Powerful Mapping Web Applications with Open Source Tools

Part Two: OpenStreetMap

Mele Sax-Barnett and
Grant Humphries

An Introduction to OpenStreetMap

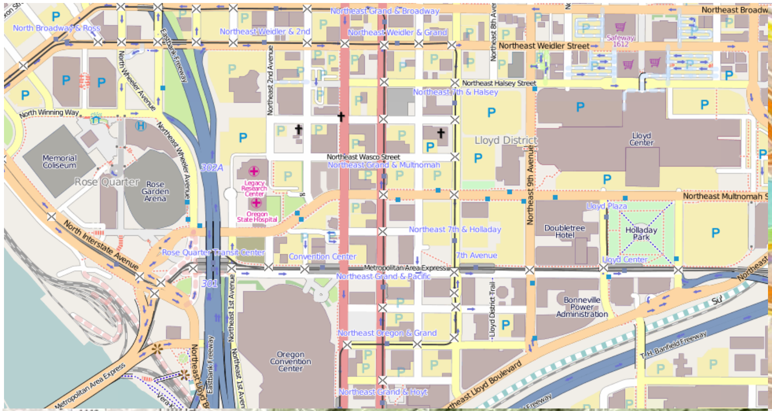
About OpenStreetMap

OpenStreetWhat?

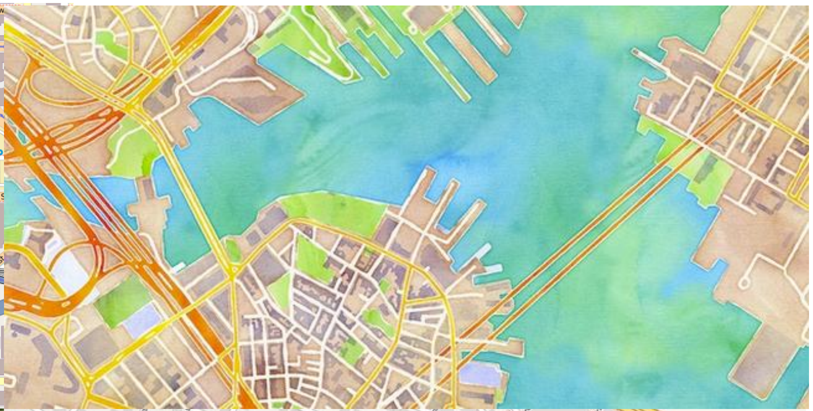
- OpenStreetMap or OSM
- ***Not*** "Open Street Maps"
- Founded in 2004
- Worldwide and seamless
- "Wikipedia of Maps"
  - Editable by anyone with an account
  - Data available to anyone, for free
  - … as long as you credit the contributors
- http://www.openstreetmap.org

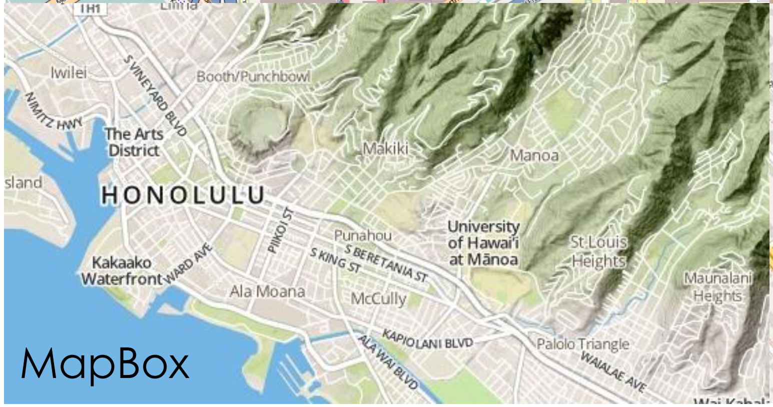
What does it look like?

OSM.org default

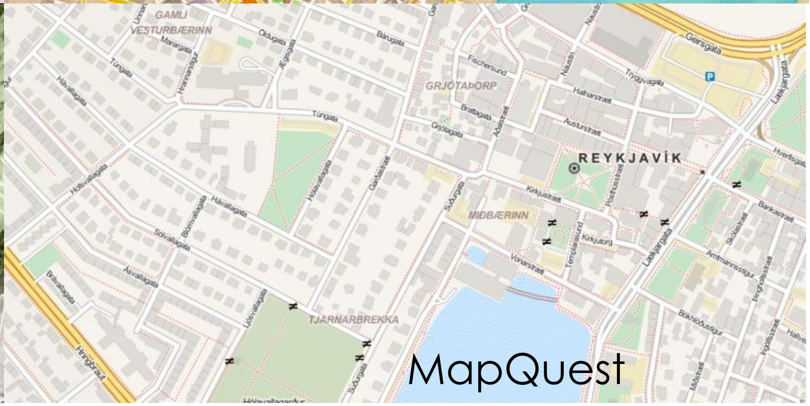


Stamen Design





MapBox



MapQuest

Who uses OpenStreetMap?

- http://switch2osm.org

flickr from YAHOO!

foursquare

craigslist

TRIMET

MapBox

WIKIPEDIA
The Free Encyclopedia

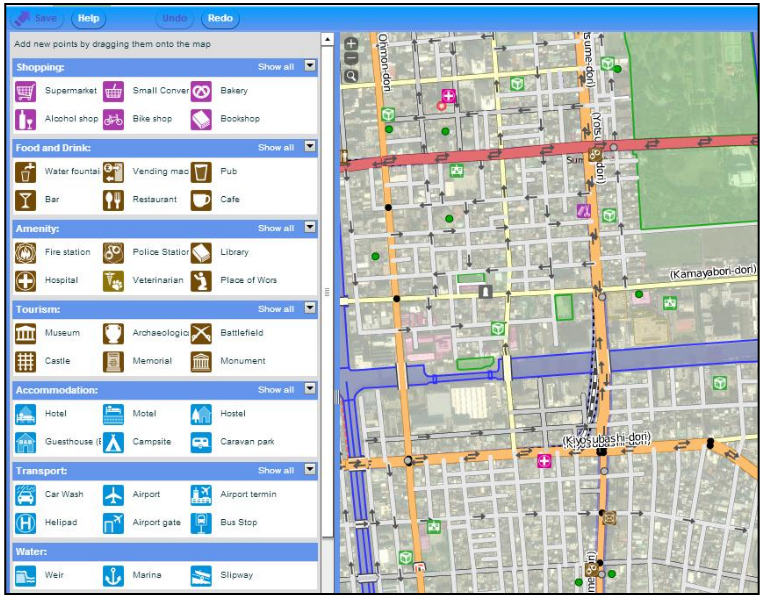
(you)

mapquest

nestoria

How do you edit it?

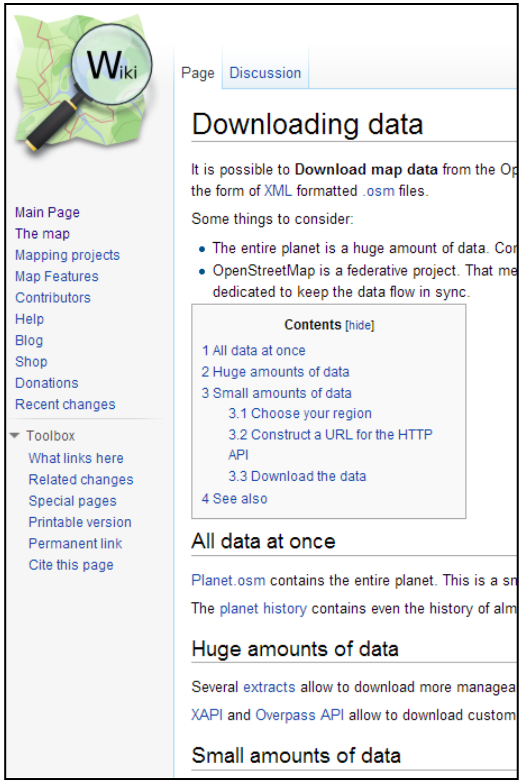
- Create an account
- Various free and open source editors available
- Potlatch and JOSM are very popular
- We will be using Potlatch 2, a flash-based, in-browser editor



Add new points by dragging them onto the map

How do you get the data?

- http://wiki.openstreetmap.org/wiki/Downloading_data
- Download via JOSM
  - Easily download and save small areas
  - “Mirrored Download” plugin for large areas
- Large extracts hosted around the web, updated at differing schedules
- We will be using the OSM plugin for QGIS



Downloading data

It is possible to **Download map data** from the Op
the form of XML formatted .osm files.

Some things to consider:

- The entire planet is a huge amount of data. Co
- OpenStreetMap is a federative project. That me
  dedicated to keep the data flow in sync.

Contents [hide]

1 All data at once
2 Huge amounts of data
3 Small amounts of data
3.1 Choose your region
3.2 Construct a URL for the HTTP API
3.3 Download the data
4 See also

All data at once

Planet.osm contains the entire planet. This is a sn

The planet history contains even the history of alm

Huge amounts of data

Several extracts allow to download more managea

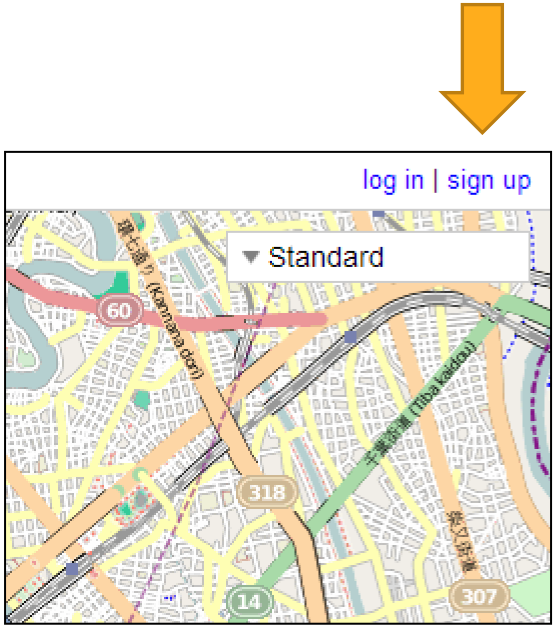
XAPI and Overpass API allow to download custom

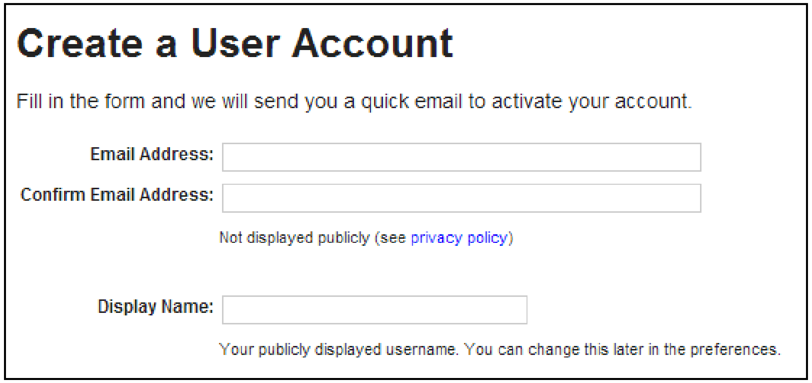
Small amounts of data

Editing basics:
Points of interest

Step 1: Sign up for an account

- Go to http://osm.org
- Click the "sign up" link in the top right corner
- Set up your account!





Create a User Account

Fill in the form and we will send you a quick email to activate your account.

Email Address:

Confirm Email Address:

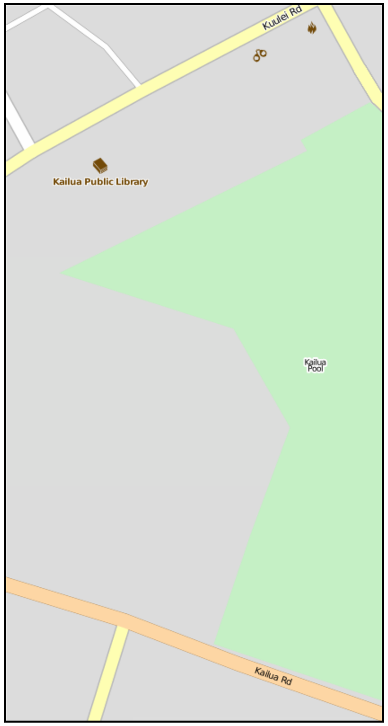
Not displayed publicly (see privacy policy)

Display Name:

Your publicly displayed username. You can change this later in the preferences.

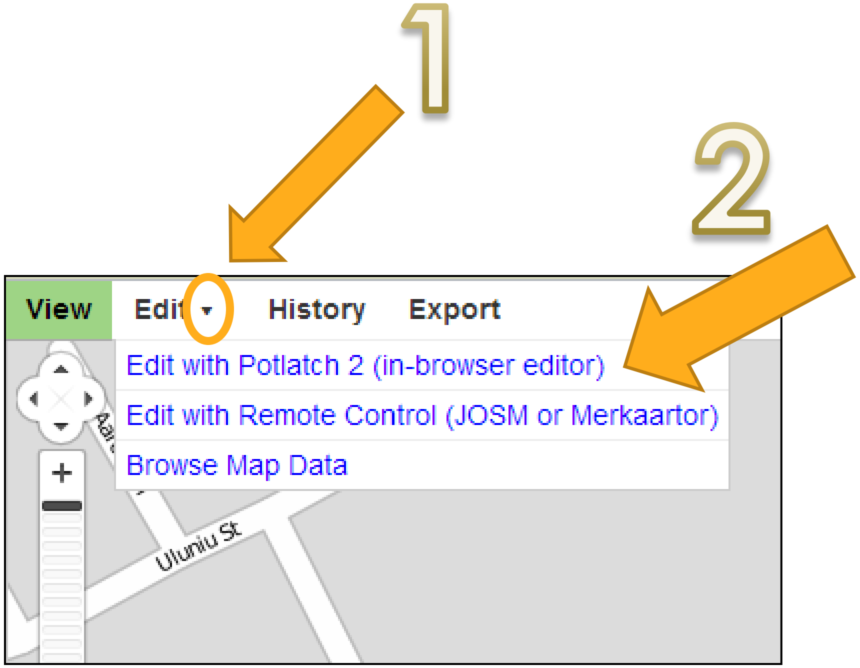
Step 2: Where and what

- Congratulations! You are now the owner of one of ~850,000 OSM editing accounts!
- Go back to http://osm.org
- Find a neighborhood that you know well
- Think about what you know about in that place
- ***Local knowledge***
- Notice anything missing?



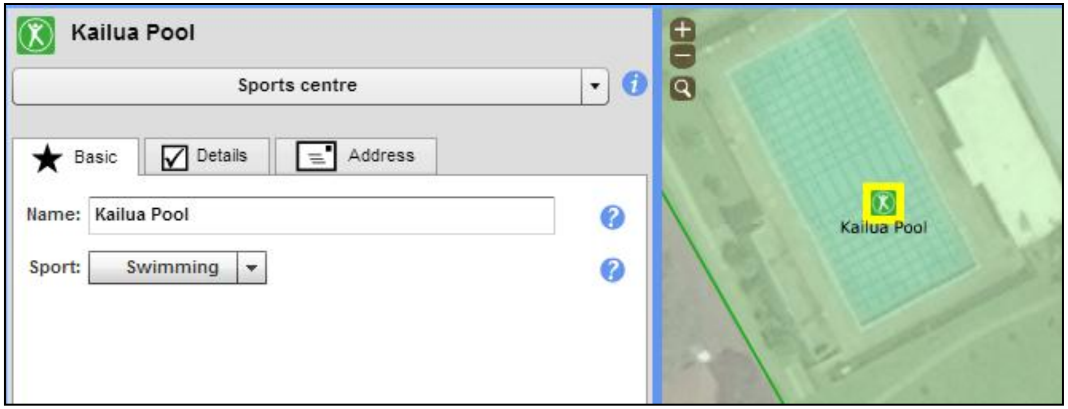
Step 3: Open the editor

- Click on the down-arrow next to the "Edit" menu
- Select "Edit with Potlatch 2"


1
2
View
Edit
History
Export
Edit with Potlatch 2 (in-browser editor)
Edit with Remote Control (JOSM or Merkaartor)
Browse Map Data
+
Uluniu St

Step 4: Explore

- Start familiarizing yourself with Potlatch
- Don't worry, you can't break anything ***until you click "Save"***
- Click things to see how they're classified



Kailua Pool

Sports centre

Name: Kailua Pool

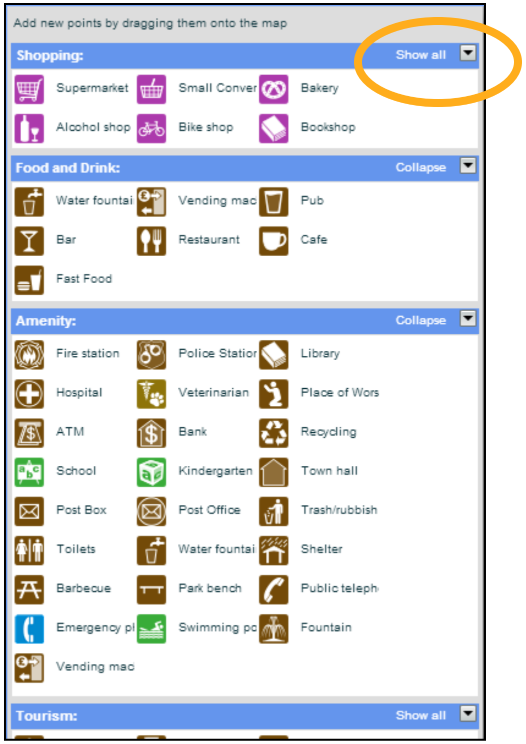
Sport: Swimming

Step 5: Add something

- But first, what's your source?
- **Don't copy from other maps**
- Local knowledge is best, but a dataset with the correct license and permissions can be a source
- You even need permission for aerial imagery (imagery included in OSM editors is OK)
- More info about the OpenStreetMap license (OdBL) can be found at http://www.openstreetmap.org/copyright

Step 5: Add something

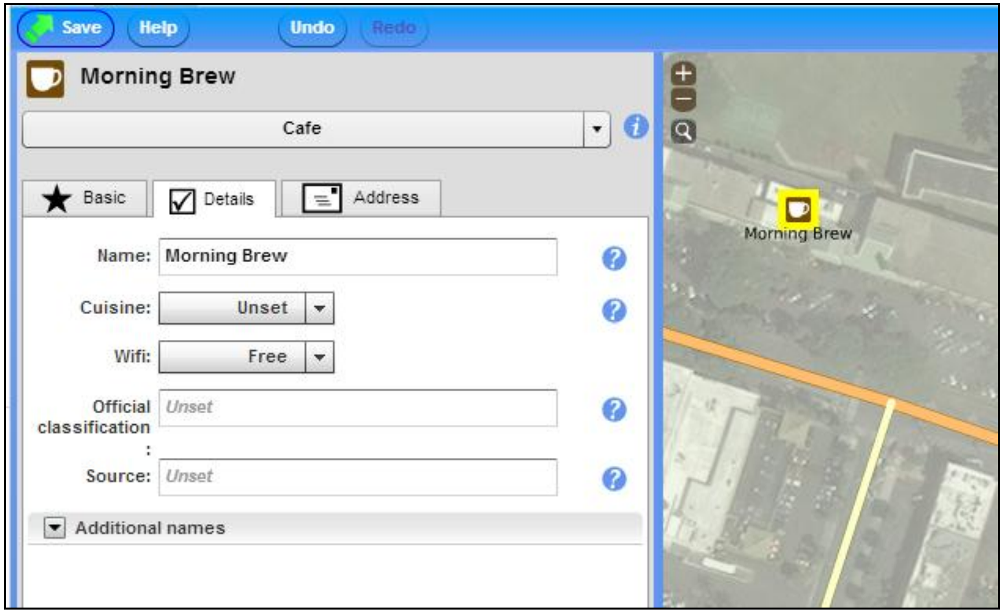
- Pick something in the panel
- Click the arrow to expand
- What do you know about in this area? What are you interested in mapping?
- I picked a café
- Drag it onto the map where the POI is



Add new points by dragging them onto the map

Step 5: Add something

- Next, fill in the details that you know



Morning Brew

Cafe

Name: Morning Brew

Cuisine: Unset

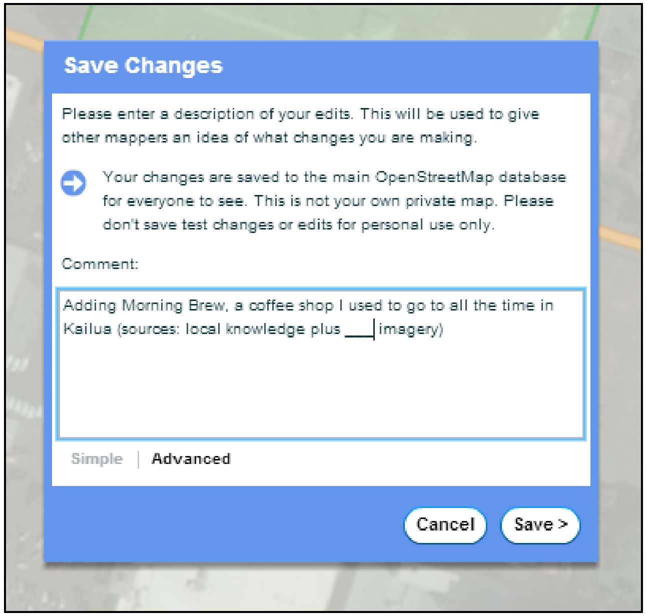
Wifi: Free

Official classification: Unset

Source: Unset

Step 5: Save your edits

- Save early, save often
- This creates a "changeset" that is sent to the database
- **Give an informative changeset comment** *that includes what you were working on and what your sources were*
- What imagery are you using? Do you know how to change it?



Save Changes

Please enter a description of your edits. This will be used to give other mappers an idea of what changes you are making.

Your changes are saved to the main OpenStreetMap database for everyone to see. This is not your own private map. Please don't save test changes or edits for personal use only.

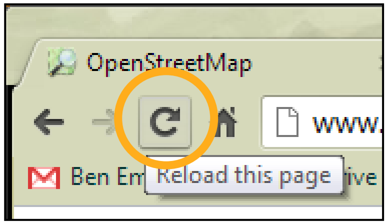
Comment:

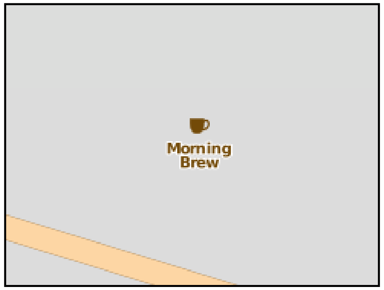
Adding Morning Brew, a coffee shop I used to go to all the time in Kailua (sources: local knowledge plus ____ imagery)

Step 6: View your edits

- Click the “View” button in the top left to go back to the map
- *Hold down Ctrl while clicking refresh* to clear your browser’s cache of map tiles (shift-refresh with Firefox)

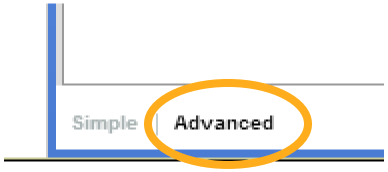
Ctrl +

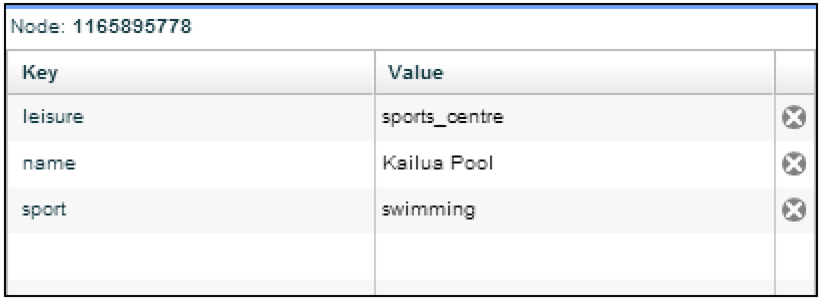




Example workflow: Fixing something

- Find a POI (point of interest) you know about that's already in the map
- Click the "Advanced" button at the bottom to see all the tags on the POI

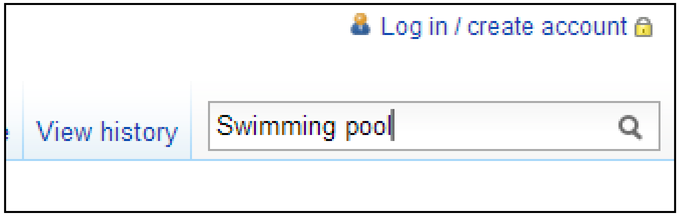



Node: 1165895778

Key	Value	
leisure	sports_centre	☒
name	Kailua Pool	☒
sport	swimming	☒

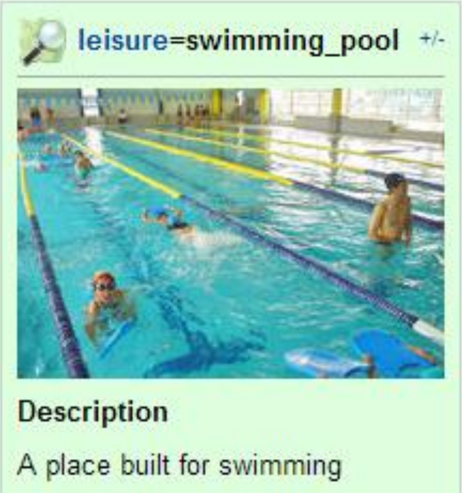
Example workflow: Fixing something

- Look that type of thing up on http://wiki.openstreetmap.org
- Is it tagged correctly?
- This one should be fixed



Swimming pool

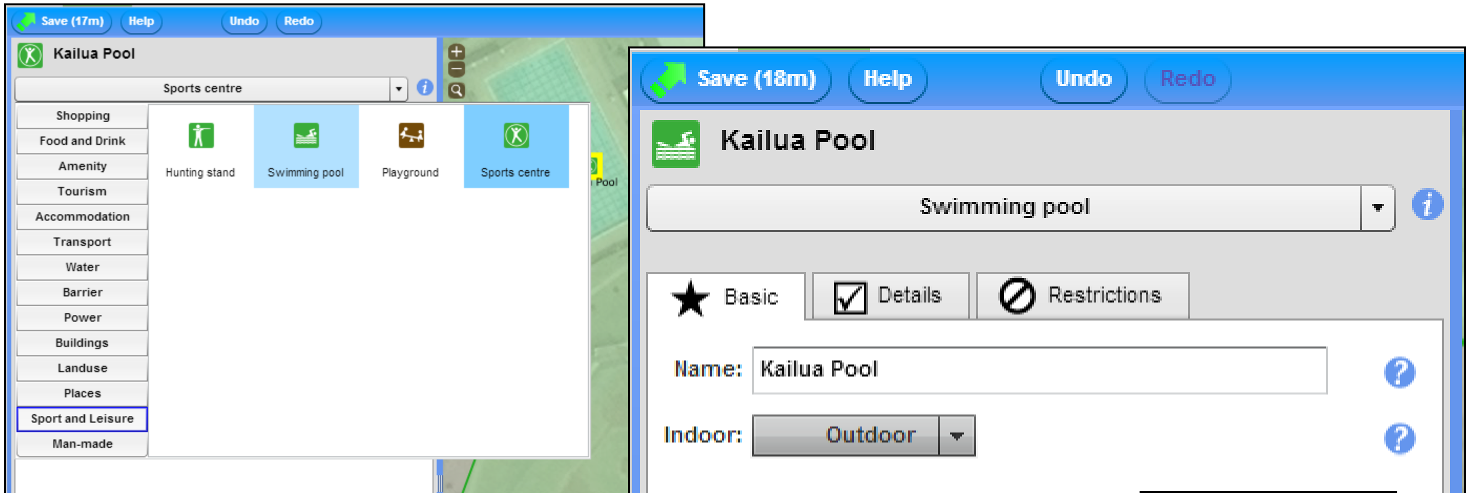
leisure=swimming_pool,
not leisure=sports_centre


leisure=swimming_pool

Description

A place built for swimming

Example workflow: Fixing something



Kailua Pool

Sports centre

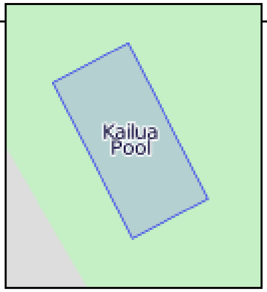
Kailua Pool

Swimming pool

Name: Kailua Pool

Indoor: Outdoor

… and after changing it to a polygon…



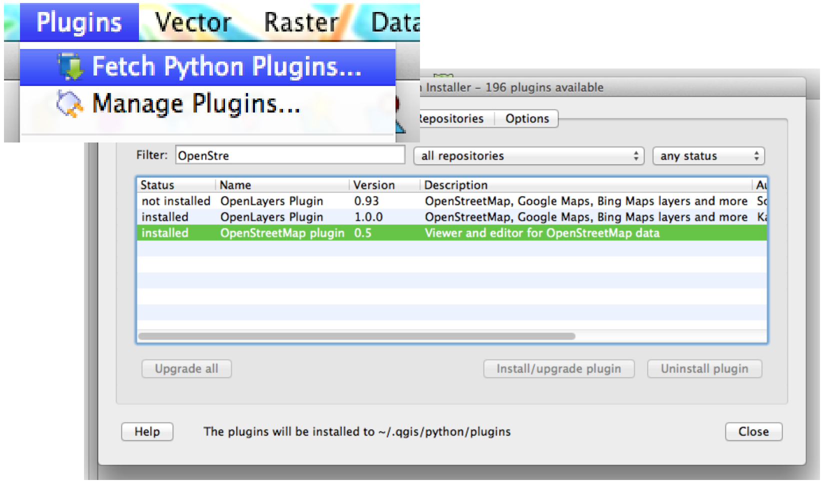
More about editing

- For anything more than point of interest editing, we recommend using JOSM (Java OpenStreetMap Editor)
- Not too hard to learn, especially if you're familiar with GIS software
- Handy tools that automatically line up nodes, orthagonalize, and make circles
- Remember to visit the wiki for tagging help, or ask on the newbies listserv http://lists.openstreetmap.org/listinfo/newbies

Getting and Preparing your OSM Data

Step 1: Get your plugin working

- We will be using QuantumGIS today to limit the software you needed to install
- Make sure you've not only downloaded the OSM plugin, but turned it on (2 steps)

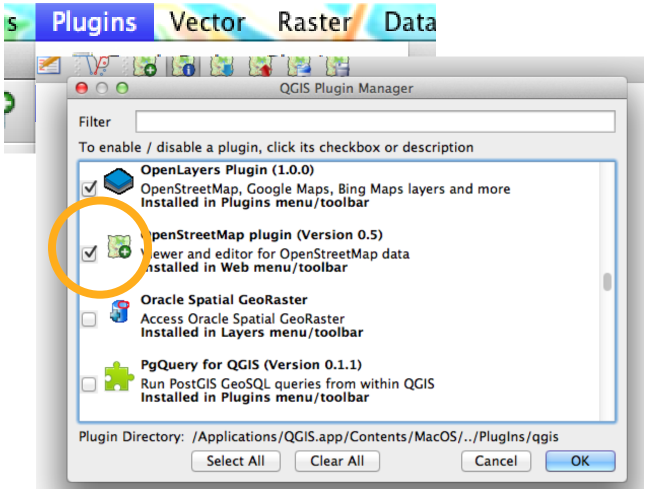


Installer – 196 plugins available

Filter: OpenStre | all repositories | any status

Status	Name	Version	Description	Au
not installed	OpenLayers Plugin	0.93	OpenStreetMap, Google Maps, Bing Maps layers and more	Sc
installed	OpenLayers Plugin	1.0.0	OpenStreetMap, Google Maps, Bing Maps layers and more	Ka
installed	OpenStreetMap plugin	0.5	Viewer and editor for OpenStreetMap data	

The plugins will be installed to ~/.qgis/python/plugins



Filter

To enable / disable a plugin, click its checkbox or description

☑ **OpenLayers Plugin (1.0.0)**
OpenStreetMap, Google Maps, Bing Maps layers and more
Installed in Plugins menu/toolbar

☑ **penStreetMap plugin (Version 0.5)**
ewer and editor for OpenStreetMap data
nstalled in Web menu/toolbar

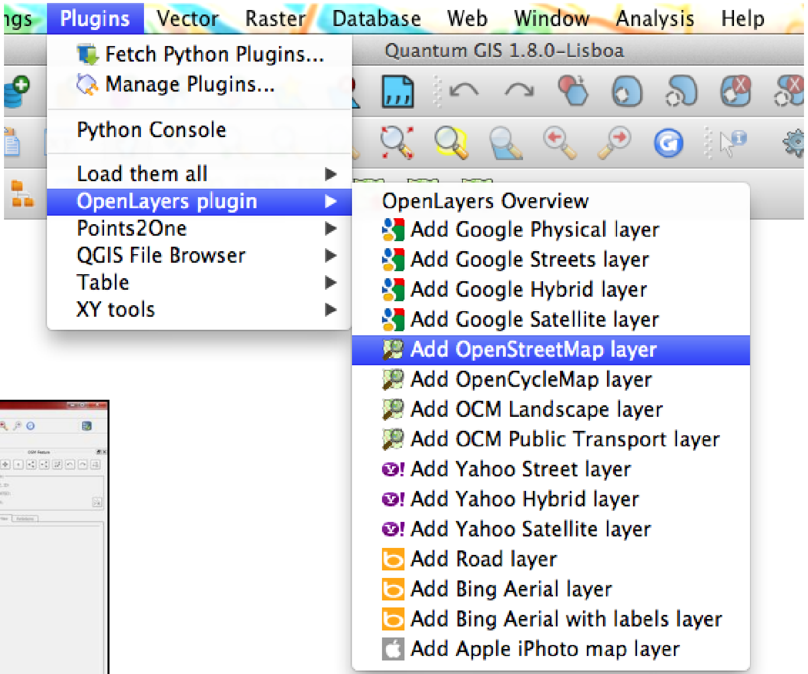
□ **Oracle Spatial GeoRaster**
Access Oracle Spatial GeoRaster
Installed in Layers menu/toolbar

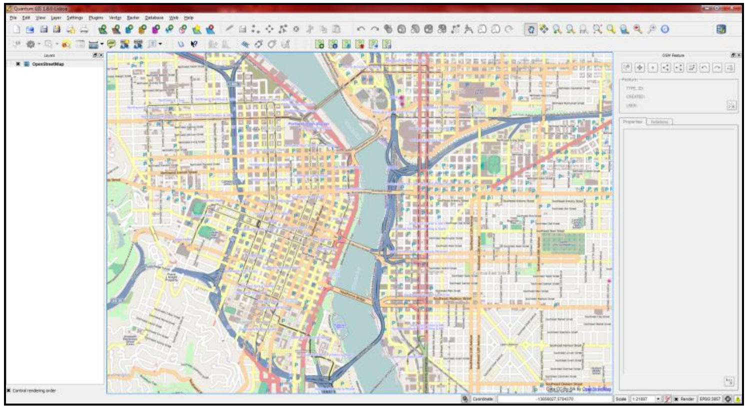
□ **PgQuery for QGIS (Version 0.1.1)**
Run PostGIS GeoSQL queries from within QGIS
Installed in Plugins menu/toolbar

Plugin Directory: /Applications/QGIS.app/Contents/MacOS/../PlugIns/qgis

Step 2: Select an area of interest

- Go to Plugins-> OpenLayers plugin -> Add OpenStreetMap Layer
- Zoom and pan to an area of interest

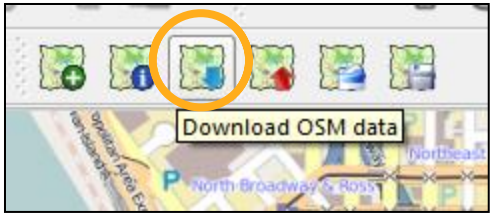




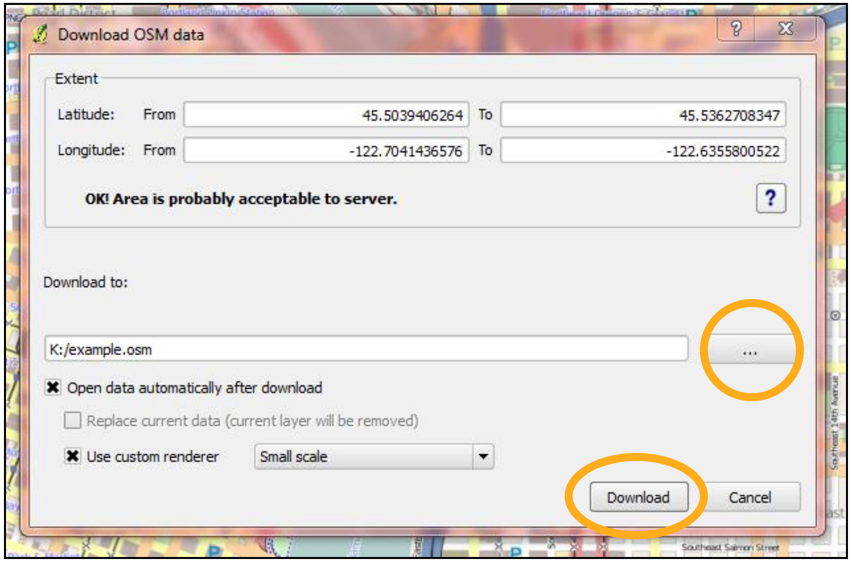
Not too big, now!

Step 3: Download from OSM

- Click the "Download OSM data" button (blue arrow pointing down)
- If you can't see the button, look for and expand the plugin's toolbar



- The extent should be filled automatically
- Click the "…" button to browse for where you want to save the .osm file
- Click "Download"



Download OSM data

Extent

Latitude:	From	45.5039406264	To	45.5362708347
Longitude:	From	-122.7041436576	To	-122.6355800522

OK! Area is probably acceptable to server.

Download to:

K:/example.osm

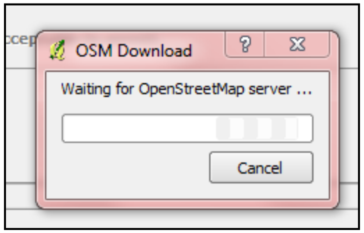
☒ Open data automatically after download

□ Replace current data (current layer will be removed)

☒ Use custom renderer: Small scale

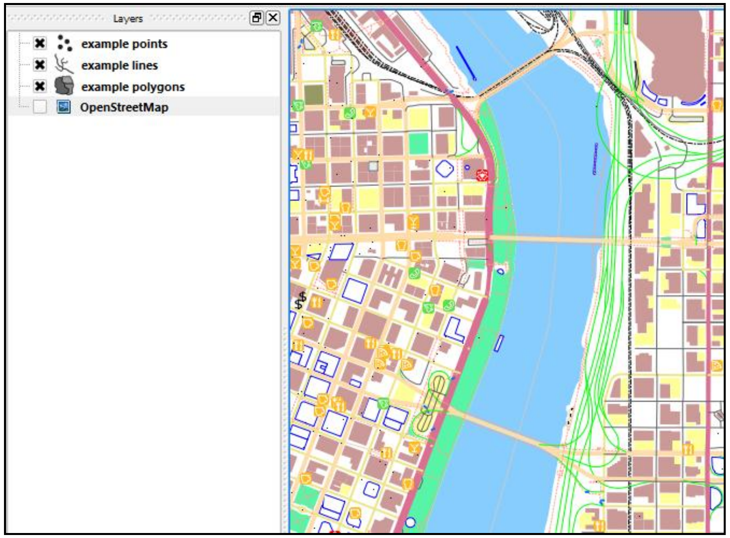
Step 4: Wait… then view

- Again, you can do faster, larger downloads via JOSM's "Mirrored download" plugin, and then open them in QGIS for the next step (though QGIS will still take a while to process large files)
- Check it out! You may want to turn off the OpenLayers OSM Layer



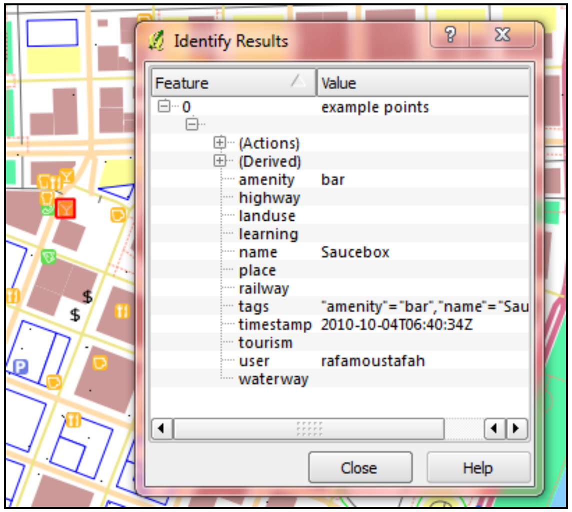
OSM Download

Waiting for OpenStreetMap server ...

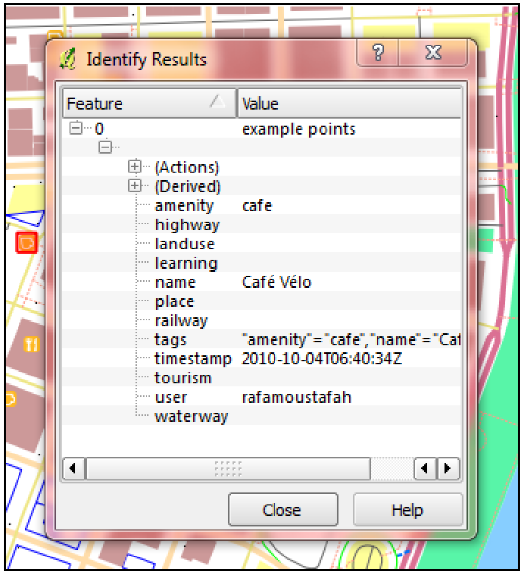


Step 5: Explore

- Use the identify tool to check out the attributes of some points (may need to select that layer first)



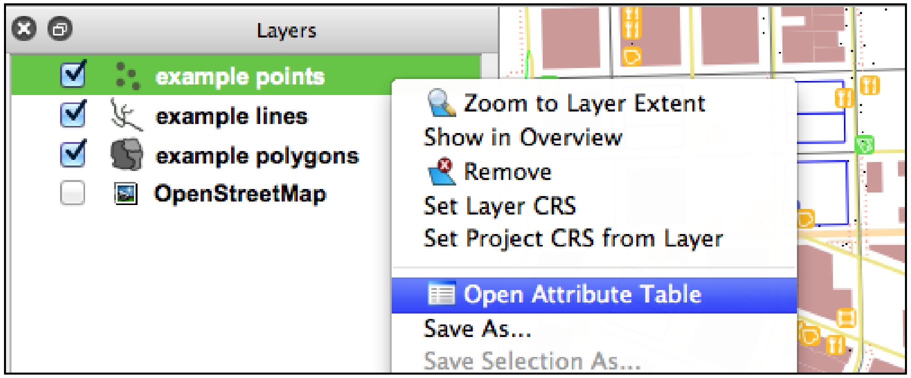
Feature	Value
0	example points
(Actions)	
(Derived)	
amenity	bar
highway	
landuse	
learning	
name	Saucebox
place	
railway	
tags	"amenity"="bar","name"="Sau
timestamp	2010-10-04T06:40:34Z
tourism	
user	rafamoustafah
waterway	



Feature	Value
0	example points
(Actions)	
(Derived)	
amenity	cafe
highway	
landuse	
learning	
name	Café Vélo
place	
railway	
tags	"amenity"="cafe","name"="Caf
timestamp	2010-10-04T06:40:34Z
tourism	
user	rafamoustafah
waterway	

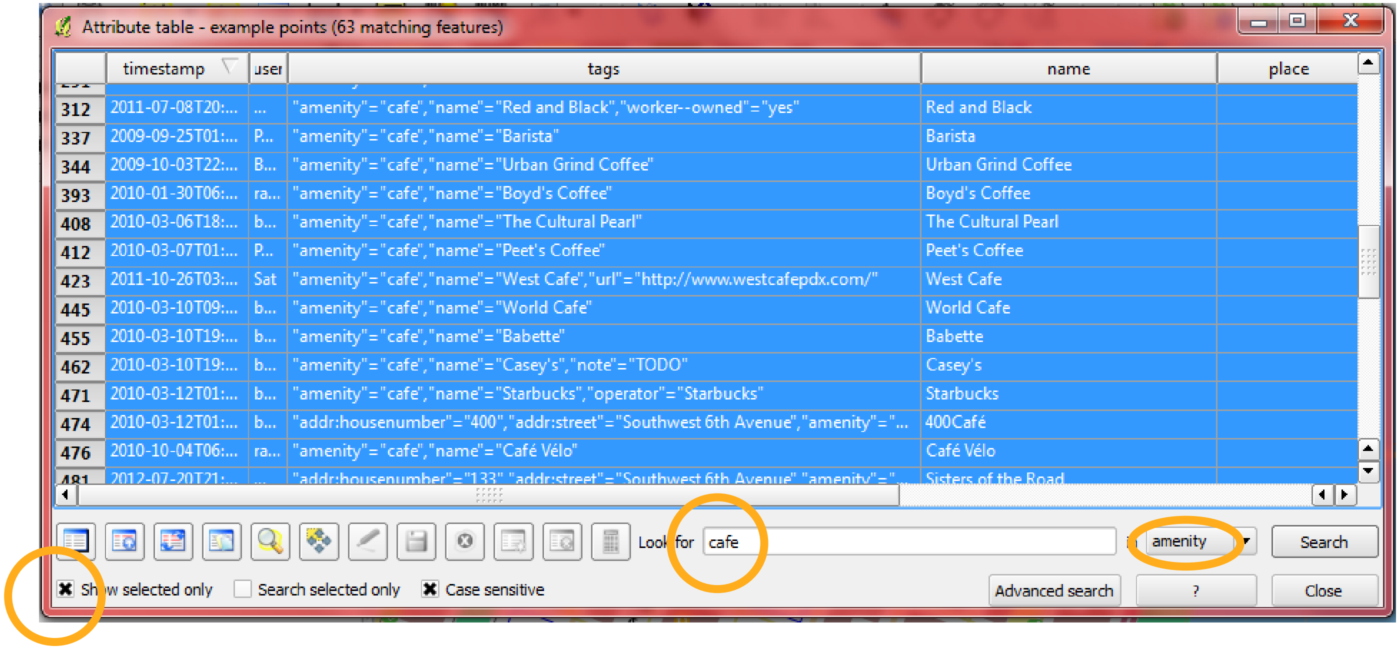
Step 6: Choose what you want

- Right-click on the points layer and select "Open Attribute Table"



Step 6: Choose what you want

- Look for **cafe**, in **amenity**
- Click the box for **“Show selected only”**



Attribute table - example points (63 matching features)

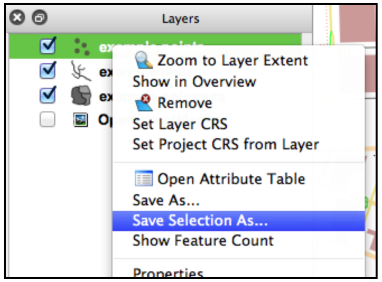
	timestamp	user	tags	name	place
312	2011-07-08T20:...	...	"amenity"="cafe","name"="Red and Black","worker--owned"="yes"	Red and Black	
337	2009-09-25T01:...	P...	"amenity"="cafe","name"="Barista"	Barista	
344	2009-10-03T22:...	B...	"amenity"="cafe","name"="Urban Grind Coffee"	Urban Grind Coffee	
393	2010-01-30T06:...	ra...	"amenity"="cafe","name"="Boyd's Coffee"	Boyd's Coffee	
408	2010-03-06T18:...	b...	"amenity"="cafe","name"="The Cultural Pearl"	The Cultural Pearl	
412	2010-03-07T01:...	P...	"amenity"="cafe","name"="Peet's Coffee"	Peet's Coffee	
423	2011-10-26T03:...	Sat	"amenity"="cafe","name"="West Cafe","url"="http://www.westcafepdx.com/"	West Cafe	
445	2010-03-10T09:...	b...	"amenity"="cafe","name"="World Cafe"	World Cafe	
455	2010-03-10T19:...	b...	"amenity"="cafe","name"="Babette"	Babette	
462	2010-03-10T19:...	b...	"amenity"="cafe","name"="Casey's","note"="TODO"	Casey's	
471	2010-03-12T01:...	b...	"amenity"="cafe","name"="Starbucks","operator"="Starbucks"	Starbucks	
474	2010-03-12T01:...	b...	"addr:housenumber"="400","addr:street"="Southwest 6th Avenue","amenity"="...	400Café	
476	2010-10-04T06:...	ra...	"amenity"="cafe","name"="Café Vélo"	Café Vélo	
481	2012-07-20T21:...	...	"addr:housenumber"="133","addr:street"="Southwest 6th Avenue","amenity"="...	Sisters of the Road	

Look for: cafe in: amenity

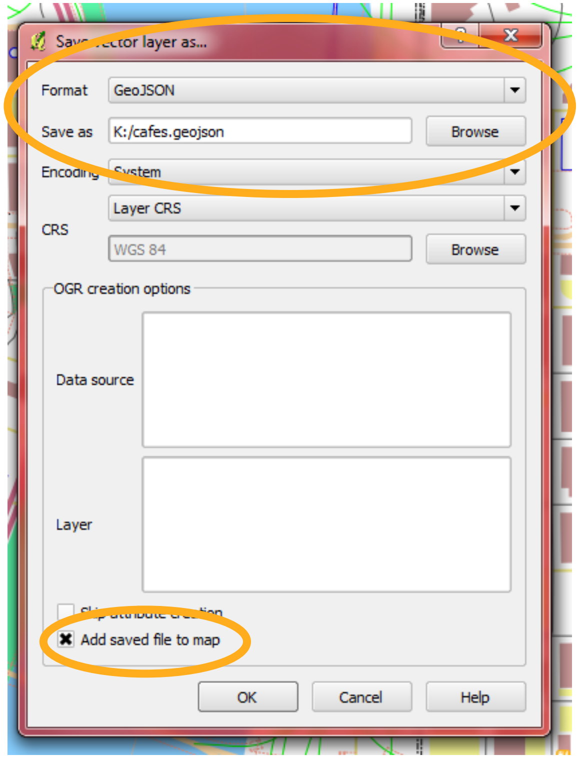
☒ Show selected only □ Search selected only ☒ Case sensitive

Step 7: Save it as a GeoJSON

- Right-click on the layer and choose “Save Selection As…”



- Choose GeoJSON for the format
- Browse for a file location and choose a name
- Click the box for “Add saved file to map”



Format: GeoJSON

Save as: K:/cafes.geojson

Encoding: System

CRS: Layer CRS

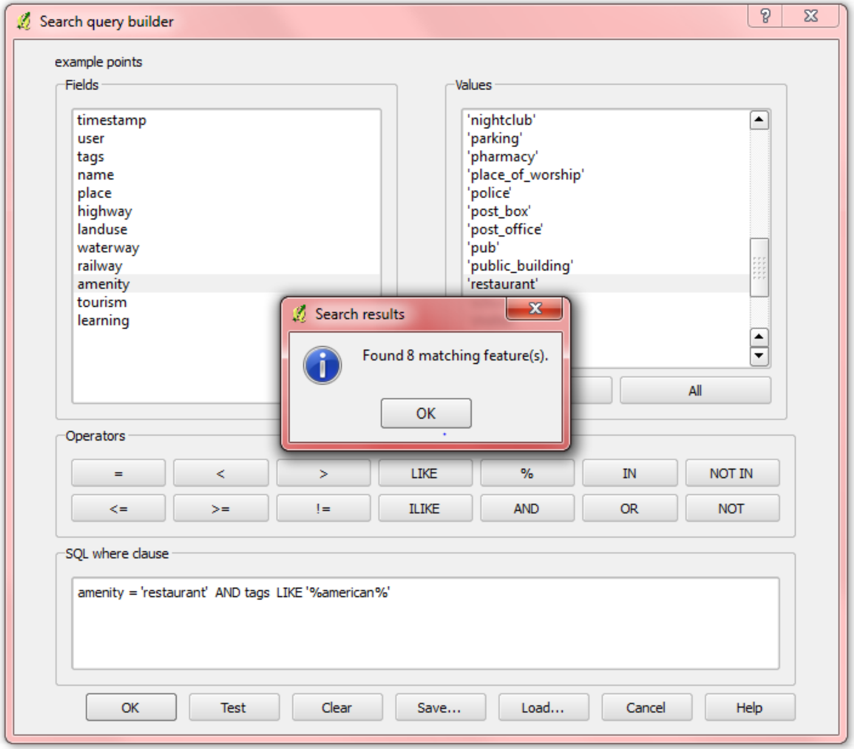
WGS 84

☐ Skip attribute creation

☒ Add saved file to map

Step 8: Do it again

- Repeat with a different type of POI
- Grant and I are here to help!
- I’m choosing bars
- You can also use the “Advanced search” button to use the Search query builder for more complex queries
- Additional tags should be in the ‘tags’ field



Search query builder

example points

Fields

timestamp
user
tags
name
place
highway
landuse
waterway
railway
amenity
tourism
learning

Values

'nightclub'
'parking'
'pharmacy'
'place_of_worship'
'police'
'post_box'
'post_office'
'pub'
'public_building'
'restaurant'

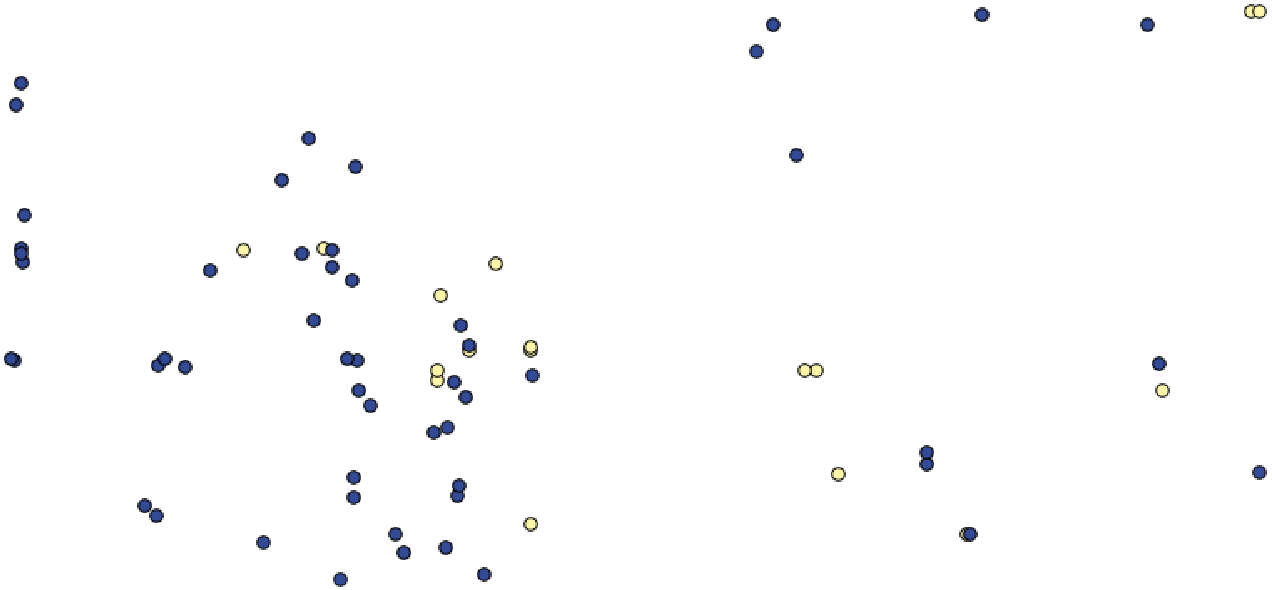
Search results

Found 8 matching feature(s).

SQL where clause

```
amenity = 'restaurant'  AND tags  LIKE '%american%'
```

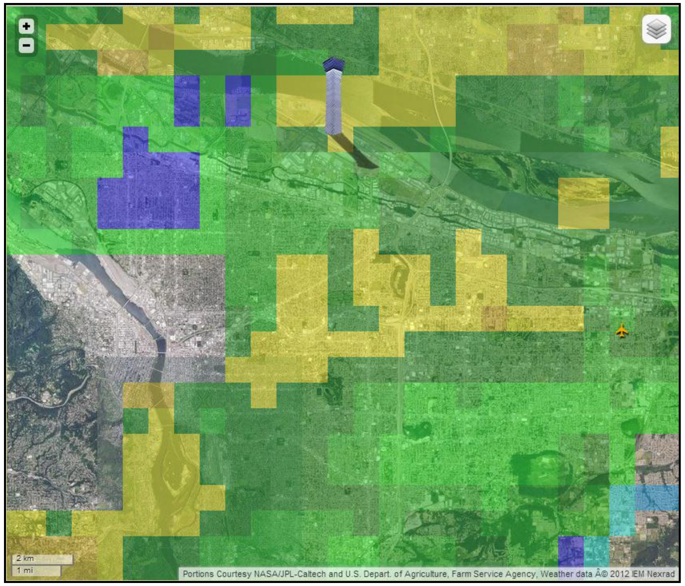
Your OSM-Leaflet Map



Putting GeoJSON OSM POIs into a Leaflet Map

Step 1: Getting started

- Let’s build off of one of Wm’s examples (Exercise 9)
- Oh no, the rain is coming! Where are some bars or coffee shops that I can hide out in for a while?
- How does the code need to be modified?

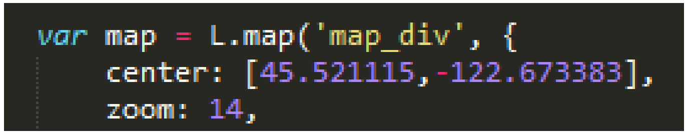

+
−
2 km
1 mi
Portions Courtesy NASA/JPL-Caltech and U.S. Depart. of Agriculture, Farm Service Agency, Weather data Â© 2012 IEM Nexrad

Step 2: Adapt what we have

- Let’s get rid of:
  - The airport (and its icon)
  - The planes
  - Google street overlay
- Do this yourself, or get some tidy files to start with at http://pdxmele.github.com/OSM-Leaf-example
- What we’ll be doing:
  - Changing the zoom and center
  - Adding a couple of new GeoJSON layers

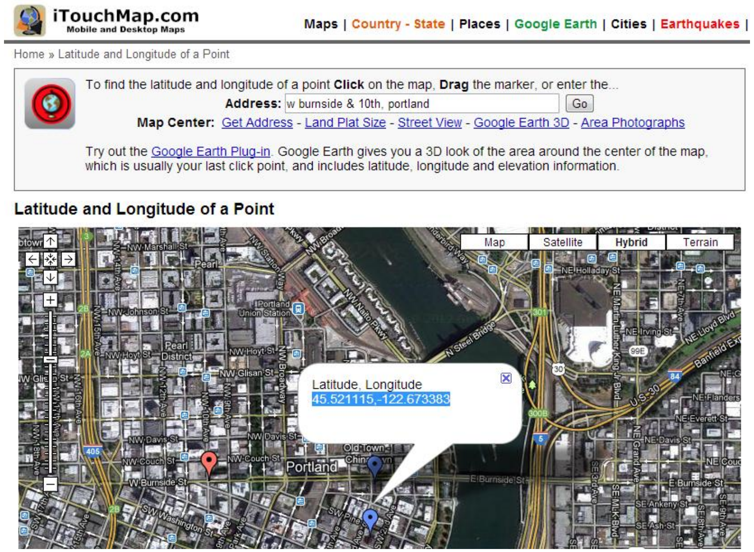
Step 3: Change the center & zoom

- http://itouchmap.com/latlong.html and similar tools can help you determine your new map center
- Paste it in



```
var map = L.map('map_div', {
    center: [45.521115,-122.673383],
    zoom: 14,
```

- Increase the zoom



iTouchMap.com
Mobile and Desktop Maps

Home » Latitude and Longitude of a Point

To find the latitude and longitude of a point **Click** on the map, **Drag** the marker, or enter the...

Address: w burnside & 10th, portland

Map Center: Get Address - Land Plat Size - Street View - Google Earth 3D - Area Photographs

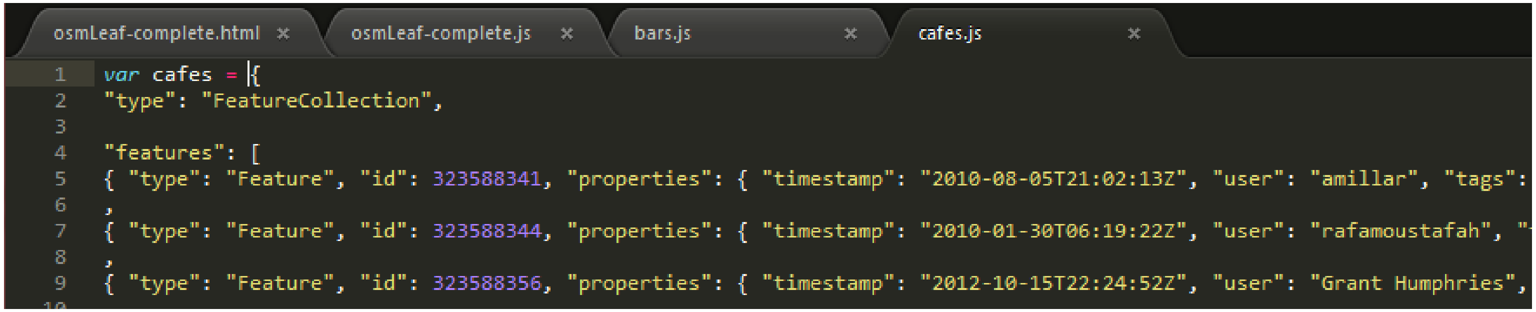
Try out the Google Earth Plug-in. Google Earth gives you a 3D look of the area around the center of the map, which is usually your last click point, and includes latitude, longitude and elevation information.

Latitude and Longitude of a Point

Latitude, Longitude
45.521115,-122.673383

Step 4: Prepare the GeoJSON

- So what is GeoJSON anyway? Open up your files in SublimeText and have a look
- They are just specially-formatted JavaScript files
- Save them as .js files instead of .geojson files and put them in the same folder as your other files
- Add "var [name] = " (i.e. var cafes =) to the beginning of each document

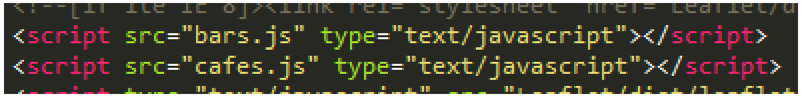


```
var cafes = {
"type": "FeatureCollection",

"features": [
{ "type": "Feature", "id": 323588341, "properties": { "timestamp": "2010-08-05T21:02:13Z", "user": "amillar", "tags":
,
{ "type": "Feature", "id": 323588344, "properties": { "timestamp": "2010-01-30T06:19:22Z", "user": "rafamoustafah", "
,
{ "type": "Feature", "id": 323588356, "properties": { "timestamp": "2012-10-15T22:24:52Z", "user": "Grant Humphries",
```

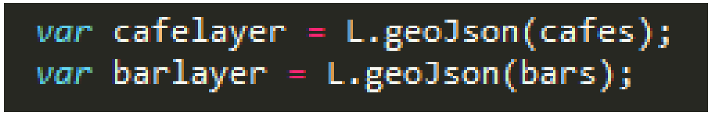
Step 5: Adding the GeoJSON layers to your map

- Add references to these files in your HTML file (put them before the Leaflet js and jQuery)



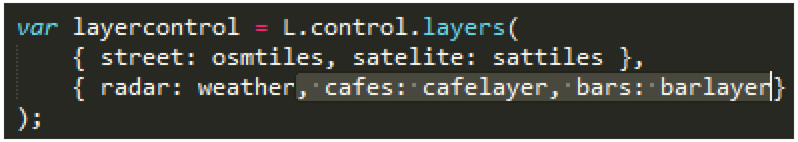
```
<!--[if lte IE 8]><link rel="stylesheet" href="leaflet/d
<script src="bars.js" type="text/javascript"></script>
<script src="cafes.js" type="text/javascript"></script>
<script type="text/javascript" src="leaflet/dist/leaflet
```

- Add this after weather:

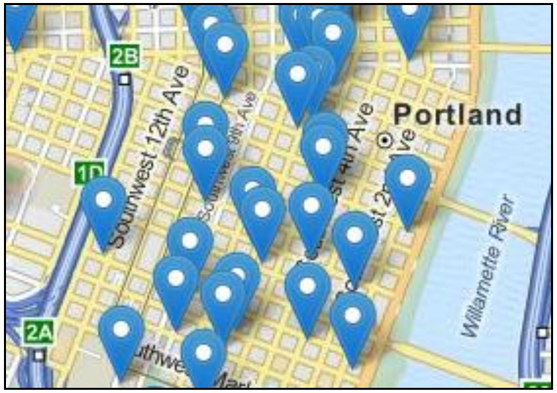


```
var cafelayer = L.geoJson(cafes);
var barlayer = L.geoJson(bars);
```

- Update your layer control:

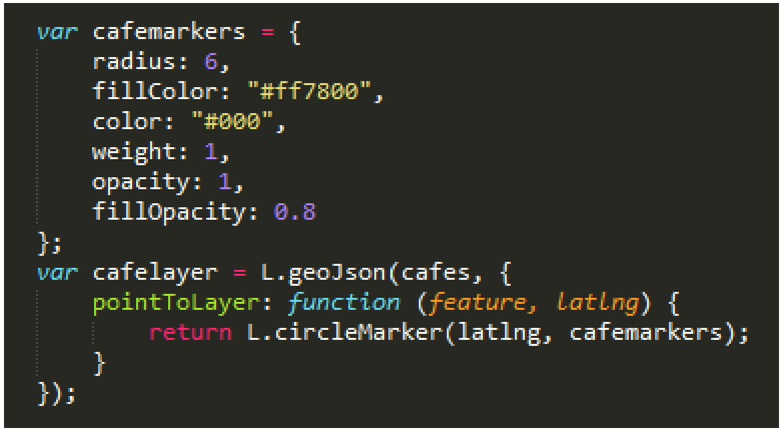


```
var layercontrol = L.control.layers(
    { street: osmtiles, satelite: sattiles },
    { radar: weather, cafes: cafelayer, bars: barlayer}
);
```

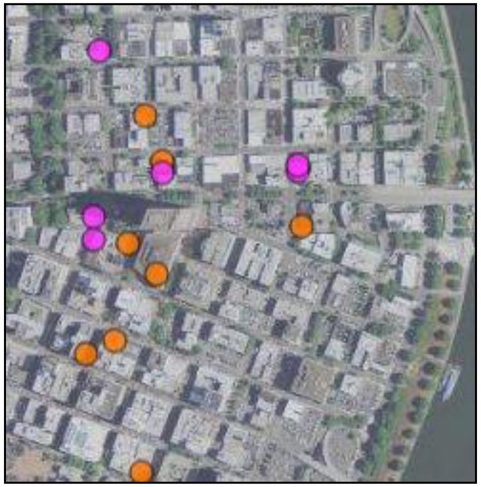


Step 6: Improve it with styling

- Let’s make it so we can tell our layers apart
- Start with this code, and mimic it for your second dataset



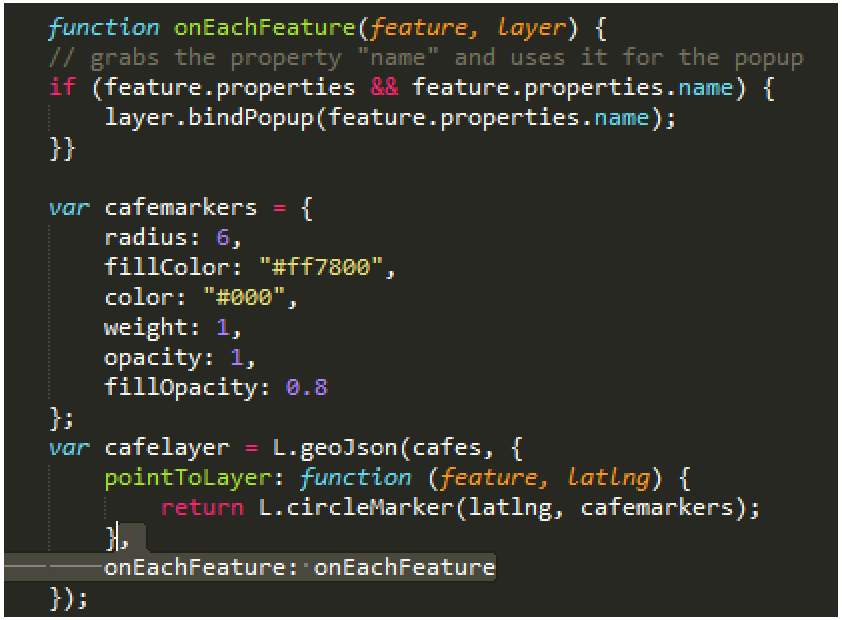
```
var cafemarkers = {
    radius: 6,
    fillColor: "#ff7800",
    color: "#000",
    weight: 1,
    opacity: 1,
    fillOpacity: 0.8
};
var cafelayer = L.geoJson(cafes, {
    pointToLayer: function (feature, latlng) {
        return L.circleMarker(latlng, cafemarkers);
    }
});
```



Step 7: Popups

- Add this section before your GeoJSON layers

- Add this highlighted bit to each layer

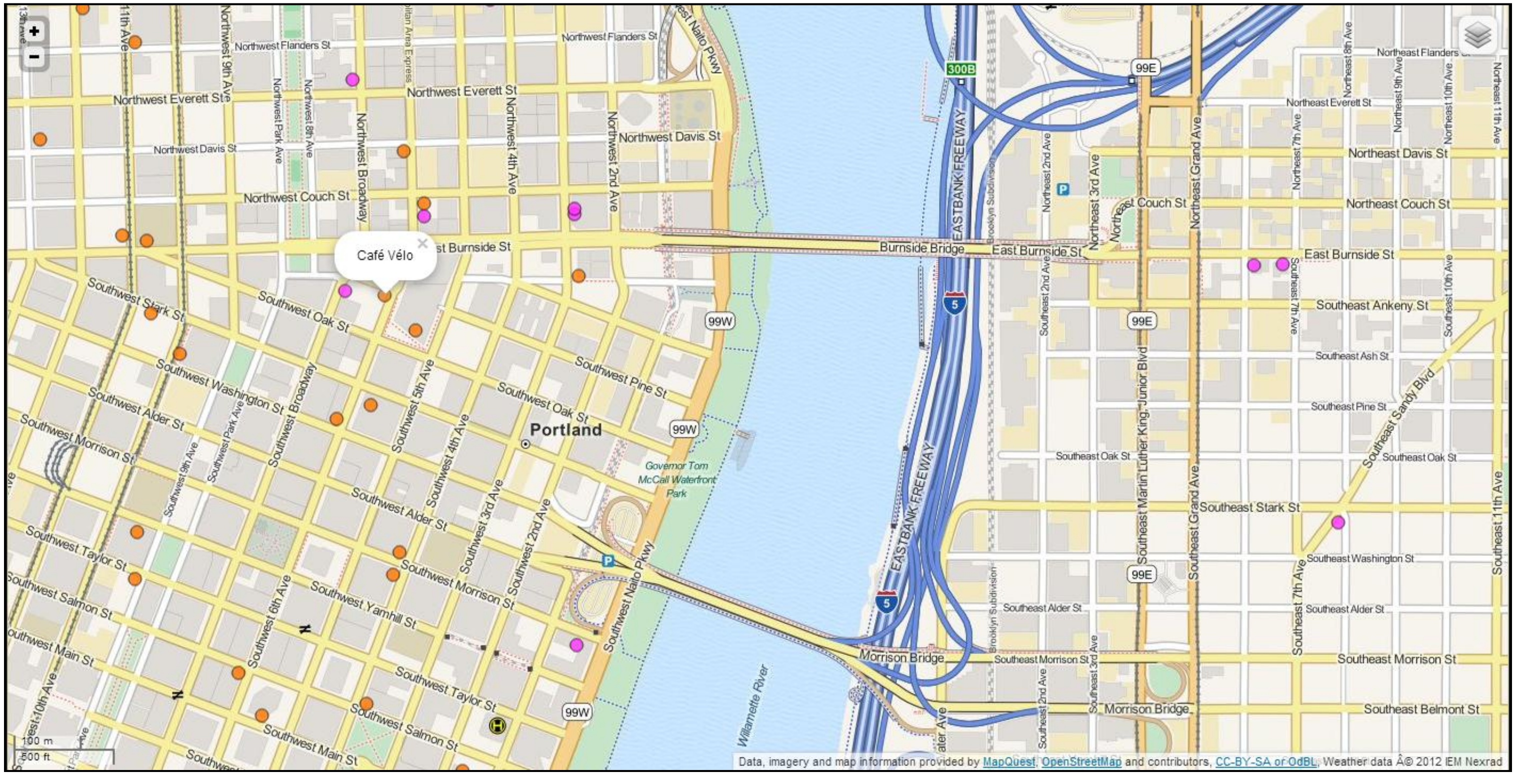


```
function onEachFeature(feature, layer) {
// grabs the property "name" and uses it for the popup
if (feature.properties && feature.properties.name) {
    layer.bindPopup(feature.properties.name);
}}

var cafemarkers = {
    radius: 6,
    fillColor: "#ff7800",
    color: "#000",
    weight: 1,
    opacity: 1,
    fillOpacity: 0.8
};
var cafelayer = L.geoJson(cafes, {
    pointToLayer: function (feature, latlng) {
        return L.circleMarker(latlng, cafemarkers);
    },
    onEachFeature: onEachFeature
});
```

Your OSM-Leaflet Map

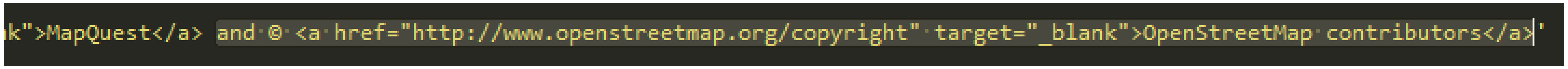
Looking good!



Data, imagery and map information provided by MapQuest, OpenStreetMap and contributors, CC-BY-SA or OdBL, Weather data Â© 2012 IEM Nexrad

One last word on attribution

- The OpenStreetMap license has recently changed (it was previously CC-by-SA)
- You need to credit OSM properly somewhere in your map or on your webpage
- Since we're already using an OSM tile layer, we can just modify the attribution for that (we should really fix that anyway)



```
k">MapQuest</a> and © <a href="http://www.openstreetmap.org/copyright" target="_blank">OpenStreetMap contributors</a>'
```

Congratulations!

Great job!
The final code is at:

http://pdxmele.github.com/OSM-Leaf-example/complete