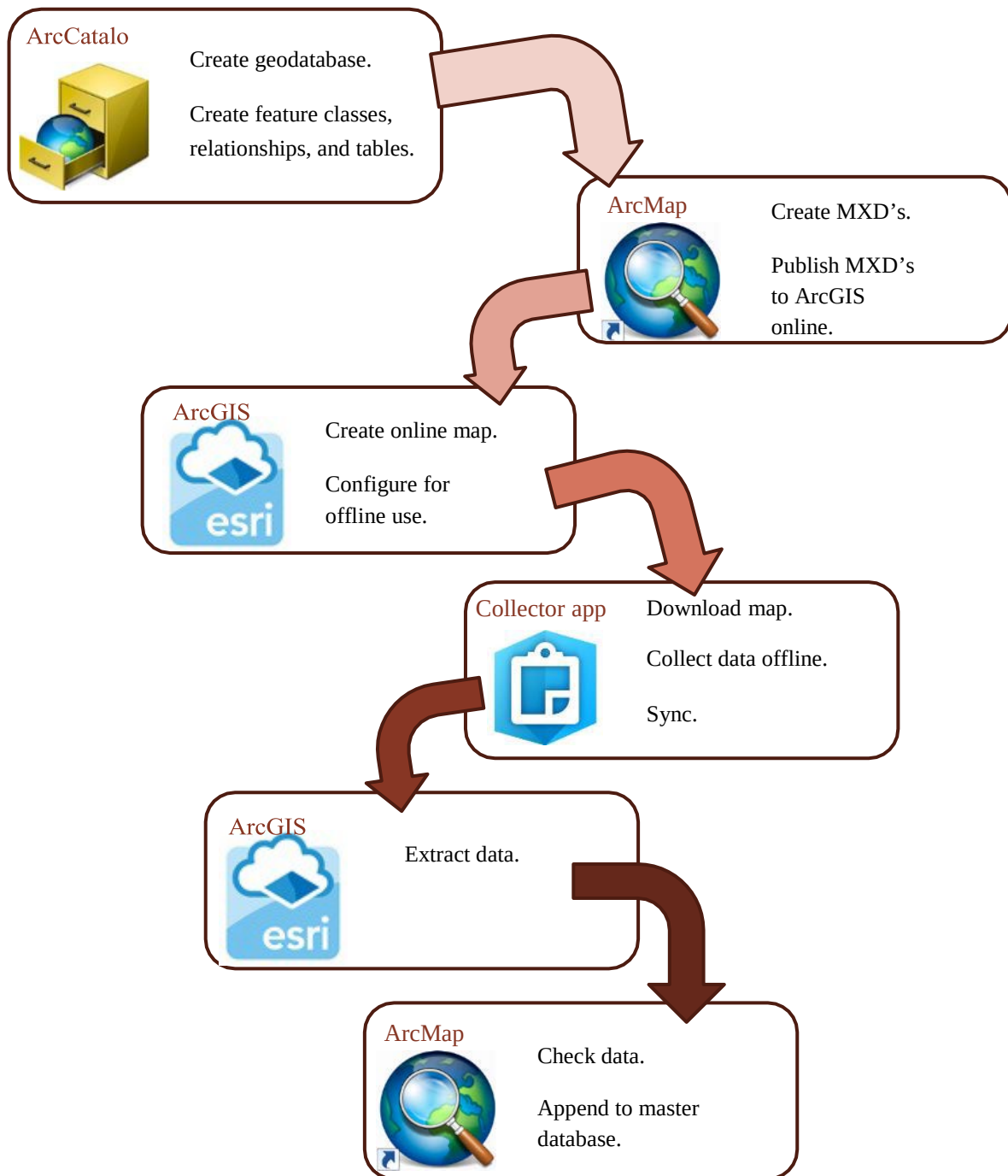
This SOP goes through the entire process of using ArcCollector for data collection. It is designed to help the user set up appropriate feature classes in ArcMap, publish maps to ArcGIS Online, collect data offline, and import data back into the master database.

As a note, the NPS encourages programs to first develop and test web maps and applications on Portal for ArcGIS prior to deployment on ArcGIS Online. However, for mobile devices that are never connected to the NPS network, it is necessary to develop in ArcGIS Online as Portal is only accessible through the NPS firewall. Guidance on ArcGIS Online versus Portal for ArcGIS usage may be found in the PWR AGOL and Portal Guidance document found on the PWR Sharepoint site

(<http://share.inside.nps.gov/sites/PWR/PWRICM/GISgroup/default.aspx>).

Most examples presented within this document are from the San Francisco Bay Area I&M Network's Early Detection of Invasive Plants Monitoring pilot work at Pinnacles National Park.

Workflow overview



Design the geodatabase

This is one of the most important steps! Careful thought at this stage will ensure your field collection goes smoothly and efficiently. Once created in ArcCollector, fields and schema are not always easy to change; forward planning can save much time further down the line.

ArcCollector 10.5 now has the capability to edit related tables as well as feature classes, so when designing think about the types of data that need collection and the analysis process the data will ultimately go through. If collecting data about discrete features it may be sufficient to contain all attributes within a feature class. However, when designing the PACN weed survey, it was only necessary to create a point feature class along with a relationship class to take photos. Below are the components of the PACN geodatabase.

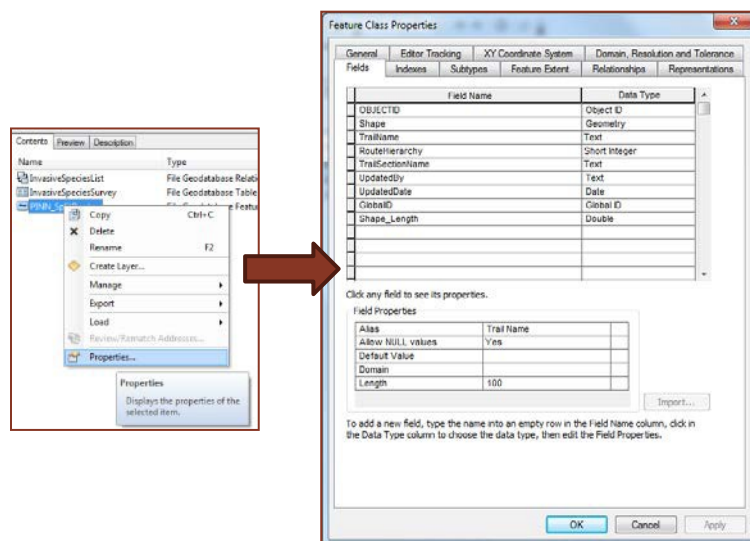
 HAVO_Boundary	File Geodatabase Feature Class
 NPSpecies	File Geodatabase Table
 Weed_Survey_Pt	File Geodatabase Feature Class
 Weed_Survey_Pt_ATTACH	File Geodatabase Table
 Weed_Survey_Pt_ATTACHREL	File Geodatabase Relationship Class

For additional help in understanding or creating related tables and relationship classes, see <http://resources.arcgis.com/en/help/main/10.2/index.html#//004t00000006000000>

Create feature classes in ArcCatalog

Open ArcCatalog and browse to the appropriate folder on the I&M drive. Either use an existing geodatabase if available, or create a new one, making sure the name follows SFAN file naming conventions.

Within that Geodatabase, create the new feature classes and tables as necessary; the type of feature class will depend on the type of data to be collected. Make sure the names for all new features are suitable and contain no spaces or characters except underscores. For each new feature class or table create the attribute fields by right clicking on the new feature class, select Properties, then accessing the **Fields** tab on the **Feature class properties** box



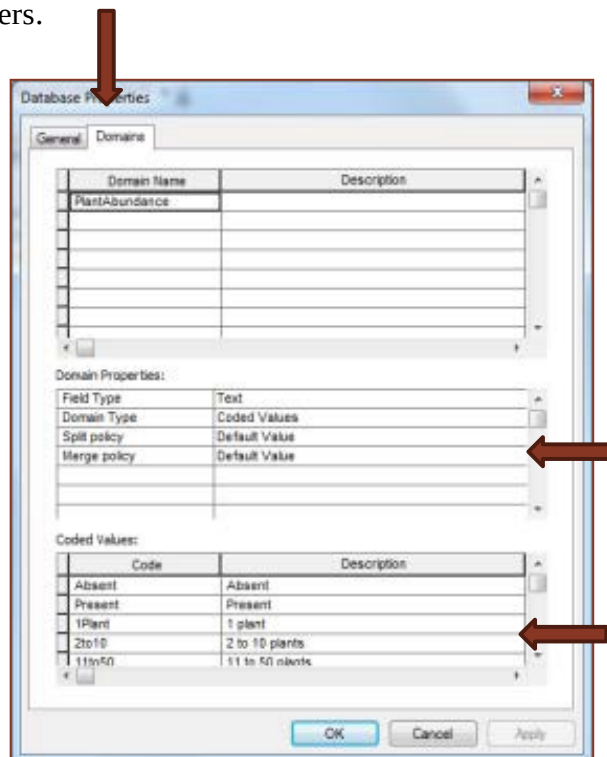
Pay attention to the data type and length of a field, as these cannot always be changed easily once created!

It is important to add metadata to each feature class, such as a description of the feature class, who created it and any limitations to use. This can be done using ArcCatalog under the **Description** tab of the feature class.

Domains

Consider using domains within fields to standardize data entry. Coded domains create the drop down selectors that appear when editing attribute tables, and are extremely useful to prevent spelling errors or unwanted data in a field. Attribute range domains prevent values outside of a set range from being entered. Another useful feature is that domains can be shared across feature classes, tables, and subtypes in a geodatabase, helping to standardize data entry across multiple datasets, and speed up feature class configuration.

To create a coded domain, first navigate to the geodatabase that the domain is going to reside in (this should be the same one that contains the feature classes that will use the domain), and right click to bring up the Database Properties dialog box. Under the Domains tab, enter the proposed name of the domain to be created, and add a description if necessary. Format the Domain Properties for each domain. Take care to choose the same field type as the fields in the feature class that you want to use the domain for. Select what rules will govern the domain if you split or merge features as well. In the Coded Values section type the code and its description. The code should contain no spaces or characters.



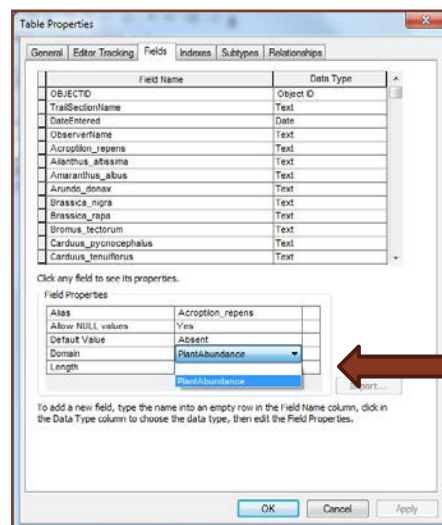
Please note that currently ArcGIS Online and Collector have a bug that becomes apparent when using a coded value domain. Instead of using the domain **description** in the drop down menu, it uses the **code** (regardless of whether it was told to or not), making it impossible to know which

option to select from the list. Therefore it is currently most useful to use coded domains on a text field, and make the domain code and description the same.

Excel tables can be used to create domains, which is useful if there are more than a handful of values. Create the table in Excel and save in the geodatabase. Make sure the field headings, and code entries have no spaces or special characters, and that the cells are formatted to the same field data type as the feature class that the domain will be used in. Also make sure the order of the entries is correct, e.g. ascending alphabetical order, as this is much easier to edit in Excel than ArcMap. Use the tool **Table to Domain** found in ArcToolbox/ Data Management/ Domains to create the domain.

Once the domain has been created in the Geodatabase, it can be used by any other feature classes in that geodatabase. There are two ways of assigning a domain to a feature class or table field:

1. Use the Assign Domain to Field tool in ArcToolbox/ Data Management/ Domains. In the dialog box, browse to select the input table, field name, and domain to use. This method only assigns one domain at a time.
2. In ArcCatalog right click the feature class or table the domain will be assigned to, and select Properties to bring up the Properties dialog box. From the Fields tab select the appropriate field name and look at the Field Properties in the table. This table can be used to assign a default value for a field, change the field length and select the domain to be used.



Find the domain to be assigned in the drop down menu.

An advantage of this method is that more of the field can be customized at the same time as adding a domain, and multiple fields can have domains assigned without closing the Properties dialog box.

Note- If the domain to be used does not appear in the domain drop down menu, it is likely that the data types for the domain and the field are not the same, or the domain was not created in the same geodatabase as the feature class.

More information about creating domains can be found here:

http://resources.arcgis.com/en/help/main/10.2/index.html#/A_quick_tour_of_attribute_domains/001s00000001000000/

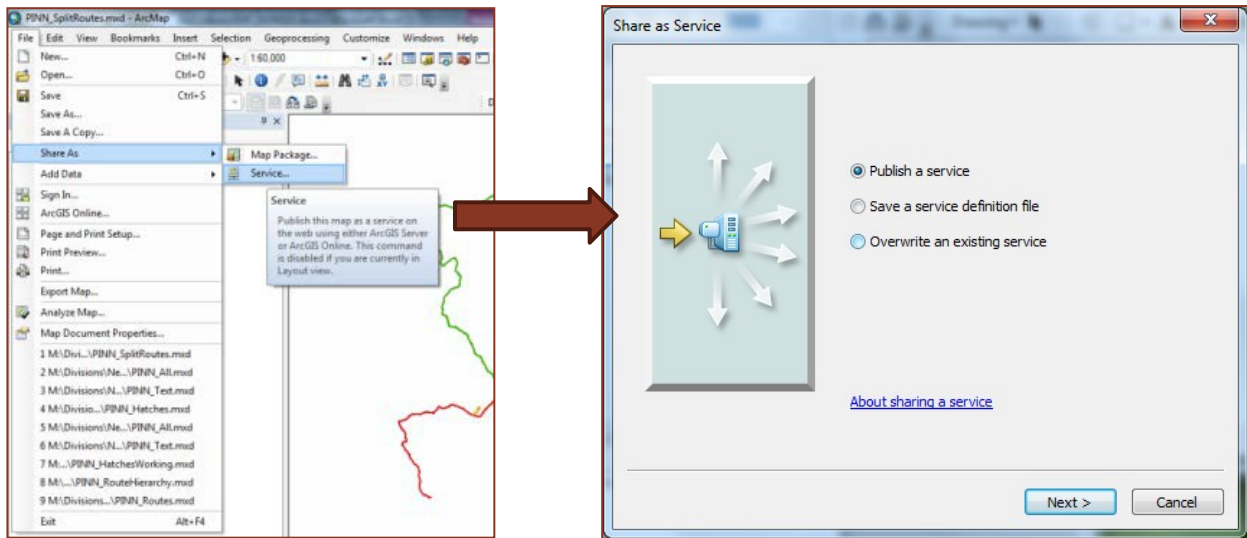
Publishing to ArcGIS Online

Publishing features to ArcGIS Online can be accomplished in the following ways : from comma-separated values (CSV) files, GeoJSON files or zipped shapefiles, feature collections, ArcMap documents (MXD's), ArcGIS Pro maps, or zipped file geodatabases. For more information about how to publish features from these formats, see https://doc.arcgis.com/en/arcgis-online/share-maps/publish-features.htm#ESRI_SECTION1_2ABC815CC7E64D85A94F278D1178D3A9

Publishing a feature via ArcMap offers the greatest flexibility for customization. For instance, you can determine the scale range and symbology. Creating and publishing MXD's to ArcGIS online was the workflow used by the Early Detection of Invasive Plants Monitoring pilot work for Pinnacles National Park. Each feature class that will be used offline needs to be published in its own MXD in ArcMap. It is important to save these MXD's in a suitable place; if changes to the feature class schema or symbology are made after publishing online, it is easier to republish from the same MXD using the previously retained publishing settings.

Note- If using related tables, both the feature class and its related table must be present in the same MXD to retain the link.

1. Open ArcMap and use the **Add Data** button to navigate to the correct feature class.
2. Create an MXD and test that data collection will function as expected.
3. Select the desired symbology. Currently there are severe limitations in ArcGIS Online with symbology features such as labels, line hatching and annotation layers. If any of these are needed for orientation in the field, they need to go through conversion processes to become feature classes, and published separately. For example, in the Pinnacles Invasive plant transects, hatched lines were needed to help orient field staff to transect boundaries. As these were part of a symbology, they had to be first converted to a graphic, then to a feature. Labels were also used and were converted first into an annotation layer, then using the **Feature Outline Mask** tool in **ArcToolbox/ Cartography tools**, converted to a polygon feature.
4. When satisfied with the MXD, remove any test data. Go to **File/ Map Document Properties** and update metadata using the **Map Properties** dialog box.
5. Log In to ArcGISOnline using **File/ Sign in**. Maps cannot be published to ArcGIS online unless signed in to a valid account with the correct permissions (Publisher Role). Go back to **File** and select **Share as a Service** to launch the dialog box where a new service can be published, or existing one republished.
6. Select the appropriate connection for publishing the map, and the service name. Generally the service name is the same as the MXD. This makes it easy to trace if there is a need to republish the service.



1. Use the **Service Editor** dialog box to create the publishing settings:

Set the number of returned records and quality of symbology.

Set Capabilities to "Feature Access" if collecting data. Check appropriate boxes in the feature access tab to allow desired functionality of the feature class. Make sure to check the Sync box if the data is to be taken offline.

Update metadata. Be sure to add appropriate tags. These can be chosen from a drop down list if present.

Share the Service with the organization.

The 'Service Editor' dialog box is shown with the 'Feature Access' tab selected. Annotations with orange arrows point from the text on the left to specific parts of the dialog:

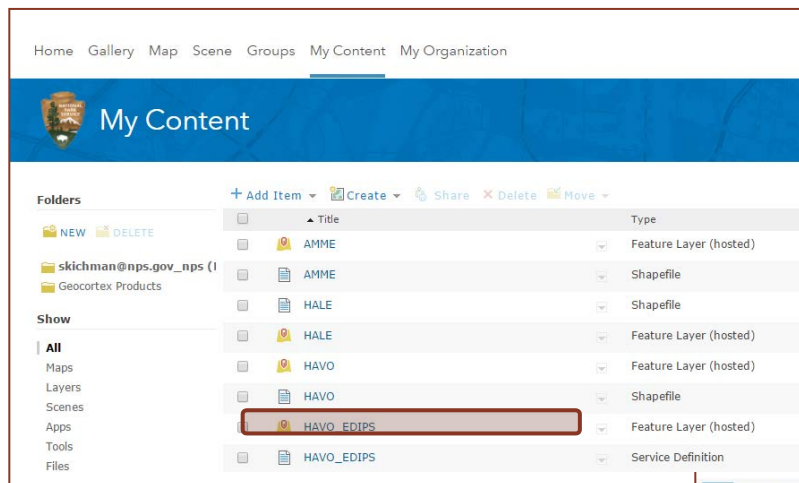
- An arrow points from 'Set the number of returned records and quality of symbology.' to the 'Parameters' tab.
- An arrow points from 'Set Capabilities to "Feature Access" if collecting data...' to the 'Capabilities' tab.
- An arrow points from 'Check appropriate boxes in the feature access tab...' to the 'Feature Access' tab.
- An arrow points from 'Make sure to check the Sync box...' to the 'Sync' checkbox under 'Operations allowed:'.
- An arrow points from 'Update metadata...' to the 'Item Description' tab.
- An arrow points from 'Share the Service with the organization.' to the 'Sharing' tab.

2. Always click **Analyze** (along the top right) before clicking **Publish**, to check if the MXD is suitable for publishing. Warnings and alerts will be generated along the bottom of the MXD screen. Review these and fix as necessary. Common warnings are that the layer draws at all scale ranges, and that the map uses the data frame's full extent. Both these warnings could potentially lead to a large amount of redundant data being published; consider limiting the data frame extent to the largest area that data will be collected within.

Creating a map in ArcGIS Online

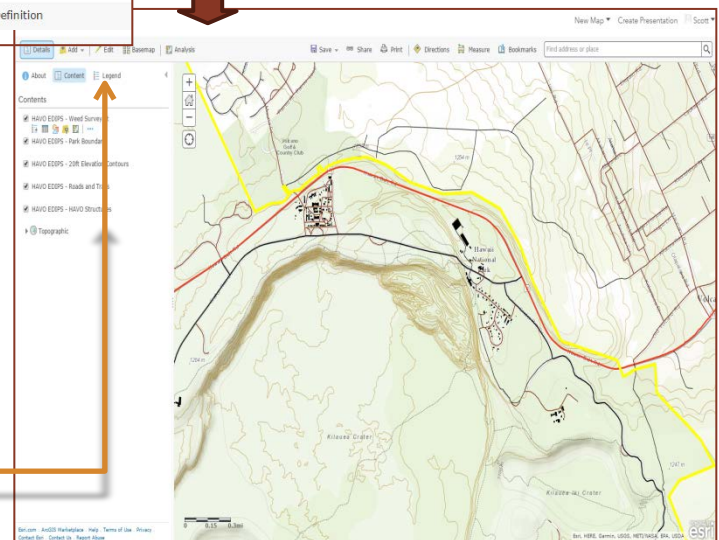
Open a web browser and go to <https://gisportal.nps.gov/arcgis/home/signin.html> and sign in to the appropriate account.

Click the My Content tab at the top of the page to view the feature class that was just published. There will be two items with the same title, one is the actual feature layer and the other is the service definition. The feature layer is the correct one to work with.



Using the drop down arrow next to the appropriate feature layer, select the option to **Add layer to Map with editing enabled**. This loads the layer into a map, with an ESRI standard basemap.

For **offline** use it is important to use a tiled basemap. Select one from www.arcgis.com/home/group.html?owner=esri&title=Tiled%20Basemaps. World Imagery (for export) seems to be the best basemap for zooming in to any detail. Click on the **Details** of the base map to be used (below the icon), and scroll down to the **Map Contents** section and copy the basemap URL.



Back in ArcGIS Online, go to the **Add** drop down arrow, select Add layer from Web, and paste the URL into the box. Be sure to check the **Use as Basemap** box before clicking **Add Layer**.

Add Layer from Web

What type of data are you referencing?

An ArcGIS Server Web Service

URL:

☒ Use as Basemap

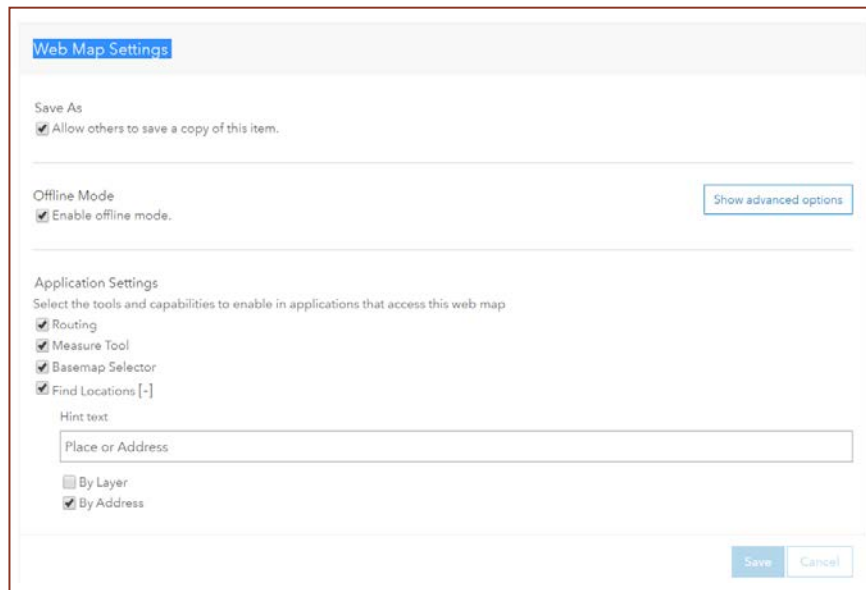
Add Layer

Cancel

Saving and sharing the web map

With the map showing the area for data collection, save the map using the **Save as** option, with a suitable title. Give it a description, tags and choose which folder to save it in. Use the **share** button above the map to enable other users in the organization or group to access the map. If the map is reloaded, it will show the last view saved.

Finally, in the table of contents on the left of the map, use the information icon to access the **More Details** page. Click on the edit icon. Fill in any missing metadata, and scroll down to update the **Properties** section to reflect the desired map functionality. Make sure the **Enable offline mode** box is checked for working offline. Save any edits.

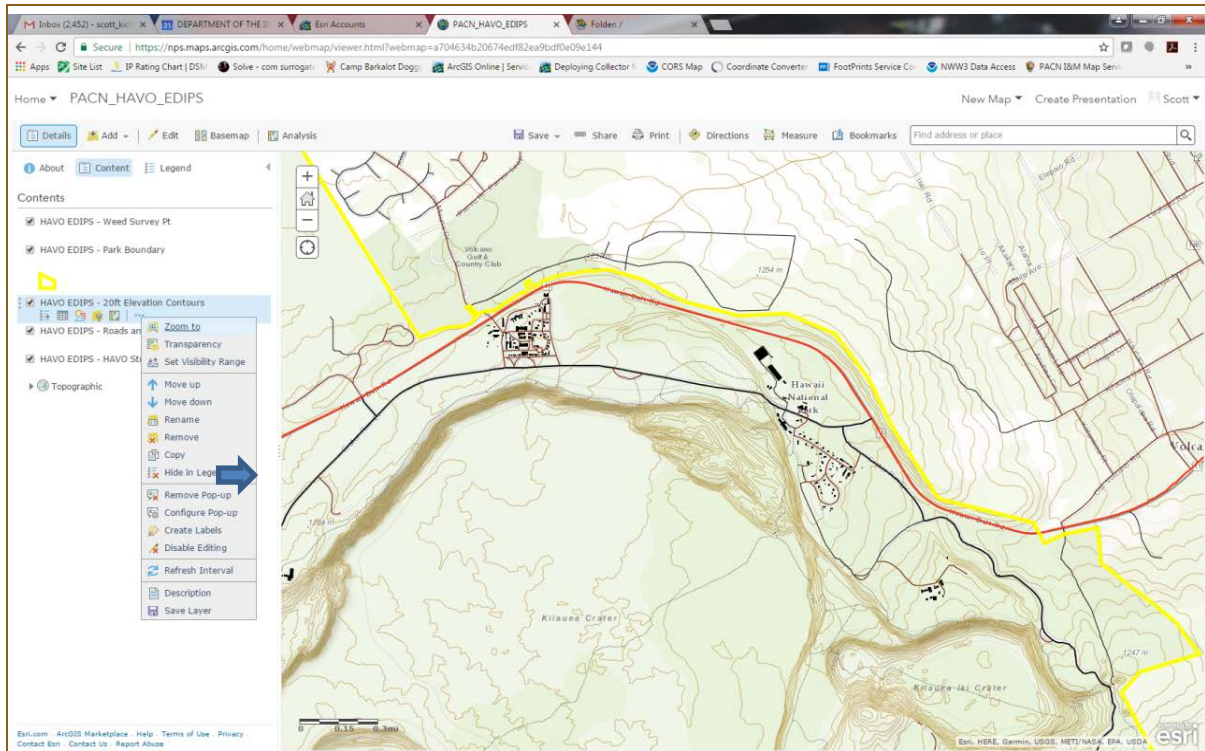


The screenshot shows the 'Web Map Settings' dialog box. It has a title bar 'Web Map Settings' in a blue header. Below the header, there are three main sections: 'Save As', 'Offline Mode', and 'Application Settings'. The 'Save As' section has a checkbox 'Allow others to save a copy of this item.' which is checked. The 'Offline Mode' section has a checkbox 'Enable offline mode.' which is checked, and a 'Show advanced options' button to its right. The 'Application Settings' section has a subtitle 'Select the tools and capabilities to enable in applications that access this web map.' and four checked checkboxes: 'Routing', 'Measure Tool', 'Basemap Selector', and 'Find Locations [-]'. Below these is a 'Hint text' section with a text input field containing 'Place or Address'. At the bottom, there are two checkboxes: 'By Layer' (unchecked) and 'By Address' (checked). At the very bottom right, there are 'Save' and 'Cancel' buttons.

Configuring pop-ups

A pop-up is the box that appears when a feature is clicked on, or when a feature is added. Information within that box can be customized with a suitable title, contents and media. Fields have the option of being displayed, editable, both or neither (hiding extraneous fields can help streamline data entry) and the order of fields can also be configured.

To customize a pop-up, click the three dots underneath the feature layer in the map, and select **Configure pop-up**. You must save the pop-up after you have configured it, and save the map to see any changes.



Any layers that are added to the map for orientation rather than data collection, should have their pop-up removed, this can be done by selecting **Remove pop-up**. This essentially makes the layer non-selectable and removes any confusion about which layer to enter data into. The layer should also be made non-editable if not already done so, use the same menu and select **Disable editing**.

Always save the map after making any changes.

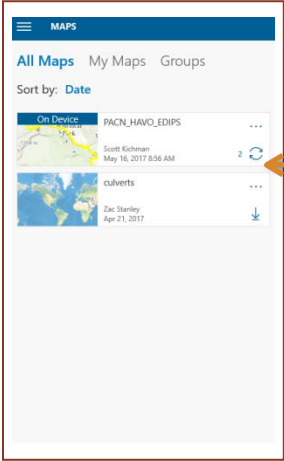
The map can be checked for functionality, but please be aware if using related tables, that currently ArcGIS Online does not support editing related tables (this has to be done using ArcMap or the Collector app). They should appear in the table of contents however.

Taking the map offline to a mobile device

If not already done so, download the Collector app and install on a mobile device. When launching the app, it will prompt to sign in to an ArcGIS online account, the account should belong to the group that hosts the web map. Wifi must be available to download a map to a mobile device. For a free 60 minute webinar about Offline data collection using collector, go to

<http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2786>

Note-The following workflow used a Dell Latitude 12 Ruggedized tablet running Windows 10 Enterprise. The buttons and symbols may be slightly different from those shown on other mobile devices. (photos have been squeezed for functionality)



1) Navigate to the web map that will be used and click download.



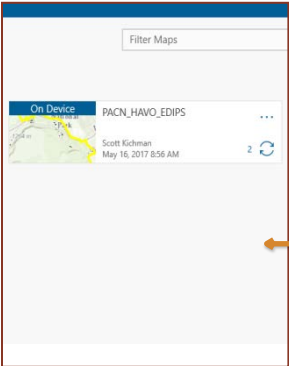
2) Zoom and pan to position the whole work area to download inside the blue box.

3) Select **Choose Map Detail**.



4) Zoom in to set the desired map detail. Bear in mind that the higher the resolution, the bigger the download size will be.

5) When finished, select **Download**.



When Collector is launched, click the drop down menu and select **On Device**. The map icon will appear ready to use offline.

For information on going offline with an apple device see <http://doc.arcgis.com/en/collector/ios/collect-data/offline-use.htm>

Managing and removing a map or basemap can be done by accessing the overflow menu of the Map Gallery (tap the three tiny squares on the top right of the google nexus screen), and selecting **Manage**. To remove a map or basemap, tap **Remove** on the item card.

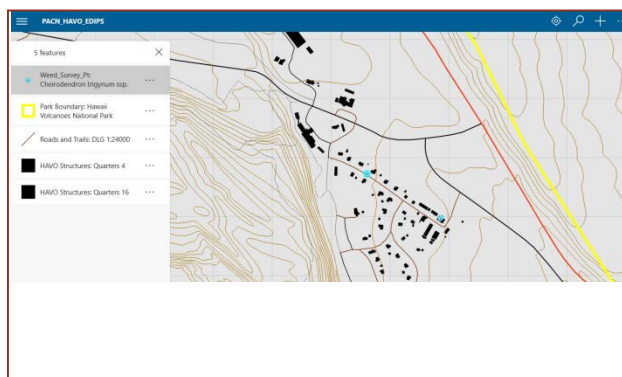
Data collection and sync

To start data collection in the field, turn on the mobile device and launch the Collector app. Select the offline map to be used from the **On device** menu.

Collecting discrete features

Make sure the location services (GPS) is on. This can be ascertained by the crosshair circle at the bottom right of the screen being filled. When collecting point data, the feature will be collected wherever the GPS position is. The feature can be moved once it is collected by tapping to highlight the point, then tapping on the map at its new location. When collecting line or polygon features, simply tap on the map to place vertices.

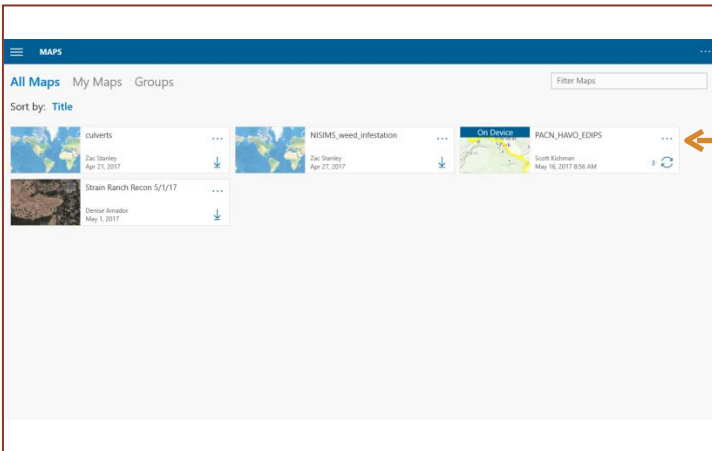
The data collection form is automatically loaded on the left of the screen. Enter data for all fields as accurately and completely as possible. Click **✓Submit** at the top right of the screen when finished.



To review and edit a feature, tap on it to highlight. Then go to the table of contents to open of the data collection form for that feature by tapping on the three dots and select edit. Make any changes necessary. Click **✓Submit** when finished to save changes. If at any point the changes are not required, click the trash can at the top left to discard any edits without saving.

Syncing data

All data gathered in the field is stored only on the mobile device until data has been synced. This can be done once the device has Network access, and should be done every day on return from the field (or as often as connectivity allows), to prevent accidental loss of data. Syncing to ArcGIS Online is two-way, allowing edits to be sent and received.



Log into the Collector app on the mobile device. Select the **On Device map** from Collector.

Tap on the Sync button to begin the process. If a map has edits to sync, there will be a number in brackets next to this button.

Depending on the number of edits, the syncing process could take a while!

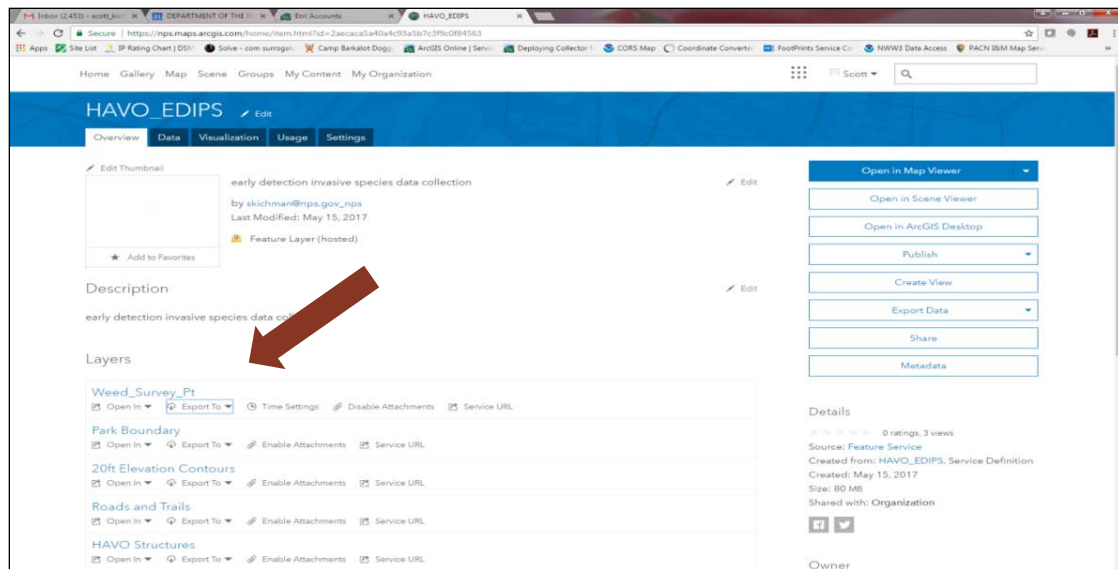
Post-processing data to a EIDPS Geodatabase

When field data collection is complete, the dataset needs to be downloaded from ArcGIS Online and back into the EIDPS geodatabase. During this process, data should be checked for accuracy and quality.

On a desktop computer, open a browser and go to <http://nps.maps.arcgis.com/home/index.html> . Sign in to an appropriate account.

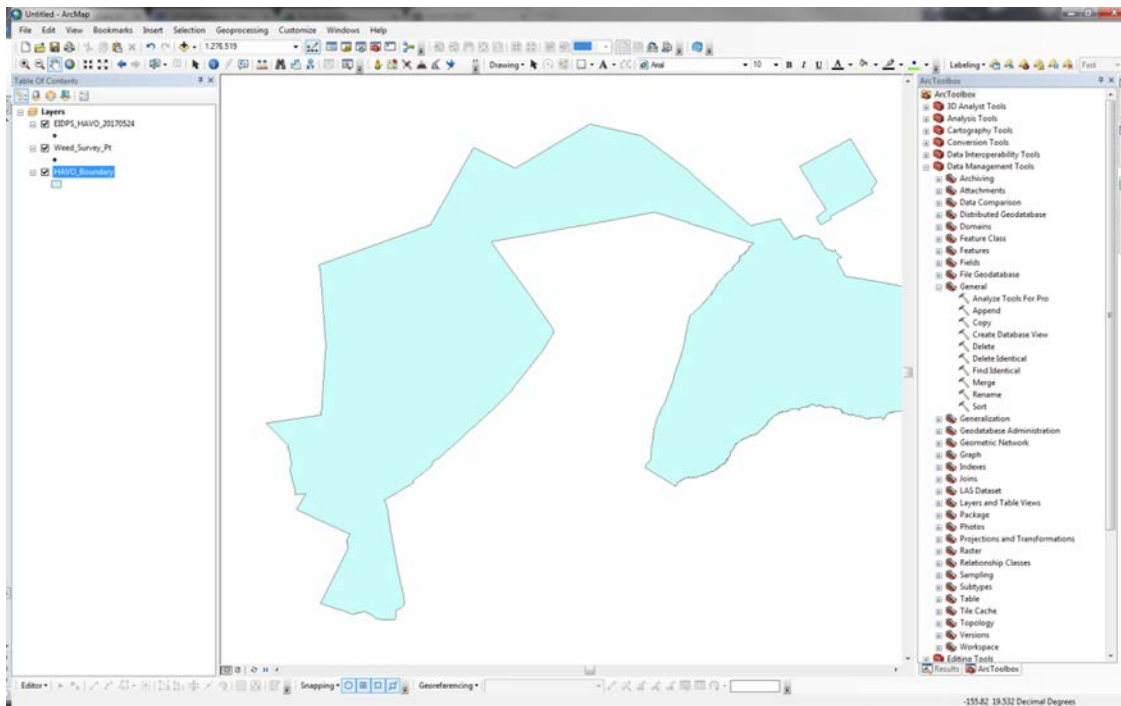
In order to download data from ArcGIS online, the feature layer must be “extractable”. To make the layer extractable, you must be the owner of the feature or the owner of the feature must allow others to export the data (see <https://doc.arcgis.com/en/arcgis-online/use-maps/extract-data.htm> for more information).

If you are the owner of the feature layer or if the owner has made the layer extractable to others, you will see an Export menu on the feature layers items page (click the feature layer in **My Content**). Click the export dropdown button and select the export file type. For the PACN Weed_Survey_Pt, download the layer to a shapefile, naming by collection date or project name and then append the shapefile data to features to the Early_Detection_Invasive_Species geodatabase.

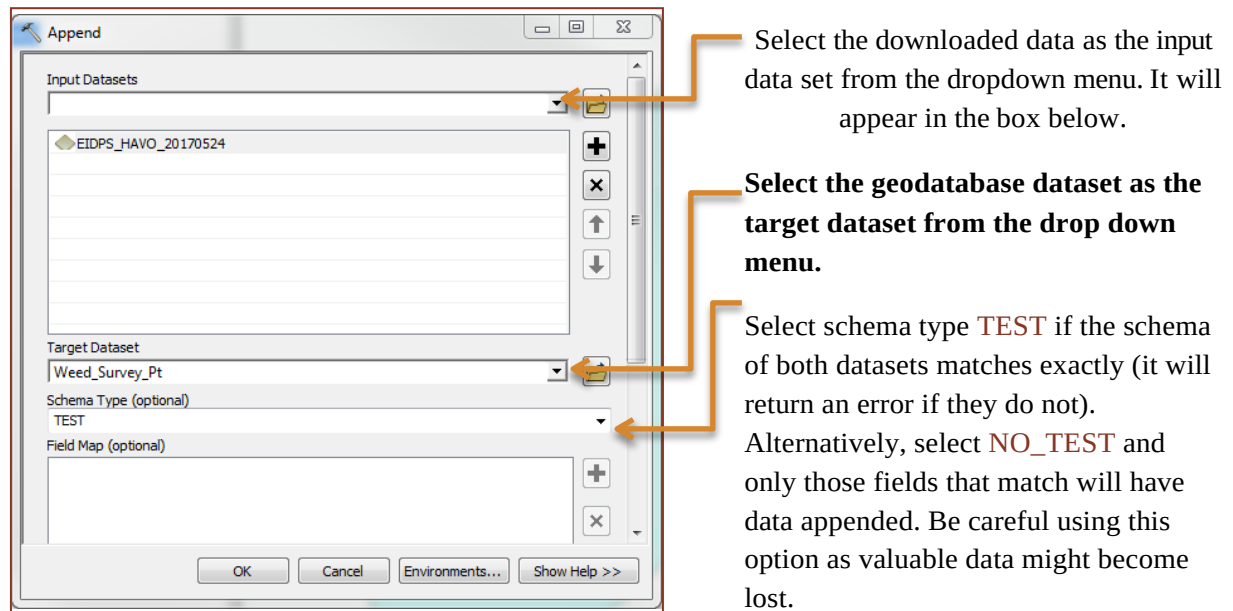


To append downloaded data to geodatabase, open a new MXD. Navigate to the Early Detection geodatabase (M:\File_Geodatabases\Early_Detection_Invasive_Species.gdb), and add M:\File_Geodatabases\Early_Detection_Invasive_Species.gdb\WeedSurveyPt, and the freshly downloaded one from ArcGIS Online.

Add new collected data and EIDPS feature class to ArcMap



When both data sets are in ArcMap, it is a good time to check the new data for accuracy. Also check that the data sets contain exactly the same fields, they should as one schema should be a duplicate of the other. When satisfied that the data in the downloaded dataset is clean and free from erroneous entries, start editing (Editor->Start Editing) the master feature class and launch the **Append** tool in ArcToolbox/ Data Management tools/ General.



Open the geodatabase feature class attribute table and check that all data came over successfully. Save edits and stop editing when satisfied.

Once the data for the season has been downloaded and appended to the master dataset, the feature layer on ArcGIS online should be removed. The unedited downloaded shapefile for the season should be retained for archival purposes according to instructions outlined in protocol/plan-specific SOPs.

Preparing Data for Subsequent Seasons

At the beginning of subsequent field seasons, a blank feature layer should be uploaded back to ArcGIS online for data collection. Use MXD files with the blank feature layers needed as specified in protocol/plan- specific SOPs, and follow instructions in the section on Publishing to ArcGIS Online.