QGIS MAP DESIGN

Anita Graser & Gretchen N. Peterson
QGIS Map Design

Anita Graser
Gretchen N. Peterson
Credits & Copyright

QGIS Map Design

by Anita Graser and Gretchen N. Peterson

Published by Locate Press LLC

Copyright © 2016 Locate Press LLC
ISBN: 978-0989421751
All rights reserved.

Direct permission requests to info@locatepress.com or mail:
Locate Press LLC, PO Box 671897, Chugiak, AK, USA, 99567-1897

Editor Gary Sherman
Cover Design Julie Springer
Interior Design Based on Memoir-L\LaTeX document class
Publisher Website http://locatepress.com
Book Website http://locatepress.com/qmd

No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage or retrieval system, without the prior written permission of the copyright owner and the publisher.
Contents

Contents  5
Foreword  7
1 Layer Styling  9
1 Mapping Economies Using GDP Choropleths or Scaled Symbols  11
1.1 Introduction to Classed Choropleth Maps  11
1.2 Exploring the Dataset  11
1.3 Setting Up a Classed Choropleth Map  12
1.4 Scaled Circle Symbols  13
Foreword

QGIS has come a long way in its fourteen years of life. From humble beginnings as a mere data viewer, it now provides a vast array of GIS functionality, tool integration, extensible plugins, and—cartographic capability.

Slighted in years past for its inability to make a "pretty" map, QGIS now boasts a hefty complement of features that move it to the forefront. In this book, Anita and Gretchen have put together an impressive set of recipes that will help you not only learn new techniques, but really bump up the quality of your maps.

The recipes in the book are tailored for use with the QGIS Long Term Release (LTR), version 2.14. You’ll also need a basic familiarity with QGIS, as the authors jump right in to the cartographic waters.

I know you’ll learn a lot from the techniques presented within, and be able to adapt and evolve them to get the most out of your mapping projects.

I hope you enjoy the book!

Gary Sherman

Founder of QGIS / Publisher at Locate Press LLC
Part 1

Layer Styling
1. Mapping Economies Using GDP Choropleths or Scaled Symbols

In this recipe, we create a classed choropleth map illustrating the per capita gross domestic product (GDP) of the countries of the world.

1.1 Introduction to Classed Choropleth Maps

Choropleths are a type of thematic map in which areas are shaded or patterned in proportion to a numerical attribute representing a rate or ratio, such as population density or per capita income. Never use choropleths for raw data or counts, such as country population or total GDP. Converting raw data and counts to rates, such as population per area unit or GDP per capita, is necessary, otherwise, all your map would show is that, on average, bigger countries have more inhabitants and a higher GPD than smaller countries.

A general rule of thumb is to stick to three to seven classes for classed choropleth maps. In this recipe, we use five classes to categorize the countries.

1.2 Exploring the Dataset

For this map, we load the:
ne_10m_admin_0_countries.shp

shapefile into QGIS.

This dataset contains data about country GDP (attribute GDP_MD_EST in million US Dollars) and population (attribute POP_EST). As shown in Figure 1.1, GDP_MD_EST ranges from -99 (unknown value) to 15094000 for the USA and similarly POP_EST ranges from -99 (unknown value) to 1338612968 for China. For our choropleth map, we use these two attributes to compute the GDP per capita:

\[
\text{GDP\_MD\_EST} / \text{POP\_EST} \times 1000000
\]

Figure 1.1: GDP and population values

To create our choropleth map, we need to deal with the -99 (unknown) values. Additionally, we need to deal with outliers in our data with extraordinarily high GDP per capita, such as, the Vatican and Antarctica. A great way to visualize the distribution of values is the Histogram feature built into the Graduated renderer interface shown in Figure 1.2 on the next page.
1.3 Setting Up a Classed Choropleth Map

The outliers in our data throw off the automatic classification algorithms, such as Natural Breaks, which is often recommended for choropleth maps. Instead of relying on the automatic classification, we therefore define the classes manually. This gives us much more control over how things are classified. Since we also need to deal with the -99 (unknown) values, we create a Rule-based renderer instead of a simple Graduated renderer.

To draw the countries with unknown GDP per capita in gray, we create a no data rule. Press the green Add rule button below the rule list to create a new rule and enter the following expression in the rule filter:

\[ \text{NOT (GDP\_MD\_EST > 0 AND POP\_EST > 0)} \]

Once the no data rule is set up, all other countries will fit the data rule, which is defined using the expression:

\[ \text{GDP\_MD\_EST > 0 AND POP\_EST > 0} \]

We then divide the countries into five classes: under 1000, 5000, 10000, 20000 and, over 20000 Dollars. To create these classes, we can use the Refine current rule | Add ranges to rule functionality in the rule’s context menu shown in Figure 1.3.

This opens a Refine a rule to ranges dialog (as shown in Figure 1.4, on the next page) where we can create classes with the same user interface we already know from the Graduated renderer. Use the expression that calculates the GDP per capita and press Classify. Afterwards, just edit the class bounds and colors.
CHAPTER 1. MAPPING ECONOMIES USING GDP CHOROPLETHS OR SCALED SYMBOLS

1.4 Scaled Circle Symbols

Using circle symbols, we visually relate the GDP per capita to the affected population instead of the affected area. This map design combines a clean global countries map in a uniform color with colorful circles, which are created using the Diagrams functionality in the Layer Properties. We use the same five-entry classification as in the classed choropleth map in order to keep the resulting maps comparable.

First, make sure the Diagram type is set to Pie chart. Then, we configure the diagram size. To scale the diagram size according to the affected population, we use the Scaled size option configured to the POP_EST attribute, as shown in Figure 1.7 on the following page.

Next, we want to make sure that all country diagrams are shown. To do this, activate the...
1.4. SCALED CIRCLE SYMBOLS

Figure 1.5: Complete set of rules for the choropleth map

Figure 1.6: Final choropleth map

Figure 1.7: Diagram size scales with population
Show all diagrams option in the Appearance section. In addition, we set the Placement to Over Centroid (as shown in Figure 1.8) to ensure that diagrams are placed at a location that is easy to associate with the corresponding country.

![Diagram type Pie chart](image)

**Figure 1.8:** Place the diagrams on the country centroids

So far, these settings place an empty circle diagram (black outline only) into each country feature. In order to control the diagram fill color, we use the rule expressions we created for the choropleth map in the first part of this recipe. To add these expressions to the pie chart settings, as shown in Figure 1.9 on the following page, press the Add expression button. This opens the expression builder dialog where we can enter our expressions, such as:

\[
\frac{\text{GDP MD EST}}{\text{POP EST}} \times 1000000 > 20000
\]

for the highest GDP per capita class. To finish the configuration, we need to add the expressions, adjust the colors and customize the legend labels.

Once all five expressions are added, the diagrams will be filled with our class colors as shown in Figure 1.10 on the next page. The diagram placement algorithm makes sure that smaller diagrams are drawn on top of larger diagrams.

To finish the style, change the diagram Line color to white and set the Transparency to 20% to make underlying country features shine through. The country features themselves are styled with a simple Single Symbol renderer in a neutral color.

This way of representing GDP per capita provides a much clearer perspective on the global economic situation and the affected population than the default choropleth map could provide.

This recipe uses diagrams rather than a centroid fill because currently the centroid fill renderer puts a centroid marker into each part of the multipart polygon.

The country color on this map is #486373.
1.4. SCALED CIRCLE SYMBOLS

Figure 1.9: Diagram color depends on GDP per capita

Figure 1.10: Final map with scaled circle symbols
Books from Locate Press

*The PyQGIS Programmer’s Guide* - Extending QGIS just got easier! This book is your fast track to getting started with PyQGIS. After a brief introduction to Python, you’ll learn how to understand the QGIS Application Programmer Interface (API), write scripts, and build a plugin. The book is designed to allow you to work through the examples as you go along. At the end of each chapter you’ll find a set of exercises you can do to enhance your learning experience. The PyQGIS Programmer’s Guide is compatible with the version 2.0 API released with QGIS 2.x. All code samples and data are freely available from the book’s website. Get started learning PyQGIS today!

*Geospatial Power Tools* - Everyone loves power tools. The GDAL and OGR utilities are the power tools of the GIS world, and best of all, they’re free. The utilities include tools for examining, converting, transforming, building and analysing data. This book is a collection of the GDAL and OGR documentation, but also includes substantial new content designed to help guide you in using the utilities to solve your current data problems. Inside you’ll find a quick reference for looking up the right syntax and example usage quickly. The book is divided into three parts: *Workflows and examples*, *GDAL raster utilities*, and *OGR vector utilities*. Once you get a taste of the power the GDAL/OGR suite provides, you’ll wonder how you ever got along without them. This book will get you on the fast track to becoming more efficient in your GIS data processing efforts.
Books from Locate Press

*The Geospatial Desktop* provides a foundational level of knowledge for understanding GIS and the open source desktop mapping applications that are available for use, for free, today. Learn about vector and raster data, how to convert data, interacting with spatial databases, creating new map data, geoprocessing, scripting, and more. Special sections include focused learning on the Quantum GIS and GRASS GIS software platforms as well as an introduction to other packages. The Geospatial Desktop is written by the founder of the Quantum GIS project, so you can rest assured that you will be led by one of the most knowledgeable authors on the subject.

*The Quantum GIS Training Manual* - Get the jump-start you need to learn this incredibly popular free desktop mapping and GIS toolset. Comprehensive and structured, your introduction begins with a quick download of example data, making it easy for you to work your way through the concepts and practical exercises, complete with answers and examples. Ideal for classroom instruction and self-guided learning, included are all the materials needed to run a five day course on Quantum GIS, PostgreSQL and PostGIS. Content is structured for novice, intermediate and advanced users alike. Seasoned Quantum GIS users will also find tips and new techniques to apply to every mapping project. Windows, Mac OS X, or Linux? It’s your choice, this book works for all.

**Works with QGIS 1.8**

Be sure to visit http://locatepress.com for information on new and upcoming titles.