

Avenza[®] and Mapping Programs

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CE | **University of California**
Agriculture and Natural Resources

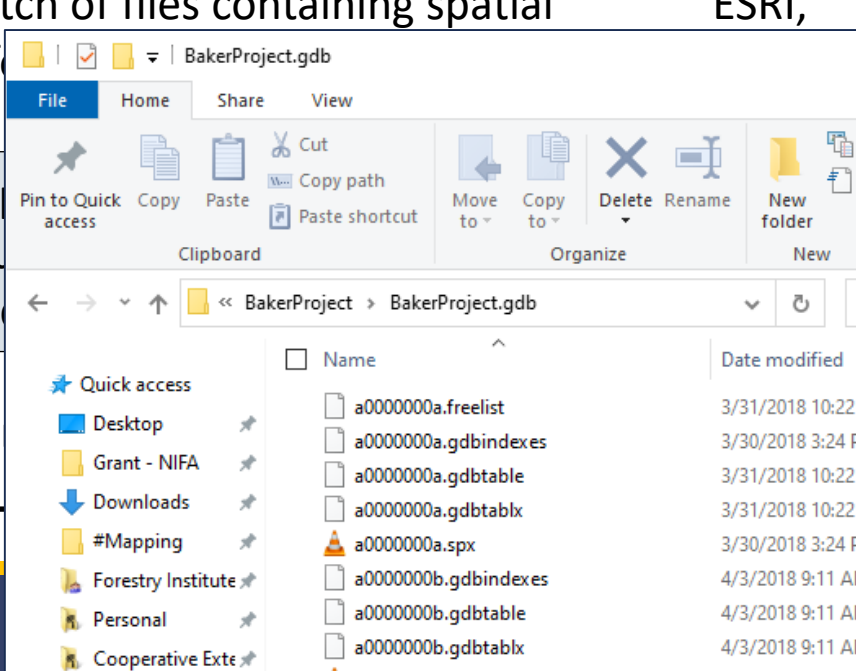
Common Spatial Formats

Name	File Suffix	English	Access
Comma separated value	.csv	<ul style="list-style-type: none">• Simple table format• Data separated by commas• Point data only	Open Source
Keyhole markup language	.kml <hr/> <i>.kmz (compressed)</i>	<ul style="list-style-type: none">• Simple x, y coordinates• EPSG:4326 (WGS 84) by default	Google
Shapefile	.cpg, .dbf, .prj, .sbn, .sbx, .shp, .shx, .txt <hr/> <i>.zip (compressed)</i>	<ul style="list-style-type: none">• Batch of files containing spatial information	ESRI, GDAL
File geodatabase	.gdb <hr/> <i>.gdbtable, .gdbtablx, .gdbindexes, .freelist, .atx, .spx (uncompressed)</i>	<ul style="list-style-type: none">• Replaces shapefile• Multiple shapefiles in a single folder	ESRI, GDAL <i>(read-only)</i>
GPS Exchange Format	.GPX	<ul style="list-style-type: none">• Common found in hand-held units	Open Source

Common Spatial Formats

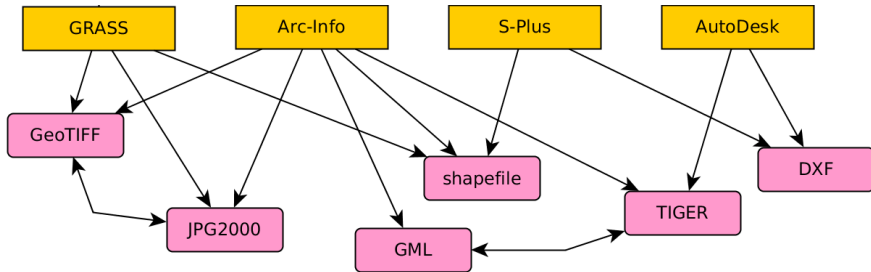
Name	File Suffix	
<pre><styleUrl>#style0</styleUrl> <name>Layer</name> <ExtendedData> <SchemaData schemaUrl="#schema0"/> </ExtendedData> <Placemark> <name>Placemark 1</name> <TimeStamp> <when>2020-01-31T14:27:31-08:00</when> </TimeStamp> <styleUrl>#style1</styleUrl> <Point> <coordinates> -122.261626569898,37.8728395426413,0 </coordinates> </Point> </Placemark> <Placemark> <name>Placemark 2</name> <TimeStamp> <when>2020-01-31T14:25:08-08:00</when> </TimeStamp> <styleUrl>#style1</styleUrl> <Point> <coordinates> -122.26158433116,37.8732269108197,0 </coordinates> </Point> </Placemark></pre>	.CSV	<ul style="list-style-type: none"> • Single Data Point
	.kml <i>.kmz (compressed)</i>	<ul style="list-style-type: none"> • Single EPS
	.cpg, .dbf, .prj, .sbn, .sbx, .shp, .shx, .txt	<ul style="list-style-type: none"> • Batch of files containing spatial info
File geodatabase	.gdb <i>.gdbtable, .gdbtblx, .gdbindexes, .freelist, .atx, .spx (uncompressed)</i>	<ul style="list-style-type: none"> • Relational • Multiple folders
GPS Exchange Format	.GPX	<ul style="list-style-type: none"> • Collection

```
*Wood_Facility_Database_Biomass_2019 - Copy.csv - Notepad
File Edit Format View Help
latitude, longitude, Status, Name
40.909703, -121.639961, Idle, Covanta Burney
41.475178, -122.829037, Idle, Cal Forest Nurs
40.302842, -121.244088, Idle, Collins Pine Bi
33.586491, -116.087907, Operational, Greenleaf Deser
35.719097, -119.234588, Idle, Covanta Delano
40.79946, -124.20309, Operational, DG Fairhaven
36.569581, -119.418984, Idle, Dinuba Energy
38.524353, -121.903077, Pilot, Dixon Ridge Far
37.943945, -121.330053, Operational, DTE Stockton Bi
39.480996, -121.565567, Idle, Covanta Pacific
37.874644, -120.477546, Operational, Pacific Ultrapo
36.688823, -119.723405, Operational, Rio Bravo Fresn
35.741508, -119.050911, Idle, Rio Bravo Jasm
35.547497, -119.075265, Idle, Rio Bravo Poso
29.27702, 120.012763, Idle, Buena Vista Bi
```

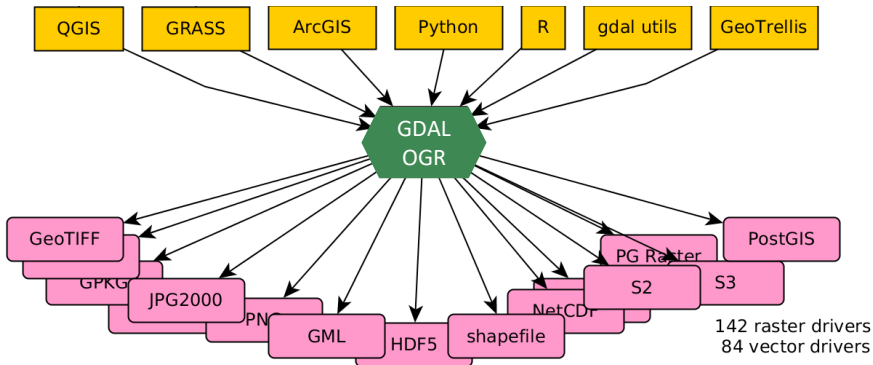


More Acronyms!

The 90s



GDAL (Raster) / OGR (Vector)



Geospatial Data Abstraction Library (GDAL)
OpenGIS Simple Features Reference Implementation (OGR)

epsg.io 

From MapTiler Team

Coordinate Systems Worldwide

SEARCH

Input coordinates

Longitude:

Latitude:

Transform coordinates

Get position on a map

Share on



European Petroleum Survey Group (EPSG)

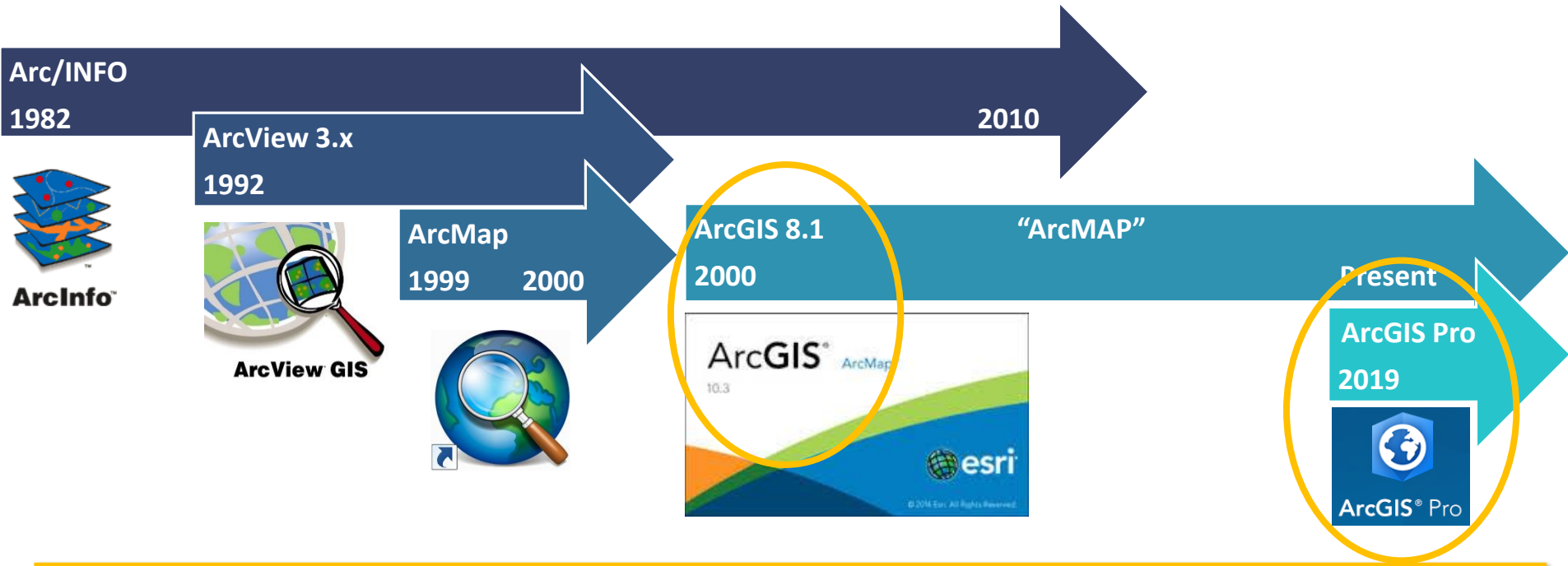
International Association of Oil & Gas Producers Database

Mapping Programs

(Table 1 of 3)

Software	GRASS	QGIS	ESRI ArcGIS	GeoDa		uDig*		gvSIG	ENVI	Idrisi 16	SAGA	MapInfo	JUMP
Full Name	Geographic Resources Analysis Support System	Quantum GIS			uDig	JGrass	DivaGIS	Generalitat Valenciana, Sistema d'Informació Geogràfica		Taiga Edition	System for Automated GeoScientific Analysis	Mapinfo Professional	
Cost	Free	Free	Proprietary	Free	Free	Free	Free	Free	Proprietary	Proprietary	Free	Proprietary	Free
Role in Workflow	Full GUI-based GIS	Full GUI-based GIS	Full GUI-based GIS	Free GUI, interactive exploratory spatial data analysis and basic spatial regression modeling	Viewing (OGC standards)	Raster Analysis based on GRASS + 3D visualization	Analyze and document potato genotypes	replacing ArcView	Full remote-sensing system	Complete Image and raster processing package	Analysis, modelling, visualisation	Full GUI-based GIS	Editing & Data conflation
Focus	Spatial analysis and scientific visualization	GRASS-Graphical User Interface	Extensive data creation, editing and analysis	Spatial analysis for polygon data; supplements GIS	Application Framework						(focus on raster)		
Supported Data Types	GDAL supported formats, voxel support	GDAL supported Formats	ECW, MrSID, JPEG,jpg, jp2, TIF, geoTIFF, PNG, GIF, img, bmp, cib,ers,img, raw,Grid,RS T,MrSID	ESRI shapefile, ASCII	Yes (1.1.0 is limited to memory)	Yes (through GRASS and Geotools)	Yes (Through Geotools)	ECW, MrSID, JPEG,jpg, jp2, TIF, geoTIFF, PNG, GIF, img, bmp, jpeg2000		Tiff, GDal supported, ECW, IMG, Grass, ERMMapper, Envi,	GDAL supported Formats	ECW, MrSID, JPEG,jpg, jp2, TIF, geoTIFF, PNG, GIF, img, bmp, jpeg2000	jpg, tif, geoTIFF, png, ecw(
Operating System	Windows, Linux, Mac	Windows, Linux, Mac	Windows only	Windows, Linux, Mac	Windows, Linux, Mac	Windows, Linux, Mac	Windows only	Windows, Linux, Mac	Windows & Mac	Windows only	Windows, Linux, Mac	Windows	Windows, Linux, Ma

Tools of the Trade

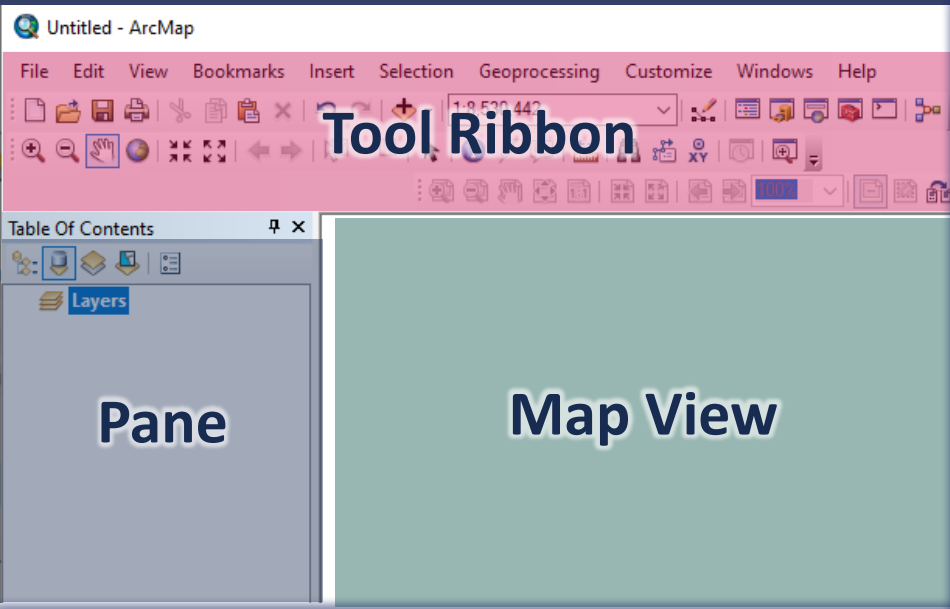


ArcMap

ArcGIS Pro

QGIS

Graphical User Interface



Untitled - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Tool Ribbon

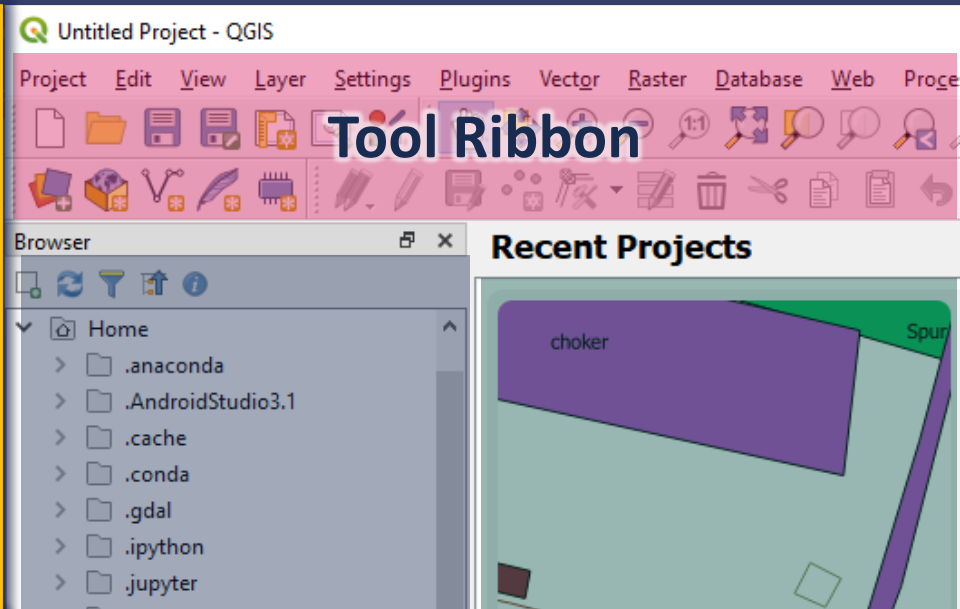
Table Of Contents

Layers

Pane

Map View

Detailed description: This screenshot shows the ArcMap interface. At the top is a menu bar with options like File, Edit, View, Bookmarks, Insert, Selection, Geoprocessing, Customize, Windows, and Help. Below the menu is a ribbon with various tool icons. A 'Table Of Contents' pane is visible on the left, showing a 'Layers' section. The main area is a 'Map View' with a light green background.



Untitled Project - QGIS

Project Edit View Layer Settings Plugins Vector Raster Database Web Process

Tool Ribbon

Browser

- Home
 - .anaconda
 - .AndroidStudio3.1
 - .cache
 - .conda
 - .gdal
 - .ipython
 - .jupyter
 - .linkchecker
 - .MakeMKV
 - .matplotlib
 - .MCTrainingCDK
 - .Mendeley Desktop
 - .plotly
 - .qgis2
 - .QtWebEngineProcess
 - .ScreamingFrogSEOSpider
 - .VirtualBox
 - 3D Objects
 - Anaconda3
 - Applications
 - ArcGIS
 - Contacts
 - Creative Cloud Files
 - Desktop

Pane

Recent Projects

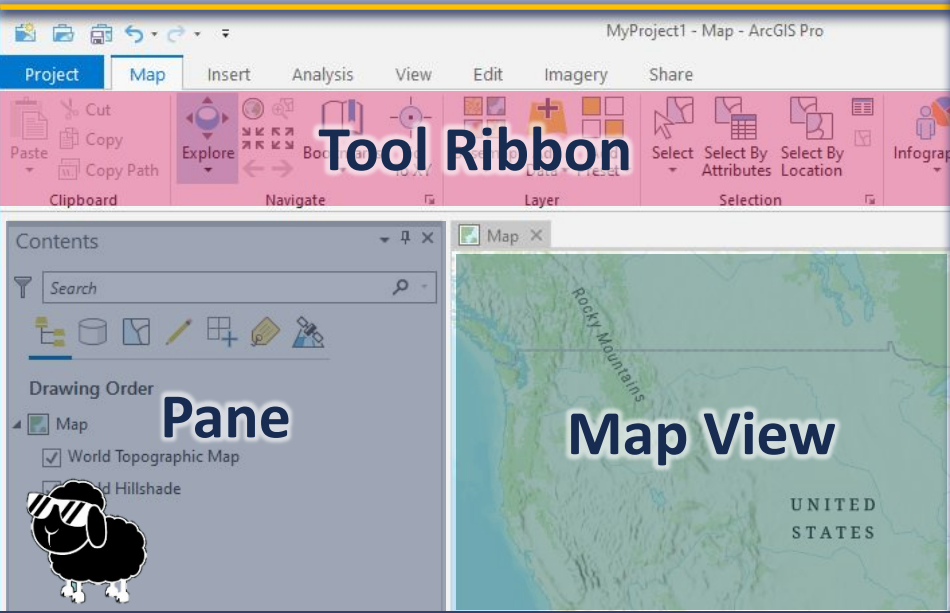
choker

Spur

Latour Map
C:\Users\RisaToMob\Desktop\Cooperative Extension
EPSG:38

Map View

Detailed description: This screenshot shows the QGIS interface. The top menu bar includes Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, and Process. A ribbon with tool icons is below. On the left is a 'Browser' pane showing a file tree under 'Home'. On the right is a 'Recent Projects' pane showing a map preview with labels 'choker' and 'Spur', and a project entry 'Latour Map'. The main area is a 'Map View' showing a map of the United States.



MyProject1 - Map - ArcGIS Pro

Project Map Insert Analysis View Edit Imagery Share

Tool Ribbon

Contents

Search

Drawing Order


- Map
- World Topographic Map
- Add Hillshade

Pane

Map View

Rocky Mountains

UNITED STATES



Detailed description: This screenshot shows the ArcGIS Pro interface. The top menu bar includes Project, Map, Insert, Analysis, View, Edit, Imagery, and Share. A ribbon with tool icons is below. On the left is a 'Contents' pane with a search bar and a 'Drawing Order' section. The main area is a 'Map View' showing a topographic map of the United States with 'Rocky Mountains' labeled. A small cartoon sheep wearing sunglasses is in the bottom left corner.

ArcMap

ArcGIS Pro

QGIS

Adding Data

Untitled - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Look in: NorthernCA

- NorthernCA_sec.shp
- NorthernCA_townships.shp
- Sections.shp
- Shasta_Corners.shp
- Shasta_Sections.shp
- Shasta_Township.shp
- Township.shp

Name:

Show of type: Datasets, Layers and Results

MyProject1 - Map - ArcGIS Pro

Project Map Insert Analysis View Edit Imagery Share

Clipboard

Contents

Search

Drawing Order

Map

Computer

- Desktop
- Documents
- Downloads
- Windows (C:)

Name

Type

Name	Type
Biomass_2019.shp	Shapefile

Untitled Project - QGIS

Project Edit View Layer Settings Plugins Vector Raster Database Web Processing Help

Data Source Manager Ctrl+L

Create Layer

Add Layer

Add Vector Layer...

Add Raster Layer...

Add Delimited Text Layer...

Add PostGIS Layers...

Add SpatialLite Layer...

Add MSSQL Spatial Layer...

Add DB2 Spatial Layer...

Add Oracle Spatial Layer...

Add/Edit Virtual Layer...

Add WMS/WMTS Layer...

Add ArcGIS MapServer Layer...

Add WCS Layer...

Add WFS Layer...

Add ArcGIS FeatureServer Layer...

Embed Layers and Groups...

Add from Layer Definition File...

Copy Style

Paste Style

Copy Layer

Paste Layer/Group

Open Attribute Table F6

Toggle Editing

Save Layer Edits

Current Edits

Save As...

Save As Layer Definition File...

Remove Layer/Group Ctrl+D

Duplicate Layer(s)

Set Scale Visibility of Layer(s)

Set CRS of Layer(s) Ctrl+Shift+C

Properties...

Filter... Ctrl+F

Labeling

Show in Overview

Show All in Overview

Hide All from Overview

Browser

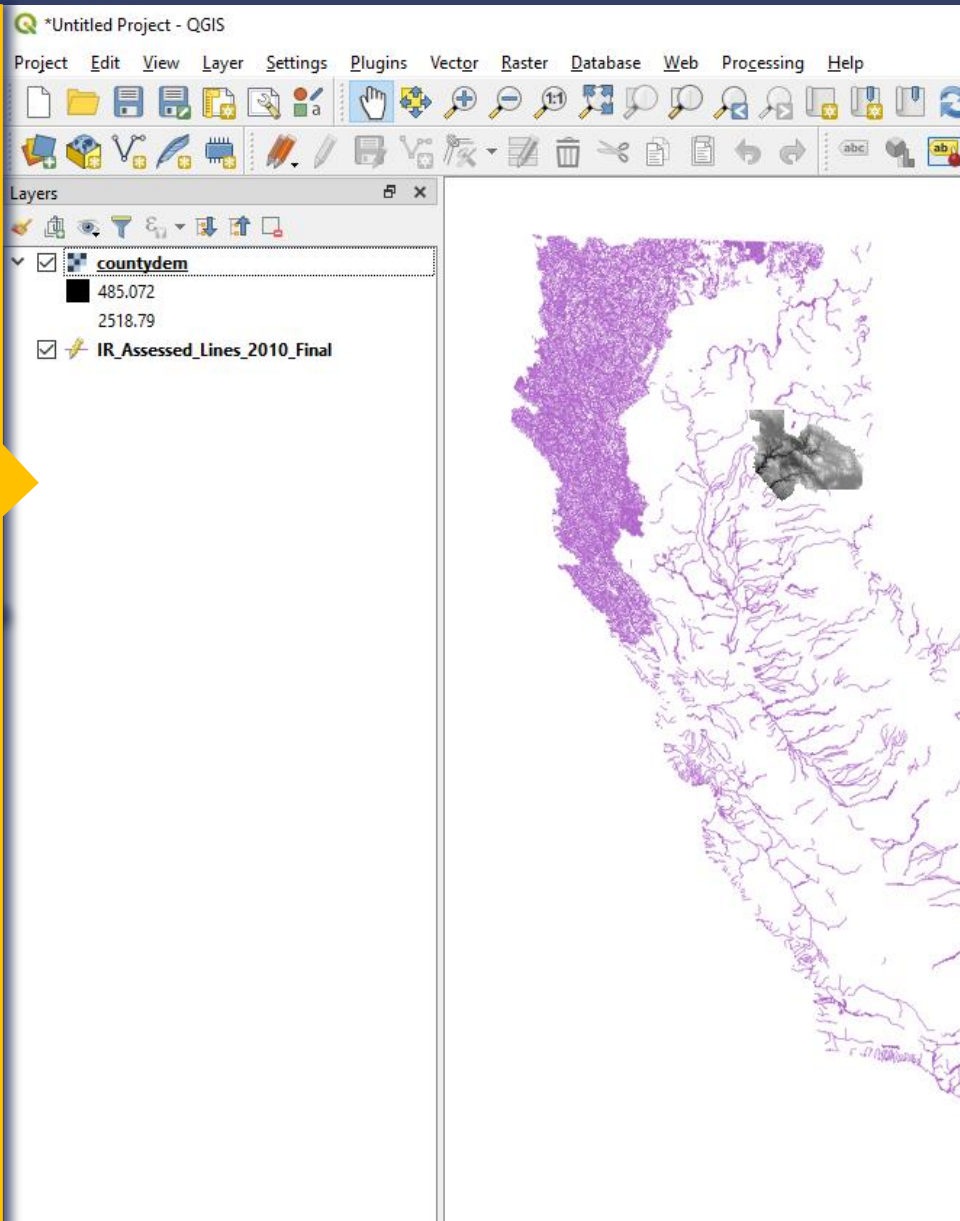
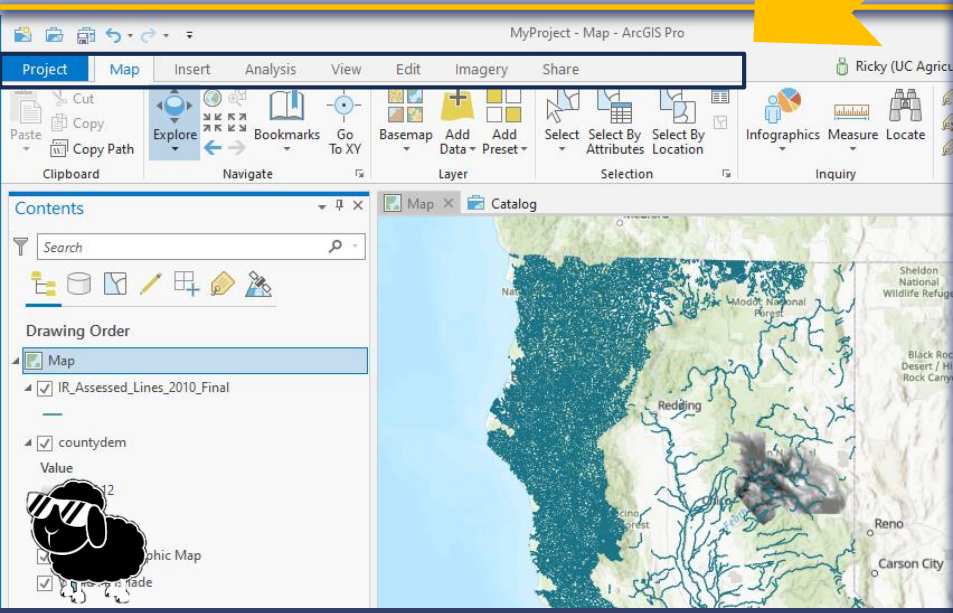
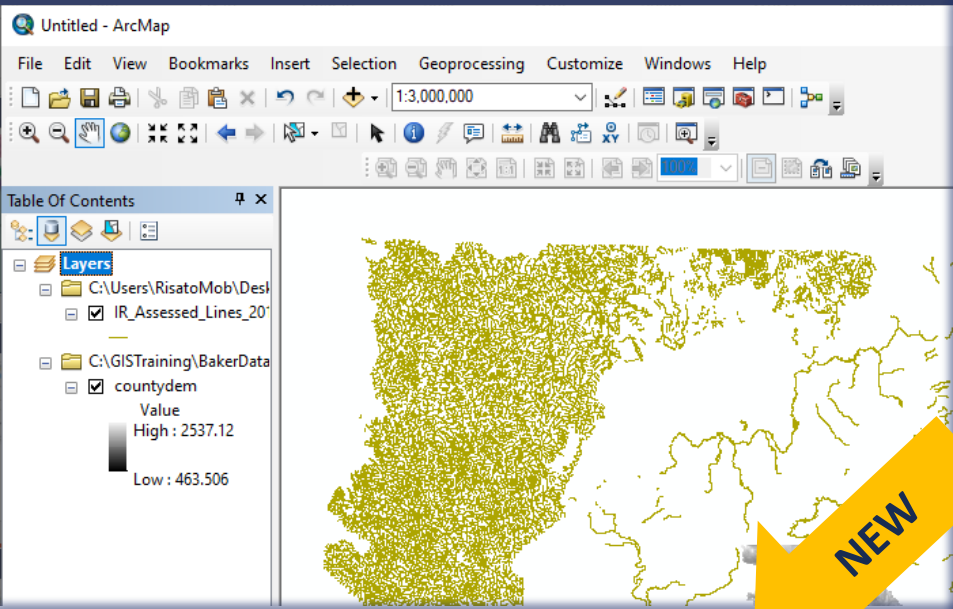
- Favorites
- #Mapping
- Desktop
- 360Photo
- Biomass
- Bion
- Blodgett
- Coopera
- Downlo
- Dropbox
- Fusion T
- Personal
- temp
- Woody f
- 5E49.km
- 5E49.km
- Analytic
- Analytic
- Bekreley
- biltmore
- Biomass
- FIT_Outr
- FIT_Outr
- LaTour.x
- LawrenceLivermore_Gettin
- LawrenceLivermore_Gettin
- layout1.pdf
- layout1.pdf
- Layout2.pdf

ArcMap

ArcGIS Pro

QGIS

Tab Views

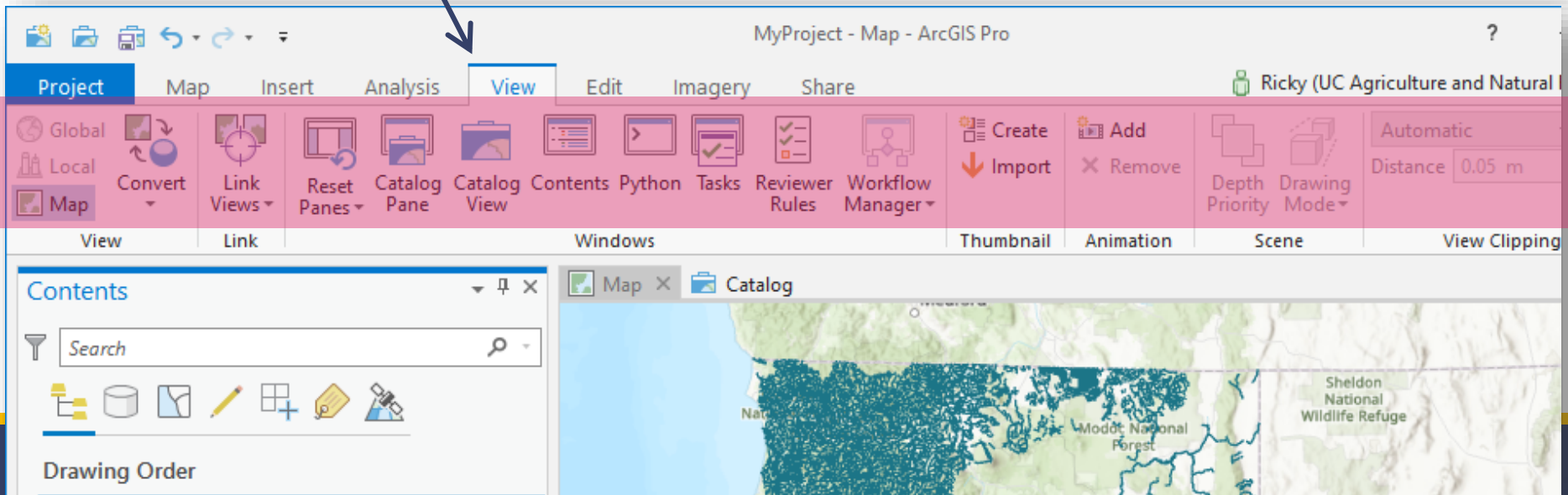
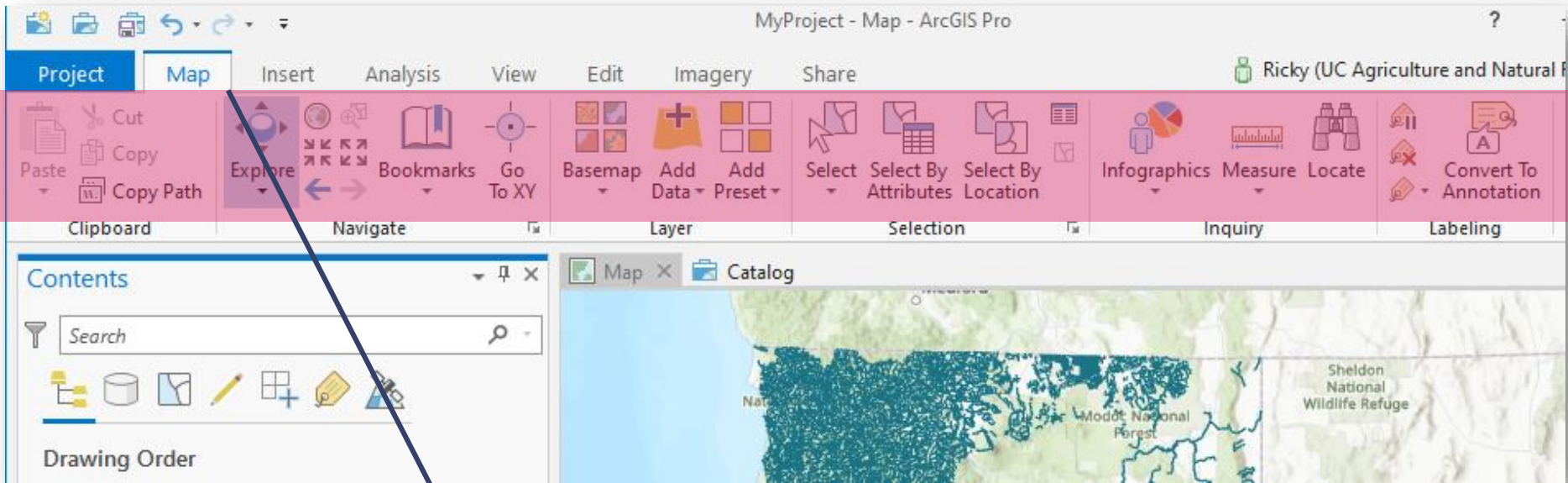


ArcMap

ArcGIS Pro

QGIS

Tab Views



ArcMap

ArcGIS Pro

QGIS

Tab Views

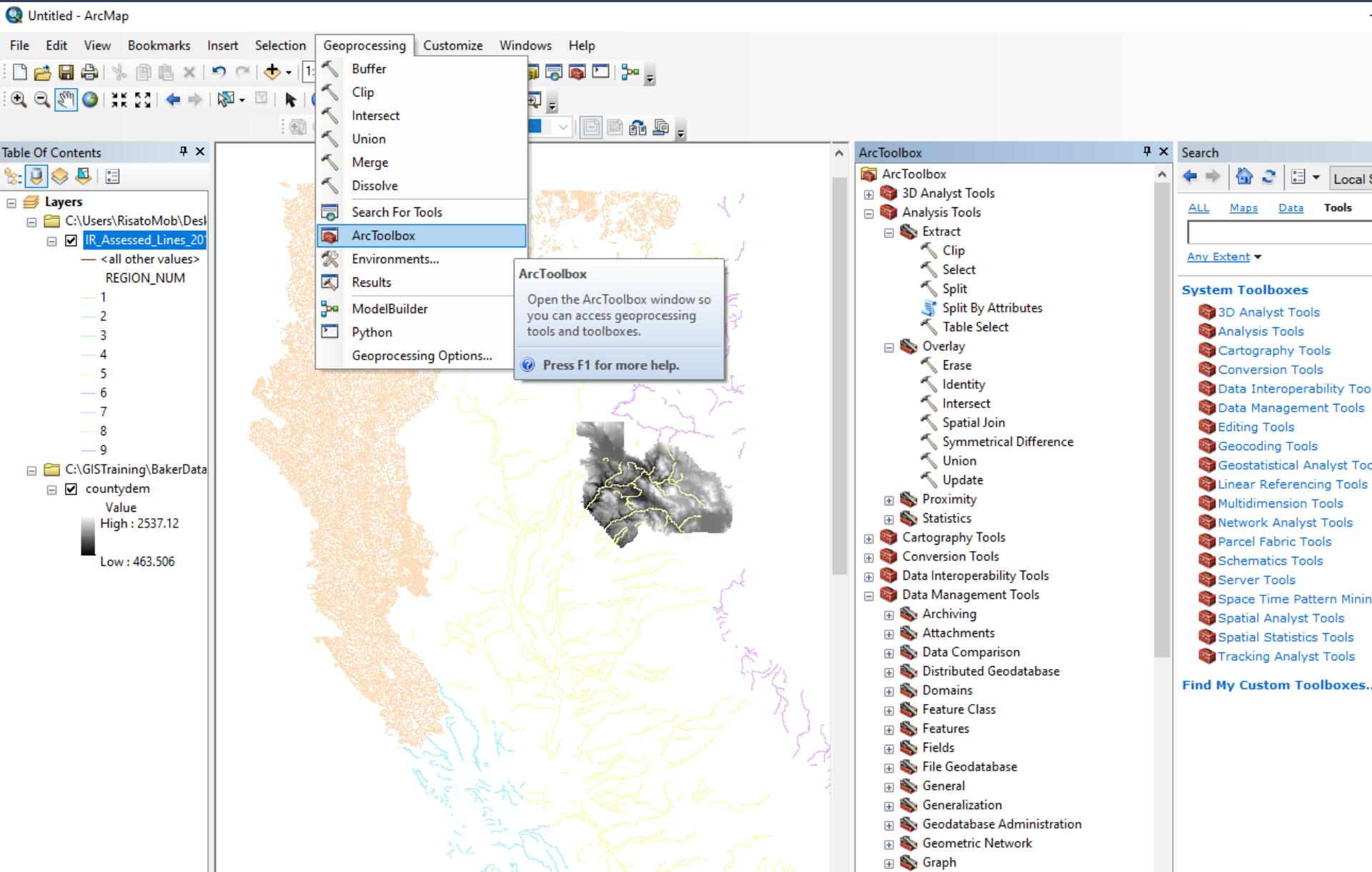
The image displays two overlapping windows of ArcGIS Pro, illustrating the 'Tab Views' feature. The top window is titled 'MyProject - Map - ArcGIS Pro' and is in 'Feature Layer' mode. The 'Data' tab is active, showing a ribbon with various data management and analysis tools. The bottom window is also titled 'MyProject - Map - ArcGIS Pro' but is in 'Raster Layer' mode. The 'Data' tab is also active here, showing a different set of tools. Both windows have a 'Contents' panel on the left side. In the top window, the layer 'IR_Assessed_Lines_2010_Final' is selected in the Drawing Order. In the bottom window, the layer 'countydem' is selected. A blue arrow points from the selected layer in the top window to the selected layer in the bottom window, indicating the transition between the two views. The map in the bottom window shows a terrain map with a blue overlay representing the 'countydem' layer.

ArcMap

ArcGIS Pro

QGIS

Geoprocessing



ArcMap

ArcGIS Pro

QGIS

Geoprocessing

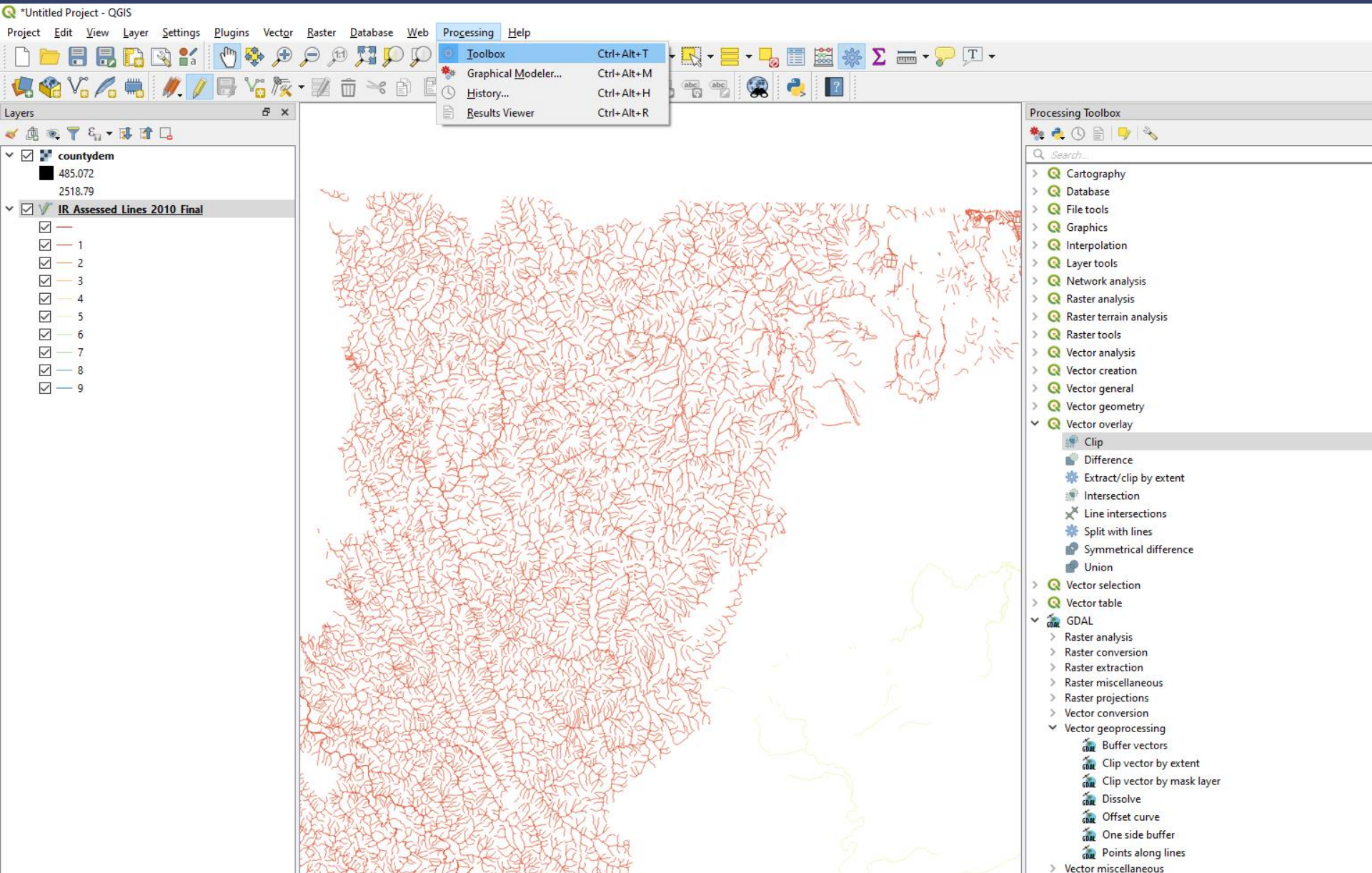
The screenshot displays the ArcGIS Pro Geoprocessing interface. At the top, the ribbon includes tabs for Project, Map, Insert, Analysis, View, Edit, Imagery, Share, Appearance, Labeling, and Data. The Analysis tab is active, showing a toolbar with tools like Summarize, Enrich, Clip, Intersect, Union, Network Analysis, Geostatistical Wizard, Business Analysis, Raster Functions, and Function Editor. Below the ribbon, the main workspace shows a map of California with a network of red lines representing assessed lines. The map is overlaid with a brown hillshade and a blue topographic map. On the left, the Contents pane shows a layer named 'IR_Assessed_Lines_2010_Final' with a legend for 'REGION_NUM' ranging from 1 to 9. Below the Contents pane, the Drawing Order pane shows the 'countydem' layer with a value range from 2537.12 to 463.506. On the right, the Geoprocessing pane is open, showing a search box with 'cl' entered. Below the search box, a list of tools is displayed, including 'Clip (Analysis Tools)', 'Clip Layer (GeoAnalytics Desktop Tools)', 'Clip Raster (Data Management Tools)', 'Classify Raster (Image Analyst Tools)', 'Classify Raster (Spatial Analyst Tools)', 'Clear Pixel Cache (Data Management Tools)', 'Class Probability (Spatial Analyst Tools)', and 'Classify LAS Noise (3D Analyst Tools)'. A tooltip is visible over the Geoprocessing pane, stating 'Show the Geoprocessing pane. You can search for a specific tool, see a list of favorite and recently run tools, and explore all tools and toolboxes that are included in ArcGIS Pro.'

ArcMap

ArcGIS Pro

QGIS

Geoprocessing



Software Comparison

ArcGIS Pro

QGIS

✓ Powerful out of the box tools	✗ Requires additional plug-ins to maximize functionality
✗ Requires set-up for offline use	✓ Works Offline
✗ Requires set-up before working with data	✓ Lightweight program easy to dive into quickly
✗ Uses proprietary data formats	✓ Defaults to open source formats
✓ Massive library of map resources and support	✗ Inconsistent availability of technical support
✗ \$\$ to \$\$\$	✓ FREE

What to do When Stuck

User Manuals

- QGIS docs.qgis.org
- ESRI pro.arcgis.com/en/pro-app/help

That young guy/gal in the office



Help Forums

- All gis.stackexchange.com/
- ESRI community.esri.com/



Data Acquisition



Contour/Elevation	https://viewer.nationalmap.gov/advanced-viewer/
Stream Data	https://apps.wildlife.ca.gov/bios/?al=Hydrography:4
Satellite Imagery	https://nracs.box.com/v/naip
Projection Guidance	https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109326
Kitchen Sink	https://geodata.lib.berkeley.edu/

GPS Hardware

GLONASS

+

GPS

+

Gallileo

NTDP GPS Receiver Horizontal Accuracy Reports

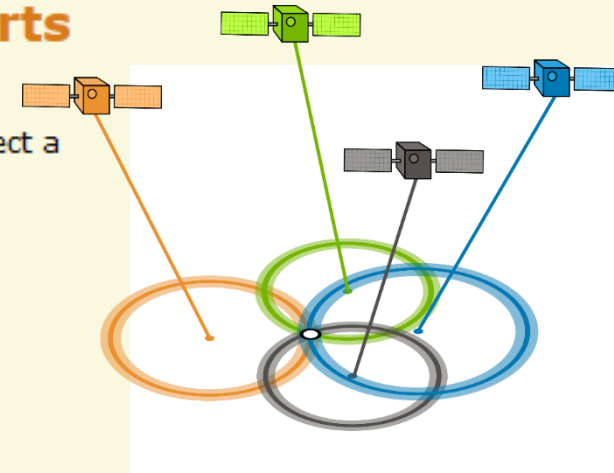
NTDP has been testing GPS receivers of various grades in order to determine their horizontal accuracy in different conditions, and, in some cases, different settings. Select a make and model to see the accuracy reports for that receiver.

Manufacturer

Samsung

Model

Galaxy S9



Apple iPhone XR

Samsung Galaxy S9

Tested Accuracies By Canopy Type NSSDA(units in meters)

Tested Accuracies By Canopy Type NSSDA(units in meters)

External Antenna	Real Time Correction	Glionass	Post Process	# of Positions Averaged	Open	Light-Medium	Heavy-Closed	Open	Light-Medium	Heavy-Closed
No	None	Yes	No	1	3.44	5.92	9.33	4.47	9.31	11.56
No	None	Yes	No	5	3.1	6.6	7.43	5.32	9.43	9.49
No	None	Yes	No	60	3.03	5.05	7.4	4.19	12.8	13.52

Helpful Avenza® Features

1. Quick Response Code
2. Navigation Map
3. Point Averaging
4. Multi-platform support

QR Code Safety:
DO NOT SCAN
unknown codes.

