no longer available, look for similar ones.)

> Help > Projects > Catalog pane, catalog view, and browse dialog box

> Help > Projects > Terminology for working with projects

> Help > Project > Project items

> Help > Maps and scenes > Interact with maps and scenes

Mastering the Skills

Preparing to begin

The tutorials in this book use a data set available for download from the book web site at http://www.mhhe.com/Price_pro2e. These data must be installed before starting the tutorials. Each step of the tutorials and all skills learned in this book are illustrated by video clips. See the web site for instructions on downloading and using the tutorial data and videos.

> A **TIP** gives useful information about the program or settings that will save time or that are important to know. Pay attention to them.

> **TIP:** In these tutorials, values you must enter are shown in this font: *type this*.

Teaching Tutorial

The following examples provide step-by-step instructions for doing tasks and solving problems in ArcGIS Pro. The steps to do are highlighted with an arrow →; follow them carefully.

TIP: This book comes with a folder of data called gisclass. Install it on the C:\ drive of the computer and not in your Documents folder, Desktop, or a network drive. Once installed, remember where it is to access it when needed.

Exploring an ArcGIS Pro project

ArcGIS Pro (or Pro, for short) organizes geospatial work in a **project**, a container that remembers the data, maps, and tools being used and organizes them into one folder.

1→ Start ArcGIS Pro and log in with an ArcGIS Online subscription account.

1→ Choose the *Open another project* link. Click Computer to access the computer files.

1→ Navigate to the C: drive and then to the gisclass folder (wherever you placed it). It contains two folders, a ClassProjects folder for storing projects related to this book and the mgisdata folder containing additional GIS data.

1→ Navigate into the ClassProjects folder and then into the CraterLake project folder.

1→ Click the project file, CraterLake.aprx, to highlight it. Click OK.

TIP: The four-letter .aprx code is called an extension. Whether it is shown depends on the Windows folder settings. If you don't see it, ignore it and other extensions for the time being.

The center of the program window is occupied by a **map view** of Crater Lake, Oregon. The name of the map, Crater Lake, appears in the upper-left corner on a view tab. To its left, the Contents pane shows the map name at the top and the different layers that make up the map (rock types, faults, volcanic vents, etc.).

> 2 → Click the Lake check box to turn off the Lake layer. The rock units of the floor of the caldera are revealed.

> 2 → Below the Lake layer, examine the Crater Lake Geology entry, known as a group layer. Uncheck the box next to it to turn all layers in the group off.

> 2 → Turn on the Hillshade layer, a raster that shows the terrain.

> 2 → Turn on the Crater Lake Geology group layer again. The Rock Types layer is slightly transparent so that the terrain beneath it can be seen.

> 2 → Turn the Lake layer back on.

The Contents pane has several icons that open **panels** with different functions (Fig. 1.12).
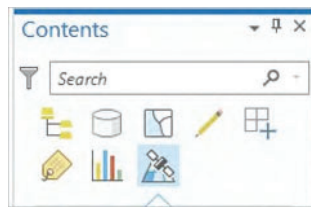
Fig. 1.12. Icons
that open panels
of the Contents
pane

Source: Esri

TIP: Menus and panes may change slightly depending on your software version, and they are also customizable, so they can appear slightly different in the figures from what you see on your screen.

3 → In the Contents pane, hover over the first icon until its name appears, List By Drawing Order. This is the default view of the pane.

3 → Click on the List By Data Source icon (the second one), which shows the source of the data used in the map, which shows the source of the data used in the map (the location of the data file). Most of the data comes from the gisclass folder, but the Topographic layer is an Internet-based GIS service.

3 → Click through each of the remaining icons to examine the different panels.

4→ When finished, return to the List By Drawing Order panel (the first one), which can change the order of drawing layers. Layers are drawn in order from bottom to top.

4→ Click and drag the Lake layer above the Vents layer. Notice that the vents in the lake disappear because they are covered by the lake polygon when drawn in this order.

4→ Move the Lake layer back between the Faults and Crater Lake Geology layers.

The top of the window organizes the program functions using ribbons titled **Project**, **Map**, **Insert**, and so on. Each ribbon has different buttons and settings, organized into functional groups.

5→ Click the Map ribbon tab and examine its groups: **Clipboard**, **Navigate**, **Layer**, and so on.

5→ Click each of the main ribbon tabs in turn and examine the groups and buttons.

The ribbon menu is context-sensitive: different ribbons may be visible depending on what is selected in a pane or view. Certain buttons may be accessible or unavailable (dim) based on what the user is doing.

6→ In the Contents pane, click to highlight the Crater Lake map title. Examine the ribbon titles.

6→ In the Contents pane, click on the Vents layer name to highlight it. Notice that a new ribbon group appears, **Feature Layer**, with three additional ribbons:

Appearance, **Labeling**, and **Data**.

6 → Click on each of the three **Feature Layer** sub-ribbons and examine the groups and buttons.

The **Feature Layer** ribbons are used to control the behavior of a layer: how it appears, whether it has labels, and so on. These buttons only make sense when applied to a particular layer, which is why a layer must be selected to make them visible.

> **TIP:** If a particular ribbon is not visible, check to make sure that the appropriate item is highlighted to make the ribbon appear.

> **TIP:** The tutorial instructions refer to ribbon functions using the format **Ribbon Name: Sub-ribbon Name: Group: Button > Drop-down** button options. The **Sub-ribbon Name** and **Drop-down** portions may not always be present.

7 → In the Contents pane, click the Lake layer to highlight it.

7 → Click the **Feature Layer: Appearanc**e ribbon and find the **Effects** group. Set the Transparency to about 50%, revealing the rock units underneath.

7 → Click the Rock Types layer and click Swipe in the **Effects** group. Place the cursor on an edge of the map; then click and drag toward the center to reveal the Hillshade layer.

7 → Click on the **Effects: Swipe** tool again, but notice that it does not turn off.

Some buttons stay in effect until another button function is selected, such as choosing the Explore button to navigate the map.

Navigating 2D and 3D maps

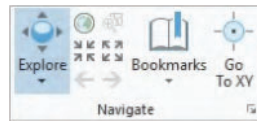8→ Click the **Map** ribbon title and examine the **Navigate** group (Fig. 1.13).

Fig. 1.13.
Navigation
tools

Source: Esri

8→ Notice that the **Swipe** tool is still enabled even after switching ribbons.

8→ Hover over the **Explore** button. A button tip appears, explaining how to use the mouse to navigate the map. All buttons have pop-up explanations.

8→ Click the **Explore** button and place the cursor over the map. The **Swipe** triangle is replaced by a hand icon for panning the map.

8 → Use the **Explore** button instructions to learn how to pan and zoom.

8 → Hold the mouse over the other buttons in the **Navigation** group to read about what they do. Experiment and practice with them to understand how each works.

Some button groups have an options menu that accesses additional settings related to that group.

9 → Hover over the small box/arrow icon on the lower-right corner of the **Navigate** group, until it shows the pop-up text **Navigation Options**.

9 → Click the **Navigation Options** icon. The Options window opens.

The left side of the Options window lists groups of settings; the Navigation options are already selected. Click on the other sections to explore them, but then return to the Navigation section.

9 → Rolling the mouse wheel forward may be assigned to Zoom in or Zoom out, depending on the user preference. Change the setting now if desired.

9 → Click OK to accept the change.

10 → Click on one of the geologic units in the map (not in the lake). The polygon flashes and a pop-up window appears with information about the polygon.

10 → Click on one of the geologic units in the lake. The pop-up shows information about the lake instead because it is the top layer.

10 → Click the little black arrow near the bottom of the **Explore** button and examine the menu choices. They control which layer(s) will appear in the pop-up.

10 → Select the **Explore** button option: **Selected in Contents**.

10 → In the Contents pane, click on the Crater Floor Geology layer to select it and then click one of the geologic units in the lake in the map. Now the pop-up shows the crater floor geology.

10 → Close the pop-up when finished.

11 → Click the **Full Extent** button to go to the extent of all the layers in the map.

Unfortunately, the Topographic basemap layer has a very large extent (map area). The default Full Extent can be changed using the map's properties.

11 → In the Contents pane, right-click the icon by the Crater Lake map title and choose Properties.

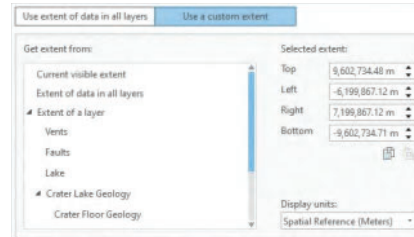11 → On the left side, click on Extent to see those properties (Fig. 1.14).

Fig. 1.14.   Setting the full extent area

11 → Click *Use a custom extent*. Under *Get extent from*, click the Crater Lake Geology layer. Click OK.

11 → Click the **Full Extent** button again and it will zoom to Crater Lake.

Bookmarks are another way to store a particular map extent and easily return to it. One bookmark has already been created for this project.

12 → Click **Map: Navigate: Bookmarks > Crater Lake**.

12 → Zoom in to the island on the west side of the lake.

12 → Choose **Bookmarks > New Bookmark**. Enter the name *Wizard Island*. Click OK.

12 → Click the **Bookmarks** drop-down and select the Crater Lake bookmark to return to the view of the lake.

The final navigation tool, Zoom to Selection, is dim because something must be selected before one can zoom to it.

13 → Click **Map: Selection: Select** (just the button, not the drop-down triangle).

13 → Click on Wizard Island. The polygon clicked is highlighted in blue, indicating that it is selected.

13 → Click the **Zoom to Selection** button in the **Navigate** group.

13 → Zoom to the previous extent.

Multiple features may be selected by drawing a box around them.

14 → Click the **Select** button in the **Selection** group. Click and drag a box around several geologic units. Features that pass partially inside the box will be selected.

14 → Click the **Clear** button in the **Selection** group to clear the selection.

15 → Choose **Map: Inquiry: Measure > Measure Distance**.

15 → Click on the map to enter a line across the lake and double-click to end the line. Read the distance.

15 → Change the units from Metric to Miles using the drop-

down box.

15 → Explore this tool and the other tools in the Measure drop-down until you can measure distances, areas, and features in a variety of units.

15 → When you are finished, close the Measure tool.

1. What is the area of the lake in hectares?

_____

16 → Click the **Map: Inquiry: Locate** tool. It opens the Locate pane.

16 → Type *Timber Crater* in the search box and select Timber Crater, Oregon, USA from the list that appears. The map zooms to Timber Crater.

16 → Search for Olympia and zoom to Olympia, WA, USA.

16 → Close the Locate pane and click the **Full Extent** button to return to Crater Lake.

Some new symbols probably appeared as you zoomed to Wizard Island.

17 → Click the *Explore* button and zoom in to the rock units southwest of the lake until some different symbols appear.

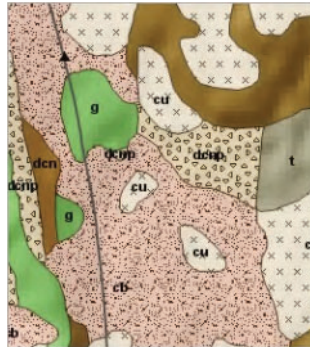Zoom in more until the labels appear (Fig. 1.15).

Fig. 1.15. The volcanic unit types and labels don't appear until a preset scale is reached.

Source: USGS

17→ Examine the Contents pane and find the Classes and Labels layer. Expand it (by clicking the triangle next to it) to see the volcanic class symbols.

17→ Zoom out until the volcanic class symbols disappear from the map. Notice that the check box by the layer turns light gray, indicating it is inactive and cannot be changed.

In this map, the Class and Labels layer has been given a **scale range** because the symbols would clutter the map if viewed at smaller scales. Layers can be given many properties to control how they appear and behave.

17 → In Contents, click the Classes and Labels layer to highlight it and reveal the **Feature Layer** ribbon group. Click the **Appearance** ribbon title.

17 → In the **Visibility Range** group, notice that the **Out Beyond** scale has been set to 1:24,000. These symbols appear when the map is zoomed in below that scale.

17 → Click the **Feature Layer: Labeling** ribbon and examine the **Visibility Range** group. A similar setting has been applied to the labels at 1:10,000.

Using the Help

Pro can do much more than can be covered in one textbook. The Help provides an extensive resource for learning more about the software and its capabilities. Getting familiar with the Help, and exploring it often, will greatly enhance your knowledge and skills. The Help is accessed online by default, although it can be downloaded and saved locally.

18 → Click the **Project** ribbon and select the **Help** entry. Wait a moment while a web browser opens to the main Help page. If you are asked to log in, use the same account as for ArcGIS Pro.

18 → Examine the solid bar containing the "ArcGIS Pro" heading and the tabs underneath it: Home, Get Started, Help, and so on (Fig. 1.16). Notice that the Help tab is currently active.
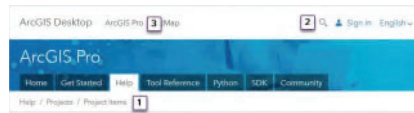
Fig. 1.16. The top of
the Help window

Source: Esri

18 → Examine the outline of topics on the left: Projects, Maps
and scenes, Data, ... Each heading can be expanded or
collapsed for more information.

18 → Examine the content presented on the right side of the
window.

18 → Expand the Projects heading, and examine the entries.

18 → Click on the *Terminology for working with projects*
entry.

18 → Skim through the topics presented in the content for this
section.

TIP: The Help organization and content may change over time as
the software is updated. If a specific item referenced in this text
cannot be found, try looking for a similar topic.

19 → In the outline on the left, click the *Project items* heading.

19 → Notice the expansion of the outline and the many blue links to additional information within the content.

19 → Click on one of the blue links in the content.

19 → Scroll to the bottom of the content and notice additional links in the *Related topics* section.

It is easy to get lost within this information. Use the breadcrumb trail immediately below the title bar (1 in Fig. 1.16) to back up to the main sections.

19 → Click Projects in the Help > Projects … breadcrumb trail.

19 → Click Help in the breadcrumb trail to return to the main Help page.

The SEARCH function provides another method to find information.

20 → Click the Search icon. Be sure to use the Help search tool (2 in Fig. 1.16) and not the search box of the browser, which would leave the Help.

20 → Type *symbols* on the Search line and click Search.

The left outline now presents filters for different software packages and versions, currently set to ArcGIS Pro. The right side contains different articles. Notice that each article has "ArcGIS Pro" listed after the title. Be sure to view only Pro content for any article.

20 → Click on one of the articles, such as *Modify symbols*.

20 → Briefly examine the outline and the content.

20 → Examine the breadcrumb trail to learn which section of Help is being shown.

20 → Click on each entry in the breadcrumb trail, starting with the last, to back out of the content and return step-by-step to the main Help page.

TIP: In the Search Results page, the main outline and Help tabs disappear. Select an article to get them back, or click ArcGIS Pro at the top of the window (3 in Figure 1.16) and click the Help tab.

20 → Minimize the browser window with the Help, rather than closing it, to facilitate consulting it later.

20 → Return to the ArcGIS Pro program.

Managing windows

Projects can contain more than a single map. The Catalog pane is used to access and manage the different items in a project.

21 → Examine the Catalog pane to the right of the map (Fig. 1.17). Notice that the window has several tabs: Project,

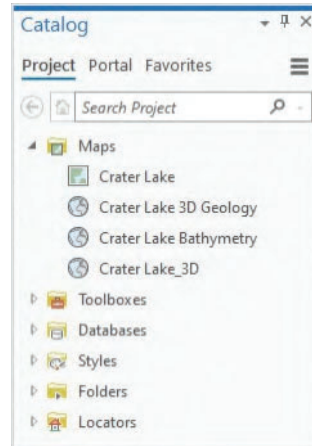Portal, and Favorites. (If the Catalog pane is not visible, click **View: Windows: Catalog Pane** to show it.)

Fig. 1.17.   The Catalog pane

21→   The Project tab should currently be selected; click it if not. It will show a list of project resources, including Maps and Toolboxes.

21→   Click the triangle next to Maps to expand the section. It contains the Crater Lake map (already open), plus three 3D maps (known as **scenes**).

21→   Double-click the Crater Lake_3D scene to open it.

Notice that the previous Crater Lake map view remains open and is visible as a view tab (above the scene), making it easy to switch back and forth. Clicking the x on the tab closes the map, but it remains in the project and can be reopened from the Catalog pane.

22 → Use **Map: Navigate: Bookmarks** to create a new bookmark named *Crater Lake 3D*.

22 → Hover over the **Map: Navigate: Explore** button again and review the instructions for navigating a 3D scene.

22 → Practice zooming, panning, tilting, and rotating the scene until you have mastered the 3D navigation tools.

22 → Return to the Crater Lake 3D bookmark when finished.

23 → In the Contents pane (now showing the layers of the active Crater Lake_3D scene), click the Classes and Labels layer to make sure that the **Feature Layer** ribbon group is visible. Select the **Appearance** ribbon and examine the **Visibility Range** group. In 3D, the scale range is expressed in the viewer's distance from the map.

Managing the placement of windows within the program area is an important skill. Currently a map view and a 3D scene view are open. Both views are docked in the same window, one atop the other, and clicking the view tabs at the top of the window switches between them. Views can also be docked side by side. A docking icon (Fig. 1.18) controls where to place an object within a window: center, left, right, top, or bottom.
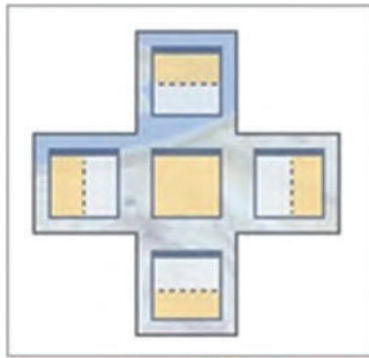
Fig. 1.18. Docking icon

24 → If necessary, resize the program interface to cover only part of the computer screen.

24 → Click the Crater Lake_3D view tab above the scene and drag it down. The docking icon appears.

24 → Drag the scene view to the left option and let go of the mouse button. The map view and scene view are placed side by side.

24 → Click on the scene view tab again, drag it to the map, and choose a different docking option. Try them all.

24 → Drag the scene away until no anchor icon is visible, and let go. The scene becomes a floating window.

Any window, whether it contains views (map and scene) or panes (Contents and Catalog), can be docked within the program area or moved to float on top of or outside it.

25 → Click the Crater Lake view title and drag it off the program area so it becomes a floating window as well.

25 → Click the Contents pane title and drag it off the program area, making it float.

25 → Click the Catalog pane title and drag it off the program area, leaving it empty.

26 → Drag the Crater Lake map view back to the program area, and notice that the center of the program area is the only place to dock it.

26 → Drag the Crater Lake_3D scene view back to the program area and use the icon to dock it to the right of the map view.

26 → Drag the Contents pane to the left edge of the program area and dock it there.

26 → Drag the Catalog pane to the left edge and use the icon to dock it in the center, on top of the Contents pane. Use the tabs at the bottom of the pane to switch back and forth between the two panes.

To remove a tabbed pane from the window, it must first be converted to a floating window again.

26 → Click the Catalog tab and drag it to make a new floating window. Then dock the window on the left edge of the program area.

26→ Practice rearranging the windows to master the docking techniques. When finished, leave the map and scene docked side by side. Place the Contents pane on the left and the Catalog pane on the right of the program area (Fig. 1.19).
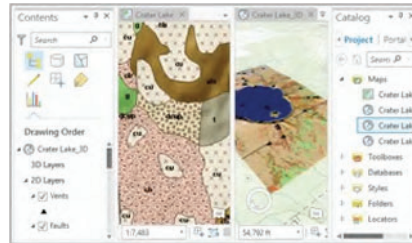

Fig. 1.19.   Place the Contents pane on the left, the Catalog pane on the right, and the two views side by side in the middle.

Source: USGS/Esri

The 2D maps and 3D scenes can be linked together for enhanced visualization.

27→ Click **View: Link: Link Views > Center and Scale**.

27→ Navigate in either the map or scene, and the other view updates to match.

27→ Click the Crater Lake view tab at the top of the map. The tab turns blue, indicating it is the active map, and the Contents pane shows its layers.

27→ Click the Crater Lake_3D tab to activate it in order to view or modify its layers.

Rearranging panes can be done the same way as rearranging map and scene views.

28→ Activate the Crater Lake map and click the Vents layer to highlight it.

28→ Click **Feature Layer: Appearance: Drawing: Symbology**.

28→ Experiment with rearranging the Symbology pane and the Catalog pane.

TIP: If two panes are docked in the same window, appearing as tabs, a pane must be separated from the window before it can be docked elsewhere, by dragging the <u>tab</u> away.

TIP: Panes have an Auto-Hide button that turns a pane into a tab along the program edge. When not in use, the pane folds away, conserving real estate for maps in the display area.

TIP: The Contents and Catalog panes are used often and are usually kept open. If needed, use the **View: Windows** group buttons to reopen them.

The flexibility of the interface makes it challenging to write instructions. The tutorials will not dictate how to arrange the windows unless it is important. You may need to independently turn layers on or off, or open and close windows and panes, as you complete the steps. Feel free to experiment to find the arrangements that work best for you.

Exploring project resources

The Catalog pane manages all the resources of a project, including the Maps entry already viewed. Now let's examine some other resources.

29→ Click the Catalog pane tab and make sure that the Project tab is selected, showing the contents of the project.

29→ Expand the Toolboxes entry. Each project has a special toolbox for storing custom tools created by the user. This one is currently empty.

29→ Expand Databases. It shows an icon labeled CraterLake or CraterLake.gdb, the **home geodatabase** that stores data sets related to this project.

29→ Expand the CraterLake database to see the data inside. Mouse over each data set to see a description of the data type, and note the icon used to show it.

The home geodatabase is the default location where the project will save data by default. It is stored in the project folder. The CraterLake home geodatabase contains one table, two raster data sets, and eight vector feature classes. Geodatabases are presented in detail in Chapter 5.

TIP: The .gdb is called a file extension. Whether it appears or not depends on your computer's settings. This book will not normally show the extension unless it is important to do so.

2. List which feature class(es) contain point data and which contain line or polygon data. Also list which ones are rasters.

29→ In the Catalog pane, expand the Styles entry to view the different symbol styles associated with this project.

29→ Expand the Folders entry, which contains shortcuts to data sources used in the project. It currently shows one shortcut, the CraterLake project folder itself.

29→ Use **Project > Save** or the **Save** icon on the Quick Access menu to save the project. It is smart to save the project periodically.

Vector feature classes, stored as points, lines, and polygons, include a table that stores information about each feature.

30→ Click on the Crater Lake view tab.

30→ In the Contents pane, right-click the Vents layer and choose Attribute Table. (It may appear docked or floating; use your new skills to arrange it as desired.)

30 → Right-click the Faults layer and open its attribute table also.

30 → Close the tables when finished looking at them.

Layers have properties that can be viewed and set. Let's examine some of them.

31 → In the Contents pane, right-click the Vents layer and choose Properties.

31 → Click the General entry, which can be used to set the layer name and to provide another way to modify the visibility range discovered earlier.

31 → Change the layer name to *Volcanic Vents*. This name is a cosmetic name for the layer only; it does not affect the stored data.

31 → Click the Metadata entry. Ideally, a data set includes information about what it is and where it came from.

31 → Click the Source entry. It gives basic information about the storage format and location of the data set (in the project's home geodatabase).

31 → Click OK. Notice that the new name has appeared in the Contents pane.

The source of this data set is the CraterLake home geodatabase. The same data sets for vents, geology, and the lake are used in both the 2D

and 3D maps. When a feature class is added to a map, it becomes a **layer**. Each layer has properties, such as the name you just modified, which are unique to the map or scene and can be set independently.

> 3. Examine the vents' layer name in the 3D scene. Did it update to match the changes made in the 2D map?

Group layers can be used to organize layers with a similar theme and make it easy to turn them on or off together. The Crater Lake Geology entry is an example of a group layer. It contains three individual layers: Crater Floor Geology, Classes and Labels, and Rock Types (Fig. 1.20).
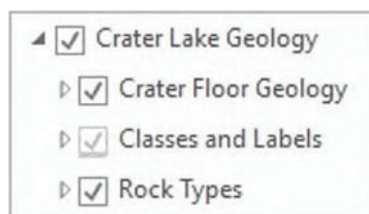

Fig. 1.20. The
Crater Lake Geology
group layer

Source: Esri

32 → Make sure the Crater Lake map view is active, and turn off the Lake layer.

32 → Use the Crater Lake Geology check box to turn the group layer off, then on, and examine the effect on the map.

32 → Expand each of the layers in the group to see their legends.

32 → Examine the effects as the individual layers are turned off and on.

32 → Collapse the individual layers to hide the legends, but leave them all checked.

32 → Turn off the Crater Lake Geology group layer and the Hillshade layer.

TIP: To save space, hereafter "In the Contents pane" will be shortened to "In Contents."

The bottom layer in Contents, Topographic, is known as the basemap. It is supplied by ArcGIS Online through an Internet connection, and it covers the whole world.

33 → Choose **Map: Layer: Basemap > Imagery** to switch to the Imagery basemap.

33 → Zoom in. Notice that more detailed imagery with a higher resolution is now displayed. Zoom in to about 1:10,000 until individual trees are visible.

Basemaps use scale ranges to present appropriately detailed imagery at different map scales.

TIP: Hold the Ctrl key and check or uncheck a visibility box to turn all the layers in the Contents off or on at the same time. This

33 → Switch to the Crater Lake_3D scene and turn off all layers.

33 → Switch to the Imagery basemap and explore the lake and Wizard Island.

We are going to work on one map at a time for a while. Let's unlink this map and scene and fix any rotation present. Maps and scenes have properties and options that can be set for them.

34 → Examine the **View: Link: Link Views** button; it should currently be blue, indicating that the views are linked (note the icons on the view tabs, which also indicate linkage).

34 → Click the **Link Views** button to remove the link.

34 → Close the Crater Lake_3D scene by clicking the x on its view tab.

34 → In Contents, right-click the icon for the Crater Lake map and choose Properties.

34 → Click the General section. Change the Rotation setting to 0. Click OK.

34 → Click **Map: Layer: Basemap >** USGS National Map.

Setting map symbols

The Symbology pane modifies the symbols used to display map layers.

35→ In Contents, make sure the Volcanic Vents layer is highlighted, and click **Feature Layer: Appearance: Drawing: Symbology**. The Symbology pane opens.

35→ In the Symbology pane, leave the Symbology set to Single Symbol.

35→ Click on the symbol representation (black triangle) to open the Format Point Symbol pane. Note that it has two tabs: a Gallery for selecting the base symbol and Properties for modifying how the symbol appears.

35→ In the Gallery tab, choose a different symbol, such as Diamond 3. The map updates to the new symbol.

35→ Click on the Properties tab and examine the symbol settings (Fig. 1.21).
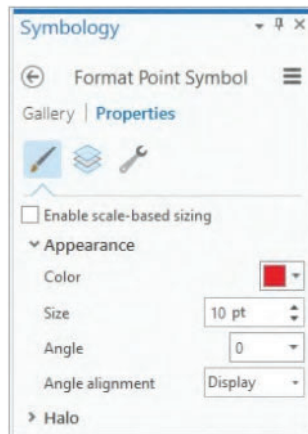
Fig. 1.21.

Formatting point

symbols

Source: Esri

The Format Point Symbol pane is an example of packing many options into a small space. It has three different panels, as indicated by the icons (hover over each icon to see its title).

35→ Click the icon for each panel and examine the settings available in each.

35→ Select the first panel, named Symbol. Expand both entries, Appearance and Halo, and view their settings.

35→ Change the color, size, or angle of the symbol, and then click Apply for the changes to take effect on the map.

36 → To start over, click on the Gallery tab to return to the array of symbols.

36 → Use the Gallery and Properties tabs to make the symbols 12-pt. pink stars.

36 → Click the circled arrow to return to the main Symbology pane.

36 → Close the Symbology pane by clicking the x in its upper-right corner.

The symbol settings can be accessed more than one way.

37 → In Contents, right-click the Volcanic Vents layer <u>name</u> to open a context menu. Choose the Symbology entry in the menu to open the Symbology pane.

37 → In Contents, left-click the Vents layer <u>symbol</u> to open the Format Point Symbol tab of the Symbology pane.

37 → In Contents, right-click the Vents layer <u>symbol</u> to select a different color.

37 → Close the Symbology pane. We will learn more about it in Chapter 2.

TIP: Watch for different ways of accessing the same functions. Once a command or pane has been introduced and used several times, the tutorial instructions will simply say to open it, not how to

Working with local GIS data

To work with data outside the project folder, we must create a link, or folder connection, to it. We will add a link to use other data that came with this book.

38 → Click **Insert: Project: Add Folder**.

38 → Click on the C:\ drive and navigate into the gisclass folder (wherever you placed it).

38 → Click the mgisdata folder to highlight it (don't double-click and go inside it) and choose OK.

38 → In the Catalog pane, expand the Folders entry to see the CraterLake project folder and the mgisdata folder. (Collapse the other entries if desired.)

38 → This mgisdata folder will be used many times. Right-click it and choose Add to Favorites to make it easily accessible in other projects from the Catalog Favorites tab.

39 → Expand the mgisdata folder to see subfolders of data, organized geographically.

39 → Expand the Oregon folder and find the oregondata geodatabase. Expand it to see its contents.

39 → Click and drag the counties feature class on top of the

Crater Lake map.

39 → Zoom in/out until several of the counties around Crater Lake appear in the map.

40 → In Contents, click the counties layer to highlight it and use **Feature Layer: Appearance: Drawing: Symbology** to open the Symbology pane.

40 → Click the Symbol representation to open the Format Polygon Symbol pane.

40 → In the Gallery tab, type *hollow* in the Search box and click Enter. Choose the Extent Hollow symbol.

40 → Switch to the Properties tab and set the outline color to hot pink. Click Apply.

41 → Zoom in and compare the counties boundary with the basemap (Fig. 1.22).

Fig. 1.22.
Difference in
county source
scales

Source: Esri

41 → In Contents, right-click the counties layer and choose
Properties (or simply double-click counties).

41 → Read the information in the Metadata section and then
close the properties.

This example illustrates the importance of **source scale**. The
metadata state that counties came from a generalized data set,
optimized for quickly drawing national maps, so it has lower
resolution and accuracy than the basemap.

Dragging data from the Catalog pane to the map is one way to add
data, but there is another.

42 → Click **Map: Layer: Add Data**. Click the Folders entry to
find the mgisdata folder.

42 → Navigate inside mgisdata to find the Oregon\OregonStateGeology\geology feature class. Select it and click OK to add it to the map.

42 → Compare this geology layer with the Crater Lake Geology group by zooming to Crater Lake and turning the geology layer off and on. Leave it off when done.

42 → In Contents, right-click the counties layer and choose Zoom to Layer. Check the scale reading.

Most data sets in the Oregon geodatabase were designed for use at the state scale, about 1:3,000,000. The pink counties appear adequate now. The Crater Lake data sets were compiled at scales around 1:24,000. When viewed at the state scale, the lake is hardly visible. The original source scale of a data set matters and should be considered when searching for data.

Since the Crater Lake and Oregon data sets are not suitable for use together, we will create a new map to continue exploring GIS data.

43 → In Contents, right-click the geology layer and choose Remove. Also remove the counties layer.

43 → Right-click the Crater Lake Geology layer and choose Zoom to Layer.

43 → Close the Crater Lake map and save the project.

43 → Choose **Insert: Project: New Map**.

43 → In Contents, find the map's icon and click the Map title

next to it twice, slowly, to enable editing.

43 → Type *Oregon* for the map name and click Enter.

44 → Use **Map: Layer: Add Data** or the Catalog pane to add the counties feature class from mgisdata\Oregon\oregondata to the map.

44 → In Contents, click twice slowly on the counties layer name and change it to *Counties*.

44 → Use the **Feature Layer: Appearance** ribbon or right-click the Counties layer to open the Symbology pane.

44 → Give the Counties layer a hollow symbol with a green outline color.

TIP: We will be using the Symbology pane extensively, so keep it open. Be sure to have the appropriate layer highlighted before changing symbols.

45 → In the Catalog pane, expand the Transportation "folder" in the oregondata geodatabase.

45 → Click the airports feature class; then hold down the Ctrl key and click on the highways feature class so that both are selected. Drag them to the map.

45 → Symbolize highways with a brown line and airports with an airport symbol.

46 → Add the parks feature class from the oregondata geodatabase. Symbolize it with light green fill and a dark green outline.

46 → Add the hospitals feature class from the oregondata geodatabase. Symbolize it using a thick cross symbol with blue fill and (extra points) a gray outline.

Using ArcGIS Online content

One of the benefits of ArcGIS Pro is its link to ArcGIS Online, which offers extensive data resources, including industry-authored content and information contributed by ordinary users. Online content is accessed through the Portal pane.

47 → In the Catalog pane, switch from the Project tab to the Portal tab by clicking the Portal heading.

47 → Examine the icons below the heading and hover over each one to view the titles: My Content, My Favorites, My Groups, and so on.

Several of these icons access content that you have saved in your ArcGIS Online account. The ArcGIS Online icon searches the entire AGOL holdings. The Living Atlas icon accesses authoritative industry-authored content (for users with an AGOL subscription account).

TIP: Online content is transient, and the specific items mentioned in this tutorial may change or disappear. If an item can't be found, look for something similar and use it instead. The important thing is to learn to search for, evaluate, and use content.

47→ Click the ArcGIS Online icon and type *Oregon* in the search box. Click Enter.

47→ Notice the different icons representing different types of data services.

47→ Hover over an item to see a pop-up description.

47→ Note the data location entry in the description. This is the URL of the service providing the data.

TIP: If a URL begins with http://www.arcgis.com/, then it is probably an ArcGIS Online published service. If it begins with anything else, it is probably an ArcGIS Portal installation run by a government or company.

48→ Edit the search term to *Oregon colleges* and click Enter (Fig. 1.23). Look for a **web map** icon—for example, Oregon Community Colleges. Hint: Click the Sort button and choose Relevance for best results.
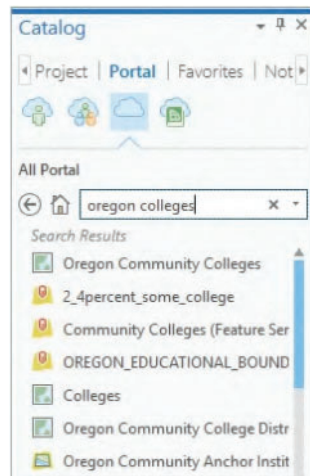
Fig. 1.23.
Searching for
Oregon colleges

Source: Esri

48→ Maps cannot be dragged in; they must be opened. Right-click a map icon and choose Add and Open. A new map, linked to the online data, is added to the project.

48→ Choose **Map: Navigate: Explore: Topmost Layer**.

48→ Click on one of the map symbols. A pop-up opens with information about the feature clicked.

48→ In Contents, double-click the map icon to open the map properties. Click the Metadata section.

ArcGIS Online requires a minimum set of metadata for an item to be published. The quality of description is sometimes a clue to the authority of the data set. Like everything else on the Internet, one

should be cautious in accepting data at face value.

Layers in a web map are services and can be copied to a different map, including the Oregon map we previously created.

49→ Close the map properties.

49→ Right-click one of the web map layers and choose Copy.

49→ Switch to the Oregon map, right-click the map icon at the top, and choose Paste.

Labels can provide more information on a map.

50→ In Contents, click the Counties layer to select it.

50→ Examine the **Feature Layer: Labeling: Label Class** group. Note that the label field is currently set to NAME.

50→ Click the **Label** button next to it to make the labels appear. (We'll learn more about setting other label options later.)

50→ Turn off the labels by clicking the **Label** button again.

50→ In Contents, click the airports layer to select it. Turn its labels on.

51→ In the Catalog pane, in the current ArcGIS Online search list, look for symbols representing a *feature layer*, and drag one into the map.

51 → Feature layers are often composed of group layers. In Contents, expand the feature layer, if needed, until the individual layers appear.

51 → Right-click an individual layer and choose Attribute Table. Feature layers behave similarly to feature classes.

Let's explore the Living Atlas (if you don't have a subscription account, skip to Step 55).

TIP: Try using the Filter option in the Catalog pane search box to filter the results by Item Type > Layers > Imagery Layers.

52 → In the Catalog pane, click the last icon to open the Living Atlas panel.

52 → Type *temperature* in the search box and click Enter.

52 → Find an ***imagery layer*** icon titled USA Mean Temperature and drag it to the map.

Unlike a basemap, feature layers and imagery layers provide actual features or pixel values, not a pre-rendered snapshot of a map. A user can change the symbols and use the data for analysis.

53 → In Contents, right-click the USA Mean Temperature layer and choose Symbology.

53 → Change the color scheme to a blue-red ramp so it looks more like temperatures.

53 → In Contents, double-click the USA Mean Temperature layer and view the Metadata section. Skim the entire entry. This is well-documented data.

4.   Construct a citation for the USA Mean Temperature service. Consult both the metadata and the pop-up window in the Portal pane to find all the information needed.

TIP: Internet services can be slow, depending on network connection speed. They can also go down and not work at times. If one service doesn't work, try another.

54 → Close the layer properties window.

54 → In the Catalog pane, change the search term to *traffic* and click Enter.

54 → Find a ***map image layer*** icon labeled World Traffic Service and add it to the map.

54 → Turn off the other layers (except the basemap) to see the traffic map better. Zoom into the Portland area.

This layer portrays a real-time map service showing current traffic conditions. Zoom close in to see the local streets light up with

information.

> 54→ Zoom to the extent of Oregon again, and turn on the Counties layer if needed.

> 54→ Save the project.

We used four types of AGOL services in this exercise (web map, feature layer, imagery layer, and map image layer), but you'll need to learn more about data formats to understand how they differ. We will tackle this material in Chapter 12.

Using geoprocessing

GIS includes more than creating maps; it also provides tools for analyzing map data. Analysis functions and many data management functions are executed as **geoprocessing** tools.

> 55→ In Contents, turn off all layers except the basemap and Counties.

> 55→ Choose **Analysis: Geoprocessing: Tools** to open the Geoprocessing pane.

> 55→ Examine the three tabs at the top of the window, and click each one in turn.

The Favorites tab keeps a list of frequently used tools. The Toolboxes tab shows all tools organized into toolsets. The Portal pane shows tools that run as services on ArcGIS Online; these tools typically require a subscription account and consume service credits. We would like to gather some statistics about the county populations in Oregon to find the largest, smallest, and average population of the counties.

TIP: The Geoprocessing and Catalog panes are used often. Try docking them one atop the other in a single window. Leave the window open to easily switch back and forth.

55 → In the Geoprocessing pane, click the Favorites panel again.

55 → Enter *statistics* in the search box.

55 → Mouse over the Summary Statistics tool to learn what it does.

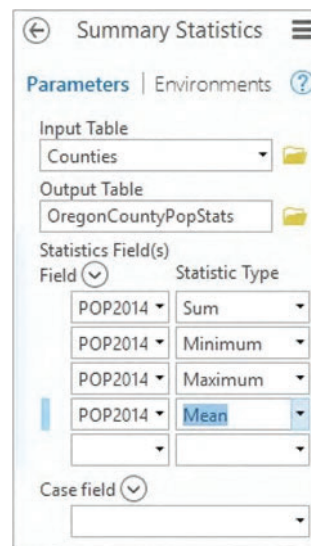55 → Click the Summary Statistics tool to open it (Fig 1.24)

Fig. 1.24. The Summary Statistics tool

The Parameters tab provides the information the tool needs to run. Items marked with an asterisk are required; the others will not be used or will contain default values.

55→ Hover over the blue-circled question mark to see the short description of the tool. Then click the circle to open the tool Help in a browser window. Minimize the browser.

55→ Hover near a parameter box; a circled "i" will appear. Hover over the "i" to see a description of the parameter.

This tool produces an output table containing the statistics. By default, outputs are placed in the project's home geodatabase. Give all outputs descriptive names that indicate their contents.

56→ For Input Table, choose Counties from the drop-down (the Browse button is only needed if the data are not already in the map).

56→ Click in the Output Table box to see the full location and name.

56→ Edit the final part of the name after the last "\" to read *OregonCountyPopStats*. Click Tab to finish entering the name.

56→ Use the Field drop-down box to select the field POP2014. Leave Sum as the Statistic Type.

56 → Use the second Field drop-down and select POP2014 again. Change the Statistic Type to Minimum.

56 → Add entries for the maximum and mean of POP2014 as well.

56 → Leave the Case field blank. The tool should appear as in Figure 1.24.

56 → Click Run at the bottom of the pane to execute the tool.

57 → In Contents, find the new table near the bottom under Standalone Tables.

57 → Right-click the OregonCountyPopStats table and choose Open.

57 → Examine the statistics.

5. How many counties does Oregon have? What is the average population?

We can sort the original table to find which counties have the smallest and largest populations.

57 → In Contents, right-click the Counties layer and choose Attribute Table.

57 → Right-click the POP2014 field heading and choose Sort Ascending.

We can use the table data to select features meeting a certain criterion. For example, how many counties have more than 100,000 people?

58 → In the Geoprocessing pane, click the circled back arrow to return to the main Geoprocessing pane.

58 → Search for *select* and open the Select Layer By Attribute tool (Fig. 1.25).
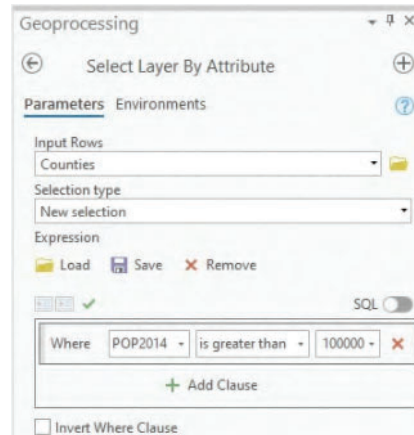

Fig. 1.25. Selecting counties with more than 100,000 people

Source: Esri

58 → Set the Input Rows (e.g. layer name) to Counties.

58 → Leave the Selection type as *New selection*.

58 → Click New Expression to enter the condition to be met.

58 → Set the Field to POP2014.

58 → Set the condition to *is Greater Than*.

58 → Type *100000* in the value box.

58 → The tool should appear as it does in Figure 1.25.

58 → Click the Run button.

59 → The selected features are highlighted in the table and on the map. Examine the bottom of the table to see the number selected (10).

59 → Click **Map: Selection: Clear** to clear the selected features.

59 → Close all tables.

This is the end of the tutorial.

→ Save the project and close ArcGIS Pro.