The Nature Conservancy

Georgia Tech | Center for Geographic Information Systems

esri

Mobile and desktop web application built for collecting coastal usage data across a variety of categories.

Coastal Use Reporting Suite
Topic List

Coastal Use Reporting Suite
Overview of the Application

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The Crowdsource Reporter Application is an ESRI Web Application template that allows for either authorized or anonymous submission of GIS data in the form of points, lines, or polygon geometry. Data collected through the application can be utilized either within the ArcGIS Online Portal for quick geoprocessing or downloaded and viewed in ArcMap for further analysis.
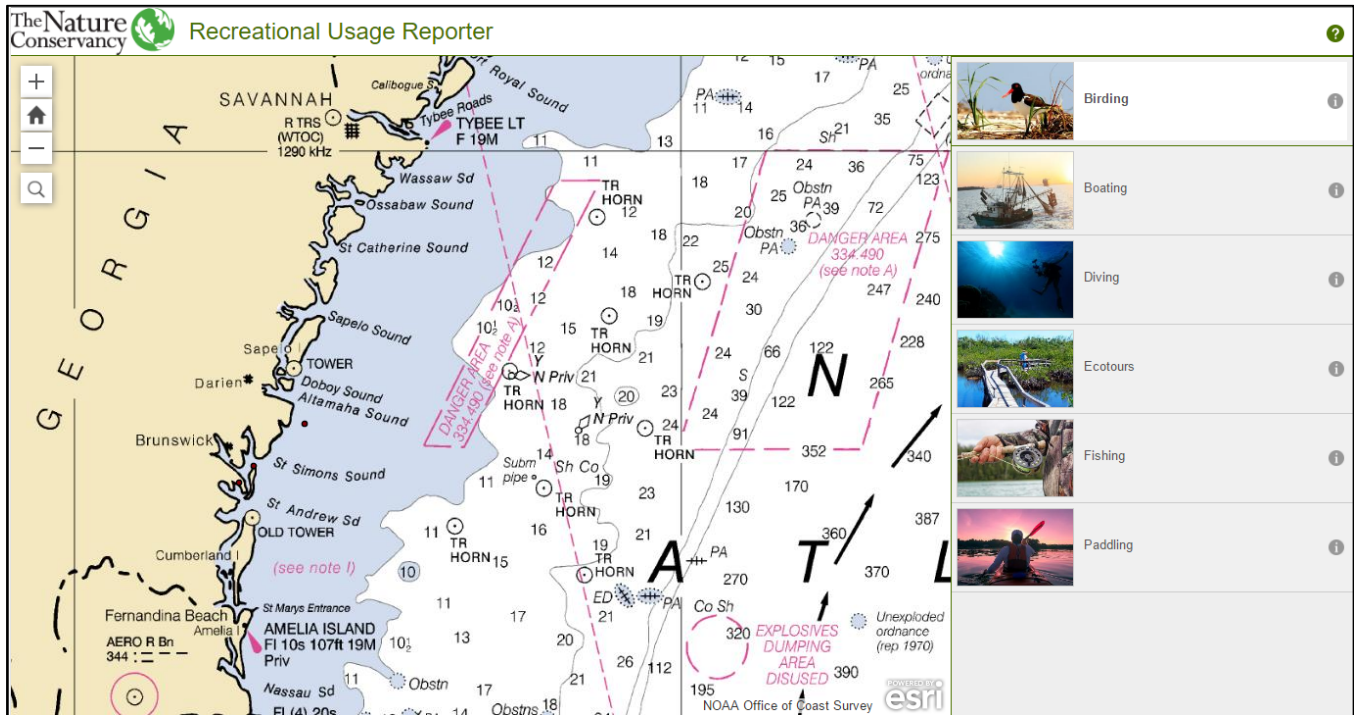
Main level of the application, containing existing reports and category layers in the right hand pane.

The Web Application, Web Maps, and Hosted Feature Layers are all by default located in a User's content in an ArcGIS Online Organization. The functionality of the Reporter Application is achieved through the creation of a Group and by sharing all content with this Group.

Sharing and Editing permissions can be configured to allow for either a single user, multiple users in an organization, or public access to the data layers used in the application. The layers used in the application can be added to other Maps and Applications and downloaded to perform local manipulation of the reports.
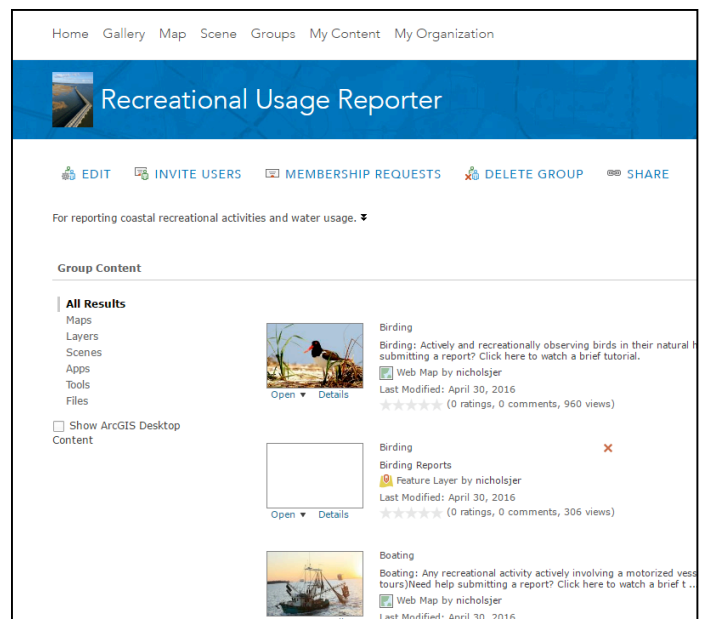
The group created to house the App, Maps, and Layers used for the Reporter.

Many of the steps required to set up and configure a functioning Crowdsource Reporter Web Application are interchangeable. The following is a brief overview of what is necessary to have created, configured, shared, and published to obtain the functionality seen in the existing CURS application.

1) Create and configure Geodatabases for each category of submission (ArcMap)
- Fields that have submission type other than raw text input, numerical entry, or a date require Domains to limit possible responses.
- A text field in the application with drop down menus requires a text domain type with Coded Values.
  - These coded values become the selectable items in the application via drop down menu.
- A numerical field in the application will have '+' and '-' signs, imposing a valid range for entries requires a numerical (Short or Long Integer, Double, or Float) domain with a Range domain type.
  - Maximum and minimum allowable submissions are designated via this range.
- Date fields do not require a domain for functionality, but imposing a date rang limit does.
  - Hidden date fields proved tricky, see 'Quirks' for further details

2) Create and Configure Feature Classes within a Geodatabase (ArcMap)
- Designate the feature geometry, coordinate system, and fields that will be used in the Hosted Feature Layer contained in Web Maps
- Allowing or rejecting submissions with null values is decided with layer properties

3) Publish these Feature Classes to the ArcGIS Online Organization (ArcMAP)
- Capabilities, descriptions, and sharing permissions are initially configured during publishing
- Designating hidden fields is accomplished through this process and layer configuration

4) Create a Group that will 'contain' all of the content (ArcGIS Online)
- The application and all of the Web Maps and Hosted Feature Layers need to be shared with this group.
- The content created for the application is found under the 'My Content' tab in ArcGIS Online and stored there.
- Sharing with this group simply makes a link between all of the different files necessary for this particular ESRI application.
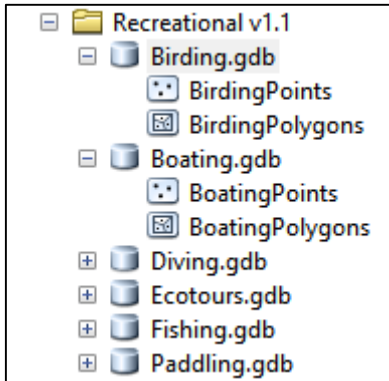
5) Create Web Maps for each category of submission and add the Layers (ArcGIS Online)
- One map can contain multiple layers
- Each map shows as a major heading in the application, and each layer shows as a subheading

6) Create a single Web Application with a Crowdsource Reporter Template (ArcGIS Online)
- Aesthetic configuration and verification of proper setup follows creation of the application

Key to the functionality of the reported is the creation of Geodatabases (GDB) and the configurations of Domains within. A reporting application can be created without this backend architecture, but it will not drop down, range, or default field value capabilities. Coded values or Ranges used in the domain allow for the creation of a drop down list of possible answers or a hard limited range for numerical values that will cause the report submission to fail if not followed. In addition, the ability to reject null values from a submission essentially makes the field required for submission.
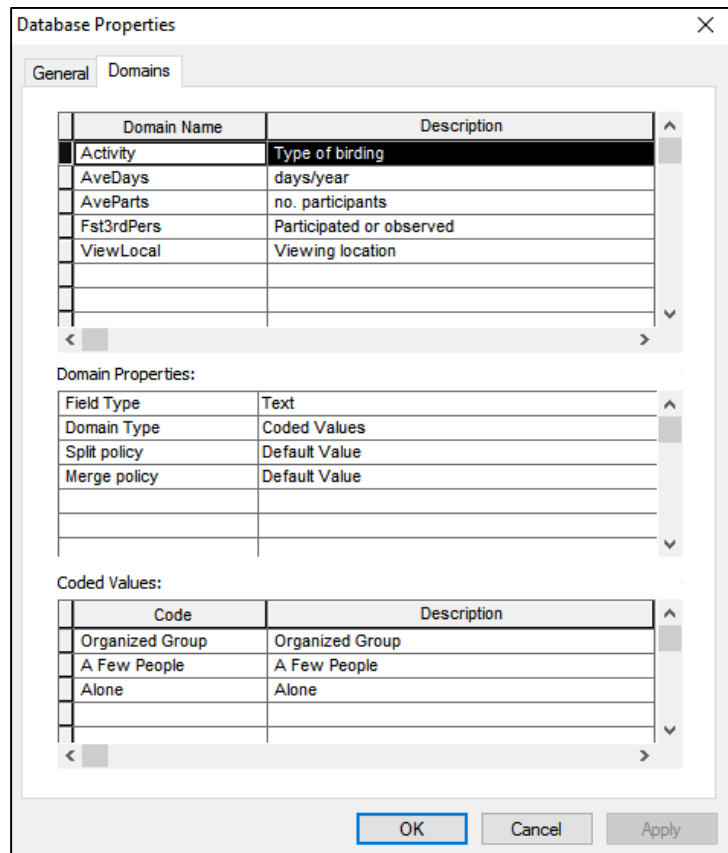

For this particular application, a discrete geodatabase for each category of submission is required. Although many of the same questions appear for different submission categories, the values available for selection in the drop down menus changes. This requires unique domains to be configured for each category, while each layer in the Geodatabase will exhibit the same properties. Each category in this application contains two layers for possible submission, a point and polygon layer. The name of these layers is fully descriptive, while the alias is simplified to prevent redundancy in the application.

Once a Geodatabase is created, the Domains tab is accessed by right-clicking the GDB in Catalog pane and selecting the properties option in the dropdown.

From here, Domains are created and given a brief description (only visible in ArcMap). For drop down menus, the Field Type will be 'Text' and the Domain Type is 'Coded Values.' A Code is created, and the description thereof is what will appear in the Application drop down menu and fill the field in the created feature.

For numerical values, 'Short Integer' is selected as the Field Type, 'Range' for the Domain Type, and Minimum and Maximum values input as needed.

Date fields do not require a domain, as simply declaring the field as 'Date' when creating the layer will default to a 'Month Day, Year' format in the application that fills with the current date.

Layers contained within a GDB inherit Domains and Coded Values, as well as any other default setting present in a Layer Template associated with the GDB. A separate layer is needed for each topic and feature type required for the reporter. For the CURS application, there are six categories each with two feature types available for submission.

Create a new layer by right clicking on the GDB and selecting New -> Feature Class.

Give it a descritptive name, and an alias that describes the geometry type. The alias will appear in the application after the Web Map name in the following format: "WebMap Title – Layer Alias."

Next, select the coordinate system that will be applied to any submissions on this layer. The projected coordinate system used in existing layers is "NAD 1983 UTM Zone 17."

Fields can be added either while the layer is being created or after the fact. If a layer with similar fields already exists, these fields can be applied to the new feature class by clicking import at the appropriate prompt and selecting the existing feature class with desirable fields.

This proved most useful when creating additional layers within a category, as the only difference between them is feature geometry. For different categories, it was found to be faster to add fields from scratch rather than try and edit existing fields.

With a field created, designate the data type, provide an alias that will appear as the question in the application, and select the appropriate domain for drop down answers or numerical range. Provide a default value if desired (a hidden layer deafult shown right).

Although not a front-end configurable aspect of the Crowdsource reporter application, it is possible to designate certain fields as 'Read-Only' and have them hidden from user view in the reporting pane. If a default value is defined for these fields, they will automatically be completed when a report is submitted. In addition, the ability to only accept a report upon completion of certain fields is possible by changing the behavior of fields submitted with no value entered (blank or Null).
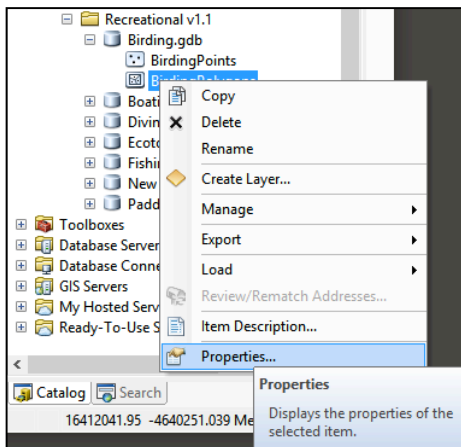
To make a field required for successful submission, it must not accept null values. This setting is configured through the layer properties menu accessible from the Catalog pane. Left click the layer name and select Properties.

Under the Fields Tab in the properties pane, select a field name and change the setting to 'No' under Allow NULL Values.

To set a default value, enter the number or text in the Default Value text box.
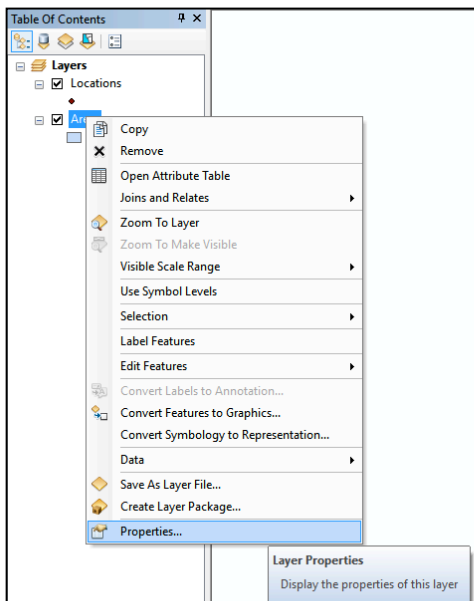
To configure a field as hidden in the report submission pane, access the Layer properties menu from the Table of Contents in ArcMap by left clicking the layer name and selecting Properties. Note that this is a different menu than previously accessed.

Under the Fields Tab, select a field name or alias and change the Read-Only property to 'Yes' before clicking Apply. Repeat this action for all fields that will be hidden from the user's view in the application.

When finished, publish the category layers by clicking File -> Share As -> Service, Publish a Service. All of the layers within the category should be in the map frame and visible in the Table of Contents before publishing.

The second step to ensuring these fields remain visible but do not disrupt report submission is to change the Read-Only property to 'No' and republish the layers, this time by selecting File -> Share As -> Service, Overwrite an existing service and making sure that you are overwriting the same category that was previously published as a new service.
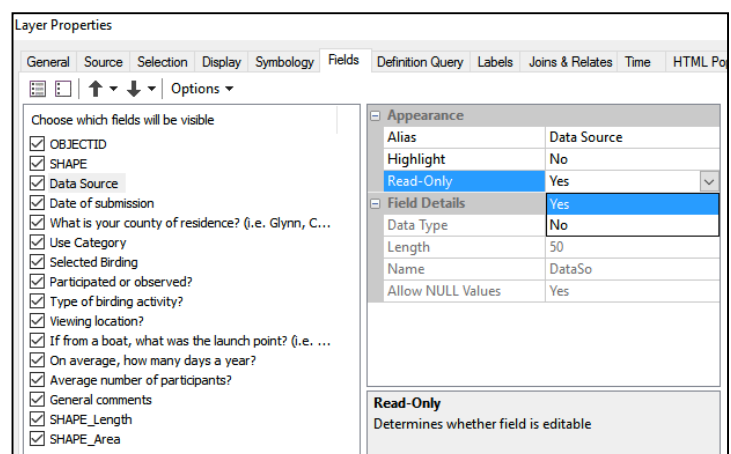
Once the layers have been created and configured, they must be published to an ArcGIS Online account as Services to act as Hosted Feature Layers that can be added to Web Maps.
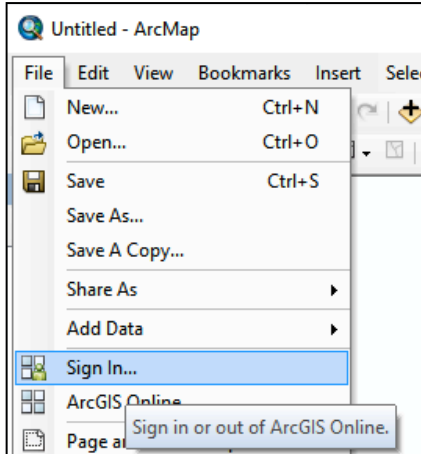
Within ArcMap, select File -> Sign In and provide the login credentials of an account with publishing or administrative permissions tied to the ArcGIS Online organization.

To publish a layer, select File -> Share As -> Service.
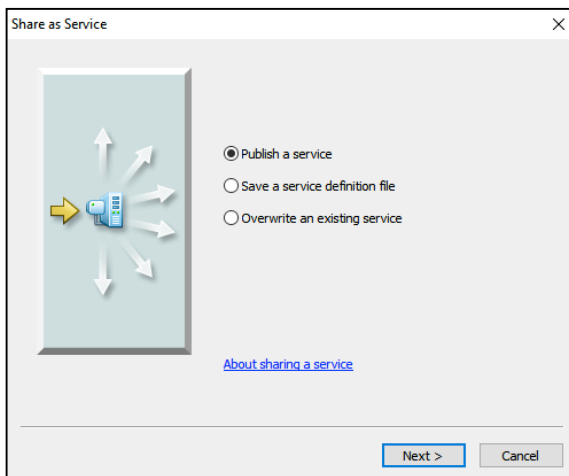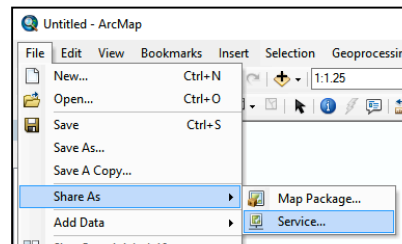
Next, select publish a service. Keep in mind when publishing, fields that are to be hidden from the user should be set as 'Read Only' to 'Yes' as mentioned in the previous section. This is then changed to 'No' and the service re-uploaded with 'Overwrite an Existing Service.'

This is discussed further in 'Quirks.'

The publishing location should default to the organization tied to the account. The service name should be descriptive, as it has no bearing on what will appear in the application.
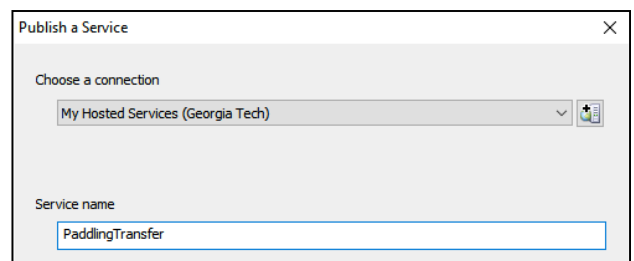

Setting certain capabilities and the sharing permissions of the Hosted Feature Layer can be accomplished directly through ArcGIS Online, however since these options are also available during publishing it is recommended to publish with these settings configured.

Note that the Item Description fields 'Tags' and 'Summary' must be filled out before the layer can be published.
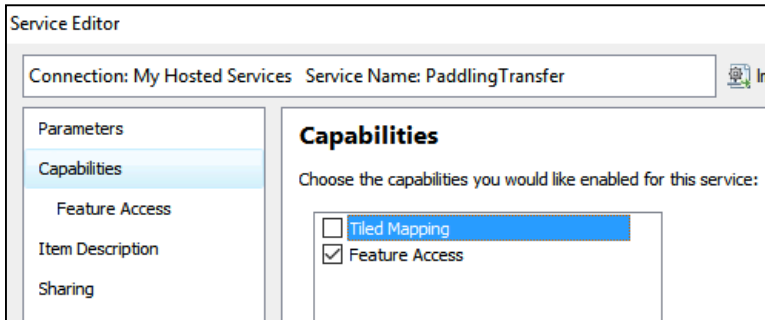
The default behavior of a published feature layer is 'Tiled Mapping' – change this to 'Feature Access' by using the tick boxes. This option must be selected during publishing; otherwise ArcGIS Credits will be used to create a Tile Cache unnecessarily.

The specific functions available to the layer can be changed through ArcGIS Online, but simply selecting 'Create' through this menu takes care of most of the configuration necessary.
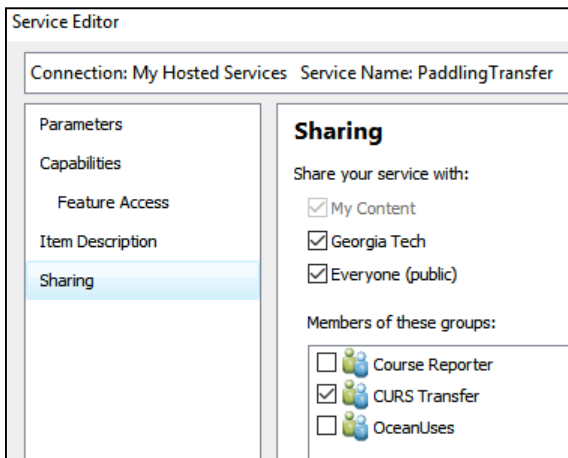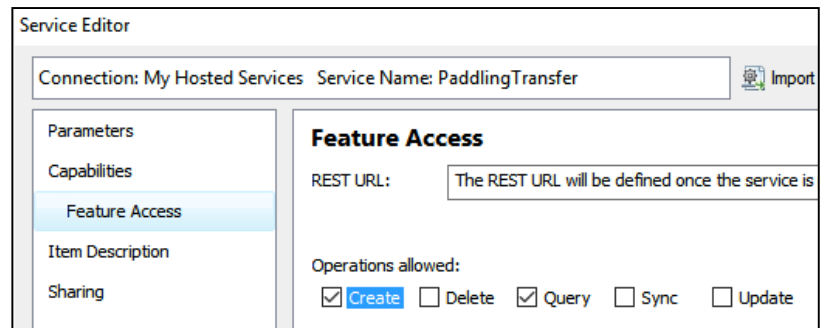

For the Reporter application to function correctly, all content used (the application, all maps, and all layers) must be publically shared ('Everyone') and shared with the group that was created to house all content.

These permissions can also be edited through ArcGIS online.

If you see the error 'Group empty or not properly configured' when opening the application and are greeted with a blank main map pane, it is most likely a sharing permission error.

Finally, select 'Publish' and wait for ArcMap to finish running the process. Warnings during publishing will occur but do not inhibit successful publishing of the layer.

Coastal Use Reporting Suite
Group Configuration
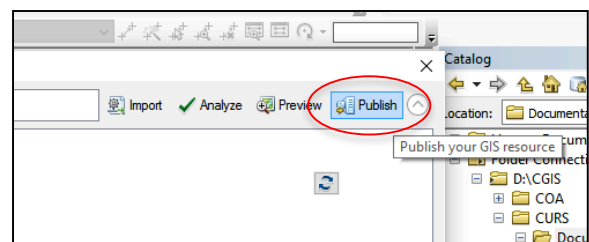
Central to the mechanisms required for a functioning Crowdsource Reporter application is the existence of a Group that contains all of the content used in the application. All items are shared with this group, and the Group itself is shared publically.
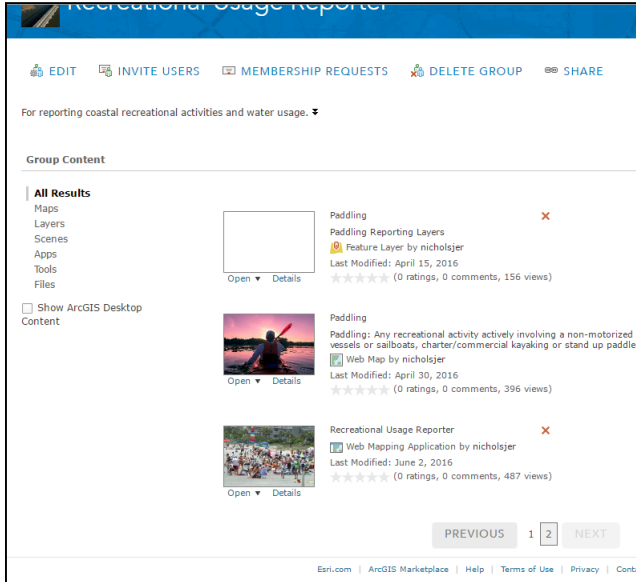
The group shown to the left is fully configured, with the three main types of content displayed (Hosted Layer, Web Map, and the Crowdsource Web Application). The Service Definition file that is created when a layer is published from ArcMap to ArcGIS Online has also been shared with this group (although it has not been confirmed this is necessary).

To create a new group that will be the target of the Crowdsource Reporter content, log in to the ArcGIS Online portal for your organization, click the 'Group' tab at the top bar and select 'Create a Group' in the upper left hand corner.

Configure the new Group by giving it a name, summary, description and tags. The group image can be selected from a thumbnail or icon relevant to the group.
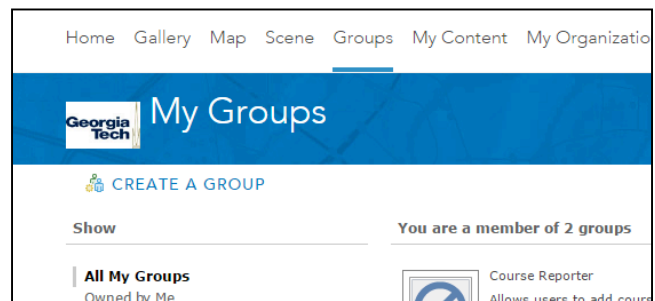
Change the Group's sharing permission to best suit the needs of contributing members and make sure it is shared with the Public before saving.

Coastal Use Reporting Suite
Application Configuration

The Crowdsource Reporter is part of a suite of template Web Applications created by ESRI to make collecting data from the public or within an organization easy to set up and use.
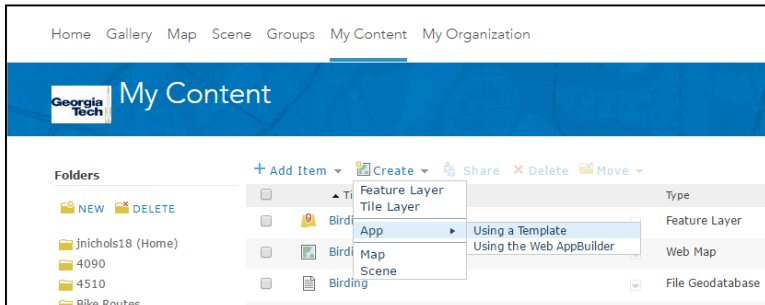
Make a new application by navigating to the My Content tab in ArcGIS Online, and selecting Create -> App -> Using a Template. There are many options for preconfigured web applications available; the Crowdsource Reporter can be found under the 'Collect/Edit Data' category.

Find the correct template, and select 'Create Web App' before filling in information for the title, tags, and summary. You will then be directed to the configuration page for the newly created app wherein you can change the aesthetics and front end functionality of the application.
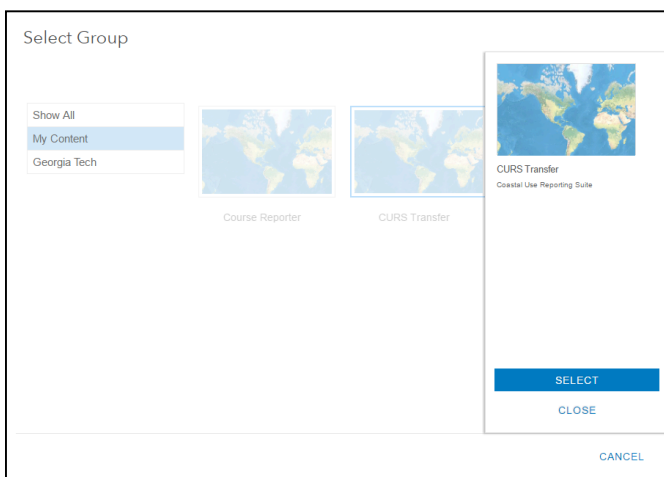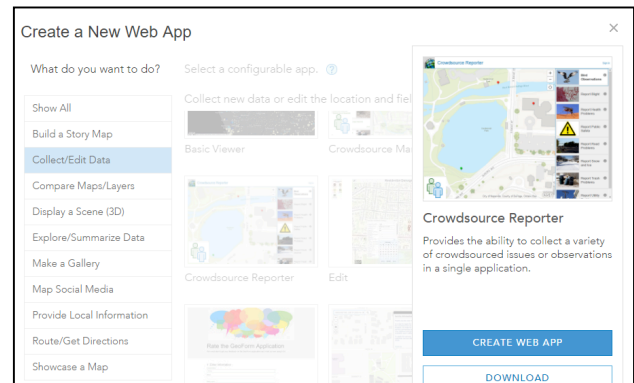
The first option for configuration is selecting the Group that the application will be associated with. Click this button, and then choose the appropriate group either from the 'My Content' filter or the organization under which the Group exists if not the creator of the Group.

Further configuration can be completed now or at a later time after the rest of the needed content has been uploaded or created. The options used for the existing Coastal Use Reporting Suite will be covered in the Aesthetics section.

Coastal Use Reporting Suite
Web Maps

Web Maps are created to contain each category of submission topic and display the data collected therein. Each map will appear as a major heading in the reporter application, and can host multiple layers (in this case a single category with two layers – point and polygon submissions).
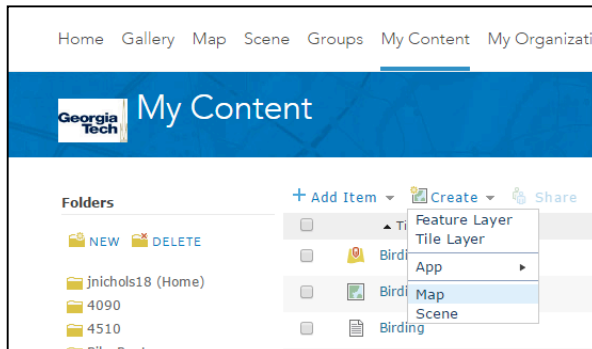

Under the My Content tab in ArcGIS Online, select Create -> Map and enter the Title, Tags, and Summary information for the new web map.

Afterwards, you will be directed to the new blank web map. From here, you can configure the basemap and content that will be shown (layers) when a user views this map. The extent of the map will be set when the map is saved, or can be directly edited from the Settings tab on the Item Details page.

Add a Hosted Feature layer that was previously published via ArcMap by clicking Add -> Search for Layers. The layer can be found either in 'My Content' if this is the authoring account, otherwise it can be found in 'My Organization.'

The single layer title should contain both the point and polygon classes that were created in ArcMap, verify this by clicking 'Add' and then 'Done Adding Layers' before checking in the Content pane on the left and side.
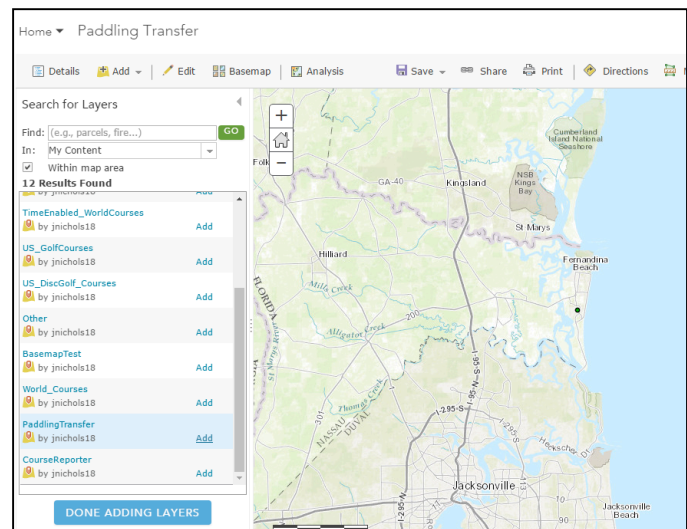
Save the map, and then either click 'Share' while still in the map viewer or select the same option from the Item Details page. Ensure that the Map is shared with 'Everyone' as well as the Group that was created for the reporter application.
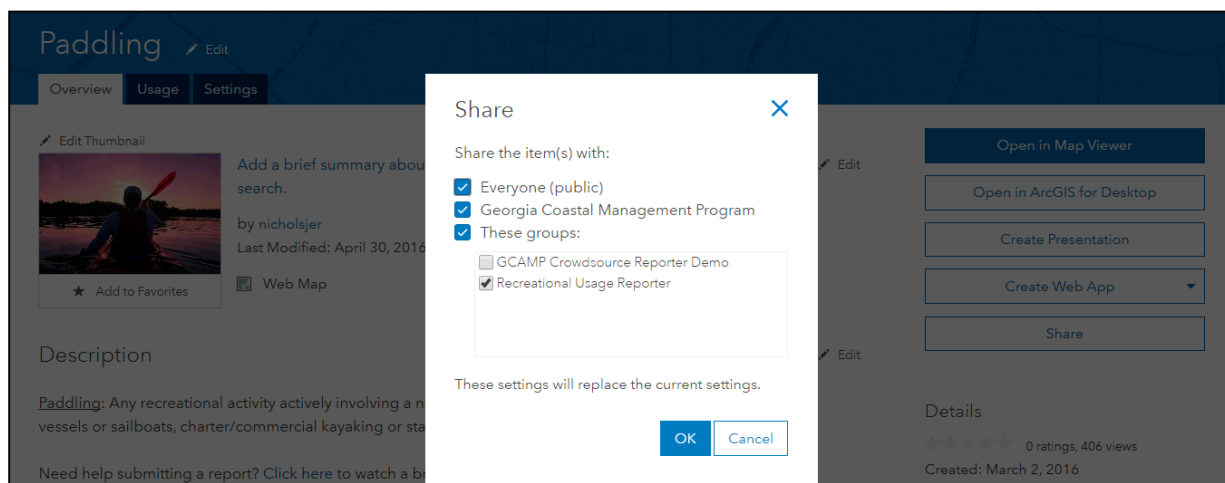
The majority of the visual settings of the Reporting Application are changed via the 'App Settings' tab accessed from the 'Configure App' page. The color scheme, logos, splash page image and text, description settings, and help page content are all controlled through this page.
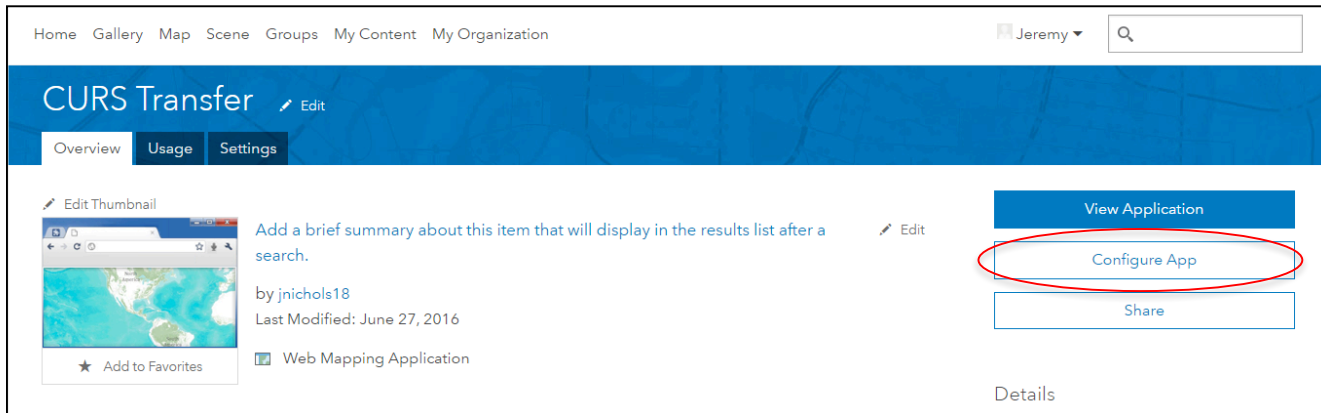
From the 'My Content' tab in ArcGIS Online, click the title of the Web App to view the Item Details page. From here, the Configure App button will direct you to the page that was first presented when creating the application.

The 'App Settings' tab allows for the selection of an associated group, the retitling of the application, including subtitle text on the splash page, as well as the configuration of images used in the app.

The existing application is titled

'Recreational Usage Reporter'

with a subtitle (limited to 36 characters) reading

'The Nature Conservancy and Georgia DNR reporting application.'

The splash screen image is hosted at **geospatial.gatech.edu/CURS/PierSmall.png** and included with this document for re-uploading and hosting. The image can be any size, but is recommended to be 640 x 960 pixels to show properly on small mobile devices.

The logo used in the upper left hand corner of the application on desktop, and the top bar on mobile is hosted at **www.nature.org/cs/groups/webasset/documents/webasset/logo-nature-notagline.png**

The application color can be chosen from the palette provided (currently **#4C7300**) or entered as a hexadecimal html color code.

Under the 'Map Settings' tab, the only change made to default values was selecting **'Description'** as the element shown for each Web Map, found under the 'Map Information' subheading. This option shows a tagline of Description and the text entered in the Web Map Item Details page when the information icon is clicked for a category title in the reporting application.

To allow or disallow users to sign in via social media, change the tick boxes under 'Access Settings' – currently only anonymous access is allowed for the application.

The help page is configured through 'Help Widget Settings' with the content as follows:

'The Recreational Reporter application presents maps that can be used to report an activity or observation. Users can submit new reports and review existing reports.

To submit a report, click on the layer group heading that best describes the activity you wish to provide information about.

Next, either **record a single point or draw a shape to record an area by selecting the layer labelled either 'Locations' or 'Areas' respectively** - this will bring up all of the existing reports under that layer. At the bottom of the screen, **click 'Submit a report.'**

Finally, **fill out the information in the form** that you wish to provide and then either click on the mini map to add a point or to start drawing a shape. Double click to end the shape and the tool will automatically connect the lines to create a closed polygon. **Clicking 'Report It' will save your report**.

Watch this Tutorial Video if you need further help getting started."

The link directs users to a story map tutorial hosted at **geospatial.gatech.edu/curs/tutorial/**

When finished configuring this side of the application aesthetics, click Save at the bottom of the page.

The images that appear for each category title in the application are controlled by setting thumbnails for the Web Maps themselves and are also included with this document. From the Web Map Item Details page, select Edit Thumbnail and choose a file from your computer to upload.

When overwriting existing hosted feature layer services, any data that currently exists in the layer (previous reports) will be lost. To ensure that reports are cataloged and kept for review, it is advisable to download the layer from ArcGIS Online and merge it was a master file maintained locally to prevent the loss of any reports.

From the desired layer's Item Details page, select Export Data -> Export to Shapefile (or other type file if needed). The layer will be then be packaged and exported as the selected file type and hosted in the selected folder under in the user's My Content tab. From here, the layer can be downloaded and opened locally for further geoprocessing and data management tasks.
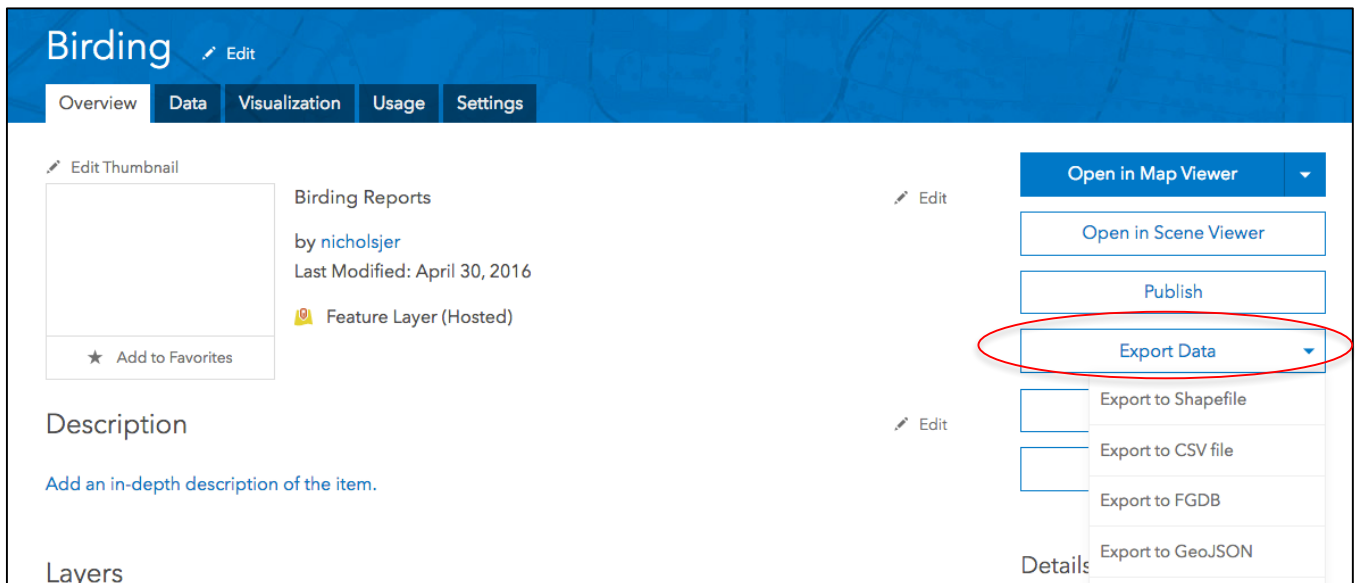
ESRI continually updates not only their selection of premade web application and map templates and the graphic user interface that controls them, but also tweaks back end behavior quite frequently. Changelogs are often included with updates, and the most current information regarding an applications behavior can be found either on the ESRI website or in threads on the GitHub page for the application.

ArcGIS online has received a rather extensive makeover since this application was first built. Navigating through the setting necessary to configure the crowdsource reporter application is accomplished through a different workflow, but all of the same options and configuration settings still exist in addition to some new options and features.

The most important aspect of the Crowdsource Reporter is the sharing hierarchy that must be built to properly allow for editing of the hosted feature layers by anonymous users. If sharing settings have been confirmed correct and the application is still not responding as required, check the editing permissions for the feature layers. Although these should be properly configured when the layer was uploaded, they can be rectified if incorrect by navigating to the layer's Item Details page, and selecting the 'Settings' tab. Scroll down to the subheading 'Feature Layer (Hosted) Settings' and ensure that Editing is Enabled.
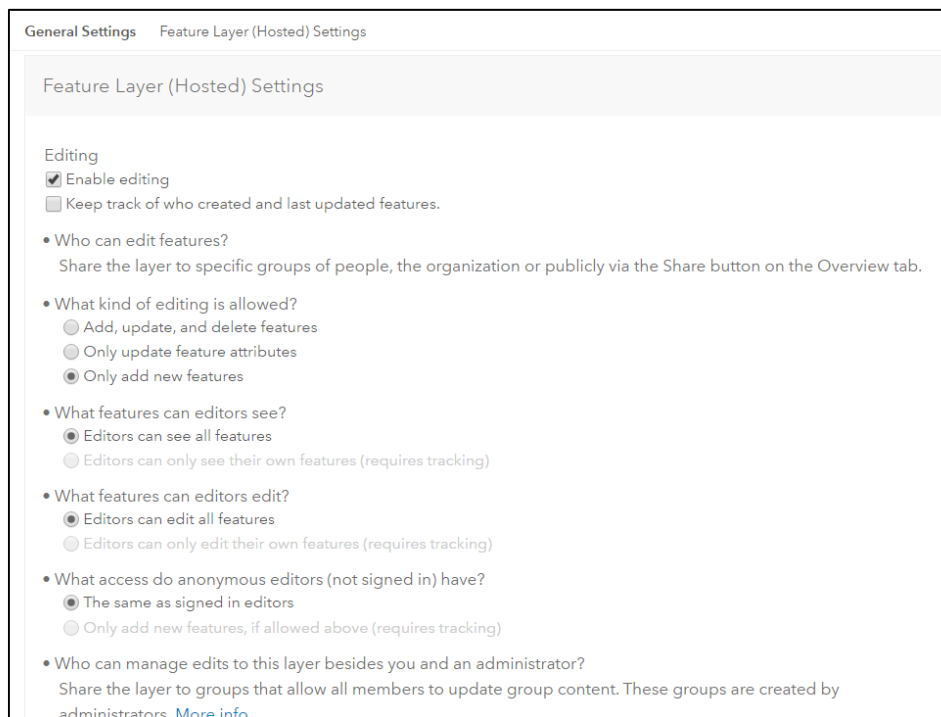
The type of editing permissions and level of access can be controlled to allow users to change existing reports or delete them entirely. For the purposes of this public-access application, allowing editors only to add new features is the desirable setting.

Hidden field functionality was discovered through trial and error. It appears that this type of behavior can be replicated when creating layers within ArcGIS Online, although CGIS has not experimented with implementing Domains through the online portal.

As mentioned previously, to properly set up a hidden field that will fill with a default value when a report is submitted, the layer must first be published with the desired hidden fields set to a Read-Only value of 'Yes' before overwriting that service with the same layer and the fields changed back to Read-Only equaling 'No.'

Once a feature layer has been successfully uploaded and implemented in the application, it is best to test that the hidden fields are filling properly by submitting a test report and then viewing the 'Data' tab of the Item Details page for that layer to ensure that all fields were correctly filled. This test report can then be deleted or left in the application to serve as an example submission.

This method feels like more of a patch to obtain the desired behavior than something that was intended for final roll-out by ESRI, and may be invalidated by future updates to the application.

Report submission via the desktop application is nearly seamless, although some issues present when reporting via a small mobile device (phone or small tablet). Point layers require a single tap to submit, while polygon layers require a tap at each vertex to draw a line, and then a double tap at the final vertex to automatically close the shape.

Reports will be considered incomplete and not submitted if the user tries to close the shape by drawing the final vertex at the same location as the starting point. The shape is not completed until it is filled with grey, meaning that a shape that appears to be a closed polygon man not in fact be complete. Once a shape is finished, clicking or tapping elsewhere on the screen will start a new shape, so one must be mindful to carefully place the first vertex if attempting to 'erase' an existing shape and start a new one.

When a location is searched for with the ESRI geocoder, the map may appear to zoom out instead of in towards the searched address or point of interest. This happens due to the fact that the area encompassed within the map extent is already a fairly high level zoom compared to the global basemap, and searching for a location will zoom to a relatively close proximity that happens to be a lower zoom level than is native to the web map. No options to configure this zoom are currently available.

Hosting the application on an organizations web server is not a complicated procedure, but does require some configuration of back end code to fully duplicate the application hosted on ESRI's servers.

The first step is pulling the AppID from the ESRI hosted application and replacing the default application code in a downloaded code bundle. Afterwards, changing the splash screen settings and image can be accomplished by including the desired image in the correct location within the code bundle's folder hierarchy. Other images such as logos and images included in the help widget must be included in the same manner.