Editing the Legend and Changing Colors by Mapping an Oil Boom

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Introduction

This online activity demonstrates how simple it is to use key tools in GeoFRED® to focus on regional economic growth and development. The activity examines U.S. unemployment data at the county level to explore how employment was affected by the energy boom around the time of the Great Recession.

Beginning in late 2007, following a worsening global financial crisis, the Great Recession lasted until mid-2009 when U.S. real GDP resumed its upward growth path. During that 1½-year period, the number of Americans unable to find work spiked, driving the unemployment rate to the highest levels in a generation. In the face of such a broad economic downturn, many workers broadened their job searches, looking elsewhere for signs of an economy with jobs instead of layoffs.

While most of the country's economy was contracting, one area in particular experienced a remarkable expansion: the oil and gas fields and adjoining counties of the Upper Great Plains, North Dakota and Montana in particular. This activity illustrates the contours of an ongoing and distinct regional economic expansion.

Excellent background on this regional economic boom can be gleaned from the following North Dakota-focused article from the July 2010 Federal Reserve Bank of Minneapolis _fedgazette_: http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=4495.

Using FRED® Dashboard Links with GeoFRED®

A FRED® dashboard is a single webpage of related widgets—graphs, data, lists, and/or notes—that correspond to a specific activity, lesson, or are developed for individual or group use. GeoFRED® users with accounts can build and save personalized FRED® dashboards, which can be kept private or made public to share with others. To learn more about FRED® dashboards, see http://fredqa.stlouisfed.org/2014/03/17/new-on-fred-user-dashboards/.

This activity uses a FRED® dashboard link of the same name. The item numbers noted in this activity correspond to those in the dashboard.

Concepts

Boom

A period characterized by sustained increases in several economic indicators—for example, output, investment, and employment

Business cycle

The fluctuating levels of economic activity in an economy over a period of time measured from the beginning of one recession to the beginning of the next

Choropleth map

A map that uses shading, color, or symbols to convey a quantity or property for an area

Frequency

The interval between occurrences; in macroeconomics it is common for data to be released monthly, quarterly, semiannually, or annually

Frictional unemployment

Unemployment that results when people are new to the job market, including recent graduates, or people who are transitioning from one job to another

Labor force

The total number of workers, including both the employed and the unemployed

Natural rate of unemployment

The rate of unemployment that does not contain cyclical unemployment

Seasonally adjusted

Data adjusted mathematically to remove the dips and bumps that occur due to seasonal events, such as extra retail workers hired for the holidays

Structural unemployment

Long-term joblessness caused by a mismatch in the skills held by those looking for work and the skills demanded by those seeking workers

Unemployment

A condition where people at least 16 years old are without jobs and actively seeking work

Unemployment rate

The percentage of the labor force that is willing and able to work, does not currently have a job, and is actively looking for employment

Getting Started

1. If you haven't already, take a step-by-step tour of GeoFRED® at http://geofred.stlouisfed.org/tutorials/ and then continue as follows.

2. Navigate to the GeoFRED® website: http://geofred.stlouisfed.org/. Or, just search the internet for "GeoFRED®" and click on the appropriate link.

3. On the GeoFRED® website, click the "Get Started" button near the top of the page. GeoFRED® will open a labeled map of the world. The name of the data displayed (the default setting) will be shown in the bar across the top of the page.

Selecting the Region

1. This activity focuses on data for the United States. To change the region, click "Tools" (between the gear and arrow in the top-left corner of the screen). The "Choose Data" tab will open (with the other tabs shown below it). Under "Region Type" at the top, select "County." A map of the United States will appear, with Alaska to the upper left and Hawaii to the lower left.

   To re-center the map, left-click and hold the map. This turns your cursor into a hand symbol that allows you to drag the map and reposition it on the screen.

Getting the Data

1. Under the "Data" heading, click the box and type "Unemployment Rate" in the search bar that appears. Select "Unemployment Rate."

2. The default setting for this series, "Not Seasonally Adjusted, Monthly, Percent," will be shown. This activity will use the default setting.

   Under "Date," select "2009 October" from the drop-down menu. Your selections so far should look like Figure 1.
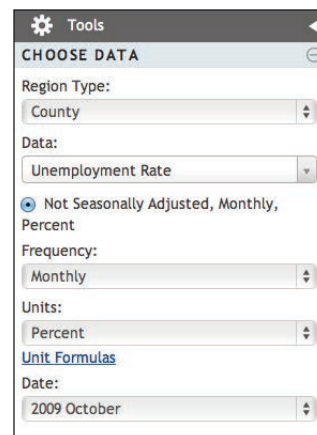
Figure 1

Checking for Accuracy

Did you make the correct selections for your GeoFRED® map? You should see a map of the U.S. counties in a range of colors. Check your maps legend: Does it match the values shown in Figure 2?
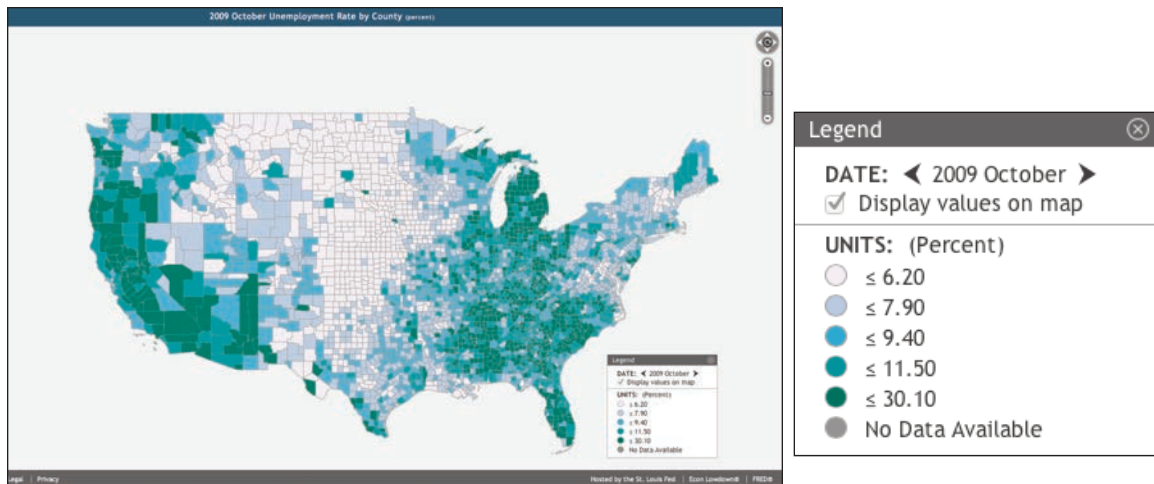
Figure 2

Changing the Legend

1. Click the "EDIT LEGEND" tab in the left-hand column. The menu shown allows you to adjust the settings of your map. You will see the following categories and default choices: "Number of Color Classes: (5)," "Interval Method (Fractile)," and "Define maximum interval values" followed by 5 color-coded values and the number of regions in each. (Figure 3)

2. The Number of Color Classes may be adjusted from 2 to 9. With two color classes, for example, the data are split in two, with roughly (or exactly) half of the values below a certain number and the remaining values at or above that same number. As you increase the number of color classes, the data separate into narrower intervals. For this activity, change the Number of Color Classes from 5 to 3 by clicking on the drop-down menu.
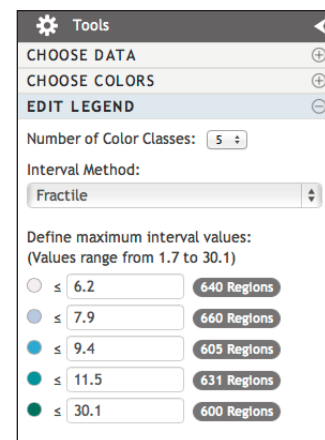
Figure 3

3. Open the following FRED® dashboard link and refer to the item numbers as noted: https://research.stlouisfed.org/dashboard/3364.

4. See *Dashboard Item 1: Real GDP During the Great Recession*. U.S. output during the Great Recession, measured by real gross domestic product (GDP; in billions of dollars), shrank by approximately 1/2 trillion dollars from December 2007 through June 2009.

5. See *Dashboard Item 2: Civilian Unemployment Rate During the Great Recession*. The civilian unemployment rate reached a high of 10.0 percent shortly after the end of the

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Great Recession. That double-digit monthly value occurred but once during this time period: in October 2009, when it was nearly double the natural rate of unemployment, which stood at 5.1 percent.

6. See *Dashboard Item 3: Natural Rate of Unemployment (Long Term) During the Great Recession*. Note that while the steep slope of the curve on the graph gives the appearance of a dramatic increase, the actual value increased very little, rising just 0.05 percent during the Great Recession.

7. See *Dashboard Item 4: Unemployment Rates During the Great Recession*, which plots the civilian unemployment rate and the natural rate of unemployment on the same graph. Relative to the increase in the civilian unemployment rate, the natural rate of unemployment moved little.

8. Referring again to the GeoFRED® map, you can map the regions (counties plus the District of Columbia [DC], hereafter all referred to as "counties") to reveal whether there were outlying pockets of unemployment significantly below the double-digit national average in October 2009. Our goal: Map the 5 percent of U.S. counties having the lowest unemployment rates at a time of peak national unemployment.

9. Accomplishing this goal is relatively easy in GeoFRED®. First, calculate the number of regions by totaling the number of regions noted in the classes (intervals), which in this case is 3,136. Now calculate 5 percent of 3,136, which is approximately 157. So, we are looking for the lowest unemployment rate that about 160 regions were at or below in October 2009.

10. The next step is to define the lowest class to include only the 160 or so regions with the lowest unemployment rates. This step relies to an extent on trial and error when deciding how to split the data values. First, change the "Interval Method" from "Fractile" to "User Defined." (For a lesson on choosing an appropriate interval method, see http://www.stlouisfed.org/education_resources/fractile-v-equal/.) Set the first value of the three user-defined rates to 4.0. This selection reveals that there were 209 regions at or below 4 percent unemployment in October 2009. Your selections so far should look like Figure 4.
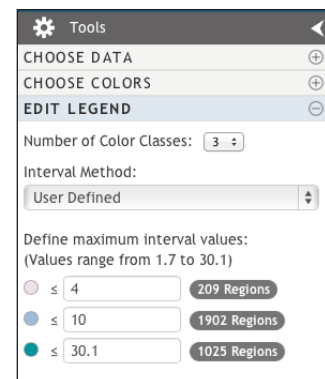

Figure 4

11. Since 209 regions is higher than our target, reduce the first value from 4.0 to 3.7. What is the result? Success! There are now just 159 regions in the lowest range. Do you see patterns in their locations? We'll get to the geographic significance of many of those low-unemployment counties soon. Your map should look like Figure 5.

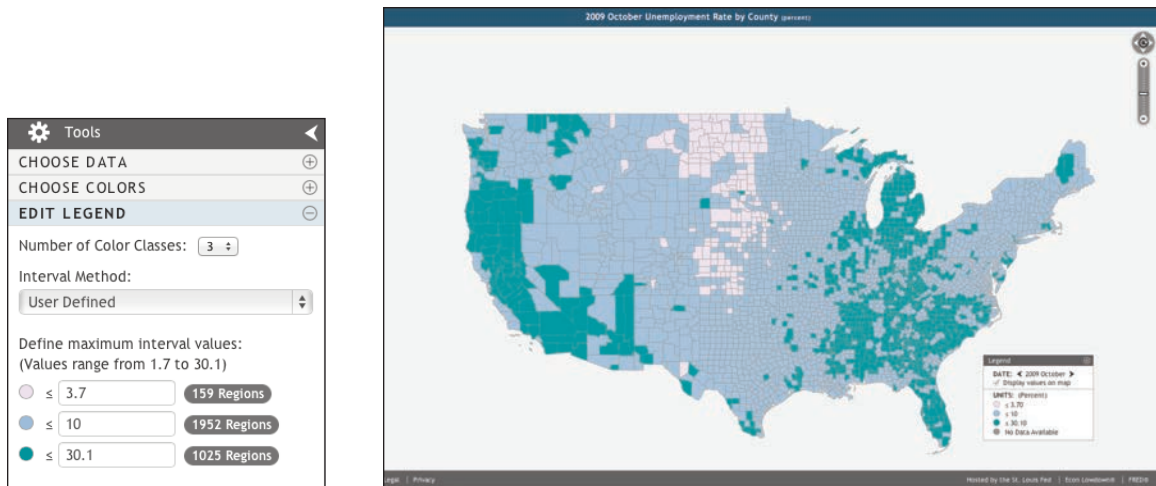**Tools *for* Teaching with GeoFRED®**

Figure 5

12. Note that during that particular month, there were over 1,000 counties with unemployment at or above the national average of 10 percent. At the same time, nearly twice as many counties (1,952) exhibited an unemployment rate somewhere between 3.7 percent and 10 percent.

13. An additional aspect of our nation's employment picture that merits attention is the natural unemployment rate. Recall that an economy's natural unemployment rate excludes cyclical unemployment. Think of it as an optimal unemployment rate for an economy that combines levels of frictional and structural unemployment, both of which are necessary for a dynamic, growing economy, but ignores unemployment due to the ups and downs of the business cycle. The natural unemployment rate is the lowest rate of joblessness an economy can sustain without inflation.

14. Recall that the natural rate of unemployment (See Dashboard Item 3) stood at 5.1 percent in October 2009. Input that value—5.1 percent—into the middle "User Defined" box to map all counties with unemployment between our lowest cutoff (3.7 percent) and the natural rate (5.1 percent). The GeoFRED® map displays the 2,751 counties with unemployment above 5.1 percent. Your map should look like Figure 6.
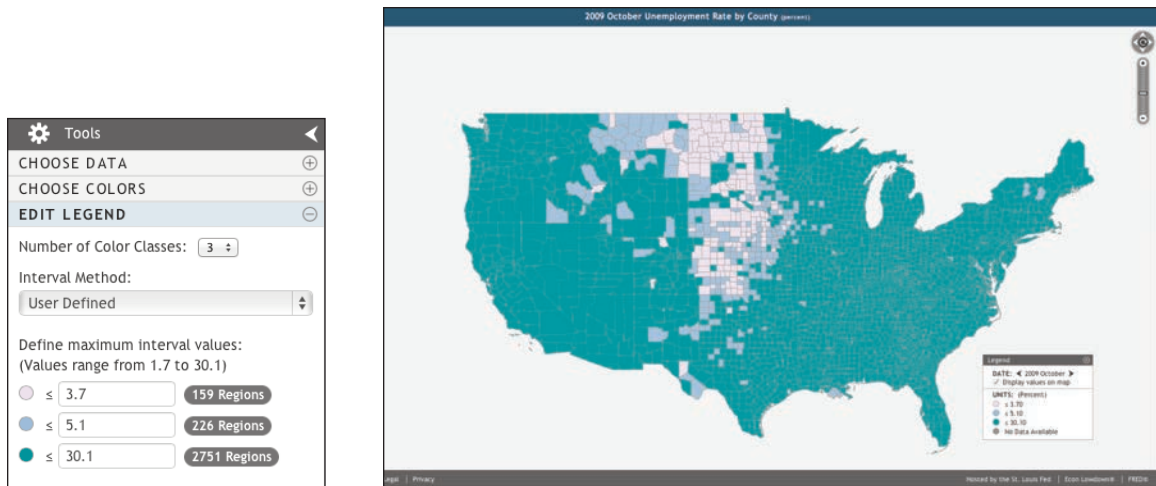
6

Figure 6

Changing the Colors

1. GeoFRED® provides a wide array of color choices for its maps. Recall that the unemployment rate reports the portion of the labor force without jobs. GeoFRED® follows the typical choropleth mapping convention and assigns darker colors to higher values and lighter colors to lower values. The focus of this activity is on low unemployment, so inverting that color scheme makes sense.

2. Click on the "Choose Colors" tab in the left-hand column. Click the "Reverse Color Scheme" box. Now the counties with the lowest unemployment appear in the darkest color and those with the highest unemployment in the lightest.

3. To further enhance the map's visuals, select a new "Multi Hue" color scheme. (Figure 7)
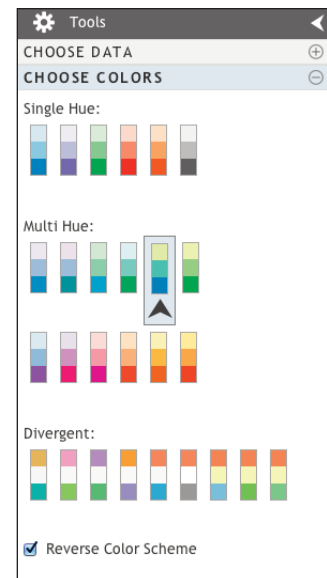
   Figure 8 shows the map rendered in yellow/green/blue with Reverse Color Scheme, showing just the lower 48 states and DC:
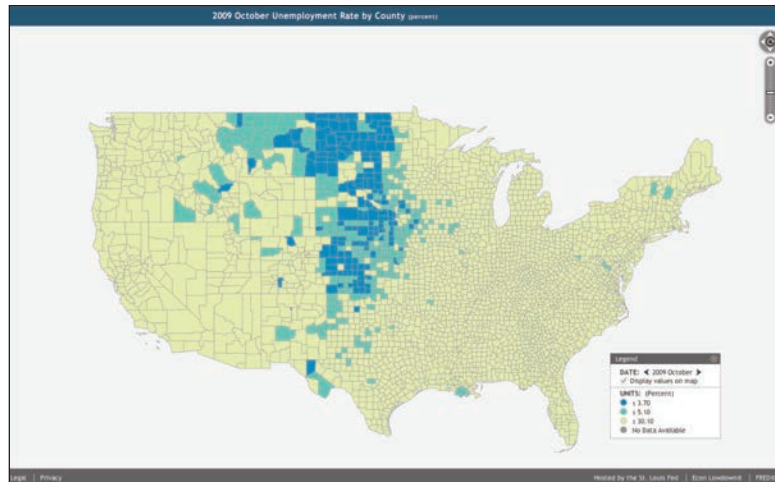

Figure 7

7

Figure 8

Downloading, Saving, Sharing, or Printing Your Map

1. When you have created a new map, you can download it as an image or PDF file. You may also save the raw data as an Excel spreadsheet. To do so, click the "Download" tab (the bottom tab in the left-hand column) and select your preferred download type: GIF, JPEG, PNG, Spreadsheet, or PDF.

2. When you have a GeoFRED® account, you can save the maps you create and return to them easily. (To create an account, which is free of charge, click "Register" in the top-right corner of the GeoFRED® webpage.) To save your map, click the "Save & Share" tab in the left-hand column. To save the map, click "Save" and follow the prompts. You will have the opportunity to create categories and subcategories for your maps, so you can easily group maps together for an individual lesson or by topic.

3. Notice that the "Save & Share" tab gives you the option to email your map or route it to a number of social media portals. Simply choose your preferred options and follow the prompts.

4. And, of course, you can print your map. While you can print any download type, the best results are obtained by printing a PDF of your map.

Recalling a Saved Map

With a GeoFRED® account, you can log in and view any map that you have saved. Your saved maps retain the settings you selected. After you sign in, click "MY MAPS" at the top-right corner of the GeoFRED® page. A list of all "Uncategorized Maps" will appear. Any maps that you have organized by category are accessed by clicking "By Category" in the top-right corner under the navigation bar. Click the name of the saved map you want to recall.

Developing Questions and Discussion

With one look at a map, a viewer may grasp information that cannot be expressed in a full page of text. Maps generate questions, too. When developing questions about a map, consider if the map reveals meaningful patterns or whether additional data would foster deeper understanding.

The following classroom activity is provided to help you think about ways to develop your own lessons and activities based on GeoFRED® maps.

1. Open the following FRED® dashboard link: https://research.stlouisfed.org/dashboard/3364. Show *Dashboard Item 1: Real GDP During the Great Recession*. Explain the following:

    • Beginning in late 2007, following a worsening global financial crisis, the Great Recession lasted until mid-2009 when U.S. real GDP resumed its upward growth path.

    • During that 1½-year period, the number of Americans unable to find work spiked, driving the unemployment rate to the highest levels in a generation—10.0 percent.

    • In the face of such a broad economic downturn, many workers broadened their job searches, looking elsewhere for signs of an economy with jobs instead of layoffs.

2. Show the following GeoFRED® map: *2009 October Unemployment Rate by County*; http://geofred.stlouisfed.org/map/?m=m. Explain the following:

    • The three color classes in the map show (i) the 5 percent of counties with the lowest unemployment rates—3.7 percent or lower; (ii) the counties with unemployment rates between 3.7 and 5.1 percent, where 5.1 percent in the natural rate of unemployment; and (iii) the counties with unemployment rates above 5.1 percent.

3. Discuss the following:

    • What pattern does the map show regarding the location of counties with extremely low unemployment in October 2009? (*A large portion of the counties with very low unemployment are concentrated in the Upper Great Plains. Nearly all of the*

remaining low-unemployment counties are directly to the south of the largest cluster of low-unemployment counties.)

4. Change the middle interval on the GeoFRED® map to 10 percent. (Click "TOOLS" in the top-left corner. Click the "EDIT LEGEND" tab. Under "Define maximum interval values," change the middle value to 10.) Discuss the following:

   • Look at the counties with unemployment above the 10 percent national average (the yellow regions). Are any patterns evident? (*Much of the Far West [Oregon and California especially] experienced double-digit unemployment at this time. Similarly, very high unemployment proliferated from Michigan southward through Florida.*)

5. Read the following passage from the April 2012 Minneapolis Federal Reserve Bank *fedgazette*:

   Rapid oil and gas development in the "oil patch" of western North Dakota and northeastern Montana has created huge demand for workers—not just in the oilfields, but also in a range of non-oil industries. But so far, the supply of labor—from within and outside the region—has responded slowly to demand. In recent years, job openings have soared and unemployment has dropped to very low levels—below 3 percent in a number of counties.

   (SOURCE: http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=4852.)

6. Discuss the following:

   • Why might workers who are unemployed and cannot find jobs near their homes be slow to relocate to a region of plentiful jobs? (*Answers will vary but may include the following: Many workers are tied to their residences by leases and mortgages, making it difficult to relocate. Employers often hesitate to extend a job offer without first meeting the applicant face-to-face, making travel necessary, which could be cost prohibitive for applicants. In a boom economy as described in the passage, housing costs may rise dramatically, erasing some of the gains created by a new position, even when wages are high.*)

7. Show *Dashboard Item 5: North Dakota and U.S. Housing Price Indexes Around the Great Recession*. If students haven't already pointed it out, explain that in a boom economy as described in the passage, housing costs may rise dramatically, erasing some of the gains created by a new position, even when wages are high. Note that the graph shows that, during the Great Recession, house prices in North Dakota rose on average over 3 percent while those for the United States fell on average over 10 percent.

8. Discuss the following:

    • What kind of unemployment explains delays in workers finding new jobs or in relocating to take advantage of a newly offered job? (*Frictional unemployment is the label affixed to unemployment resulting from workers transitioning between jobs or from school to a first job.*)

    • Is frictional unemployment always undesirable? (*In a healthy and growing economy, it is normal for some workers to leave one position to pursue new and better job opportunities. While structural unemployment—the long-term joblessness caused by a mismatch between workers' skills and those required for available jobs—is often viewed negatively, workers who retrain successfully may qualify for jobs at higher wages than before.*)

    • What does a map showing counties with unemployment above the natural rate reveal about a country's overall condition? (*An economy operating at its natural rate of unemployment is producing at a level of output that does not induce up-ward price pressures leading to inflation. When an economy experiences unem-ployment well above its natural rate [as the United States did during the Great Recession], much of its industrial capacity is unused.*)

9. Show *Dashboard Item 6: Capacity Utilization During the Great Recession*. Explain that the graph shows that during October 2009, the United States was exploiting less than 70 percent of its total industrial capacity, well below the 78.9 percent median rate of the previous 10 years.

10. Discuss the following:

    • Can county maps tell a complete story of unemployment? (*No. Not all counties are the same size in terms of area. Also, county populations vary widely.*)

11. Explain that caution is needed when generalizing from county-level data and that look-ing at such data presents at least two risks of confusion as follows:

    • First, not all counties are the same size in terms of area and, second, county popu-lations vary widely. For example, Arizona is the 6th largest state in terms of area, with over 6.5 million residents, making it the 16th most populous state, but it has only 15 counties, just one more than Vermont. Vermont is the 45th largest state in terms of area and ranks 49th in population, with just over 626,000 residents.

    • Stretching the definition of county to include county equivalents such as Washington, D.C., and independent cities such as Baltimore, Maryland, and Saint Louis, Missouri, does nothing to resolve the geographical dilemma.

    • Point out that, nevertheless, all counties have some population and mapping them can reveal underlying patterns.

Tools *for* Teaching with GeoFRED®

Conclusion

The purpose of this activity was to review the basics of unemployment and to help you reveal differences in U.S. unemployment levels during the Great Recession. To that end you created a map that used color to display counties with especially low unemployment resulting from increased oil and gas drilling in the Upper Great Plains. You encountered factors that contribute to frictional unemployment, such as housing and travel. Finally, you saw evidence that although unemployment may
increase markedly during a downturn in the business cycle, it does not do so uniformly.

EconLowdown Lessons Using GeoFRED®

For a complete listing of GeoFRED® map-based activities, which may include FRED® dashboards, see http://www.stlouisfed.org/education_resources/tools-for-teaching-with-geofred/.