

2017 Apr 12

Open Source GIS Implementation - Part 4

Installing GeoServer

Sorry for the delay in posting part 4. I've been a little busy lately but here it is. Part 4 goes over how to install GeoServer and how to publish a PostGIS database to it. Here I am using GeoServer 2.10.1 Installation was done on both a Windows 10 laptop and Windows Server 2012R machine for testing.

There is more detailed [instructions on the GeoServer site](#) which you should read. The instructions were easy to follow, so there's no need to rewrite it so here. I'm just giving a summary of what I did.

JRE 8

- JRE 8 is required.
- [Download JRE 8 from Oracle](#)
- I installed both x86 (jre-8u121-windows-i586.exe) and x64 (jre-8u12-windows-x64.exe) versions.

Installing GeoServer 2.10.1

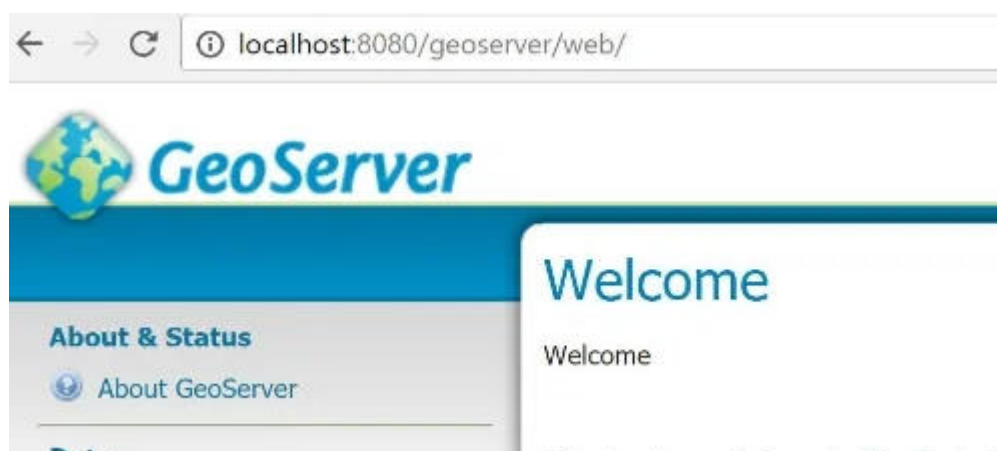
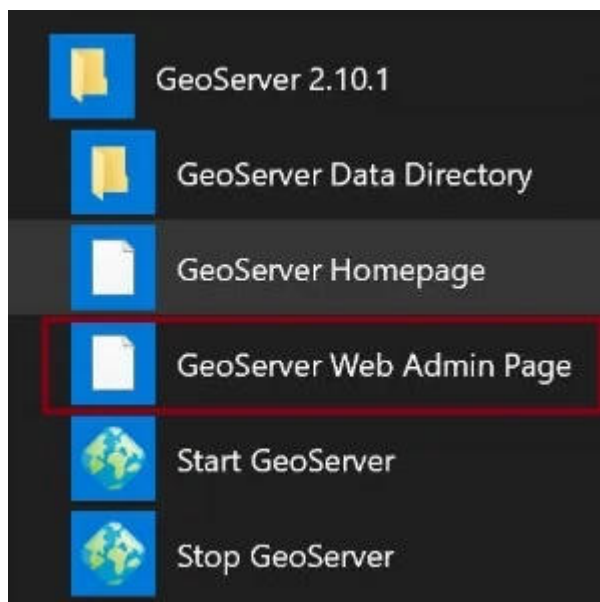
- [Download GeoServer](#). I used the stable version 2.10.1
- Follow the [instructions on the GeoServer site](#)

I found the installation process to be fairly easy. The only thing I had to do was make sure that the JRE path was correct. I have both the x64 and x86 JRE 8 versions installed - the default option during the installation process uses the path to the the x86 JRE (e.g. C:\Program Files \(\x86\)Java\jre8\). I left the path as the default since I want to run GeoServer as a service, which requires 32bit JRE (i.e. x86 JRE version\).



Installed for all users. Will run as as a Windows Service for greater security.
Requires a 32 bit JRE.

Once the installation completes and if you're able access the Geoserver web admin page from the program menu or by opening a web browser and typing **<http://localhost:8080/geoserver/web>** then you're good.



If you can access this page then it means GeoServer was installed properly

Installing GeoServer Extensions

There are many [GeoServer Extensions](#) -- you should read about them and decide which one you want to install to extend the functionalities of your GeoServer. These are the ones that I installed on my GeoServer. They seemed to have been installed properly but haven't been fully tested out yet. There are tutorials on the GeoServer site you can explore.

- [Vector Tiles](#) - outputs json, geojson, topojson, mbtile
- [Importer](#) - batch uploading of data via a GUI
- [YSLD](#) - styling of layers in YSLD format (easier to do/read then SLD)
- [Printing Module](#) - printing using Mapfish printing service. I installed this but haven't figured it out or worked with it yet. I will post my notes when I get it working.

You can download the extension(s), [here](#). Make sure the extension(s) you download matches your GeoServer version, in this case it is 2.10.1. The Vector Tiles extension for GeoServer 2.10.1 can be found in the [community-latest folder](#). With GeoServer 2.11 Vector Tiles is part of the core extensions. The instructions from the GeoServer site to install the Vector Tiles extension is for GeoServer 2.11 but it is still applicable to version 2.10. You can read the instructions [here](#).

Basically you just download and extract the jar files for the extension and put them in the directory of your GeoServer's WEB-INF\lib folder (e.g. C:\Program Files\(\x86)\GeoServer 2.10.1\webapps\geoserver\WEB-INF\lib\).

After you copy and paste the jar files into the correct directory, the instruction guide (above links) says to restart GeoServer. That didn't work for me on my Windows 10 laptop. I had to restart my computer then restart GeoServer before I could see the added extension. The same thing happened on a Windows 2012R Server - I had to restart the server, then restart GeoServer and wait for a few minutes (up to 5 minutes) then refresh the GeoServer Web Admin page to see the extensions showed up.

Verifying Extensions Installed properly

Vector Tile Extension

If you log into the Geoserver through the web admin page and click on a layer and then click the **Tile Caching Tab** you should see the vector tile output options that you just added to GeoServer.

Data **Publishing** **Dimensions** **Tile Caching**

Tile cache configuration

- ☒ Create a cached layer for this layer
- ☒ Enable tile caching for this layer
- ☒ Enable In Memory Caching for this Layer.

BlobStore

(*) Default BlobStore ▼

Metatiling factors

4 ▼ tiles wide by 4 ▼ tiles high

Gutter size in pixels

0 ▼

Tile Image Formats

- ☐ application/json;type=geojson
- ☐ application/json;type=topojson
- ☐ application/json;type=utfgrid
- ☐ application/x-protobuf;type=mapbox-vector
- ☐ image/gif
- ☒ image/jpeg
- ☒ image/png
- ☐ image/png8
- ☐ image/png8

Output options available after installing the Vector Tiles extension

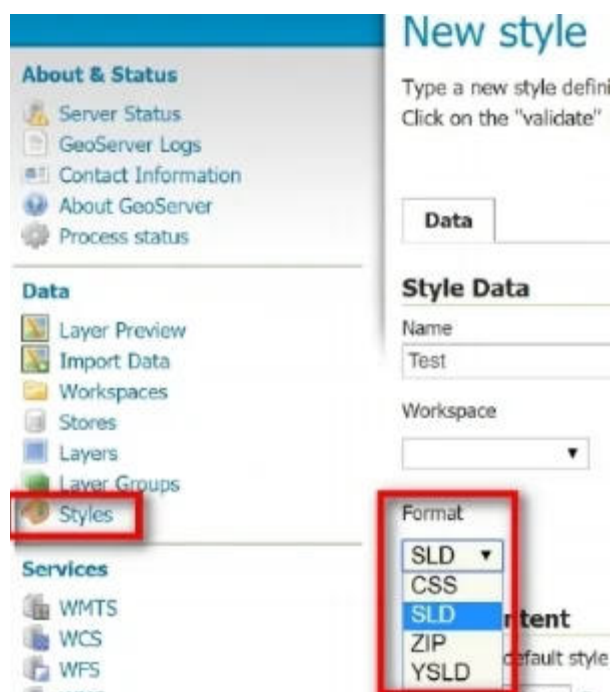
Importer Extension

If the Importer extension installed properly then you should see a new tool, called Import Data under Data Section in the left hand side of the GeoServer web admin page.



YSLD Extension

If the YSLD extension installed properly then you should be able to see the available format under Data >> Styles >> New Style. With this extension, you can style layers in YSLD and SLD formats. As you can see from the example below, I've also added the [CSS extension](#) for styling layers in CSS format. See [link here](#) for more information on styling in GeoServer. There are even styling cookbooks available to make it easier.

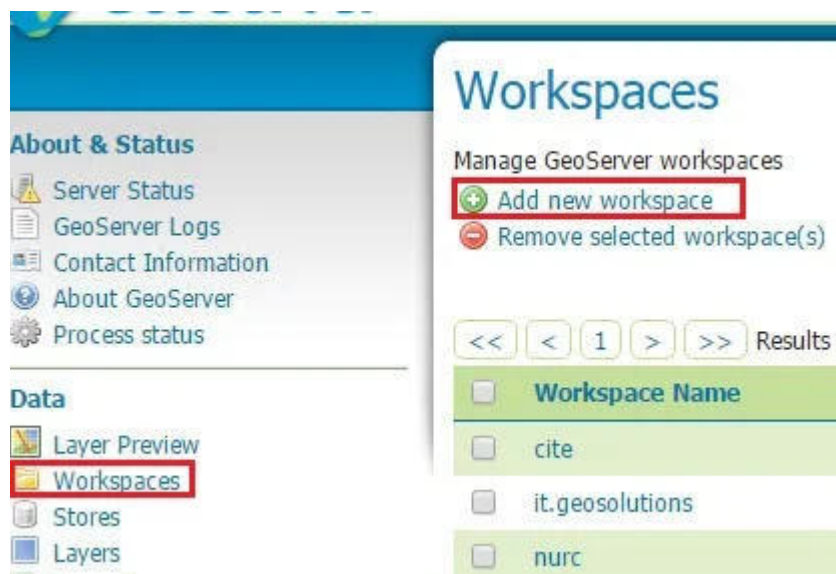


Importing Data to GeoServer

This section goes over how to use the Import Data tool to batch import a PostGIS database. Using the Import Data tool is a much easier option than having to use cURL command line option to do batching data importing to GeoServer.

Create a new Workspace and Data Store

Open the GeoServer web admin page - login if needed. Then under the Data section, click Workspaces >> Add new workspace



In the new workspace window that comes up, type in a name for your new workspace - limited to 10 characters and no spaces (e.g. CCH). For Namespace URI (Uniform Resource Identifier) this can be anything - according to the GeoServer site, a URI is similar to a URL except it does not need to point to an actual location on the web. It just needs to be a unique identifier, such as `http://g70.design/geoserver/CCH`.

The screenshot shows the 'New Workspace' configuration window. The title is 'New Workspace' and the subtitle is 'Configure a new workspace'. There are two input fields: 'Name' with the value 'CCH' and 'Namespace URI' with the value 'http://g70.design/geoserver/CCH'. Below the 'Namespace URI' field, there is a text label: 'The namespace uri associated with this workspace'. At the bottom, there is a checkbox labeled 'Default Workspace' which is checked. Below the checkbox are two buttons: 'Submit' and 'Cancel'.

Type in a Name (limit to 10 characters & no spaces) and a URI

Batch Import Data

When you are done creating a new workspace, it's time to import some data into it. For this example, I'm batch importing some layers from a PostGIS database that I created earlier in part 3.

In GeoServer, click Import Data. Then in the right hand panel, 1) Choose PostGIS as the data source to import from; 2) Under Configure the data source: fill in the appropriate information to connect to your PostGIS database; 3) Specify the Target for the Import: fill in the appropriate info for your workspace and data store - you can use an existing data store or create a new. If you create a new one - the store name will default to the name of your PostGIS table (e.g. workspace = CCH, store = CCHGIS (which is the name of my PostGIS database)).

GeoServer

About & Status

- Server Status
- GeoServer Logs
- Contact Information
- About GeoServer
- Process status

Data

- Layer Preview
- Import Data**
- Workspaces
- Stores
- Layers
- Layer Groups
- Styles

Services

- WMTS
- WCS
- WFS
- WMS
- WPS

Settings

- Global
- Image Processing
- Raster Access

Tile Caching

- Tile Layers
- Caching Defaults
- Gridsets
- Disk Quota
- BlobStores

Security

- Settings
- Authentication
- Passwords
- Users, Groups, Roles
- Data
- Services
- WPS security

Import Data

- Choose a data source to import from**
 - ☐ Spatial Files - Files from a directory or archive
 - ☐ Mosaic - Raster files from a directory composing a mosaic
 - ☒ **PostGIS - Tables from PostGIS database**
 - ☐ Oracle - Tables from Oracle database (Install plugin and drivers.)
 - ☐ SQL Server - Tables from Microsoft SQL Server database (Install plugin and drivers.)
- Configure the data source**

Connection type *
Default ▾

Host *
localhost

Port *
5432

Database *
CCHGIS

Schema
public

Username *
postgres

Password

▶ Connection pooling
▶ Advanced
- Specify the target for the import**

Workspace
CCH ▾

Store
Create new ▾

Next Cancel

Substitute your own information in the fields above. For Store you can create a new one (default name store name will be the name of your database) or use an existing one. Click Next button

In the Import panel that comes up you should be able to see the PostGIS database you just connected to. Select the layer(s) that you want to import into the data Store. I think of the workspace as the directory and

the store as a container for the data.

Note: When batch importing I was only able to batch import layers that were on the same page. If I selected layers that were listed on page 1 then clicked to page 2 to select more layers then GeoServer only imported the layers I selected from the current page that I was on. This meant that I had to select all the layers I wanted to imported on page 1 then click Import and wait for it to successfully import, then go to page 2 and repeat the process, etc.

postgres@localhost:5432/CCHGIS

Layer	Status	Actions
☐ addresspts	Ready	Advanced...
☐ building_centroids	Ready	Advanced...
☐ building_footprints	Ready	Advanced...
☐ citynopath	Ready	Advanced...
☐ citynopathline	Ready	Advanced...
☐ coastline	Ready	Advanced...
☐ contour20ft	Ready	Advanced...
☒ contour40ft	Ready	Advanced...
☐ contour5ft_ngalidar2005	Ready	Advanced...
☐ contour5ft_noaa_ifsar2005	Ready	Advanced...
☐ easementcntln	Ready	Advanced...
☐ easementdpp	Ready	Advanced...
☐ emergency_shelters	Ready	Advanced...
☐ emergency_shelters0	Ready	Advanced...
☐ neighborhoodboards	Ready	Advanced...
☐ oahugeneralplacenames	Ready	Advanced...
☐ ohana_zoning	Ready	Advanced...
☐ park	Ready	Advanced...
☐ park0	Ready	Advanced...
☐ plateasements	Ready	Advanced...
☐ pointcloud_formats	Projection could not be determined.	Find...
☒ prop_waipahu_tc_special_district	Ready	Advanced...
☒ prop_west_loch_sp_dist	Ready	Advanced...
☐ prop_zonchange_waipahu_tc_r	Ready	Advanced...
☒ prop_zonchange_westloch	Ready	Advanced...

<< < 1 2 3 > >> Results 1 to 25 (out of 53 items)

Select the layers you want to import >> Click Import then wait for the layers to be successfully imported before importing more layers on page 2, 3, etc. See Note above.

If you go to the Stores panel, you will see the newly created Workspace (e.g CCH) and the Store (CCHGIS, which is also the name of my PostGIS database).

Stores

Manage the stores providing data to GeoServer

[Add new Store](#)
[Remove selected Stores](#)

Results 1 to 10 (out of 10 items)

Data Type	Workspace	Store Name	Type
	CCH	CCHGIS	PostGIS
	nurc	arcGridSample	ArcGrid
	nurc	img_sample2	WorldImage
	nurc	mosaic	ImageMosaic

If you click on Layers in the left hand panel, you will see the layers that were imported. Notice under Name, it is the workspace name followed by the layer name (e.g. CCH:park) and the Store is CCHGIS.

Layers

Manage the layers being published by GeoServer

[Add a new layer](#)
[Remove selected layers](#)

Results 1 to 24 (out of 24 items)

Type	Title	Name	Store
	emergency_shelters	CCH:emergency_shelters	CCHGIS
	park	CCH:park	CCHGIS
	tax_parcel	CCH:tax_parcel	CCHGIS
	tsunamievaczones2015	CCH:tsunamievaczones2015	CCHGIS
	zoning_luo	CCH:zoning_luo	CCHGIS

You can also preview the layers by Clicking Layer Preview in the left hand panel then click OpenLayers (under Common Formats heading). Notice that the layer is given a default feature color.

Layer Preview

List of all layers configured in GeoServer and provides previews in various formats for each.

Results 1 to 25 (out of 28 items)

Type	Title	Name	Common Formats
	emergency_shelters	CCH:emergency_shelters	OpenLayers KML GML
	park	CCH:park	OpenLayers KML GML
	tax_parcel	CCH:tax_parcel	OpenLayers KML GML
	tsunamievaczones2015	CCH:tsunamievaczones2015	OpenLayers KML GML
	zoning_luo	CCH:zoning_luo	OpenLayers KML GML

Below is an example layer preview of the park layer with polygon features shown in gray (default color).



Styling Layers

Styling layers in GeoServer can be done using SLD, YSLD, or CSS. See the [GeoServer Styling Workshop](#) for more info. Supposedly you can use QGIS to create SLDs – this would be an easy option, however, when I tried it using QGIS 2.18.3 it didn't work. Out of curiosity I also tried exporting an SLD using an extension in ArcGIS, called Arc2Earth - this didn't work either. So for now I guess the best way to create and edit styling in GeoServer is directly edit XML or use the GeoServer style editor.

Click on Styles in the left hand panel then in the right hand panel you can either Add a new style or click on an existing style to edit it. Notice there are already default styles for the layers I batched imported (e.g. CCH_citynopass, CCH_coastline, etc). You can either delete then and create new ones or edit them - whatever you prefer.

The screenshot displays the GeoServer web interface. On the left is a navigation sidebar with three main sections: 'About & Status' (containing links for Server Status, GeoServer Logs, Contact Information, About GeoServer, and Process status), 'Data' (containing links for Layer Preview, Import Data, Workspaces, Stores, Layers, Layer Groups, and Styles), and 'Services' (containing links for WMTS, WCS, and WFS). The 'Styles' link in the 'Data' section is highlighted with a red box. The main content area is titled 'Styles' and includes the text 'Manage the Styles published by GeoServer'. Below this, there are two buttons: 'Add a new style' (with a green plus icon) and 'Removed selected style(s)' (with a red minus icon). The 'Add a new style' button is highlighted with a red box. Below the buttons is a pagination control showing '<< < 1 2 > >>' and 'Results 1 to 25 (out of 28 items)'. A table lists the published styles, with the following names visible: CCH_citynopass, CCH_coastline, CCH_emergency_shelters, CCH_park, CCH_tax_parcel, CCH_tsunamievacuationzones2015, CCHzoning, and burg. The 'CCHzoning' entry is highlighted with a red box.

Below is a snapshot of the New Style window. Choose a format then either upload an existing style file or use the Style Editor to write your own styles. I highly recommend reading the [GeoServer Styling Section](#). It has lots of useful info, including "cookbook recipes" you can copy and edit for your purpose.

New style

Type a new style definition, or use an existing one as a template, or upload a ready made style from your file system. The editor can provide syntax highlighting and automatic formatting. Click on the "validate" button to verify the style is a valid style document.

Data

Style Data

Name:

Workspace:

Format: SLD ▼

Style Content

Generate a default style

Choose One ▼ Generate ...

Copy from existing style

Choose One ▼ Copy ...

Upload a style file

Choose File No file chosen Upload ...

Legend

Legend

Add legend

Preview legend

Style Editor

12pt ▼

1

Validate Apply Submit Cancel

Here is a sample of a style in YSLD format I created for a zoning layer. Notice under Format, you can't change the format from one to another (e.g. can't switch format from YSLD to SLD). Also notice there are 3 tabs: Publishing, Layer Preview, and Layer Attributes -- these are shown below.

Style Editor - CCHzoning

Edit the current style. The editor can provide syntax highlighting and automatic formatting. Click on the "validate" button to verify the style is a valid SLD

Data

Publishing

Layer Preview

Layer Attributes

Style Data

Name
CCHzoning

Workspace
CCH ▼

Format
YSLD ▼ ⓘ Format only editable for new styles

Legend

Legend

Add legend

Preview legend

Style Content

Generate a default style

Choose One ▼ Generate ...

Copy from existing style

Choose One ▼ Copy ...

Upload a style file

Choose File No file chosen Upload ...

Style Editor

12pt ▼

```

27 define: &Resort 'Resort: Resort'
28 define: &Aloha 'Aloha: Aloha Tower Special Use'
29 define: &Kak 'Kak: Kakaako Special District'
30 define: &Waikiki 'Waikiki: Waikiki Special District'
31 # Polygon Style
32 define: &polystyle
33   # stroke-width: 0.5
34   # stroke-color: '#777777'
35   fill-opacity: 0.7
36 # Head Info
37 name: zoning
38 title: zoning style
39 abstract: CCH zoning
40 # Symbol Styles
41 feature-styles:
42 - name: A1
43   rules:
44   - name: A1
45     title: *A1
46     filter: ${zone_class = 'A-1'}
47     symbolizers:
48     - polygon:
49       <<: *polystyle
50       fill-color: '#ffb319'
51 - name: A2

```

Validate

Apply

Submit

Cancel

With the Publishing tab you can select which layer the style is associated with and whether it is the default style for that layer. Here I am associating my CCHzoning style to the zoning layer and making it the default symbology.

Style Editor - CCHzoning

Edit the current style. The editor can provide syntax highlighting and automatic formatting. Click on the "validate" button to verify the style is a valid SLD document.

[Data](#)
[Publishing](#)
[Layer Preview](#)
[Layer Attributes](#)

<< < 1 > >> Results 1 to 24 (out of 24 items)

Workspace	Layer	Default	Associated
CCH	emergency_shelters	☐	☐
CCH	tax_parcel	☐	☐
CCH	tsunamievaczones2015	☐	☐
CCH	zoning_luo	☒	☒
nurc	Arc_Sample	☐	☐

The Layer Preview tab gives you a preview of your style. Any changes/edits made in the Style Editor will be reflected in the preview. Notice where it says "Previewing on layer: CCH:zoning_luo" - make sure this corresponds correctly to your style. I've had it where maybe I forgot to check of something and I'm not previewing on the correct layer (i.e. Previewing on layer: CCH_TMK but my style is for zoning so nothing shows up in preview). If this happens, you can click on the layer name and then you can select the correct layer.

Style Editor - CCHzoning

Edit the current style. The editor can provide syntax highlighting and automatic formatting. Click on the "validate" button to verify the style is a valid SLD document.

[Data](#)
[Publishing](#)
[Layer Preview](#)
[Layer Attributes](#)

Previewing on layer: **CCH:zoning_luo**

zoning_luo

- A-1: Low Density Apt.
- A-2: Medium Density Apt.
- A-3: High Density Apt.
- AG-1: Restricted Agriculture
- AG-2: General Agriculture
- AMX-1: Low Density Apt. Mixed Use
- AMX-2: Medium Density Apt. Mixed Use
- AMX-3: High Density Apt. Mixed Use
- B-1: Neighborhood Business
- B-2: Community Business
- BMX-3: Comm. Business Mixed Used
- BMX-4: Central Business Mixed Used
- C: Country
- F-1: Military & Fed. Presen

Scale = 1 : 1M

Style Editor

12pt ▼

```

27 define: &Resort 'Resort: Resort'
28 define: &Aloha 'Aloha: Aloha Tower Special Use'
29 define: &Kak 'Kak: Kakaako Special District'
30 define: &Maikiki 'Maikiki: Maikiki Special District'
31 # Polygon Style
32 define: &polystyle
33 # stroke-width: 0.5
34 # stroke-color: '#777777'
35 # fill-opacity: 0.7
36 # Head Info
  
```

Make style changes/edits using the Style Editor to see a preview of what changes will look like. You may have to click the Apply button to see the changes. Use the Validate button to help you "debug" your style structure. Use the Submit button to finalize/save the changes.

The Layer Attributes tab will allow you to see the attribute field names, and type associate with the layer.

Style Editor - CCHzoning

Edit the current style. The editor can provide syntax highlighting and automatic formatting. Click on the "validate" button to verify the style is a valid SLD document.

Data **Publishing** **Layer Preview** **Layer Attributes**

Previewing on layer: CCH:zoning_luo

For reference, here is a listing of the attributes in this data set.

name	type	sample
objectid	Integer	21
zone_class	String	A-1
zoning_des	String	A-1 Low-density Apartment District
zoning_lab	String	A-1
loaddate	Timestamp	2016-02-19T10:00:00Z
shape_length	Double	1105.33916007183
shape_area	Double	48952.9182006463
wkb_geometry	MultiPolygon	MULTIPOLYGON (((-17566011.0808 2427422.4886000007, -17566018.4283 2427402.599199999, -17566018.714 242740... -17566030.6695 2427419.091400001, -17566040...

Style Editor



27 define: &Resort 'Resort: Resort'
28 define: &Aloha 'Aloha: Aloha Tower Special Use'
29 define: &Kak 'Kak: Kakaako Special District'
30 define: &Waikiki 'Waikiki: Waikiki Special District'
31 # Polygon Style
32 define: &polystyle
33

It takes a bit of work to do the styling but it's not that hard to do. It's just a hassle and not as easy as just being able to use SLD created in QGIS. I'm hoping the SLD from the next version of QGIS will work with GeoServer.

Publishing Layers

Once you've create styles for your layer then the next thing you'd want to do is publish them as WMS, WFS, etc. Click on Layers in the left hand panel then select a layer to edit its properties. There are 4 tabs: Data, Publishing, Dimension, and Tile Caching. I would suggest reading up on all the options within these tabs to properly configure and publish your layers. Don't forget to click the SAVE at the bottom of each tab after you make your changes.

The Data tab, shown below is basically the metadata for your layer. Fill in any input that is needed, make sure the layer is enabled though.

CCH:zoning_luo

Configure the resource and publishing information for the current layer

Data

Publishing

Dimensions

Tile Caching

Edit Layer

Basic Resource Info

Name

zoning_luo



Enabled



Advertised

Title

zoning_luo

Abstract

City and County of Honolulu Zoning

The Publishing tab allows you to edit the WFS and WMS settings for the layer. Notice the default style for WMS is the zoning style I created earlier.

CCH:zoning_luo

Configure the resource and publishing information for the current layer

Data

Publishing

Dimensions

Tile Caching

HTTP Settings

Caching Settings

☐ Response Cache Headers

Cache Time (seconds)

WFS Settings

Feature Settings

Per-Request Feature Limit

Maximum number of decimals

NumberMatched skip

☐ Skip the counting of the numberMatched attribute

Extra SRS codes for WFS capabilities generation

☐ Override WFS wide SRS list

WMS Settings

Layer Settings

☒ Queryable

☐ Opaque

Default Style

☐ A-1: Low Density Apt.

☐ A-2: Medium Density Apt.

☐ A-3: High Density Apt.

The Dimension tab allows you to enable a time and elevation dimension if your layer has these properties.

CCH:zoning_luo

Configure the resource and publishing information for the current layer

Data **Publishing** **Dimensions** **Tile Caching**

Time

☒ Enabled

Elevation

☒ Enabled

Save **Cancel**

The Tile Caching tab is where you can create caches for your layer. and select the tile image format. Notice you will not have these formats: geojson, topojson, utfgrid, or mapbox-vector if you didn't install their respective extensions.

Data

Publishing

Dimensions

Tile Caching

Tile cache configuration

☒ Create a cached layer for this layer

☒ Enable tile caching for this layer

☒ Enable In Memory Caching for this Layer.

BlobStore

(*) Default BlobStore ▼

Metatiling factors

4 ▼ tiles wide by 4 ▼ tiles high

Gutter size in pixels

0 ▼

Tile Image Formats

☒ application/json;type=geojson

☒ application/json;type=topojson

☒ application/json;type=utfgrid

☒ application/x-protobuf;type=mapbox-vector

☐ image/gif

☒ image/jpeg

☒ image/png

☐ image/png8

☐ image/vnd.jpeg-png

0

0

Default Style

CCHzoning ▼

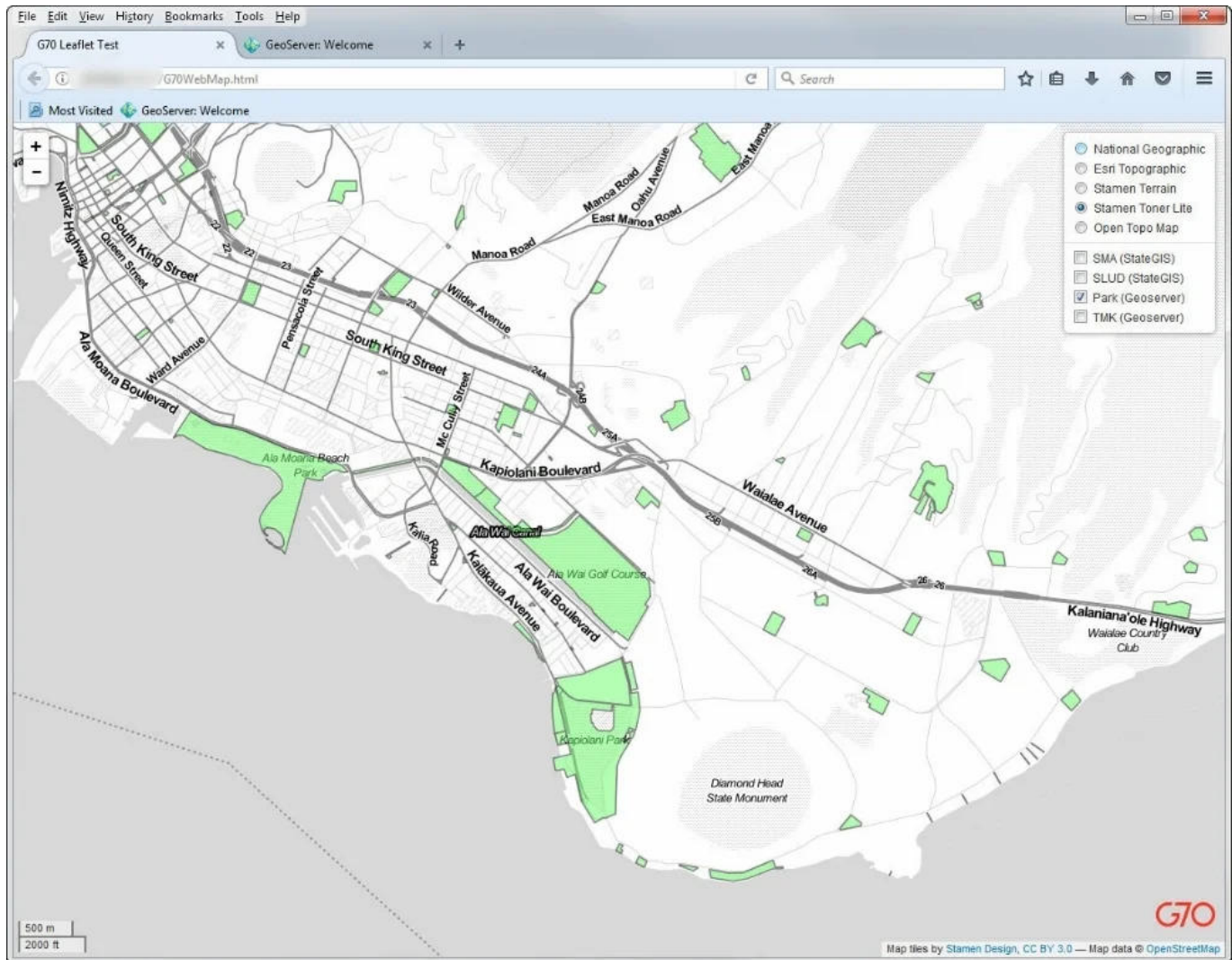
Alternate Styles

☐ ALL STYLES

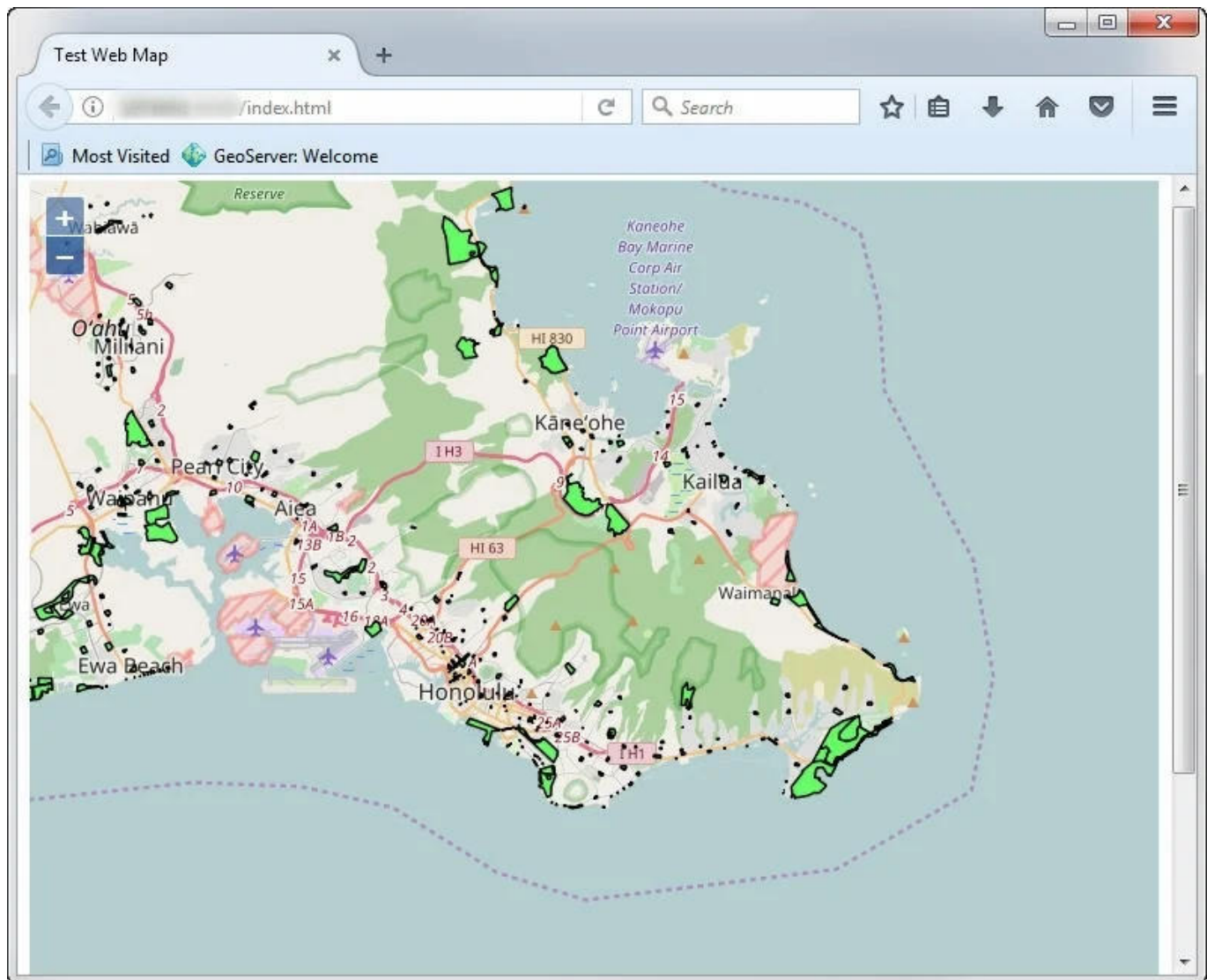
☐ CCHzoning

Once your layers are published you should test it out to see if your GeoServer services are working by trying to call them in a web mapping application or in a desktop GIS software (e.g. ArcGIS, QGIS). Below are some

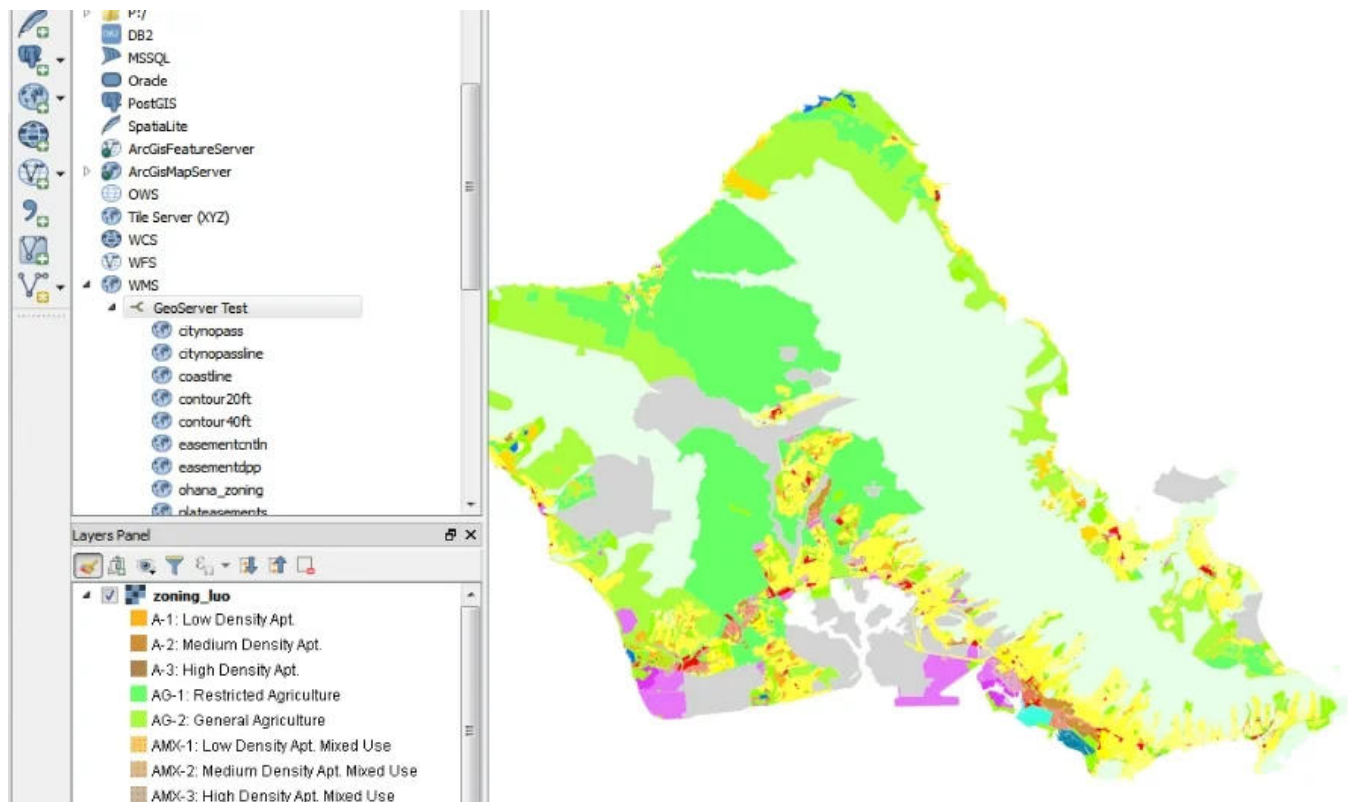
examples of my GeoServer services as shown in a Leaflet and Open Layers web maps, and in ArcGIS and QGIS.



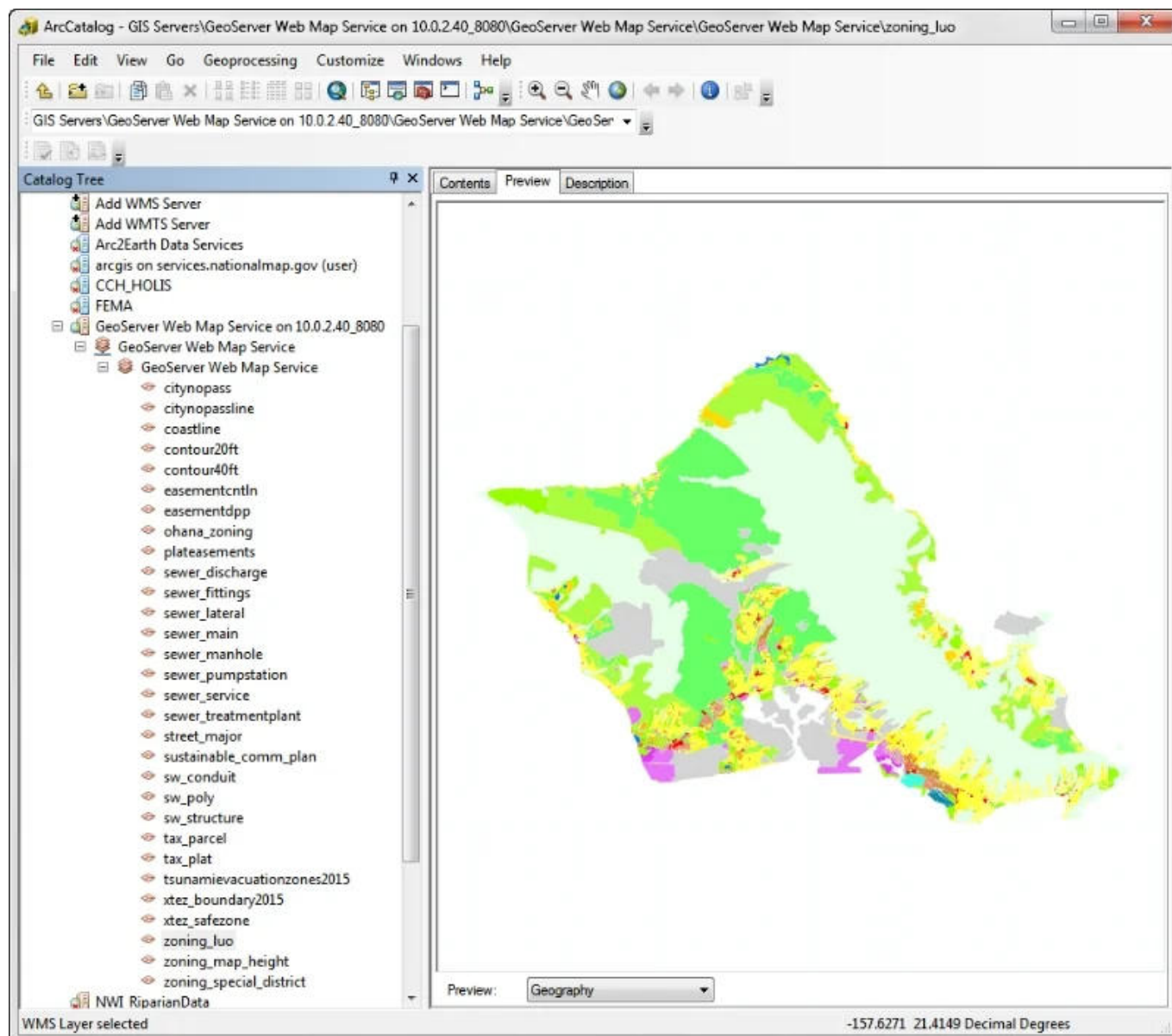
Leaflet map showing layers from my GeoServer



Open Layers web map showing the park layer from my GeoServer



My GeoServer added in QGIS with zoning layer displayed



My GeoServer added in ArcCatlog with a preview of the zoning layer.

< GIS4DAR ArcGIS Training
Workshop - September 7-8,
2017

Open Source GIS
Implementation - Part 3
> Creating PostGIS Database

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