



GEOSPATIAL METADATA DEVELOPMENT & MAINTENANCE MANUAL

[A Quick Guide to Metadata Management]



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What is Metadata?

According to an article published by OpenDataSoft in 2016, Metadata is described as:

- Data that provides information about other data
- A summary of basic information about data, making finding and working with particular data easier.

Metadata is essentially, “a shorthand representation of the data to which they refer”, (OpenDataSoft, 2016).

Metadata describes other data. It provides information about a certain item's content. For example, an image may include metadata that describes how large the picture is, the color depth, the image resolution, when the image was created, and other data. A text document's metadata may contain information about how long the document is, who the author is, when the document was written, and a short summary of the document.

What Software is used to create and manage metadata?

The ESRI ArcGIS suite has two major software options used in metadata management. These are ArcCatalog and ArcMap (10.6 currently). These software platforms facilitate the creation of metadata using different templates and styles that are adjustable depending on the information that a data collector is trying to glean. Though both software options use the same general platform, the capabilities and tools available for use in each are differently suited for different tasks.

Styles of Metadata

In ArcGIS, a metadata style configures ArcGIS to create the metadata you want. Choosing a metadata style is like applying a filter to an item's metadata. The style controls how you view the metadata and also the pages that appear for editing metadata in the Description tab. A metadata style may be designed to support a metadata standard or profile. If so, the style will determine how metadata is exported and validated for that standard or profile (ESRI, 2019).

ESRI Currently supports six (6) metadata styles. These styles are:

- The (default) **Item Description** style- lets you see and edit a simple set of metadata properties for an item. Only one page of information is available when editing metadata with this style.
- The **ISO 19139 Metadata Implementation Specification**- This style lets you view and edit a complete metadata document that complies with ISO standard 19139. XML schema implementation, export metadata in this format, and validate it using the standard's XML Schemas. Use this style to create metadata that complies with ISO standard ISO 19115-1:2014,
- The **ISO 19139 Metadata Implementation Specification GML3.2--** This style is identical to the one above, except the exported files use the GML 3.2 namespace, and therefore can be validated with versions of the ISO 19139 XML Schemas that reference the GML 3.2 namespace.
- The **North American Profile of ISO 19115 2003**- This style lets you view and edit a complete metadata document that complies with North American Profile of ISO 19115:2003
- The **INSPIRE Metadata Directive**- this style lets you view and edit a complete ISO 19139 metadata document that adheres to the INSPIRE Implementing Rules, export metadata in the ISO 19139 format, and validate it using the ISO 19139 XML Schemas.
- The **FGDC CSDGM Metadata**- this style lets you view and edit metadata following the FGDC Content Standard for Digital Geospatial Metadata (CSDGM) guidelines, export metadata in this standard's XML format, and validate it using the CSDGM XML DTD.

All metadata styles other than the default are similar. They use the same XSLT stylesheet for display to ensure you can see all available content. The same simple description is shown at the top of the page, followed by sections that give you access to the rest of the information. When you click the Edit button, you'll see several pages in the editor's table of contents that let you provide complete metadata content for the item. All styles include the same Item Description page.

What are Metadata standards?

According to ESRI, “A metadata standard is a document identifying content that should be provided to describe geospatial resources such as maps, map services, vector data, imagery, and even non-spatial resources such as tables and tools that are relevant to your spatial work. A metadata standard may also provide an XML schema describing the format in which the content should be stored. Typically, a standard XML format is defined using XML Schema or document type definition (DTD). Standards are typically ratified by national or international standards bodies” (ESRI, 2019).

The Federal Geographic Data Committee (FGDC) posits that when metadata records are formatted to a common standard, it facilitates the location and readability of the data by both humans and machines (FGDC, 2019). Metadata Standards are important as they offer users with improved analysis capabilities as they provide essential information about the quality, use and genesis of the information being offered. Standards allow the creation of consistent and quality metadata.

Introduction to ArcCatalog

The ArcCatalog application provides a catalog window that is used to organize and manage various types of geographic information for ArcGIS Desktop. The kinds of information that can be organized and managed in ArcCatalog include:

- Geodatabases
- Raster files
- Map documents, globe documents, 3D scene documents, and layer files
- Geoprocessing toolboxes, models, and Python scripts
- GIS services published using ArcGIS Server
- Standards-based metadata for these GIS information items

ArcCatalog organizes these contents into a tree view that you can work with to organize your GIS datasets and ArcGIS documents, search and find information items, and to manage them as shown in image 1. ArcCatalog presents this information in a tree view and allows you to select a GIS item, view its properties, and to access tools to operate on the selected item(s).

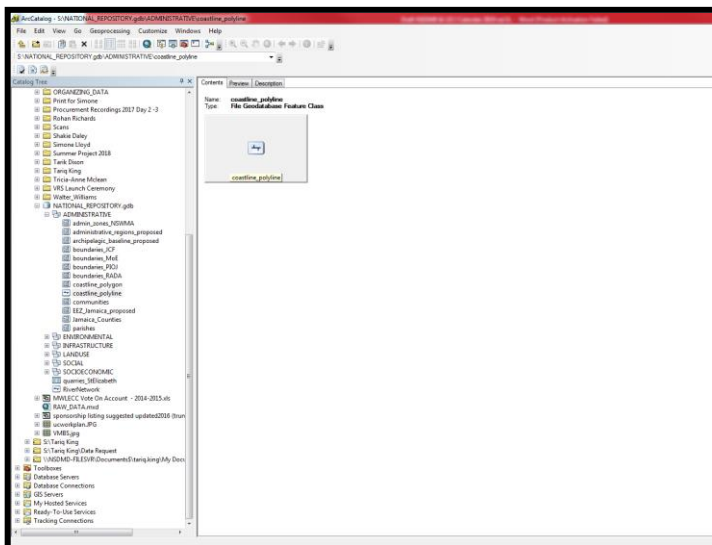



Image 1: Organization of Metadata

This tutorial guides you through the process of creating metadata following the **FGDC** and **ISO 19115-1:2014**, *Geographic Information – Metadata*. However, you don't need to know anything about FGDC or ISO metadata to use this editor because it asks you for information in plain language. You can navigate through the wizard from start to finish by clicking the Next button. You can stop paging through the wizard at any time and pick up where you left off later. To move directly to a specific page, select it in the editor's table of contents.

MAIN FEATURES

1. Organize your GIS contents
2. Manage geodatabase schemas
3. Search for and add content to ArcGIS applications
4. Document your contents
5. Manage GIS servers
6. Manage standards-based metadata

Accessing ArcCatalog

ArcCatalog can be accessed from clicking on the ArcCatalog icon  in ArcMap or from navigating to the Start / All Programs/ ArcGIS and clicking ArcCatalog (see image 2).

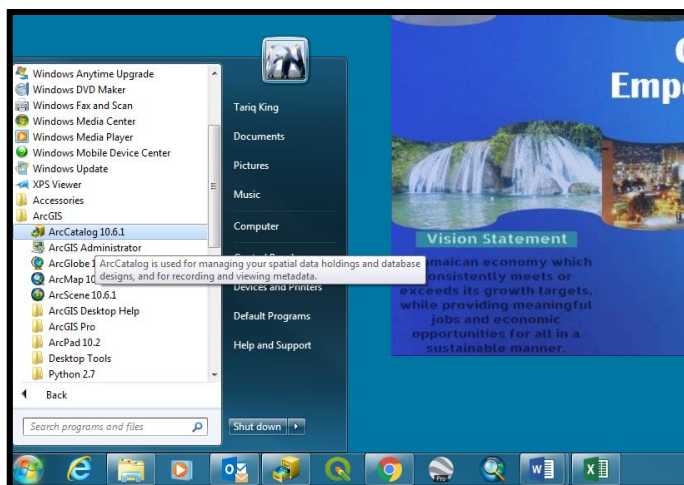
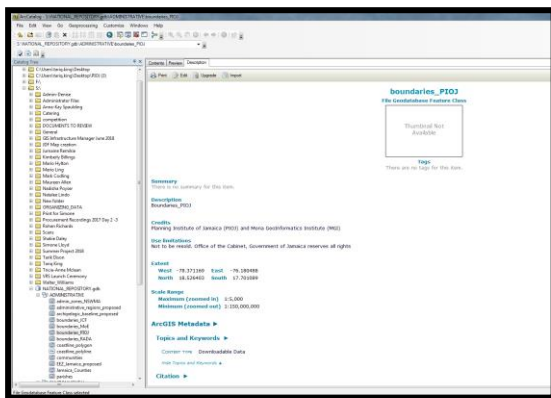


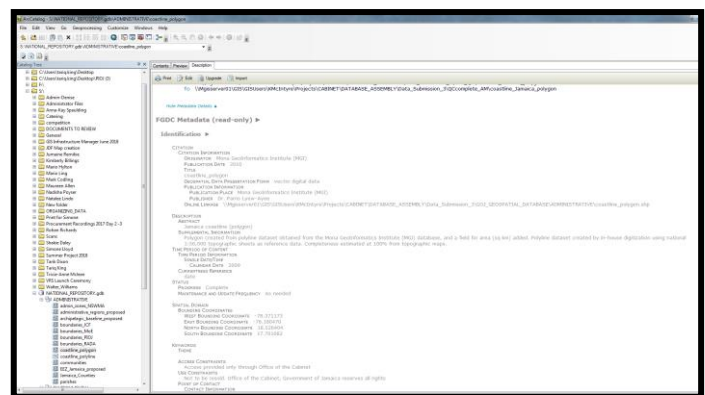
Image 2: Accessing ArcCatalog

Working with Metadata in ArcCatalog

The Description tab shows information about the selected item in the Catalog tree. Metadata includes properties and documentation. Properties are derived from the data source, while documentation is information provided by a person. Metadata is stored as extensible markup language (XML) data in a file with the data or in a geodatabase (see image 3A and 3B).



**Image 3A: Item Description
Organization of Metadata**

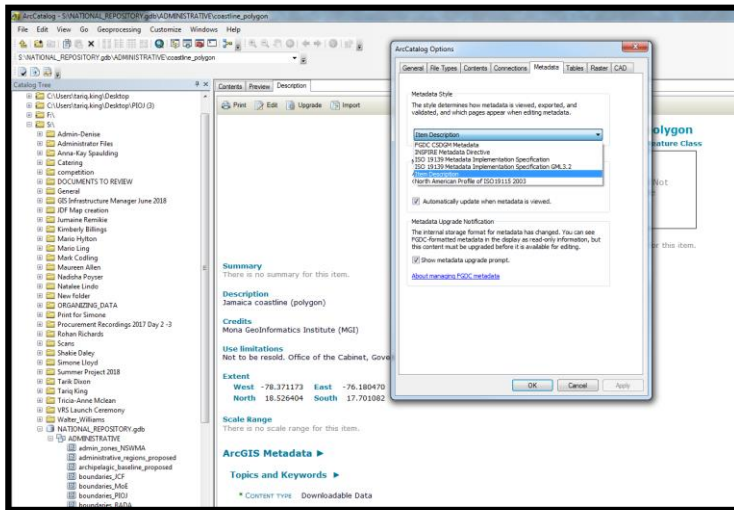


**Image 3B: FGDC CSDGM
Metadata organization**

You can change the metadata’s appearance by changing the current style to a more appropriate one using the style sheet in the Options dialog box of any ArcGIS for Desktop application:

- In ArcCatalog, click Customize > ArcCatalog Options>Metadata

The different styles available will be displayed in the drop down box (see image 4).



You can browse through the available metadata just as you would browse through any Web page in a browser (see image 5).

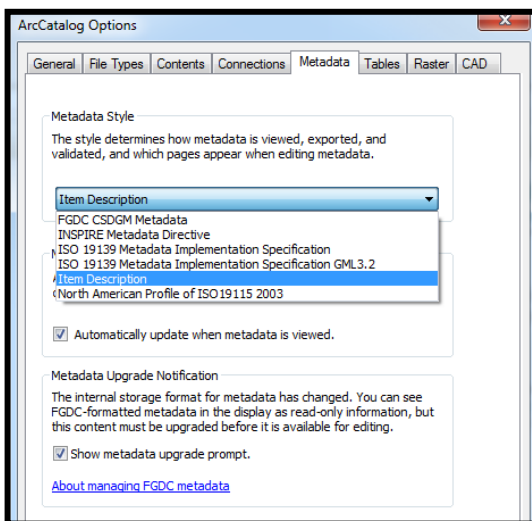


Image 5: Item Description Style (default)

Navigating around ArcCatalog

The shapefiles located in the workshop files geodatabase (Metadata_Activities> Workshop_files.gdb) provides an overview of the data it contains. By selecting the metadata tab for the Coastline_Polygon shape file, you can find out if any metadata exists for the dataset and if

the shapefile has metadata what metadata standard was used. You can also look at the data's properties.

1. Open ArcCatalog
2. Click the Workshop_files.gdb in the Catalog tree.
3. Click the Coastline_Polygon shapefile in the Catalog tree. Metadata is presented with the Item description style sheet by default.

The Catalog automatically adds the item's current property values to the metadata when you view it in the ArcGIS Metadata tab (see image 6-7).

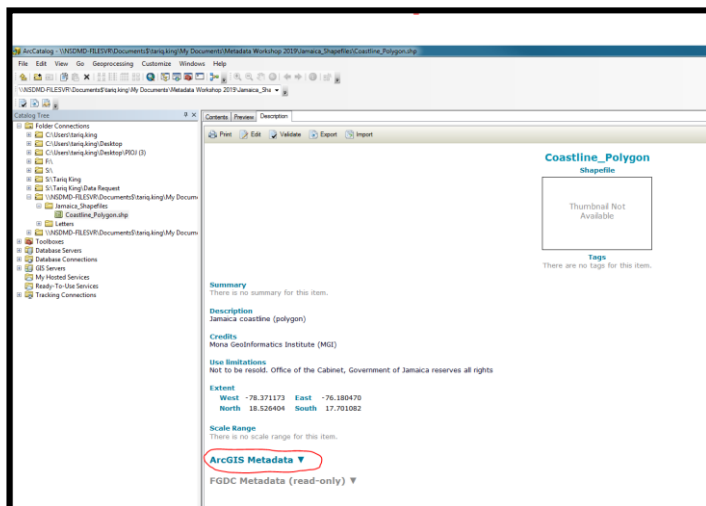
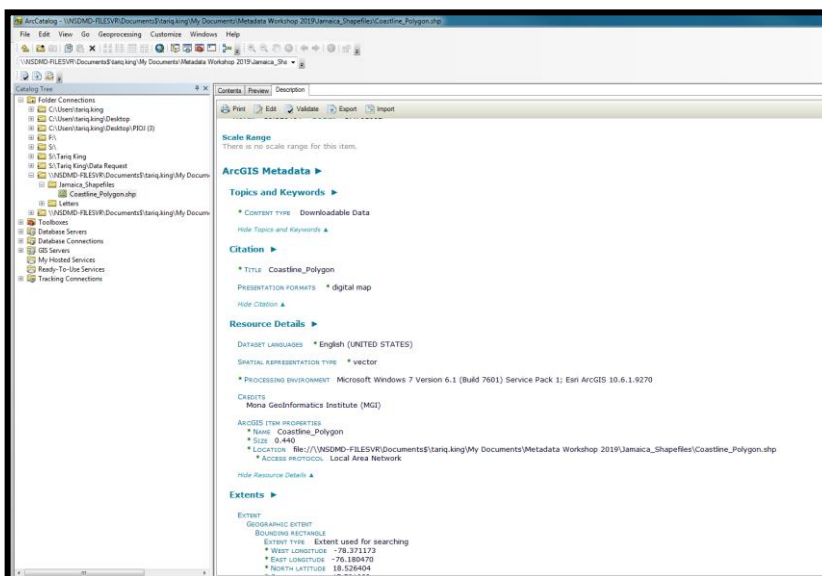


Image 6: Metadata automatically populated

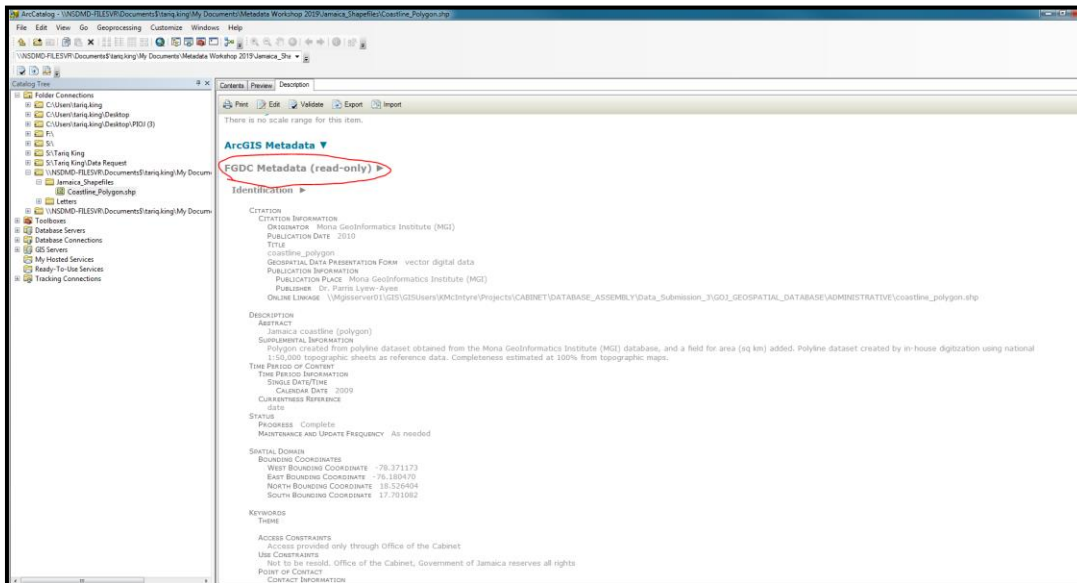


4. In ArcCatalog, click Customize > ArcCatalog Options>Metadata

Image 7: Metadata generated in ArcGIS Metadata

5. Click the Style sheet drop-down arrow again and click **FGDC CSDGM** . Different style sheets present the same body of metadata in different ways.
6. Click **Apply**

You should then see the tab in grey, **FGDC Metadata (Read-only)**, Clicking this tab will display all the metadata the file possesses in the FDGC format.



The FDGC Metadata tab has several subsections:

- Identification
- Data Quality
- Spatial Reference
- Entities and attributes
- Distribution Information
- Metadata reference

The Identification tab shows in detail, the name of data collector, the date it was collected, and a description of the file contents. On the other hand, the Spatial Reference tab shows just that, the

name and details of the coordinate system used. Metadata can even be generated to show the organization creating the information and highlight other attributes of the information.

Note: If you clicked on a shapefile without any spatial extent no coordinate system would be available because the shapefile’s projection would not yet been defined and because there is no coordinate system information, the Catalog would not be able to calculate the data’s extent in decimal degrees.

Comparing, Creating, Editing & Updating Geospatial Metadata

In the previous tasks you viewed the different metadata style sheets available in ArcCatalog and saw how ArcCatalog automatically populates some metadata elements. Now you will learn how to create, edit/update, import and compare metadata for geospatial datasets.

Comparing Metadata

1. Navigate to Metadata Activities>Workshop_Files.gdb.

In this file geodatabase, you will see two shapefiles

“maximum_inundation_Homers_Cove” and “Birds_Pigeon”. Select either of the two shapefiles.

2. Select the “details” tab.
3. Take note of the fields then repeat step 2-3 for the remaining file.

Carefully review the metadata information provided and complete the following table.

Metadata Items	Maximum_Inundation_Homers_Cove	Birds_Pigeon
Purpose		
Reason for Creation		
Date Created		
Author		
Extent		
Spatial Reference		

Outline the differences you have observed between both data layers:

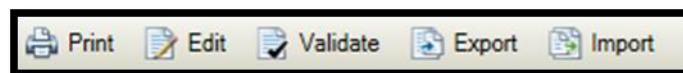
You should notice distinct differences in the data. (**maximum_inundation_Homers_Cove**) has all the fields filled out in a manner that makes it easier for the user to identify the purpose of the dataset and why it was created, who created it and to what extent. On the other hand, (**birds_Pigeon**) possesses very little, if any, information that tells the user what the data is intended for; either through summary of the dataset, description or otherwise.

The quality of a given dataset is highly dependent on the quality of the metadata given.

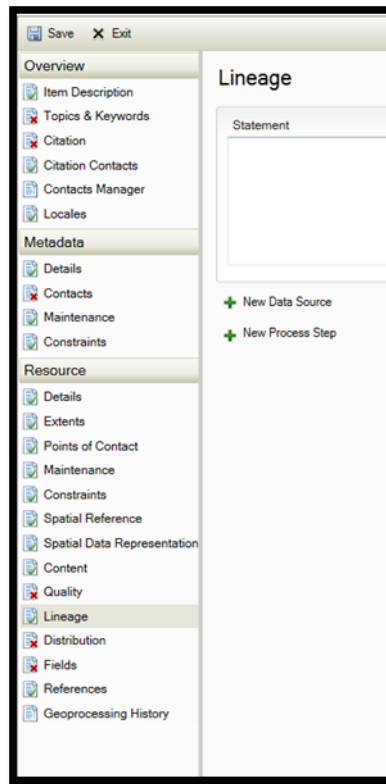
Dataset creators should always ensure that they fill out all required fields in accordance with the ISO 19115-1:2014 standard. This has been the style most suited to our national needs in terms of standardization of metadata.

Editing Metadata

1. Navigate to Metadata Activities>meta1> (For this example we will focus on editing/creating metadata. Where fields are empty, populate with required information when creating metadata.)
2. Please ensure the metadata style sheet is set to ISO 19139 Metadata Implementation Specification.
3. Select the “stcsuit_sample” shapefile



4. Click the Description Tab. From the Description toolbar > Click Edit
5. Populate the fields in each section (Overview, Metadata, Resource)




6. Click Save

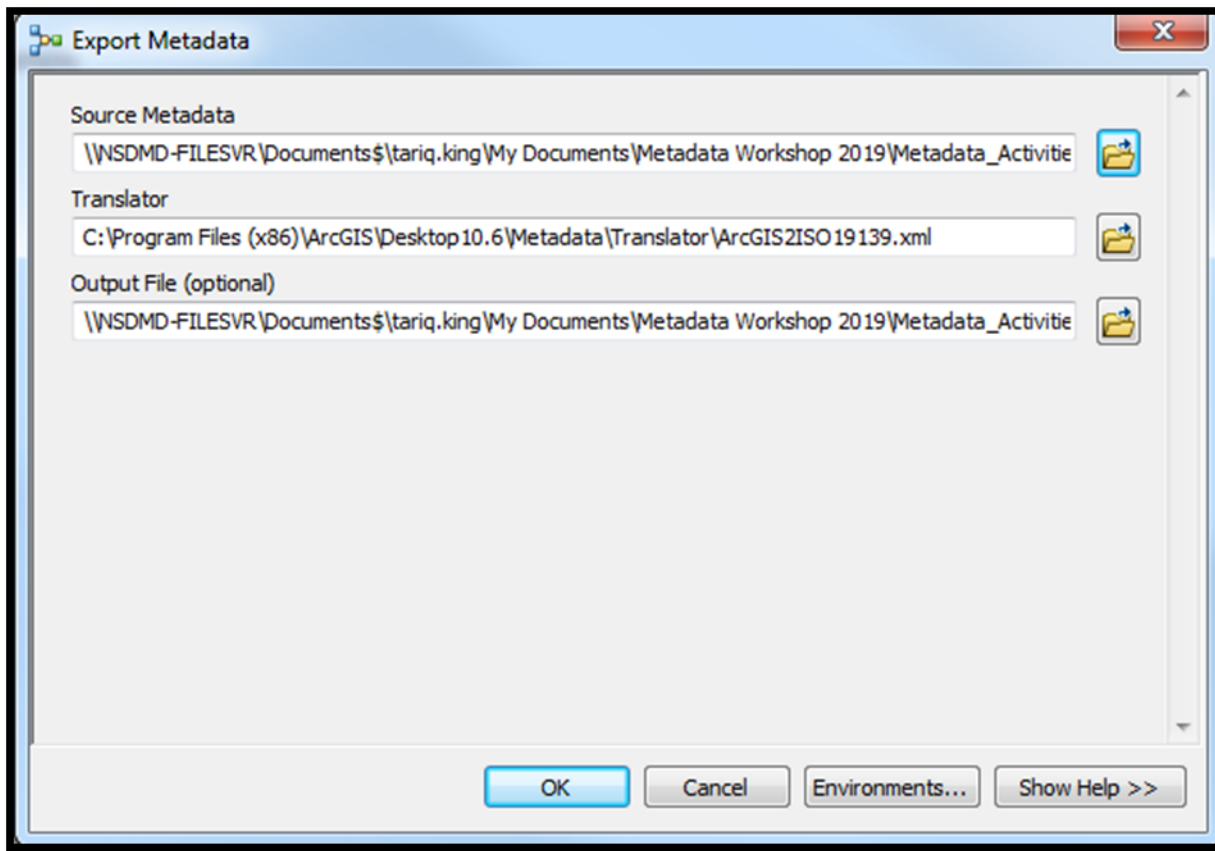
7. The description you added should now appear in the metadata shown in the description tab.

Exporting Metadata


After creating metadata, you may need to export it. Export metadata from the Metadata toolbar as part of a routine operation for publishing the most current version of your metadata.

1. In the ArcCatalog Contents tab select; Meta1>stcsuit.shp
2. Click the  **Export** button on the Metadata toolbar.
3. The Export Metadata tool opens.

NB. The content of your display will look differently from the below display as you are using a different computer with data stored in a different location.



The Translator parameter is automatically populated with the appropriate value for your metadata style.

4. Provide a location by selecting the  icon in the “Output File (optional)” section. Then navigate to (Metadata_Activities>Exported_Metadata)
5. Provide an appropriate Output File name. (stcsuit_metadata.xml)

Click OK.

Stand-alone metadata XML files are created as specified by the Output File or Output Folder parameters. These files will be formatted appropriately for your metadata style.

Importing Metadata

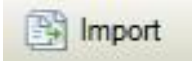

Importing metadata is the process of associating existing metadata with an ArcGIS item; it is stored as part of the ArcGIS item. You typically import information in these circumstances:

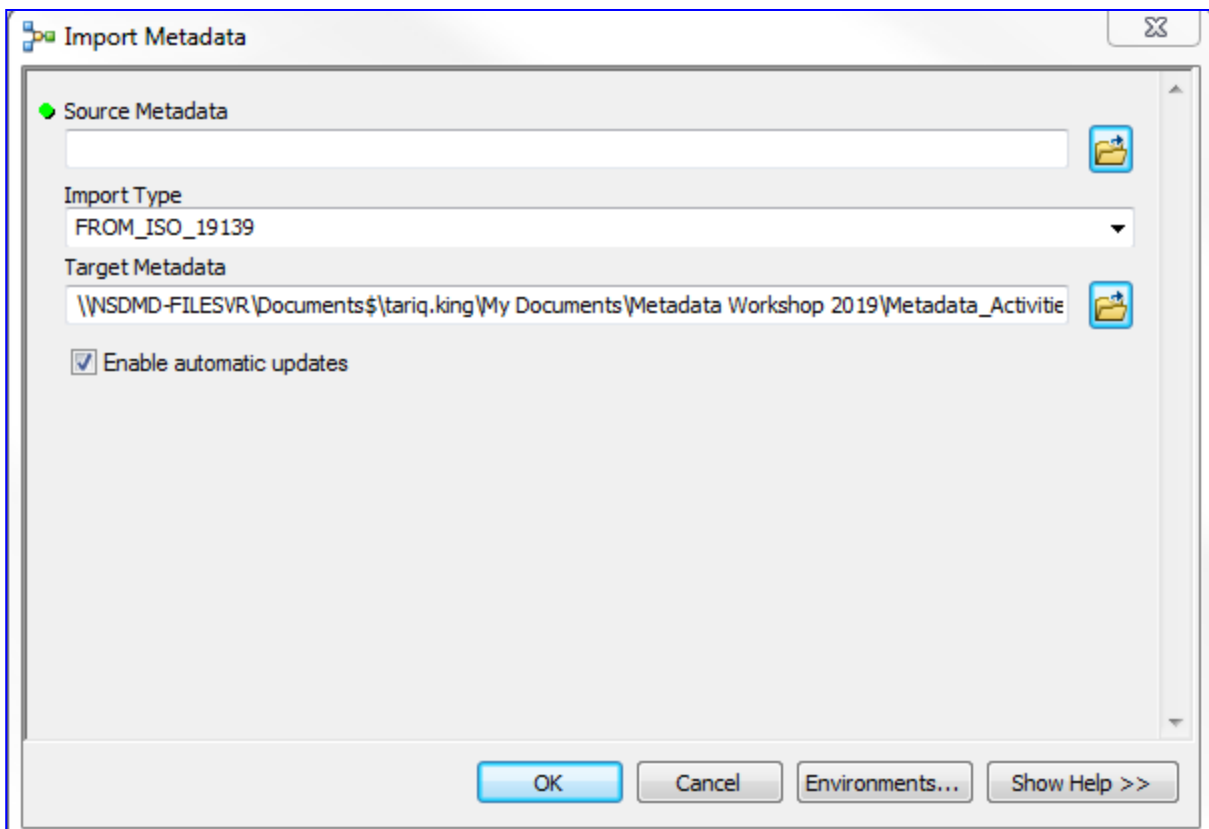
- You received an item from somewhere else that you have started using in ArcGIS, and the item didn't come with ArcGIS metadata. The item's metadata is in a separate file. Import the original metadata to store it with the item and access it in ArcGIS Desktop.
- You are creating metadata for a number of items associated with the same project. You created a template containing information that is the same for all items in the project. Import the template before adding the rest of the information that describes an item. You create a metadata template for the same reasons you would create a map or Word document template.
- You need to create metadata for a couple items. Because there aren't many, you didn't create a template, but you want to copy the metadata from another item to simplify your work. Copy the metadata before adding the rest of the information that describes the item. You create metadata for one item from another item's metadata for the same reasons you create a map or Word document from another using **Save As**.

When discussing importing metadata, the information you want to import is the **Source Metadata**, and the ArcGIS item to which you are importing the information is the **Target Metadata**. Both the source and target can be ArcGIS items or stand-alone metadata XML files.

A stand-alone metadata XML file might be metadata describing a Web service or another GIS resource that either doesn't support creating metadata or can't be represented in ArcGIS; you can create a new XML file in the **Catalog** window, then add metadata to it describing the resource.

When Importing Metadata:

1. Select the shapefile that you wish to add the data to (Navigate to Workshop_files.gdb>Stcuit.shp)
2. Select the  button.
3. When the “Import Metadata” tool opens, Click the  icon and navigate to Metadata_Activities>Exported_Metadata and select the “stcsuit_metadata” that you created.




4. Then select “OK”

The metadata that you imported should now be showing in the description section of the metadata toolbar.

Introduction to ArcMap

ArcMap represents geographic information as a collection of layers and other elements in a map. Common map elements include the data frame containing map layers for a given extent plus a scale bar, north arrow, title, descriptive text, a symbol legend, and so on. ArcMap is the primary application used in ArcGIS and is used to perform a wide range of common GIS tasks as well as specialized user specific tasks. These tasks range from working with maps (Designing, printing), to the compilation and editing of datasets and allows for the organization and management of geodatabases and ArcGIS documents. ArcMap includes the Catalog window that enables you to organize all of your GIS datasets and geodatabases, your map documents and other ArcGIS files, your geoprocessing tools, and many other GIS information sets. You can also set up and manage geodatabase schemas in the Catalog window. This catalog window opens up a small version of the ArcCatalog application, allowing the user to even create, edit, import and export metadata to the data they are working on.

Accessing ArcMap

ArcMap can be accessed from clicking on the ArcMap icon  in ArcCatalog or from navigating to the Start / All Programs/ ArcGIS and clicking ArcMap. (See Image 9)

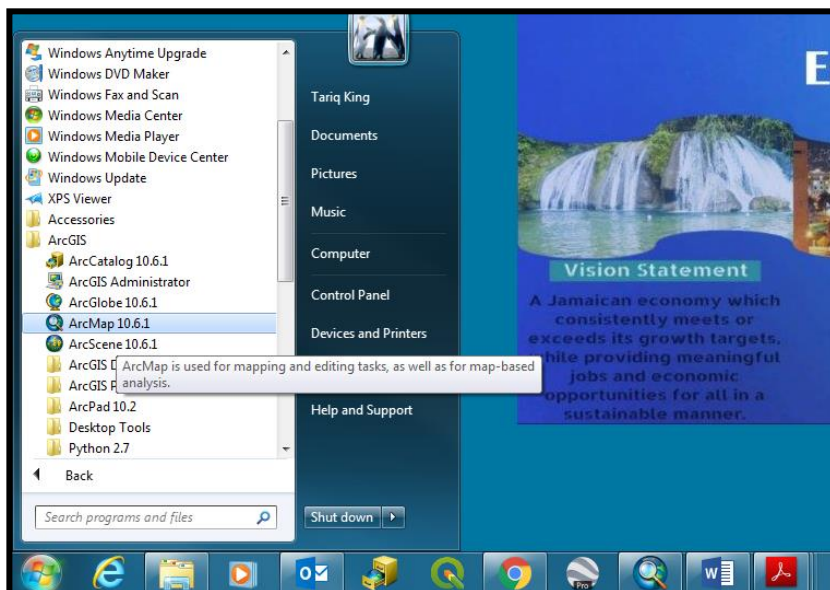


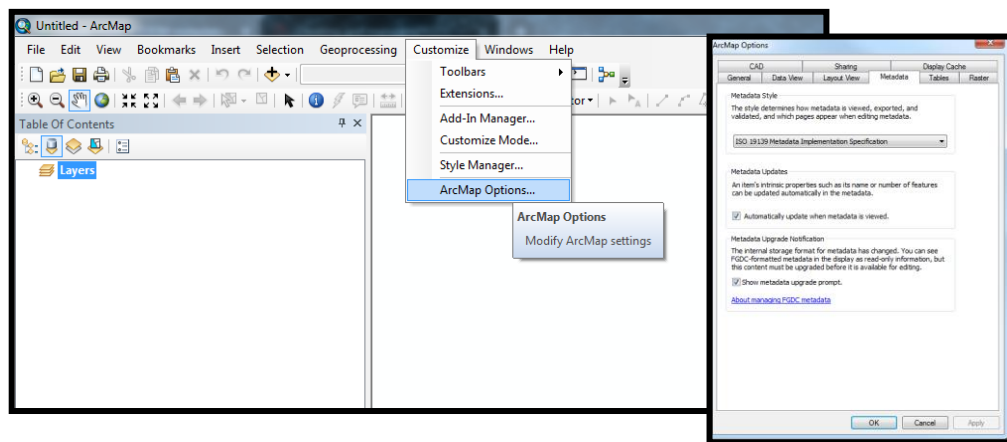
Image 9: Accessing ArcMap

Working with Metadata in ArcCatalog

Metadata is available in the Catalog pane and the catalog view to help you learn about an item and decide if you want to use it. Its content is updated automatically when you view it in the details panel in the catalog view; metadata is created for the item if it doesn't already exist. ArcGIS extracts the item's properties and records appropriate information in its metadata. For example, the extent and count of a feature class's features are current when you look at its metadata, even if new features were recently added. This process is known as synchronization—values in the metadata are synchronized with the properties of the item.


Modifying the metadata style in ArcMap is not very different from ArcCatalog, Firstly:

- In ArcMap, click **Customize > ArcMap Options**.



- Select The Metadata Tab
- Select the metadata style from the drop down box.

When using ArcMap, the Arc Catalog window can be opened by selecting the ArcCatalog

icon . Once opened, a dockable window will open showing the file tree of linked folders as you would see in the ArcCatalog application (Please See Image 10).

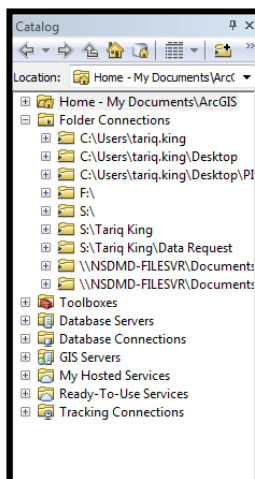


Image 10: Catalog window in ArcMap

In order to create, edit import or export metadata for a particular file:

- Navigate to the required file from the file tree
- Right click the item and select **Item Description** (Image 11)

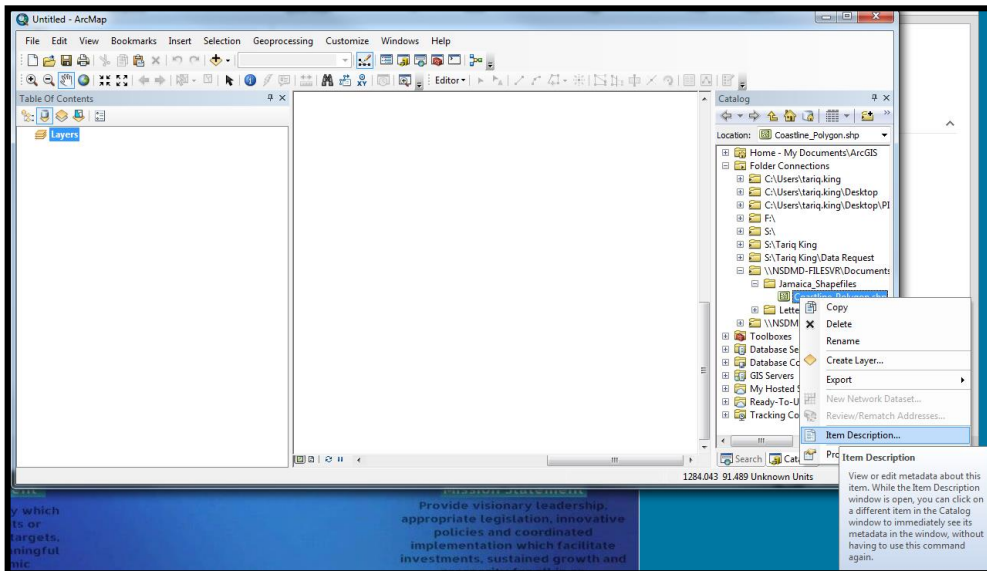


Image 11: Viewing metadata in ArcMap

- This brings up a pop up window (Image 12) that is identical to the Description tab in ArcCatalog
- Data is created, edited, imported and exported as it is in ArcMap.

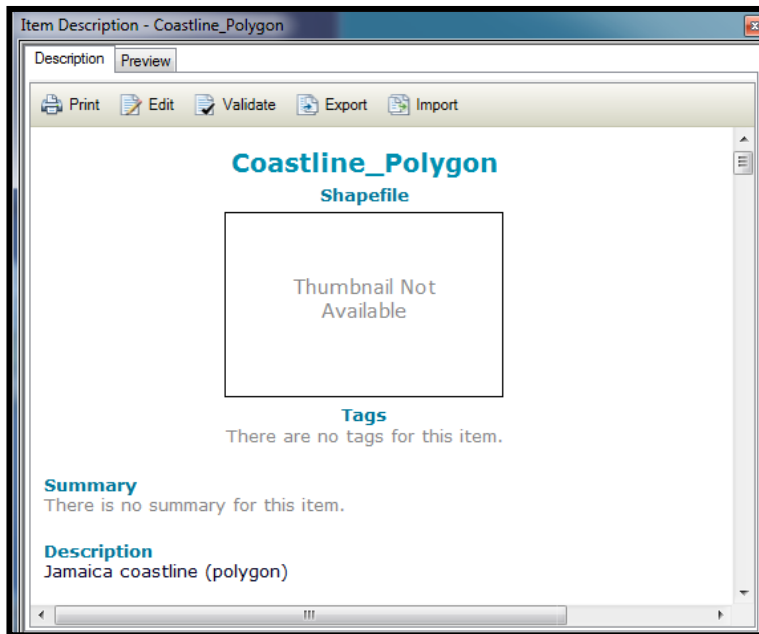


Image 12: Pop up metadata window ArcMap

References

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- FGDC. (2019). *GEOSPATIAL METADATA STANDARDS AND GUIDELINES*. Retrieved from FDGC.gov: <https://www.fgdc.gov/metadata/geospatial-metadata-standards>
- OpenDataSoft. (2016, August 25). *What is metadata and why is it as important as the data itself?* Retrieved from OpenDataSoft: <https://www.opendatasoft.com/2016/08/25/what-is-metadata-and-why-is-it-important-data/>