European Frog-bit Collaborative

Delimitation of European frog-bit (*Hydrocharis morsus-ranae*) populations in Great Lakes waterways

EUROPEAN FROG-BIT DELIMITATION APP

Standard Operating Procedure

Updated September 16, 2025

Great Lakes Commission des Grands Lacs

Great Lakes RESTORATION

European Frog-bit Collaborative

Data use statement: This app collects a user's ArcGIS username and associated email address. If provided, it also collects their name and organization. The purpose of collecting this data is to facilitate quality checking of data and enhance collaboration within the EFB Collaborative's ArcGIS group. We do not share users' personal information when reporting data to external organizations without permission. However, this data is available to view by members of the EFB Collaborative's ArcGIS group. Anonymized data is reported to the Midwest Invasive Species Information Network (MISIN) yearly. Users have the right to access, correct, or delete their personal information.

A. Introduction

Detecting an invasive species early while abundance is low provides the most realistic chance for management activities to successfully eradicate or contain the population. However, aquatic invasive plants are often cryptic and difficult to locate before widespread establishment occurs. Detecting a species requires thorough surveillance of all its preferred habitat. Documentation of surveillance efforts provides critical information on target species' presence and absence.

European frog-bit (*Hydrocharis morsus-ranae*; EFB) continues to spread across the Great Lakes basin, including inland expansion in Michigan since 2016 and its initial discovery in Wisconsin in 2021. Conservation groups and government agencies are collaborating to better understand EFB distribution. This document provides a standardized process for detecting EFB and, if found, how to delimit the population.

B. Objectives

1. Document European frog-bit presence or absence in a waterbody
2. Delimit European frog-bit populations once located in a waterbody

C. App and online resources

All data are collected on the "**EFB Collab AIS Survey Field Maps**" map in the ArcGIS **Field Maps** app. Alternatively, you can use the "**EFB Collab OFFLINE AIS Survey Field Maps**" map if you plan to collect your data offline and sync it later. The Field Maps app is available for Apple and Android devices. The application ensures standardized data collection across all locations surveyed for EFB. All associated app resources can be found at the EFB Collaborative's ArcGIS Hub Site, including this SOP, maps of EFB locations collected by app users, summaries of results, instructional videos, and a browser-based web editor for editing data you have submitted. An ArcGIS Online account and permission to use EFB-specific apps are required for using this application and the Hub site. Request access to join the EFB Collaborative's ArcGIS online group here: https://bit.ly/EFBapp. Don't have access to an ArcGIS account? The EFB Collaborative offers access upon request by granting an 'ArcGIS Community' account to a limited number of users. Request an ArcGIS Community account here. A step-by-step guide for using the app on Apple or Android devices can be found in Appendices A and B, respectively.

D. Managing your data

Important! All data collected in the delimitation app must be finalized and quality checked by users yearly by **December 1**. At this point, any un-synced/offline copies of the maps created by users may be deleted. ALL TEST DATA MUST BE DELETED! Great Lakes Commission staff will also quality check the data and submit EFB observations to the Midwest Invasive Species Information Network (MISIN). Therefore, it is very important that your data is accurate!

Delimitation data can either be added via the smartphone/tablet app or by desktop computer using ArcGIS Online. Most of this SOP's instructions reference the app but see the Data Collection Tips and Tricks section for how to use the ArcGIS Online version for adding and editing data.

Keep in mind when collecting data in the delimitation app that you should be logged into the ArcGIS Online user account you will use to manage your data throughout its entire life cycle. Make sure you are not logged into a testing account provided by the Great Lakes Commission or any other unintended account.

E. Survey site selection

1. Select sites protected from wave/water energy

EFB is a free-floating plant that flourishes in shallow areas protected from wave and/or water energy. Bays, wetlands, backwaters, ponds, and stormwater retention basins can provide suitable habitat. Additionally, areas with dense emergent and floating leaf vegetation such as cattails, water lilies, reeds such as *Phragmites*, or woody plants can provide needed shelter for EFB. Areas where cattails or Phragmites have been managed are also habitats likely to be invaded by EFB.

2. Select sites with recreation access points

Recreational boating is a known pathway for the transport of aquatic invasive species (AIS) between waterbodies. Based on observed locations of EFB, there may be a link between popular waterfowl hunting locations and EFB presence. Recreational access points such as boat launches are not a definitive factor for locating EFB populations but have been shown to be associated with many recently discovered populations. It is important to note that other factors such as proximity to infested waters, watershed connectivity, or wildlife may also aid in spreading EFB and should be taken into consideration when selecting sites.

To aid in survey site selection, check out the mapping tool under the "Early detection" page on the EFB Collaborative's ArcGIS Hub Site.

F. Field Methods

Data collection procedure

A critical aspect of EFB surveillance is ensuring all available habitat is surveyed. This includes sampling from the water's edge to open water areas. Achieving this level of surveillance often requires a combination of wading and boating and may be physically challenging. Conducting surveys from kayaks or boats alone is inadequate as the water-shoreline interface is a common location of EFB that is often missed. Figure 1 demonstrates locations where EFB can often be found in comparison to emergent vegetation edge and the water's edge. Seasonal fluctuations in water levels may dictate survey location boundaries. EFB has been found outside the water's edge (e.g., behind break walls), where high spring water levels allowed EFB to float into secluded places before water levels receded, trapping the plants (Figure 2).

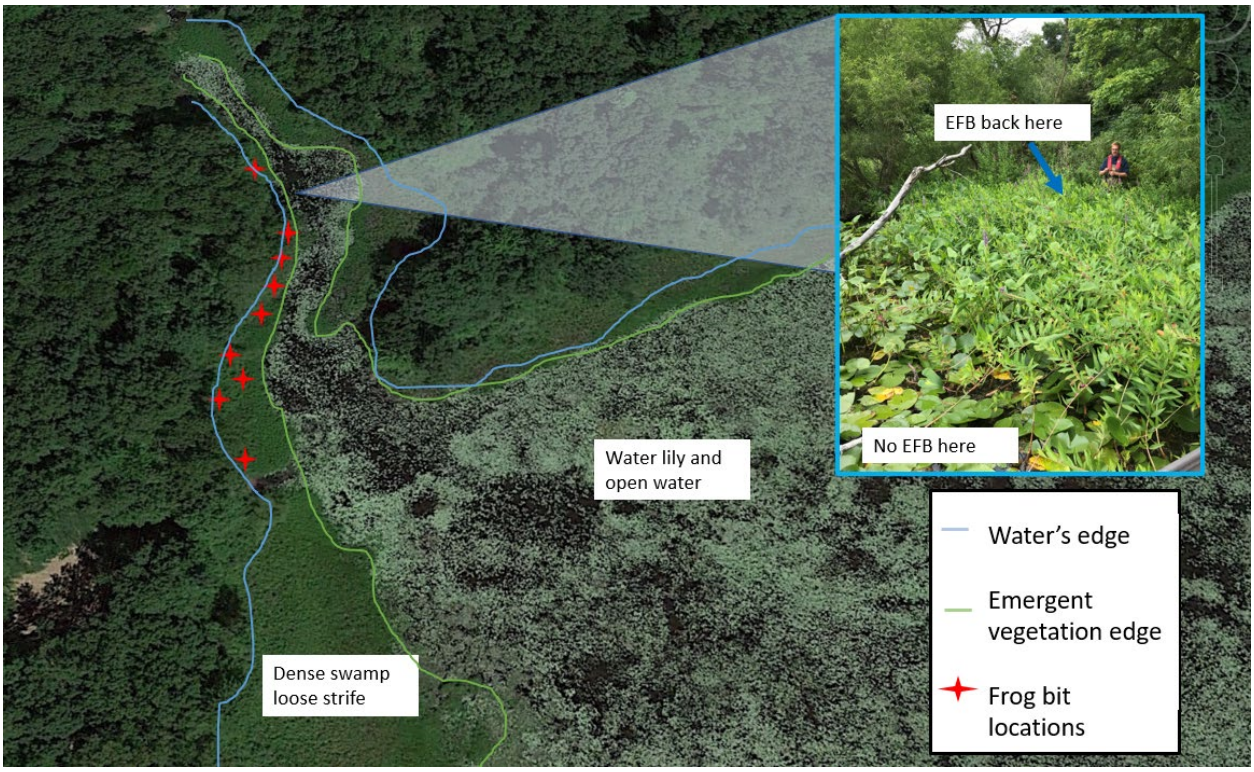


Figure 1. Actual locations of European frog-bit in relation to water's edge and emergent vegetation along lake shoreline. A combination of wading and kayaking was used to locate European frog-bit.

Sampling schedule

Sampling can occur from the time EFB emerges for the season until senescence begins. In the southern portion of the Great Lakes basin, EFB often emerges in mid-May and begins senescence in late September; the farther north, the later the emergence timing. In the northern basin, emergence is often not observed until July 1st. Senescence may also occur earlier in northern areas where the growing season is more constrained. Typically, the most effective time to survey for EFB is prior to full leaf out of water lilies (June in the southern basin) as water lilies occupy similar habitats and their leaves can block EFB plants, making them harder to see.

Sampling crew

Surveys are most effective when completed in teams of two or more. Working as a team provides better surveillance coverage and a safer work environment should an accident happen. Surveying can be physically exhausting, with risk of overheating, becoming physically stuck, and overexertion, so working as a team is highly recommended. Crews should always maintain visual contact with one another and stay within hearing distance.

Sampling equipment

Conducting delimitation and early detection surveys for EFB can be accomplished with a modest amount of equipment. The basic materials include a smart device (with Field Maps app installed and made available offline using steps in Section G), a portable battery to charge the smart device, safety equipment (e.g., life jacket, first aid kit, sunscreen, bug repellent, etc.), decontamination

equipment (e.g., bleach sprayer, brush, etc.), waders, and, depending on the habitat being sampled, a kayak/boat. Appendix C includes a complete equipment list.

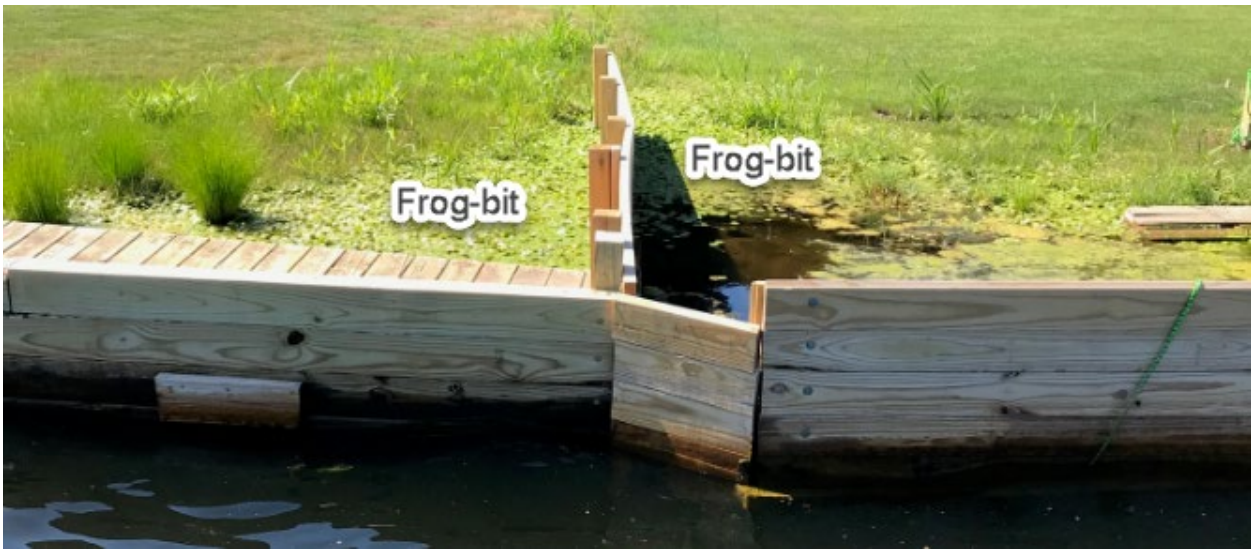


Figure 2. European frog-bit behind break wall. Surveyors should pay close attention to refuge areas.

G. Data Collection using the ArcGIS Field Maps App

There are three types of features that can be collected by the Field Maps app: **lines**, **polygons**, and **points**. Differing amounts of data are submitted with each feature: **lines** and **polygons** only provide measures of EFB density and distribution, while **points** allow you to submit additional data about EFB and the surrounding area (e.g., waterbody name/type, the date, EFB life stage, notes, etc.). Due to the limited data collected by **line** and **polygon** features, it is recommended that you also collect a **point** at the end of your **line** survey or inside/near your **polygon**(s). This allows you to quickly add new **line** and **polygon** features while surveying, and then record all relevant information in a **point** when finished. The sections below detail when to use each feature and why.
See Appendix A or B for a step-by-step process for using the app!

Important! When testing the app when using it for the first time or training others, feel free to make test data by toggling the "Is this test data?" button to "Yes." To assist with the Great Lakes Commission's data quality checking process, please make sure this test data is deleted, preferably right after it is created. Creating your test data in an area that is obviously not a survey location (e.g., in a parking lot or in a building) is preferred. Any data labeled as test data will be deleted at the end of the year.

Delimitation line

The delimitation line survey is designed to collect EFB surveillance data across a broad range of environments including large waterbodies such as coastal wetlands, inland lakes, or large rivers but may still be used on smaller systems such as wetlands, small inland lakes, or ponds. Lines provide a coarse EFB delimitation within a site (i.e., a waterbody or section of a waterbody) in addition to displaying overall EFB presence and absence at the site level.

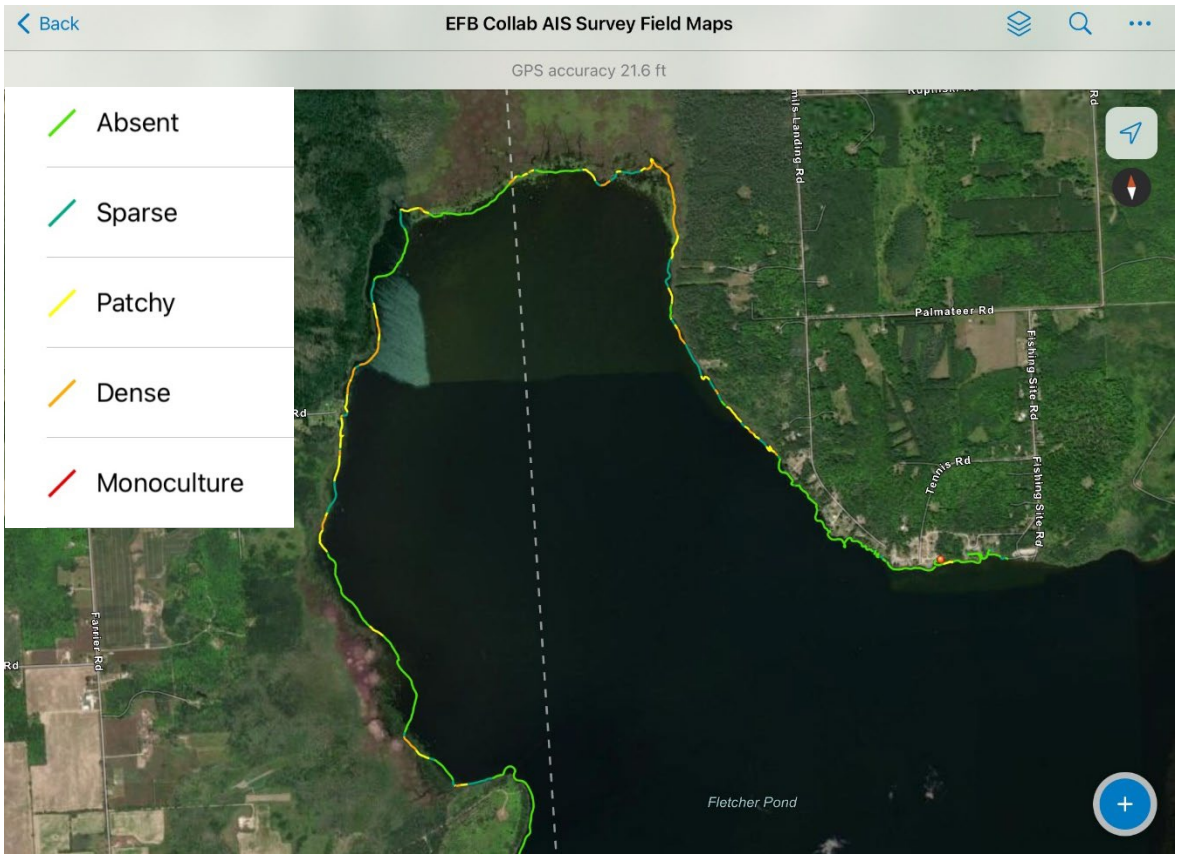


Figure 3. EFB delimitation line surveys collected using the EFB Collab AIS Survey *map in the ArcGIS Field Maps app.*

- Crews begin the survey at the access point or navigate to their desired survey starting location.
- Use the Field Maps app to collect a line (under "Collect" in the app, this is titled "AIS EFB – Lines (streaming capability)" for the current year). The goal of the line is to demonstrate where surveillance was conducted. Therefore, if multiple people are surveying the waterbody, each person should collect a line. Choose the EFB density level appropriate for your starting area (e.g., if no EFB is present, select "Absent"). Density categories are aligned with the Midwest Invasive Species Information Network (MISIN; Table 1 and Figure 4).
- Slowly meander through the search area looking for EFB. Sampling should occur from water's edge to open water. This area can range widely in size and in coastal wetlands may be over a quarter mile. A kayak may be used in areas where vegetation densities allow for travel. Wading should be used when kayaks can no longer navigate through dense vegetation, provided site conditions allow for safe wading.
- Crews should pay special attention to locations most likely to harbor EFB, such as floating debris mats that may trap EFB plants and dense vegetation stands (i.e., cattail and *Phragmites*) which act as a refuge for floating EFB plants.
- When EFB density changes during the survey, submit the current line and begin a new line with the appropriate EFB density in the app and continue surveying. If EFB is removed during the survey, please select "Found but removed" to ensure that EFB-positive information does not exist for areas that no longer have EFB. Keep in mind GPS accuracy with a typical cell phone is about 30 feet, therefore subtle changes in EFB density over a short distance (every 10 feet) isn't

as critical to document as changes over a larger scale (every 100 feet). Use best professional judgement to characterize EFB within a site.

- Continue line survey until the area is searched completely or until the crew is satisfied with survey coverage (use best professional judgement). Submit data if cell coverage is available or submit data the next time the device links to a Wi-Fi connection (see Section G Data Collection Tips and Tricks for guidance on how to use the app when cell service is unavailable).

Table 1. EFB density values, including Midwest Invasive Species Information Network (MISIN) density categories.

EFB Density	General description of plant density
Absent	No EFB is present
Sparse	Scattered individual plants
Patchy	A mix of densities such as sparse and dense
Dense	Greater than 40% of area
Monoculture	Nearly 100% if area
Found but removed	EFB was present, but was removed while performing the survey

Polygon feature

Collecting polygon data with Field Maps app captures density at the patch level. Under "Collect" in the app, add a polygon using "AIS EFB Polygons" (current year). See Appendices A and B for guidance on mapping a polygon in Field Maps. Polygons allow the user to capture a known area of infestation which may be used for monitoring changes in total area over time (Figure 5). Polygons may also be useful for mapping out areas where EFB is absent. Like lines, polygons only contain data on density and distribution, so be sure to capture additional data for the whole site using a point, either using one point per polygon or one point for multiple polygons representing similar patches (see section on points below for more details).

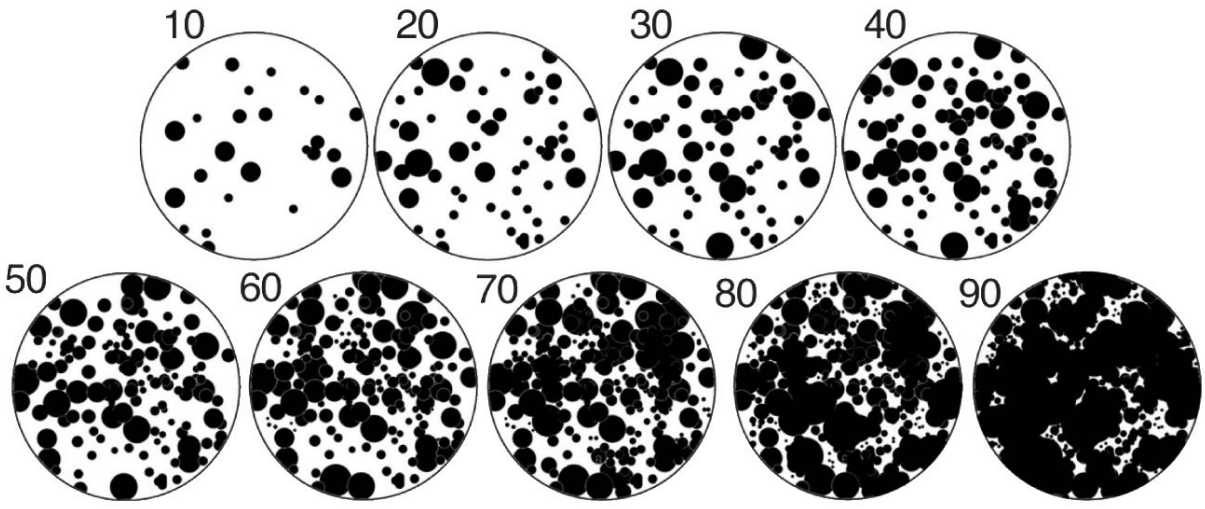


Figure 4. Diagram for estimating percent (%) cover. Adapted from: https://johnmuirlaws.com/wp-content/uploads/2019/03/Untitled-1.jpg

Figure 5. EFB locations delimited using the EFB Collab AIS Survey map *in the* ArcGIS Field Maps *app using the Polygon feature.*

Point feature

Collecting point features captures detailed information at the site level including data about the overall area surveyed. Under "Collect" in the app, add a point using "AIS EFB Points" (current year). See Appendices A and B for guidance on collecting point data. **A minimum of <u>one</u> of these points should be collected at each location surveyed (e.g., one point for an inland lake, pond, or wetland) upon completion of the delimitation line or polygon survey, even if EFB is absent.** A point could also be placed alone (i.e., without an accompanying line or polygon) if there is not time for a full delimitation survey (although it is recommended the site be later revisited and fully delimited). Additional points should be collected if habitat within the survey area changes to accurately capture EFB survey information. Multiple points may be taken if crews find isolated patches that may elicit different management actions or are separated from other EFB patches in the system. Use your best professional judgement to determine when to collect additional information. Ideally, collect one point per single patch or polygon. If multiple patches are spread across a system, additional points may be warranted to characterize that location. This is more critical when there are differences among patches within a system. The following guidance should be used to determine if additional points should be collected.

Examples when more than one point could be taken:

- Significant habitat changes within a system where EFB is present (e.g., open cattail wetland to forested wetland). An additional point will help better characterize the habitat surveyed.
- Changes in the area being surveyed such as transfer from an inland lake to outlet creek or channel. Often these types of habitats vary widely, and an additional point will better characterize the habitat surveyed.
- EFB is found in more than one location within a site separated by some distance or habitat type (e.g., EFB patches A and B are found over a half mile apart on an inland lake).
- EFB is found in an isolated patch with a density of two levels of separation or more from other patches (e.g., a new patch is found with dense EFB whereas previous EFB was sparse).

Table 2. Summary of the features you may wish to collect using the Field Maps app and when to collect them.

Feature	Data collected	When to use it
Line	Density of EFB	To quickly delimit linear areas surveyed where EFB is present/absent
Polygon	Density of EFB	To quickly delimit patches or whole areas surveyed where EFB is present/absent
Point	Density of EFB, site name and conditions, EFB characteristics, survey information (e.g., date, surveyors), and more	To submit additional data associated with a line or polygon survey, or use alone to submit information about a site when there is not time to fully delimit the population using lines or polygons

H. Data Collection Tips and Tricks

Device limitations

Older devices may not have the capacity to run the Field Maps app. It is recommended to use a relatively new device with an up-to-date operating system.

Battery

Running this app can quickly drain a device's battery, especially if you are actively using the app and changing features frequently. It is unlikely you will be able to complete a full field day on a single charge, so plan your battery usage and device charging accordingly. A portable battery charger is recommended.

Offline use

Offline use may be required when conducting field work in remote areas without consistent or stable internet/cellular network connections. This app can be used offline (e.g., in airplane mode)

but accuracy may be reduced, leading to potential gaps in survey lines. Survey gaps are okay and can be edited on the back end. Follow these instructions when you will be in areas with no or inconsistent cellular service:

- Use the **"EFB Collab OFFLINE AIS Survey Field Maps"** map if you are planning to work offline extensively. This version of the app doesn't auto calculate certain fields, which can create errors if offline.
- Before heading out into the field, **make sure to download an "Offline Area" while you have good internet or Wi-Fi service** (see Appendix A and B). This will create a local version of the map area selected (Maps: On Device), and allow you to create lines, points, and polygons as you normally would.
- **Make sure to sync the data as soon as you are connected to the internet.** You do this by hitting the sync button in the offline "On Device" map area (see Appendix A and B).
- **The "On Device" map can be deleted once you have successfully synced your data and the offline map is no longer needed.**

Tips to ensure the best possible offline data collection:

- Verify your device can properly run the app offline ahead of time by using airplane mode to manually turn off Internet/cellular connectivity to your device. With the app open in offline mode, verify that GPS accuracy is within 30 feet or less of the known position.
- Make sure to open the app on your device when you have service prior to going into the field to ensure the app loads properly.
- Monitor your progress throughout the day. If you are having issues, there may be some ways to troubleshoot the issue. See Appendix D or collect a survey line using a handheld GPS.
- Pairing your device with an external GPS receiver will help in offline areas.
- When you regain reliable cellular service or reconnect to Wi-Fi, review lines, points, and polygons to ensure accuracy. Edit incorrect features by tapping on the feature you want to edit and selecting the pencil icon in the lower left to edit as needed. You may also edit features via your desktop computer (see below).

Using ArcGIS Online

To add or edit features on your computer, login to your ArcGIS Online and navigate to "CISMA AIS Survey [CURRENT YEAR]" in the EFB Collaborative Group's content. Open in Map Viewer. To add or edit data, click on the "Edit" button on the left side of the screen.  From here, you can create a point, line, or polygon by clicking on the feature in the list you wish to make, then drawing it on the map. To edit a feature, click "Select" from the edit menu, find your feature on the map, and click on it. From there, correct any information or move your feature around/move its vertices on the map and click "Update" to update the feature. Make sure to save your edits in the side bar on the left of the screen.

Attachments

Photos and notes can be attached to each feature layer if you want to capture that information. It is highly recommended to submit the base feature layer first (e.g., a polygon, line, or point) then go

back and edit the feature to add a picture. In areas with poor cell service, this step is highly recommended.

I. Decontamination

After surveys are complete, ensure all gear and equipment is properly decontaminated following proper decontamination procedures such as the Invasive Species Decontamination for Field Operations in Michigan. When possible, perform field surveys from least infested to most infested areas (considering all known invasive species) or from upstream to downstream on flowing systems to reduce the likelihood of spread to uninfested waters. If possible, allow your gear to fully dry between sites or have two sets of gear that you can switch between to allow for drying time.

J. Post field work

All uploaded data collected will be available through an ArcGIS Online web application titled EFB Collab AIS Survey. Crews should regularly review their data submitted to the app to ensure accuracy. Ensure that all test points on the Delimitation app are deleted before the data is set to be analyzed. If errors are found, they should be corrected using the “edit” function in ArcGIS Online.

ArcGIS Field Maps Reference Sheet – EFB Collab AIS Survey

For iPhone and iPad

Getting Started – Sign in

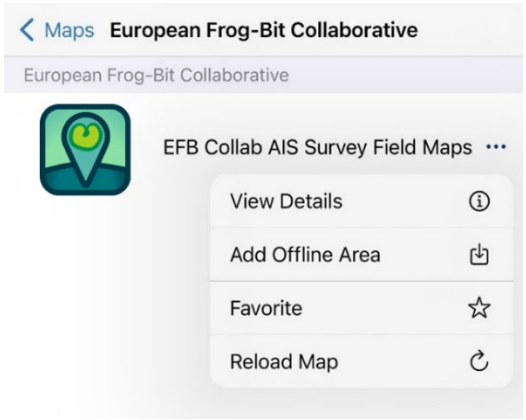
Open Field Maps app. Sign into your ArcGIS Online Account.

1. Tap **Sign in with ArcGIS Online**
2. Enter your credentials.
3. Tap **Sign in.**

Online Data Collection: In the list of maps, open: **EFB Collab AIS Survey Field Maps** OR **EFB Collab OFFLINE AIS Survey Field Maps** (if offline)

Offline Data Collection:

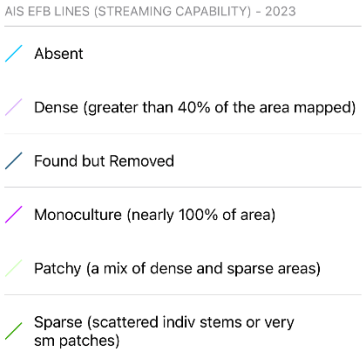
1. In the list of maps, select the Overflow ••• on the right of the map name: **EFB Collab AIS Survey Field Maps**.



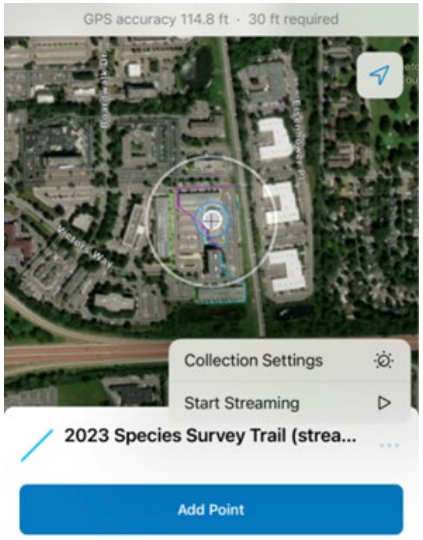
2. Select **Add Offline Area** to download your sample area.
3. Choose **Download Area** once you pick your offline area in the map.

Record AIS EFB Line Segment

1. Tap Add (+) (on the map).
2. **Choose to create an AIS EFB Line by selecting the density you wish to record.**



3. **Create a line segment by streaming your location:** select the **Overflow menu** ••• and select **Start Streaming**. Or manually draw the line segment by adding vertices on the map.



4. **Click submit** to end line segment.
5. **To change EFB density:** repeat the process and create a new line segment.
6. **Taking Photos:** Add a photo to an existing item by tapping on the item and hitting the ✎ button in the bottom left-hand corner of the screen and then tap **Take Photo** to take and add a photo or tap **Attach** if attaching an existing item. While in the editing window, you can long press an attachment to rename it, save it to your device, or remove it from the asset.
7. Tap **Submit to confirm edits**.

Record Polygon

1. Tap Add (+) (on the map).
2. Choose to create a Polygon by selecting the density you wish to record.

3. **Manually draw the polygon** by adding vertices on the map. Or use Streaming.
4. Click **Submit** to create a polygon.
5. **To change EFB density:** repeat the process and create a new polygon.
6. **Taking Photos:** Tap **Take Photo** to take and add a photo or tap **Attach** if attaching an existing item. Long press an attachment to rename it, save it to your device, or remove it from the asset.
7. Tap **Submit to confirm edits**.

Record AIS EFB Point

1. Tap Add (on the map).
2. Choose the **AIS EFB Points** option.
3. Complete the form.
4. **Taking Photos:** Tap **Take Photo** to take and add a photo or tap **Attach** if attaching an existing item. Long press an attachment to rename it, save it to your device, or remove it from the asset.
5. Tap **Submit** to confirm edits.

Editing Data – Point, Line or Polygon

1. Tap the record you'd like to edit on the map.
2. Tap **Edit** in the available actions.
3. **Editing Data:** Update the form by tapping an entry to edit it.
4. **Editing Photos:** Tap **Take Photo** to take and add a photo or tap **Attach** if attaching an existing item. Long press an attachment to remove it. Once an attachment is downloaded, long press it to rename it or save it to your device.
5. Tap **Submit**.

Delete

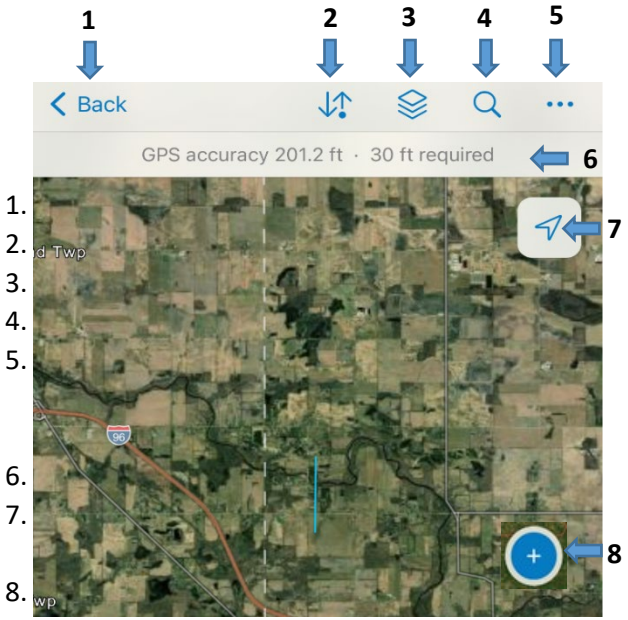
1. Using the map, tap a record you'd like to delete.
2. Tap **Overflow** ••• at the bottom of the screen, tap **Delete**, and choose **Delete**. **NOTE: This action cannot be undone.**

Sync – If working offline

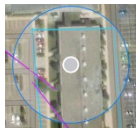
You should sync when you have good connectivity. It's recommended that you sync whenever you can, and that you enable auto-sync.

1. Tap **Sync** to open the Sync panel. (If there is no dot in the icon, you have no edits to sync.)
2. Review the edits you made (if any) and tap **Sync**.
3. Wait for it to complete.

Quick reference – Map tools



Quick reference – Asset location tools



While creating or editing a feature you can edit its location. You'll see a location target. The target is blue when at your location and the GPS meets required accuracy. When red, the GPS doesn't meet required accuracy. A grey target is positioned manually (by moving the map).

- Tap **Add Point** to add a point under the location target. By default, the location target is over your location and moves with you. Move the map to position it manually. Use the GPS button to center it over your location. (With GPS averaging, an average is calculated with each point added with GPS.)
- Use streaming to add multiple points to a length or area automatically while you walk or drive: Tap **Overflow** ••• and tap Start Streaming. To change the frequency of what points are added, update **Streaming Interval** in Overflow •••. **Stop Streaming** to collect locations manually.
- Tap **Update Point (Update Selected Point**, in **Overflow** ••• for lengths and areas) to move the selected point.
- Tap **Delete Selected Point**, in the **Overflow** ••• to delete the selected point.
- Use **Overflow** ••• to undo and redo changes.

Contact information

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ArcGIS Field Maps Reference Sheet – EFB Collab AIS Survey

For Android phones and tablets

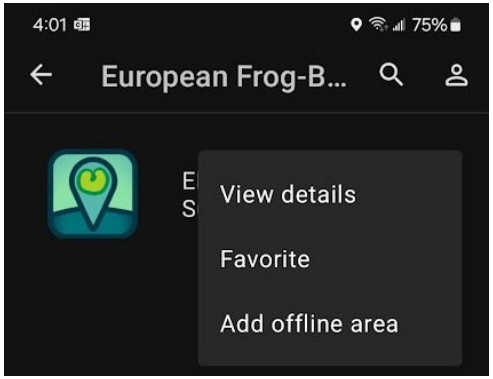
Getting Started – Sign in

Open Field Maps app. Sign into your ArcGIS Online Account.

4. Tap **Sign in with ArcGIS Online**
5. Enter your credentials.
6. Tap **Sign in.**

Offline Data Collection:

1. In the list of maps, select the **Overflow** ⋮ on the right of the map name: **EFB Collab AIS Survey Field Maps** OR **EFB Collab OFFLINE AIS Survey Field Maps** (if offline)

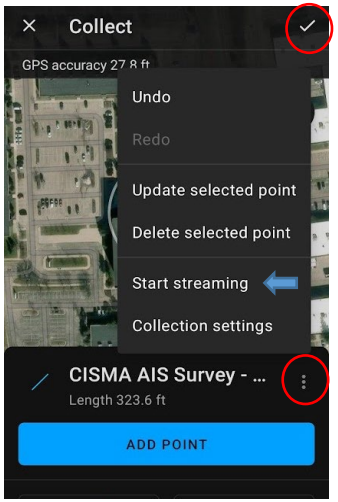


2. Select **Add Offline Area** to download your sample area.
3. Choose **Download Area** once you pick your offline area in the map.

Record AIS EFB Line Segment

8. Tap Add (+) (on the map).
9. **Choose to create an AIS EFB Line by selecting the density you wish to record.**

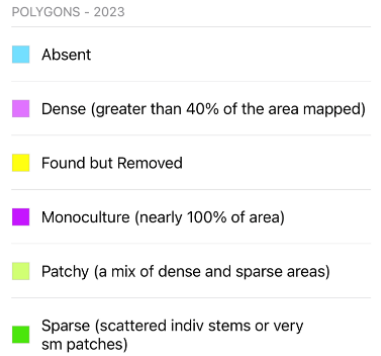
10. **Create a line segment by streaming your location:** select the **Overflow menu** ⋮ and select **Start streaming**. Or manually draw the line segment by adding vertices on the map using the **Add point** button.



11. Click the **check mark** to end line segment.
12. **To change EFB density:** repeat the process and create a new line segment.
13. **Taking Photos:** Add a new photo to an existing item by tapping on the item and hitting the ✎ button in the bottom left-hand corner of the screen and then tap **Take Photo** to take and add a photo or tap **Attach** if attaching an existing item. While in the editing window, you can long press an attachment to rename it, save it to your device, or remove it from the asset.
14. Tap the **check mark** to confirm edits.

Record Polygon

8. Tap Add (+) (on the map).
9. **Choose to create a Polygon by selecting the density you wish to record.**



10. **Manually draw the polygon** by adding vertices on the map. Or use Streaming.
11. Click the **check mark** to create a polygon.
12. **To change EFB density:** repeat the process and create a new polygon.
13. **Taking Photos:** Tap **Take Photo** to take and add a photo or tap **Attach** if attaching an existing item. Long press an attachment to rename it, save it to your device, or remove it from the asset.
14. Tap the **check mark** to confirm edits.

Record AIS EFB Point

6. Tap Add (+) (on the map).
7. Choose the **AIS EFB Points** option.
8. Complete the form.
9. Taking Photos: Tap **Take Photo** to take and add a photo or tap **Attach** if attaching an existing item. Long press an attachment to rename it, save it to your device, or remove it from the asset.
10. Tap the **check mark** to confirm edits.

Editing Data – Point, Line or Polygon

6. Tap the record you'd like to edit on the map.
7. Tap **Edit** in the available actions.
8. **Editing Data:** Update the form by tapping an entry to edit it.
9. **Editing Photos:** Tap **Take Photo** to take and add a photo or tap **Attach** if attaching an existing item. Long press an attachment to remove it. Once an attachment is downloaded, long press it to rename it or save it to your device.
10. Tap the **check mark**.

Delete

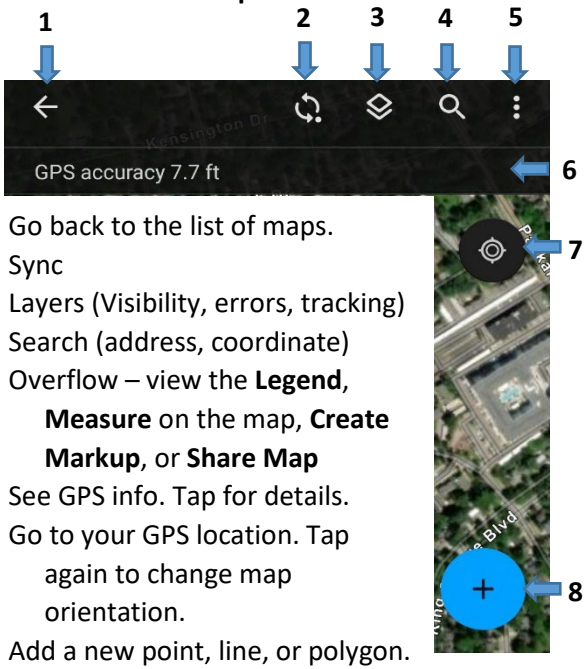
1. View the form of the data to delete.
2. Tap **Delete** in the available actions and choose **Delete**.
   NOTE: This action cannot be undone.

Sync – If working offline

You should sync when you have good connectivity. It's recommended that you sync whenever you can, and that you enable auto-sync.

4. Tap **Sync** to open the Sync panel. (If there is no dot in the icon , you have no edits to sync.)
5. Review the edits you made (if any) and tap **Sync**.
6. Wait for it to complete.

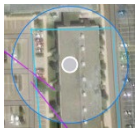
Quick reference – Map tools



1. Go back to the list of maps.
2. Sync
3. Layers (Visibility, errors, tracking)
4. Search (address, coordinate)
5. Overflow – view the **Legend**, **Measure** on the map, **Create Markup**, or **Share Map**
6. See GPS info. Tap for details.
7. Go to your GPS location. Tap again to change map orientation.
8. Add a new point, line, or polygon.

Quick reference – Asset location tools

While creating or editing a feature you can edit its location. You'll see a location target. The target is blue when at your location and the GPS meets required accuracy. When red, the GPS doesn't meet required accuracy. A grey target is positioned manually (by moving the map).



- Tap **Add Point** to add a point under the location target. By default, the location target is over your location and moves with you. Move the map to position it manually. Use the GPS button to center it over your location.
- Use streaming to add multiple points to a length or area automatically while you walk or drive: Tap **Overflow** and tap **Start Streaming**. To change the frequency of what points are added, update **Streaming Interval** in **Overflow** . **Stop Streaming** to collect locations manually.
- Tap **Update Point (Update Selected Point**, in **Overflow** for lengths and areas) to move the selected point.
- Tap **Delete Selected Point**, in the **Overflow** to delete the selected point.
- Use **Overflow** to undo and redo changes.

Contact information

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734-396-6055

APPENDIX C. Equipment list

- ☐ Emergency contact and numbers for all crew members*
- ☐ Cell phone or tablet with **ArcGIS Field Maps** app and **EFB Collab AIS Survey** downloaded (Join the ERSI group)*
- ☐ Auxiliary GPS receiver if surveying in areas with poor cellular coverage (Example here)
- ☐ Auxiliary battery for charging devices (including appropriate charging cables)
- ☐ Waders
- ☐ Kayak or small boat
- ☐ Life jackets
- ☐ Garbage bags (if removing any EFB plants)
- ☐ Bug repellent and sunscreen
- ☐ First aid kit
- ☐ Portable sprayer with bleach solution for equipment decontamination
- ☐ AIS Watchlist identification field guide
- ☐ Personnel gear such as water bottle, food, and rain gear

*Required

APPENDIX D. Troubleshooting

1. **I can't sign in:**
- You need to be connected to the internet for initial sign in.
- Check for typos in username and password. Password is case sensitive.

2. **I can't add an asset:**
- Make sure it has a location (check the map).

3. **I can't get GPS fix** (no location available):
- Go to an open area (away from trees, buildings, etc.) until you get to a location, then go back to a point of interest.
- Make sure Field Maps is allowed to use your device's location (in your device's settings).

4. **I am getting a 'poor location accuracy' message and can't collect a feature.**
- Wait a few moments and see if accuracy improves.
- Override the required accuracy by tapping **Add point**.
- Manually place the point with location target.

5. **Sync failed:**
- Make sure you have good internet/cell connectivity.
- Make sure your device isn't in airplane mode.
- Specify a smaller photo upload size in **Profile**, delete images, and retake them.

6. **Sync takes forever:**
- Specify a smaller preferred attachment size in **Profile setting of Field Maps settings**, delete images, and retake them.
- Sync more frequently.

7. **Enable error logging:**
- See and share information about download and sync issues by enabling logging.
- Go to **Profile in Field Maps Settings**, choose **Troubleshooting**, and enable **Logging**.
- To view your logs, go to your profile in the Field Maps app, scroll down to **Troubleshooting**, and then pressing the **View Logs** button. Check to see if anything unusual appears there, and if so, send a screenshot to efb@glc.org so we can check out what the issue could possibly be.