CHAPTER 1

Introducing ArcGIS

LEARNING GOALS

- Get an introduction to ArcGIS®.
- Get an introduction to the ArcGIS Pro user interface.
- Learn to navigate maps.
- Work with tables of attribute data.
- Get an introduction to symbolizing and labeling maps.
- Work with 2D and 3D maps.

Introduction

ArcGIS is an integrated collection of geographic information system (GIS) software developed by Esri® that works seamlessly across desktop computers, the internet, and mobile devices. The tutorials in this first chapter will familiarize you with a major component of this suite: ArcGIS Pro. ArcGIS Pro is a 64-bit desktop GIS application that uses a ribbon interface for 2D and 3D map authoring, analysis, and web publishing. You'll use additional ArcGIS apps in other chapters.

In this chapter, you will work with a finished map in ArcGIS Pro that has the locations of urgent health-care clinics in Allegheny County, Pennsylvania. These clinics are (1) federally qualified health centers (FQHCs) that provide subsidized health care for underserved populations and (2) nonsubsidized clinics that provide health care (called urgent care clinics in this book). You will become familiar with the software, learn how the map works, and analyze the locations of both types of health-care clinics to see whether they are sited in appropriate locations.

Tutorial 1-1: Getting an overview of ArcGIS Pro

Before starting work on your computer, review this terminology for ArcGIS Pro projects and spatial data.

- A *feature class* is the basic building block for displaying geographic features on a map. You can think of a feature class as a homogeneous layer on a map. Feature classes are vector data and have corresponding attributes for each feature. For example, you will work with a point feature class named **FQHC Clinics** that has points for all FQHCs in Allegheny County. In addition, **Streets** is a line feature class that has centerlines for all streets in the county, and **Municipalities** is a polygon feature class that has boundaries for all municipalities in the county.
- A *raster dataset* (or *raster*) is a major type of spatial data. A raster is an image made up of pixels—squares so small that you can't see them until you zoom in. A common example of a raster is satellite imagery. A raster encoded with geographic coordinates can be used as a layer in a map.
- A *file geodatabase* is a folder with the extension .gdb that stores feature classes, raster datasets, and other related files. Although many other file formats are used for storing spatial data, the file geodatabase is a preferred Esri format. The data used in the Tutorial 1-1 project is in the **Chapter1** file geodatabase, stored in the **Chapter1\Tutorials** folder on your computer.
- A *project* is a file with the extension .aprx that contains one or more maps and related items. For example, you'll open **Tutorial1-1.aprx** after this introduction. This project has two maps, **Health Care Clinics** and **Health Care Clinics_3D**, plus other project items. A project doesn't contain spatial data (such as the feature classes you may use on your maps)—it simply pulls in spatial data that's stored elsewhere, such as in a file geodatabase. A project can be stored in a location of your choice.

Set up the Tutorial 1-1 project

You'll start by opening a project in ArcGIS Pro. The opening map has 12 layers available for Allegheny County but only one turned on—a layer for population density by census tract from the 2020 census. The city of Pittsburgh is in the center of the county.

1. Browse to links.esri.com/GISTforPro3.1Data to download the tutorial data for the book. Download and extract the files to your local drive.

2. Start ArcGIS Pro on your computer.

3. Sign in with your ArcGIS account username and password. If you don't already have a license, see the licensing options at the beginning of this book in the section "About This Book."

4. Click **Open another project**. In the **Open Project** pane, browse to **\EsriPress\GISTforPro\Chapter1\Tutorials** and double-click **Tutorial1-1.aprx**.

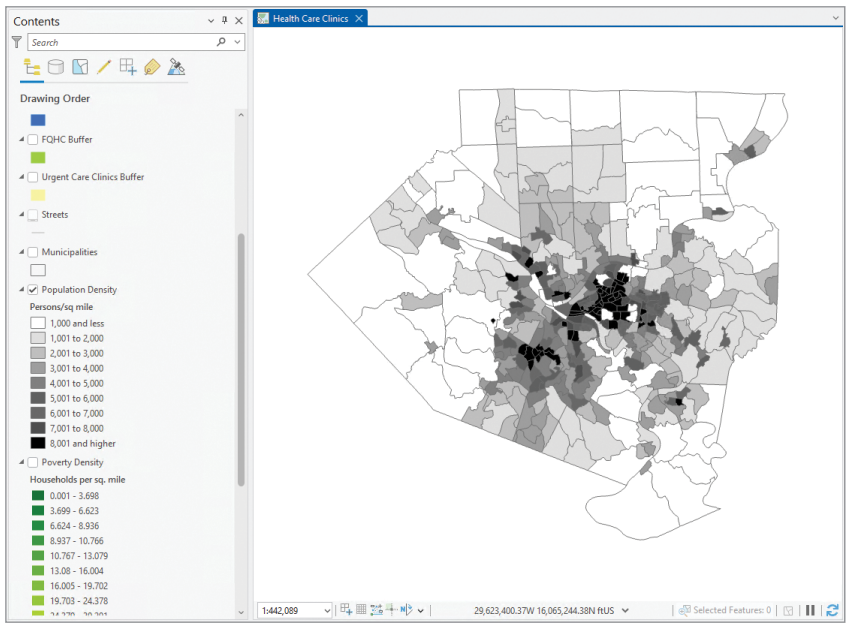
   The project opens and displays a map called **Health Care Clinics**.

5. On the **Map** tab, click **Bookmarks** > **Allegheny County**.

   The bookmark centers the map to fill the view.

6. In the **Contents** pane, scroll down to see the legend for the **Population Density** layer.

   This groups the census tracts into nine classes. A white-to-black color scheme shows how many people live there per square mile, in increments of 1,000.



7. On the **Project** tab, click **Save Project As**, browse to **Chapter1\Tutorials**, and save the project as **Tutorial1-1YourName.aprx** (substitute your name for YourName).

   You'll generally open and save projects for each chapter this way. If you make a mistake, you can start again with the original project.

Add and remove a basemap

A basemap is a layer that helps orient users to a location. Map designers place additional feature classes on top of a basemap to provide specific information for visualization, analysis, or problem solving. Although you can create your own basemap, Esri provides the basemaps you'll use in this book. These basemaps are stored in ArcGIS Online.

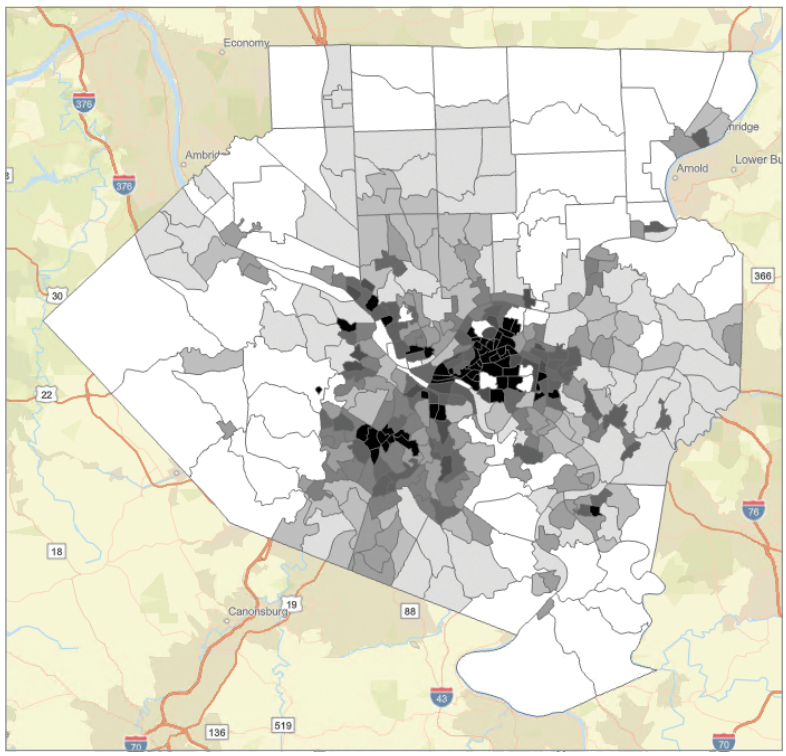
1. On the **Map** tab, in the **Layer** group, click **Basemap**.

   You'll see a variety of basemaps—available basemaps depend on licensing.

2. Click the **Streets** basemap to add the basemap to your map.

   The **Population Density** feature class covers most of the **Streets** basemap.

   Because the basemap doesn't add useful information in this case, you'll remove it.



3. Scroll to the bottom of the **Contents** pane, right-click **World Street Map**, and click **Remove**.

YOUR TURN

The Your Turn assignments in this book ask you to repeat the steps just completed but with some modifications. These assignments help you retain the workflows in the steps. Often, you'll need to complete the Your Turn assignments so you can use their results in the next tutorial steps, so don't skip Your Turn assignments.

For this Your Turn assignment, add and remove several basemaps of your choice. You'll notice that some basemaps, such as **Light Gray Canvas**, add a labeling reference layer at the top of the **Contents** pane. When you remove those basemaps, remove the corresponding labeling layer, too.

Turn layers on and off

The order in which feature classes are drawn is shown in the **Contents** pane. The feature class at the bottom of the pane is drawn first, and each layer above it is drawn in turn on top of the preceding layer until you reach the top of the list. Feature classes that cover large areas, such as **Population Density**, must go on the bottom. Other feature classes that may be covered by other layers—such as **FQHC Clinics**, which has points—must go higher in the list to be visible.

1. In the **Contents** pane, scroll down to see the legend for **Population Density**.

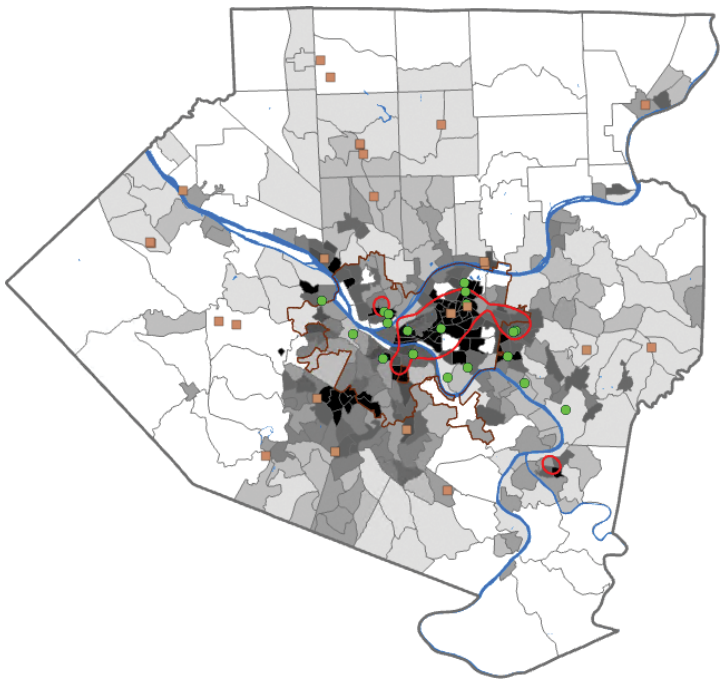
   The check mark on the left of **Population Density** indicates that the feature class is turned on.

2. In the **Contents** pane, check the boxes for **Urgent Care Clinics**, **FQHC Clinics**, and **Poverty Risk Area**.

   The three feature classes you just turned on are the subject of this map and show the locations of urgent care clinics relative to poverty risk areas. Right away, you'll notice that the subsidized FQHC clinics tend to be concentrated in areas of high population density (urban) and poverty risk, whereas the non-subsidized urgent care clinics are mostly spread out in areas of low population density (suburbs). Areas inside the poverty risk area polygons have high proportions of poor populations, as determined by the number of households below the poverty income threshold (using average American Community Survey data for the five-year period ending in 2019). The locations of FQHC and urgent care clinics are from 2022.

3. Turn on feature classes that provide the spatial context of where subject features are located: **Pittsburgh**, **Allegheny County**, **Rivers**, and **Streets**.

   Streets, an important spatial context feature class, won't display until the map is zoomed in to a small area (you'll learn about zooming later in this chapter). There are too many detailed streets for viewing at full extent.



Reorder feature classes in the Contents pane

To make the point that ArcGIS Pro draws from the bottom up in the **Contents** pane, you'll temporarily drag **Population Density** higher to cover other feature classes.

1. Drag **Population Density** to the top of the **Contents** pane, under **Health Care Clinics**.

   Now this feature class covers all other feature classes in the map.

2. Drag **Population Density** back to directly above the **Poverty Density** feature class.

3. At the top of the screen, above the ribbon, click the **Save Project** button.

Some ribbon buttons don't have labels. To identify the button you need, position the pointer above the button to view a pop-up ScreenTip. The **Save Project** button saves the entire project.

Examine the Catalog pane and open and export a map layout

The **Catalog** pane provides access to all components in an ArcGIS Pro project.

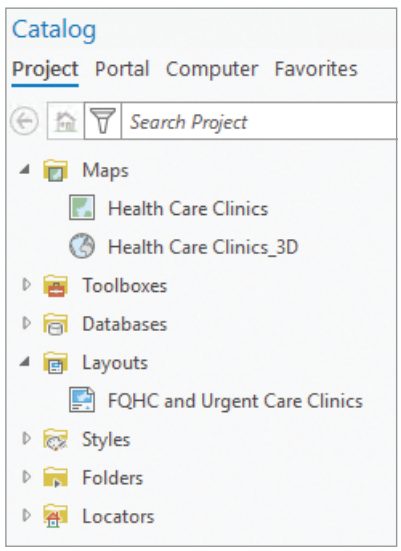
1. On the **View** tab, in the **Windows** group, click **Catalog Pane**.

   The **Catalog** pane appears.

2. If the pane isn't docked on the right side of the ArcGIS Pro window, right-click the top of the pane and click **Dock**.

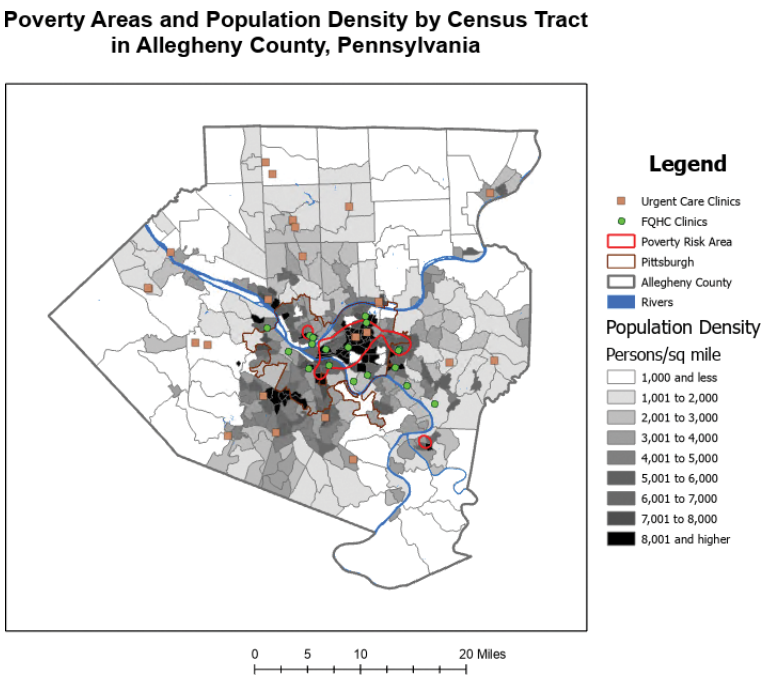
3. In the **Catalog** pane, click the arrows on the left of both the **Maps** and the **Layouts** folders to expand the folders, revealing what's been built so far for this project.

   You are viewing the **Health Care Clinics** map, but you'll also view a 3D version of the same map at the end of this chapter.



4. In the **Catalog** pane, under **Layouts**, double-click **FQHC and Urgent Care Clinics**.

   ArcGIS Pro displays the layout on a new tab, next to the tab for the map. The map is the main element of a layout, which also includes the title, legend, and scale bar. You'll learn about making layouts later.



5. At the upper right of the **Catalog** pane, click the **Auto-Hide** button (the push-pin) to temporarily hide the pane.

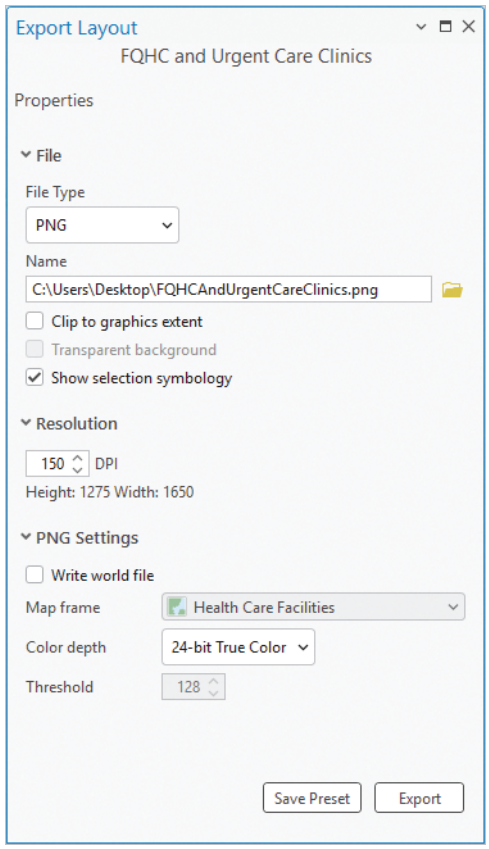
   The **Auto-Hide** button will collapse the panes along the edge of the screen. You can restore and hide the **Catalog** pane as needed by clicking the **Catalog** tab.

   Next, you'll use a tool to export the map layout as an image file that can be used in a report or presentation or on a website. ArcGIS Pro has hundreds of tools, and you'll use many of them in this book. Each tool has a dialog box (a pane) for values (parameters) you need to add to run the tool, generally by choosing values from lists or entering values by typing.

6. On the **Share** tab, in the **Output** group, click **Export Layout**.

   The **Export Layout** tool pane opens, ready for you to add and type parameters as needed to export an image file of the layout.

7. Complete the following steps to add parameters:
   - On the **File Type** drop-down menu, click **PNG**.
   - For **Name**, click the **Browse** button, browse to save the file to your desktop, and rename it **FQHCAndUrgentCareClinics.png**.
   - For **Resolution**, type **150**.
   - On the **Color Depth** drop-down menu, click **24-bit True Color**.
   - Click **Export** to run the tool.



8. On your desktop, double-click **FQHCAndUrgentCareClinics.png** to open the image in a photo viewer.

9. Examine the image and close the photo viewer.

10. Click **Save Project** to save your project.

YOUR TURN

Next to the **FQHC and Urgent Care Clinics** layout tab, click the **Health Care Clinics** map tab to activate it. In the **Contents** pane, turn on the **FQHC Buffer** and **Urgent Care Clinics Buffer** feature classes. The **FQHC Buffer** shows circles with a one-mile radius, and the **Urgent Care Clinics Buffer** shows circles with a five-mile radius, each drawn around its respective clinics. Allegheny County, outside Pittsburgh, consists mostly of suburbs for which expected travel distances are greater than distances in urban areas. The buffers are partly transparent, allowing you to see the population density below them. By comparing the clinic service areas and the population density, you can get an idea of how services are apportioned. Next, switch back to the **Layout** tab. ArcGIS Pro has already added the newly displayed feature classes to the layout map and legend. When you've finished, save your project.