

Setting Up and Deploying Geospatial Data Shares Using the QGIS Server Application

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Quantum GIS (QGIS) Applications

QGIS is not only a desktop GIS. We also provide a spatial file browser, a server application, and web applications.

QGIS Desktop: Create, edit, visualize and publish geospatial information. For Windows, Mac, Linux, BSD and Android.

QGIS Browser: Browse and preview your data and metadata. Drag Drop your data from one datastore into the other.

QGIS Server: Publish your QGIS projects and layers as OGC compatible WMS and WFS services. Control which layers, attributes, layouts and coordinates systems are exported.

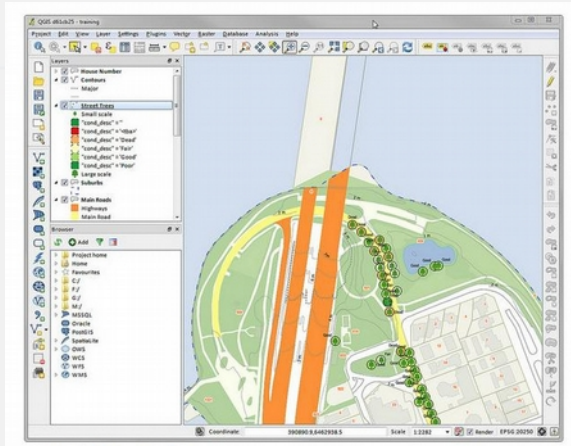
QGIS Web Client: Publish your QGIS Projects on the web with ease. Benefit from the powerful symbology, labeling and blending features to impress with your maps.

QGIS on Android (in beta)



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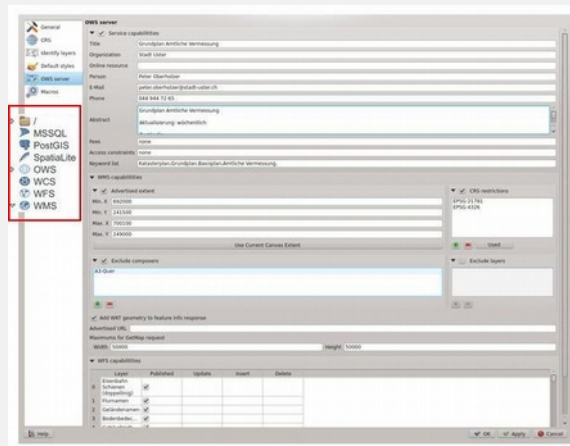
Quantum GIS (QGIS) Applications



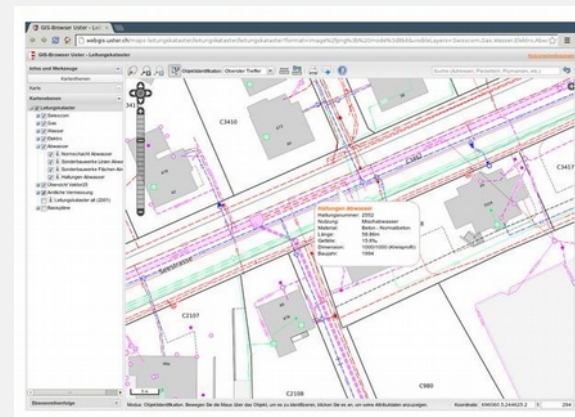
QGIS Desktop



QGIS Browser



QGIS Server



QGIS Web Client



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QGIS Server is an open source **WMS 1.3, WFS 1.0.0 and WCS 1 1.1.1** implementation that, in addition, implements Advanced cartographic General features for thematic mapping. The QGIS Server is a **FastCGI/CGI Tools** (Common Gateway Interface) application written in C++ that **works together with** a web server (e.g., **Apache, Lighttpd**). It has **Python plugin support** allowing for fast and efficient development and deployment of new QGIS features. The original development of QGIS Server was Funded by the EU projects Orchestra, Sany and the city of Uster in Switzerland.



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QGIS Server Set Up

Background on Set Up

Server: QGIS Server

Server OS: Ubuntu 17.04 LTS (Linux)

Server Software:

Apache2 – Version 2.4.25

PHP – Version 7.0.22

QGIS – Version 2.14.11

Client: QGIS Desktop

Client OS: Ubuntu 14.04 LTS (Linux)

QGIS Version 2.18



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Setting Up QGIS Server - STEPS

1. Installed Quantum GIS Desktop (Synaptic)
2. Installed Quantum GIS Server (Synaptic)
3. Followed “QGIS as a OGC Data Server” Document from qgis.org
4. Rounded up Tennessee geospatial data
5. Set up ‘o2k17_tn_wms’ Workspace
6. Set up ‘o2k17_tn_wcs’ Workspace
7. Built QGIS Desktop Projects for Raster and Vector
8. Added Web Services to Projects
9. Verified QGS Server Fast CGI configurations



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Setting Up QGIS Server - STEPS

1. Installed Quantum GIS Desktop (Synaptic) or . . .

```
sudo apt-get install qgis python-qgis
```

2. Installed Quantum GIS Server (Synaptic) or . . .

```
sudo apt-get install qgis-server
```

3. “QGIS as a OGC Data Server” - STEPS [qgis.org]

3a. Installation of a HelloWorld example plugin for testing servers. You create a directory to hold server plugins. [details: next slide]



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Setting Up QGIS Server - STEPS

“QGIS as a OGC Data Server” - STEPS [continued]

3a. Installation of a HelloWorld example plugin.

```
$ sudo mkdir -p /opt/qgis-server/plugins  
$ cd /opt/qgis-server/plugins  
$ sudo wget https://github.com/elpaso/qgis-helloserver/archive/master.zip  
# In case unzip was not installed before:  
$ sudo apt-get install unzip  
$ sudo unzip master.zip  
$ sudo mv qgis-helloserver-master HelloServer
```



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Setting Up QGIS Server - STEPS

“QGIS as a OGC Data Server” - STEPS [continued]

3c. Then enabled the virtual host and restart Apache:

```
$ sudo a2ensite 001-qgis-server
```

```
$ sudo service apache2 restart
```

3d. Test the server with the HelloWorld plugin:

```
$ wget -q -O - "http : // localhost/cgi-bin/qgis_mapserv.fcgi?SERVICE=HELLO"
```

HelloServer!'



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Setting Up QGIS Server - STEPS

“QGIS as a OGC Data Server” - STEPS [continued]

- 3e. Creating a WMS/WFS/WCS server from a QGIS project. To provide a new QGIS Server WMS, WFS or WCS, we have to create a QGIS project file with some data. Here, we use the ‘Alaska’ shapefile from the QGIS sample dataset. Define the colors and styles of the layers in QGIS and the project CRS, if not already defined.

NOTE: I followed the steps given to set up a QGIS Server with the Alaska data set, then set up QGIS Server instances for the

“OFWIM 2017 QGIS Server Tennessee Data Shares”



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Setting Up a QGIS Server for: “OFWIM 2017 Tennessee Data Shares QGIS Server”

4. Rounded up Tennessee geospatial data

Sources of the Tennessee geospatial data were:

USDA/NRCS Geospatial Data Gateway:

<https://gdg.sc.egov.usda.gov/>

USGS Geonames Web Site:

<https://geonames.usgs.gov/>

Tennessee Wildlife Resources Agency ArcGIS Online Site:

<https://twra.maps.arcgis.com/home/gallery.html#c=organization&o=modified>



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Setting Up a QGIS Server for: “OFWIM 2017 Tennessee Data Shares QGIS Server”

4. Rounded up Tennessee geospatial data

The image shows two overlapping web browser windows. The background window is the United States Board on Geographic Names website, featuring a header with the 125th anniversary logo (1890-2015) and navigation links for Domestic, Foreign, and Antarctic names. The foreground window is the Geospatial Data Gateway (GDG) website, which includes a 'Welcome to GDG' message, a 'GET DATA' button, and a 'Gallery' section titled 'Tennessee Wildlife Resources Agency Featured Content'. The gallery displays various maps and data layers, such as 'TWRA Huntable Lands' and 'TWRA_Lands_Nov2016', with 'OPEN' and 'DETAILS' buttons for each item.



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Setting Up a QGIS Server for:
“OFWIM 2017 Tennessee Data Shares QGIS Server”

5. Set up ‘o2k17_tn_wms’ Workspace

Placed 'Vector' Coverages in a QGIS Desktop 'Project' *

Chattanooga, Tennessee	(point coverage)	NRCS/GSD
Chattanooga Topo Quad Boundary	(polygon coverage)	NRCS/GSD
Hamilton County GNIS Features	(point coverage)	USGS/Geonames
Hamilton County Populated Places	(point coverage)	USGS/Geonames
Hamilton County Primary Roads	(line coverage)	NRCS/GSD
Hamilton County Secondary Roads	(line coverage)	NRCS/GSD
Hamilton County Streets	(line coverage)	NRCS/GSD
Hamilton Vicinity Watersheds	(polygon coverage)	NRCS/GSD
Hamilton County Boundary	(polygon coverage)	NRCS/GSD
Hamilton County Topo Boundaries	(polygon coverage)	NRCS/GSD
Tennessee Counties	(polygon coverage)	NRCS/GSD
Tennessee Geology	(polygon coverage)	NRCS/GSD
TWRA Lands	(polygon coverage)	TWRA/ArcGIS

* **Style(s) applied to coverages; 2 Projections: EPSG: 26916 / EPSG: 102736**

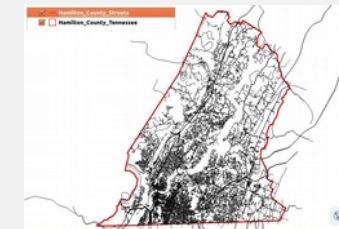
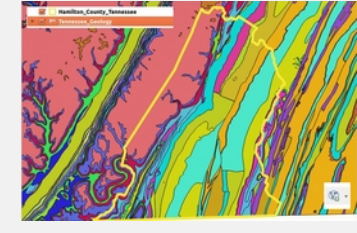
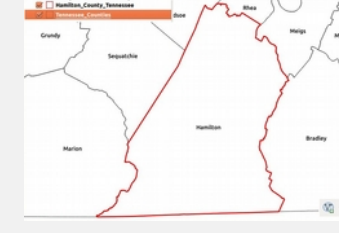
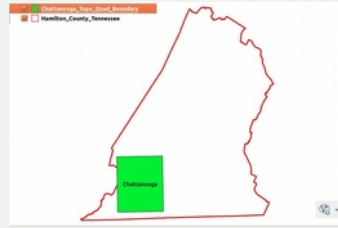


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Setting Up a QGIS Server for: “OFWIM 2017 Tennessee Data Shares QGIS Server”

5. Set up ‘o2k17_tn_wms’ Workspace (continued)

Placed 'Vector' Coverages in a QGIS Desktop 'Project'

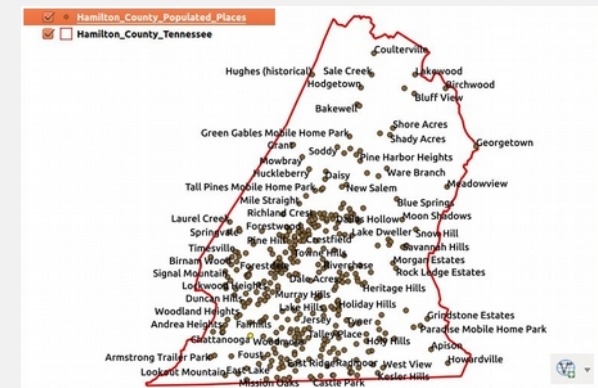
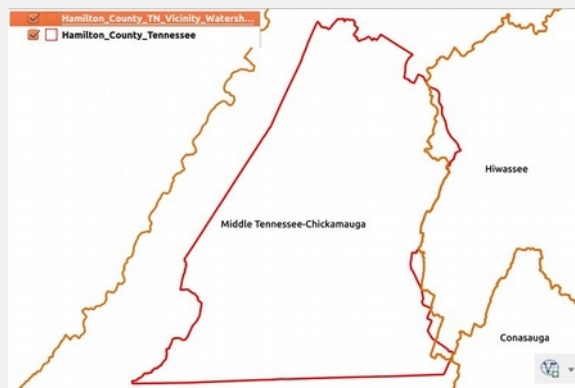
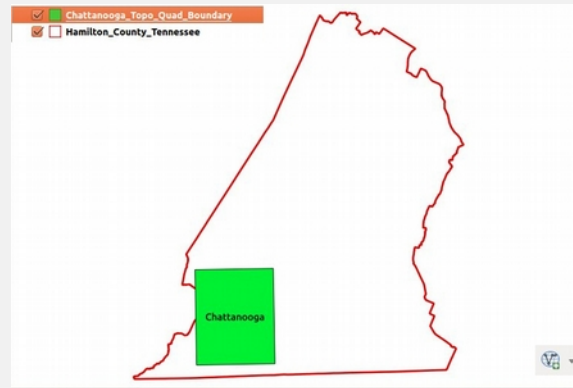
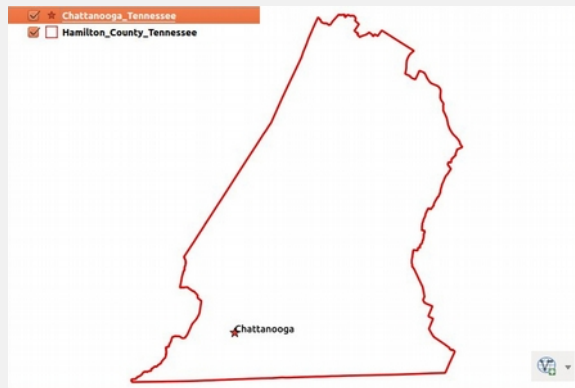


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Setting Up a QGIS Server for: “OFWIM 2017 Tennessee Data Shares QGIS Server”

5. Set up ‘o2k17_tn_wms’ Workspace (continued)

Placed 'Vector' Coverages in a QGIS Desktop 'Project'

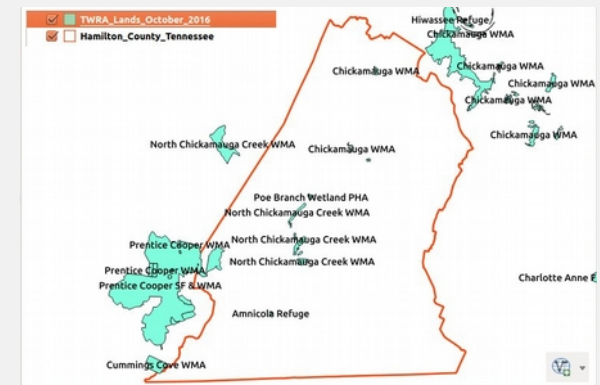
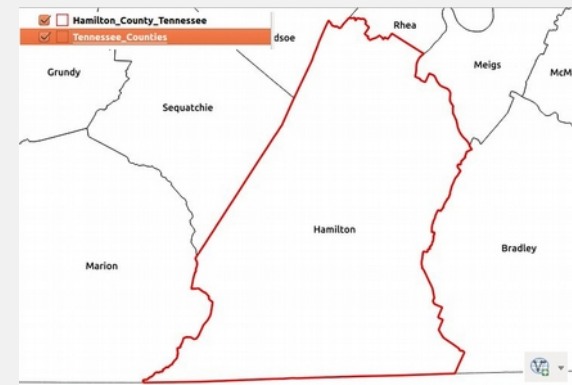
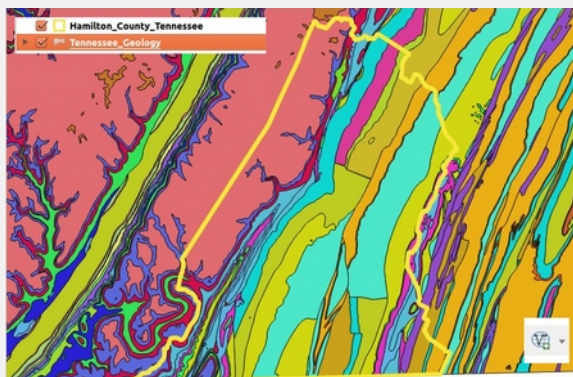
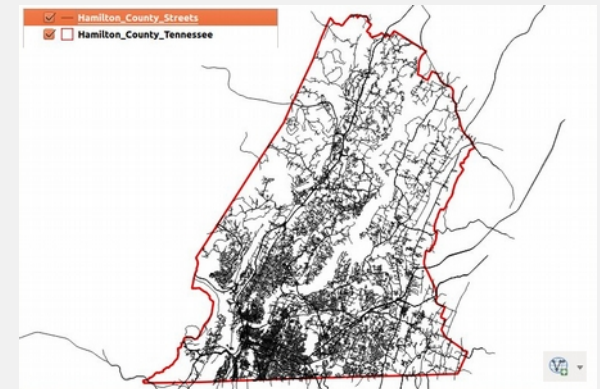
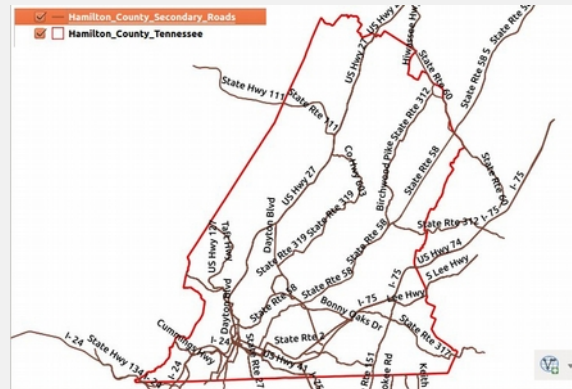
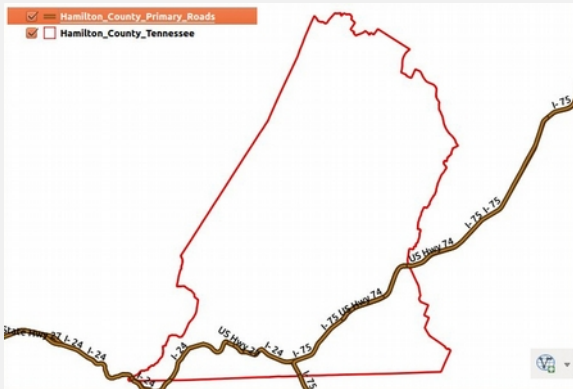


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5. Set up ‘o2k17_tn_wms’ Workspace (continued)

Placed 'Vector' Coverages in a QGIS Desktop 'Project'



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Setting Up a QGIS Server for:
“OFWIM 2017 Tennessee Data Shares QGIS Server”

6. Set up ‘o2k17_tn_wcs’ Workspace

Placed 'Raster' Coverages in a QGIS Desktop 'Project'

Hamilton County National Elevation Data NRCS/GDG
30 m resolution

Hamilton County NAIP (2016) Imagery (subset) NRCS/GDG
1m resolution – subset of Chattanooga Topo Area

Hamilton County Digital Raster Graphic (subset) NRCS/GDG
30m resolution – subset of Chattanooga Topo Area

Tennessee Land Use Land Cover (USGS) NRCS/GDG
Statewide coverage for Tennessee

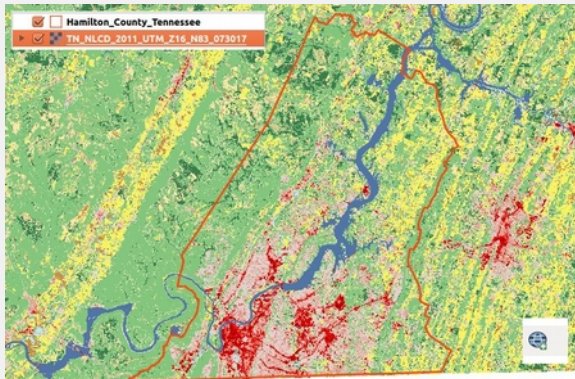
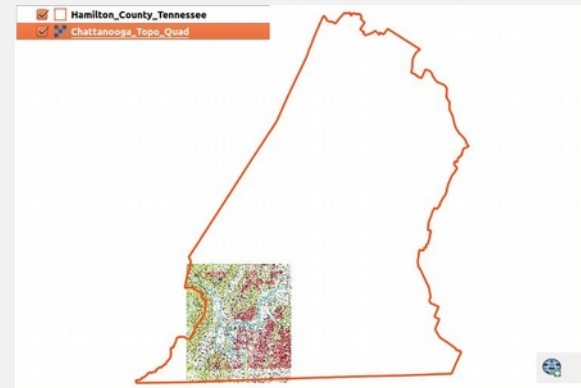
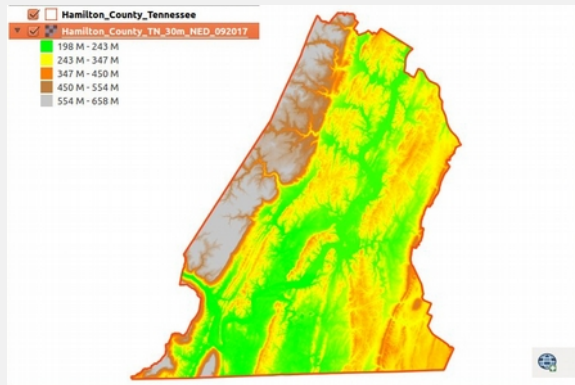


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Setting Up a QGIS Server for: “OFWIM 2017 Tennessee Data Shares QGIS Server”

6. Set up ‘o2k17_tn_wcs’ Workspace

Placed 'Raster' Coverages in a QGIS Desktop 'Project'

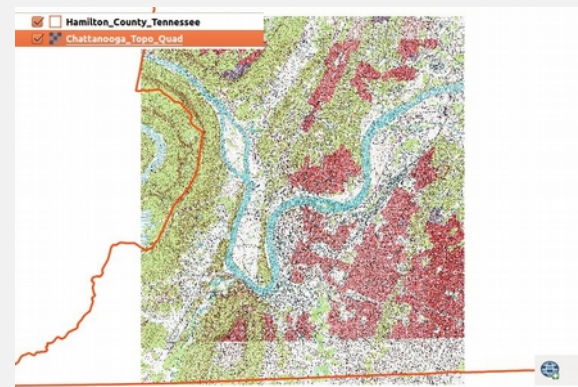
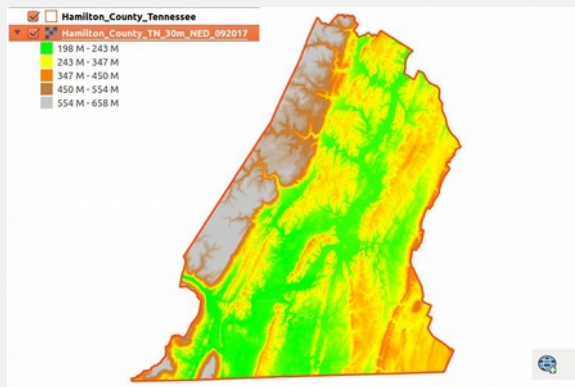


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Setting Up a QGIS Server for: “OFWIM 2017 Tennessee Data Shares QGIS Server”

6. Set up ‘o2k17_tn_wcs’ Workspace

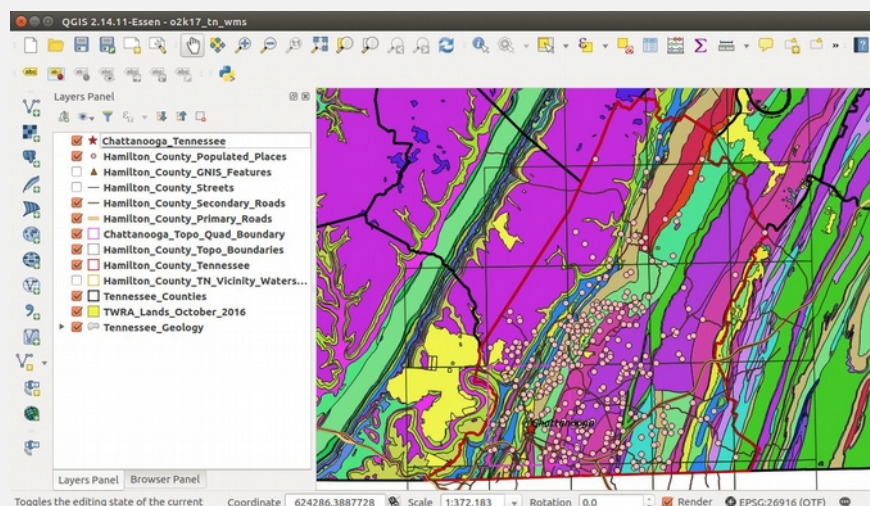
Placed 'Raster' Coverages in a QGIS Desktop 'Project'



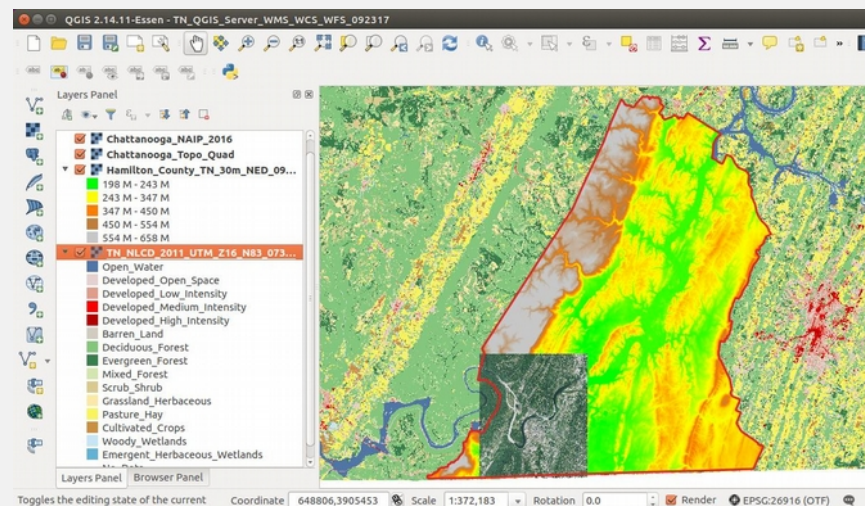
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Setting Up QGIS Server - STEPS

7. Built QGIS Desktop Projects for Vector and Raster



O2K17_TN_WFS.qgs



O2K17_TN_WCS.qgs

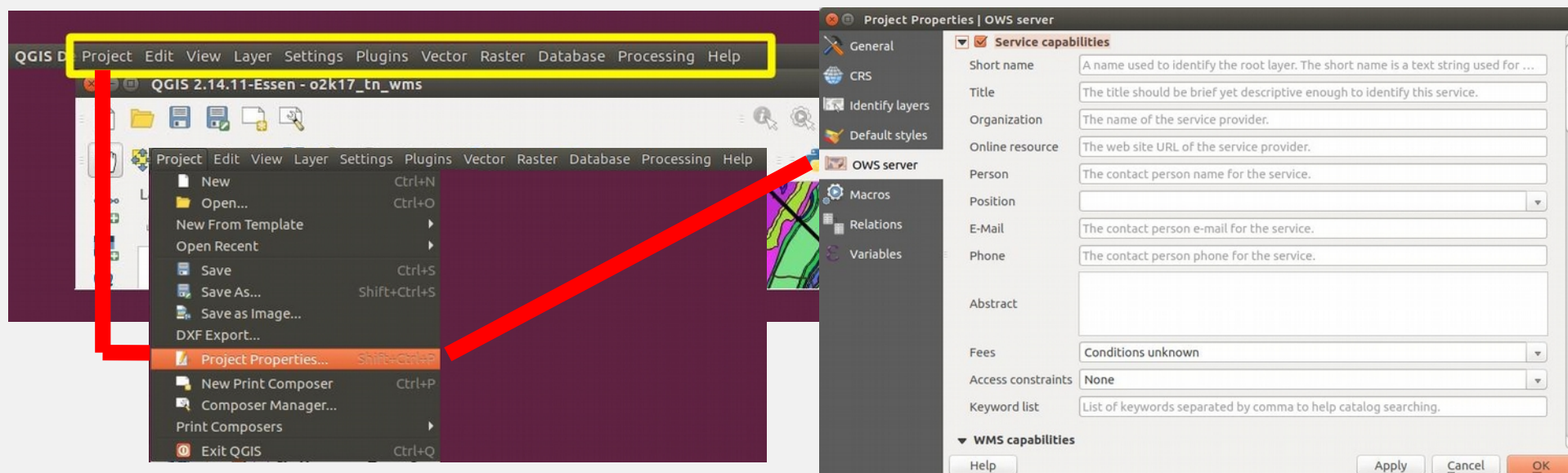


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects

Done by way of the File / Project Menu Options . . .

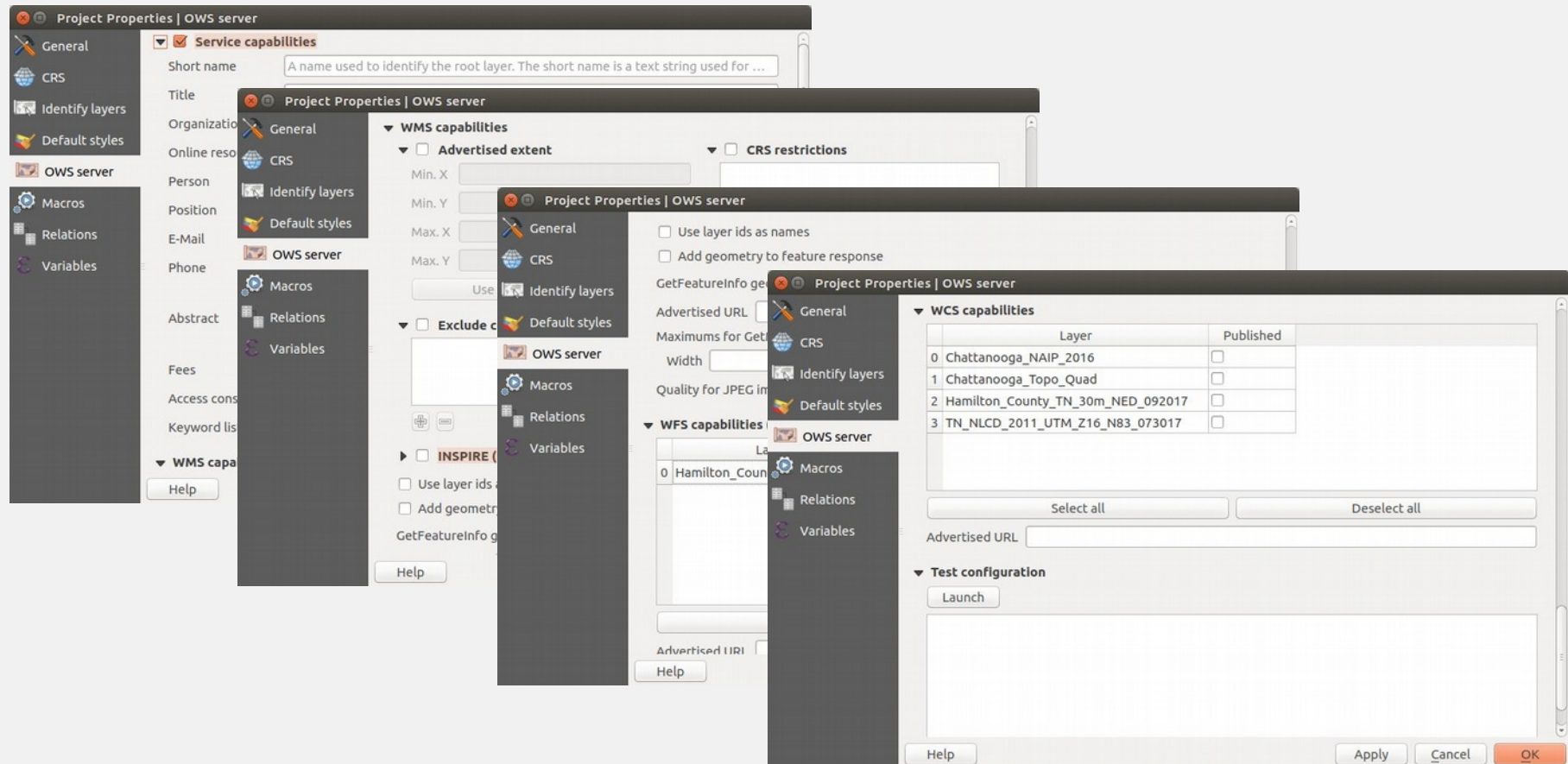


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Four 'Screen' of Parameters to Be Entered

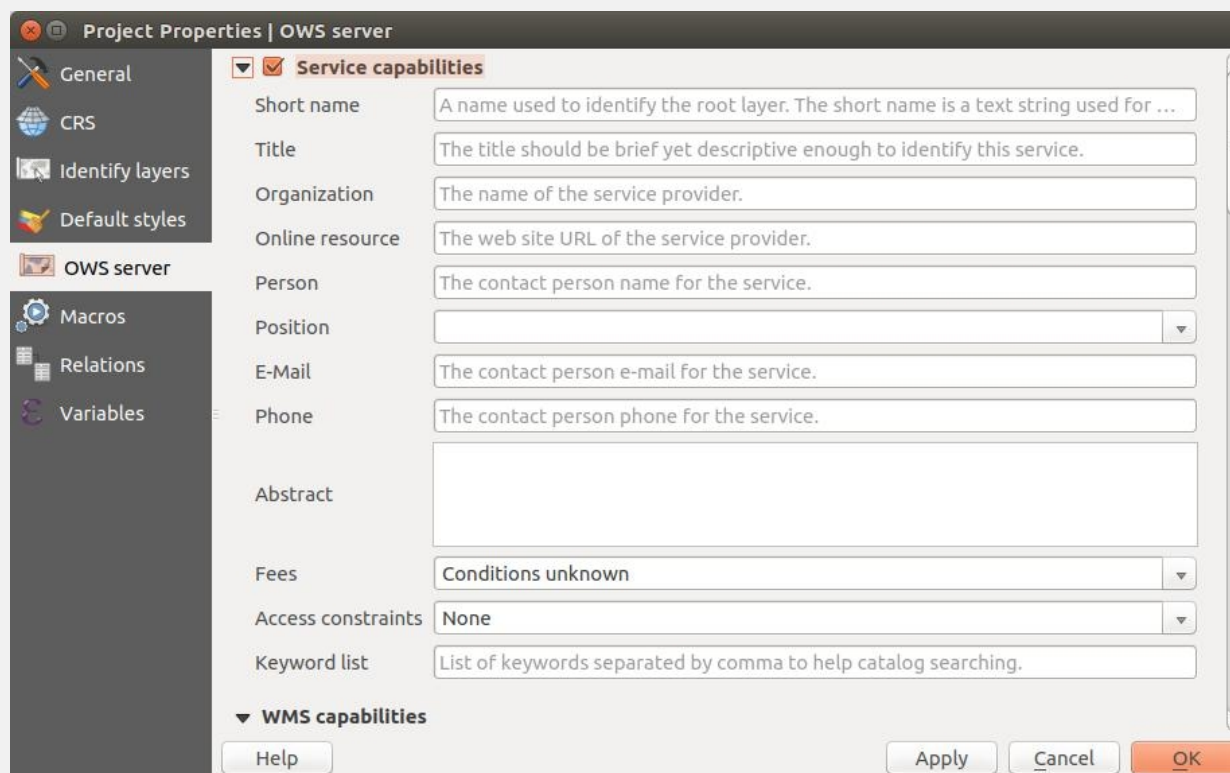


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Screen 1 of 4 - of Parameters to Be Entered



The screenshot shows the 'Project Properties | OWS server' dialog box. The left sidebar contains a tree view with the following items: General, CRS, Identify layers, Default styles, OWS server (selected), Macros, Relations, and Variables. The main area is titled 'Service capabilities' and contains the following fields:

- Short name:** A name used to identify the root layer. The short name is a text string used for ...
- Title:** The title should be brief yet descriptive enough to identify this service.
- Organization:** The name of the service provider.
- Online resource:** The web site URL of the service provider.
- Person:** The contact person name for the service.
- Position:** (Empty dropdown menu)
- E-Mail:** The contact person e-mail for the service.
- Phone:** The contact person phone for the service.
- Abstract:** (Empty text area)
- Fees:** Conditions unknown (dropdown menu)
- Access constraints:** None (dropdown menu)
- Keyword list:** List of keywords separated by comma to help catalog searching.

Below these fields is a section for 'WMS capabilities' which is currently collapsed. At the bottom of the dialog are three buttons: 'Help', 'Apply', and 'OK'.

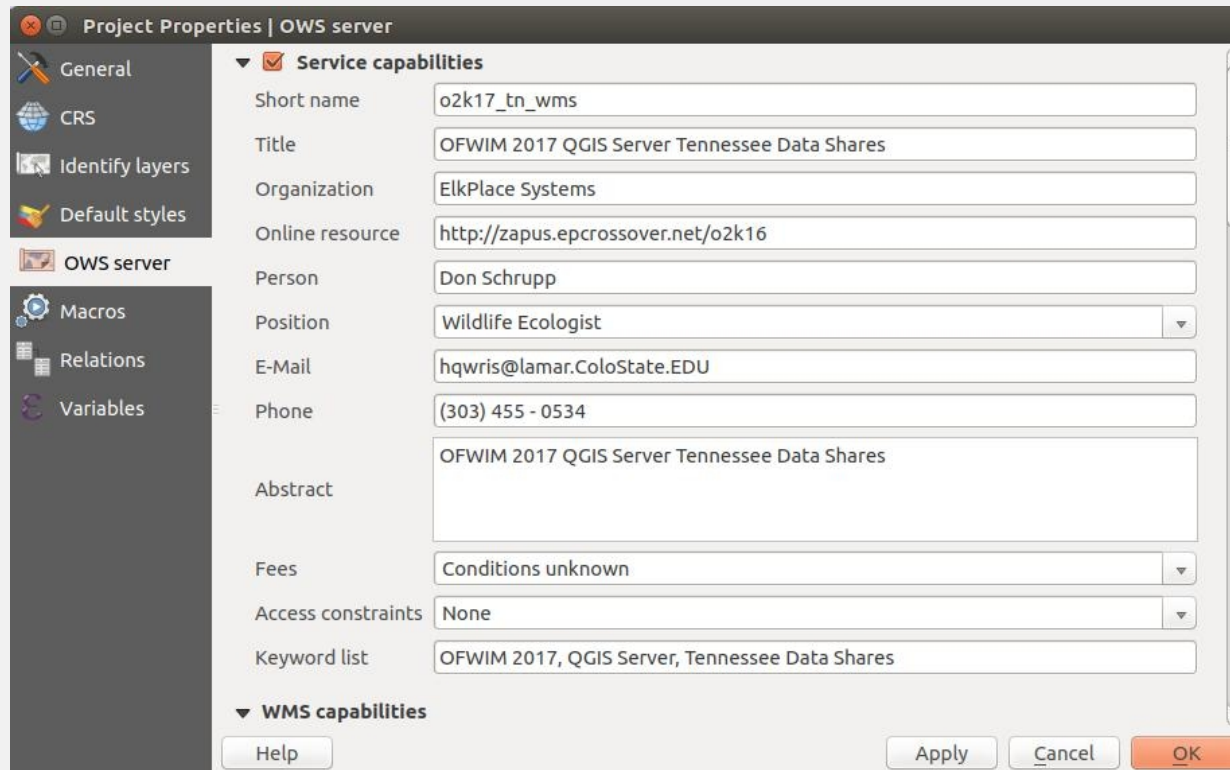


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Screen 1 of 4 - of Parameters Populated



The screenshot shows the 'Project Properties | OWS server' dialog box. The left sidebar contains icons for General, CRS, Identify layers, Default styles, OWS server (selected), Macros, Relations, and Variables. The main area is titled 'Service capabilities' and contains the following fields:

- Short name: o2k17_tn_wms
- Title: OFWIM 2017 QGIS Server Tennessee Data Shares
- Organization: ElkPlace Systems
- Online resource: <http://zapus.epcrossover.net/o2k16>
- Person: Don Schrupp
- Position: Wildlife Ecologist
- E-Mail: hqwris@lamar.ColoState.EDU
- Phone: (303) 455 - 0534
- Abstract: OFWIM 2017 QGIS Server Tennessee Data Shares
- Fees: Conditions unknown
- Access constraints: None
- Keyword list: OFWIM 2017, QGIS Server, Tennessee Data Shares

Below the 'Service capabilities' section is the 'WMS capabilities' section, which is currently collapsed. At the bottom of the dialog are buttons for 'Help', 'Apply', 'Cancel', and 'OK'.

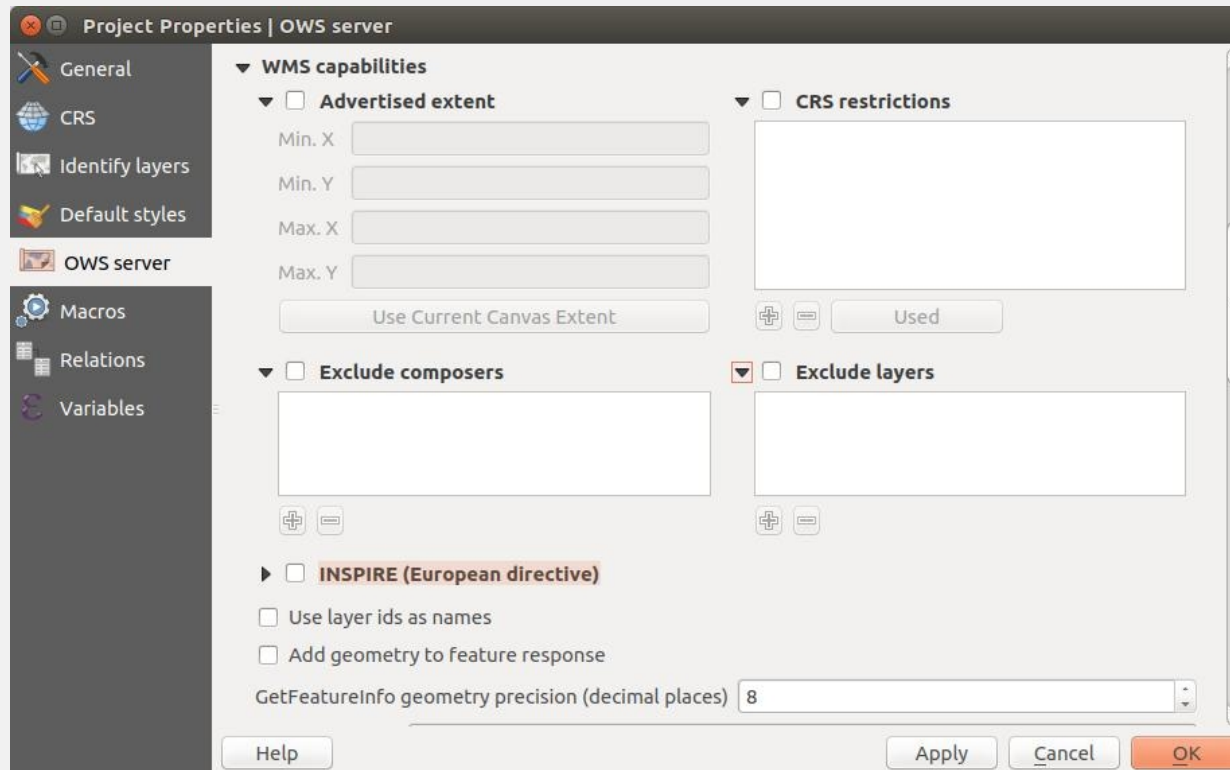


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Screen 2 of 4 - of Parameters to Be Entered



The screenshot shows the 'Project Properties | OWS server' dialog box. The left sidebar contains icons for General, CRS, Identify layers, Default styles, OWS server (selected), Macros, Relations, and Variables. The main area is divided into several sections:

- WMS capabilities**
 - ☐ **Advertised extent**: Includes input fields for Min. X, Min. Y, Max. X, and Max. Y, and a 'Use Current Canvas Extent' button.
 - ☐ **CRS restrictions**: Includes a large empty text area and a 'Used' button.
 - ☐ **Exclude composers**: Includes a large empty text area.
 - ☒ **Exclude layers**: Includes a large empty text area.
- ☐ **INSPIRE (European directive)**
 - ☐ Use layer ids as names
 - ☐ Add geometry to feature response
- GetFeatureInfo geometry precision (decimal places)**: A spinner box set to 8.

At the bottom are buttons for Help, Apply, Cancel, and OK.



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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Screen 2 of 4 - of Parameters Populated

The screenshot shows the 'Project Properties | OWS server' dialog box. The left sidebar contains icons for General, CRS, Identify layers, Default styles, OWS server (selected), Macros, Relations, and Variables. The main area is divided into several sections:

- WMS capabilities**
 - ☒ **Advertised extent**: Fields for Min. X (617988.14792840566951782), Min. Y (3810633.1730655306018889), Max. X (817804.3168674026383087), and Max. Y (3971447.03463029628619552). A 'Use Current Canvas Extent' button is below.
 - ☐ **CRS restrictions**: An empty text area with a 'Used' button below.
- ☒ **Exclude composers**: An empty list box with add and remove icons below.
- ☒ **Exclude layers**: An empty list box with add and remove icons below.
- ☐ **INSPIRE (European directive)**
 - ☒ Use layer ids as names
 - ☒ Add geometry to feature response
 - GetFeatureInfo geometry precision (decimal places): 8
- Advertised URL**: An empty text field.

Buttons at the bottom: Help, Apply, Cancel, and OK.

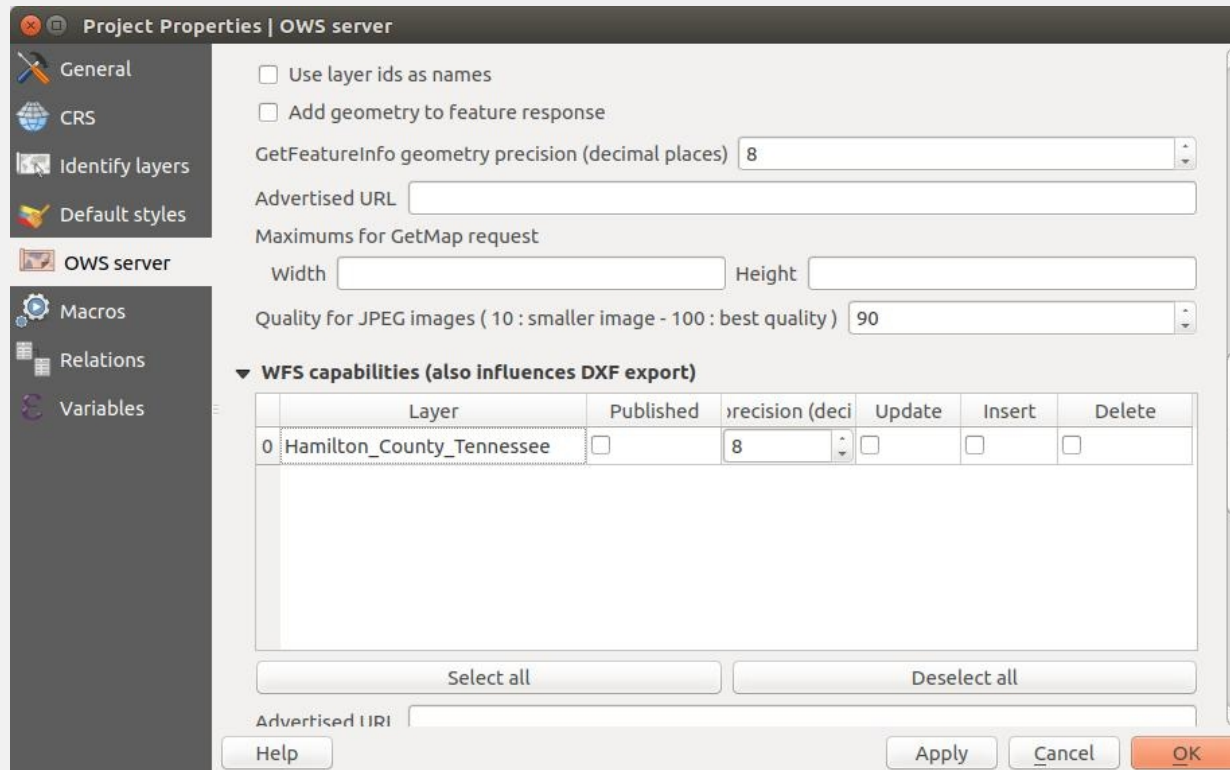


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Screen 3 of 4 - of Parameters to Be Entered



The screenshot shows the 'Project Properties | OWS server' dialog box. The left sidebar contains tabs: General, CRS, Identify layers, Default styles, OWS server (selected), Macros, Relations, and Variables. The main area has the following settings:

- ☐ Use layer ids as names
- ☐ Add geometry to feature response
- GetFeatureInfo geometry precision (decimal places): 8
- Advertised URL: [empty text box]
- Maximums for GetMap request:
 - Width: [empty text box]
 - Height: [empty text box]
- Quality for JPEG images (10 : smaller image - 100 : best quality) : 90
- ▼ WFS capabilities (also influences DXF export)

	Layer	Published	precision (dec)	Update	Insert	Delete
0	Hamilton_County_Tennessee	☐	8	☐	☐	☐

Below the table are buttons: 'Select all' and 'Deselect all'. At the bottom, there is an 'Advertised URL' field, a 'Help' button, and 'Apply', 'Cancel', and 'OK' buttons.

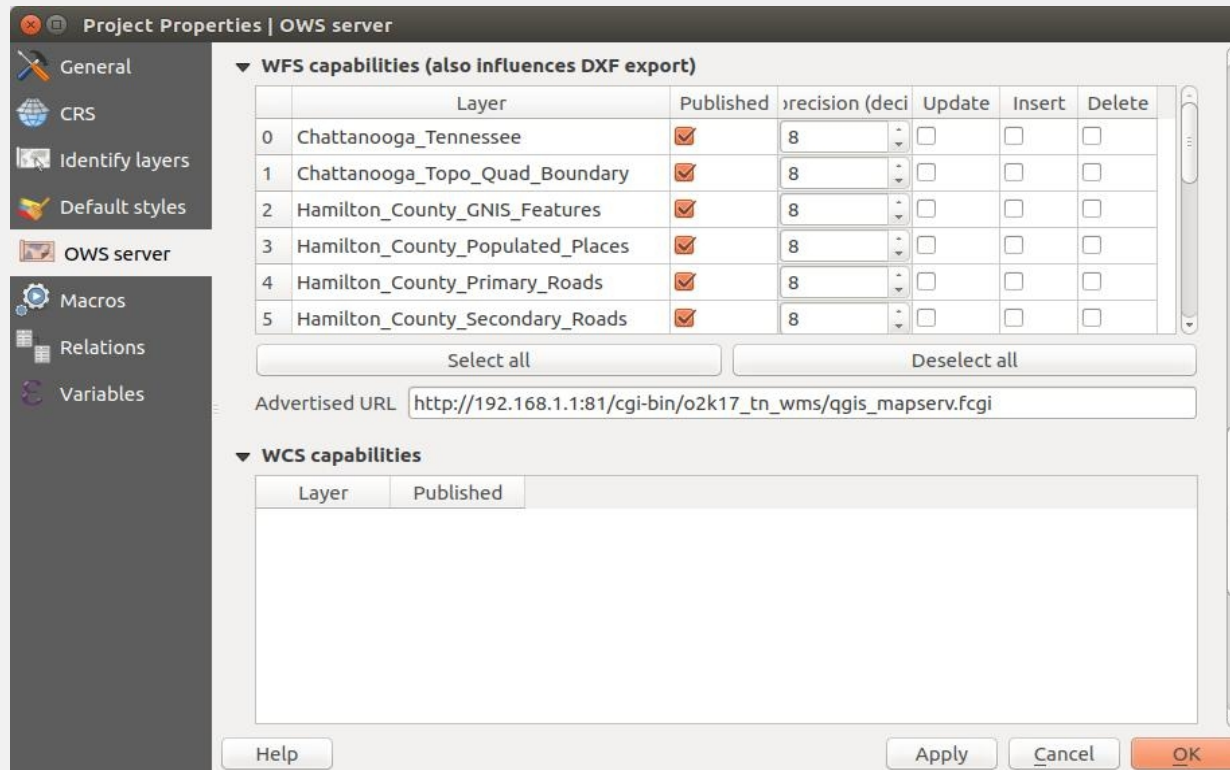


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Screen 3 of 4 - of Parameters Populated



Project Properties | OWS server

General
CRS
Identify layers
Default styles
OWS server
Macros
Relations
Variables

▼ WFS capabilities (also influences DXF export)

	Layer	Published	precision (dec)	Update	Insert	Delete
0	Chattanooga_Tennessee	☒	8	☐	☐	☐
1	Chattanooga_Topo_Quad_Boundary	☒	8	☐	☐	☐
2	Hamilton_County_GNIS_Features	☒	8	☐	☐	☐
3	Hamilton_County_Populated_Places	☒	8	☐	☐	☐
4	Hamilton_County_Primary_Roads	☒	8	☐	☐	☐
5	Hamilton_County_Secondary_Roads	☒	8	☐	☐	☐

Select all Deselect all

Advertised URL

▼ WCS capabilities

Layer	Published
-------	-----------

Help Apply Cancel OK

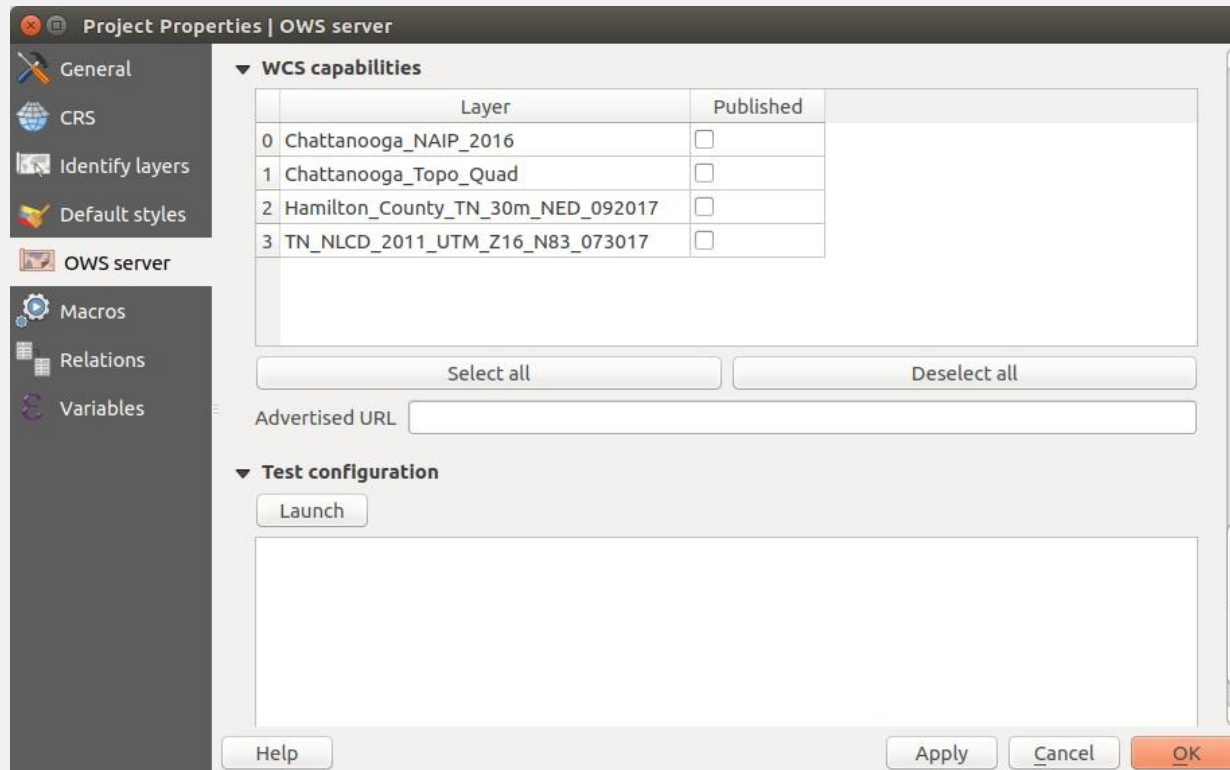


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Screen 4 of 4 - of Parameters to Be Entered



The screenshot shows the 'Project Properties | OWS server' dialog box. The left sidebar contains the following tabs: General, CRS, Identify layers, Default styles, OWS server (selected), Macros, Relations, and Variables. The main area is divided into two sections: 'WCS capabilities' and 'Test configuration'.

WCS capabilities

	Layer	Published
0	Chattanooga_NAIP_2016	☐
1	Chattanooga_Topo_Quad	☐
2	Hamilton_County_TN_30m_NED_092017	☐
3	TN_NLCD_2011_UTM_Z16_N83_073017	☐

Below the table are two buttons: 'Select all' and 'Deselect all'.

Below the buttons is a text field labeled 'Advertised URL'.

Test configuration

Below the 'Test configuration' section is a 'Launch' button and a large empty text area.

At the bottom of the dialog are three buttons: 'Help', 'Apply', and 'OK'.

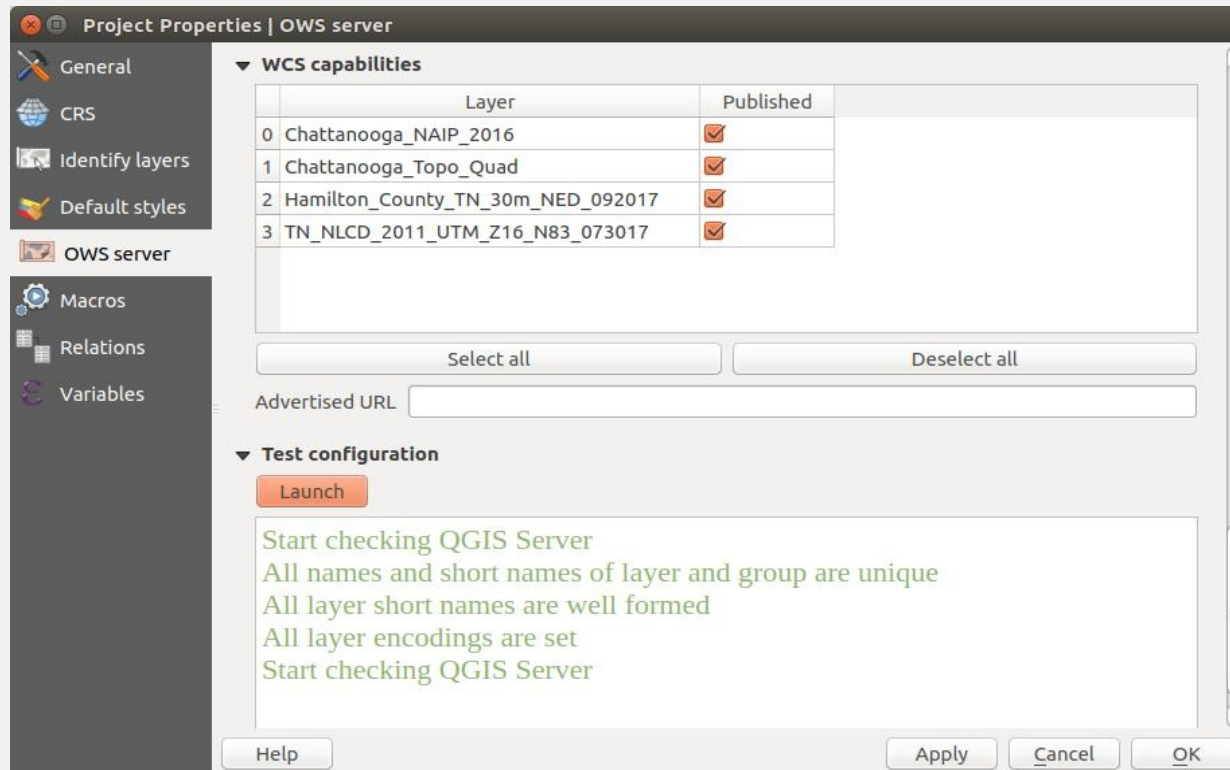


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Setting Up QGIS Server - STEPS

8. Added Web Services to Projects [continued]

Screen 4 of 4 - of Parameters Populated



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Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configuration

9a. Made 'CGI' workspaces under /usr/lib/cgi-bin

For WMS/WFS ./o2k17_tn_wms

For WMS/WCS ./o2k17_tn_wcs

placed qgis_mapserv.fcgi in these . . .

9b. Placed 'Project' Files under /usr/lib/cgi-bin

o2k17_tn_wms.qgs in ./o2k17_tn_wms

o2k17_tn_wcs.qgs in ./o2k17_tn_wcs

9c. Placed 'Data' Files under /usr/lib/cgi-bin *

Vectors in ./o2k17_tn_wms

Rasters in ./o2k17_tn_wcs

*** Note: on Linux system these could be symbolic links**



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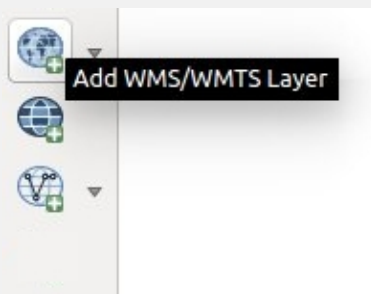
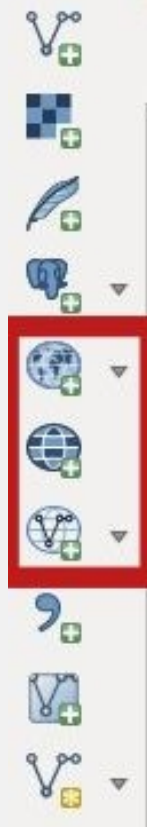
Chattanooga, Tennessee

Setting Up QGIS Server - STEPS

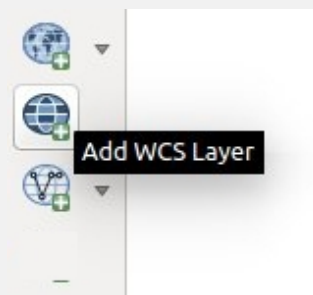
9. Verified QGS Server Fast CGI configurations [continued]

In QGIS Desktop from client ('gulo.epcrossover.net')
- Accessed Web Services on server ('zapus.epcrossover.net')

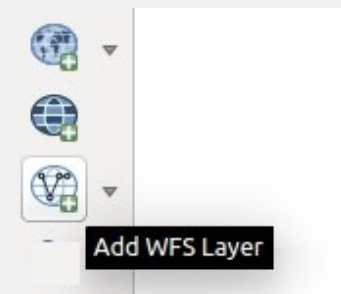
Built “Connections” to Access “Data Shares” on 'zapus' . . .



WMS
Web Services



WCS
Web Services



WFS
Web Services



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Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [continued]

Built “Connections” to Access “Data Shares” on 'zapus' . . .

Examples for:

WMS (Web Map Services)	o2k17_tn_wms
WCS (Web Coverage Services)	o2k17_tn_wcs
WFS (Web Feature Services)	o2k17_tn_wfs

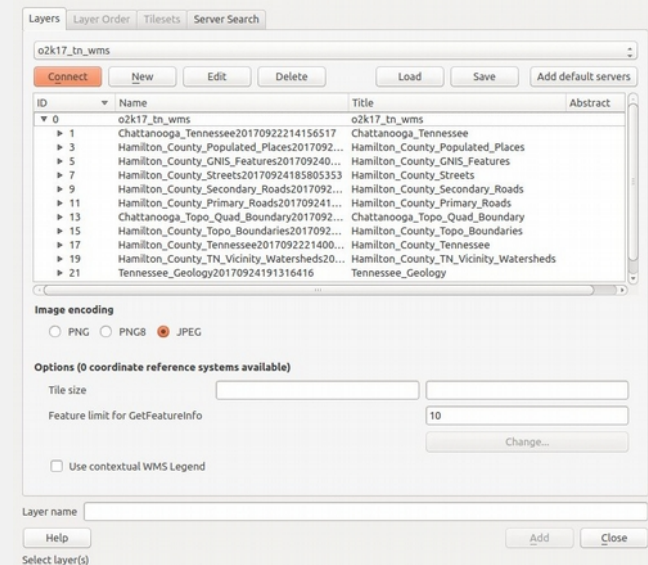
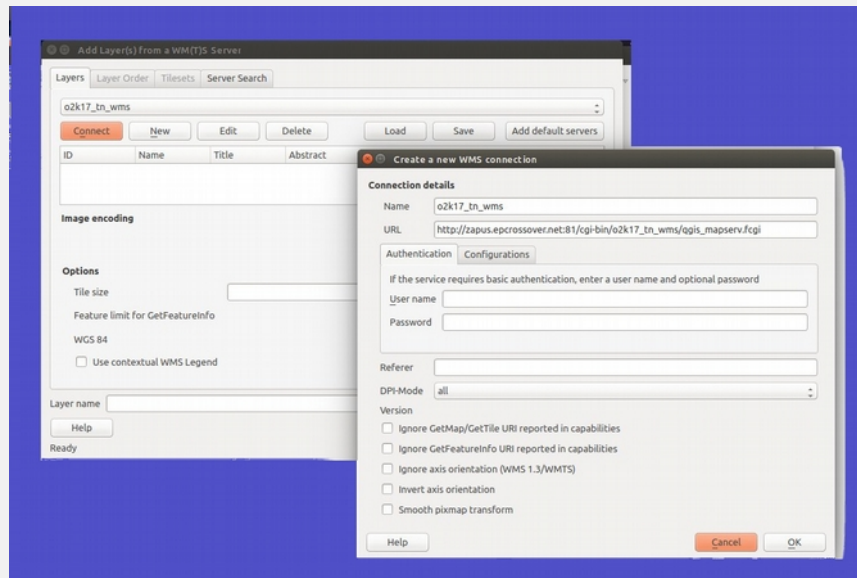


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Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [continued]

Example for: WMS (Web Map Services) o2k17_tn_wms

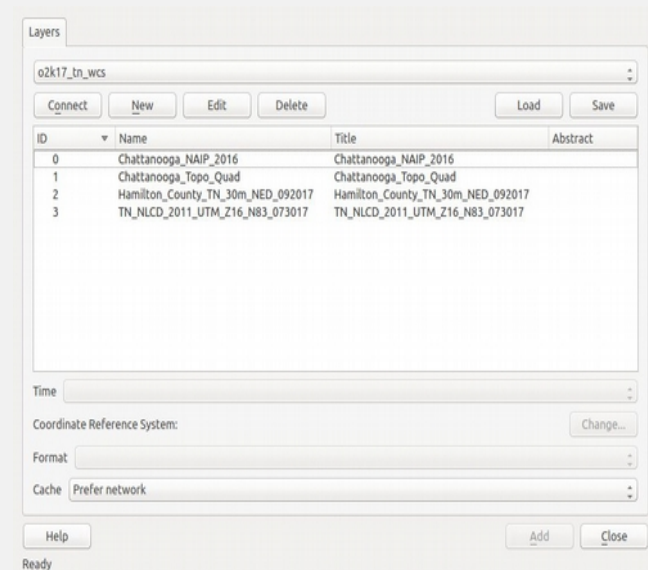
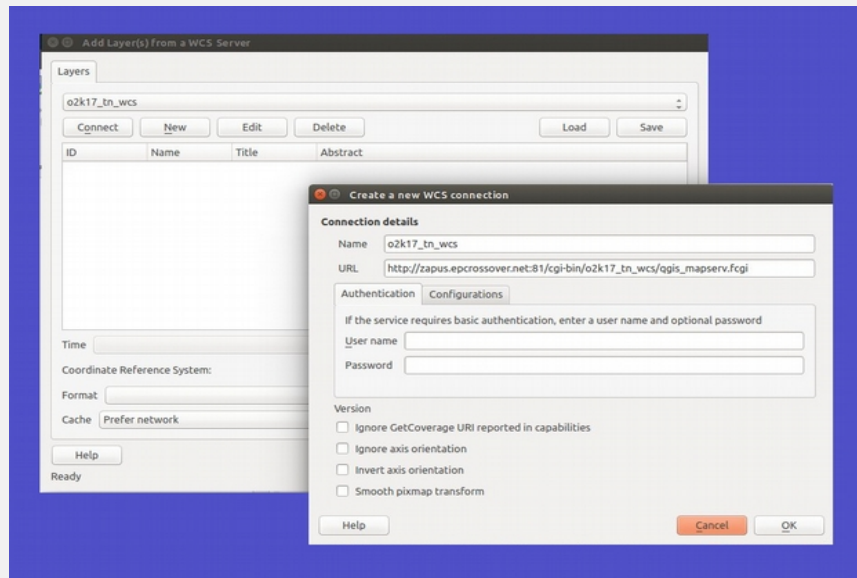


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Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [continued]

Example for: WCS (Web Map Services) o2k17_tn_wcs

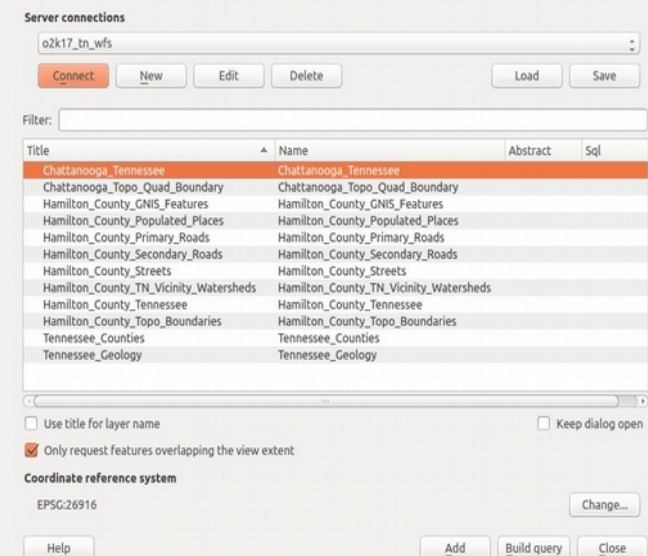
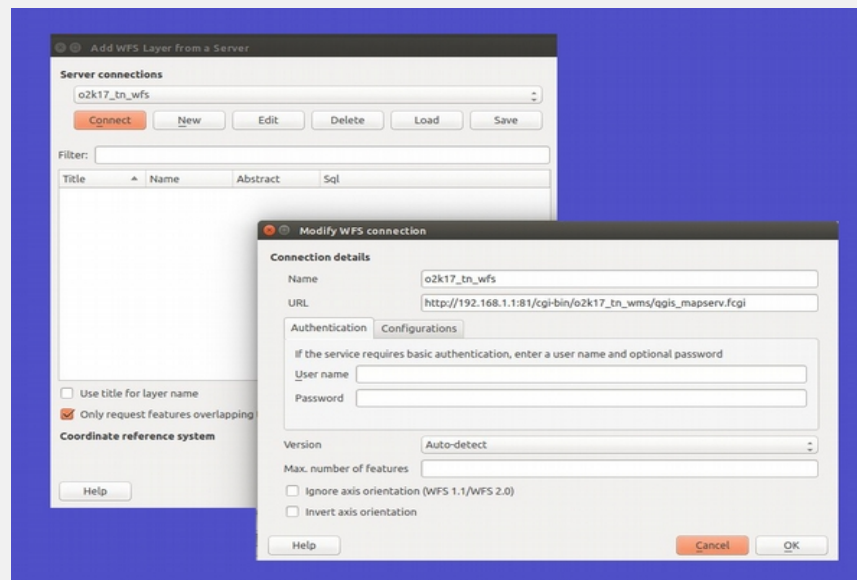


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Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [continued]

Example for: WFS (Web Map Services) o2k17_tn_wfs

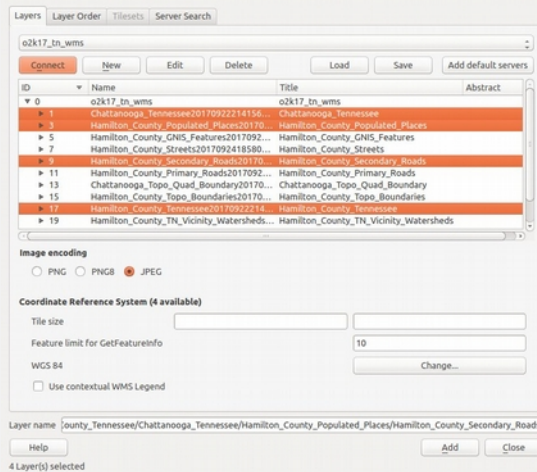


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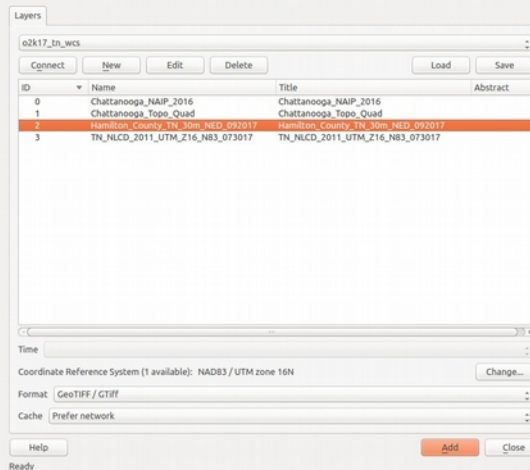
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [continued]

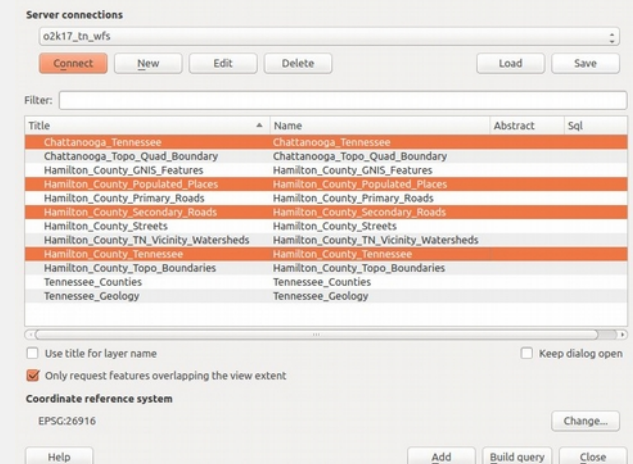
Examples Outputs for:



WM(T)S Selections



WCS Selections



WFS Selections

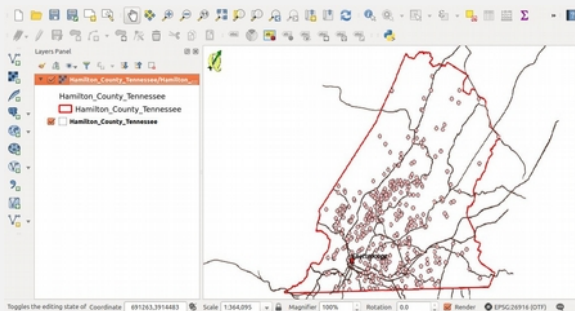


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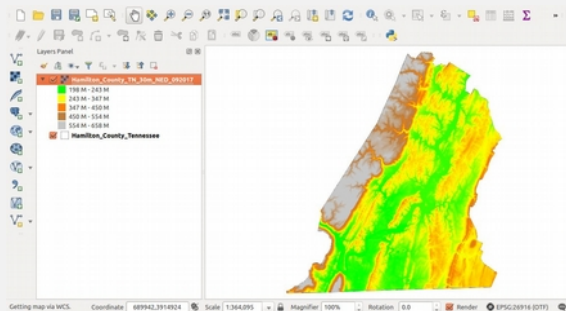
Setting Up QGIS Server - STEPS

9. Verified QGS Server Fast CGI configurations [continued]

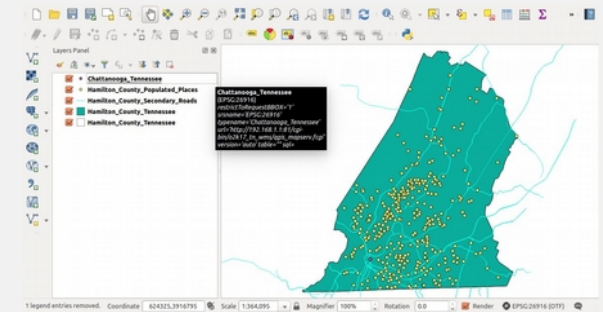
Examples Outputs for:



WM(T)S Output



WCS Output



WFS Output



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Thanks . . .

Quantum GIS Development Community (Coding)

Open Geospatial Consortium (Standards)

Data:

USDA/NRCS Geospatial Data Gateway

USGS Geonames Web Site

Tennessee Wildlife Resources Agency

Organization of Fish & Wildlife Information Managers



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