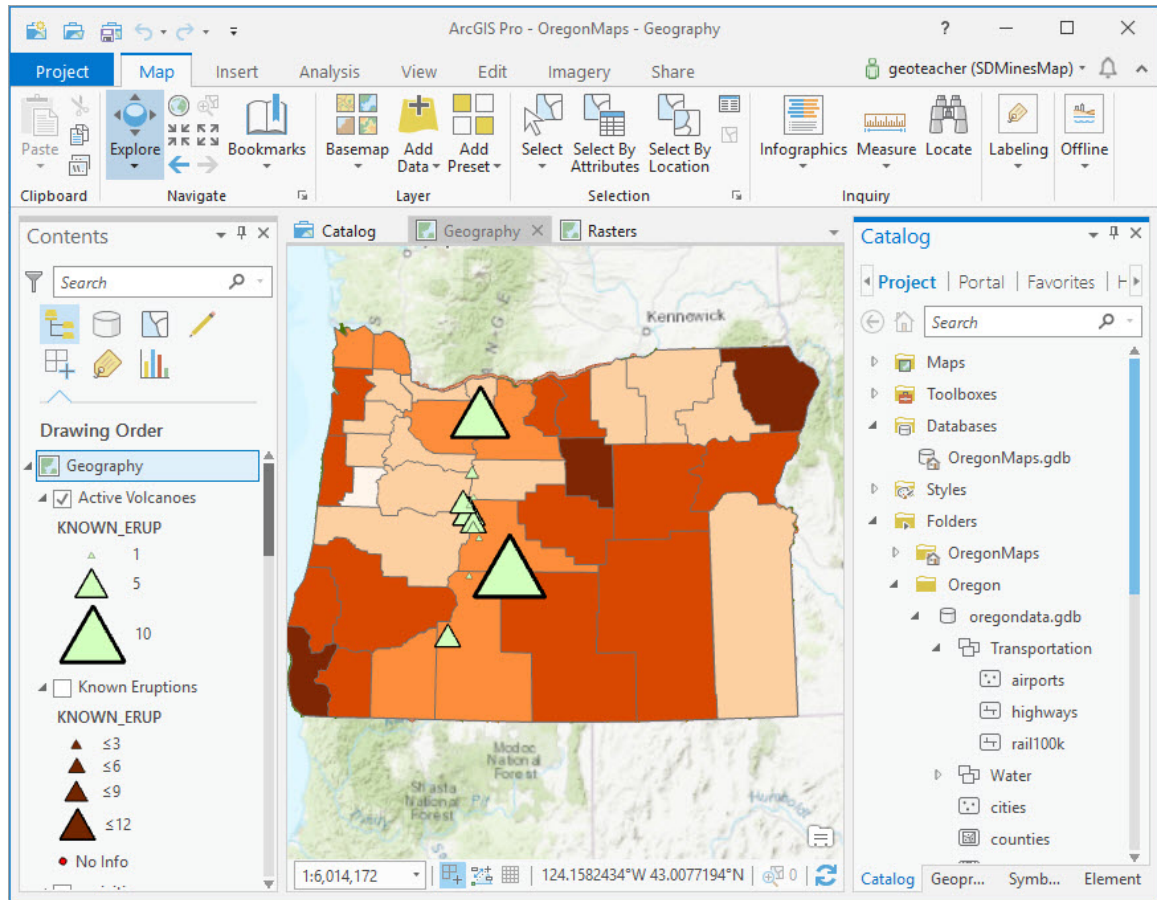


# Chapter 1

## Contemplating the switch to ArcGIS Pro

### Background

ArcGIS Pro will seem both familiar and completely new to users of ArcMap and ArcCatalog. The GUI arrangement echoes the design of ArcMap: the map in the middle, map layers on one side, the data catalog on the other, with menus above (figure 1.1). Much of the architecture and terminology will persist in the new paradigm: geographic data, maps, layouts, geoprocessing tools, tables, joins, and so on. However, the implementation and details of how these functions are accessed and manipulated takes a completely different approach in some cases. For users who know ArcMap well, the experience will be initially frustrating as one searches for familiar tools and tasks that no longer appear in the same spot, or as one gets used to a totally new mindset for some tasks. Too, ArcGIS Pro has only gradually developed the capabilities already available in ArcMap, so it is possible that the feature sought has not yet been implemented.



**Figure 1.1.** ArcGIS Pro showing a map of Oregon.

However, tapping down the chagrin and opening up to a new way of doing certain things will have its rewards. New users unfamiliar with ArcMap seem to learn ArcGIS Pro more quickly as it follows modern software GUI conventions (a ribbon with tabs and context-sensitive menus). In many aspects, it is more intuitive and more efficient. After some months of using ArcGIS Pro exclusively, I had to return to ArcMap for a month, and my immediate reaction was “Oh my, how clunky.” Hopefully after some practice, you too will grow to like the new software.

## System requirements

ArcGIS Pro requires a 64-bit multiprocessor machine with at least a dual core, and a quad-core processor or higher is recommended. Unlike ArcMap, ArcGIS Pro operates in a multithreaded manner, enabling it to take full advantage of multicore computers, which ArcMap could not. Significant performance improvements should

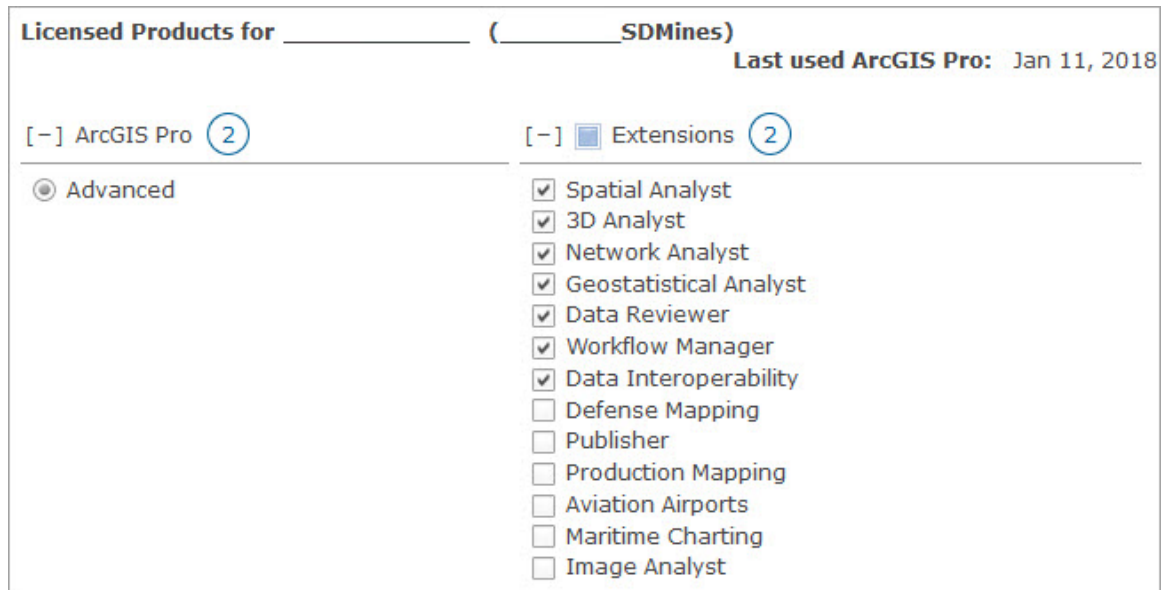
be expected in most cases. ArcGIS Pro operates better when more cores are available to it.

ArcGIS Pro requires a minimum of 8 GB of RAM and a good graphics card with at least 2 GB of RAM and 24-bit display color depth. For a complete description of system requirements, consult the Esri product website, <http://pro.arcgis.com/en/pro-app/get-started/arcgis-pro-system-requirements.htm>.

ArcGIS Pro is tightly joined with ArcGIS Online, a cloud-based system built to encourage sharing of GIS data, workflows, and other resources between organizations and users. It is strongly recommended that the user have an ArcGIS Online organizational account, which provides access to significantly more data and tools. ArcGIS Pro is also designed to run with a fast internet connection. Although the software can be run offline, provided the data sources are stored on the local computer, it will temporarily lose access to basemaps and internet-provided map services. If you're planning to use ArcGIS Pro offline regularly, such as on a field laptop, it makes sense to limit maps and tools to use only local data on the computer's hard drive.

## Licensing

Because ArcGIS Pro is designed to interact with ArcGIS Online, its preferred method of licensing is an ArcGIS Online organizational account. In this method, the administrator of an ArcGIS Online organization creates a user account and assigns to it an ArcGIS Pro license from among the total number allotted to the organization. Extensions may also be assigned if available. Figure 1.2 shows the screen the ArcGIS Online administrator uses to assign licenses and extensions to a user account. When starting ArcGIS Pro, users are asked to sign into ArcGIS Online using their account, which simultaneously licenses the software and provides users access to any content they have created within ArcGIS Online.



For continuity with previous licensing methods, Esri also offers a concurrent licensing model and a single-use license model, both previously used for ArcMap licensing. In the concurrent model, a license manager program runs on a server and allocates licenses at a user's request. This model is often called a "floating license," because it is assigned, and then taken back when the user is finished, allowing a fixed number of licenses to be shared across many computers. In the single-use model, the license is tied to a specific computer.

**Figure 1.2.** Configuring an ArcGIS Pro license for a user's ArcGIS Online account.

## Capabilities of ArcGIS Pro

Although it is different in many ways, ArcGIS Pro will eventually have the equivalent capabilities of ArcMap and more. This updating process is ongoing, with new capabilities being added with each release. ArcGIS Pro 2.3, for which this book is tested, represented a significant milestone in which nearly all of ArcMap's key functions were present, and additional capabilities and improvements are still being added.

ArcGIS Pro integrates the functions of ArcMap, ArcCatalog, ArcToolbox, ArcScene, and ArcGlobe within a single interface so that 3D data visualization and analysis no longer require opening a separate program. ArcGIS Pro retains the Python® and ModelBuilder™ customization modules. Certain aspects that users are accustomed to using as separate features, such as COGO or Maplex™ for ArcGIS®, are now integrated directly into the

program. The familiar extensions, such as Spatial Analyst or 3D Analyst, continue to be available and work in much the same way, as additional licensed tools in ArcToolbox.

However, users should be aware that the very design of ArcGIS Pro precludes certain familiar aspects of ArcMap from working precisely the same way. In ArcGIS Pro, the design criteria specify that most actions are geoprocessing events (taking advantage of the multiprocessor computer). Tools have replaced some of the common right-click commands, either as a temporary measure until the functionality is integrated into the GUI, or as a design choice. For example, instead of opening a window to execute a selection using table attributes with the Query Builder, you must run a tool named Select Layer By Attribute.

**TIP** *Can't find something? Try searching for a tool.*

## When should I switch?

Several factors will affect the decision of when to switch to ArcGIS Pro.

Reasons for making the switch include:

- Improved performance that takes advantage of multicore architecture
- Seamless integration of two- and three-dimensional visualization, analysis, and editing
- Improved flexibility in creating dynamic labels
- Creating multiple layouts based on the same map or maps
- Tight integration with ArcGIS Online, making it easier to share maps and map services
- A more modern and intuitive GUI
- Expanded use of defaults that can make life easier for inexperienced users
- The product life cycle of ArcMap (See the Esri Support Product Life Cycles website.)

ArcMap users may dispute the “more intuitive interface” claim when encountering ArcGIS Pro for the first time. In truth, the GUI is probably more difficult to learn if you already know ArcMap and have become accustomed to certain ways of doing things. In general, new users find the ArcGIS Pro GUI easier to learn. Over time, you get used to it.

The software also implements reasonable defaults more than ArcMap, hiding complications from beginners. This feature has

both benefits and pitfalls. For example, ArcGIS Pro does not automatically warn users when two different geographic coordinate systems (datums) are being used in the same map (although this warning can be turned on). This choice makes little difference unless the user is working at very large scales with precise data, and in many situations the issue can be safely ignored. However, it can cause difficulties later if inexperienced users compile data for a project without being aware that the feature classes and rasters use multiple datums.

When ArcMap retires, the software will continue to be available, and people can continue to use it, but it will no longer be updated or supported. A similar process occurred when ArcInfo® Workstation and ArcView became ArcGIS® Desktop.

Delaying the switch might be wise under some circumstances:

- The organization does not have enough computers capable of running ArcGIS Pro.
- Some critical functionality may not yet be available.
- The organization has many custom scripts or tools that must be updated and tested.
- Third-party extensions (such as HEC-RAS or MODFLOW) may not yet be supported.
- Maps and layouts must be shared with ArcMap users.

Several other considerations regarding data must also be considered:

- ArcGIS Pro does not recognize personal geodatabases or ArcInfo coverages.
- The organization and structure of maps and layouts are different.
- Data management in ArcGIS Pro has complications not seen in ArcCatalog.
- Absolute/relative paths are now fixed by default and have less flexibility.
- The Excel™ interpreter is different and seems less forgiving than the one in ArcMap.

As discussed in the next section, even though the data format is consistent (the geodatabase), the way that files are organized is quite altered and not as flexible. To switch to ArcGIS Pro, you must learn different ways of doing things. For example, it is extremely difficult to rename a project, so you are stuck with the initial name, even if you decide it is inappropriate or confusing. You no longer have a choice whether to use absolute or relative paths in a document; the choice is made by the software. This feature removes a potential trap for inexperienced users, and the defaults

usually work well, but experienced users who are accustomed to controlling this option may find that they need to change how they organize datasets.

If you use many Excel files, problems may occur. The Excel interpreter has had difficulty reading files, in my experience, and usually I must resort to the comma-delimited CSV file format instead. The errors can be delayed and subtle. For example, in one project an Excel table imported just fine but generated fatal errors when it was exported to a geodatabase. A CSV version of the same table was imported and exported to the geodatabase without trouble.

Mapping differences to consider before switching:

- The default symbols follow a different cartographic style.
- Previous custom styles (such as Civic or Forestry) are not included and must be imported.
- Labels are more flexible, but the options are more numerous and take getting used to.
- Annotation editing tools are still catching up to ArcMap in functionality and reliability.

The symbol styles have been changed to favor web mapping applications and may make it difficult to see multiple layers well. Dark colors with white outlines dominate the default symbols, and although they can be changed, it adds an extra step when a feature class is added to a map. Previous custom style sets must be imported from the ArcMap symbol folder, although if a map document is imported, the symbols will be included. In general, the map document import function works well, although a few settings may not be preserved and will need to be reset, such as the data frame clip setting.

Annotation can no longer be saved in a map as graphic text; it can only be created as a geodatabase feature class. The annotation editing tools have lagged in development. ArcGIS Pro 2.0 had one annotation construction tool (Straight), and ArcGIS Pro 2.3 has three (Horizontal, Straight, and Curved). The workflow for placing unplaced annotation appears to be a manual process of editing the attribute table, without the convenient overflow window. Users who rely heavily on annotation may wish to stick to ArcMap a while longer.

Geoprocessing considerations to consider before switching:

- Some familiar menu tasks have been replaced by tools.
- Tool outputs are now saved to a project geodatabase by default.
- Background processing is “gone.”

Overall, geoprocessing is similar, except that familiar functions, such as joining two tables, may now require running a tool instead of opening a menu. The spatial join, available in ArcMap as a relatively simple window, must now be run as the full tool, and although the tool has more options, it is complex compared with the simple menu in ArcMap.

The background geoprocessing option has also disappeared as a separate option, but only in a sense. ArcGIS Pro, with its multi-threaded design, essentially runs all tools in the background, and it does so more quickly and reliably than the ArcMap background geoprocessor.

All these factors and considerations will influence an organization in deciding when it is time to switch to the new software. Because ArcMap/ArcCatalog and ArcGIS Pro can be installed and run on the same computer, users have more time and flexibility when making the switch. (However, it is not recommended to run both programs at the same time: both are memory hogs, and issues may result if they try to modify the same data simultaneously). They use the same data models so that you can work with the same datasets using either program. However, maps and layouts are completely different. You can import an ArcMap map document to ArcGIS Pro and save it to the new format, but ArcGIS Pro cannot edit map documents, and ArcMap cannot work with ArcGIS Pro layouts. Once created, an ArcGIS Pro layout cannot be saved to the older map document format.

## Time to explore

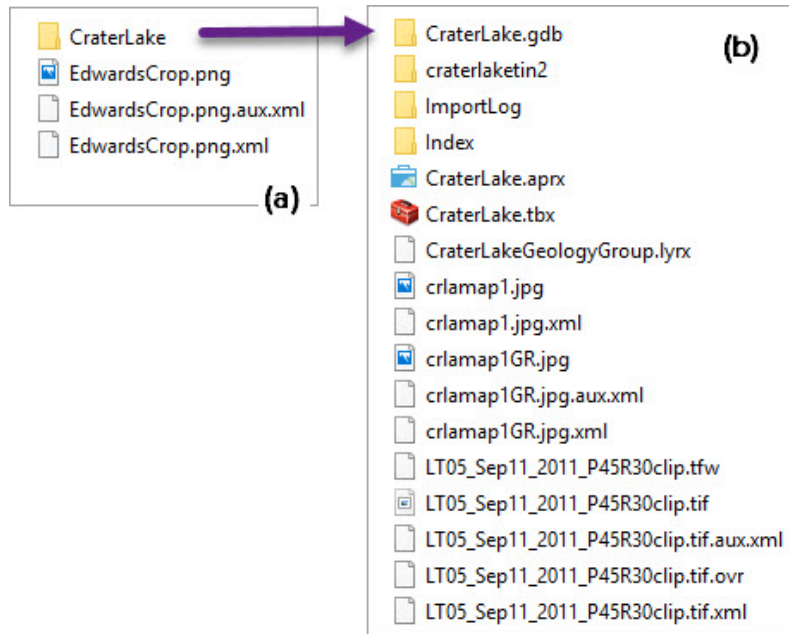
This exercise assumes that you have installed ArcGIS Pro, have been assigned an ArcGIS Pro license, and possess an ArcGIS Online organizational account. It is helpful to be familiar with the ArcGIS Online terminology for services, such as web maps, feature layers, and so on.

### Objective 1.1: Downloading the data for these exercises

A set of data has been assembled to use with this book, and the data must be downloaded and installed on your computer. It is smart to keep data organized. It is best to put GIS data on drive C; the Desktop and user Documents folders don't always work well,



especially in networked environments. You can download the data from ArcGIS Online, as described next.



**Figure 1.3.** Contents of the SwitchToProData folder as shown in Windows Explorer.

The data is saved to a book group named Switch to ArcGIS Pro (Esri Press) in the Learn ArcGIS organization.

1. **Go to <https://www.arcgis.com> and log in with an ArcGIS Online account.**
2. **On the Home tab, in the Search box, type Switch to ArcGIS Pro, and then click the Search for Groups entry in the list. If no groups are found, turn off the option to “Only search in (your organization).”**
3. **Click the link to open the Switch to ArcGIS Pro (Esri Press) group and find the data, a zip file named SwitchToProData.**
4. **Click the thumbnail and download the file, saving it to a location on drive C, rather than in the Documents library or on Desktop.**

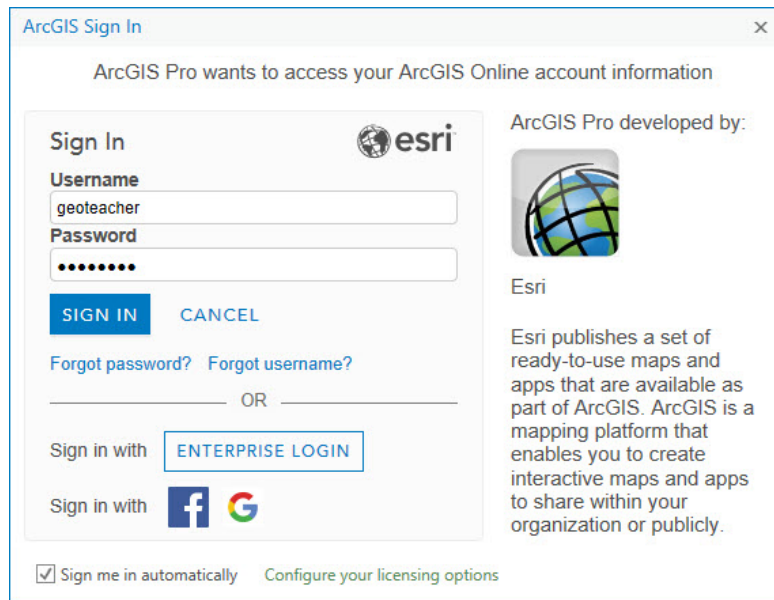
## 5. Extract the zip file. It will create a folder named

**SwitchToProData.** The SwitchToProData folder contains an ArcGIS Pro project named CraterLake and a PNG image named EdwardsCrop (figure 1.3a). Within the CraterLake project folder (figure 1.3b) is a file geodatabase, a TIN, a project file (.aprx), a layer file (.lyrx), a toolbox, a couple of JPEG (.jpg) images, and a multiband Landsat 5 scene.

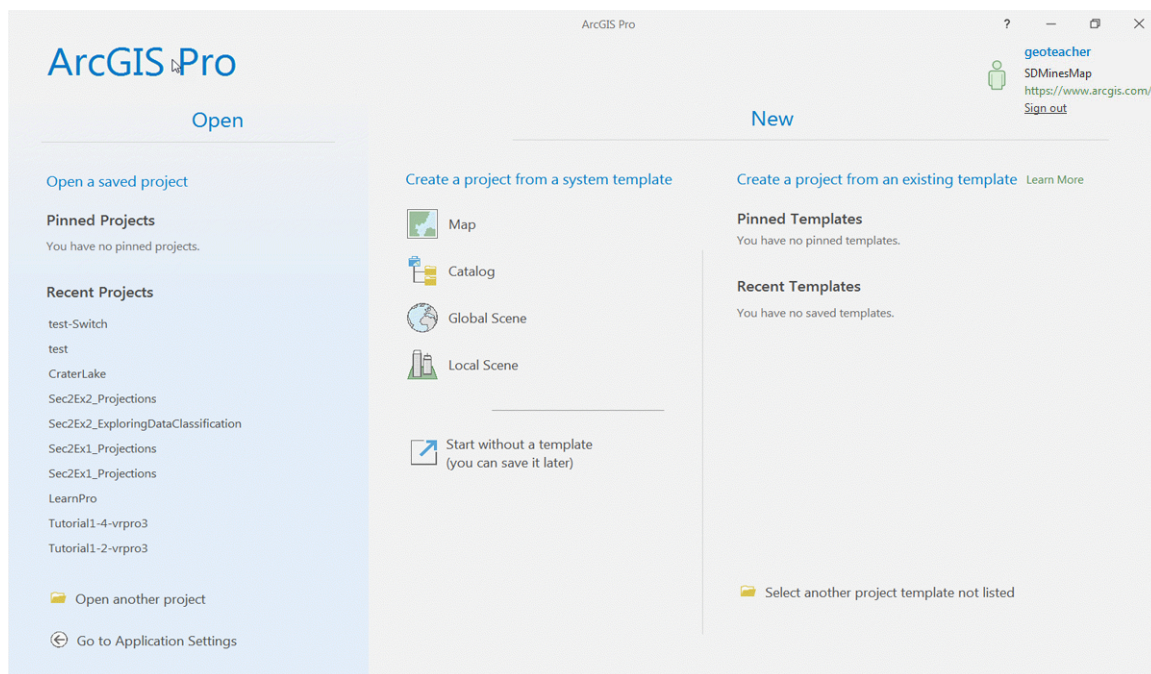
## Objective 1.2: Starting ArcGIS Pro, signing in, creating a project, and exploring the interface

The preferred licensing model for ArcGIS Pro uses a named user account, which is an ArcGIS Online subscription organizational account that your administrator has configured with an ArcGIS Pro license.

Instead of a map document used by ArcMap, ArcGIS Pro uses a more complex data structure called a *project*, which will be presented in detail in chapter 3.



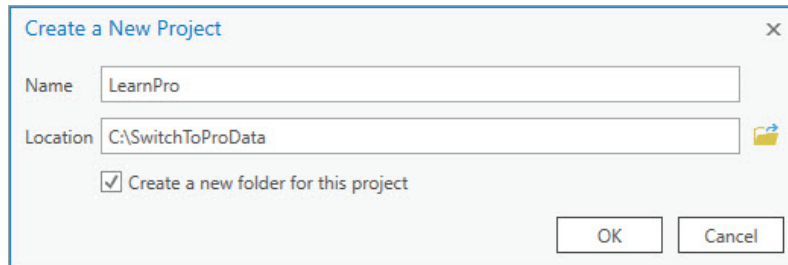
**Figure 1.4.** The first time ArcGIS Pro starts, you will be prompted to enter your ArcGIS Online user name and password.



**Figure 1.5.** The initial start screen of ArcGIS Pro.

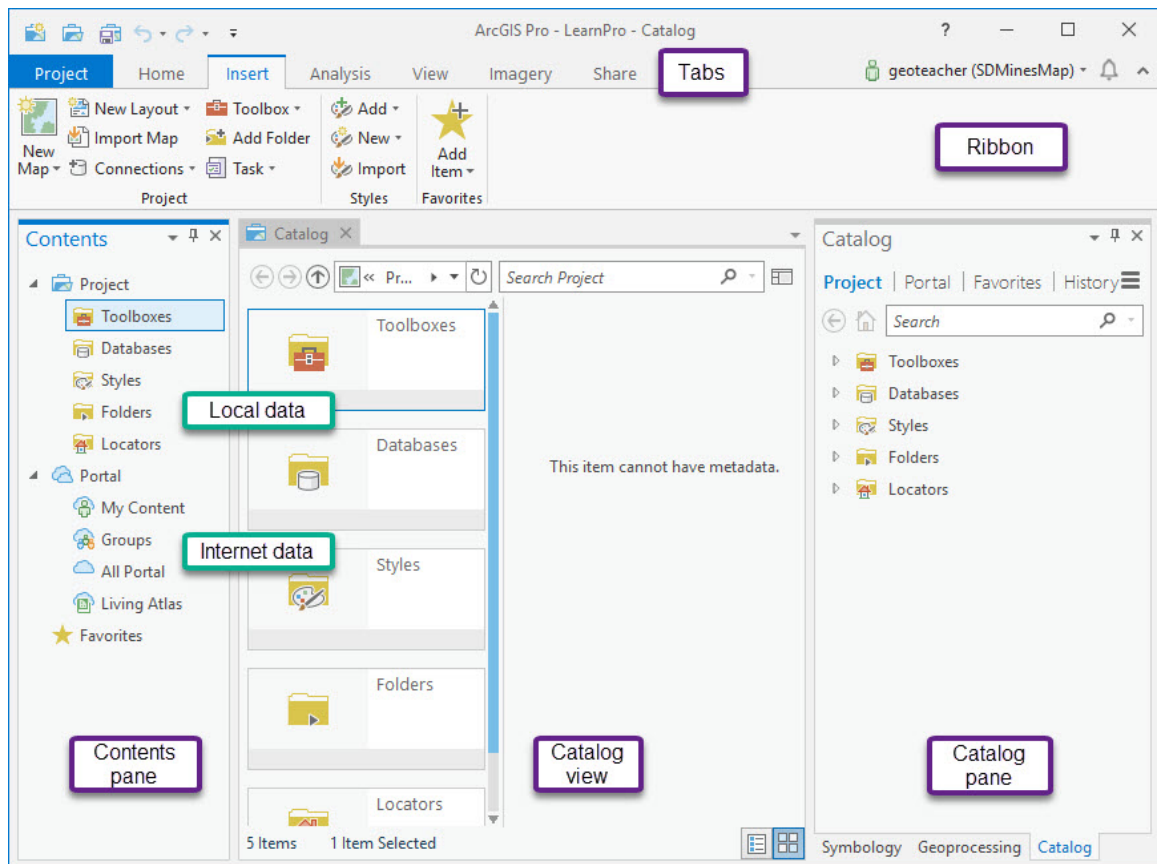
- 1. Start ArcGIS Pro (figure 1.4) and log in using your ArcGIS Online account.** The initial start screen for ArcGIS Pro presents a variety of options (figure 1.5). On the left, you can open a project that is already saved by choosing one from the recent list or a pinned list, or by browsing for another one. The middle section is used to create a new project using one of the system templates: Map, Catalog, Global Scene, or Local Scene. The key difference between them is the initial type of display that will be created. The section on the right lets you access your own templates.
- 2. In the middle section, under the heading Create a project from a system template, choose the Catalog template (figure 1.5).**

3. Enter **LearnPro** for the project name (figure 1.6). Click the **Browse** button to specify the new **SwitchToProData** folder as the location. Keep the option to create a new folder, and finish creating the project.



**Figure 1.6.** Creating a new, blank project named LearnPro.

4. Examine the interface.



**Figure 1.7.** The ArcGIS Pro GUI showing a new project.

**TIP** *If your interface looks different from figure 1.7, close every window using the X in the upper-right corner, until only the tabs remain. Then open the View tab and click the Contents button, the Catalog Pane button, and the Catalog View button (preferably in that order). You can use the View tab at any time if you inadvertently close one of these main panes.*

- 5. Examine the top of the GUI containing the tabs used to access features and functions.**
- 6. Review the Contents pane (probably on the left side).** This pane behaves much like the ArcMap Table of Contents.

Unlike the Table of Contents in ArcMap, which shows only map layers, the Contents pane in ArcGIS Pro portrays other types of content as well, as it does here in showing the contents of the project.

The middle section shows the Catalog view, which portrays the metadata for, or a preview of, items selected in the Contents pane. It is also used to edit metadata.
- 7. Click several entries in the Contents pane. The Catalog view updates to show the items contained within the clicked item.**













Note that in the top half of the Contents pane, the Project folder links to resources saved to the computer. The bottom half, the Portal folder, accesses internet servers.
- 8. Peruse the Catalog pane on the right side; it is analogous to the Catalog window in ArcMap. Although it is similar to the Catalog view in the center of the GUI, it has fewer functions (for example, not allowing you to preview data).** The terms pane and view have specific meanings in ArcGIS Pro. Panes are dockable windows that contain commands and tools, whereas views contain objects that you are working with, such as a map, 3D scene, layout, or table. A window is a container that can display multiple panes or views. Three windows are visible in figure 1.7: one containing the Contents pane, one containing the Catalog view, and one containing the Catalog pane.


- 9. Compare the bottom of the Catalog pane in figure 1.7 with your ArcGIS Pro GUI.** The window in the figure contains three tabs representing three different panes docked in this window: Symbology, Geoprocessing, and Catalog. Your configuration may not match: the Symbology and Geoprocessing tabs are probably not visible in your project at the moment, because you may not have opened the panes yet. One characteristic of the ArcGIS Pro GUI is that it constantly changes depending on what the user is doing.

### Objective 1.3: Accessing maps and data from ArcGIS Online


ArcGIS Pro is designed to work closely with ArcGIS Online, so that you can access maps and data that have been saved by others. In the Contents pane, the upper section, Project, lists data stored on the local computer or a local network drive. The lower section, Portal, lists data available in ArcGIS Online or other GIS servers, including your own saved content, My Content; content available to your ArcGIS Online groups, the table in the graphics Groups; all content available in ArcGIS Online, All Portal; and the ArcGIS Living Atlas of the World data available to ArcGIS Online subscribers.

Much of the content accessed by ArcGIS Pro (figure 1.8) is like the content available to ArcMap, although the terminology has changed. A feature service and an image service are now called a *feature layer* and an *imagery layer*, respectively. Next, you can search for and add a couple different types of data.

 Name in ArcGIS Pro	Name in ArcMap	Description
 Feature layers	Feature service	Serve point, line, or polygon features and their attributes
 Imagery	Image service	Serve raster data products such as satellite images or aerial photography in analyzable form.
 Map image layers	Map service	Map cartography based on vector or raster data dynamically rendered and served as image tiles.
 Tile layers	Hosted tile services	A collection of web-accessible tiles that reside on a service, prerendered for rapid display. Includes basemaps and vector basemaps.
 Elevation layers	Elevation services	Cached elevation image tiles in a compressed format, suitable to show terrain in 3D scenes.
 Web tools	Geoprocessing services	Geoprocessing function that runs on the GIS server rather than using local GIS software capabilities.
 Scenes	Scenes	Symbolized 3D spatial content for visualization. May include 2D and 3D layer services.
 Web maps	Web maps	Maps based solely on GIS services. May include other types of services listed in this table.
 Packages	Packages	Data uploaded to ArcGIS Online for sharing. Includes layer, map, project, rule, or geoprocessing packages.
 Scene layers	Scenes	Collection of 3D objects and z-values, including points, 3D objects, integrated meshes, or point clouds.
 Tables	Tables	Rows and columns of information. May contain locations and be drawn on the map.

- In the Contents pane, click the All Portal entry and type a search term in the box in the Catalog view.**
- Note the different types of items available. Click on one of the items to view its metadata.**
- Click the Preview option at the bottom of the metadata section to examine a preview. Switch between the Details and Preview tabs as needed.**
- Take a moment to examine the Insert tab that is currently visible.**
- Right-click a web map  in the Catalog view and click Add and Open.** A web map is a shared map that accesses only GIS services. The map and its contents are displayed in the project. A new map view is added to the center window, and the Contents pane now shows the map layers, much like the ArcMap Table of Contents. In the Catalog pane, a new heading, Maps, is added.

**Figure 1.8.** Types of services available to ArcGIS Pro in ArcGIS Online. The terminology has changed somewhat for ArcGIS Pro, and the services are shown with different names than when adding them in ArcMap.

6. **Expand the Maps entry in the Catalog pane and note that the map is now listed there.**
7. **Examine the ribbon along the top.** It switched automatically from the Insert tab to the Map tab when the map was added.
8. **Switch back to the Insert tab.** You may notice that additional commands are now available. Tabs update depending on what the user is doing and what is open.
9. **Return to the Map tab, and examine it for familiar capabilities, such as the basemap, bookmarks, adding data, and so on.** The Catalog view remained open as a second tab in the display window.
10. **Use the tabs to switch back and forth between the map view and the Catalog view.**
11. **Open the Catalog view again, right-click a feature layer  (not any other kind of layer) from your search group, and click Add to New > Map to add it to a new map, different from the first.**
12. **In the Contents pane, click twice slowly on the map name (currently Map) and change it to something more descriptive.**
13. **Examine the contents of the Maps folder in the Catalog pane, noting that it now has two maps listed.**
14. **Close one of the maps using the X on the tab at the top of the display window.** The map closes but is still available in the Catalog pane.
15. **Click the Save button on the Quick Access Toolbar at the top of the GUI to save the LearnPro project.** The connections to your new maps will be saved to the project.

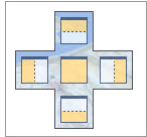
Like ArcMap, ArcGIS Pro stores only links to these ArcGIS Online maps and data services.

**TIP** *Maps in projects are analogous to data frames in an ArcMap map document.*



## Objective 1.4: Arranging the windows and panes

As in ArcMap, windows can be docked in the program or float above it. Objects within windows can be rearranged in different ways: stacked on top of each other, side by side, top over bottom, and so on. The docking icon should already be familiar to ArcMap users, and it works much the same way in ArcGIS Pro (figure 1.9).



**Figure 1.9.** The docking icon is used to arrange panes within a window: stacked (drop on the center) or side by side (left, right, top, or bottom).

- 1. In the display window, click the map tab and drag to pull it out of the program onto the desktop, making it a floating window.**
- 2. Drag it back into the center display area to make the docking icon appear. Drag the map tab to the center of the icon and release to stack the map back on top of the Catalog view again.**
- 3. Drag the map away again and use the docking icon to arrange the map view and Catalog view side by side. Experiment until all five docking locations have been used.**
- 4. In the Catalog pane, open the Maps entry, if needed, and double-click the second map to open it.**
- 5. Experiment with arranging the three views.** Panes can also be arranged within their windows.
- 6. Open the second map, the one containing the feature layer, and click its title bar to ensure that it is the active view.** The Contents pane shows the content of the active view.
- 7. If the feature layer loaded as a group layer, expand it until an individual layer is visible.**
- 8. In the Contents pane, right-click the layer and click Symbology to open the Symbology pane.**

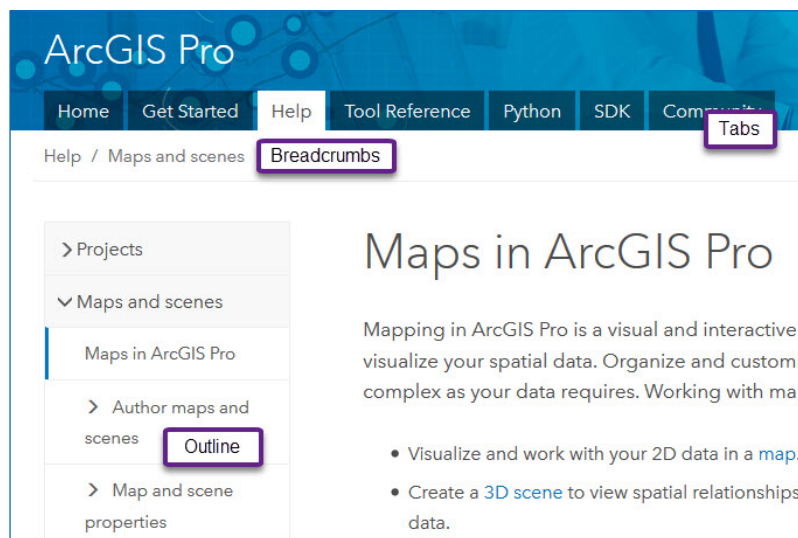
- 9. Drag and dock the Symbology pane in different locations: below the Contents pane, on top of the Catalog pane, next to the Catalog pane, and so on until comfortable with arranging panes.**
- 10. Save the LearnPro project.**

*TIP* When two panes are stacked in a window, use the top bar to move the window with all the panes together. To move a single pane out of a window, click its tab on the bottom.

### **Objective 1.5: Accessing the help**

The help files are normally accessed in a web browser window, rather than being part of the program as in ArcMap. For offline work, the help files can also be downloaded and installed separately.

- 1. Open the Project ribbon and click Help.** Your default browser opens to the help pages.
- 2. Widen the browser window, if needed, to see the outline on the left and the text on the right (figure 1.10).**
- 3. Expand some entries in the outline to explore the content and organization.**
- 4. Find the Search icon and click to open the search page. Type a search term, such as labels, click Search or click Enter on your keyboard, and select one of the topics that appears.**
- 5. Examine the breadcrumb trail to locate the content in the Table of Contents outline. Click on a higher level to climb out to more general topics.**
- 6. Examine each of the tabs, and then return to the Help tab.**
- 7. Spend some time exploring ArcGIS Pro Help until you are comfortable using it.**
- 8. Minimize the browser, making the help access quicker next time, and return to ArcGIS Pro.**



**Figure 1.10.** The help for ArcGIS Pro.

## Objective 1.6: Importing a map document

ArcGIS Pro can easily import existing map documents from ArcMap. Every data frame in the map document will be imported as a map, and new layouts will be created in the project. Folder connections needed to access the data in the map document, styles used to display the features, and most data frame and layer settings will be imported. If you have a map document (.mxd) on your computer, you can try importing it now.

1. **Close any open maps.**
2. **Open the Insert tab, and in the Project group, click the Import Map button.**
3. **Navigate to a map document, select it, and click OK. Wait while the map document imports from ArcMap—it may take a few minutes.**
4. **Examine the map views in the main window. One is created for each data frame in the map document.**
5. **In one of the imported maps, double-click a layer to open its properties and examine the Source setting. Close the properties when finished.** The data upon which the map layers are based is imported as paths to the original source in its original location. No data will be copied into the project.

- 6. In the Catalog pane, expand the Layouts entry and find the new layout added from the map document. Double-click it to open it.** Most settings will be copied to the new layout, but you may find that a few are not because of differences between ArcMap and ArcGIS Pro. You may need to adjust some layouts or maps to get the same result as the original. Once imported, however, layouts cannot be exported back to ArcMap format.
- 7. Examine the layout and see if you notice any difference between the ArcGIS Pro and ArcMap versions.**
- 8. In the Catalog pane, expand the Styles entry.** Custom styles used in the map document, if any, would be imported and shown here.

Remember, ArcGIS Pro can have multiple layouts.
- 9. Import another map document if you wish.**
- 10. Save the LearnPro project to save the imported map(s) and layout(s).**