Collecting Data in the Field with ArcGIS Field Maps

Tutorial Overview

ArcGIS Field Maps is a mobile solution with two components: the Field Maps mobile app that allows you to view and collect data from the map or in the field using an Android or iOS smartphone or tablet, and the Field Maps Designer web app that allows you to create layers for collecting data and configure web maps for use in the mobile app. In this tutorial, you will learn how to create and configure a web map that can be taken offline in the ArcGIS Field Maps mobile app for use in areas where there is limited internet connectivity, and then collect data in the field using the mobile app.

Learning Path

This tutorial is the third tutorial in the learning path Working with ArcGIS Field Maps. The first tutorial introduced the ArcGIS Field Maps mobile app. The second tutorial covered how to create and configure web maps that can be used in the Field Maps mobile app and how to collect data from the map in the mobile app.

You are encouraged to read the Learning Path Overview document before beginning this tutorial for more information about ArcGIS Apps and the other tutorials in this learning path.

Skills

By completing this tutorial, you will become comfortable with the following skills:

- Creating a web map that contains editable layers that can be taken offline.
- Configuring a web map in the Field Maps Designer web app to use offline in the Field Maps mobile app.
- Collecting data in the field using the Field Maps mobile app.

Time Required

The following classroom time is required to complete this tutorial:

- 60 – 90* minutes

*In the final part of this tutorial, you will collect data in the field. Additional time may be required to travel to and from the field location and to collect data.

Materials Required

Technology:

- Creator, Professional or Professional Plus ArcGIS Online account with Publisher or equivalent role.
- Smartphone or tablet running Android 8.0+ or iOS 14.5+ with the ArcGIS Field Maps mobile app installed.

Data:

- Reference data used in this tutorial are available in ArcGIS Online.

Production Date

The Education and Research Group at Esri Canada makes every effort to present accurate and reliable information. The Web sites and URLs used in this tutorial are from sources that were current at the time of production but are subject to change without notice to Esri Canada.

- Production Date: October 2021. Updated October 2024.

Background Information

[ArcGIS Field Maps](#) combines the features of ArcGIS Explorer, ArcGIS Collector and ArcGIS Tracker in one app. It has two component apps: a mobile app and a web app. The mobile app is designed to collect data in the field, i.e., when you are on site, using your device's Global Navigation Satellite System (GNSS) receiver to determine the collection location. Note that Field Maps uses the term GPS (Global Positioning System) because it is more familiar to users. GPS is a specific type of GNSS.

The Field Maps Designer web app allows you to enable offline mode for a map that may be used in areas where there is poor or no internet connectivity. There are parameters that can be configured for offline mode that can help improve performance, including creating map areas that users will be able to download in the mobile app before they go out in the field.

References and Reading
- Field Operations
  https://www.esri.ca/en-ca/products/capabilities/field-operations
- ArcGIS Field Maps at a Glance
  https://resources.esri.ca/news-and-updates/arcgis-field-maps-at-a-glance
- ArcGIS Field Maps Resources
  https://www.esri.com/en-us/arcgis/products/arcgis-field-maps/resources
- Field Maps Designer quick reference
  https://doc.arcgis.com/en/field-maps/latest/prepare-maps/configure-the-map.htm#ESRI_SECTION1_6BC07E037A204380946604C7C954CC6D
- Quick reference (Android)
  https://doc.arcgis.com/en/field-maps/android/use-maps/quick-reference.htm
- Quick reference (iOS)
  https://doc.arcgis.com/en/field-maps/ios/use-maps/quick-reference.htm
- Migrate to ArcGIS Field Maps
  https://www.esri.com/arcgis-blog/products/field-maps/field-mobility/migrate-to-arcgis-field-maps/
- Esri Video: ArcGIS Field Maps
  https://mediaspace.esri.com/channel/ArcGIS+Field+Maps/238781423/

Before you begin, you need to decide what data you want to collect and where you will collect it. Adapt the steps below as needed for your data collection.

Part 1: Creating a New Map in Field Maps Designer

In the previous tutorial in this learning path, you created a new map with three feature layers in Field Maps Designer for collecting data. You will follow the same steps in this tutorial but will create a map and layers that you can use to collect data at your current location or a location that you can visit easily.

1. Go to https://www.arcgis.com/ and sign in to your ArcGIS Online account.

2. Open the App Launcher ⠿ and select **Field Maps Designer**.

3. Click **New map**.

4. For the first layer, enter **Animal Observations** or an appropriate name for your point data as the layer name and leave the layer type as **Point layer**.

5. Click Add ⊕. For the second layer, enter **Observation Route** as the layer name. Change the layer type to **Line layer**.

6. Click Add ⊕. For the third layer, enter **Observation Boundaries** as the layer name. Change the layer type to **Polygon layer**.

7. Click **Next**.

8. Enable **GPS metadata collection** (Will high-accuracy GPS receivers be used to collect data?)

   Although you will not be using high-accuracy GPS receivers, you can still collect GPS metadata for your device to see how good, or how poor, its accuracy is under different conditions.

9. Click **Next**.

10. Enter **Field Data Collection Map <Your Name>** as the **Map title** and **Field Data Collection Layers <Your Name>** as the **Feature layer title**.

    Layer names must be unique in your ArcGIS Online organization. Adding your name to the end of the titles will help ensure they are unique.

11. Click **Create map**.

You will be taken to the Forms page where you can add fields to your layers, configure forms and templates, and add additional layers to your map.

Part 2: Adding Fields to a Feature Layer in Field Maps Designer

Field Maps Designer creates empty feature layers in new maps. You can add fields through the form builder in the Forms page.

1. In the Forms page, if necessary, select the point layer in the **Layers** list on the left side of the form builder.

2. Drag the **Text - Single line** form element from the pane on the right side into the canvas area in the centre.

3. In the **Properties** pane on the right side, enter **Species Common Name** or an appropriate label for the names of the point data you will be collecting as the **Display Name** and **species_name** or corresponding label as the **Field Name**. Leave the default values for the other parameters. Click **x** at the top of the Properties pane or anywhere in the form builder to close the pane and return to the form elements list.

4. Drag the **Radio buttons** element into the form. Enter an appropriate label for a category field as the **Display Name** and the **Field Name**. Click **Create List** and add items to the list. Click **Done** then **Continue** to confirm you want to create a list of the selected field type (String).

   In the previous tutorial, point observations were categorized by the zoo area in which the animal could be found. You may similarly use location-based categories for your point data, or you may want to use categories based on characteristics of the point data. For example, if you are conducting a tree survey, you may want to use tree health to categorize observations with list items such as New Planting, Mature Tree, Unhealthy/Damaged, Dead Tree, and Stump.

   If your list has more than 5 values, you will see a warning that a combo box is recommended. You can change the input type from Radio buttons to Combo box if you think it is a better choice for your data collection form.

5. Check the box beside **Include "No value" option**. Change the text for the "no value" option to **Other**. Close the properties pane.

6. Add other form elements depending on the information that you want to collect in the field.

   You can collect numbers (whole or decimal values), single or multiline text, or date and time. Use the Switch element to give users a choice between two values, radio buttons for three to five values and combo boxes for more than five values. See Build the form for more information about creating and editing each form element.

7. When you have finished adding form elements for the point layer, click Save 💾 at the top-right above the canvas to save the form to the map.

8. Click the **Templates** tab. Select the default template and change the **Display name** to **New Observation**. Click **Save**.

9. Select the **Observation Route** layer. In the **Form** tab add the following elements:

Type	Display Name	Field Name
Text – Single line	Starting Point	starting_point
Text – Single line	End Point	end_point
Text – Multiline	Comments	comments

10. Add a choice form element for the type of route then save the form.

    In the previous tutorial, a switch was used to set the route type as either indoor or outdoor. If you will only be collecting data outdoors, you could use surface type (e.g., paved, gravel, dirt), degree of difficulty (e.g., easy, medium, challenging), or another characteristic for your routes.

11. In the **Templates** tab, change the display name for the default template to **New Route**.

12. Select the **Observation Boundaries** layer in the **Layers** list. In the **Form** tab, add a Radio button form element with the following properties:

Property	Value
Display name	Boundary Type
Field name	boundary_type
Field type	Integer
List	Location Sharing Zone, code 0
	Location Alert Zone, code 1
	Non-Geofence Zone, code 2
Include "No value" option	Off

13. Add a multiline text element for comments then save the form.

14. In the **Templates** tab, change the display name for the default template to **New Boundary**.

Part 3: Configuring Layers and Changing the Basemap

In the previous tutorial, you added reference layers to your web map that prevented offline mode from being enabled. For this tutorial, you will include only your editable layers. You will also change the basemap to a tile layer that is intended for offline use.

1. Click **Open** at the bottom of the left menu. Select **Map Viewer**.

   Map Viewer will open in a pop-up window, allowing you to edit and save changes to the map without leaving Field Maps Designer.

2. Open the **Layers** pane and select the point layer (Animal Observations or the layer name you chose in Part 1, Step 4).

3. Click 🖾 **Styles** in the right menu. Add the category field you created in Part 2, Step 4, as the style attribute and use **Types (unique symbols)** for the layer style. Click **Done**.

4. Select the **Observation Route** layer.

5. Set the route type field you created in Part 2, Step 10, as the style attribute. Add an arrow to the end of the symbols and optionally choose a different pattern, change the colour and increase the line width.

6. Select the **Observation Boundaries** layer.

7. Set **Boundary Type** as the style attribute. For the **Location Sharing Zone** type, select **No color** for the fill and choose a dash-dot pattern for the outline. Optionally increase the outline width. Set the transparency to 50% for the other types.

8. Remove the pop-up content for the **Observation Boundaries** layer and change the title to **{boundary_type} {comments}**.
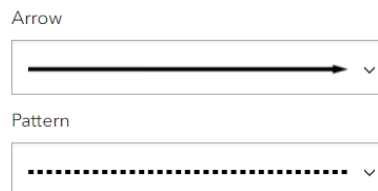
9. In the left menu, click ⊞ **Basemap**. Click the arrow beside **Current basemap** to go to the basemap layers pane.

Current basemap
Topographic / Topographie (>)

10. Click **Add**. Select **Living Atlas** from the drop-down and enter **CMOC** in the search field.

11. Click on the card for the **CMOCOffline** tile layer by Esri Canada to see the layer details, then click the **Use as basemap** button.

    You should see that the map now only includes Canada. When you are modifying the basemap contents in Map Viewer, you can choose to either add a layer to the current basemap contents or replace the current basemap with a layer. In this case, you replaced your organization's default basemap with the CMOCOffline layer. CMOC stands for Community Map of Canada. The CMOCOffline layer is a topographic basemap of Canada that has been enabled for offline use. It, or one of the other basemap layers in Living Atlas that explicitly state they are for offline use, should be used in maps that may be taken offline.

12. Click the Back arrow to return to the basemap layers pane. Verify that only **CMOCOffline** is listed as a **Base** layer. Click **Basemap** in the left menu to close the Basemap pane.

13. Pan and zoom or use the search tool to centre the map at the location where you plan to collect data

14. Save the map.

15. Click **Edit** in the right menu.

16. Select **New Boundary**. Draw a polygon around the perimeter of the area where you plan to collect data. Double-click to complete the feature. Select **Location Sharing Zone** as the **Boundary Type**. Enter *Field Data Collection* in the **Comments** field. Click **Create**.

17. Draw a second polygon within the first around a specific feature, for example a parking lot, playground, or rest area. Select **Location Alert Zone** as the **Boundary Type**. Add a brief description of the area in the **Comments** field, then click **Create**.

18. Optionally, create additional location alert zones.

19. Click **x** at the top-right corner of the Map Viewer pop-up window to close it.

Part 4: Configuring a Map for Offline Use

When you create a map in Field Maps Designer, the new layers have the necessary settings for offline data collection: editing is enabled, sync is enabled, and attachments are enabled. Depending on what is set as the default basemap for your organization, the map may be ready for offline use without any further modifications. However, there are settings you can configure to improve the offline experience.

1. In the left menu, select **Overview**.

   Note: If you see that offline status is Offline disabled, this does not necessarily mean that the map cannot be taken offline, only that it hasn't been enabled for offline use.

2. Click **Edit** and enter the following text in the **Summary** field: *This map was created in Field Maps Designer as part of a tutorial to illustrate some of the capabilities of ArcGIS Field Maps.*

3. In the left menu, select **Offline**.

4. Expand **Content**, then **Layers** and **Basemap**. Verify that there are no errors that are preventing offline use.

   If you include layers that you did not create in Field Maps Designer or use a basemap that has not been enabled for offline use, you may encounter errors that must be resolved if you want to be able to take the map offline. Common errors include:

   Sync is not enabled. If you own the layer, you will see a link to enable sync. Clicking it will update the Editing settings for the feature layer. It will also add a global ID field, if the layer is missing one. If you do not own the layer, you will have to remove the layer from the map. A related error is *The feature layer view is created from a layer that isn't sync-enabled*. You will have to enable sync in the items detail page of the source layer to resolve the error for the layer view.

   The layer is missing a global ID field and cannot be taken offline. This error will appear together with the sync error. Enabling sync will also resolve this error.

   Layer contains an unsupported field type. Field Maps does not support all field types. If the layer contains an unsupported type, e.g., Date Only, it will not load when you open the map in the mobile app and you will have to remove the layer from the map for offline use.

   Layer type is not supported. Field Maps only supports feature layers and tile layers hosted on ArcGIS Online or ArcGIS Enterprise, and ArcGIS Server image services for offline use. Other layer types, such as media layers, will not load when you open the map in the mobile app and must be removed to enable offline use.

   Export tiles is not enabled. This error may appear for basemap layers that haven't been enabled for offline use or image layers added as reference layers. You will need to remove them for offline use.

5. If necessary, toggle **Offline** mode on.

6. Expand **Map areas** and click the **Manage areas** button.

   Map areas are packages that can be downloaded onto a device that contain the basemap and feature layers in a defined area for a defined range of scales. Once a map is enabled for offline mode, you can create maps areas in Field Maps Designer that the user will be able to download onto their device before going out in the field. The user will also be able to create their own map areas on their device or use the map in online mode.

7. Click the button **Create offline area**.

8. Enter a short name for your area or accept the default name.

9. Use the rectangle or polygon tool to draw an area around your collection area. The image below shows a sample offline area for the Toronto Zoo.

10. Expand **Level of Detail** and set the range to **Town** to **Small building**.

11. Expand **Packaging schedule**. Change **Every week** to **Never**.

   The map area package you are creating for this tutorial will not need to be updated, but for other maps you create you will need to consider whether the package should be updated to include new data on a daily, weekly or monthly basis.

12. Click **Save** to generate the map area.

   The map area packaging process may take several minutes. The *Packaging* label will appear beside the name of the map area until the process is complete.

13. Repeat Steps 7 to 12 to create a small map area named **Test Offline Mode** at your current location that you can use to test offline data collection and syncing before going out in the field.

14. Once the packages have been generated, click **X** at the top right to close the **Manage areas** window.

15. Expand **Features and attachments**. Review the options.

   If you want to minimize the amount of data that may be consumed by the mobile app and reduce the amount of time it takes to synchronize edits, you can change the settings to download and update features only. For the purposes of this tutorial, you can leave the default settings.

Part 5: Configuring Additional Collection Parameters

In addition to parameters for offline use, Field Maps has a number of app settings that affect the data collection experience for both offline and online use. Users can modify certain collection settings, including accuracy distance and photo upload size, on their device. They can either change them in the profile settings on their device so that they apply to any map they open, or they can choose to override the settings for the current map. Other settings, such as feature actions and location sharing, can only be modified in Field Maps Designer and only apply to the map for which they were configured. You should review the default settings and modify them to suit your data collection needs.

1. In the left menu, select **App settings**. Expand **Collection**.

2. Set the required location accuracy distance to **65 m**.

    Because you will be testing offline mode while indoors, where accuracy is typically poor, you will need to set the accuracy distance to a higher value than you would use when collecting data outdoors. You will reset the accuracy distance to the default value after testing.

3. In the **Manual location** section, select **Warn when manual location is used**.

    This setting will only have an effect when the feature layer includes GPS metadata. If the user manually moves the map when collecting data, they will see a warning when they try to add a point and will need to confirm that they want to continue.

4. In the **Photo upload size** section, optionally decrease the size of photo attachments.

5. Expand **Layer filters**. Choose **Selected feature layers and fields** to see the options, then choose **Off** to disable filtering.

    For the purposes of this tutorial, you will not enable layer filters. However, when there are multiple users collecting data in the same map or a large number of features have been collected, layer filters can help users by limiting the features displayed on their map. Any text fields, including Creator and Editor username, and any fields with lists (combo boxes, radio buttons, or switches) can be used as filters.

6. Expand **Map** and click the **Set extent** button. Optionally change the extent and click **Save**.

    Since you edited the map in Part 2, the default extent should already be set to the area where you plan to collect data. In cases where you don't need to configure layer styles or use other tools in Map Viewer, you can use app settings to determine the extent of the map when it is opened in the mobile app.

7. Click the save button at the top of the **App settings** page to save your changes

8. In the left menu, select **Geofences**.

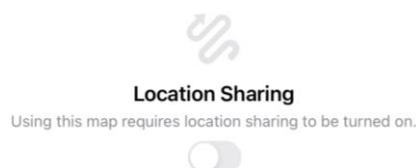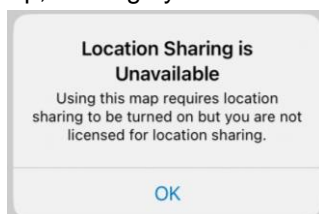9. Click **Add geofence**. Enter **Entering Area** as the name.

10. Select **Observation Boundaries** as the layer to use for the geofence then click Filter ▽ . Add a new filter with the condition **Boundary Type is Location Alert Zone.** Click **Done**.

11. Select **Location alert** as the action type. Check the box beside **On enter**. Enter the following message: *You are entering a new {boundary_type}: {comments}.*

12. Click **Save**.

13. *Optional*: If location sharing is enabled in your organization and you have the ArcGIS Location Sharing user type extension, add another geofence with action type **Location sharing** that is set to **start on enter, stop on exit**. Use the **Observation Boundaries** layer and filter condition **Boundary Type is Location Sharing Zone**.

Important: If you create a location sharing geofence, you will not be able to open the map in the Field Maps mobile app if you don't have the Location Sharing user type extension. If you do have the user type extension, you will have to turn on location sharing every time you open or reload the map, although your location will not be tracked unless you are within the geofence area.

Location Sharing is Unavailable
Using this map requires location sharing to be turned on but you are not licensed for location sharing.

OK

Location Sharing
Using this map requires location sharing to be turned on.

Part 6: Collecting data with the Field Maps mobile app

If you've used the Collector or Explorer apps in the past, the Field Maps mobile app interface should be familiar but there may be some important differences. See the first tutorial in this learning path, Introduction to ArcGIS Field Maps, to learn about the tools available in the mobile app. You will first simulate taking your device offline to verify that you are able to collect data and sync it when your device is back online, and then go out into the field to collect data.

1. Open the ArcGIS Field Maps app on your mobile device and sign in to your ArcGIS Online account.

2. Tap **Profile** (🔵 on iOS, 👤 on Android).

3. Tap **Cellular Data**. If necessary, toggle **Sync and Update** and **Downloads** off to ensure Field Maps will only sync features when connected to wi-fi.

4. Return to the Profile screen then tap **Done** to close it.

5. Find the card **Field Data Collection Map <Your Name>** in the list of maps.

Field Data Collection Map
Offline areas

6. Tap **>** on the card. You should see the map areas you created listed.

7. Tap **Overflow** (**…** on iOS, ⋮ on Android) beside the online map. You should see the **View Details**, **Add Offline Area** and **Favorite** actions. Tap **Favorite** to add the map to your Favorites list.

   If you want to collect data outside of the map areas you created above, you can add an offline area directly on your device.

Testing data collection and syncing

8. Tap on the **Test Offline Mode** map area you created for testing to download it to your device. Once it is downloaded, tap on it to open it. If your device prompts you to allow Field Maps to use your location, tap the option to allow this.

9. Tap the toggle in the Location Alerts notice to allow the map to use your location.

   Unlike with location sharing, your location and movements will not be tracked. Location alerts simply compare your location to the geofence areas and notify you when you enter or exit an area, depending on how you configured the geofence.

10. Open the Settings app on your device and turn wi-fi off or turn on airplane mode to disconnect from any wi-fi networks.

11. In the Field Maps mobile app, tap the **Add** button ⊕ .

12. Tap **New Route** to start a new line feature at your current location.

    By default, when collecting new features, the map is centred and a point is added at your current location.

13. Pan the map to position the crosshairs at a different location and tap **Add Point**. Repeat to create a route with 4 or 5 points. Enter **Current location** as the starting point and **Offline test** in the comments field. Optionally take a photo or attach a photo from your device's photo library (you will need to allow Field Maps to access your library). Tap **Submit**.

14. Tap the **Add** button again then **New Observation** to add a new point feature at your current location. Enter **Test** as the name. Optionally add a photo. Tap **Submit**.

15. Turn wi-fi back on for your device.

16. In the Field Maps mobile app, tap Sync (⤓ on iOS, ↻ on Android) at the top of the screen. If necessary, tap **Sync Now** to sync your test data.

    If the data are synced successfully, the sync button will briefly turn green, and you will see that there are no pending edits. If the sync is unsuccessful, there will be an error message. See ArcGIS Field Maps: Offline Edits Fail to Sync - Let's Troubleshoot for possible reasons and solutions.

17. Once you've successfully completed a sync test, reopen the app settings page for the map in Field Maps Designed and change the **required location accuracy distance** to **10 m**. Save the settings.

Collecting data in the field

18. In the Field Maps mobile app, tap **< Back** to return to the list of map areas. Tap the map area you created for field collection to download it to your device. Tap the map area to open it once the download is complete.
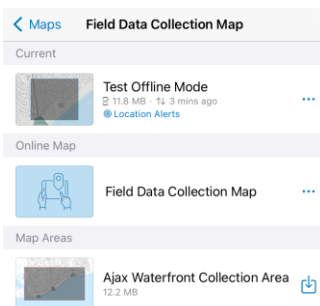
19. Turn off your device and go out into the field to the location where you want to start your observation route.

20. Turn on your device and, if necessary, open Field Maps and your field collection map, and allow the map to use your location.

21. Tap the **Add** button and select **New Route**.

22. Tap **Overflow** (**…** on iOS, ⋮ on Android) on the data collection panel then **Start Streaming**.

Streaming is similar to location sharing, in that it tracks your location and records your position at defined intervals, which can be configured in App settings or by the user. The default interval is 3 m. However, unlike with location sharing, the data is only available on your device until you submit the feature and, if collecting data offline, sync it. Streaming can be an easy way to collect irregular line or polygon features but note that you can't collect other features while streaming or before submitting the current feature. If you want to collect point features along a line feature, you will need to retrace your route, collect the line in segments, or work with a partner.

23. Walk along your chosen collection route and look for features that you'd like to record. Try to identify at least one feature for each of the categories you created in Part 2 Step 4. You may turn off your device, if you wish. Field Maps will track your location and record points along your route while streaming is on. It will also notify you if you enter an area you defined as a Location Alert Zone.

Note: If you see a notification about poor GPS accuracy, move away from any buildings or large trees so that your device has a better sight line to the GPS satellites.

24. When you reach the end of your planned collection route, reopen your device and Field Maps, if necessary, and tap **Stop Streaming**. Slide the data collection form up to add text to the starting point, end point and comments fields and choose the route type. Optionally add a photo. Tap **Submit**.

25. Walk back along your route until you reach a feature you identified for data collection.
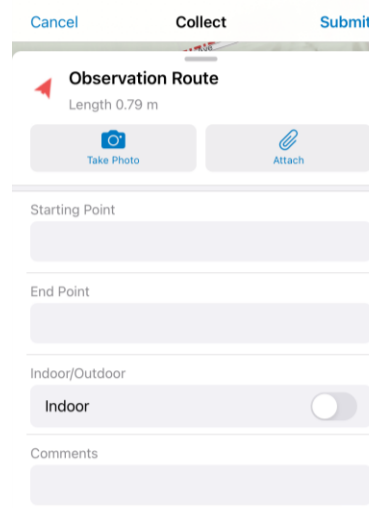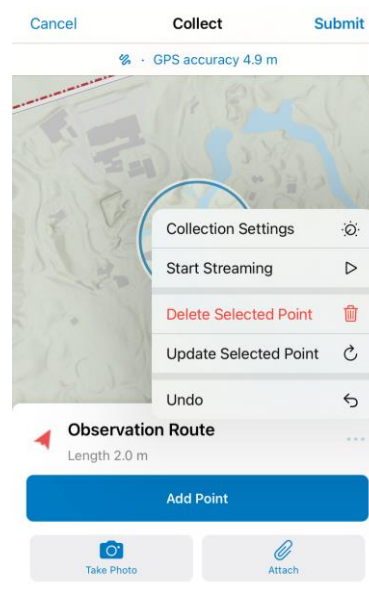
26. Tap the **Add** button then **New Observation**. Slide the data collection form up to enter your observations. Optionally take a photo and then click **Submit**. (See image below for an example.)

27. Continue back along your route collecting observations until you reach your route starting point. If you are unable to position yourself directly beside a feature to capture its location, you can move the map to manually collect the location. You will be prompted to confirm that you want to use a manual location.

28. When you've finished collecting observations, in the Field Maps mobile app tap Sync (⤋• on iOS, ↻• on Android) to see the number of edits that are stored locally on your device. It should be equal to the number of observations you collected plus the observation route.

29. Slide the sync panel up to see the list of pending edits.
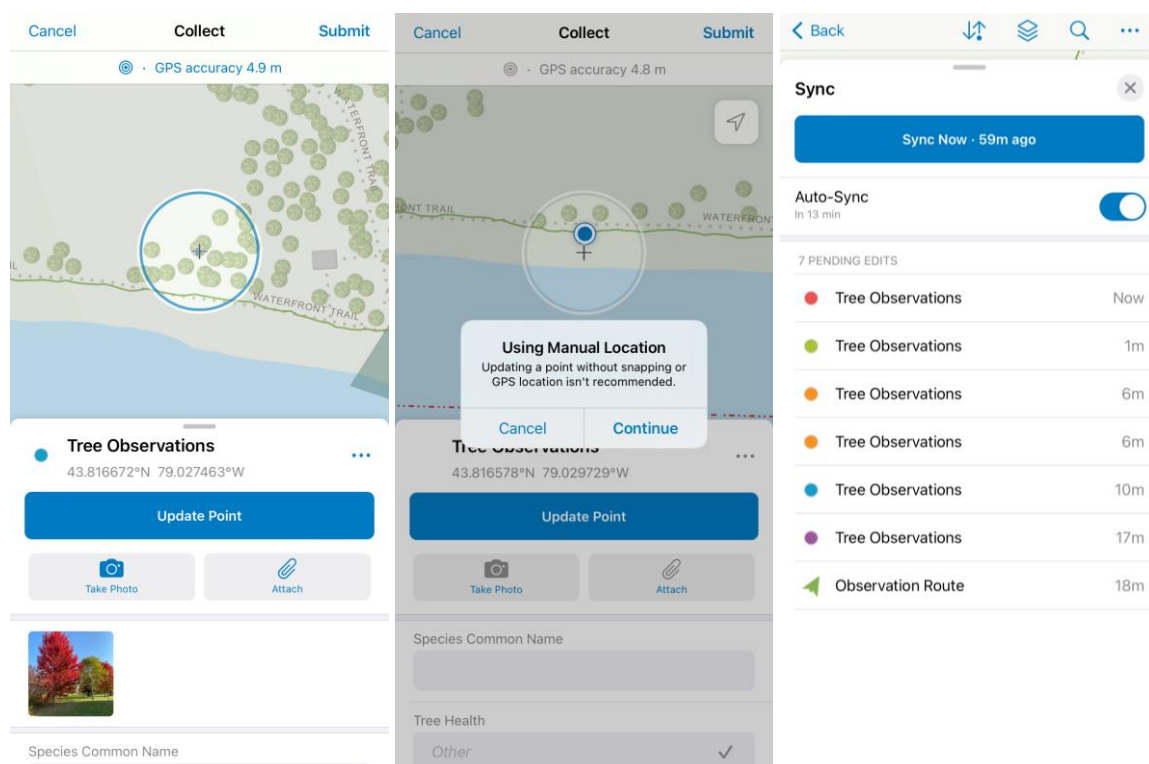
30. Tap **Layers** at the top of the screen then **Observation Route** in the layers list to view your route and the collected point observations. (See image below for an example.)

31. Return from the field to a location where you have a wi-fi connection. If necessary, open the sync panel and tap Sync to sync your local edits.

Auto-sync is on by default and may begin soon after you return from the field. If, when you open the sync panel, the button reads "Cancel Sync" or there are no pending edits, you do not need to take any action to sync your data.
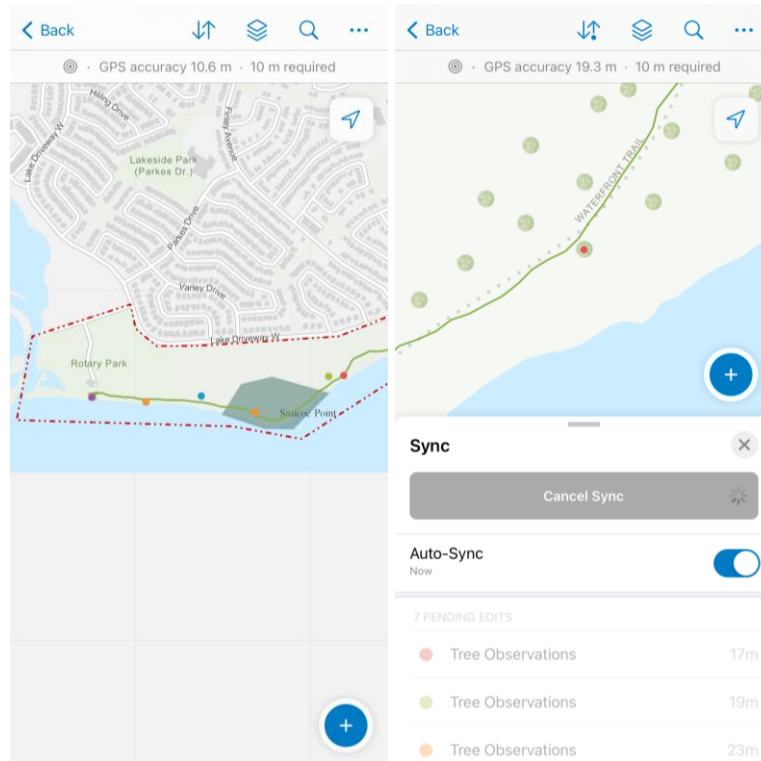
32. Close the Field Maps mobile app on your device or open a different map to stop location alerts.

33. Optionally, open a browser on your device, sign in to ArcGIS Online and open your map to verify that your field data has been synced.

Summary

In this tutorial, you have learned how to create and configure a map in Field Maps Designer that can be used in offline mode, and collected data in the field using the Field Maps mobile app.

Future Considerations

After syncing edits, the data you collected will appear in the web map you created for the data collection as well as any other map to which the collection layers are added. However, web maps are not the only way to display data. You can also share data collected in Field Maps through ArcGIS Dashboards, ArcGIS Instant Apps, and other web apps.

Along with the attribute fields that you added to the layers, additional information from the GPS receiver in your mobile device was also captured with each collected data point. You should examine this information and explore how it can be used to change the way the data are displayed, as well as consider what it can tell you about the quality of the location data you collected.

In this tutorial and the previous tutorial in the learning path, you created simple forms for data collection. The form builder in Field Maps Designer also allows you to add logic using Arcade expressions to conditionally show or hide elements, conditionally require users to enter a value for elements, conditionally enable or disable editing for elements, or automatically calculate a field value. See Add logic for more information and examples of expressions.