iMapInvasives Web Map Services

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General Overview

A Web Map Service (WMS) is an internet service which delivers map image tiles or geographic data to mapping applications. An application makes a request for data contained within in a specific map bounding box. The web map service then returns either:
  ➢ Map tile images (served by a **Map Service**)
  ➢ Geographic data (served by a **Feature Service**)

The iMap3 WMS provides an always-current view of iMap data**,** which can be integrated into custom maps in online (such as web maps, dashboards, and StoryMaps in ArcGIS Online) and desktop environments (such as Esri ArcGIS Pro). Publicly sharable Confirmed Presence records can be easily utilized in public-facing maps, however layers requiring an iMap account to view (such as Unconfirmed Presences, Treatments, etc.) can also be used in more advanced applications.

When you should consider using the WMS:	When you should consider using an export:

➢ Overlaying iMap layers with your own data
➢ For always having the most current data
   • *No need to repeatedly export the data*
➢ Viewing data records when zoomed-out
   • *Rather than viewing the hexagons on the iMap interface*
➢ Only a limited number of fields are needed
	➢ If you need very detailed fields
	➢ If you are working with a very large amount of data in an advanced analysis
	➢ If you want a copy of the data to store permanently
	➢ When using ArcMap
	   • *Unless you are using ArcMap 10.6 or higher, and are only using public layers*

What platforms are supported?
  ➢ iMap WMS will work best in ArcGIS Pro or ArcGIS Online
  ➢ ArcMap is generally limited to confirmed (public) observation data, and running version 10.6+
  ➢ Open-source desktop software such as QGIS might work, with some limitations

Capabilities of the iMap3 Web Map Service Layers	ArcMap (< 10.6)	ArcMap (10.6 +)	ArcGIS Pro	ArcGIS Online
View Records	yes	yes	yes	yes
Identify Records	yes	yes	yes	yes
Query/Filter Records	no	limited*	yes	yes
Save Filter Results	no	limited*	yes	yes
View Attribute Fields	no	limited*	yes	yes
Symbolize Records on Map	no	limited*	yes	yes
Label Features	no	limited*	yes	yes
Create Story Maps	no	no	no	yes
Create Dashboards	no	no	no	yes
Create Summary Tables (e.g. species counts by county)	no	no**	yes	yes****
Perform Spatial Analyses (e.g. proximity analysis)	no	limited***	yes***	limited****

* limited to public layers
** no tool built-in to ArcMap to do so
*** may be slow when directly connected to live iMap web map service data
**** large summaries (e.g. statewide or lots of species) could utilize many Esri ArcGIS Online credits

Accessing the iMap3 Web Map Services

The iMap3 WMS can be found using this link:
https://imapinvasives.natureserve.org/arcgis/rest/services

This page displays a list of web map services that are openly available without authentication.
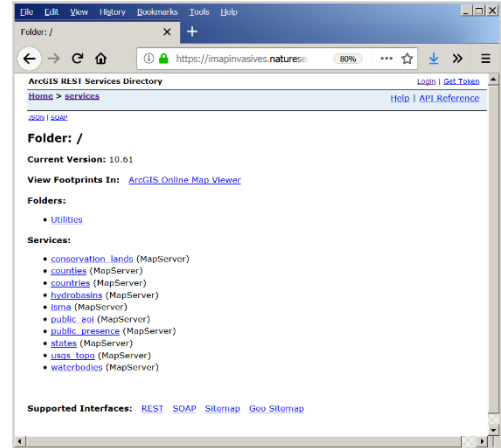
Feature vs. Map Services

For many of the iMap web map service layers, note that each **Map Service** is comprised of several layers (**Feature Services**). For example –

Public Presence Map Service *(top-level link)*:
https://imapinvasives.natureserve.org/arcgis/rest/services/public_presence/MapServer

Public Presence individual Feature Services *(individual layers within top-level link):*
- Points: https://imapinvasives.natureserve.org/arcgis/rest/services/public_presence/MapServer/0
- Lines: https://imapinvasives.natureserve.org/arcgis/rest/services/public_presence/MapServer/1
- Polygons: https://imapinvasives.natureserve.org/arcgis/rest/services/public_presence/MapServer/2
- Polygon Centroids: https://imapinvasives.natureserve.org/arcgis/rest/services/public_presence/MapServer/3

(More information on when to use the Feature vs. Map Services is provided in subsequent sections of this document.)

When a Map Service layer is added to a map, all layers which comprise it are automatically added. However, for Feature Services, each layer must be manually added to the map.

For example, when adding the Confirmed Presence Map Service layer, the layers representing Points, Lines, Polygons, and Polygon Centroids are automatically added to the map. However, if using the Feature Services for Present Species, each layer listed above (Points, Lines, Polygons, and Polygon Centroids) should be added individually to ensure complete representation of the species in the map.

(Note that Present Species is comprised of all four layers, however Not Detected, Treatment, and Searched Area layers are comprised only of the Polygon and Polygon Centroids layers.)

Authenticated Web Map Services

If a WMS layer you are interested in using is not in the list of public services (e.g.: *Not Detected*, *Unconfirmed Present Species*), it may require authentication to view.

To authenticate with the iMap WMS, select the **Login** button at the top right of the screen. Enter your iMap email address as the username and your iMap password. You will then be redirected back to the full list of services, which will now contain all layers for which you have access to view.
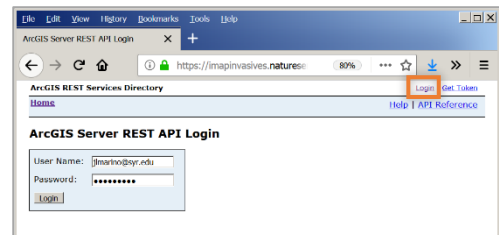
Connecting to iMap WMS Layers in ArcGIS Online

Live data from the iMap WMS can be incorporated into ArcGIS Online web maps. These maps can then be expanded to more interactive data visualizations such as Esri StoryMaps, Web Applications, and Dashboards.

Selecting a WMS for use in ArcGIS Online

As indicated in the section above, the iMap WMS layers can be accessed as either Map or Feature Services.

If you are displaying a large amount of data (over ~1,000 records), we generally recommend using the **Map Services** (top-level links) rather than **Feature Services**, because map tile images will often load faster than geographic data.

	Map Service Layers	Feature Service Layers
Performance	Should work well for large or small amounts of data *(When layers are filtered properly)*	Fast for small amounts of data, slower when many (~1,000+) records are returned
Use in Dashboard *(for statistics/graphs/etc.)*	✗	☑
Customize Symbology	☑ *may be slightly limited*	☑
Flexibility in layer order	✗ *will appear as a tile layer (near basemaps)*	☑
Customize record pop-up	☑	☑

Adding iMap WMS Layer(s) to ArcGIS Online

Navigate to the WMS URL of your layer of choice as outlined above. Log in to your ArcGIS Online account and open an existing web map or create a new one. Go to the **Add +** button and choose **Add Layer from Web**. Paste in the URL to the service you want to add. If adding a service which requires authentication, you will be asked to enter your iMap username and password. Once that is correctly entered, the map service will load into your AGOL map.

To filter the data, click on the Funnel icon under each of the sublayers in the Contents panel. See the section titled **Finding ID values to use when filtering the iMap3 WMS** later in this document for more information on finding iMap ID values to use in the filter.

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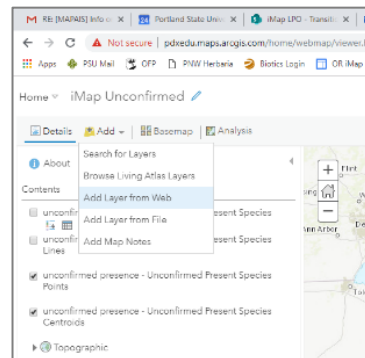
## Considerations for using the iMap WMS in ArcGIS Online

General Tips

1. **Please filter each WMS layer in use such that as few records as necessary are loaded from the WMS and displayed in the map.**

   ➢ When filtering, use **ID values** (rather than text) whenever possible.

   ➢ For example, when filtering by NY Asian Clam records, use:
   jurisdiction_species_id = 1290
   rather than:
   common_name = 'Asian Clam'

   ➢ For more details on finding ID values to use in the iMap WMS, see the section later in this document titled **Finding ID values to use when filtering the iMap3 WMS**.

   ➢ Following this tip will improve the speed and performance for your web map and reduce the demand on the iMap WMS server.

2. If the iMap3 WMS is not loading in your web map, clear your browser's cache and re-load. *Note:* this will not be an issue for most viewers of your map, only for very frequent AGOL users.

3. *Note:* Many general common reference layers are publicly available (e.g. state/county/administrative boundaries, hydrography, etc.) in ArcGIS Online, generally hosted by government agencies and/or Esri's Living Atlas. Rather than uploading your own layers to represent these data, consider searching for and leveraging these existing public layers to save AGOL credits for you/your organization.

   To find these layers: Open a web map, select the **Add** icon, and choose **Search For Layers**. Then in the subsequent dropdown, select **Living Atlas** or **ArcGIS Online**, and enter a search. (Additionally, for NY-specific layers, visit gis.ny.gov/webservices/)
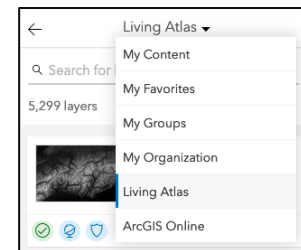
Style guidelines for iMap layer symbology

➢ Symbology – match iMapInvasives online where possible
   • *(Note that by default, layers will load with correct symbology automatically)*
➢ Legend – clearly describe the data displayed. Example →
   • *"Confirmed Presences from iMap"*
   • *"Confirmed iMapInvasives Presences"*
   • *"HWA Presences from iMapInvasives"*
➢ Please reference or link to iMapInvasives somewhere
➢ Consider screen sizes & accessibility
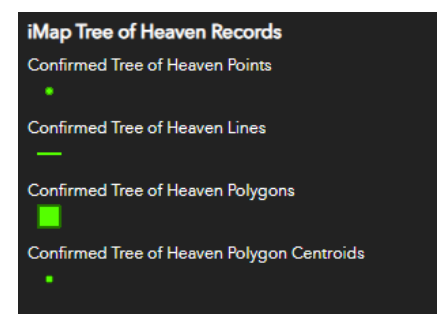
Best practices for publicly displayed web maps

➢ Consider a disclaimer for maps that will be prominent in public view:
   • e.g. *"This map shows confirmed observations (green points) submitted to the NYS Invasive Species Database. Absence of data does not necessarily mean absence of the species at that site, but that it has not been reported there. For more information, please visit iMapInvasives."*

➢ For publicly displayed web maps: using the WMS works well for displaying public layers (confirmed presences), however is generally not recommended for displaying non-public layers

(not-detected, treatment). An alternative option to consider for sharing a view of iMapInvasives data via URL, particularly non-public layers:

- The iMap URL displayed in the web browser is dynamic and updates to reflect the current map state (basemap, layer visibility, filter parameters). For example, if you log in to iMapInvasives, filter on a species, zoom in to your area, and turn on the not-detected layer, you can then share the page URL with partners. Partners can then use this link to see this same map view of iMapInvasives.

  Note that if any non-public layers are visible in the map when sharing the iMap URL, any recipients should first sign-in to iMap before loading it to ensure proper layer visibility.

- For example, [this link will take users to a map filtered for Ailanthus with Confirmed Presence hexagons and Not Detected visible](#).

Connecting to iMap WMS Layers in ArcGIS Desktop Software

ArcGIS Pro (preferred)

To utilize the iMap web map services in ArcGIS Pro, find the URL to the Map Service of interest in the section above titled Accessing the iMap3 Web Map Services. *(Note that ArcGIS Pro handles both the Map and Feature Services similarly, so both should work well.)*

(Before adding any of the iMap WMS layers to the map in ArcGIS Pro, it is advisable to best to zoom into near county-level, as this will help the initial load of the iMap WMS layers.)

Once you have the URL(s) of the layer(s) of interest, select the **Add Data** menu, and click **Data From Path**. Paste the URL and add the layer to the map. If the layer requires authentication, you will be prompted to enter your iMap username (which is the email address associated with your iMap account) and iMap password.

Applying a Definition Query for the iMap WMS Layer(s)

Please apply a definition query for each iMap WMS layer used in ArcGIS Pro to reduce the total volume of data requested from the iMap WMS server and increase the responsiveness of the layers in your map. In the definition query, **please utilize ID values rather than text whenever possible**.

For example, standard useful filters could include:
- **jurisdiction_id = 32**
  (NY records only)
- **jurisdiction_species_id = …**
  *(using a jurisdiction species ID filter will work much better than filtering by a species scientific or common name. See the section later in this document titled **Finding ID values to use when filtering the iMap3 WMS** for more details.)*

Applying a Scale Definition to the iMap WMS Layer(s)

It is best to add a scale definition to restrict the amount of data being requested from the server at once. Consider having the scale definition set to **not** display data from the iMap WMS when zoomed out to a state-wide or smaller scale (e.g. national).

Known challenges with using iMap3 WMS in ArcGIS Pro

If the iMap WMS layers are loading very slowly:
- ➢ **First: Turn off the layers** in ArcGIS Pro Table of Contents.
  *Then, check **each** of the following:*
- ➢ Ensure you have filtered each layer as much as possible
- ➢ Ensure you are filtering by ID value rather than text whenever possible
- ➢ iMap may be experiencing heavy traffic – try again a little later

ArcMap

Due to limitations in ArcMap, only public layers (Confirmed Presence and Searched Area) work well in ArcMap. Any layers requiring authentication do not allow full access to the attribute table, definition queries, etc.

Additionally, when using the iMap WMS layers in ArcMap, please apply a definition query and scale restriction to the layers similar to what is outlined in the ArcGIS Pro section immediately above.

ArcGIS Online Method

Due to limitations of ArcMap, at this time, the best way to add iMap data to ArcMap is by adding the individual Public Presence **Feature Service** layers (following the steps outlined above in section titled **Connecting to iMap 3 data in ArcGIS Online**) to a map that is saved in your ArcGIS Online content. Then, go to ArcMap, go to the **File** menu, and click **ArcGIS Online**. Within the ArcGIS screen, select the map in ArcGIS Online containing the iMap layers.

.LYR File Method

In the iMap WMS layer list, select the layer you want to view in ArcMap. At the top of the page there will be links for viewing the layer in a variety of platforms. Click the link for ArcMap. This will download a .lyr file to your computer.
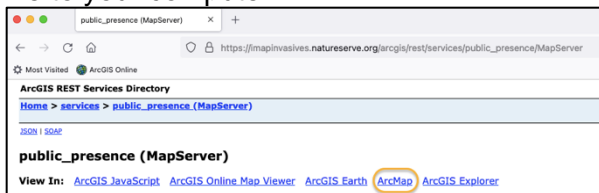
Open an ArcMap project and click the Add Data button. Navigate to the .lyr file and add it to your project. You can now view and ID all the features in that layer.

Additional Resources for using the iMap WMS

Fields Available

The following fields are available on the WMS Layers (more fields are available in the exports, and all fields viewable are on the online interface, depending on permission levels).

PRESENCE:	NOT DETECTED:
• iMap Presence ID • iMap Record URL • Observer Name • Habitat Type (aquatic, semiaquatic, terrestrial, marine) • Organization Name • Jurisdiction (e.g. NY, PA) • Species – State Scientific Name • Species – Network Scientific Name • Species – State Common Name • Species – Network Common Name • Genus • Kingdom • Project(s) • County • PRISM • Source Record Unique ID [if from external dataset] • Source Record URL [if from external dataset]	• Observer Name • Observation Date • Habitat Type (aquatic, semiaquatic, terrestrial, marine) • Presumed Eliminated (1/0 or yes/no) • Organization Name • Jurisdiction • Species – State Scientific Name • Species – Network Scientific Name • Species – State Common Name • Species – Network Common Name • Genus • Kingdom • Project(s) • County • PRISM • Source Record Unique ID [if from external dataset]
SEARCHED AREA: • Created By • Organization Name • Search Date	**TREATMENT:** • Organization Name • Treatment Type (physical, chemical, biological) • Lead Contact • Target Species • Begin Date • End Date • County • PRISM • Project(s) • Source Record Unique ID [if from external dataset]

Table created by Heidi Krahling, January 2020.
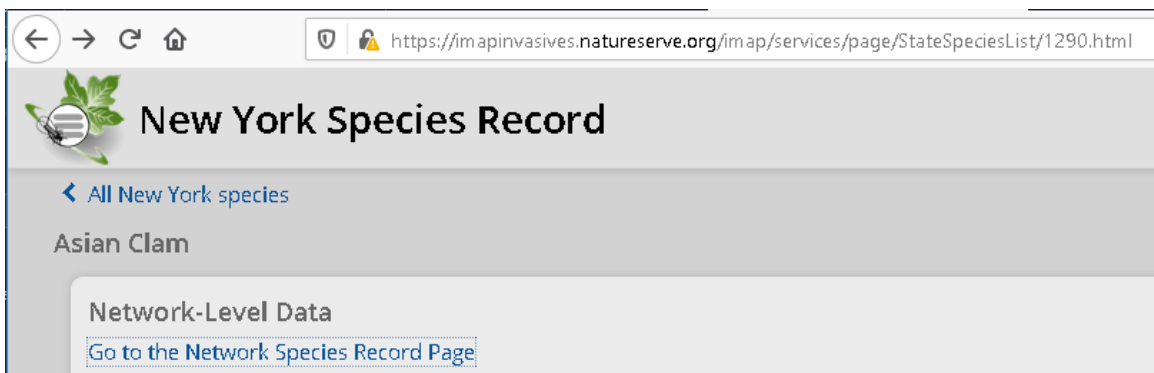
Finding ID values to use when filtering the iMap3 WMS

Habitat type and Kingdom

Habitat Type	habitat_type_id
Aquatic	1
Terrestrial	2
Semiaquatic	3
Marine	4

Kingdom	kingdom_id
Plantae	1
Animalia	2
Protoctista	3
Bacteria	4
Fungi	5

Species

1. View the iMapInvasives Jurisdiction Species Lists (accessible from the main menu)
   https://imapinvasives.natureserve.org/imap/services/page/JurisdictionSpeciesList.html
2. Select your Jurisdiction, search for the species you are interested in, and click the species name.
3. *To display data for that species in your jurisdiction only:*
   Use the jurisdiction species ID (digits at the end of the URL; see yellow box in screenshot below).
4. *To display data for that species in all jurisdictions*:
   Click "See More" in Network-Level data, then click "Go to the Network-level species page" (see yellow arrow in screenshot below). The network species id is the sequence of digits at the end of the new URL.

Example: Asian clam, *Corbicula fluminea*

- ➢ NY Species Record: https://imapinvasives.natureserve.org/imap/services/page/StateSpeciesList/**1290**.html
    - To display NY jurisdiction data only, filter on **jurisdiction_species_id = 1290**

- ➢ Network Species Record:
  https://imapinvasives.natureserve.org/imap/services/page/NationalSpeciesList/**339**.html
    - To display all Asian clam data regardless of jurisdiction, filter on **network_species_id = 339**

Organization or project

1. Login to iMap at https://imapinvasives.natureserve.org/imap/login.jsp and select Organizations or Projects from the main menu
2. Search for your Organization or Project and click the link
3. The digits at the end of the URL is the id for your Organization or Project
    - Filter on organization_id or project_id as appropriate, using the ID from the URL

Jurisdiction (State/Province)

1. Zoom into your map (ArcGIS online or desktop) to the Jurisdiction you are interested in and load in the WMS. Click on one of the points within your desired geography to view the attributes, and grab the county_id or isma_id to use in filters or definition queries.

Online reference materials

NYNHP webinars on using the iMap3 WMS – *Email imapinvasives@dec.ny.gov for recordings*
- ➢ ArcGIS Online Session –StoryMaps, Dashboards, Web Maps, and more.
- ➢ Desktop GIS Session – Conducting repeatable GIS analyses on live iMapInvasives data.

Esri Academy
- ➢ https://www.esri.com/training/

Learn ArcGIS
- ➢ https://learn-arcgis-learngis.hub.arcgis.com/

Esri Community Forum (formerly known as "GeoNet**"**)
- ➢ https://www.community.esri.com/

Getting Started with Esri StoryMaps
- ➢ https://storymaps.arcgis.com/stories/cea22a609a1d4cccb8d54c650b595bc4

Contact info:
- ➢ Email: imapinvasives@dec.ny.gov
- ➢ Website: www.nyimapinvasives.org