

# HIST 207 - Introduction to GIS Data Management

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*This guide was created by the staff of the GIS/Data Center at Rice University and is to be used for individual educational purposes only. The steps outlined in this guide require access to ArcGIS Pro software and data that is available both online and at Fondren Library.*

The following text styles are used throughout the guide:

Explanatory text appears in a regular font.

1. Instruction text is numbered.
2. Required actions are underlined.
3. **Objects of the actions are in bold.**

*Folder and file names are in italics.*

Names of Programs, Windows, Panes, Views, or Buttons are Capitalized.

'Names of windows or entry fields are in single quotation marks.'

"Text to be typed appears in double quotation marks."

The following step-by-step instructions and screenshots are based on the Windows 10 operating system with the Windows Classic desktop theme and ArcGIS Pro 2.1.3 software. If your personal system configuration varies, you may experience minor differences from the instructions and screenshots.

This course will teach you how to download, evaluate, and prepare GIS data from public online sources and set up a project in ArcGIS Pro.

## Obtaining Tutorial Data

### COHGIS Open Data Portal

The COHGIS (City of Houston GIS) Open Data Portal website provides over 100 data sets including administrative boundaries, amenity locations, transportation routes, crime, and flooding.

1. Using a web browser, search for "**houston gis data**" and select the result as shown below or go directly to: <https://cohgis-mycity.opendata.arcgis.com/>.

#### City of Houston GIS Open Data

<https://cohgis-mycity.opendata.arcgis.com/> ▼

Discover, analyze and download data from City of Houston GIS Open Data. Download in CSV, KML, Zip, GeoJSON, GeoTIFF or PNG. Find API links for ...

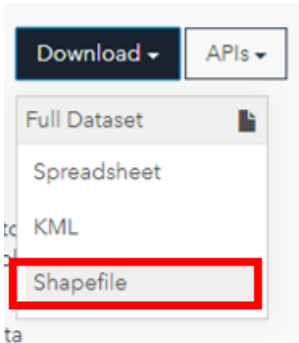
Whenever you see a URL that ends in [opendata.arcgis.com](https://cohgis-mycity.opendata.arcgis.com/), you will know that you are visiting a standard ArcGIS Open Data portal.

1. In the 'Search for Data' box, type "**historic sites**" and press **Enter**.

2. Click the second option for **COH HISTORIC SITES/LANDMARKS**, as shown below.



1. In the middle right of the page, click **Download > Shapefile**.



## H-GAC GIS Datasets

The Houston-Galveston Area Council (H-GAC) is the 13-county Metropolitan Planning Organization (MPO) for the Houston region. Federal legislation requires that an MPO be designated for each urbanized area with a population greater than 50,000 people (as established by the U.S. Census Bureau) in order to conduct long-range metropolitan transportation planning and be eligible for Federal funding for transportation projects. Their mission to carry out metropolitan transportation planning means that MPOs are a great source of data on topics such as demographics, employment, land use, transportation, and environmental conditions and most of these topics are well-suited towards GIS analysis.

Most of the data provided on the H-GAC portal is not originally created by the H-GAC, but rather is either aggregated from multiple municipalities up to the 13-county region, or clipped from the country or state down to the 13-county region.

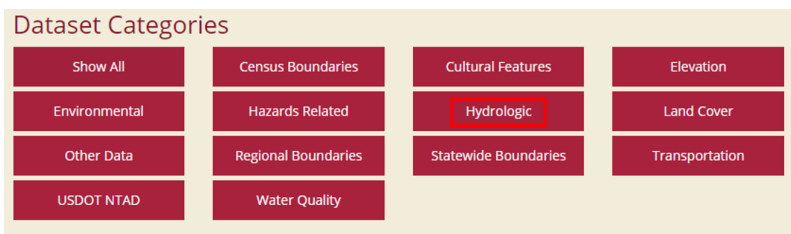
1. Using a web browser, search for "**h-gac gis**" and select the result as shown below or go directly to: <http://www.h-gac.com/gis-applications-and-data/datasets.aspx>

### GIS Datasets - Houston-Galveston Area Council (H-GAC)

[www.h-gac.com/rds/gis-data/gis-datasets.aspx](http://www.h-gac.com/rds/gis-data/gis-datasets.aspx)

GIS Datasets. The Houston-Galveston Area Council provides data on this page free of charge for downloading. Usage Agreement. These products, data, and/or ...

2. Under the 'Dataset Categories' section, click the **Hydrologic** button to filter the results by subject.



3. Under the 'Datasets' section, click **Major Rivers**.



4. Click **Download Dataset** in the pop-up window.
5. Click the blue **Download button** in the top right corner of the new window.

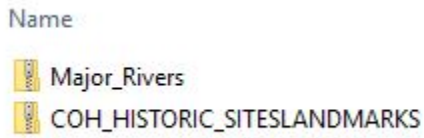
## IPUMS NHGIS Datasets

The National Historical Geographic Information System (NHGIS) provides free online access to summary statistics and GIS boundary files for U.S. censuses and other nationwide surveys from 1790 through the present. NHGIS datasets are large and require additional processing steps for use in ArcGIS Pro. Therefore, a sample of this data will be provided later in this tutorial. If you are interested in using NHGIS data for your project, please visit the GDC lab or use this link to book an appointment at the GDC for further assistance: <https://library.rice.edu/services/gis-assistance>

## Preparing the Downloaded Data for ArcGIS Pro

Once you have downloaded the historic sites from COHGIS and the major rivers data from H-GAC, you will be able to find the data files in your Downloads folder. You will see that all the files are zipped, meaning they contain compressed files of data within them (you can tell a file is zipped when the file type column reads "Compressed (zipped) Folder"). You will need to unzip the folders to be able to see the data inside them.

1. On the Desktop, click the **File Explorer** icon located on the Windows Taskbar on the bottom left corner of the screen.
2. In the left column, click **My Computer**. In the right column, double-click **C:/ > Users > gistrain.ADRICE > Downloads**.
3. Ensure that you see the following zipped folders in your Downloads folder.



4. Select both folders.
5. Right-click any of the selected folders and select **7-Zip > Extract Here**. Your data is now in its decompressed format and ready to be brought into ArcGIS Pro.

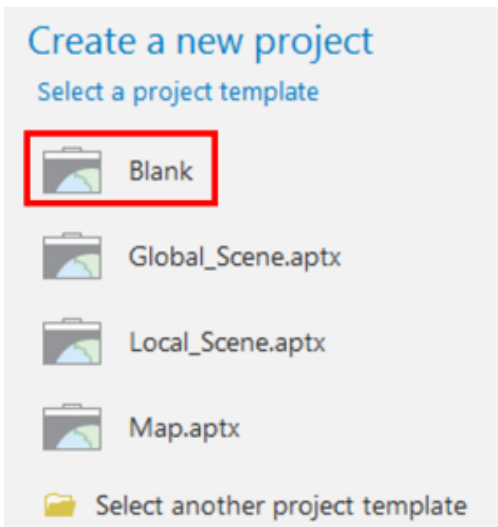
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## Creating a New Project in ArcGIS Pro

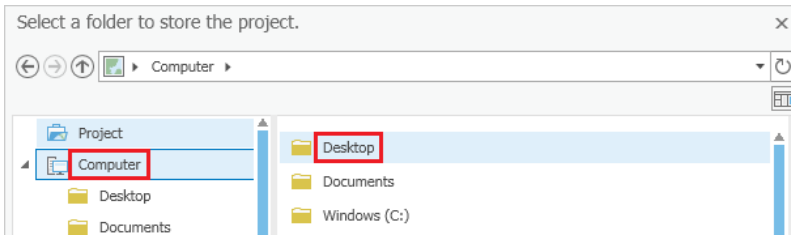
1. From the Windows Taskbar, click the **blue globe** icon to launch ArcGIS Pro.



2. When ArcGIS Pro opens, under the 'Create a new project' section on the right side of the screen, click the **Blank** project template.



3. In the 'Create a New Project' window, for the 'Name' input, type **"Intro\_Part2"**.
4. For 'Location', click the yellow **Browse...** button to the right.
5. In the 'Select a folder to store the project.' window, click **Computer** in the left column and click **Desktop** in the right column and click **OK**.



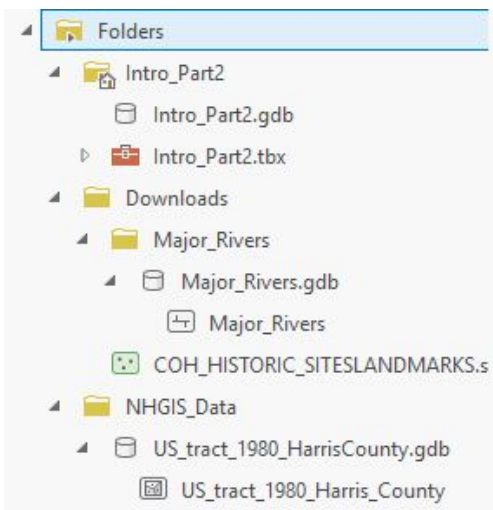
6. In the 'Create a New Project' Window, click OK.
7. Maximize the **ArcGIS Pro** application window.

## Managing GIS Data

1. In the Catalog pane, under the Folders section, click the arrow to expand **Folders > Intro\_Part2 > Intro\_Part2.gdb**. You will notice there is no data in the geodatabase. Over the next few steps, we will import the data we downloaded online from the Downloads folder to our Project Geodatabase.

## Connecting to a folder

1. In the Catalog pane, right-click Folders and select Add Folder Connection.
2. In the left column, click My Computer. In the right column, click C:/ > Users > gistrain.ADRICE and single click on Downloads. Click OK.
3. In the Catalog pane, expand Downloads.
4. Fully expand all **folders and geodatabases** in the Downloads folder.
5. We will repeat the above process to connect to a folder containing a sample of NHGIS data. In the Catalog pane, right-click Folders and select Add Folder Connection.
6. In the left column click My Computer. In the right column, click gisdata (\\file-rnas.rice.edu)(R) > Short\_Courses\_HIST207 > HIST207\_GDC2 > and single-click on NHGIS\_Data. Click OK.
7. In the Catalog pane, expand NHGIS\_Data.
8. Your 'Folders' directory should look like the below.



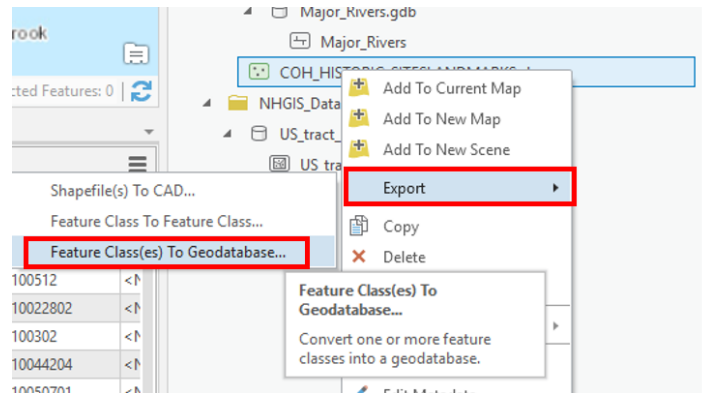
## Importing and Exporting Data in the Project Geodatabase

For this tutorial, we are working with vector data which is a spatial data format that uses points, lines, and polygons to represent real features on the Earth's surface. Vector data is ideal for discrete themes with definite boundaries. A Feature Class is a vector storage format that represents a homogeneous collection of common features. There are two types of Feature Classes: a Shapefile feature class and a Geodatabase feature class. A Shapefile feature class is an open source format. Its file extension is .shp and its icon is green. A Geodatabase feature class is an Esri proprietary format. A Geodatabase feature class must be stored inside a Geodatabase (.gdb) and its icon is white. To better organize our project, we will import data into our Project Geodatabase.

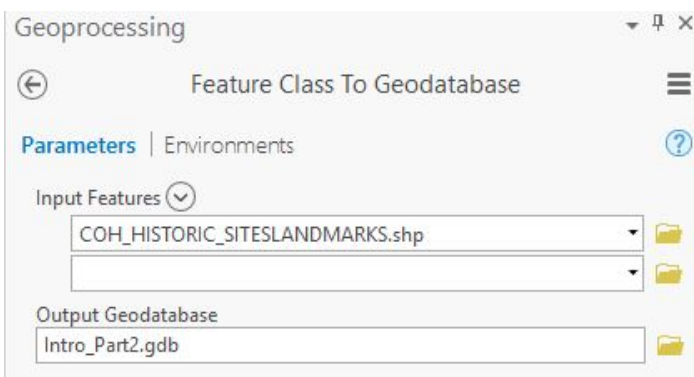
1. In the Catalog pane, click the US\_tract\_1980\_Harris\_County geodatabase feature class located in the NHGIS folder and drag-and-drop it into the **Intro\_Part2.gdb**. A progress bar will appear that reads 'Copying...'. Once it is complete, you will see a copy of US\_tract\_1980\_Harris\_County inside the **Intro\_Part2.gdb** as shown below.



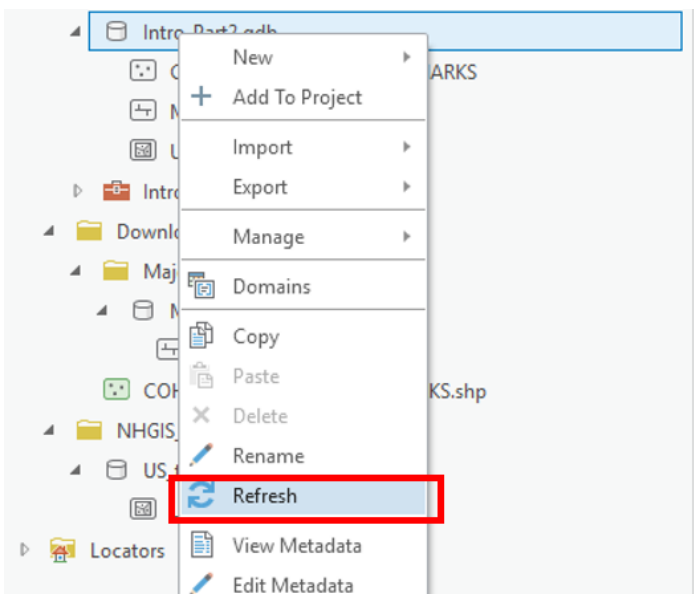
2. Repeat the above step to drag-and-drop **Major\_Rivers** from the *Major\_Rivers.gdb* into the *Intro\_Part2.gdb*.
3. **COH\_HISTORIC\_SITESLANDMARKS** is a Shapefile feature class, so it requires a different method to be imported into the Project Geodatabase. In the Catalog pane, right-click on **COH\_HISTORIC\_SITESLANDMARKS.shp** and select **Export > Feature class(es) to geodatabase**.



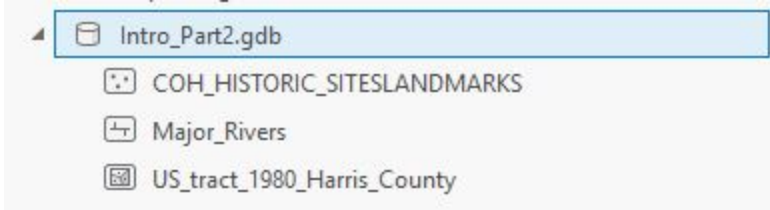
4. In the Geoprocessing pane, accept default settings as shown below and click **Run**.



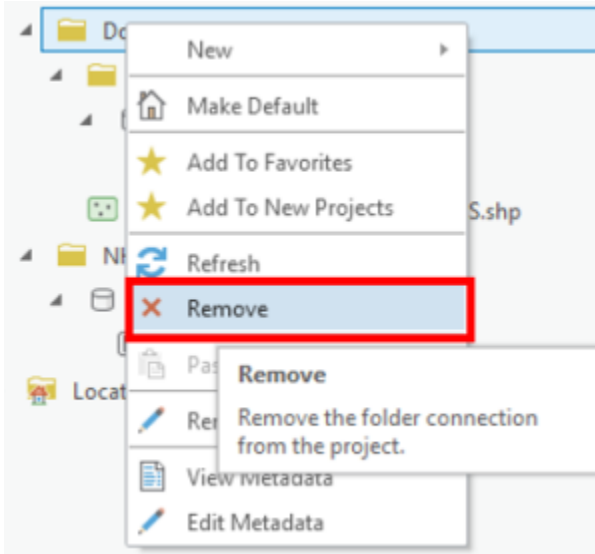
5. In the Catalog pane, right-click on **Intro\_Part2.gdb** and select **Refresh**.



6. Your Project Geodatabase should now contain three Geodatabase feature classes: **COH\_HISTORIC\_SITESLANDMARKS**, **Major\_Rivers**, and **US\_tract\_1980\_Harris\_County**.



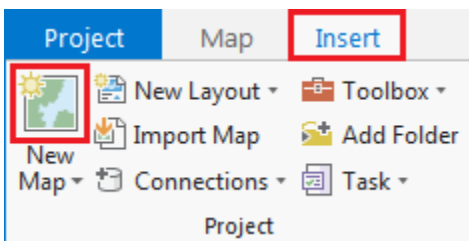
7. In the Catalog pane, in the Folders section, right-click on **Downloads** and select **Remove**.



8. Repeat **Step 7** to remove the connection to the *NHGIS\_Data* folder.

## Bonus: Symbolizing Layers By Attributes

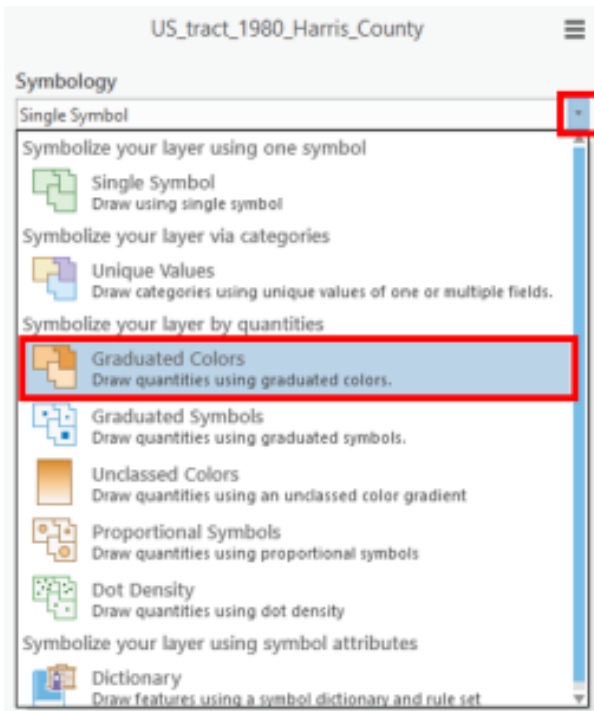
1. On the ribbon, click the **Insert** tab.
2. In the Project group, click the **New Map** button.



3. In the Catalog pane, right-click the **US\_tract\_1980\_Harris\_County** feature class and select **Add To Current Map**.
4. Above the ribbon, on the Quick Access toolbar, click the **Save** button.

## Symbolizing Layers By Quantity

1. In the Contents pane, right-click the **US\_tract\_1980\_Harris\_County** layer name and select **Symbology**.
2. In the Symbology pane, click the primary **drop-down menu** and select **Graduated Colors**.



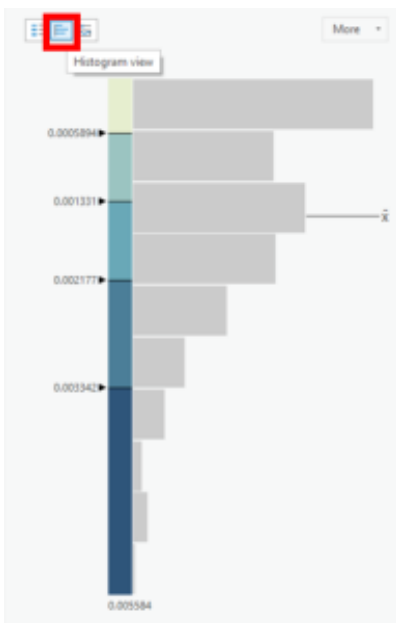
3. Use the 'Field' drop-down menu to select the **AV0AA1980** field. NHGIS data downloads include a read-me file that defines the codes for each field (column). AV0AA1980 stores the number of people within each census tract for the year 1980.

The Map view now displays a choropleth map, where the darker colors represent higher numbers of people. In studying the map, it appears as if there is no discernible pattern to population numbers. While this is true according to raw counts per census tract, there could be differences in the census tracts that are unaccounted for in this symbology. Now you will try normalizing by the area of the census tracts.

4. Use the 'Normalization' drop-down menu to scroll to the bottom and select the last **Shape\_Area** field.

The projection of the census layer is GCS WGS 1984. Therefore, the layer is unprojected and the coordinates are stored in angular units of decimal degrees. Therefore, the Shape\_Area field is displaying square decimal degrees and the map is displaying number of people per square decimal degree. This is a somewhat incomprehensible unit, however, the values are still proportional to how they would be in a different unit and the relative coloring on the map remains correct. Notice that according to the density of population count, the greatest amount of people appear to be inside the major loops.

5. On the lower half of the Symbology pane, click the **Histogram** tab.



6. Use the 'Method' drop-down menu to select **Equal Interval**.
7. Use the 'Method' drop-down menu to select **Quantile**.
8. Use the 'Classes' drop-down menu to select **20**.

9. Use the 'Classes' drop-down menu to select **2**.
10. Use the 'Color Scheme' drop-down menu to select **a different color scheme of your choice**.

## Adding Layer Transparency

1. In the Contents pane, ensure that the *US\_tract\_1980\_Harris\_County* layer is selected.
2. In the ribbon, click the Appearance tab.
3. In the Effects group, slide the **Layer Transparency slider** or type "50" and hit **Enter**.
4. Return the **Layer Transparency slider** to "0".



Using what you learned in [HIST 207 - Introduction to ArcGIS Pro](#), create a simple layout that displays *US\_tract\_1980\_Harris\_County* and export the layout as a PDF.