

UA Libraries Data Cooperative Unit's

# GIS TUTORIALS

*OPENING QGIS AND STARTING A PROJECT*

## QGIS

SOFTWARE USED

1

TUTORIAL NUMBER



DIFFICULTY LEVEL



LEVEL OF STOKE

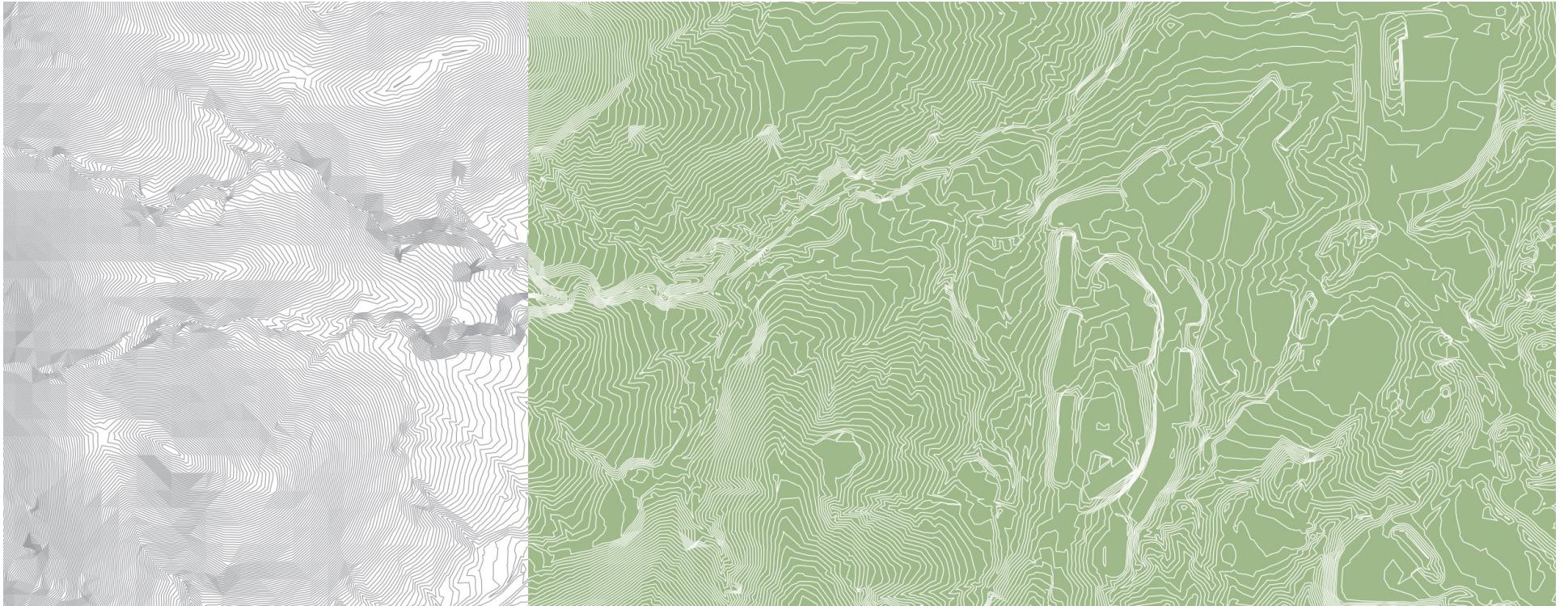


HARDWARE NEEDED:

desktop or laptop computer  
running Windows  
internet connection

SOFTWARE NEEDED:

ESRI ArcGIS Pro



## INTRODUCTION

# 1

The purpose of this tutorial is to teach you how to open QGIS and start a new project. You will also learn how to import shapefiles into the project and add a basemap through a third-party plugin.

Upon completion of this tutorial, you should be comfortable:

1. Opening QGIS.
2. Starting a new QGIS project.
3. Adding and exploring geospatial data in QGIS.
4. Installing a plugin to QGIS and using this plugin to add a basemap to your project.

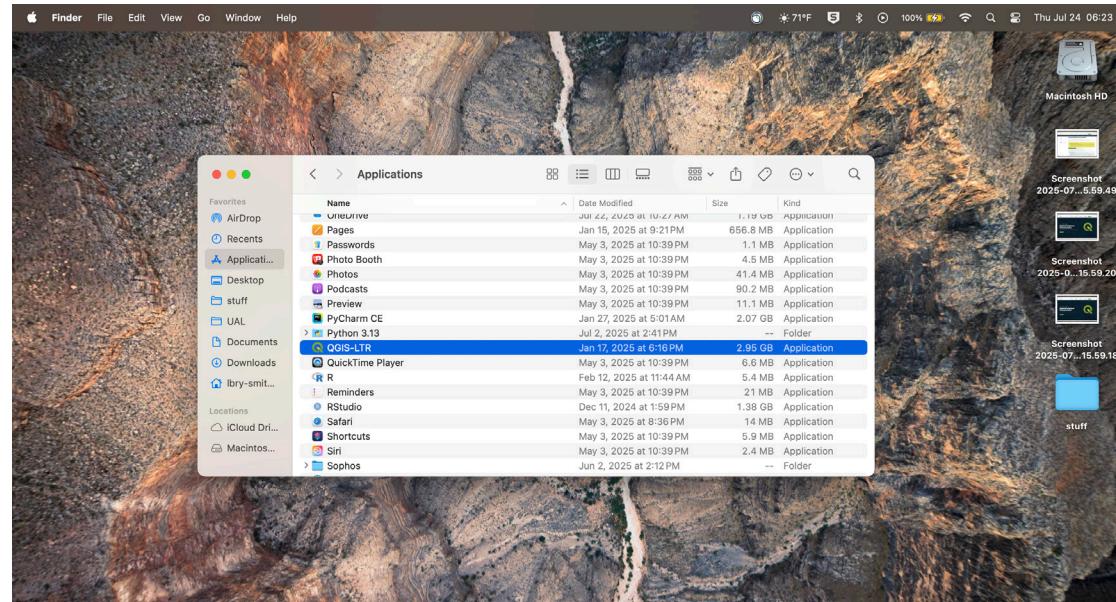
## QGIS TUTORIAL STARTING QGIS AND STARTING A NEW PROJECT

## OPENING QGIS

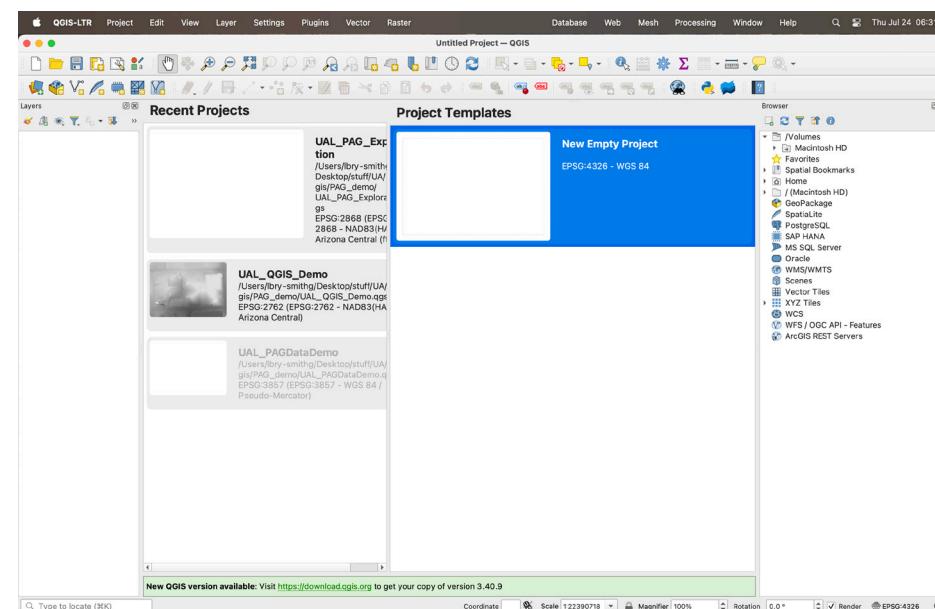
1. Open QGIS by clicking on the QGIS Icon, which is generally found in your Applications folder.
2. In the QGIS startup screen click on New Empty Project under Project Templates to start a new project.

## HELPFUL HINT:

In addition to starting a new project the startup screen QGIS will show all of the recent projects that you have previously worked on.



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## QGIS TUTORIAL STARTING QGIS AND STARTING A NEW PROJECT

## QGIS USER INTERFACE

## 1. The QGIS interface.

**QGIS USER INTERFACE:**

The QGIS user interface consists of a number of windows and depending on your operating system the location of the windows may look different from the one in this image.

You can customize the windows by dragging them around the interface to suit your needs.

**Layer**

Contains tools to create data sources, add them to a project, or save modifications to them.

**Map View**

The central place where maps are displayed.

**Browser**

A place where files and folders affiliated with the project and located on your computer are displayed.

**Toolbars**

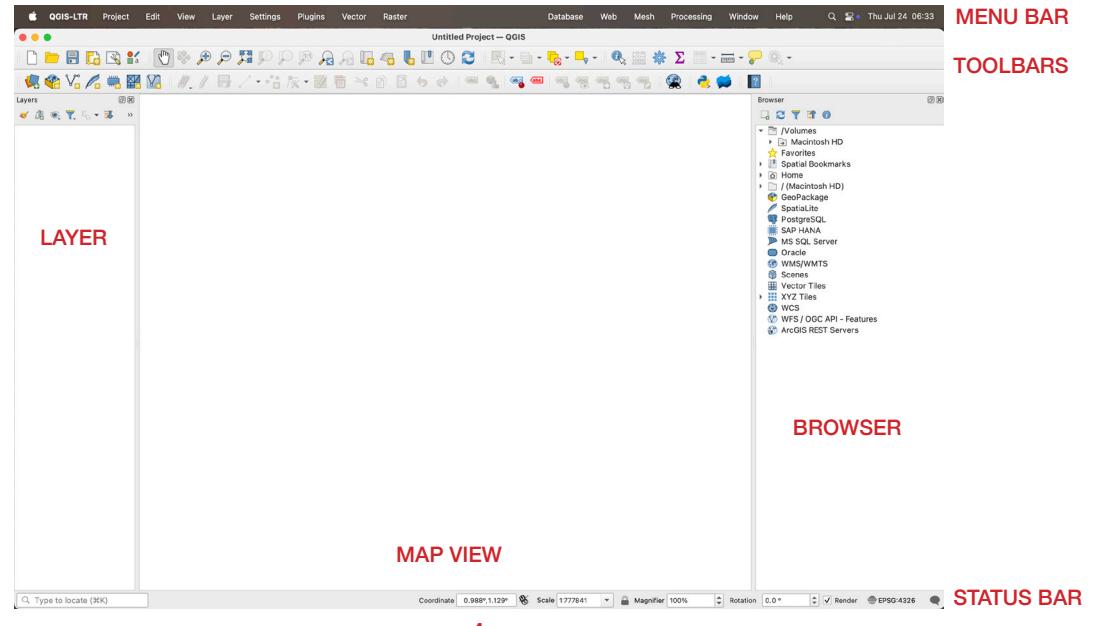
Provides access to most of the functions in the menus, plus additional tools for interacting with the map.

**Menu Bar**

Provides access to QGIS functions using standard hierarchical menus.

**Status Bar**

Provides general information about the map view and processed or available actions, and offers you tools to manage the map view.



MENU BAR

TOOLBARS

BROWSER

STATUS BAR

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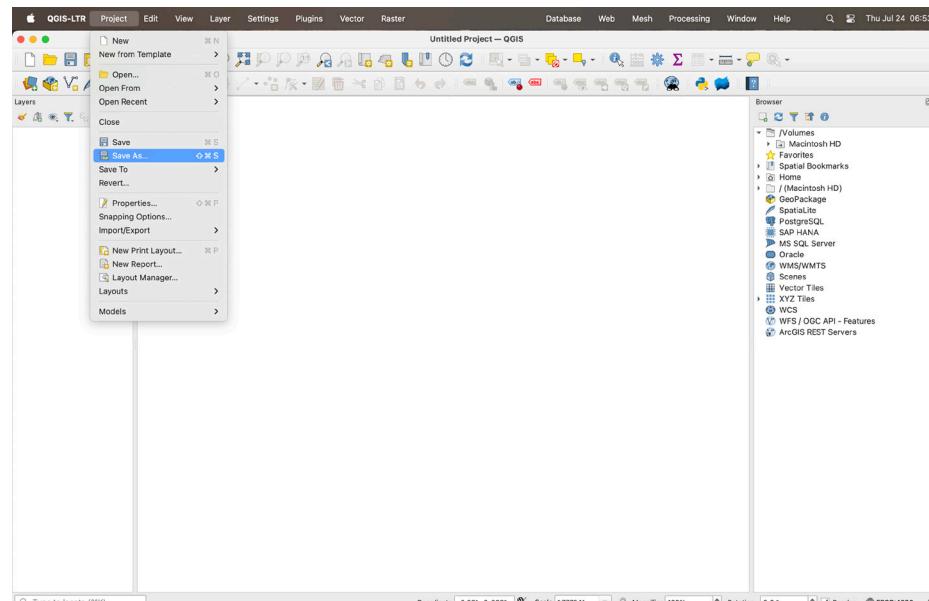
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## SAVING A PROJECT

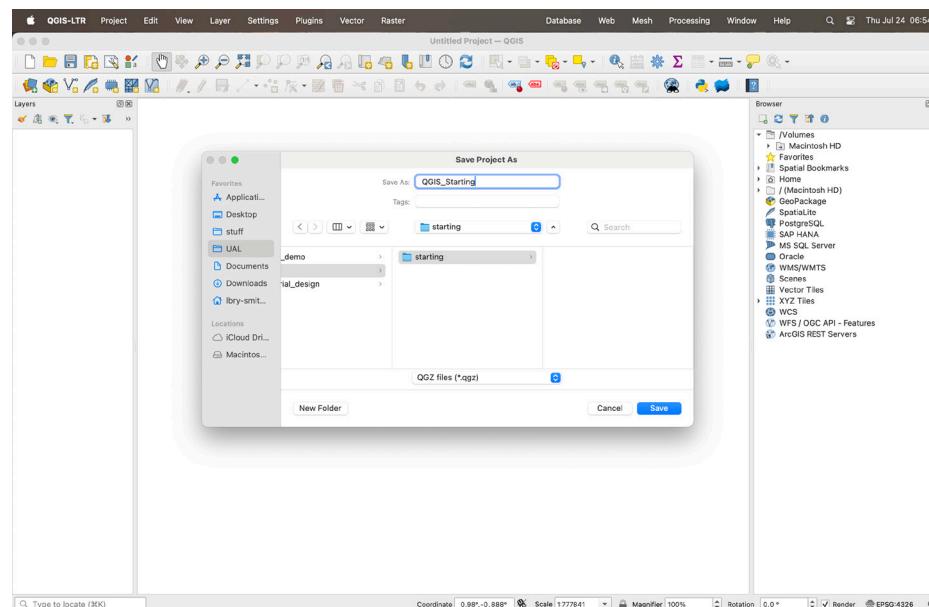
1. In the Menu Bar select Project Save As...
2. Navigate to a location on your computer that you would like to save your file to.

**HELPFUL HINT:**

It is a good practice when working on GIS projects to develop a system of data management practices that includes folder structure and file naming conventions.



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## DOWNLOADING DATA

Download the data that will be used in this tutorial from the following link:

[GIS IntroData.zip](#)

**Please note:** All of the data used in this tutorial is available on the UA Library's GeoBlacklight Data Portal: <https://geodata.lib.arizona.edu/>

1. Unzip the GIS\_IntroData folder and place it the project's folder that you created in the previous step.
2. In the File Explorer window, open the Dam folder located in the GIS\_IntroData folder.

### GIS DATA STRUCTURE:

When looking at GIS data in the File Explorer window you will notice that there are a number of files present, each of which are or are not required and who have their own purpose:

Dam.cpg (not required)

Codepage for identifying the character set to be used.

Dam.dbf (required)

The dBASE table that stores the attribute information of the features.

Dam.prj (required)

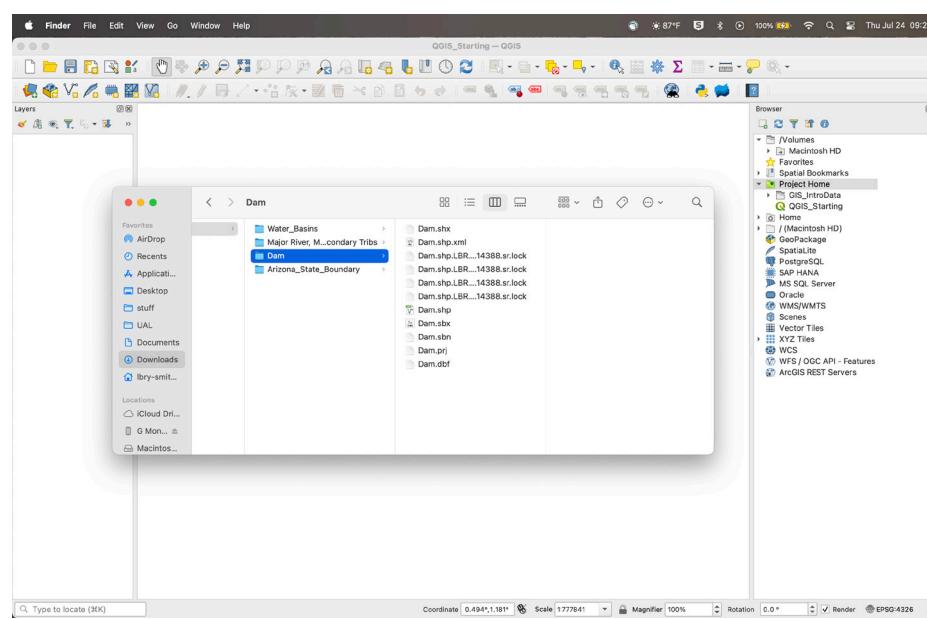
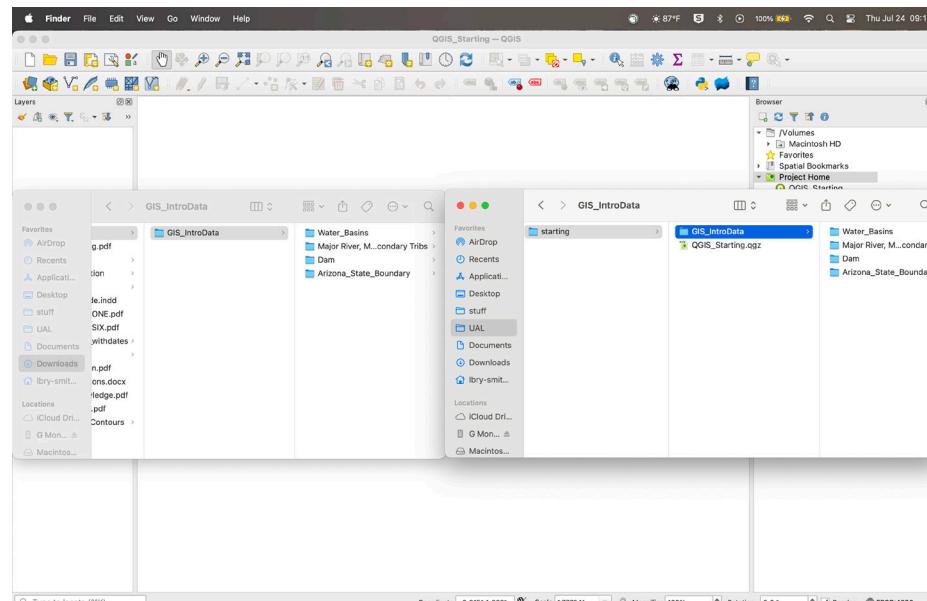
Stores the coordinate system of the file.

Dam.shp (required)

The main file storing the geography.

Dam.shx (required)

The index file that stores the index of the feature geometry.



## SIMPLE DATA EXPLORATION

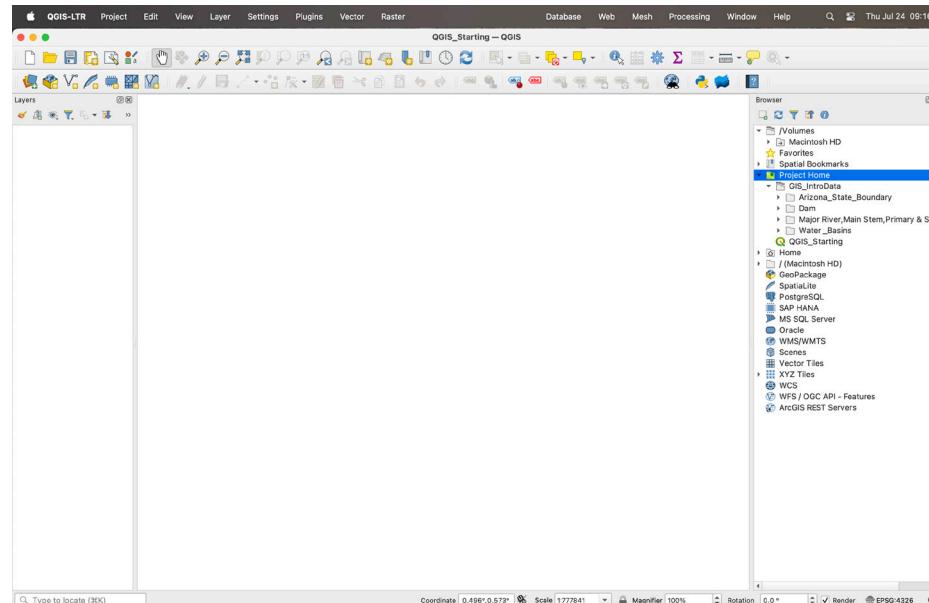
1. In the Browser window expand the Project Home and GIS\_ IntroData folders.
2. Expand the Water\_Basins folder, click on the Water\_Basins.shp and select Add Layer to Project.

### SHAPEFILES:

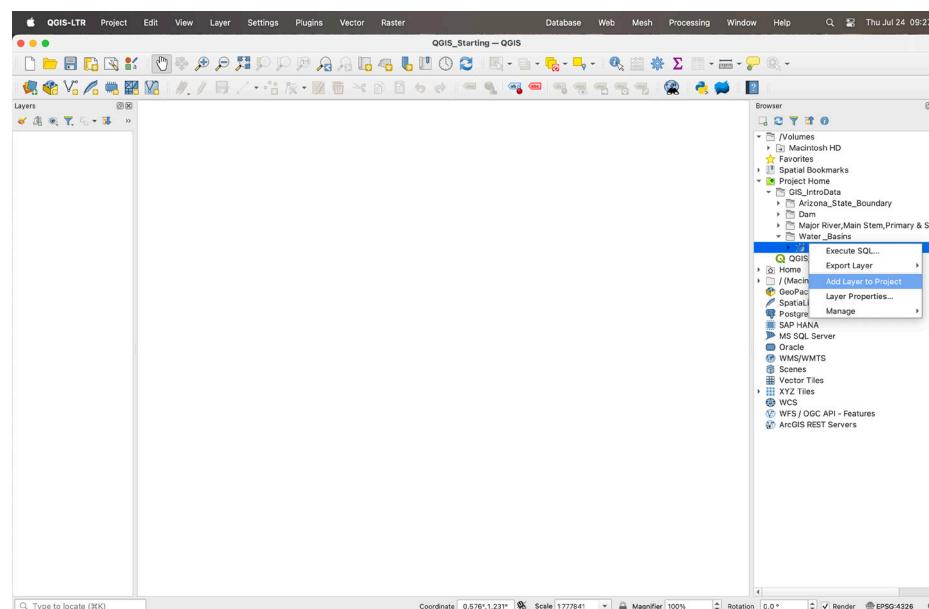
Shapefiles, also known as vector data, is a file storage format that stores the geographic location, shape, and attributes (table) of geographic features of the same geometry type. Shapefiles (.shp) are native to Esri's ArcGIS platform and are the most widely used vector file format, though they can be read by QGIS.

Notice, in the Catalog pane, that you can only see the .shp files and not the other files that underlie the data that is found in the same folders if you were to open them in the Windows File Explorer as you did previously. Shapefiles are represented as points, lines, and polygons.

Points are used to represent the location of something on the Earth's surface through the use of the location's latitude and longitude. Lines consist of nodes (points) and arcs (connect nodes to one another) and can be measured using length. Finally, polygons also consist of nodes and points but are closed and can be measured using area.



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3. In the Menu Bar click on Project and select Properties.
4. In the Project Properties window select CRS (Coordinate Reference System) and notice that the Projected Coordinate Reference System for the project is set as NAD83 / UTM zone 12N. This CRS was acquired via the Water\_Basins.shp file.

Add the CO4.shp and Dam.shp shapefiles to the map.

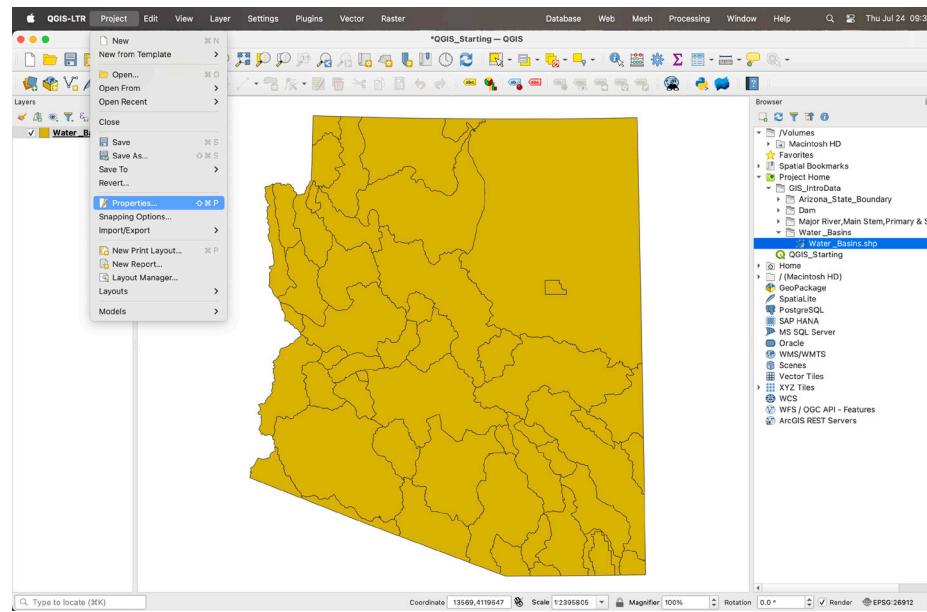
**PROJECTED COORDINATE SYSTEMS:**

Geospatial data contains numerical information that allows it to be positioned on the Earth's surface when brought into a GIS software program. This numerical information is also known as the coordinate system and provides the reference that places the feature on the surface of the Earth, allowing the data to align with other data, and that allows for accurate spatial analysis and map creation.

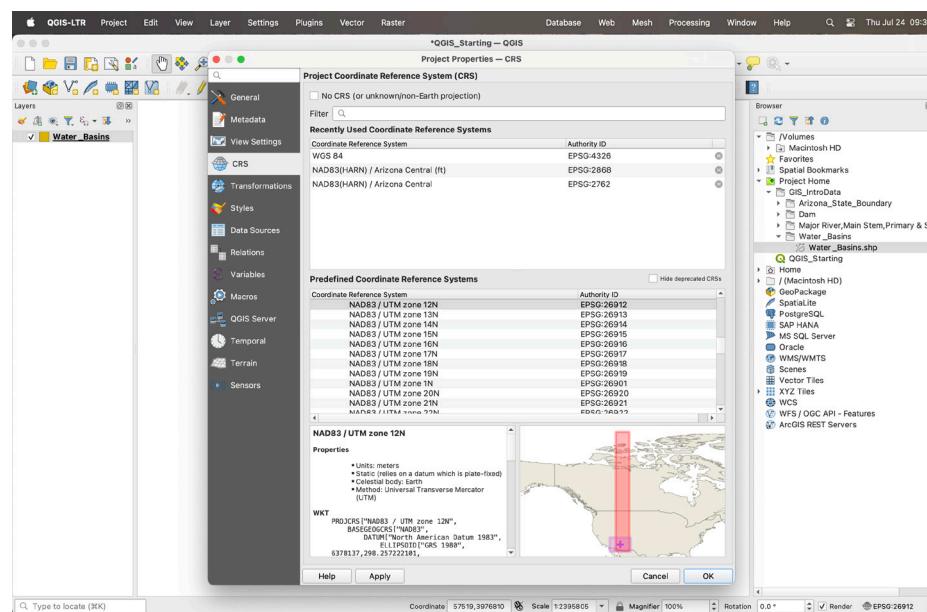
Projected coordinate systems are comprised of a geographic coordinate system and a map projection that contains the mathematical calculations that converts angular coordinates to planar (flat) coordinates.

**HELPFUL HINT:**

QGIS is able to reproject data on the fly so that any data that is added to the map will inherit the coordinate system that is defined from the map. It is always a good idea when you start any project to set the map's coordinate system so that all data will inherit that coordinate system for the project.



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5. In the Layers window right-click on the Dam layer and select Open Attribute Table.
6. The attribute table contains all the attributes (characteristics) of the individual feature and is displayed as a table of rows (features) and columns (attributes) contained within the shapefile.

**ATTRIBUTE TABLES:**

Attribute tables consist of the following characteristics:

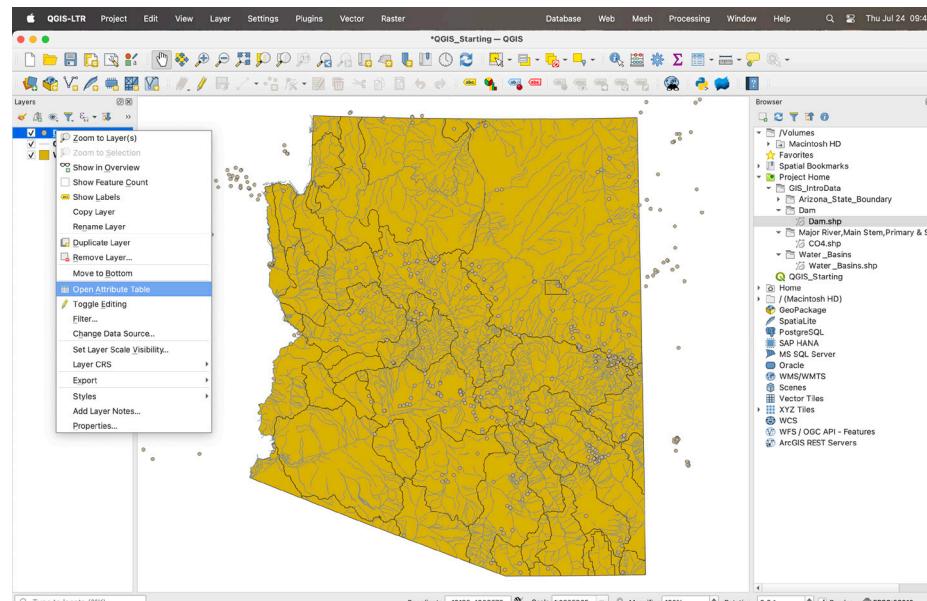
Tables that contains rows

All rows in the table have the same fields

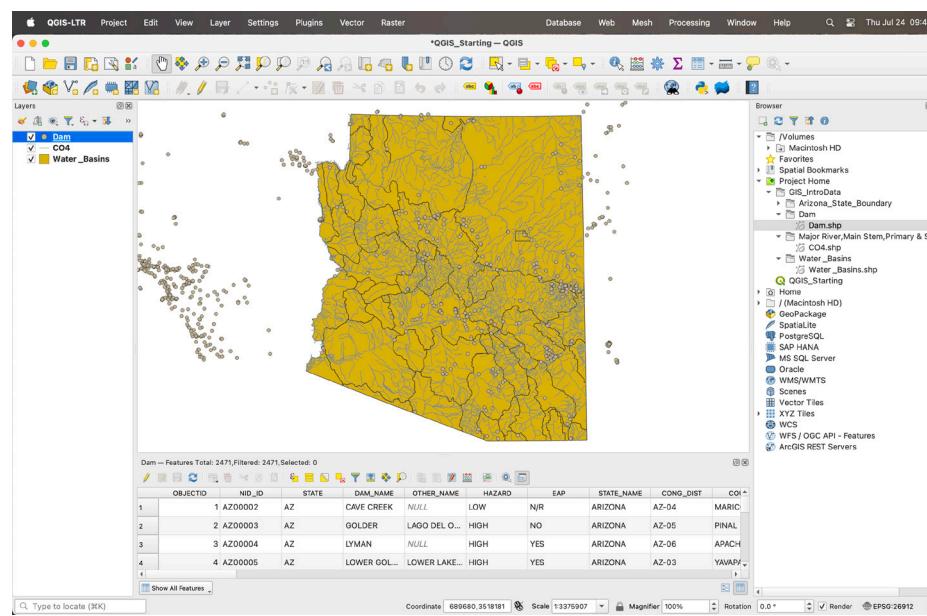
Each column has a data type (integer, decimal, number, character, date)

**HELPFUL HINT:**

Whenever loading new data into a GIS project it is good practice to (1) place the data on the Map to ensure that it is contained within your study area and to (2) open the attribute table after loading the data into the Contents pane to make sure that there are attributes listed that will ensure that you are able to complete your GIS analysis.



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## INSTALLING PLUG-INS

In addition to checking the attribute table, another step that you want to take is to ensure that the data is being projected in the correct location. To do this you can plot the data in the Map View window on top of a basemap. However, you will need to install the Basemaps plug-in to do so.

1. In the Menu Bar click on Plugins and then select Manage and Install Plugins.

2. In the Plugins window search for basemaps.

Highlight the Basemaps plugin and click on Install Plugins.

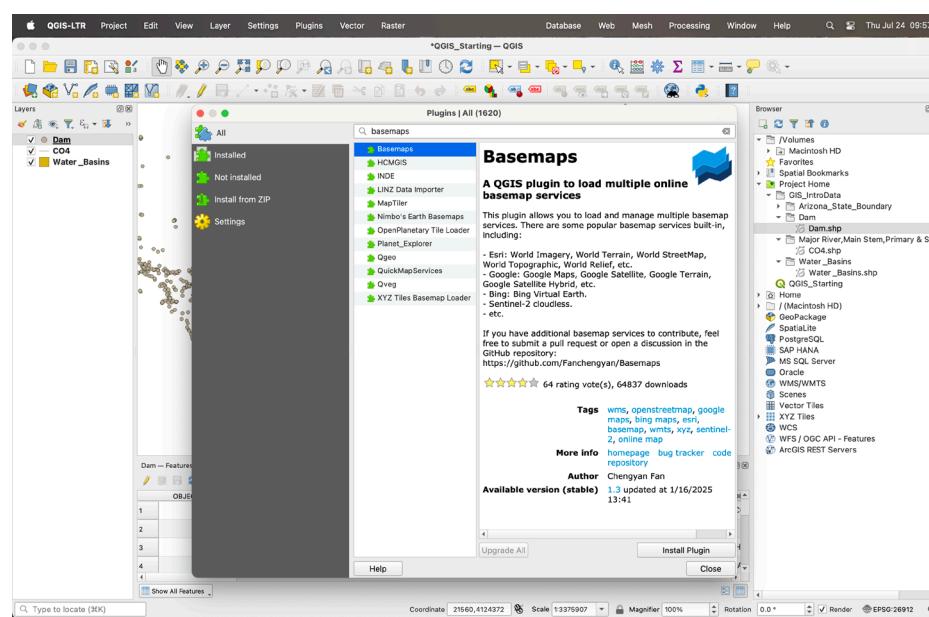
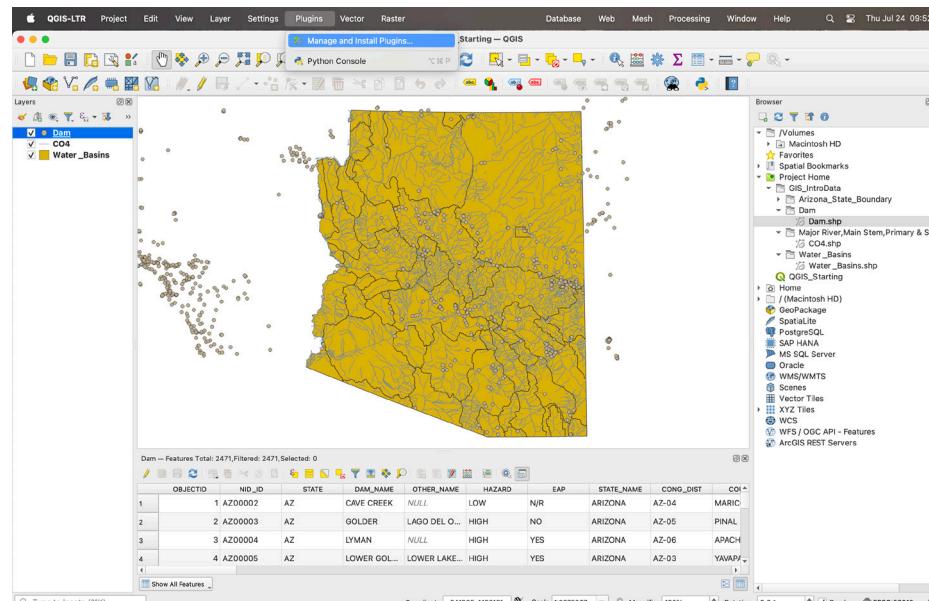
After the Basemaps plugin is installed click on the Close button.

## BASEMAPS:

Basemaps provide a background (base) geographical context for your map display. There are a number of basemaps that are available for display and the choice of the basemap that you want to use will generally be dependent on the type of GIS project that you are working on.

## PLUGINS:

Plugins in QGIS are written by QGIS and independent developers to extend the core functionality of QGIS. All plugins are validated by QGIS community members to ensure that they work correctly. Due to the open-sourced nature of QGIS there are a wide variety of plugins available for many different fields of study and/or applications in QGIS.

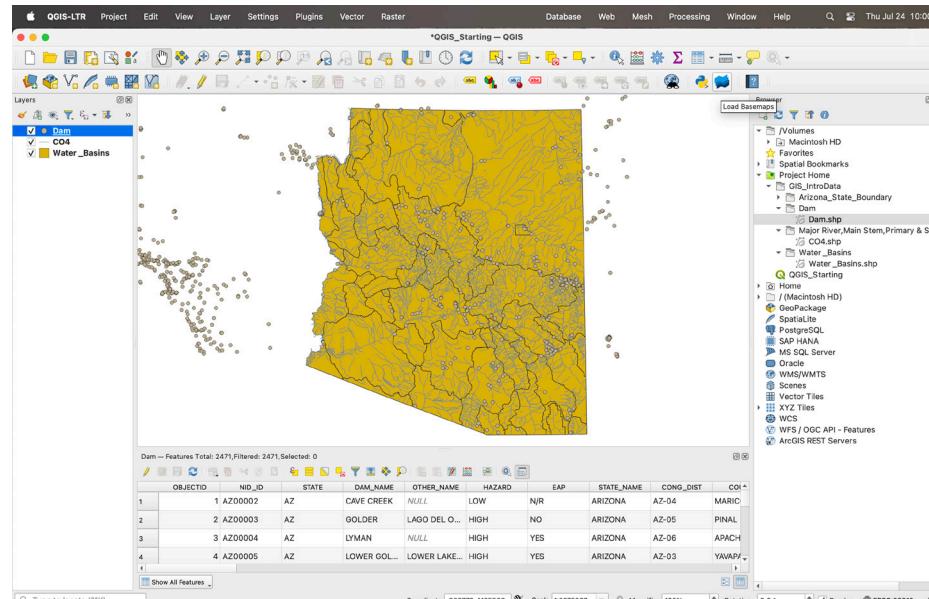


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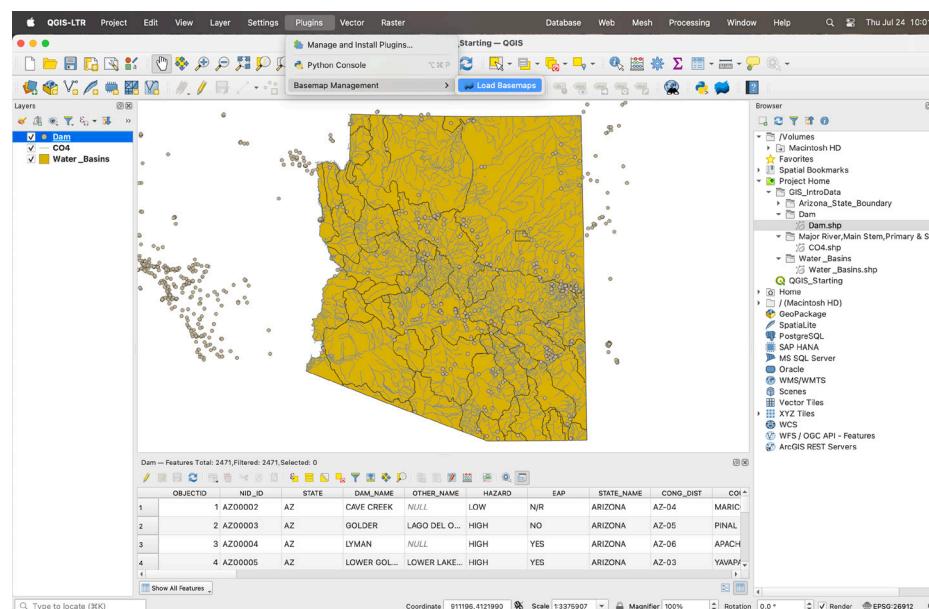
- 3.** After installing the Basemaps plugin, it should automatically be loaded into the Tools toolbar.

Click on the Basemaps icon to open the plugin.

- 4.** If you do not see the Basemaps plugin in the Tools toolbar, you can also open it by selecting Plugins from the Menu Bar and selecting Base-map Management Load Basemaps to open the plugin.



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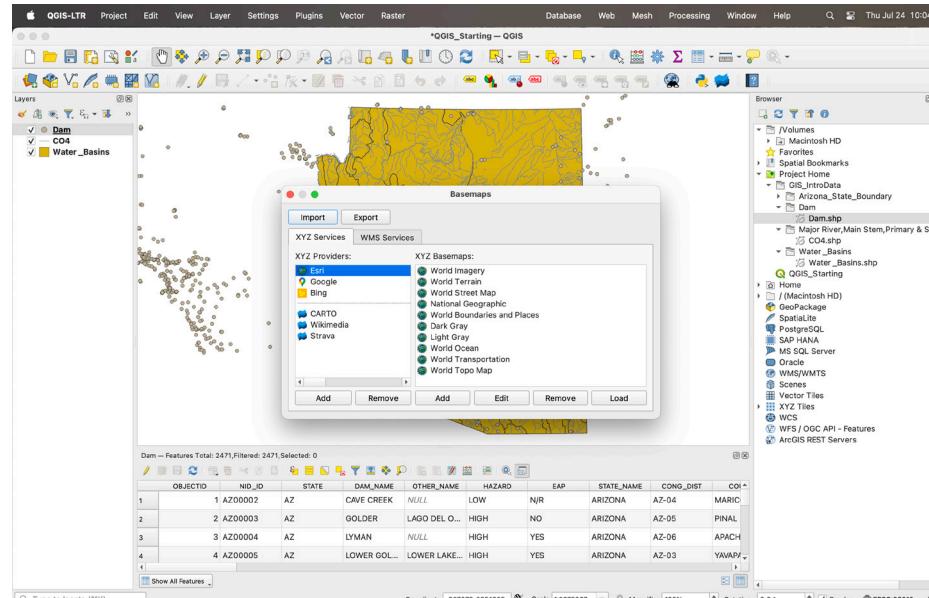
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5. In the Basemaps window select one of the Basemaps that is available.

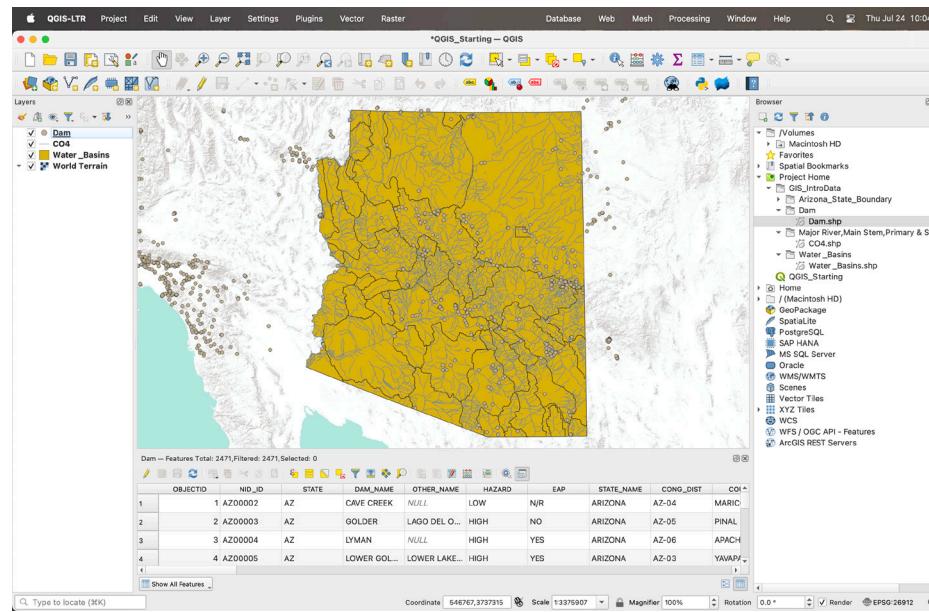
Click Load to add the Basemap to the Map View window.

6. Drag the basemap that you selected to the bottom in the Layers window.

Now you can check to see if the state of Arizona is being projected in the correct area.



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END