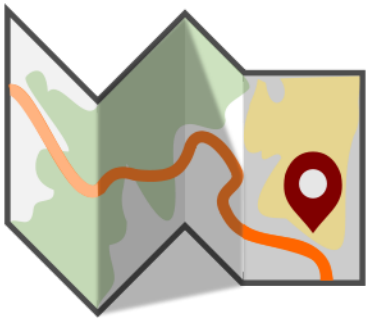
Basic Raster Styling and Analysis

QGIS Tutorials and Tips



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[redacted] QGIS [redacted] *Raster Calculator*. [redacted] *Raster Calculator* [redacted].

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We will use population density grid data to find and visualize areas of the world that have seen dramatic population density change between year 1990 and 2000.

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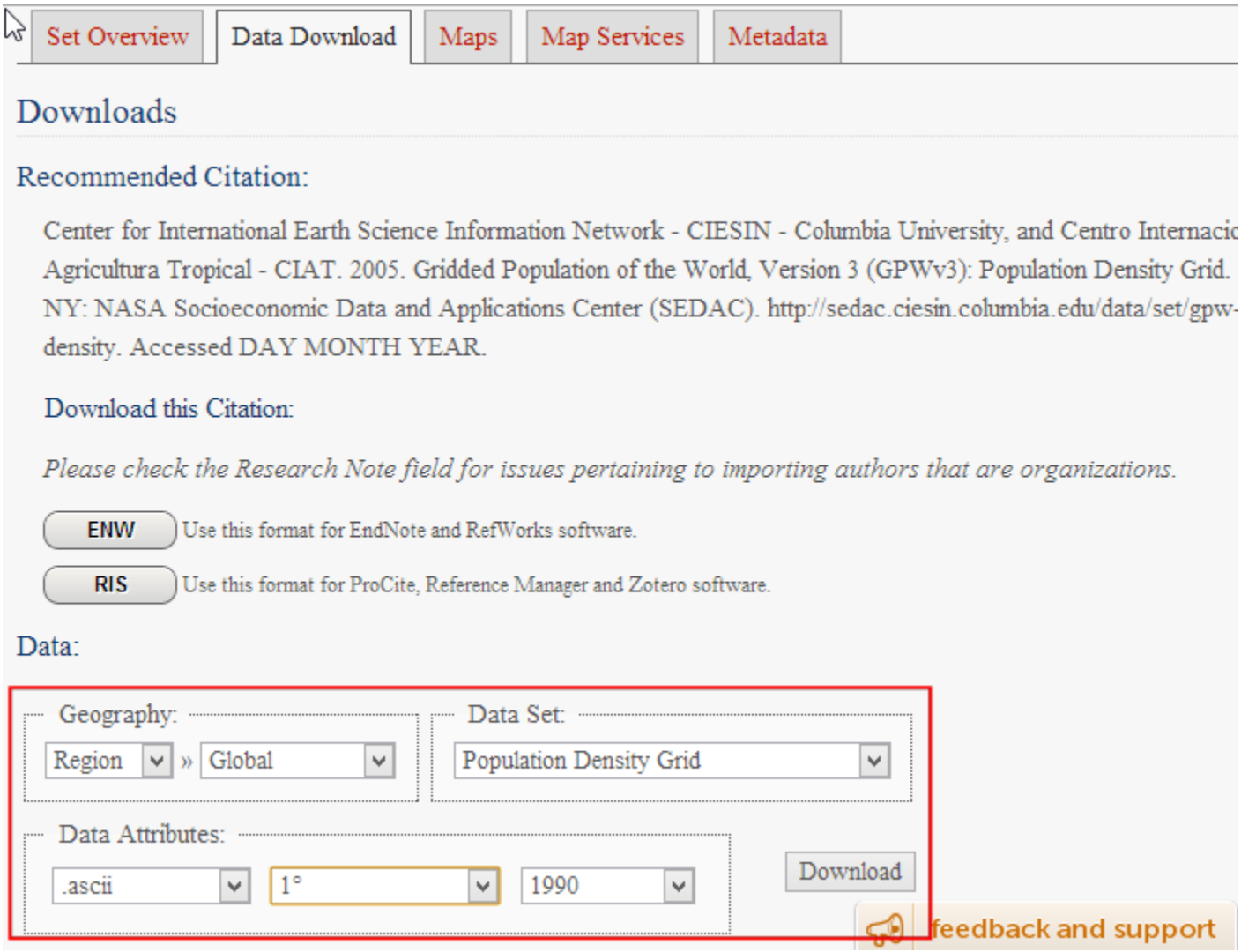
We will use the Gridded Population of the World (GPW) v3 dataset from Columbia University. Specifically, we need the Population Density Grid for the entire globe in ASCII format and for the year 1990 and 2000.

Here is how to search and download the revelant data.

1. Go to the Population Density Grid, v3 download page. Select the *Data Attributes* as *.ascii format*, *1° resolution* and *1990 year*. Click *Download*. At this point, you may create a free account and login, or use the *Guest Download* button at the bottom to immediately download the data. Repeat the process for *2000 year* data.

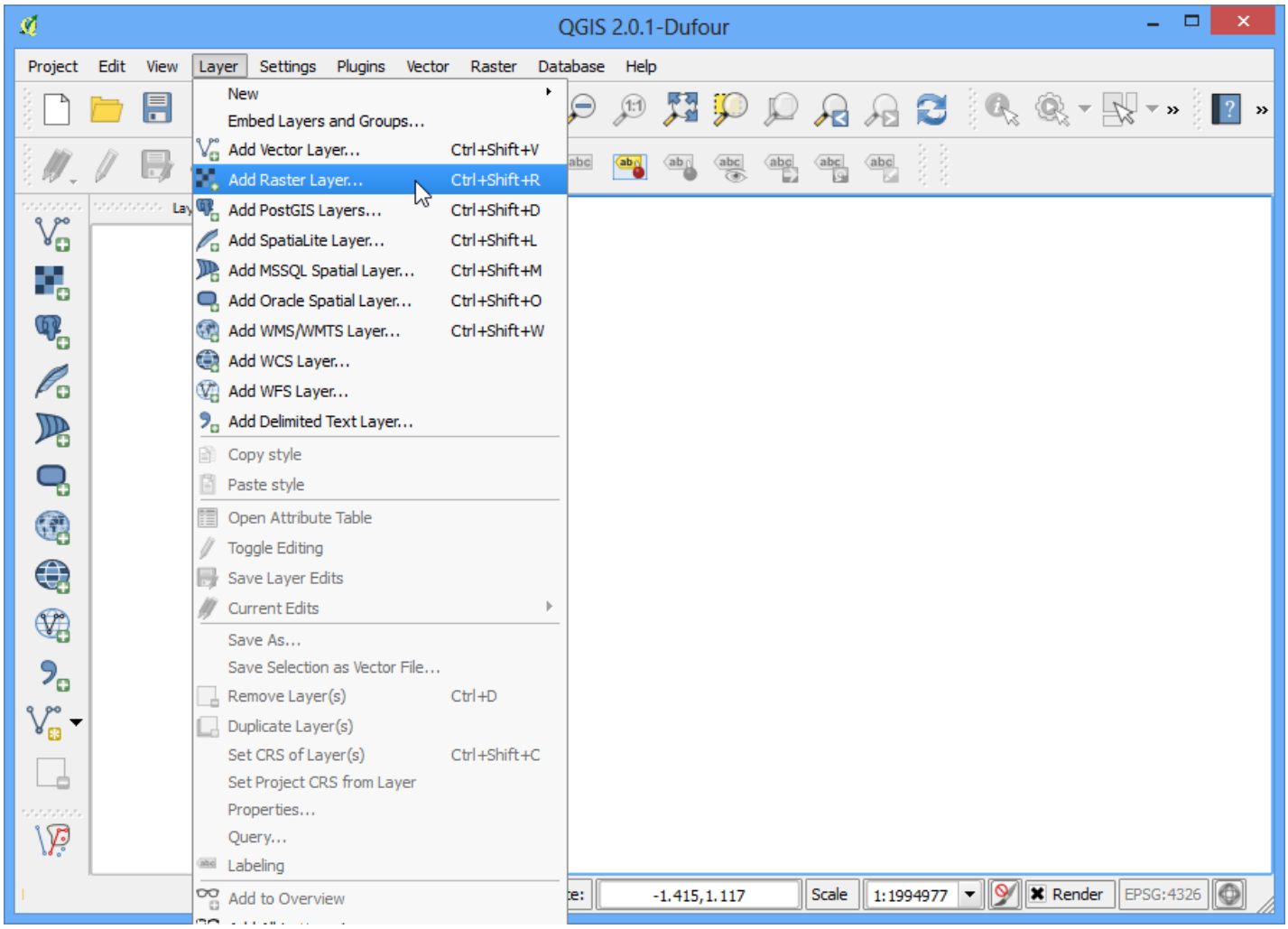


[illegible] [illegible] 2 [illegible] zip-[illegible].

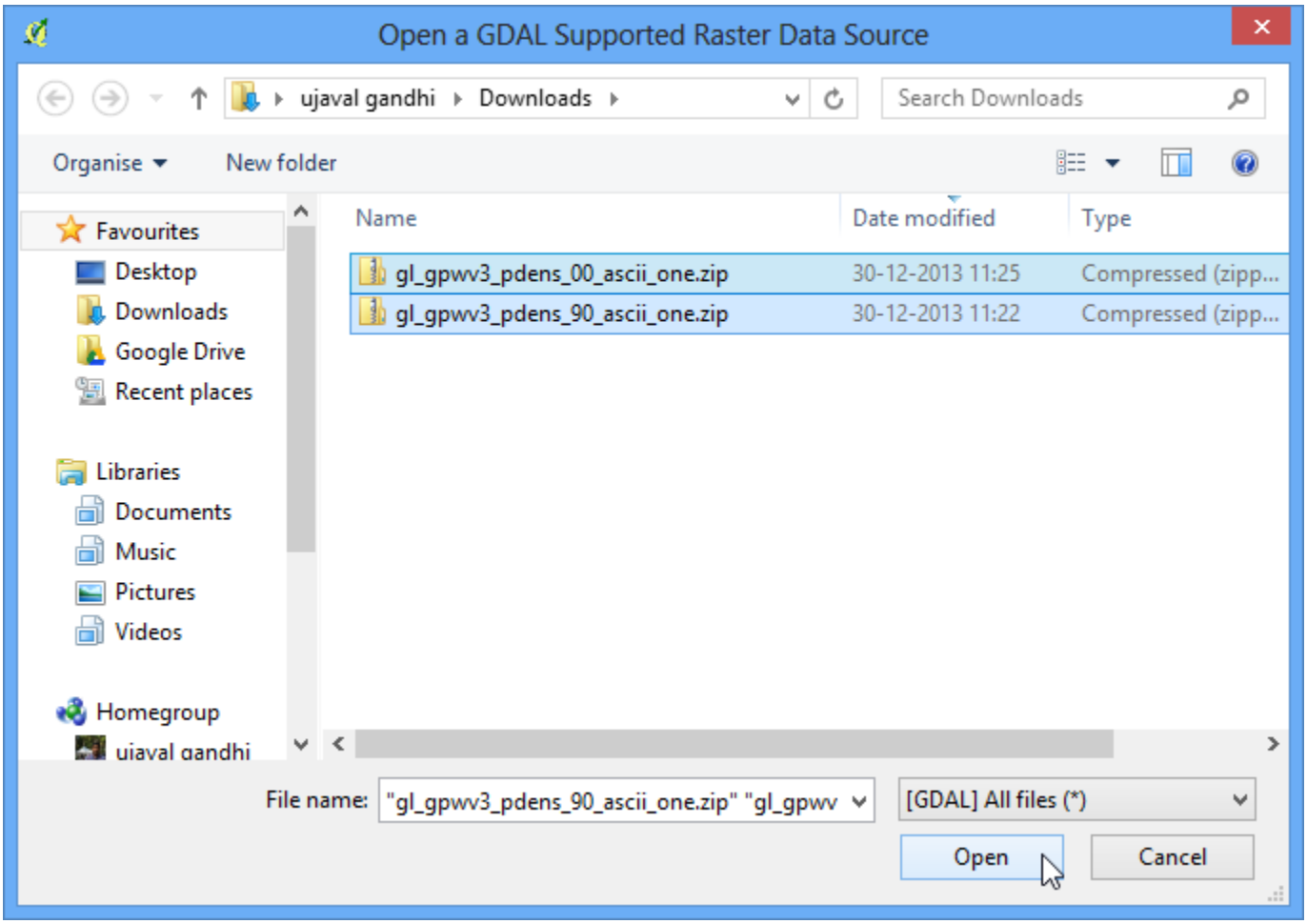
[illegible]: [GPW3]

[illegible]

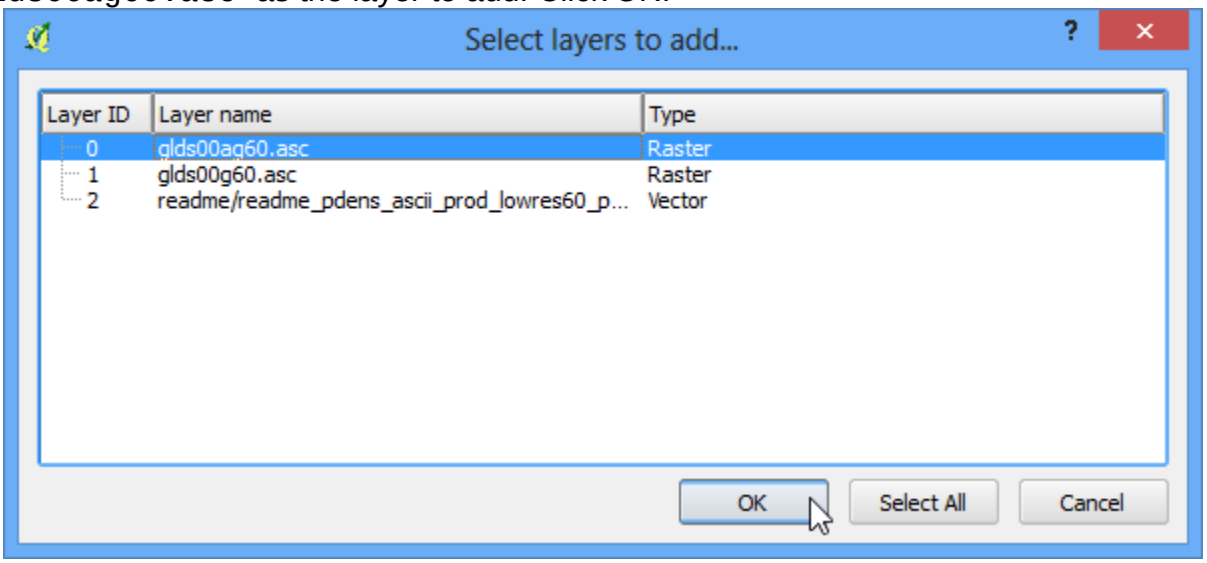
2. Open QGIS and go to *Layer* ■ *Add Raster Layer...*



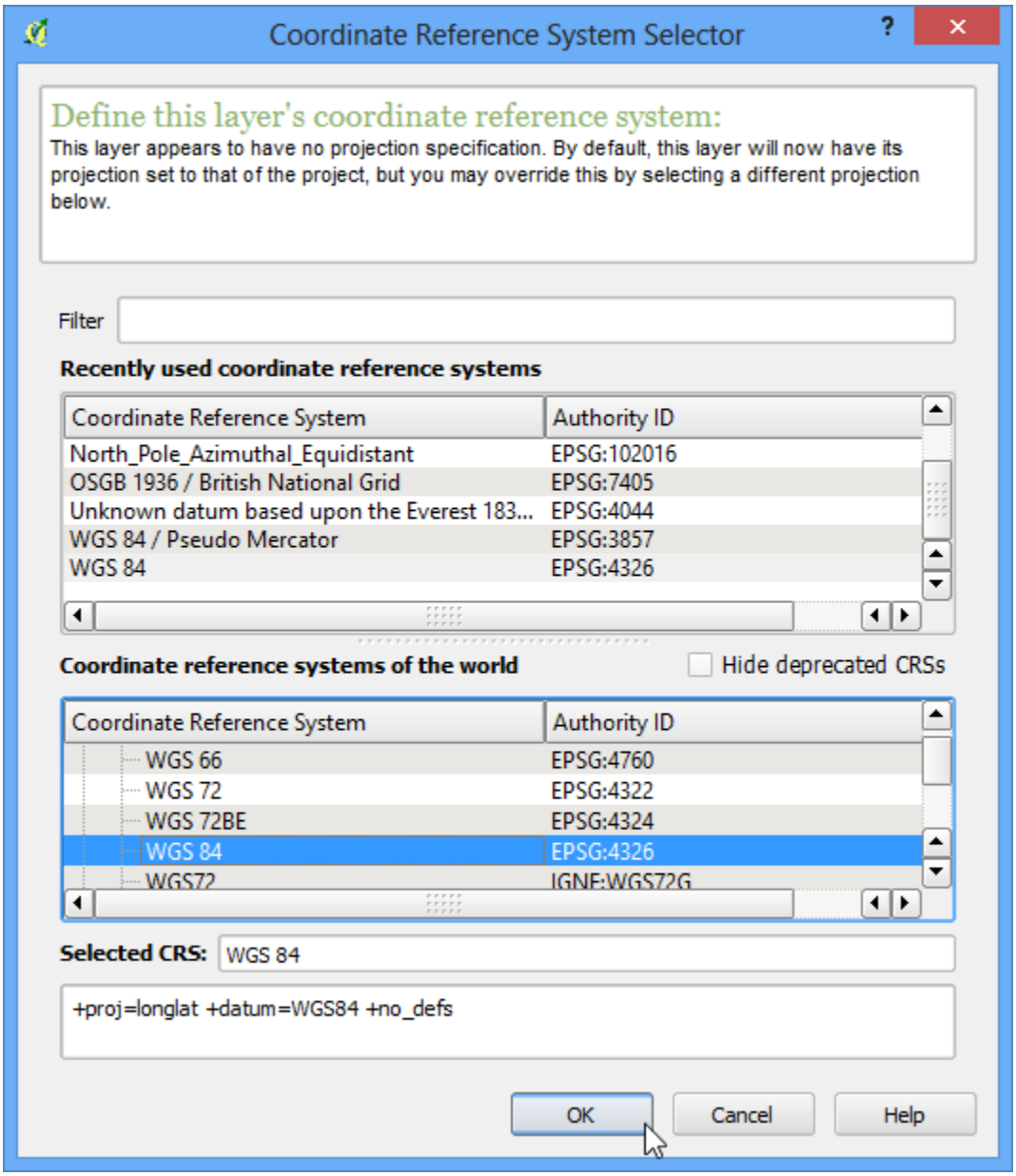
3. Locate the downloaded zip files. Hold down the Ctrl key and click on both the zip files to select them. This way you are able to load both the files in a single step.



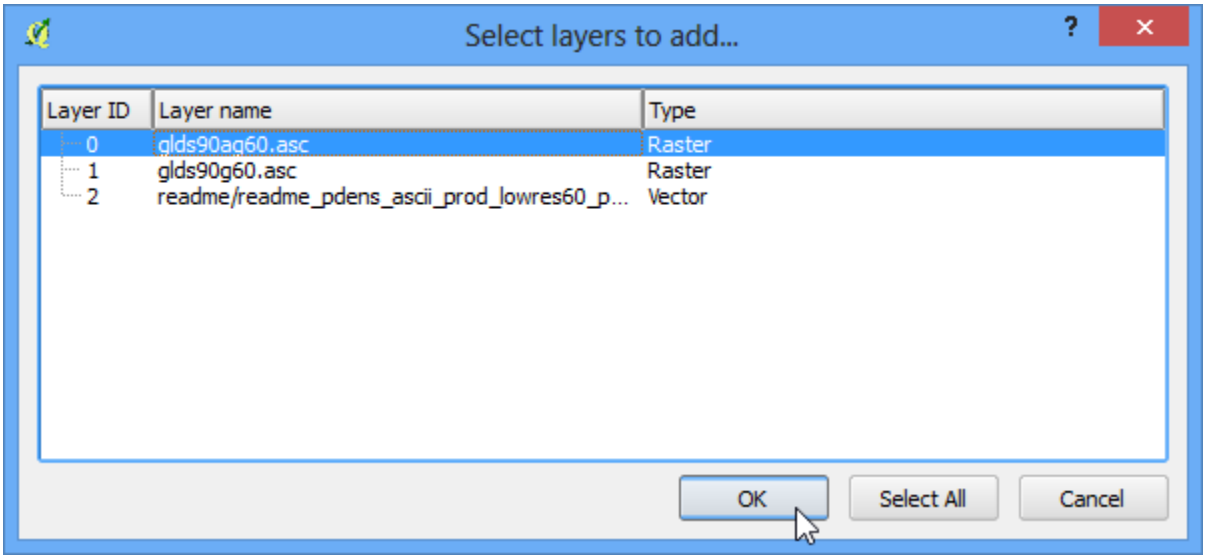
4. Each zip file contain 2 grid files. The a in the filename suggests that the population counts were adjusted to match the UN totals. We will use the adjusted grids for this tutorial. Select `glds00ag60.asc` as the layer to add. Click *OK*.



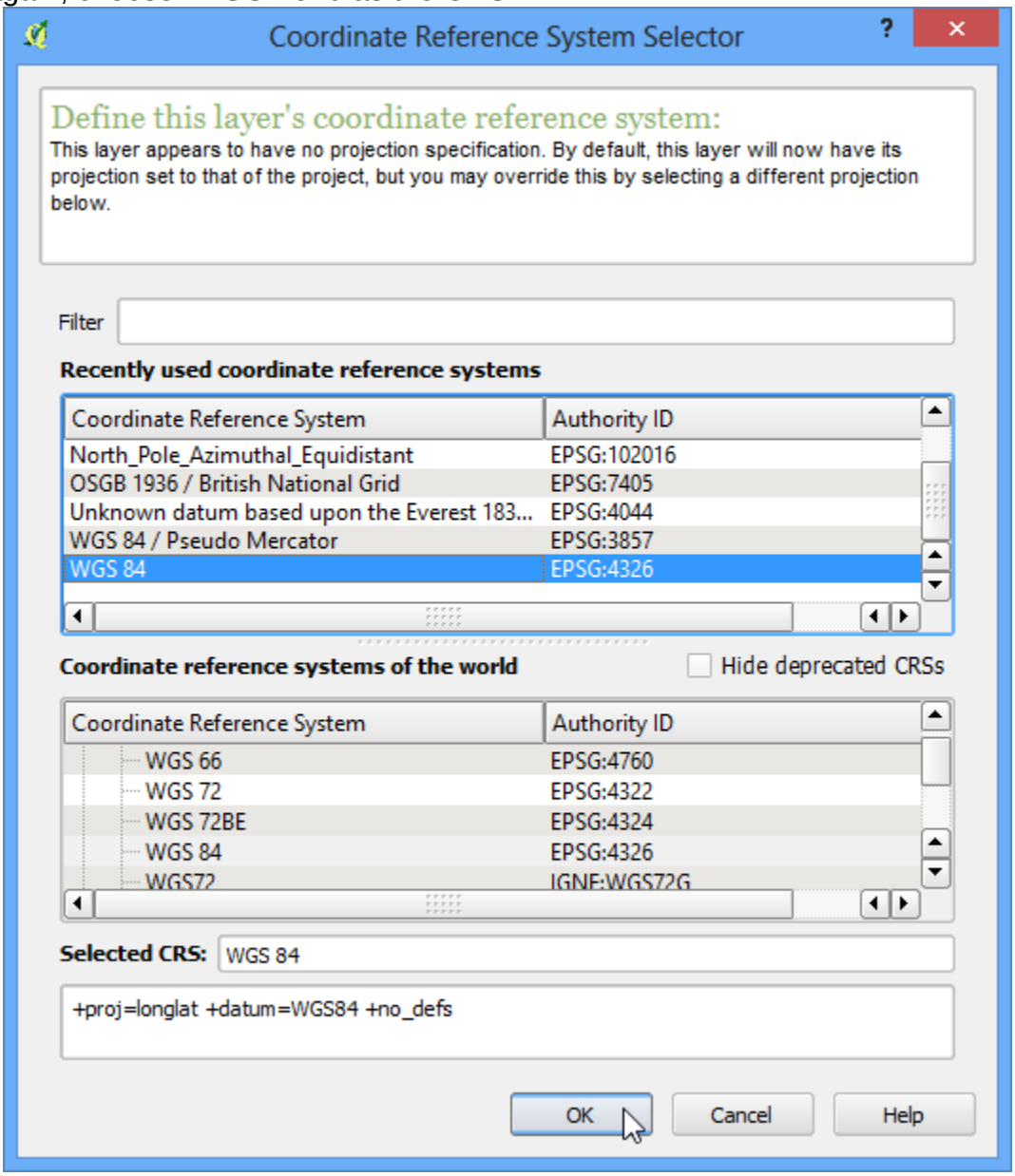
5. The layer doesn't have a CRS defined, and since the grids are in lat/long, choose *EPSG:4326* as the coordinate reference system.



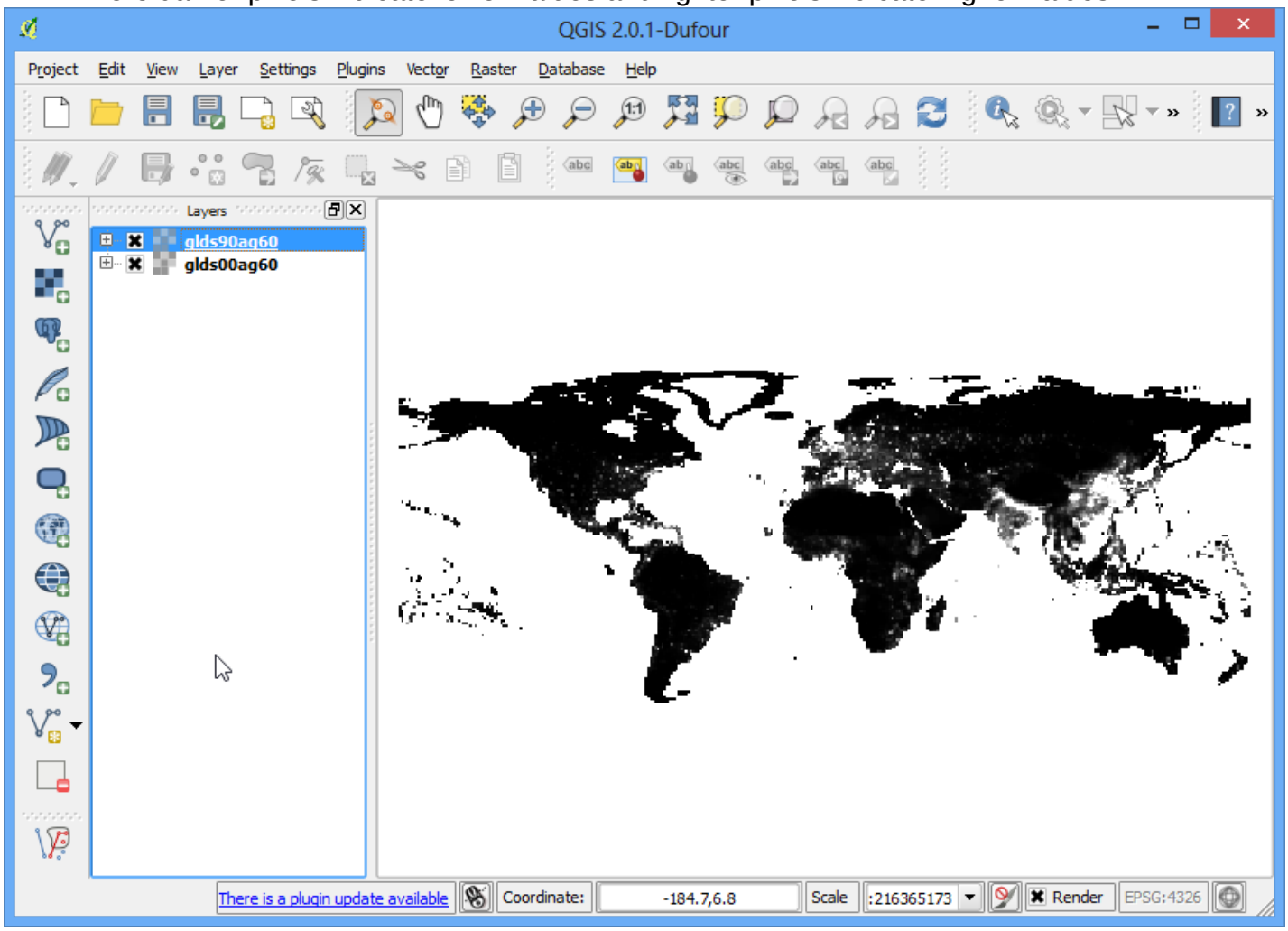
6. Since we selected both the zip files, you will see similar dialogs once again. Repeat the process and select `glds90ag60.asc` grid as the layer to add.



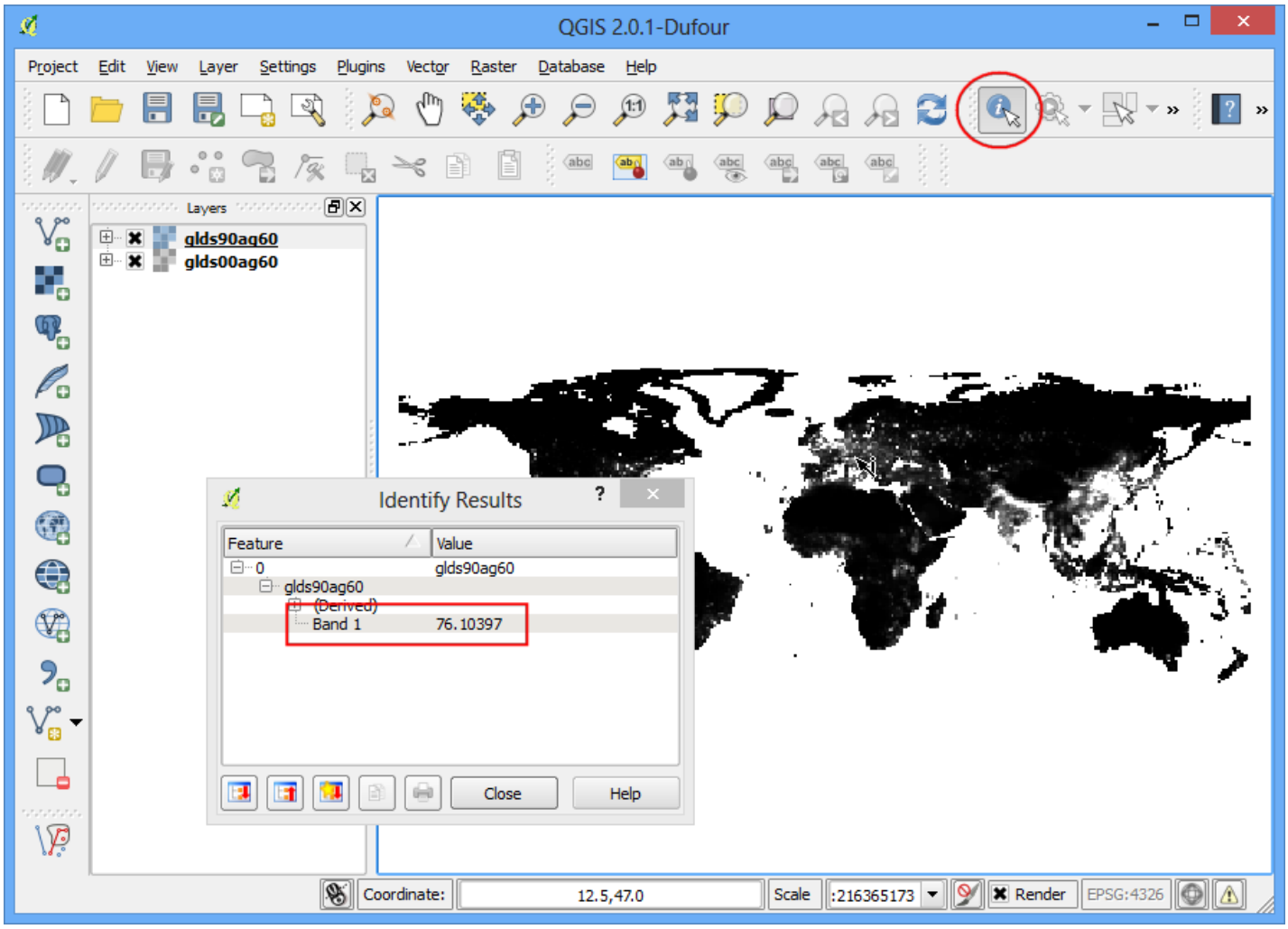
7. Once again, choose *EPSG:4326* as the CRS.



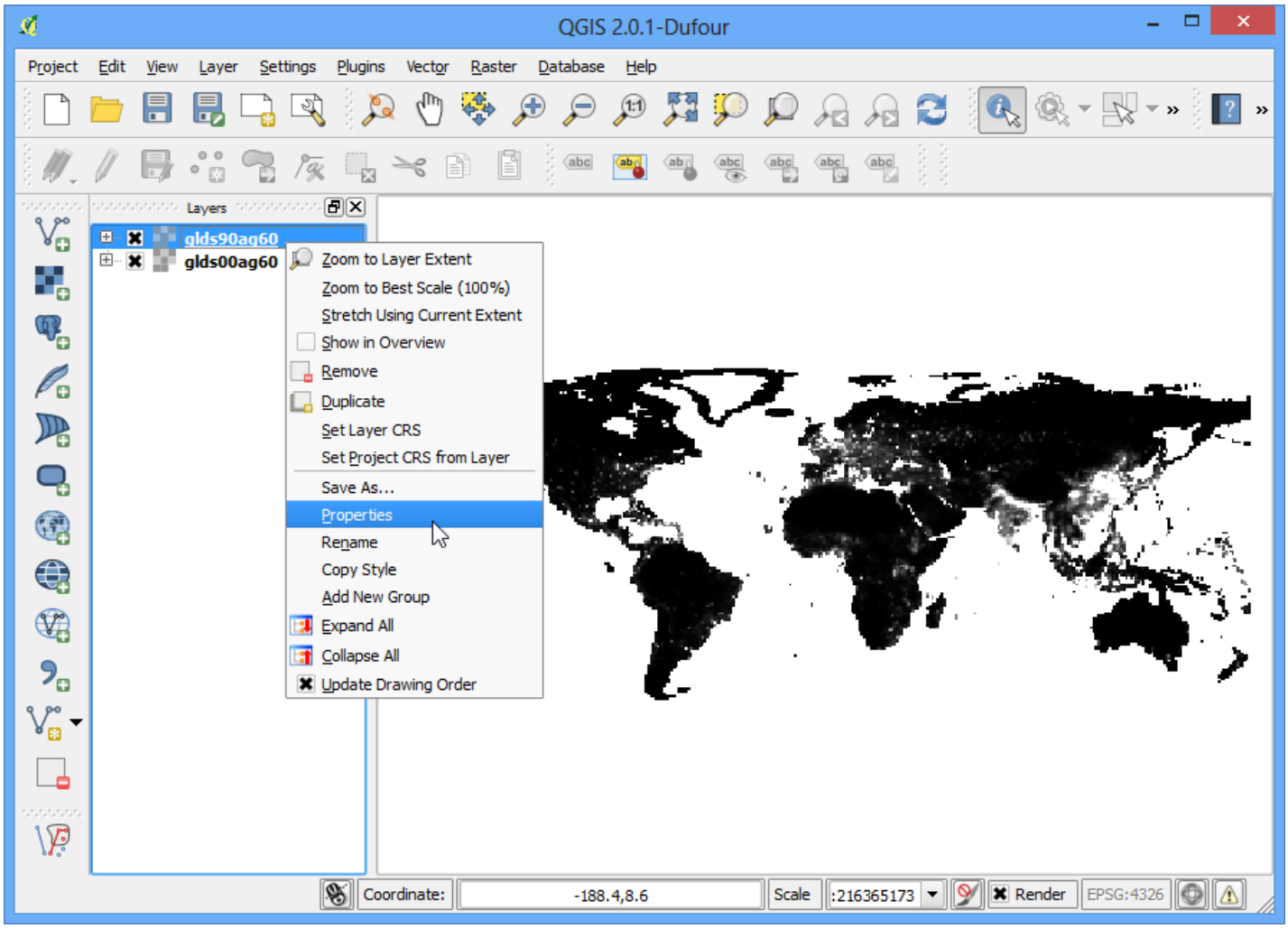
8. Now you will see both the rasters loaded in QGIS. The raster is rendered as in grayscale, where darker pixels indicate lower values and lighter pixels indicate higher values.



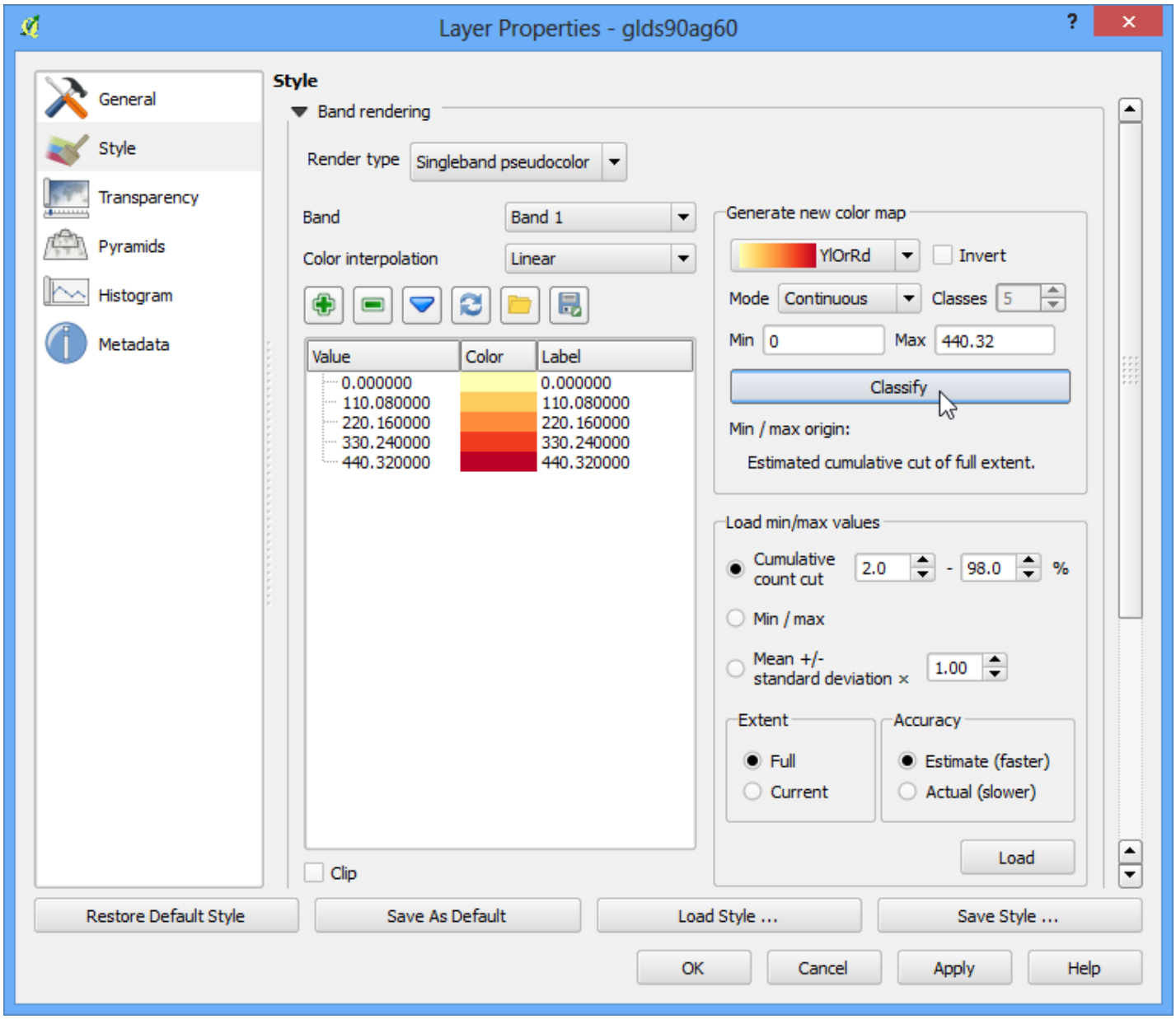
9. Each pixel in the raster has a value assigned. This value is the population density for that grid. Click on *Identify Features* button to select the tool and click anywhere on the raster to see the value of that pixel.



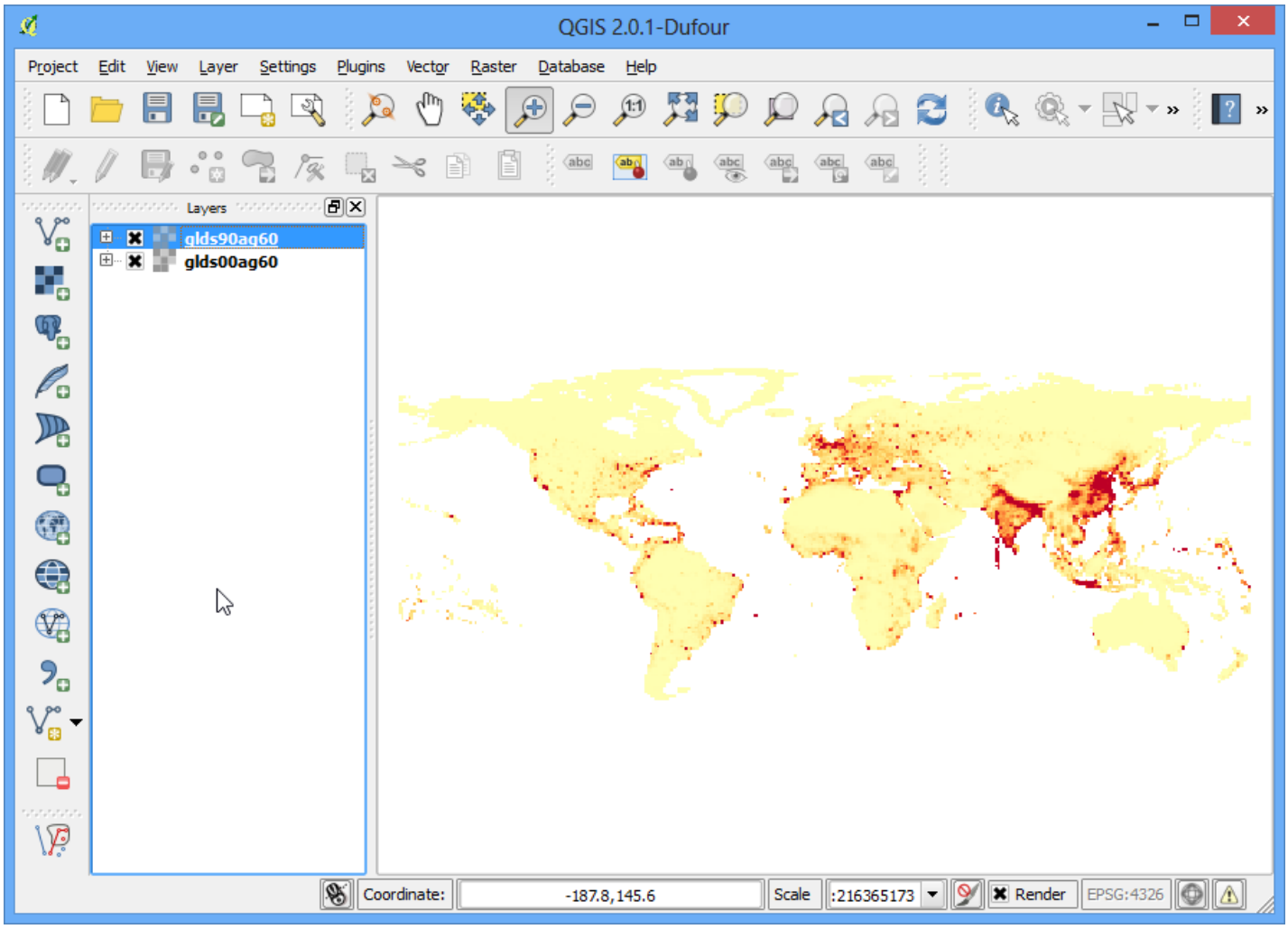
10. To better visualize the pattern of population density, we would need to style it. Right-click on the layer name and select *Properties*. You can also double-click on the layer name in the TOC to bring up the Layer Properties dialog.



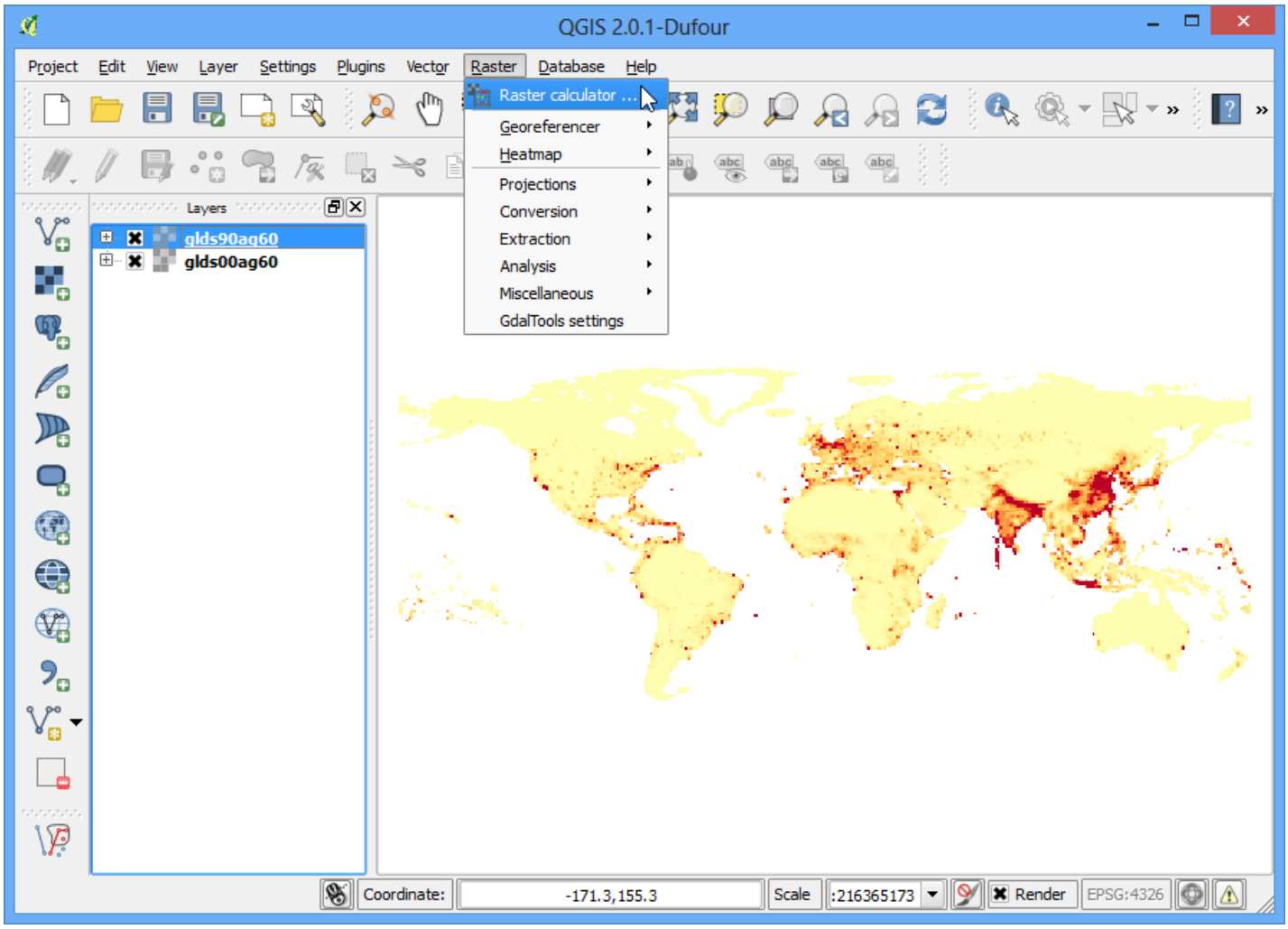
11. Under the *Style* tab, change the *Render type* to *Singleband pseudocolor*. Next, click *Classify* under *Generate a new color map*. You will see 5 new color values created. Click *OK*.



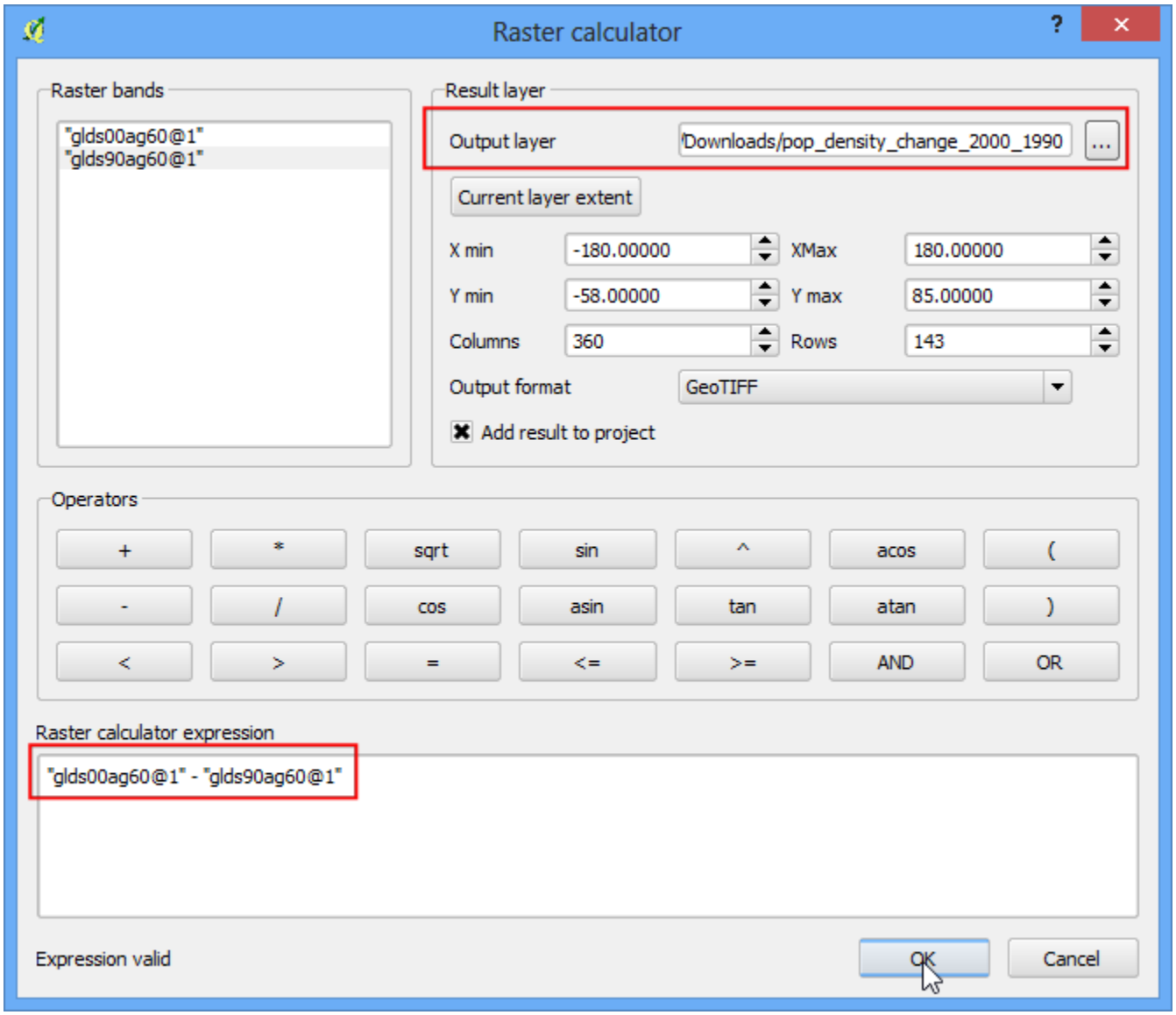
12. Back in the QGIS Canvas, you will see a heatmap-like rendering of the raster. Repeat the same process for the other raster as well.



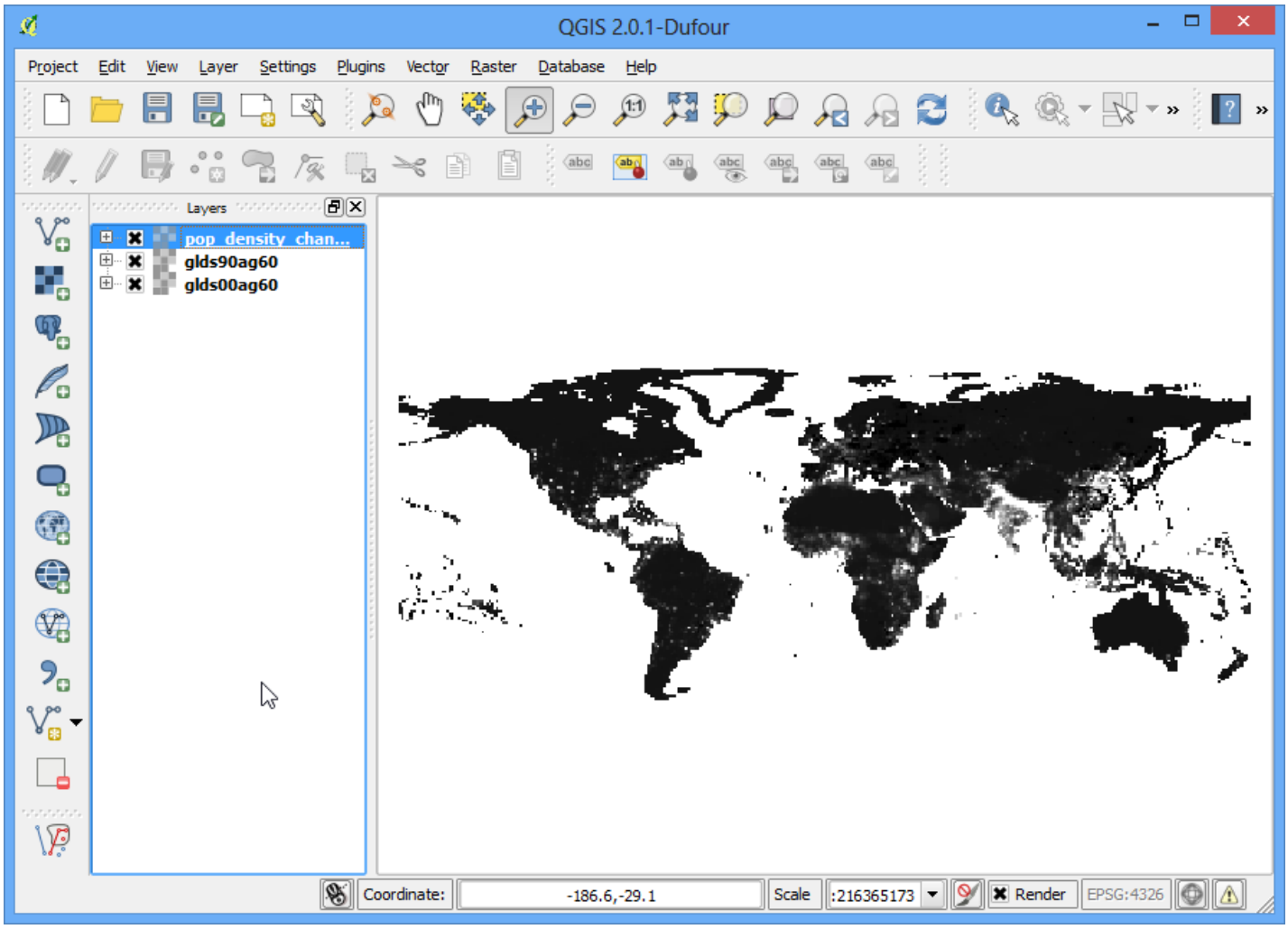
13. For our analysis, we would like to find areas with largest population change between 1990 and 2000. The way to accomplish this is by finding the difference between each grid's pixel value in both the layers. Select *Raster* ■ *Raster calculator*.



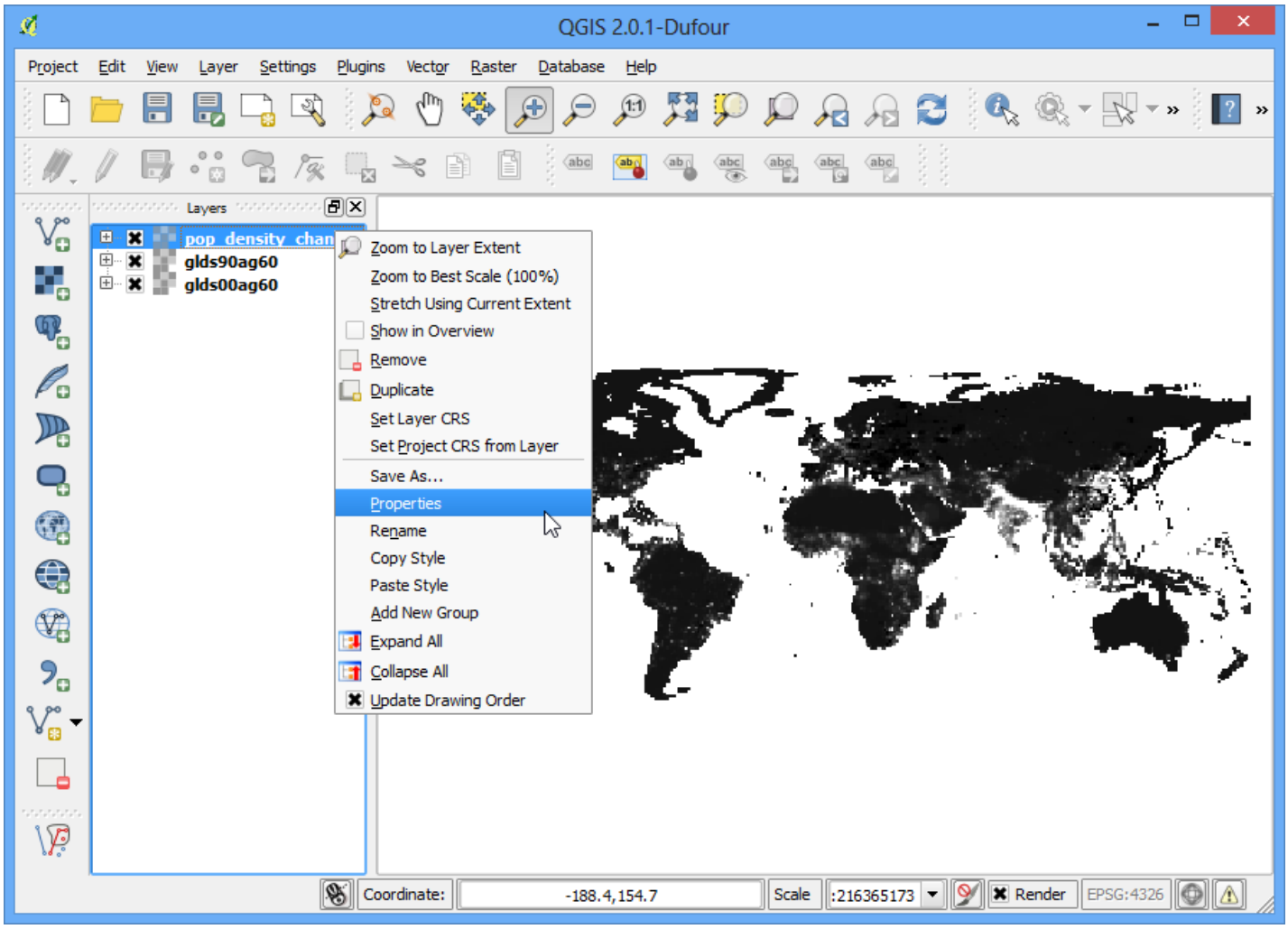
14. In the *Raster bands* section, you can select the layer by double-clicking on them. The bands are named after the raster name followed by @ and band number. Since each of our rasters have only 1 band, you will see only 1 entry per raster. The raster calculator can apply mathematical operations on the raster pixels. In this case we want to enter a simple formula to subtract the 1990 population density from 2000. Enter `glds00ag60@1 - glds90ag60@1` as the formula. Name your output layer as *pop_density_change_2000_1990.tif* and check the box next to *Add result to project*. Click *OK*.



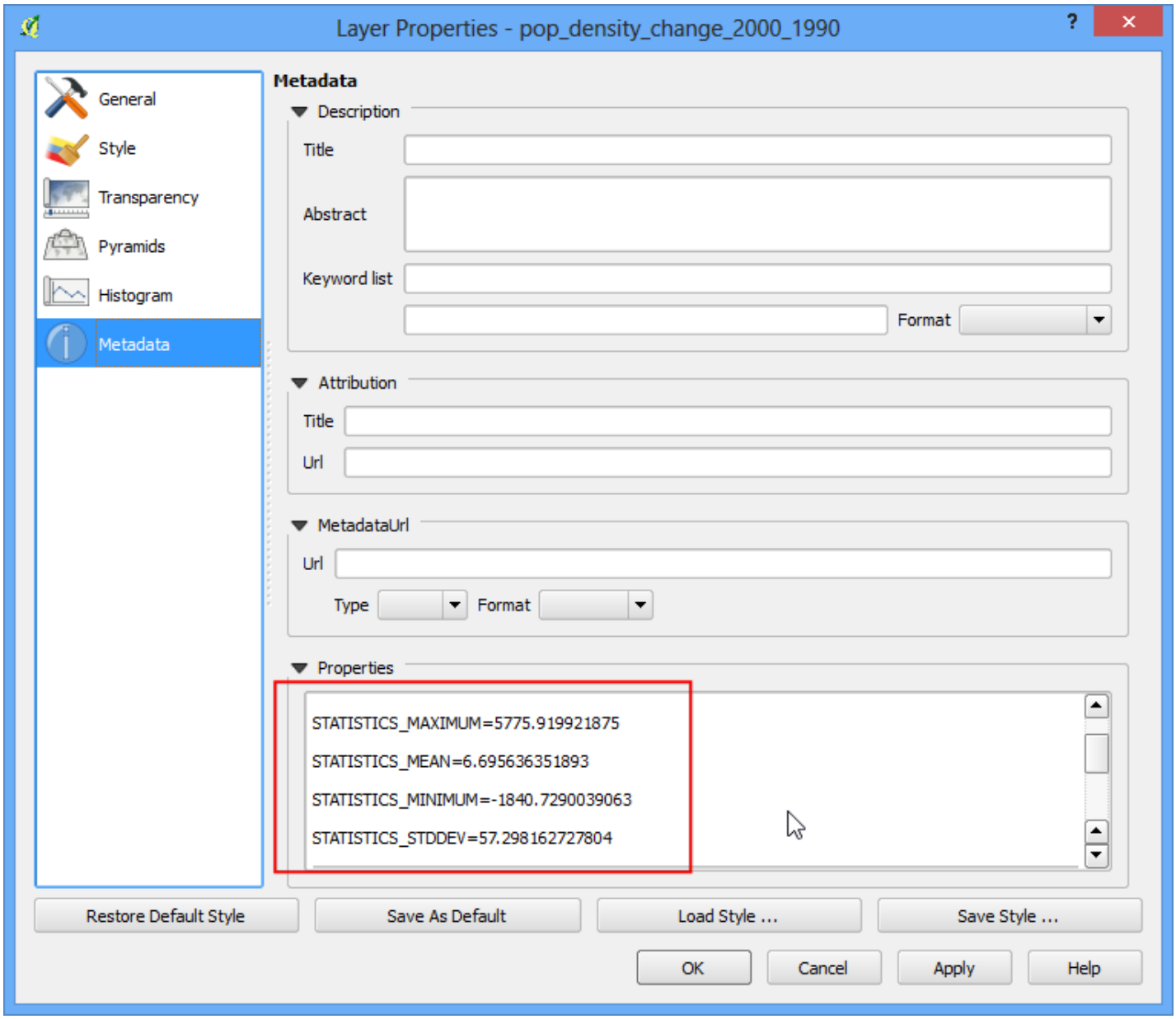
15. Once the operation is complete, you will see the new layer load in QGIS.



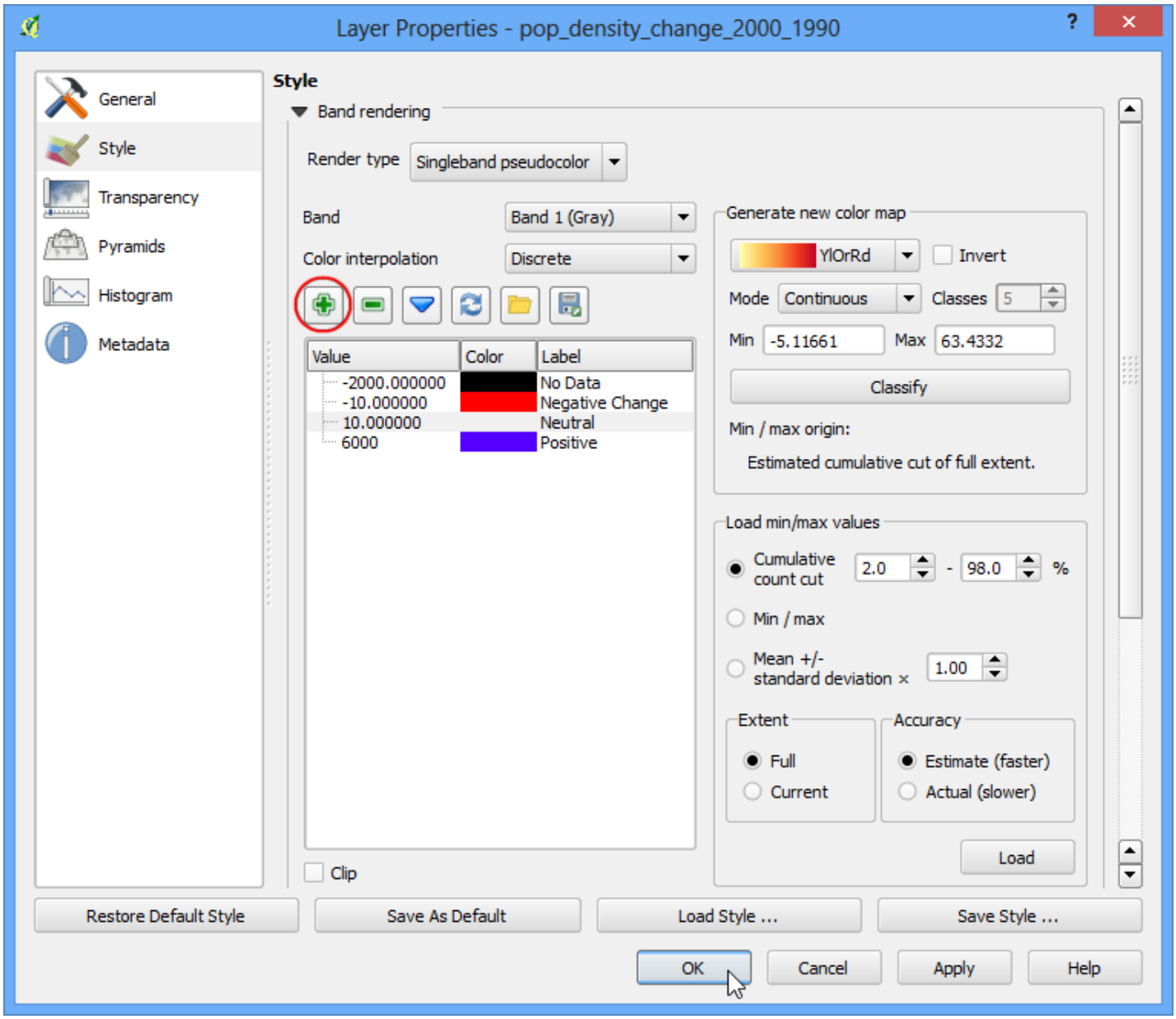
16. This grayscale visualization is useful, but we can create a much more informative output. Right-click on the `pop_density_change_2000_1990` layer and select *Properties*.



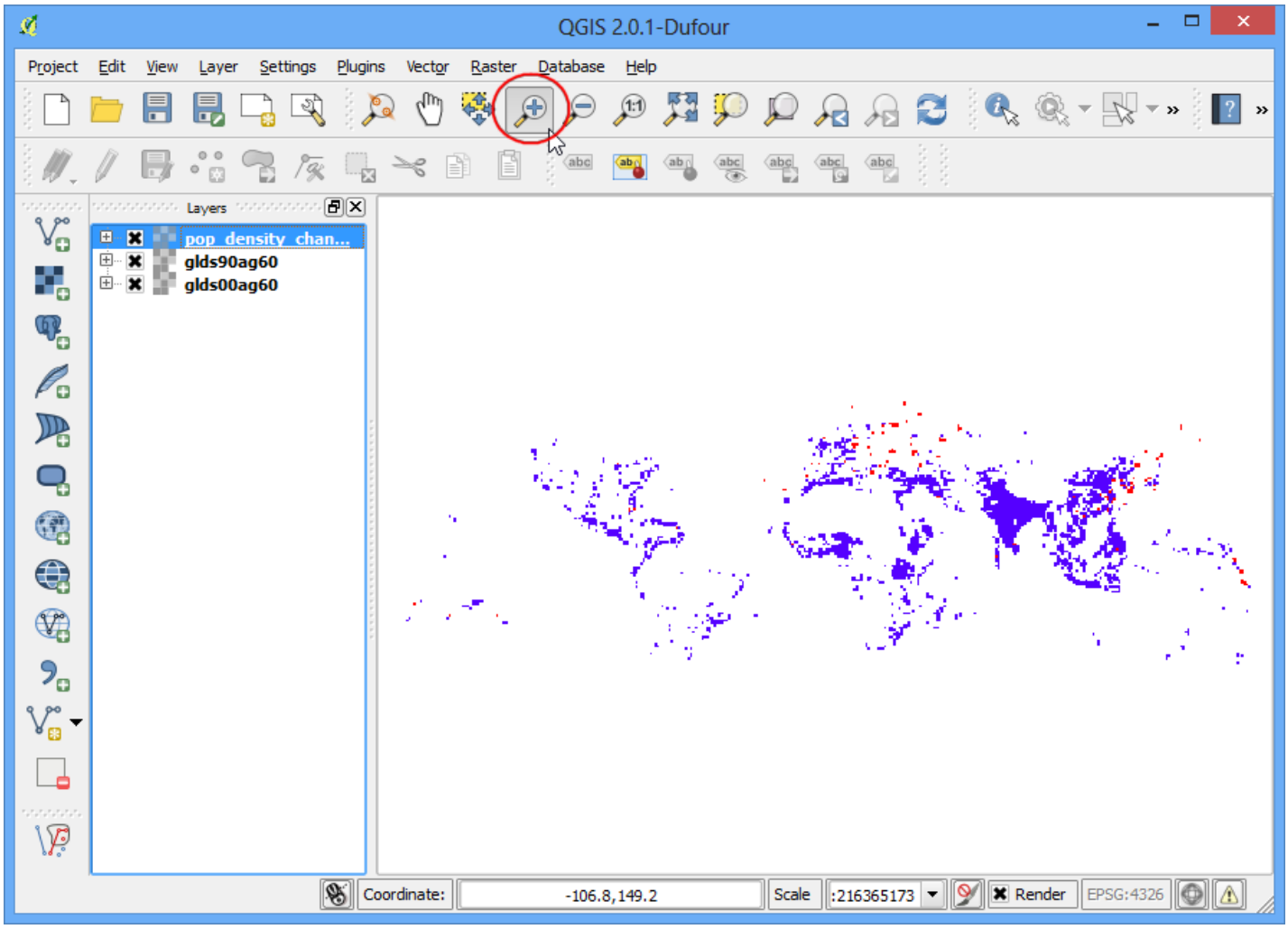
17. We want to style the layer so pixel values in certain ranges get the same color. Before we dive in to that, go to the *Metadata* tab and look at the properties of the raster. Note the minimum and maximum values of this layer.



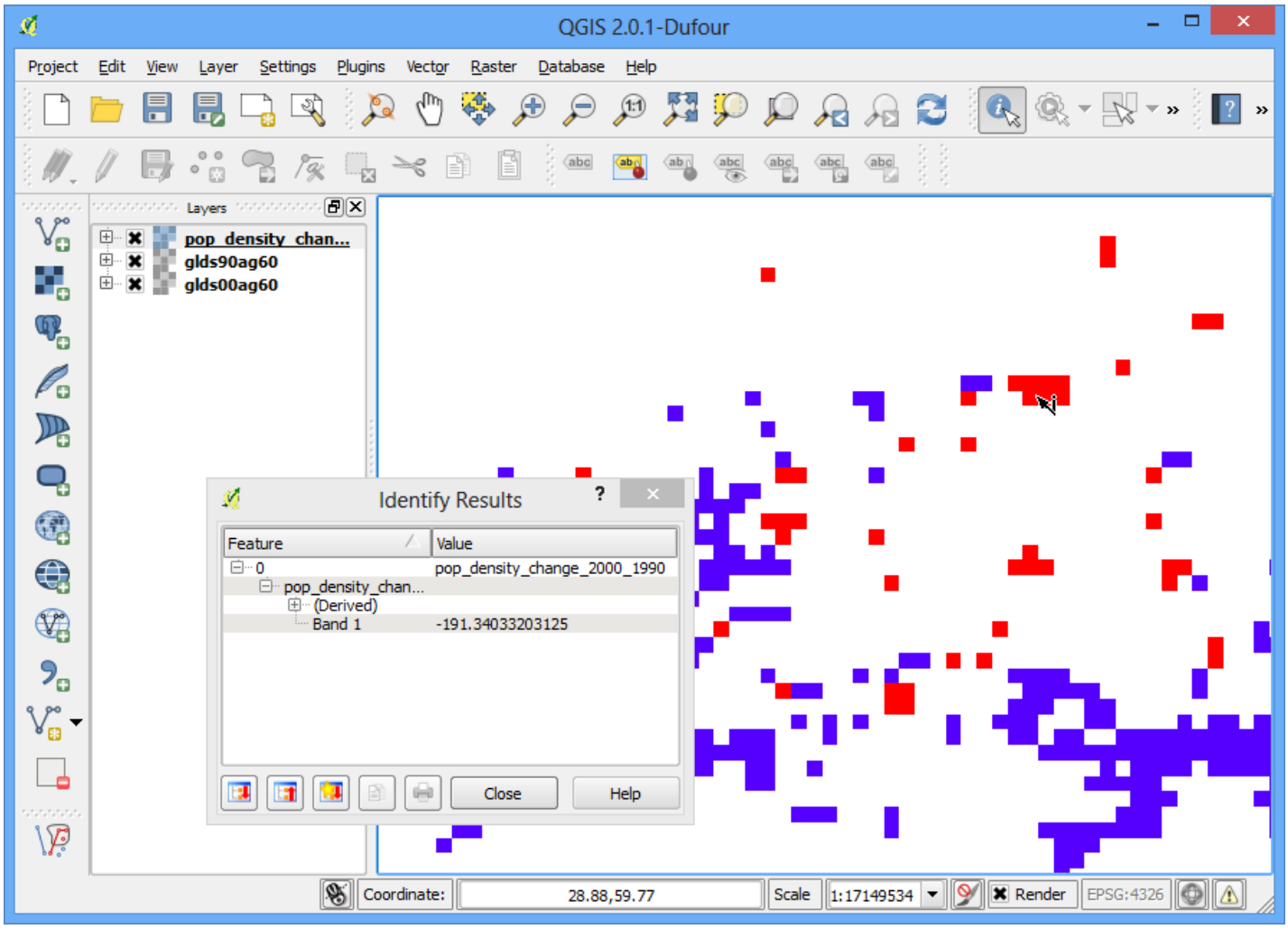
18. Now go to the *Style* tab. Select *Singleband pseudocolor* as the *Render type* under *Band Rendering*. Set the *Color interpolation* to *Discrete*. Click the *Add entry* button 4 times to create 4 unique classes. Click on an entry to change the values. The way color map works is that all values lower than the value entered will be given the color of that entry. Since the minmum value in our raster is just above -2000, we choose -2000 as the first entry. This will be for the No Data values. Enter the values and Labels for other entries as below and click *OK*.



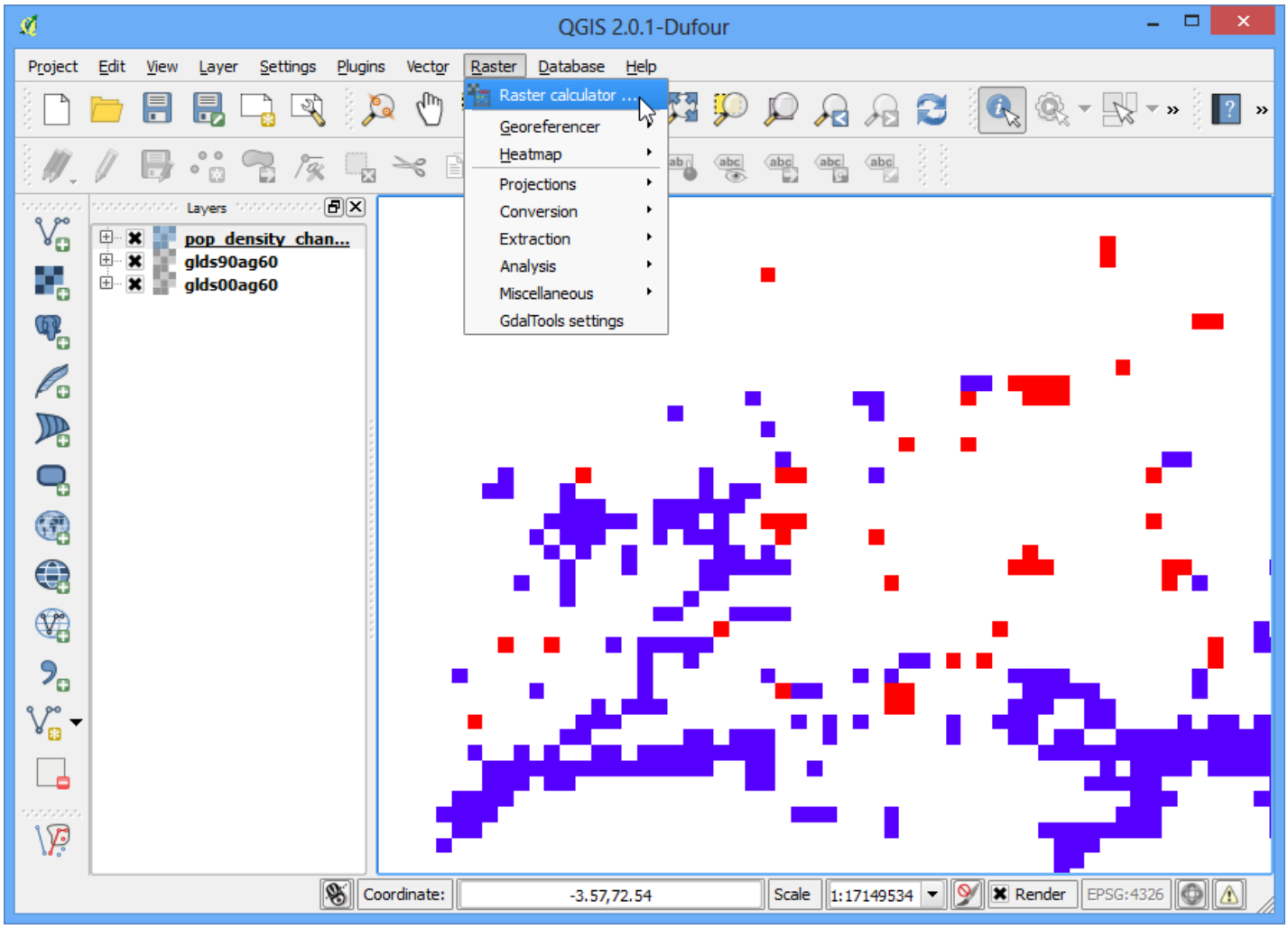
19. Now you will see a much more powerful visualization where you can see areas which has seen positive and negative population density changes. Click on *Zoom In* button and draw a rectangle around Europe to explore the region in more detail.



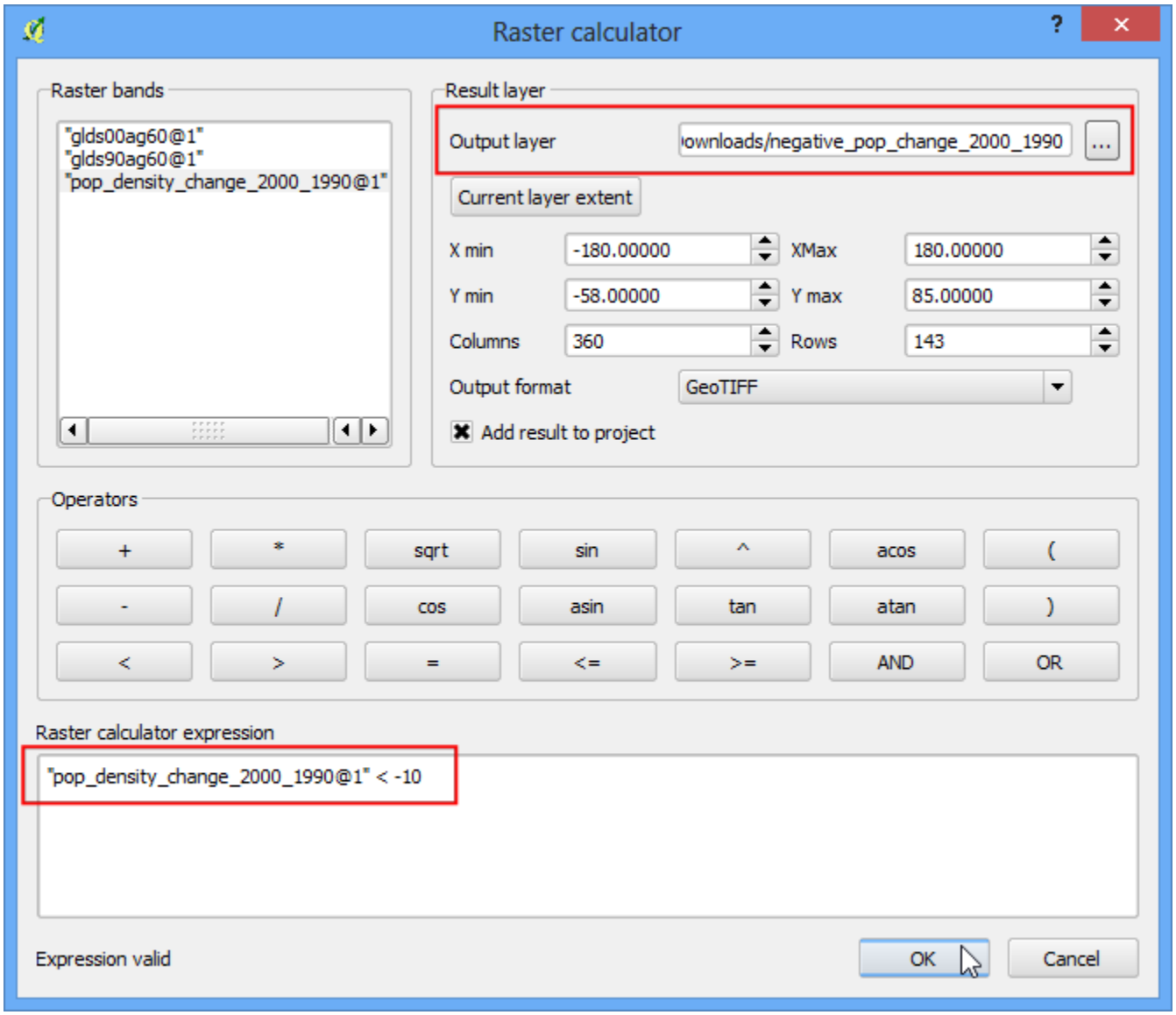
20. Select the *Identify* tool and click on the Red and Blue regions to verify that your styling rules worked as intended.



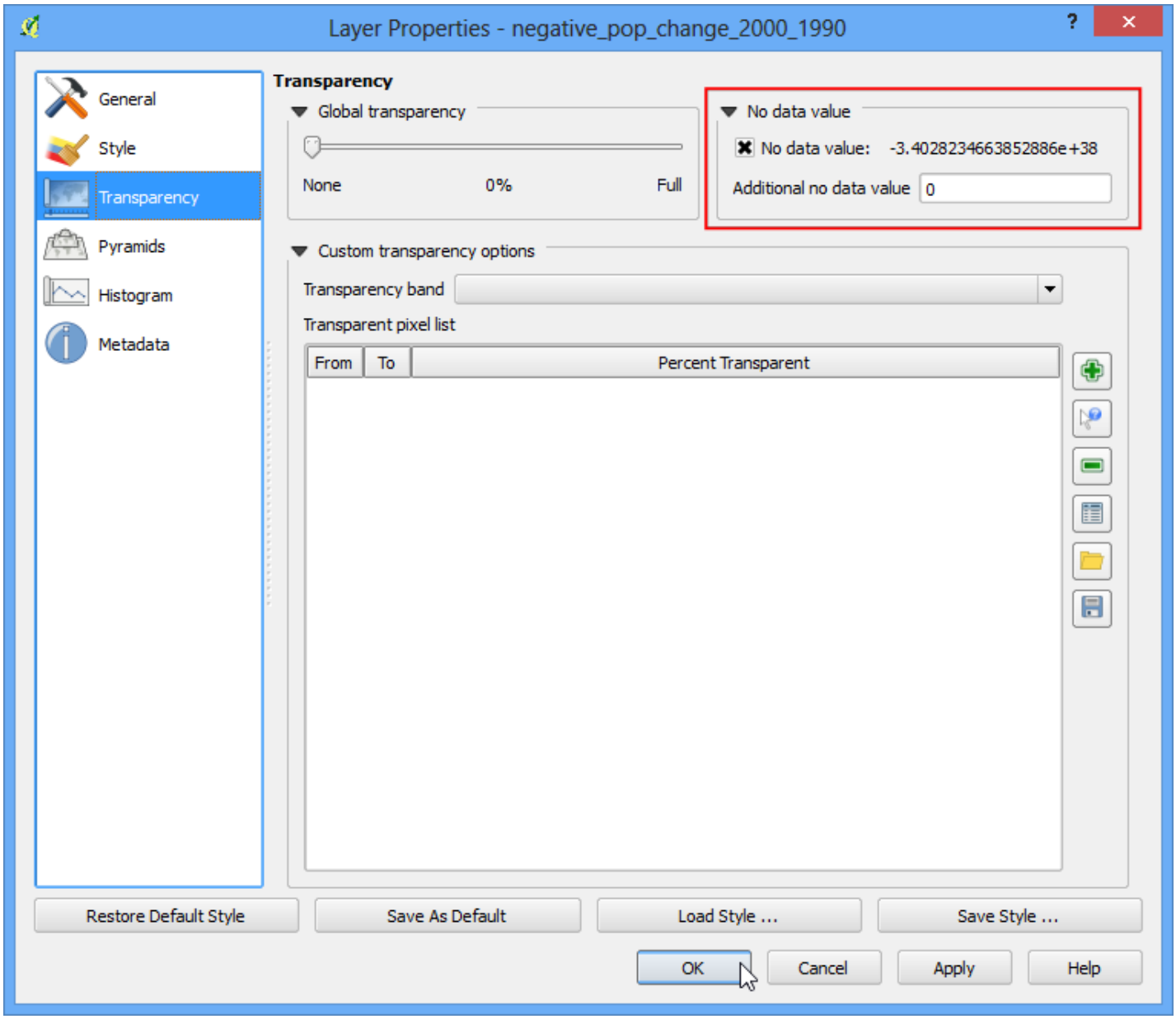
21. Now let's take this analysis one-step further and find areas with only *negative* population density change. Open *Raster* ■ *Raster calculator*.



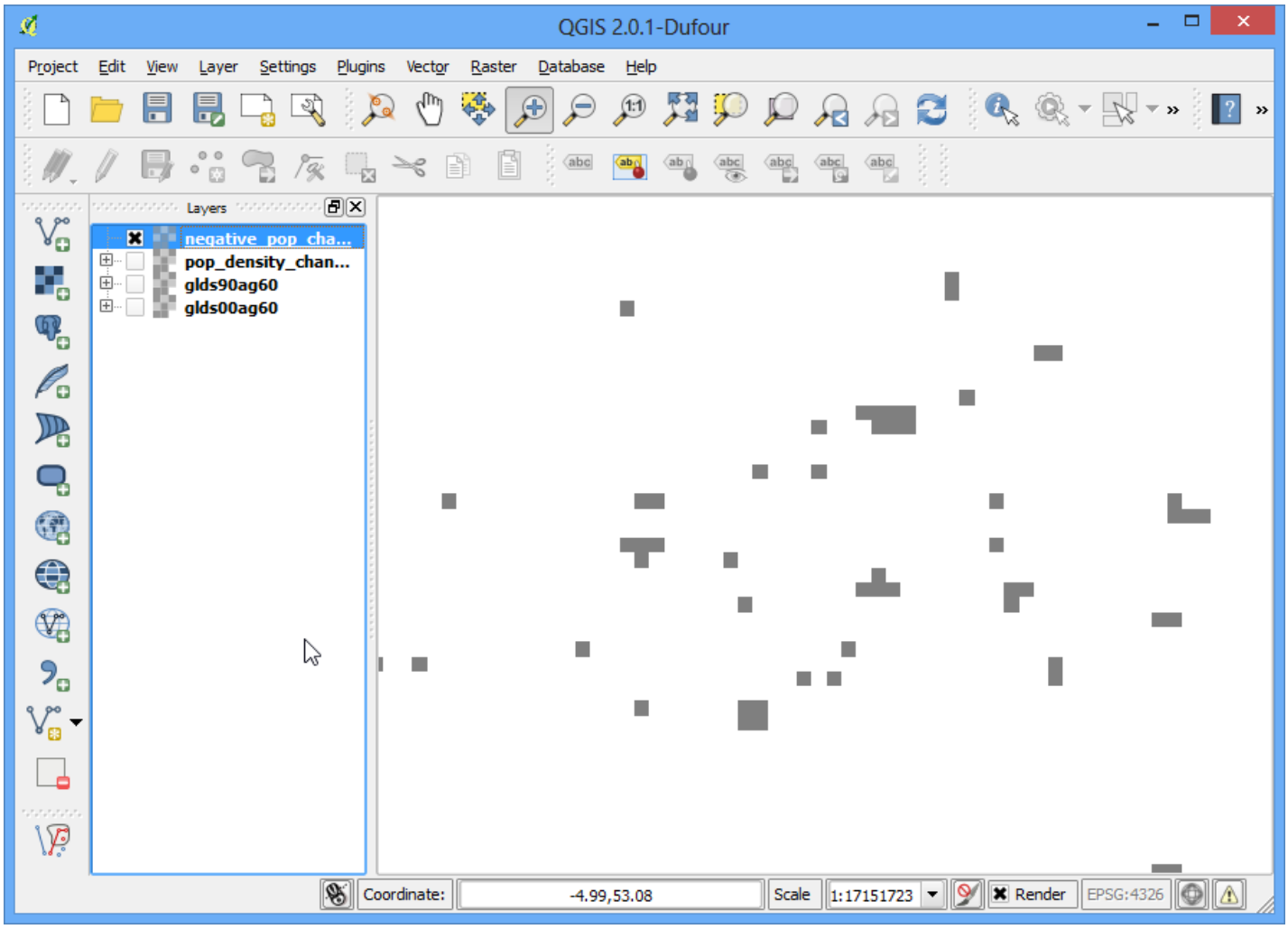
22. Enter the expression `pop_density_change_2000_1990@1 < -10`. What this expression will do is set the value of the pixel to 1 is if matches the expression and 0 if it doesn't. So we will get a raster with pixel value of 1 where there was negative change and 0 where there wasn't. Name the output layer as `negative_pop_change_2000_1990` and check the box next to *Add result to project*. Click OK.



23. Once the new layer is loaded, right-click on it and select *Properties*. In the *Transparency* tab, add 0 as the *Additional no data value*. This setting will make the pixels with 0 values also transparent. Click *OK*.



24. Now you will see the areas of negative population density change as gray pixels.


QGIS 2.0.1-Dufour
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