

Brooke County

Land Use Master Plan 2014



Office of Coalfield Community Development
WV Division of Energy

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Executive Summary

This Land Use Master Plan (LUMP) conveys information on Brooke County's current demographic and geographic status. This plan will be used to evaluate the potential of post-mine sites for development, and evaluate Brooke County's investment position.

Senate Bill (SB) 603 mandates the development of a LUMP by counties with surface mining operations. The LUMP will be an effective tool towards achieving Brooke County's development goals. The Nick J. Rahall Appalachian Transportation Institute (RTI) coordinates with the Office of Coalfield Community Development to provide this essential information. Brooke County has one post-mine development in place: the Weirton Medical Center. This plan will help Brooke take advantage of its other post-mine sites in a varied and potentially lucrative manner.

Brooke County has continually lost population since 1980. The county's median age and age distribution are average for the state, and indicate a population capable of productivity in the labor force. The population is also projected to decrease past 2030.

Employment consists mainly of Manufacturing; Education and Health Services; Government Services; Trade, Transportation, and Utilities; and Leisure and Hospitality. Manufacturing and Education and Health Services are the major wage contributors: Manufacturing due to the size of the sector in Brooke County, and

Education and Health Services likely because of the higher wages at Weirton Medical Center. Brooke County maintains a high labor force participation rate, and a slightly above average ratio of government transfers to income (28 percent).

Brooke County's total enrollment has been falling steadily as the County's manufacturing sector declined, and the dropout rate, while low by state standards, has been erratic. However, educational attainment is far above average, with only 11 percent of people age 25 and older having less than a high school diploma.

Utility prices are varied throughout the county, and this plan provides municipal and private rates for electricity, sewer, and water. Brooke County has an extensive broadband network as well, positioning the County towards success in the future.

Transportation is an important issue in any development strategy. Brooke County has no interstate (though the interstate is relatively close), one US Route, and a small airport. Its rail system, because of Brooke's status as a manufacturing county, is extensive.

Brooke County also has 23 historic sites in the National Register and several pieces of historic architecture designated by the state. Historic preservation can be a basis for tourism, cultural identity, and community cohesion.

This plan also reviews energy and environmental issues in Brooke County. The

environment of the county should be considered in an overall development strategy. Brooke County is not heavily forested but has a few designated recreational areas. Brooke County is on the list of air pollution non-attainment areas, which is negative. Brooke County has several completed and permitted Marcellus Shale wells and an oil field, and is a vibrant actor in the Marcellus Shale, but appears to have very little potential in the most popular renewable energy resources: solar, wind, and geothermal.

This information is as critical as the site information for several reasons. One is that development is not a process that can occur in a vacuum. Without understanding the resources available in the county, and the demand for more investment, money will end up wasted. Another is that investment requires active partners who will need information on each of the county's essential demographic topics to determine their level of risk. Without this, investors will not be persuaded to enter the county. Finally, this information can help policy makers target their land use strategies to any of these topics, as long as they understand the situation.

Site analysis is integral to this report. Researchers identified all the post mine sites given certain criteria for Brooke County. The researchers created a distance analysis using a scoring system based on distance to certain essential utilities and features, summed the scores, and plotted each score

for each mine site. A workforce analysis was conducted to determine available labor within certain radii for each site, and a retail analysis was conducted to determine which areas had the most retail activity. The top five mine sites were then identified, and are displayed individually. Map A contains the top five sites within a view of the county.

The tables below are comprehensive comparisons between the top five post-mine lands for potential development. In table A, and table B, distances and total scores are compared, providing an idea of the more suitable site under a considered criterion. For example, if we want to look for a site which is located closest to power lines, the answer is site ranking #3, permit ID S005084. However, if we wanted the site closest to an existing highway, the best site is site ranking #1, permit ID S005585.

Table C explains how each criterion contributes to the final total score and the importance of the weights. Because of the assumption that one criterion may be more important than others through differing weights, the site with higher absolute and relative scores is still able to receive a smaller total score than the others. Site ranking #4 (permit ID S016978) is a good explanation of this situation. Site #4 has smaller absolute and a similar relative score compared to site #5. Still, site #4 receives a higher total score because the distances from this site to major criteria (with weights from 9-10) are shorter than the other.

Table A: Distances Comparison Between Top Five Sites for Potential Development

| Suitability Ranking | 1 | 2 | 3 | 4 | 5 | Weight |
|----------------------------------|----------|----------|----------|----------|----------|---------------|
| Broadband | 0.48 | 0.41 | 0.29 | 0.00 | 0.18 | 9 |
| Gas Pipes | 0.79 | 0.67 | 0.60 | 0.02 | 0.46 | 6 |
| National Waterway Network | 2.41 | 4.50 | 2.77 | 3.37 | 4.01 | 4 |
| Oil Pipes | 0.00 | 0.65 | 0.05 | 0.58 | 0.36 | 6 |
| Power Lines | 0.14 | 0.32 | 0.12 | 0.50 | 0.43 | 10 |
| Railroad | 3.70 | 4.15 | 5.75 | 5.67 | 2.96 | 5 |
| Sewer Lines | 2.66 | 0.41 | 2.64 | 2.02 | 0.93 | 8 |
| Water Lines | 0.19 | 0.06 | 0.23 | 0.00 | 0.70 | 10 |
| Existing Highway | 2.35 | 3.95 | 3.59 | 4.09 | 4.12 | 8 |
| Intermodal Terminal Facilities | 15.18 | 7.41 | 16.52 | 17.02 | 7.85 | 6 |
| Interstate | 11.71 | 22.76 | 9.32 | 9.22 | 21.47 | 8 |
| Solid Waste Treatment Facilities | 5.41 | 3.52 | 3.30 | 3.81 | 3.92 | 8 |
| Sewer Treatment Facilities | 1.60 | 0.73 | 1.42 | 1.92 | 0.95 | 7 |

Table B: Total Score Comparison Between Top Five Sites for Potential Development

| Suitability Ranking | 1 | 2 | 3 | 4 | 5 | Weight |
|----------------------------------|---------------|------------|---------------|---------------|--------------|---------------|
| Broadband | 67.5 | 67.5 | 67.5 | 90 | 90 | 9 |
| Gas Pipes | 21 | 31.5 | 31.5 | 60 | 45 | 6 |
| National Waterway Network | 40 | 7 | 21 | 21 | 14 | 4 |
| Oil Pipes | 60 | 22.5 | 60 | 22.5 | 42 | 6 |
| Power Lines | 100 | 75 | 100 | 35 | 50 | 10 |
| Railroad | 18.75 | 7.5 | 1.25 | 1.25 | 35 | 5 |
| Sewer Lines | 28 | 80 | 28 | 28 | 80 | 8 |
| Water Lines | 75 | 75 | 50 | 100 | 12.5 | 10 |
| Existing Highway | 80 | 40 | 40 | 40 | 20 | 8 |
| Intermodal Terminal Facilities | 21 | 60 | 10.5 | 10.5 | 60 | 6 |
| Interstate | 42 | 6 | 56 | 56 | 10 | 8 |
| Solid Waste Treatment Facilities | 42 | 80 | 80 | 80 | 60 | 8 |
| Sewer Treatment Facilities | 52.5 | 70 | 52.5 | 52.5 | 70 | 7 |
| Total Weighted Score | 647.75 | 622 | 598.25 | 596.75 | 588.5 | |

Table C: Absolute/Relative Score Comparison Between Top Five Sites for Potential Development

| Suitability Ranking | 1 | 2 | 3 | 4 | 5 | Weight |
|----------------------------------|----------|----------|----------|----------|----------|---------------|
| Broadband | 10 | 10 | 10 | 10 | 10 | 9 |
| Gas Pipes | 7 | 7 | 7 | 10 | 10 | 6 |
| National Waterway Network | 10 | 7 | 7 | 7 | 7 | 4 |
| Oil Pipes | 10 | 5 | 10 | 5 | 7 | 6 |
| Power Lines | 10 | 10 | 10 | 7 | 10 | 10 |
| Railroad | 5 | 3 | 1 | 1 | 7 | 5 |
| Sewer Lines | 7 | 10 | 7 | 7 | 10 | 8 |
| Water Lines | 10 | 10 | 10 | 10 | 5 | 10 |
| Existing Highway | 10 | 10 | 10 | 10 | 10 | 8 |
| Intermodal Terminal Facilities | 7 | 10 | 7 | 7 | 10 | 6 |
| Interstate | 7 | 3 | 7 | 7 | 5 | 8 |
| Solid Waste Treatment Facilities | 7 | 10 | 10 | 10 | 10 | 8 |
| Sewer Treatment Facilities | 10 | 10 | 10 | 10 | 10 | 7 |
| Total Absolute Score | 110 | 105 | 106 | 101 | 111 | |
| Suitability Ranking | 1 | 2 | 3 | 4 | 5 | Weight |
| Broadband | 7.5 | 7.5 | 7.5 | 10 | 10 | 9 |
| Gas Pipes | 5 | 7.5 | 7.5 | 10 | 7.5 | 6 |
| National Waterway Network | 10 | 2.5 | 7.5 | 7.5 | 5 | 4 |
| Oil Pipes | 10 | 7.5 | 10 | 7.5 | 10 | 6 |
| Power Lines | 10 | 7.5 | 10 | 5 | 5 | 10 |
| Railroad | 7.5 | 5 | 2.5 | 2.5 | 10 | 5 |
| Sewer Lines | 5 | 10 | 5 | 5 | 10 | 8 |
| Water Lines | 7.5 | 7.5 | 5 | 10 | 2.5 | 10 |
| Existing Highway | 10 | 5 | 5 | 5 | 2.5 | 8 |
| Intermodal Terminal Facilities | 5 | 10 | 2.5 | 2.5 | 10 | 6 |
| Interstate | 7.5 | 2.5 | 10 | 10 | 2.5 | 8 |
| Solid Waste Treatment Facilities | 7.5 | 10 | 10 | 10 | 7.5 | 8 |
| Sewer Treatment Facilities | 7.5 | 10 | 7.5 | 7.5 | 10 | 7 |
| Total Relative Score | 100 | 92.5 | 90 | 92.5 | 92.5 | |

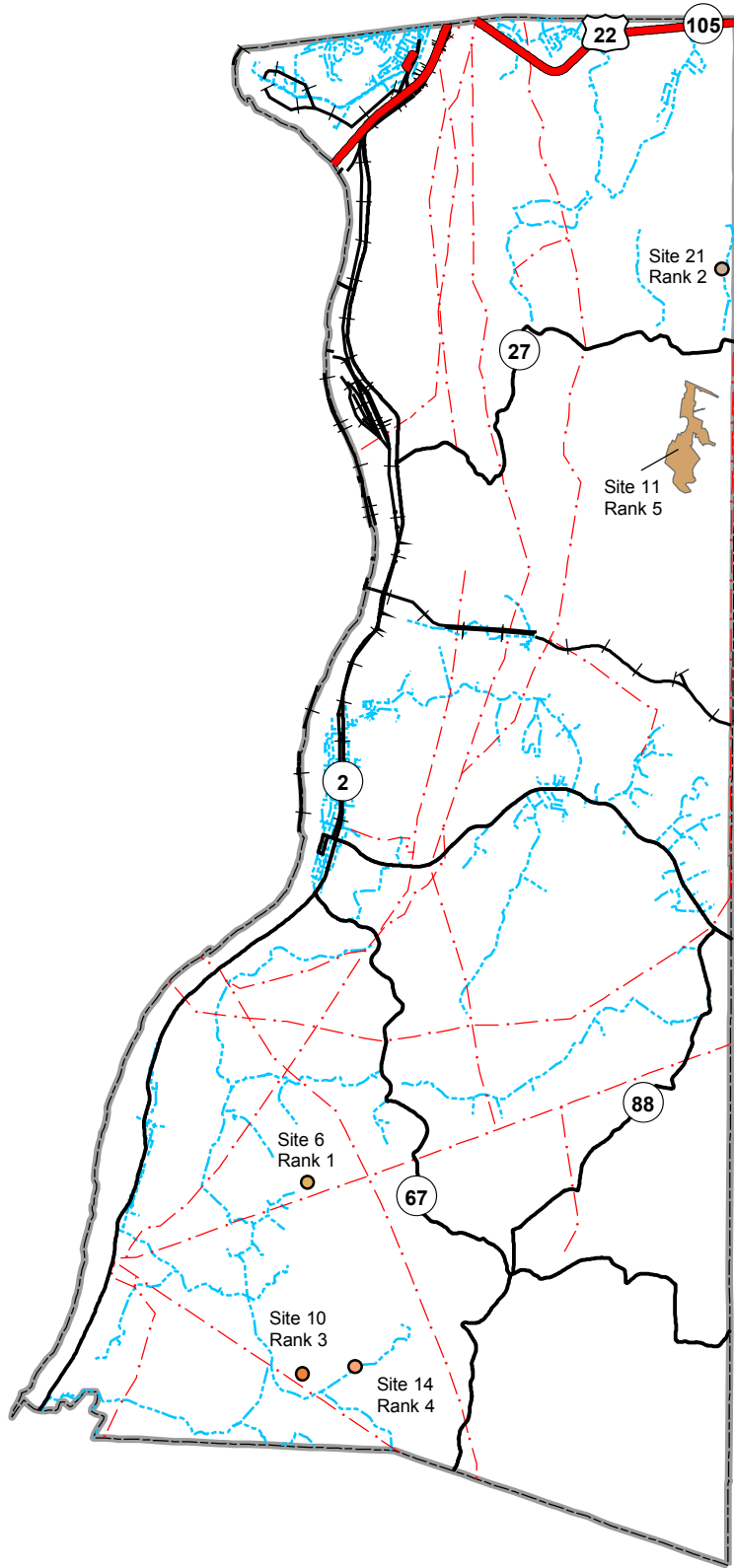
Top Five Sites for Potential Development

Brooke County

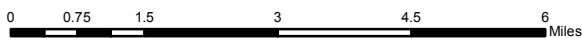


Mining Site

- Site 6
- Site 21
- Site 10
- Site 14
- Site 11
- US Routes
- WV Routes
- Railroads
- - - Power Lines
- - - Water Lines
- ▭ County Boundary



Source: Rahall Transportation Institute Analysis 2014



Site's General Info

| | |
|---------------------|--------------------------|
| Permittee | West Virginia Energy Inc |
| Facility Name | NA |
| Permit ID | S005585 |
| Issue Date | 6/25/1985 |
| Expiration Date | 6/25/1990 |
| Current Acres | NA |
| Lat | 40.218671 |
| Long | -80.615597 |
| Nearest Post Office | |

| | |
|---------------------|---------------|
| Site Number | 6 |
| Suitability Ranking | 1 |
| Total Score | 647.75 |

Distance Analysis Results

| | |
|----------------------------------|-------|
| Broadband | 0.48 |
| Gas Pipes | 0.79 |
| National Waterway Network | 2.41 |
| Oil Pipes | 0.00 |
| Power Lines | 0.14 |
| Railroad | 3.70 |
| Sewer Lines | 2.66 |
| Water Lines | 0.19 |
| Existing Highway | 2.35 |
| Intermodal Terminal Facilities | 15.18 |
| Interstate | 11.71 |
| Solid Waste Treatment Facilities | 5.41 |
| Sewer Treatment Facilities | 1.60 |

Site number 6 should be the first choice for potential development. It scores highly in many of the most important features, such as Power Lines (.14 mi.), Water Lines (.19 mi.) and is close to the Ohio River Waterway Network (2.41 mi.). It is also close to the Interstate (11.71 mi.) and Existing Highways (2.35 mi.), though it only achieves the best score in Existing Highways.



Site's General Info

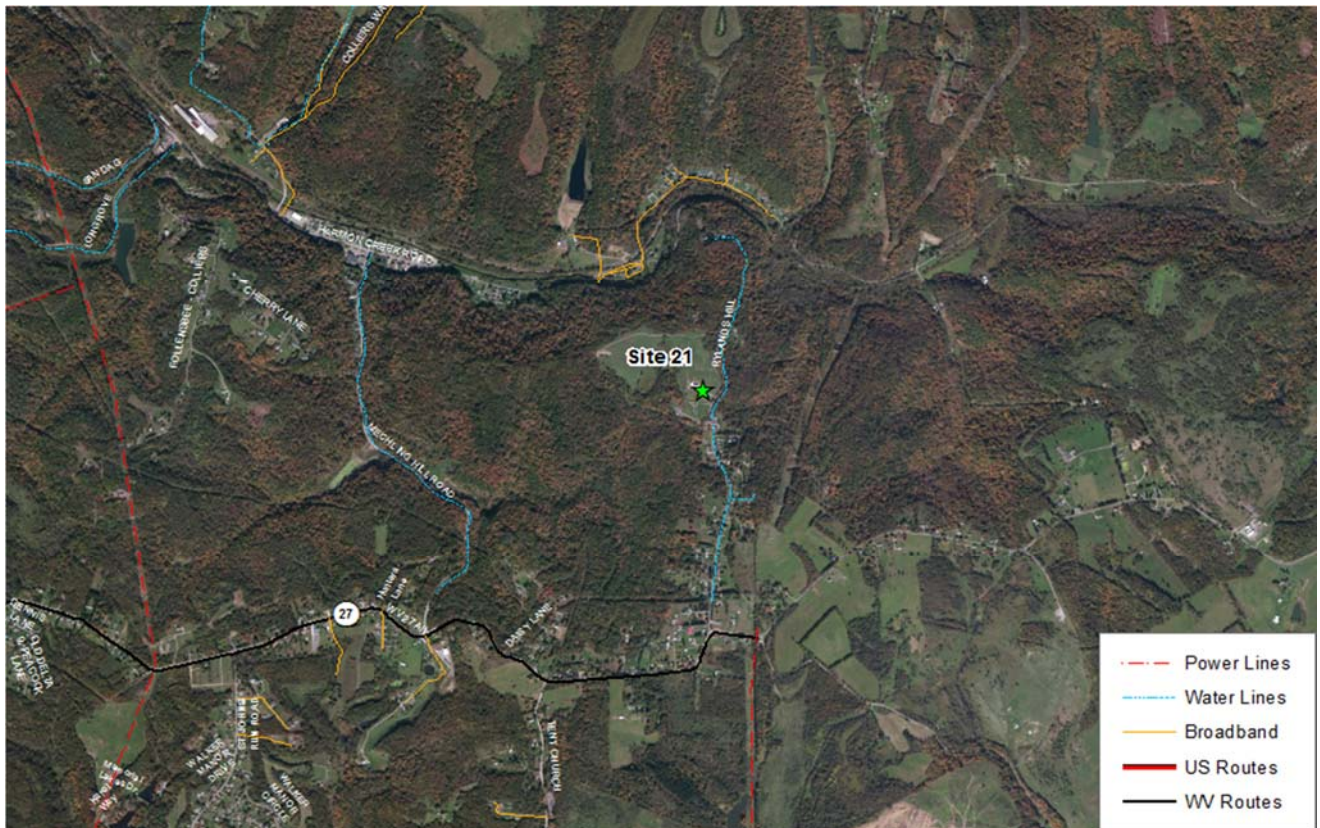
| | |
|---------------------|-------------------|
| Permittee | Bologna Mining Co |
| Facility Name | NA |
| Permit ID | S001983 |
| Issue Date | 2/24/1983 |
| Expiration Date | 2/24/1993 |
| Current Acres | 20 |
| Lat | 40.360869 |
| Long | -80.521991 |
| Nearest Post Office | |

| | |
|---------------------|------------|
| Site Number | 21 |
| Suitability Ranking | 2 |
| Total Score | 622 |

Distance Analysis Results

| | |
|----------------------------------|-------|
| Broadband | 0.41 |
| Gas Pipes | 0.67 |
| National Waterway Network | 4.50 |
| Oil Pipes | 0.65 |
| Power Lines | 0.32 |
| Railroad | 4.15 |
| Sewer Lines | 0.41 |
| Water Lines | 0.06 |
| Existing Highway | 3.95 |
| Intermodal Terminal Facilities | 7.41 |
| Interstate | 22.76 |
| Solid Waste Treatment Facilities | 3.52 |
| Sewer Treatment Facilities | 0.73 |

Site number 21 has the second highest score in the suitability model. The site is located closely to utility features such as Power Lines (.32 mi.), Water Lines (0.06 mi.) and Broadband (0.41 miles), which makes the site to be a good place for future residency area. The only disadvantages are its distance from the Interstate (22.76 mi.) and the Ohio River Waterway Network (4.5 mi.).



Site's General Info

| | |
|---------------------|----------------|
| Permittee | Rayle Coal Co. |
| Facility Name | NA |
| Permit ID | S005084 |
| Issue Date | 8/3/1984 |
| Expiration Date | 8/3/1994 |
| Current Acres | 83.1 |
| Lat | 40.188971 |
| Long | -80.616497 |
| Nearest Post Office | |

| | |
|---------------------|---------------|
| Site Number | 10 |
| Suitability Ranking | 3 |
| Total Score | 598.25 |

Distance Analysis Results

| | |
|----------------------------------|-------|
| Broadband | 0.29 |
| Gas Pipes | 0.60 |
| National Waterway Network | 2.77 |
| Oil Pipes | 0.05 |
| Power Lines | 0.12 |
| Railroad | 5.75 |
| Sewer Lines | 2.64 |
| Water Lines | 0.23 |
| Existing Highway | 3.59 |
| Intermodal Terminal Facilities | 16.52 |
| Interstate | 9.32 |
| Solid Waste Treatment Facilities | 3.30 |
| Sewer Treatment Facilities | 1.42 |

Site number 10 is listed as the third suitable site for post-mine land development. The site is fairly close to several important criteria. It is only 0.12 miles from a Power Line (10 pts. in the suitability model) and .23 miles from Water Lines (also 10 pts.). Short distances to other factors still make it a good choice for development despite farther distances from Railroads or Interstates (5.75 and 9.32 mi.).



Site's General Info

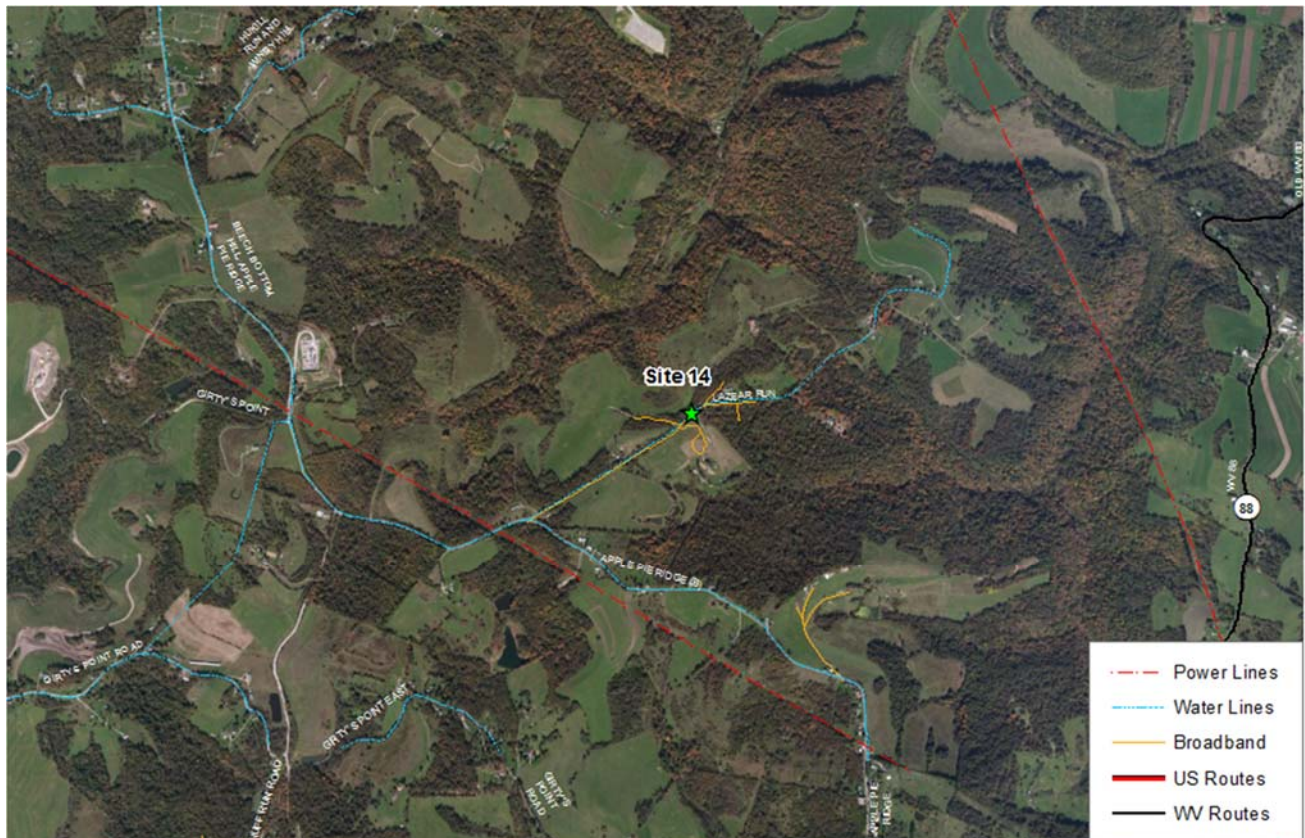
| | |
|---------------------|--------------------|
| Permittee | Wheeling Energy Co |
| Facility Name | NA |
| Permit ID | S016978 |
| Issue Date | 9/7/1978 |
| Expiration Date | 9/7/1992 |
| Current Acres | NA |
| Lat | 40.190071 |
| Long | -80.604497 |
| Nearest Post Office | |

| | |
|---------------------|---------------|
| Site Number | 14 |
| Suitability Ranking | 4 |
| Total Score | 596.75 |

Distance Analysis Results

| | |
|----------------------------------|-------|
| Broadband | 0.00 |
| Gas Pipes | 0.02 |
| National Waterway Network | 3.37 |
| Oil Pipes | 0.58 |
| Power Lines | 0.50 |
| Railroad | 5.67 |
| Sewer Lines | 2.02 |
| Water Lines | 0.00 |
| Existing Highway | 4.09 |
| Intermodal Terminal Facilities | 17.02 |
| Interstate | 9.22 |
| Solid Waste Treatment Facilities | 3.81 |
| Sewer Treatment Facilities | 1.92 |

Site number 14 is ranked as the fourth suitable site for post-mine land development in the county. There are a few advantages of the site including on-site water lines and broadband availability. However, it is far from most transportation methods including Interstate (9.22 mi.), Existing Highway (4.09 mi.), and Railroad (5.67 mi.).



Site's General Info.

| | |
|---------------------|--------------------------|
| Permittee | Starvaggi Industries Inc |
| Facility Name | NA |
| Permit ID | S011382 |
| Issue Date | 11/16/1982 |
| Expiration Date | 11/16/1997 |
| Current Acres | 171.5 |
| Lat | 40.342269 |
| Long | -80.527592 |
| Nearest Post Office | Colliers |

| | |
|---------------------|--------------|
| Site Number | 11 |
| Suitability Ranking | 5 |
| Total Score | 588.5 |

Distance Analysis Results

| | |
|----------------------------------|-------|
| Broadband | 0.18 |
| Gas Pipes | 0.46 |
| National Waterway Network | 4.01 |
| Oil Pipes | 0.36 |
| Power Lines | 0.43 |
| Railroad | 2.96 |
| Sewer Lines | 0.93 |
| Water Lines | 0.70 |
| Existing Highway | 4.12 |
| Intermodal Terminal Facilities | 7.85 |
| Interstate | 21.47 |
| Solid Waste Treatment Facilities | 3.92 |
| Sewer Treatment Facilities | 0.95 |

Site number 11 has the fifth highest score in the suitability model for its relatively close distances to several criteria including Broadband (0.18 mi), Sewer Lines (0.93 miles), and Power Lines (0.43mi.). All of those criteria receive high absolute points. The distances from the site to other important criteria, such as Water Lines and Sewer Treatment Facilities, are also positive.



I. Introduction

Senate Bill (SB) 603, passed in the 2001 Legislative Session, mandates the development of a Land Use Master Plan (LUMP) by counties with surface mining operations. The creation of a LUMP would facilitate the development of economic or community assets, secure developable land and infrastructure, and ensure that post-mining land use proposed in any reclamation plan is in compliance with the specified land use in the approved LUMP. In order to promote acceptable principles of smart growth within the desired community it has become evident that a sustainable land use plan is needed to determine development needs within a community. This detailed document addresses the physical development needs of properties within the coalfield counties and provides guidelines, strategies, and a framework for future decisions relating to land use and projected community needs.

The 1977 Surface Mining Control and Reclamation Act established a program for the regulation of surface mining activities and the reclamation of coal-mined lands. The Act requires that coal operators minimize the disturbance and adverse impact on the environment and community in addition to restoring the mined property to its approximate original contour. Special provisions are granted for operators who offer development plans for post-mining land use, in which the coal operators (private sector) make capital investments towards land development that would benefit the community (public sector) affected by the mining operations. This unique opportunity, also known as Public-Private Partnership (P3), has far-reaching consequences on those communities with coal mining operations. The operators utilize the LUMP, created by the county officials with post-mine land use in mind, to gain insight into the land and infrastructure needs of the local community and then materialize the development opportunities described in the LUMP. The LUMP leverages private investment to facilitate public development, which is critical to the sustainability of counties and communities. Community sustainability requires a transition from poorly managed land to land-use planning practices that create and maintain efficient infrastructure, ensure close-knit neighborhoods and sense of community, and preserve natural systems.

RTI, a nationally recognized center of excellence for rural transportation research, was established through the Transportation Equity Act for the 21st Century passed by Congress in 1998 and is funded through a grant from the Research and Innovative Technology Administration (RITA) of the US Department of Transportation. As a University Transportation Center, RTI has cultivated relationships with private industry and public agencies to leverage resources, technology and strategic thinking to improve mobility and to stimulate economic development. RTI has taken the lead in conducting site-specific research, supporting multimodal planning and analysis to improve mobility and global connectivity for rural regions. The Office of Coalfield Community Development (OCCD) was created by the 1999 Legislative Session to assist communities affected by surface mining activity throughout the State. With the passage of SB 603 in 2001, the responsibilities of the OCCD changed to include working with local economic development agencies to develop land use master plans and include the

recommendations of local economic redevelopment authorities in the reclamation plans of surface mine permits. The OCCD established criteria to consider development of these sites, provided for certain land uses as post-mining land uses and stipulated that master plans must comport to environmental reclamation requirements. The office allows existing and future surface mining permits to include master plan criteria and reclamation standards.

This plan provides information and analysis specifically for Brooke County. Unlike coalfield counties, Brooke County's economy has a strong dependence on manufacturing and education and health services for employment and wages. The resulting combination has led to an unsteady increase in wages. However, this has not translated to a complete success, as the population continues to decrease, age, and lack varied job opportunities. Brooke County is potentially positioning itself for success in the long-run, however, as its broadband access is extensive and the educational attainment in the county is high. This plan will put focus on these issues, encouraging an analysis of the range of options available to policymakers, including land use planning.

This plan, including both the demographic and post-mine site analysis, requires data gathered from professional, secondary sources. Every attempt has been made to verify the accuracy of this data. However, the datasets are subject to differing methodologies, third-party error, and changes in time. Any and all information should be verified for accuracy.

II. Planning Area

Brooke County was formed in 1796, one of the oldest counties in the state. It was formed from parts of Ohio County and named after the then-governor of Virginia. The county had, and has, vast natural resources that were used during the Industrial Age. As with many coalfield counties, the boom from natural resource extraction and, in Brooke County's case, manufacturing, brought people and money to the area, but through the Great Depression and the withdrawal of many natural resource and manufacturing industries, Brooke began to decline. Some indications show a recovery in wages, population, and jobs, but other indications reveal troubled times.¹

¹ Greathouse, Ruby A., "Brooke County," *The West Virginia Encyclopedia*, Accessed March 24, 2014, <http://www.wvencyclopedia.org/articles/661>.

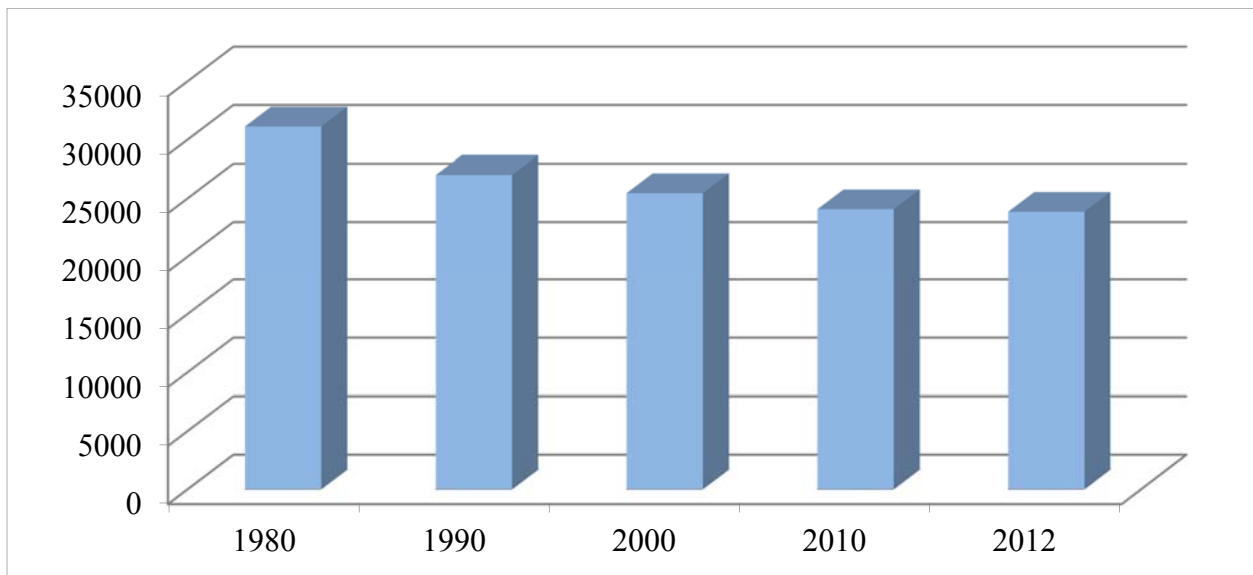
III. Existing Conditions

This information will provide a background understanding of the demographic trends in the county. This base information is meant to provide overall detail on Brooke County's status as it stands. Part IV will deal with possible future site development information, to be considered with the demographic data to target strategies for investment.

Population

The population of Brooke County in 2012 was 23,853 according to the 2012 American Community Survey (ACS) 5-year estimates, ranking it 28th in county population among the 55 counties in West Virginia.² The decennial censuses show that Brooke County has slowly but steadily lost population. The trend has slowed since the drop between 1980 and 1990, but continues into the current analysis year.

Figure 1: Census Populations for Brooke County

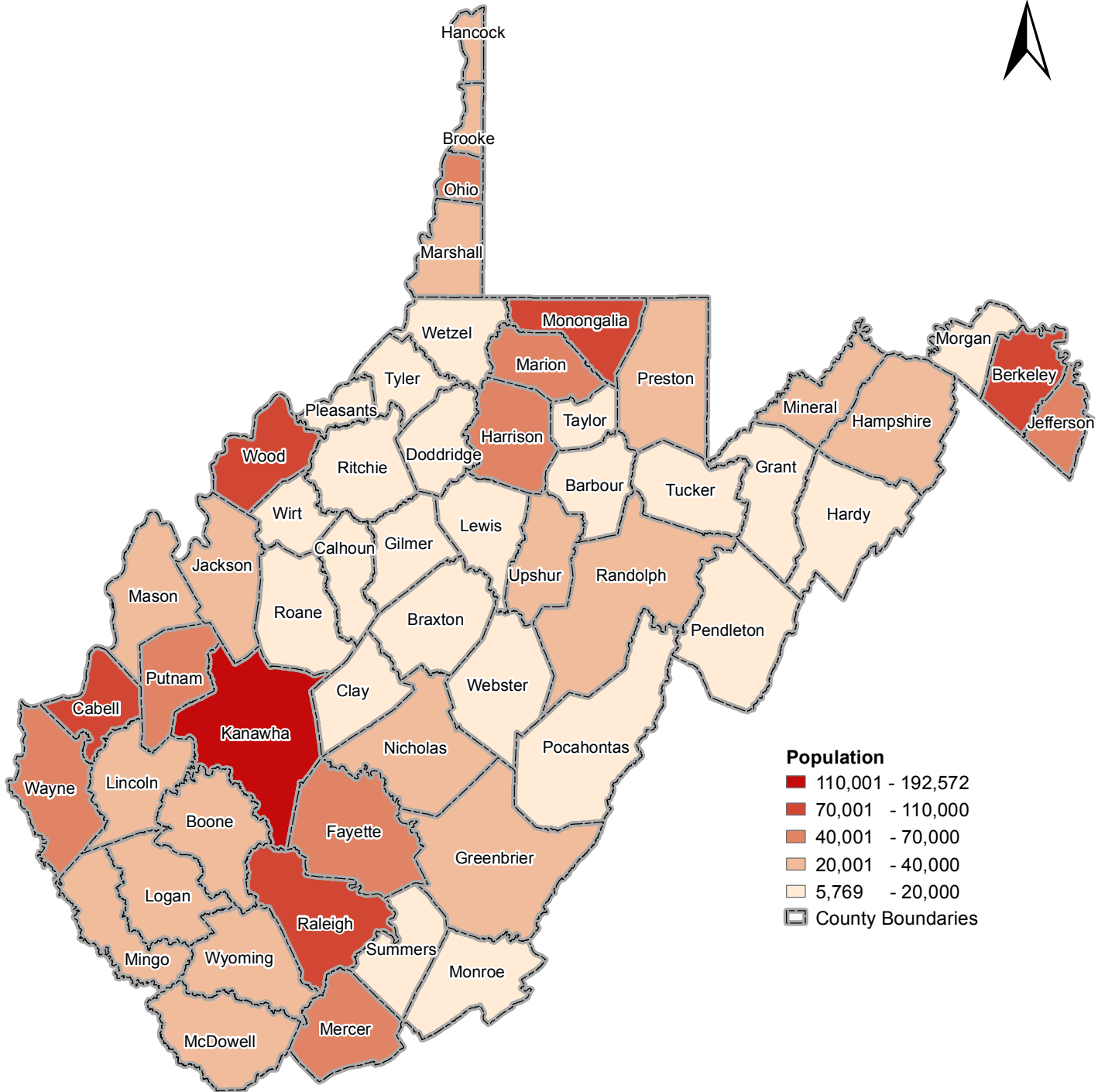


Source: Stats Indiana, USA Counties in Profile

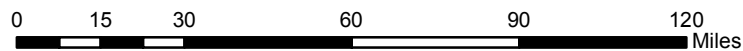
Map 1 illustrates the Brooke County population compared to West Virginia overall. Brooke is in the middle of the spectrum, its population boosted by the city of Wheeling and the county's proximity to Pittsburgh, Pennsylvania.

² United States Census Bureau, "2012 American Community Survey 5-year Estimates," Accessed April 20, 2013, www.factfinder2.census.gov

Demographic Population



Population
 ■ 110,001 - 192,572
 ■ 70,001 - 110,000
 ■ 40,001 - 70,000
 ■ 20,001 - 40,000
 ■ 5,769 - 20,000
 □ County Boundaries



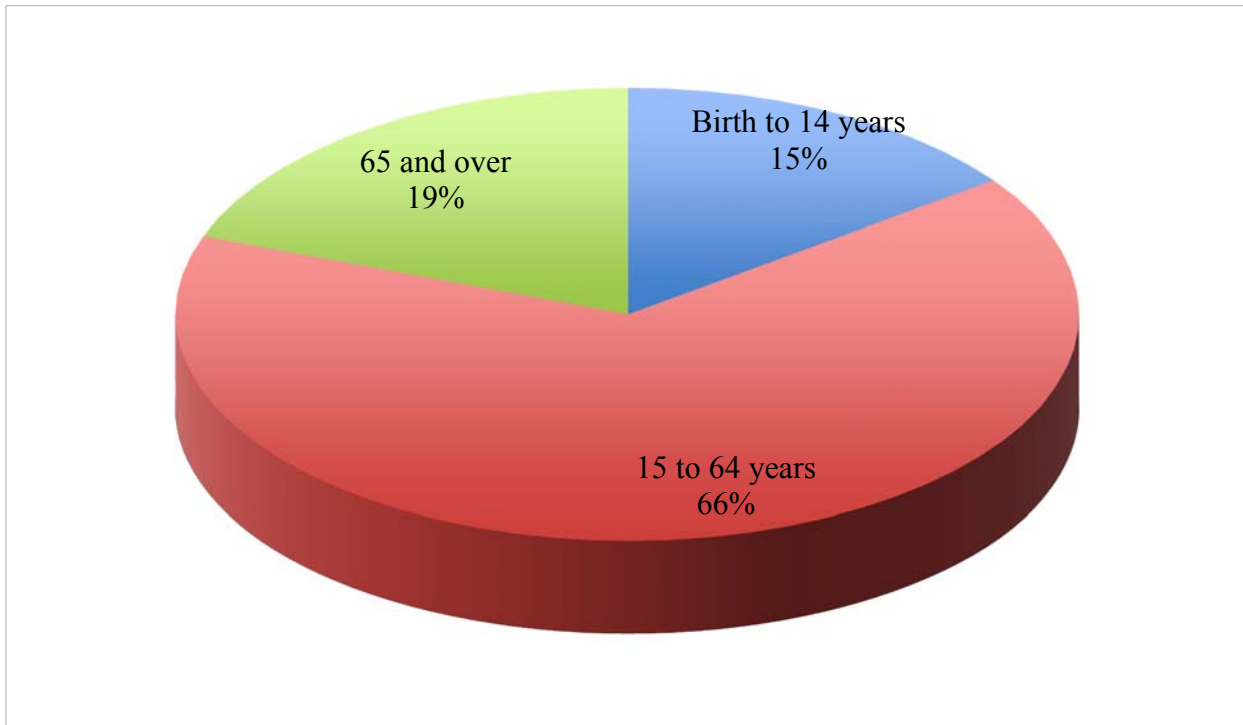
Source: U.S. Census Bureau, 2008-2012 American Community Survey

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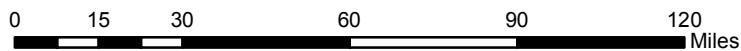
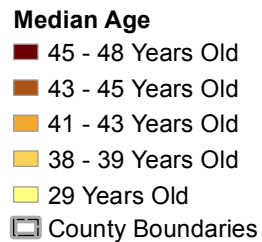
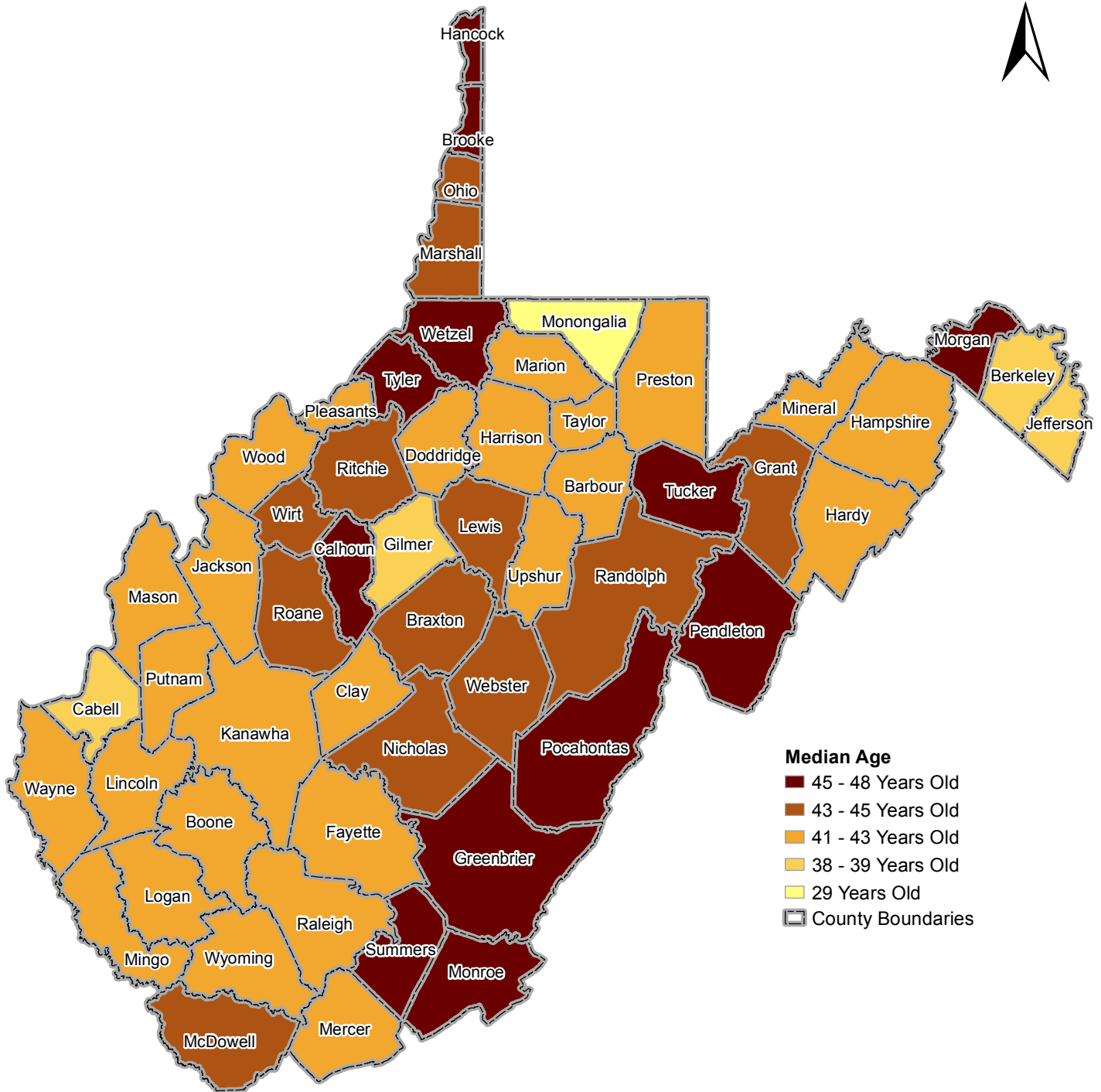
According to the ACS, just over 23 percent of Brooke County residents are 62 years of age and over, while 14 percent are between 5 and 17 years of age and just over 4 percent are below the age of 5. Approximately 5,600 people are of retirement age. The median age in Brooke is 44.9, which is very near the median age of the State (Map 2). The majority of the population is of prime working age, as denoted in Figure 2.

Figure 2: Brooke County Age Breakdown



Source: 2012 American Community Survey 5-Year Estimate Calculation

Demographic Median Age



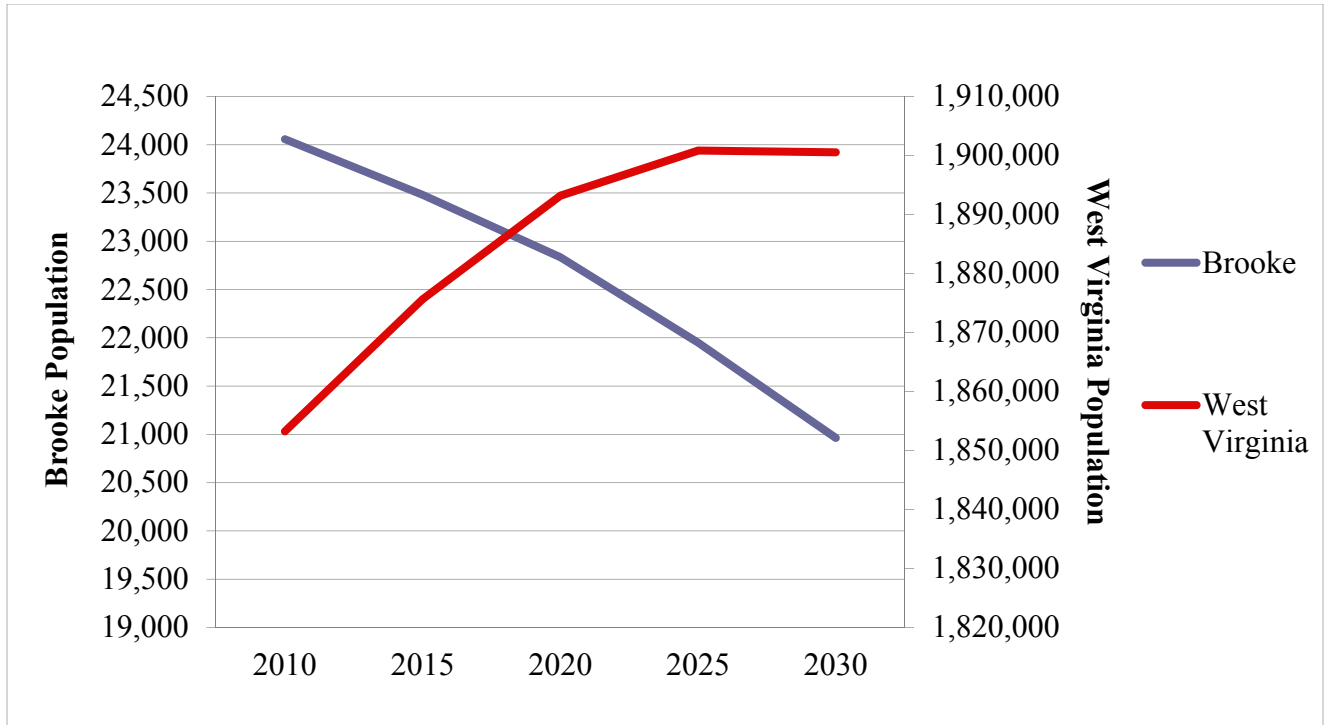
Source: U.S. Census Bureau, 2008-2012 American Community Survey

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The Bureau of Business and Economic Research at West Virginia University projects a 12.9 percent decrease in the Brooke County population between 2010 and 2030, which is significantly different from the projected growth of West Virginia.³ The model for the projection is based on past population patterns and statistics, and should not be taken as permanent. The projected decrease is derived from the consistent decrease from 1980 to 2012 and the lack of any noticeable increase in between these census and ACS years.

Figure 3: Population Projections



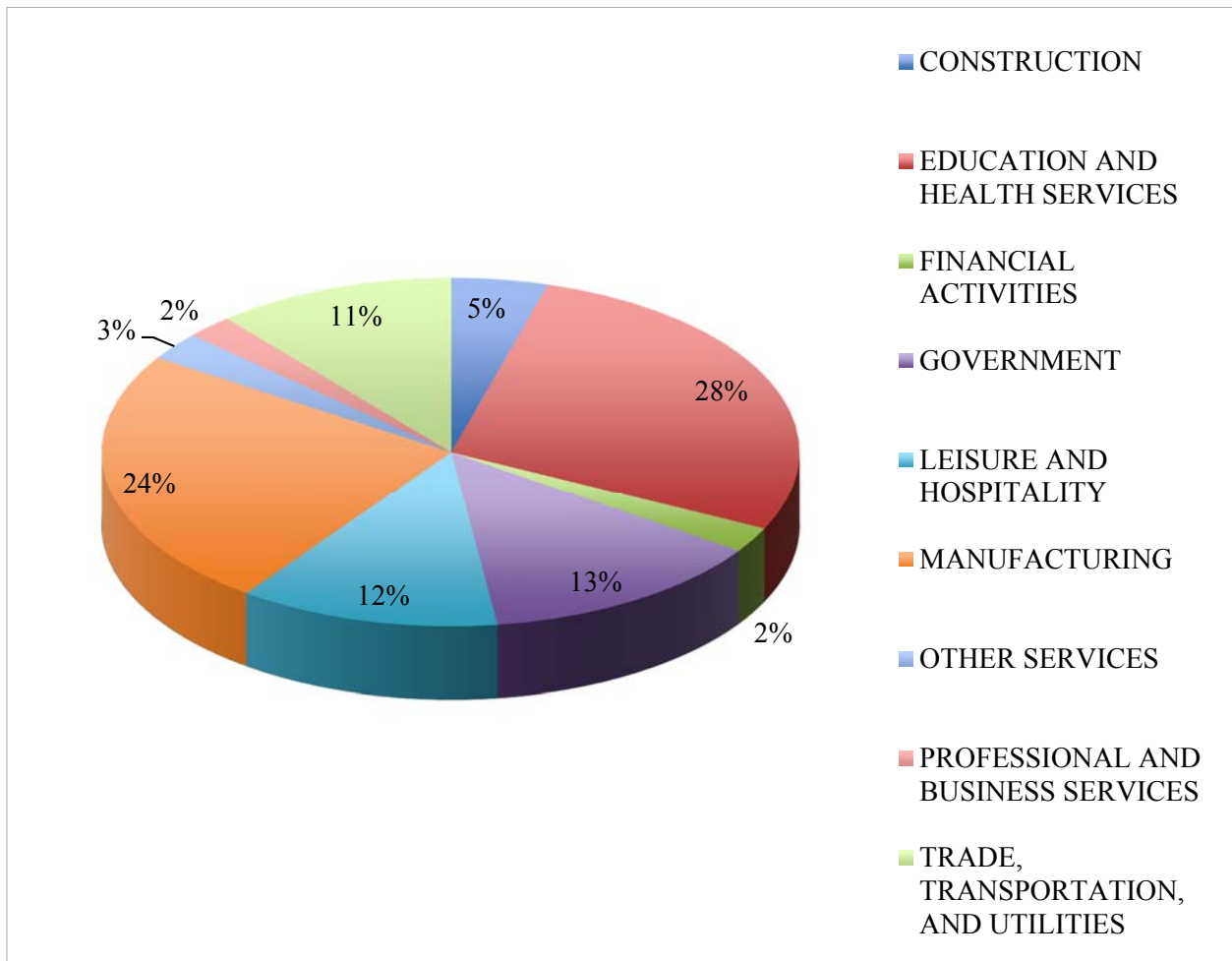
Source: WVU Bureau of Business and Economic Research

Employment

Workforce WV has a complete dataset on employment numbers and wages. The total number of employed in 2012 was 7,535. Approximately 28 percent of wage earners in Brooke County worked in Education and Health Services and just under a fifth worked in Manufacturing. Brooke County’s employment mix is consistent with several other coalfield counties, yet surprising in which sectors make up the largest proportions of employment and wages. This mix is fairly diversified, but recessions and declining manufacturing are all great risks to future prosperity. Most conspicuous is the lack of any Natural Resource employment, which is surprising given the rise of natural gas drilling in the area.

³ Christiadi. “Population Projection for West Virginia Counties.” Bureau of Business and Economic Research, College of Business and Economics, West Virginia University, Morgantown, WV (August 2011).

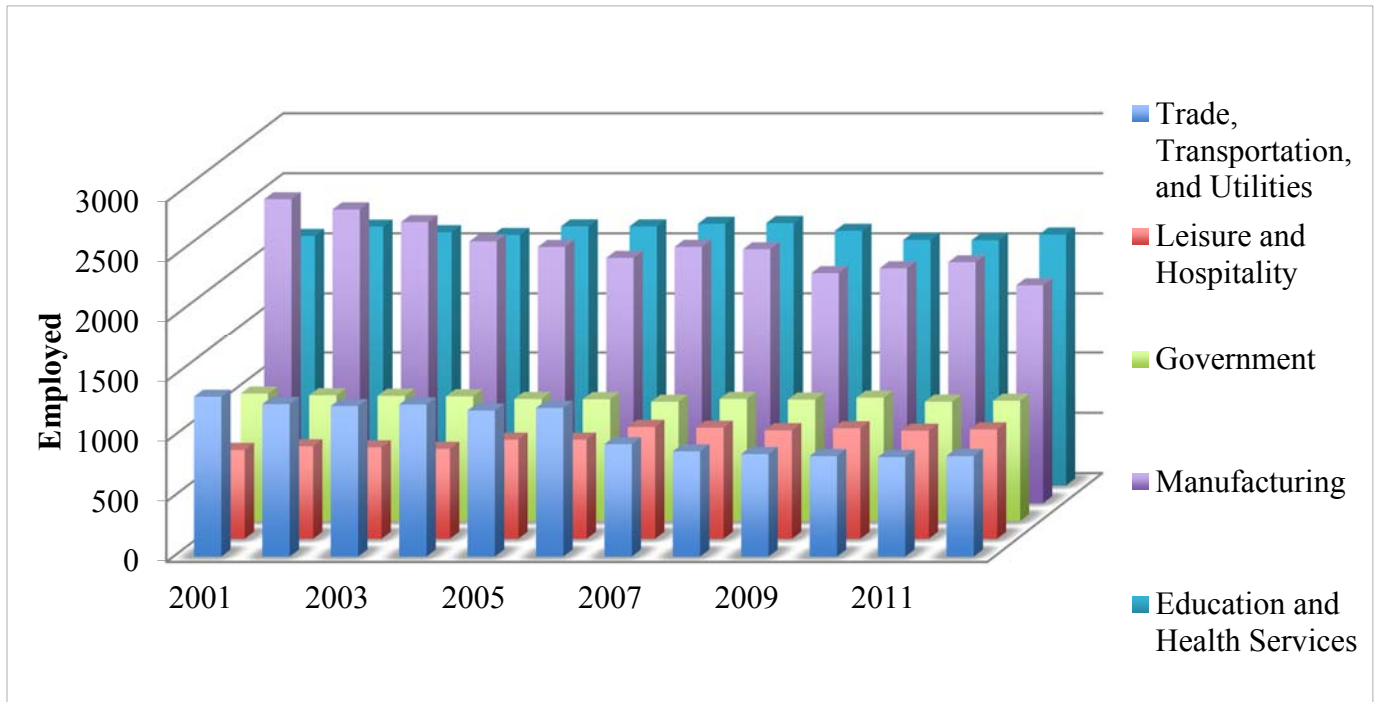
Figure 4: 2012 Brooke County Employment



Source: Workforce WV

Five sectors have been the major contributors to employment throughout the past decade: Manufacturing; Education and Health Services; Government; Trade, Transportation and Utilities; and Leisure and Hospitality. Manufacturing has steadily been losing employment share to Education and Health Services with the general national decline in the manufacturing sector. Government; Trade, Transportation, and Utilities; and Leisure and Hospitality all follow with generally similar percentages of employment over time, though there was a sizable decline in Trade, Transportation, and Utilities between 2006 and 2007 following the similar decline in manufacturing.

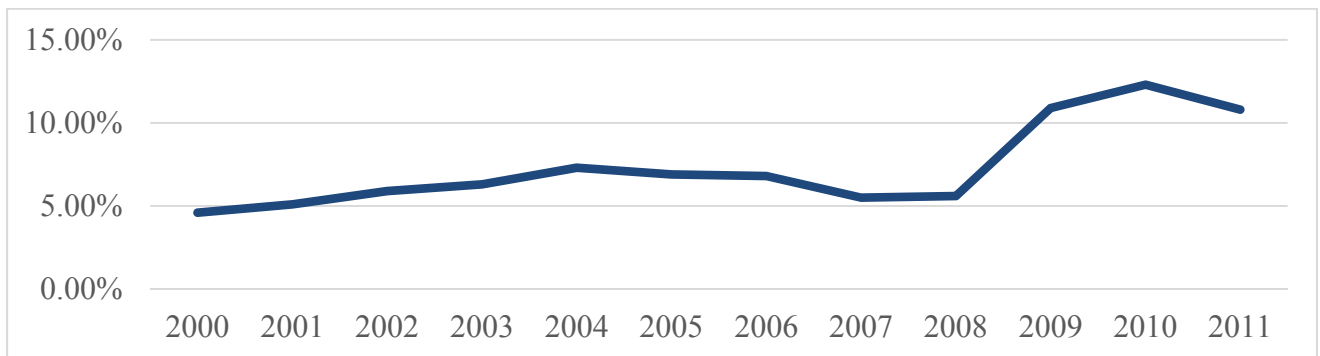
Figure 5: Brooke County Employment by 5 Sectors 2001-2012



Source: Workforce WV

The civilian labor force in the county is one of the most interesting statistics when determining potential investors. As Map 3 shows, Brooke’s participation rate is at the higher end of the scale. This is a good sign for a county facing many obstacles, and sets it apart from many of the coalfield counties. Despite a small rise from the national economic contraction in the early 2000s, unemployment was decreasing until the recession in 2008 and manufacturing industry decline around the same period. (Figure 6). Unemployment has slowly been falling, and in 2011 was slightly above the state average. Note that 2011 data is used for this graph and map, as the data for Workforce WV and the Census Bureau did not match because the most recent data has not been seasonally adjusted.

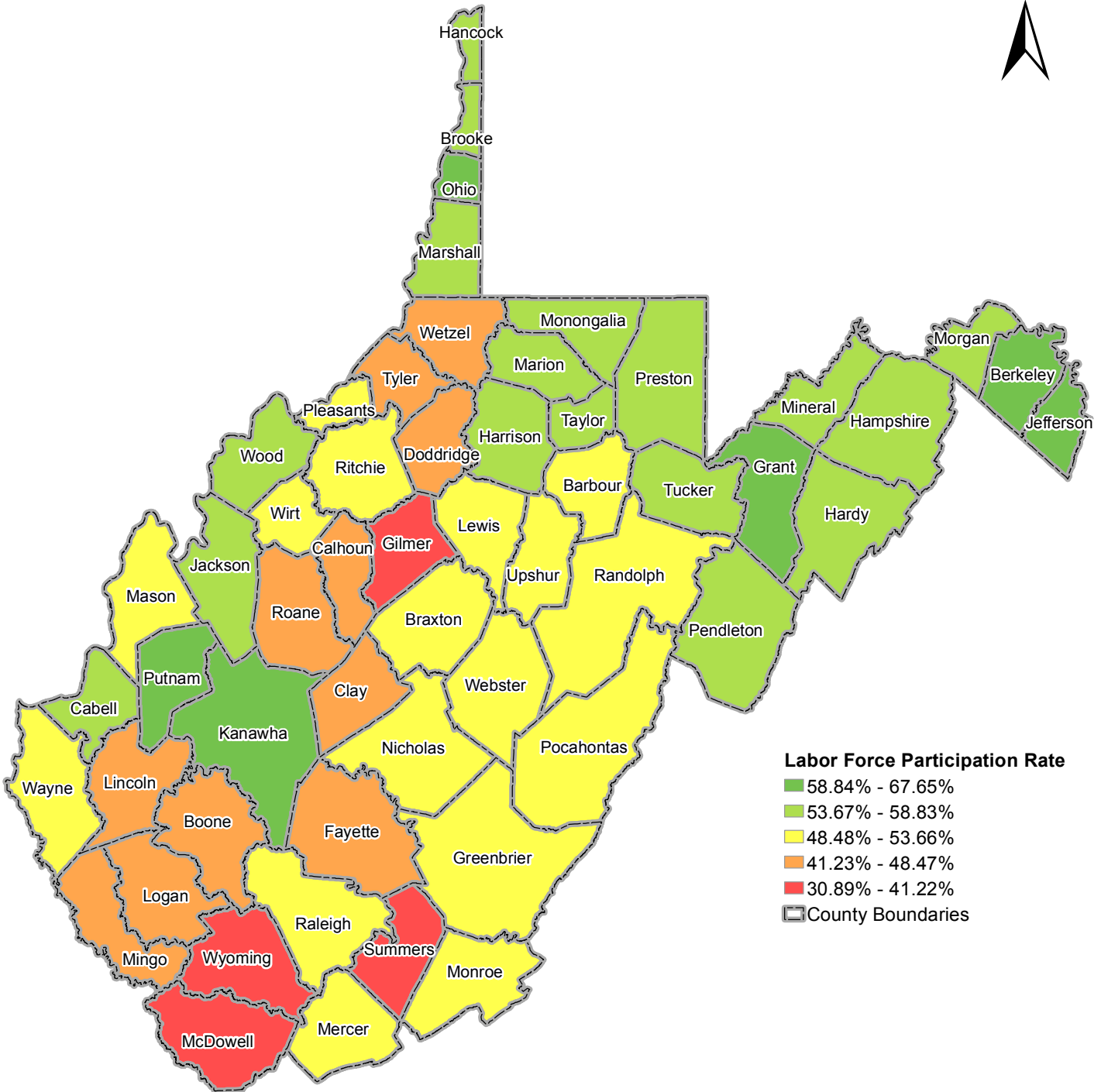
Figure 6: Brooke County Unemployment Rate



Source: Workforce WV

Demographic

Labor Force Participation Rate



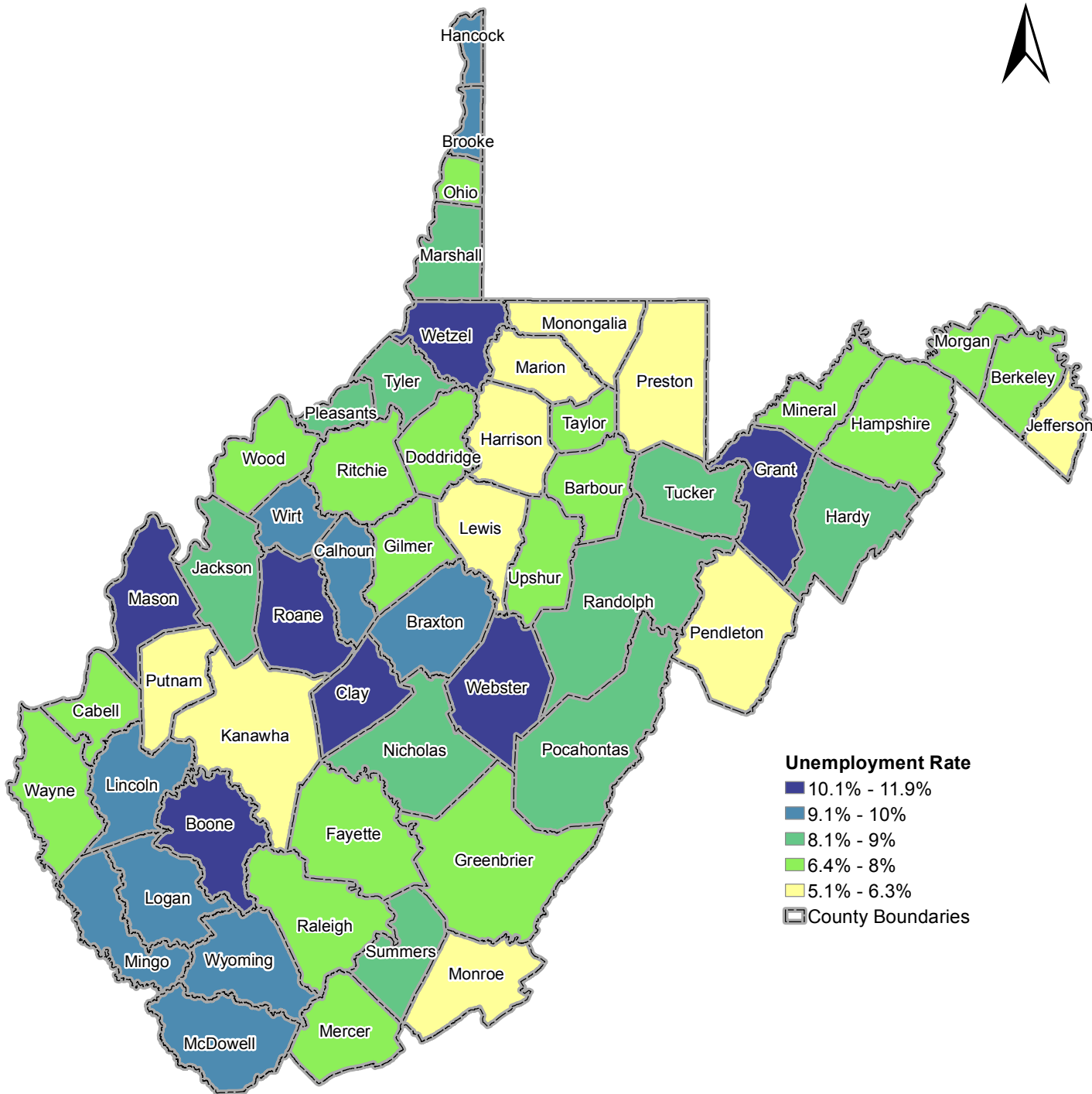
Source: U.S. Census Bureau, 2008-2012 American Community Survey

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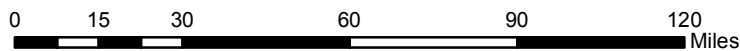


www.njrati.org

Demographic Unemployment Rate



Unemployment Rate
 ■ 10.1% - 11.9%
 ■ 9.1% - 10%
 ■ 8.1% - 9%
 ■ 6.4% - 8%
 ■ 5.1% - 6.3%
 □ County Boundaries



Source: United States Census Bureau 2011

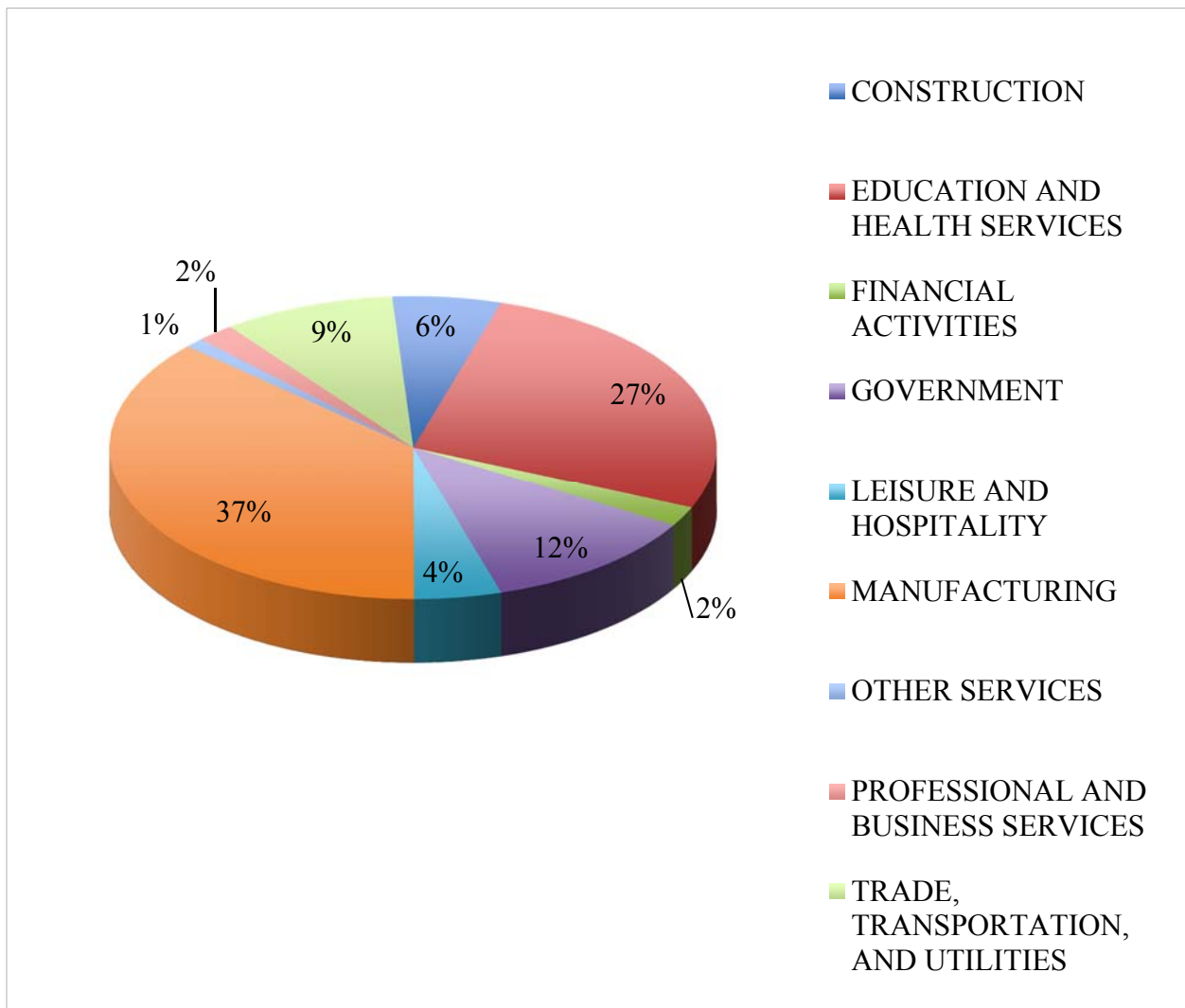
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Wages and Income

Brooke County's main wage contributors are Manufacturing and Education and Health Services, due to the size of the sectors in the county. Government and Trade, Transportation and Utilities follow far behind, and finally Construction becomes one of the top 5 wage earners, as Leisure and Hospitality jobs are mostly minimum wage (Figure 7).

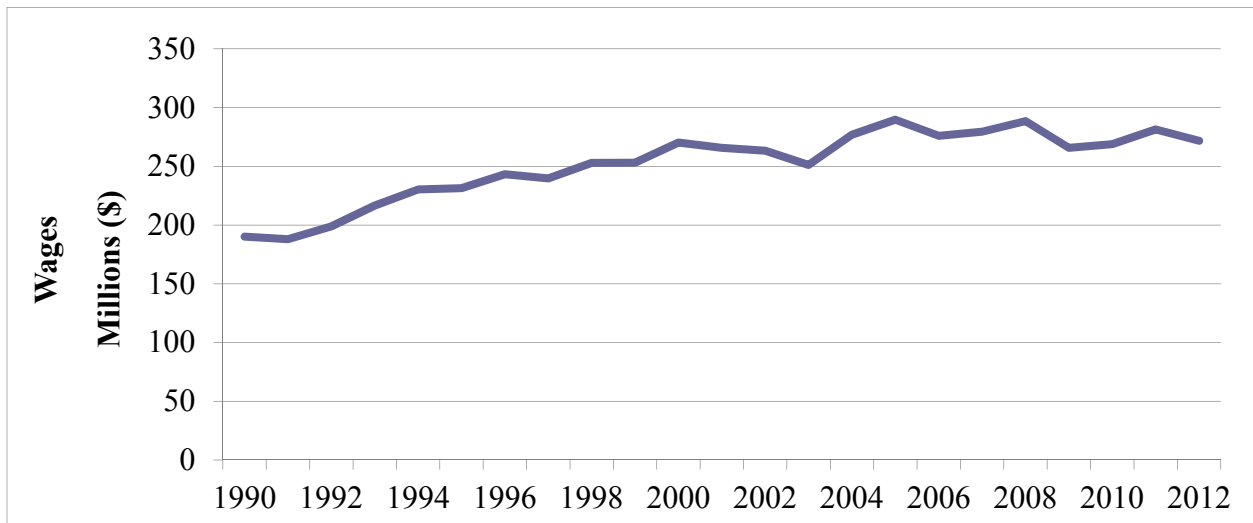
Figure 7: 2012 Brooke County Total Wages



Source: Workforce WV

Historically, wages for Brooke County have shown a tendency to rise, though somewhat erratically. Brooke County has managed to replace manufacturing jobs with education and health services jobs, but the results of manufacturing layoffs and closures can be seen in Figure 8. Figure 8 shows total wages for Brooke County, which have shown an erratic upward trajectory until the recession years, when unemployment spiked.

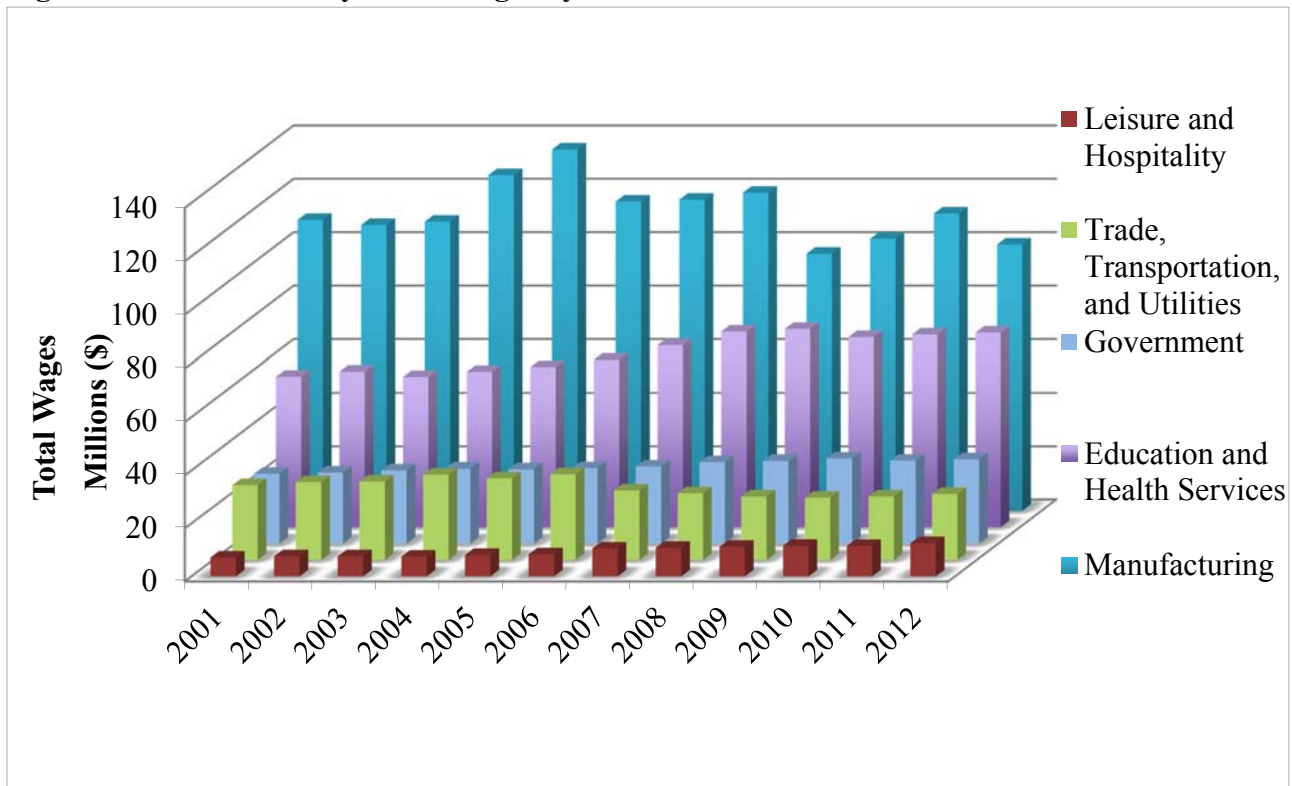
Figure 8: Brooke County Total Wages 1990-2012



Source: Workforce WV

Figure 9 confirms the general trend in wages, also showcasing the dominance of two major sectors. Manufacturing’s decline is showcased pretty clearly in the fall of wages, but still is the dominant wage sector. Figure 9 also shows the rise in Education and Health Services wages, but those wages have not risen enough to replace the lost manufacturing wages.

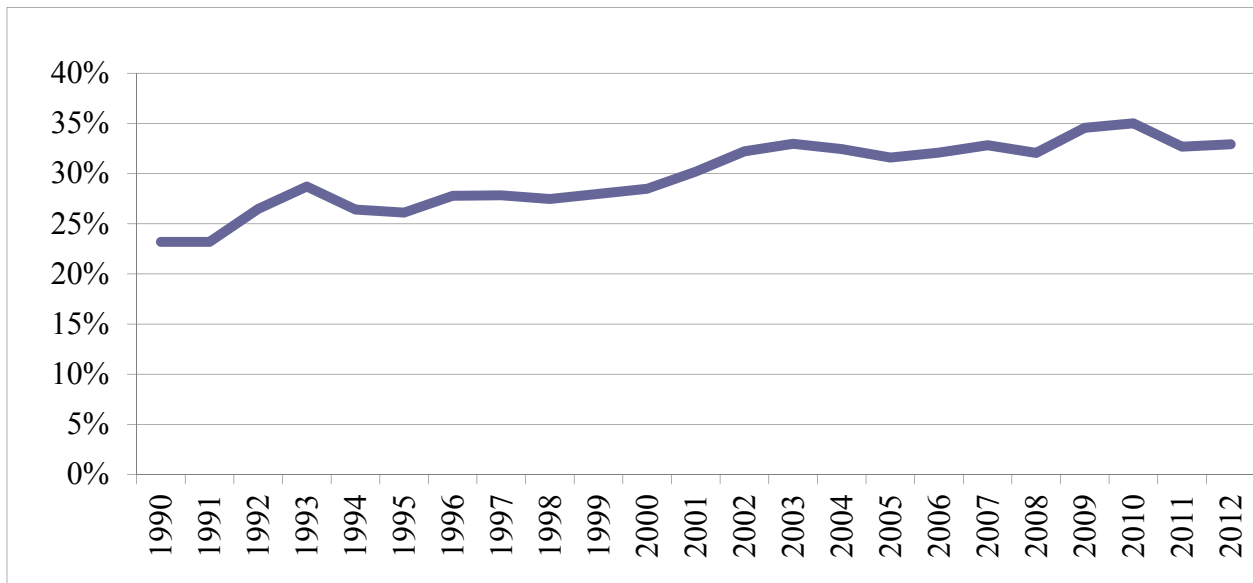
Figure 9: Brooke County Total Wages by 5 Sectors 2001-2012



Source: Workforce WV

In most American counties, one would find that the majority of income for people stems from wages. In West Virginia, however, an important distinction must be made between income and wages. Income is the total receipt of earnings resulting from any economic activity, while wages are derived from actual work in an employed setting. Therefore, dividends from stockholdings are considered income, but not wages. The distinction is necessary in the case of Brooke County because in 2012, Brooke County wages were \$272 million for all industries.⁴ Income for the County was larger (around \$806 million). Though there are many components to income other than work earnings, 28 percent of total Brooke County income is derived from government transfers.⁵ Government transfers accounted for about 95 percent of total transfers to Brooke County, dwarfing transfers from private institutions such as charities. Government transfers have consistently contributed between 15 percent to almost a third of income over the past 20 years. This does not count the wages for government workers. This percentage is lower than most of the counties and is just above the state average.

Figure 10: Government Transfers as a Percentage of Income for Brooke County



Source: United States Bureau of Economic Analysis

The total personal income of Brooke County is therefore made up of 28 percent government transfers and 56 percent earnings from work. Brooke County has just above the average rate of government transfers. According to the BEA, per capita income was \$33,805 for Brooke County

⁴ “Employment and Wages – 2012, Brooke County,” Workforce WV, Accessed February 13, 2014, <http://www.workforcewv.org/lmi/EW2011/ew11x059.htm>

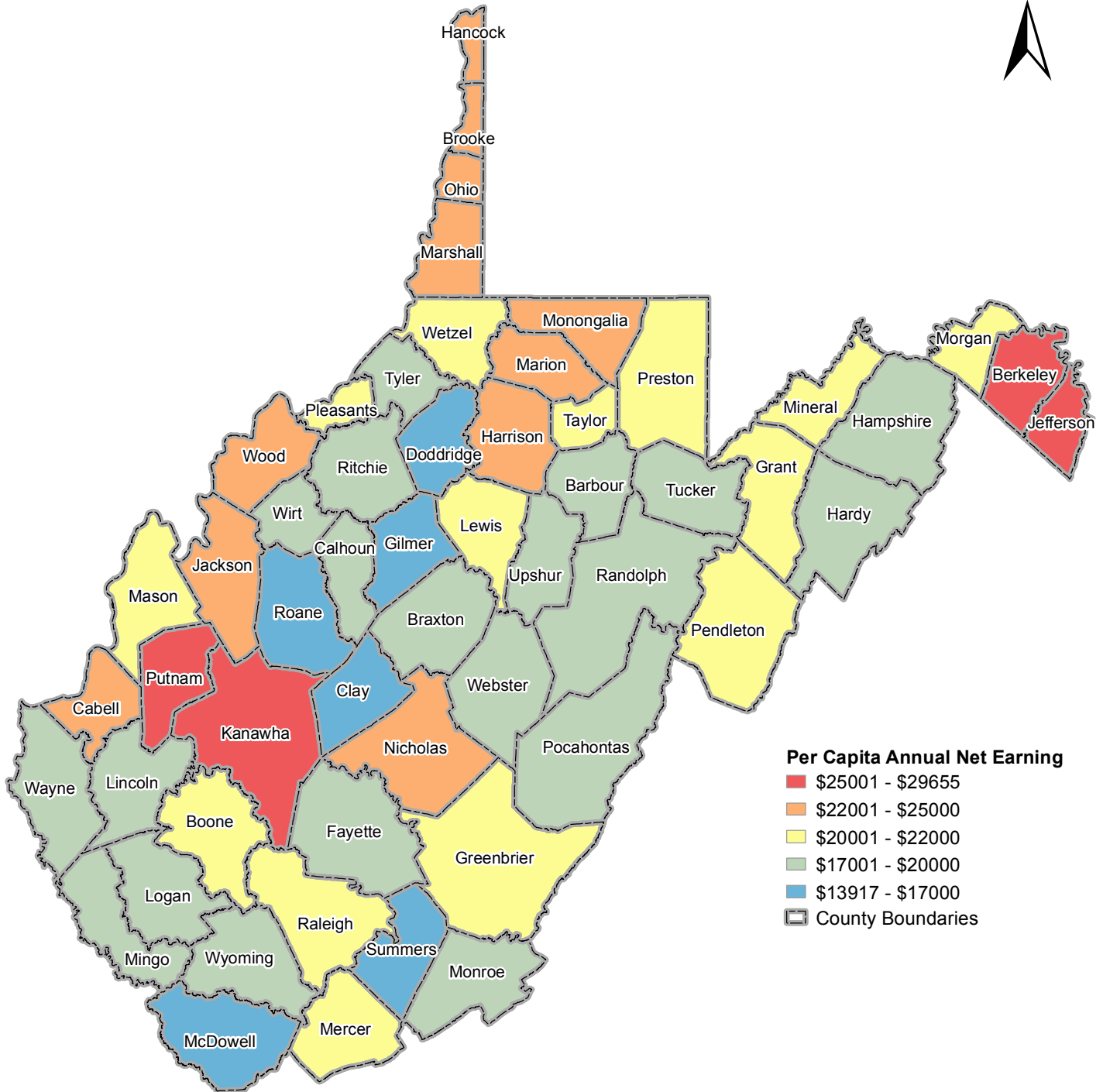
⁵ “Tables CA 04 and CA 35 analysis,” Bureau of Economic Analysis, Regional Economic Accounts, Local Area Person Income and Employment, Accessed February 13, 2014, <http://www.bea.gov/regional/index.htm>.

in 2012. Annual net earning, or income from work, is displayed in Map 5, and Brooke is ranked above average in earned income in West Virginia.

Another measure of economic health is the number of establishments that do business in the area. Map 6 shows the number of establishments in each county in West Virginia. Brooke County appears to be at the lowest end of the spectrum. The number of establishments may be misleading, as the manufacturing sector and education and health service are often characterized by a small number of firms.

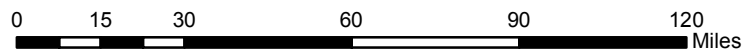
Demographic

Per Capita Annual Net Earning



Per Capita Annual Net Earning

- \$25001 - \$29655
- \$22001 - \$25000
- \$20001 - \$22000
- \$17001 - \$20000
- \$13917 - \$17000
- County Boundaries



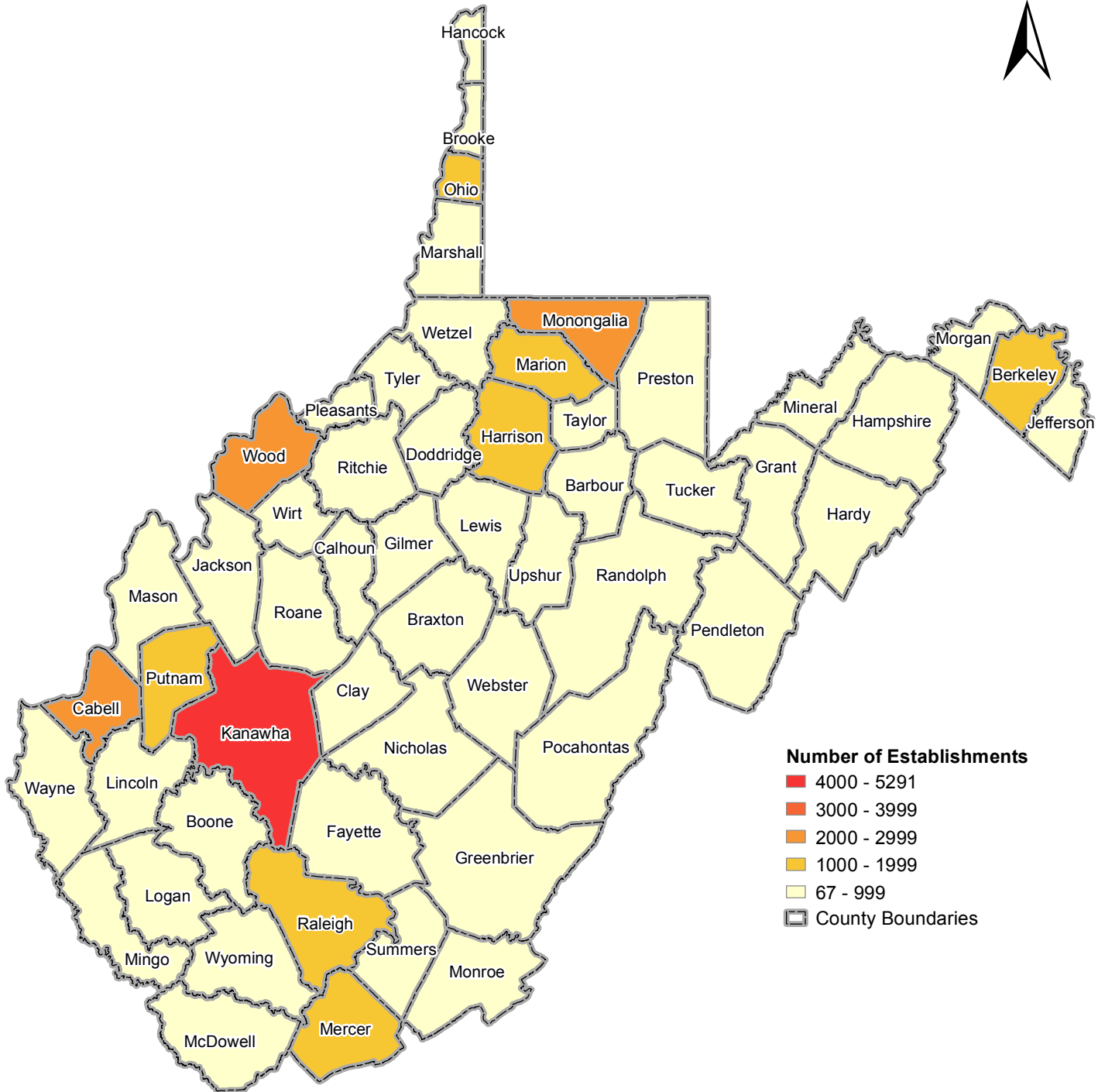
Source: U.S. Census Bureau, 2008-2012 American Community Survey

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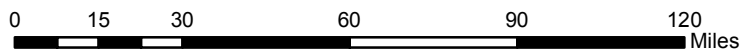
Demographic

Number of Establishments



Number of Establishments

- 4000 - 5291
- 3000 - 3999
- 2000 - 2999
- 1000 - 1999
- 67 - 999
- County Boundaries



Source: U.S. Census Bureau, 2011

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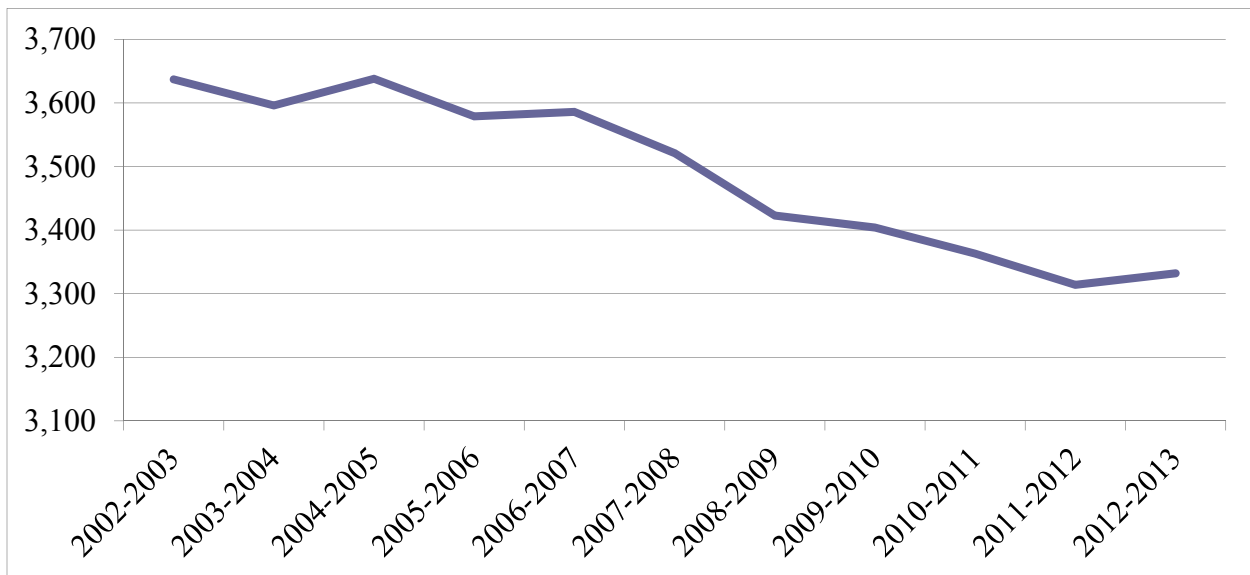


Education

Brooke County has one high school, two middle schools, and seven primary schools as of the 2012-2013 school year.⁶

Brooke County 2nd month school enrollment has shown a consistent decline, most likely due to parents who have lost their jobs due to the decline of the manufacturing sector moving out. Schools have seen a decrease in enrollment of about 10 percent since the 2002-2003 school year (Figure 11). However, Brooke County still has a sizable student population compared to many other counties (Map 7).

Figure 11: Brooke County School Enrollment

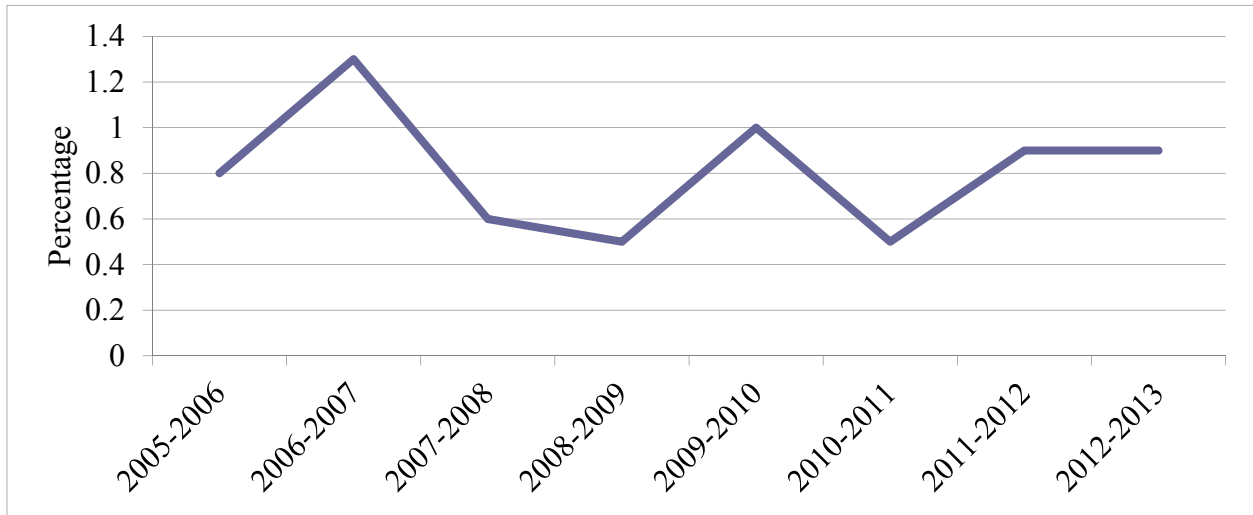


Source: WVEIS

The West Virginia Education Information System (WVEIS) also has dropout rates for the school years from 2005 to 2013. Dropout rates for grades 7-12, which showcase the most likely time for school dropouts, do not follow the total enrollment statistic, as total enrollment is computed with the grades below 7th grade as well. Dropout rates have been erratic, ranging from a low of .5 percent in 2008-2009 and 2010-2011 to a high of 1.3 in 2006-2007 (Figure 12).

⁶ “School Profiles,” West Virginia Education Information System, West Virginia Department of Education, Accessed February 13, 2014, http://wveis.k12.wv.us/nclb/profiles/c_profile.cfm?cn=043.

Figure 12: Brooke County Dropout Rate

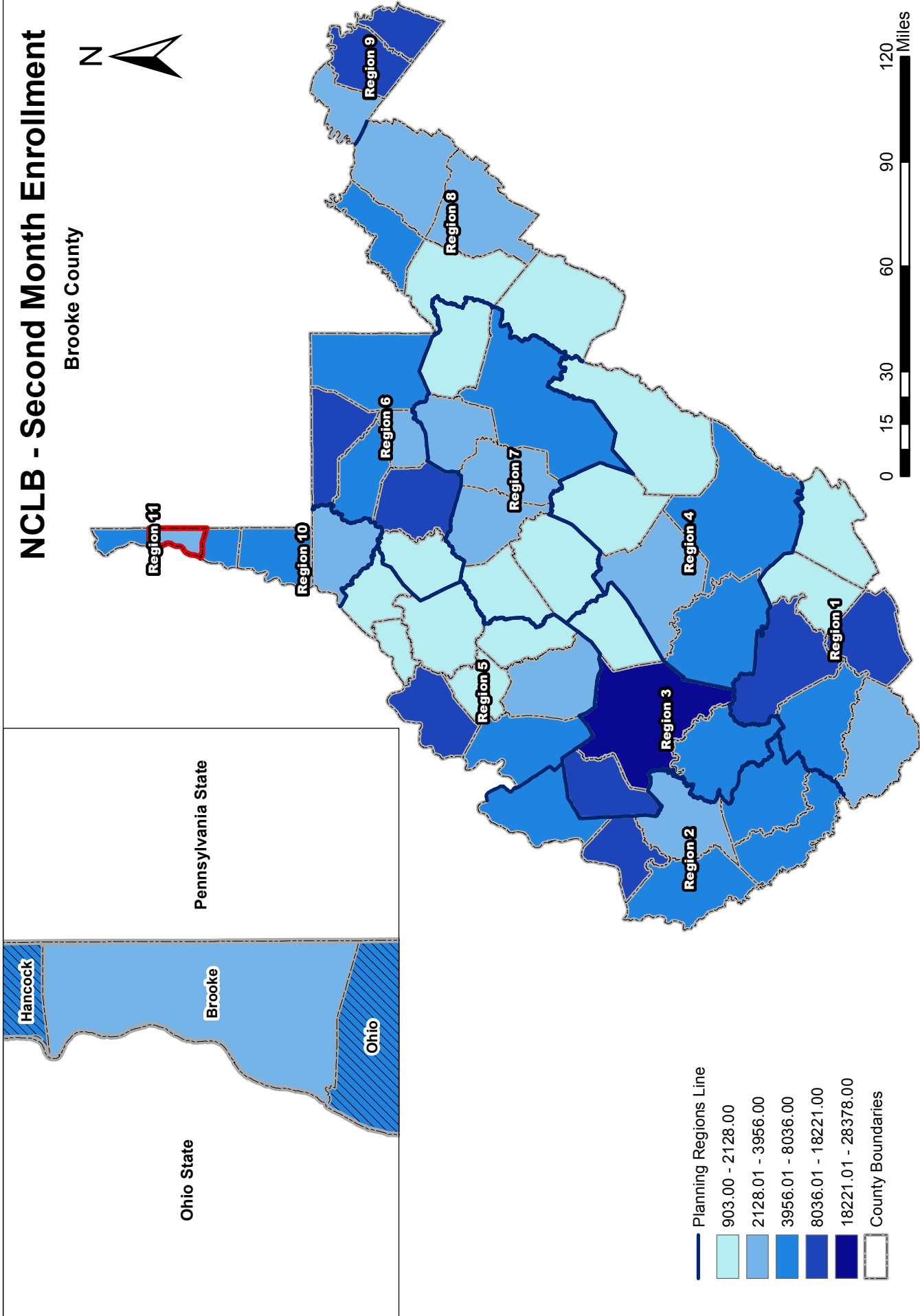


Source: WVEIS

Map 8 shows each county's dropout rate. Brooke County currently has a below average dropout rate, resulting from a combination of education services and the lack of value in dropping out of high school. Maps 9 and 10 show the total graduates and the graduation rate by county, both of which are just below average for the state. Brooke County's ten schools' locations are noted in Map 11. Not coincidentally, the major schools are located on the main roads in the county. The largest school by attendance is Brooke High School, which is the county's only high school. The significance of the locations of these schools is the access to major transportation routes. The schools appear to be built in order for parents and students to maintain steady access, which is important to discourage dropping out and to maintain attendance levels.

NCLB - Second Month Enrollment

Brooke County



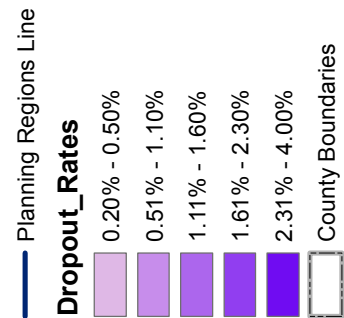
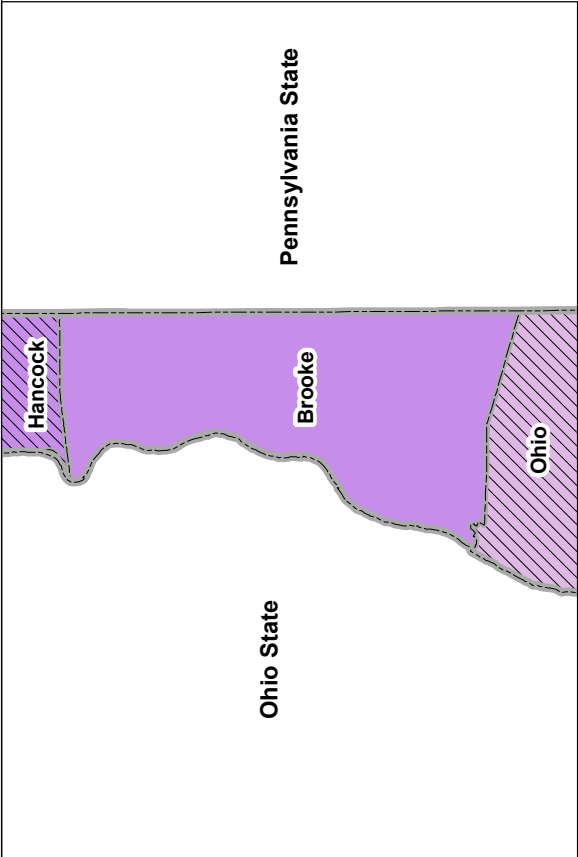
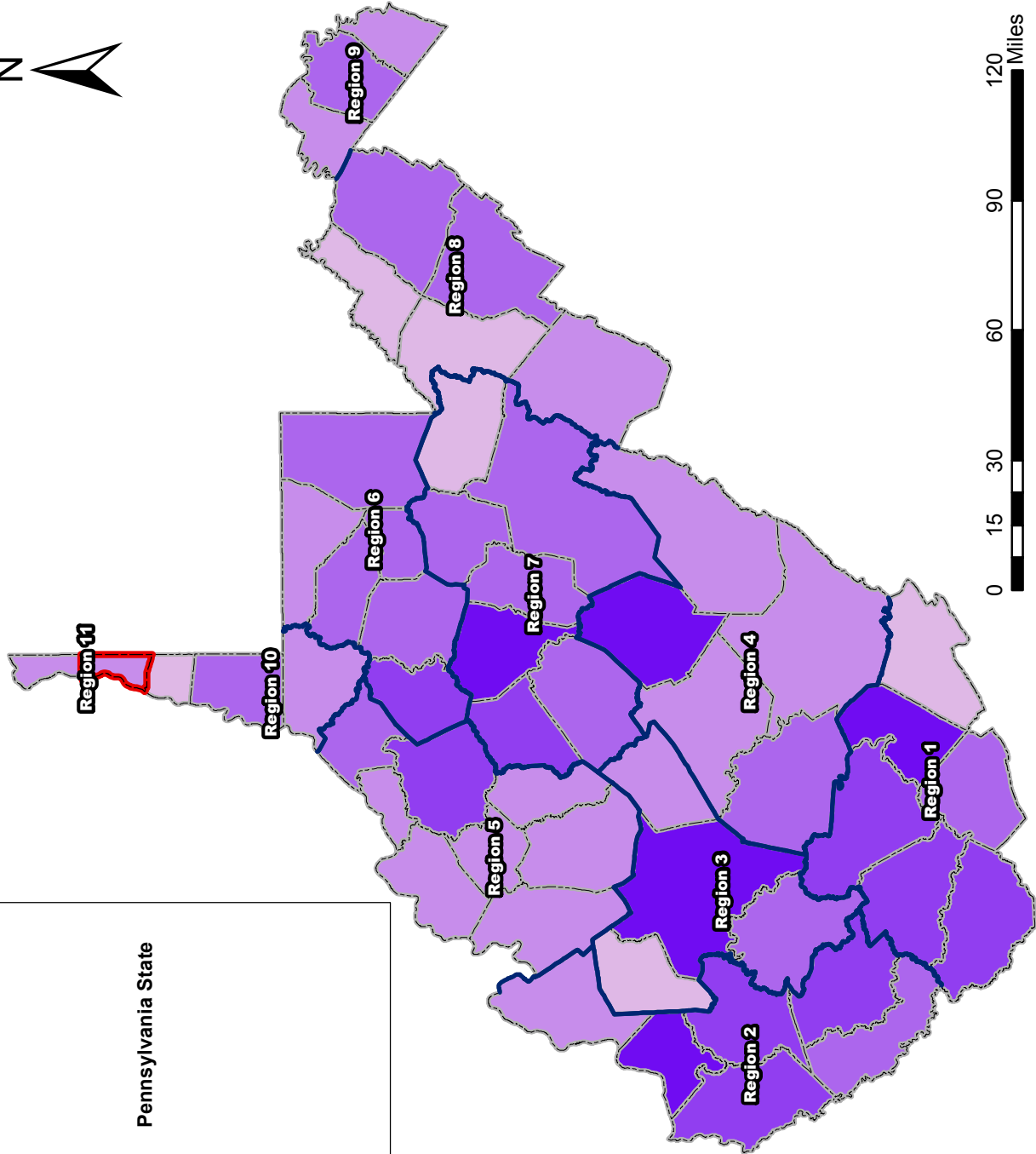
Source: West Virginia Department of Education 2014

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NCLB - Dropout Rate

Brooke County



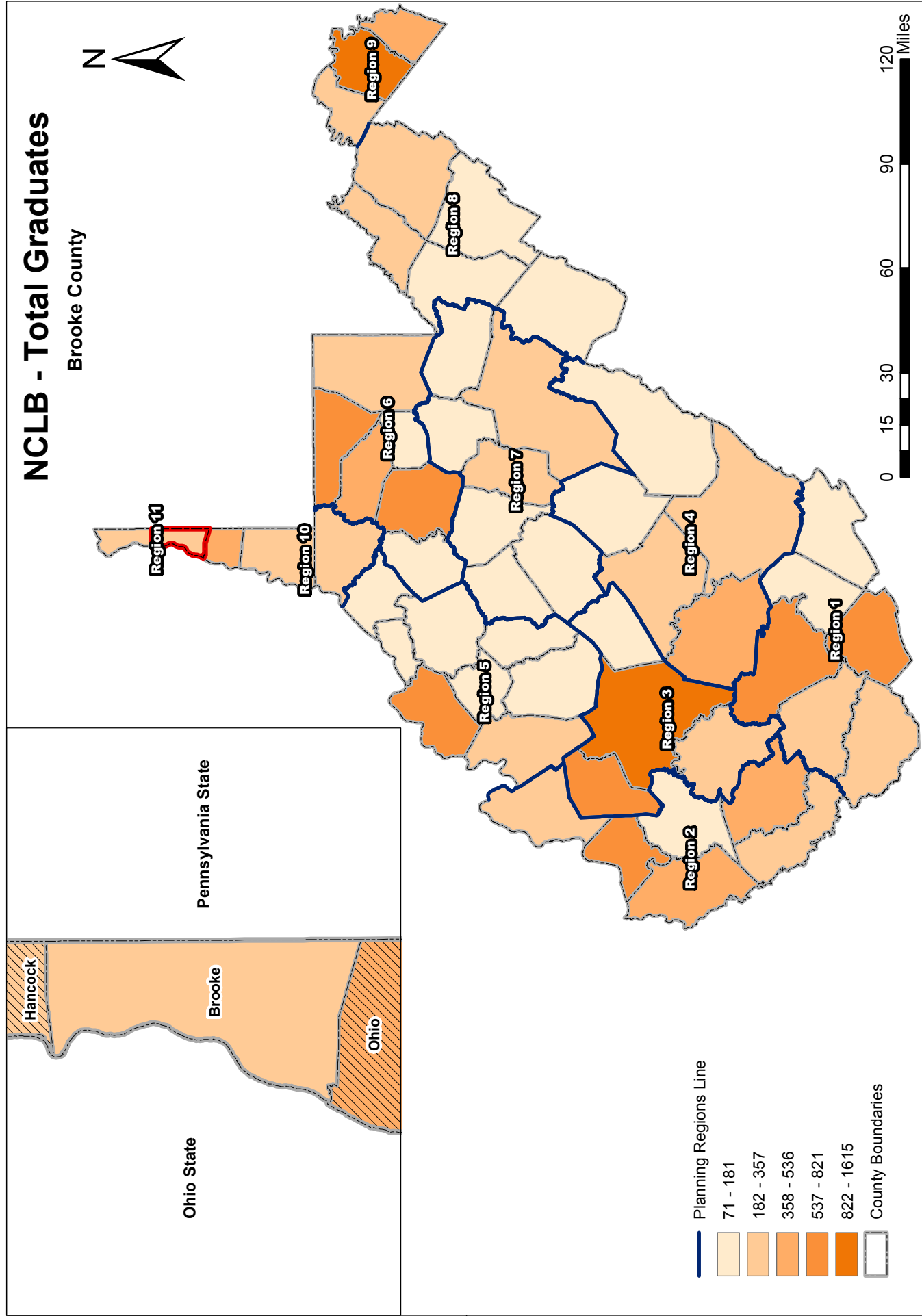
Source: West Virginia Department of Education 2014

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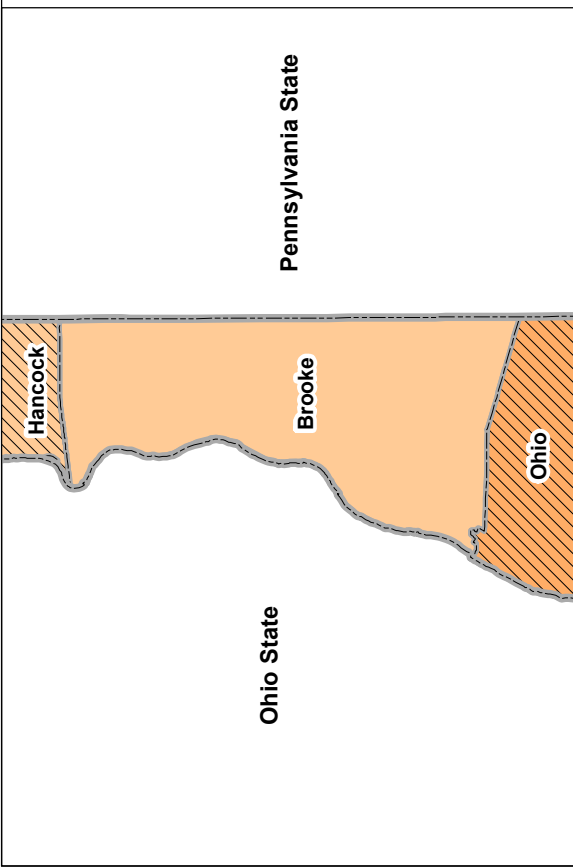


NCLB - Total Graduates

Brooke County



- Planning Regions Line
- 71 - 181
- 182 - 357
- 358 - 536
- 537 - 821
- 822 - 1615
- County Boundaries

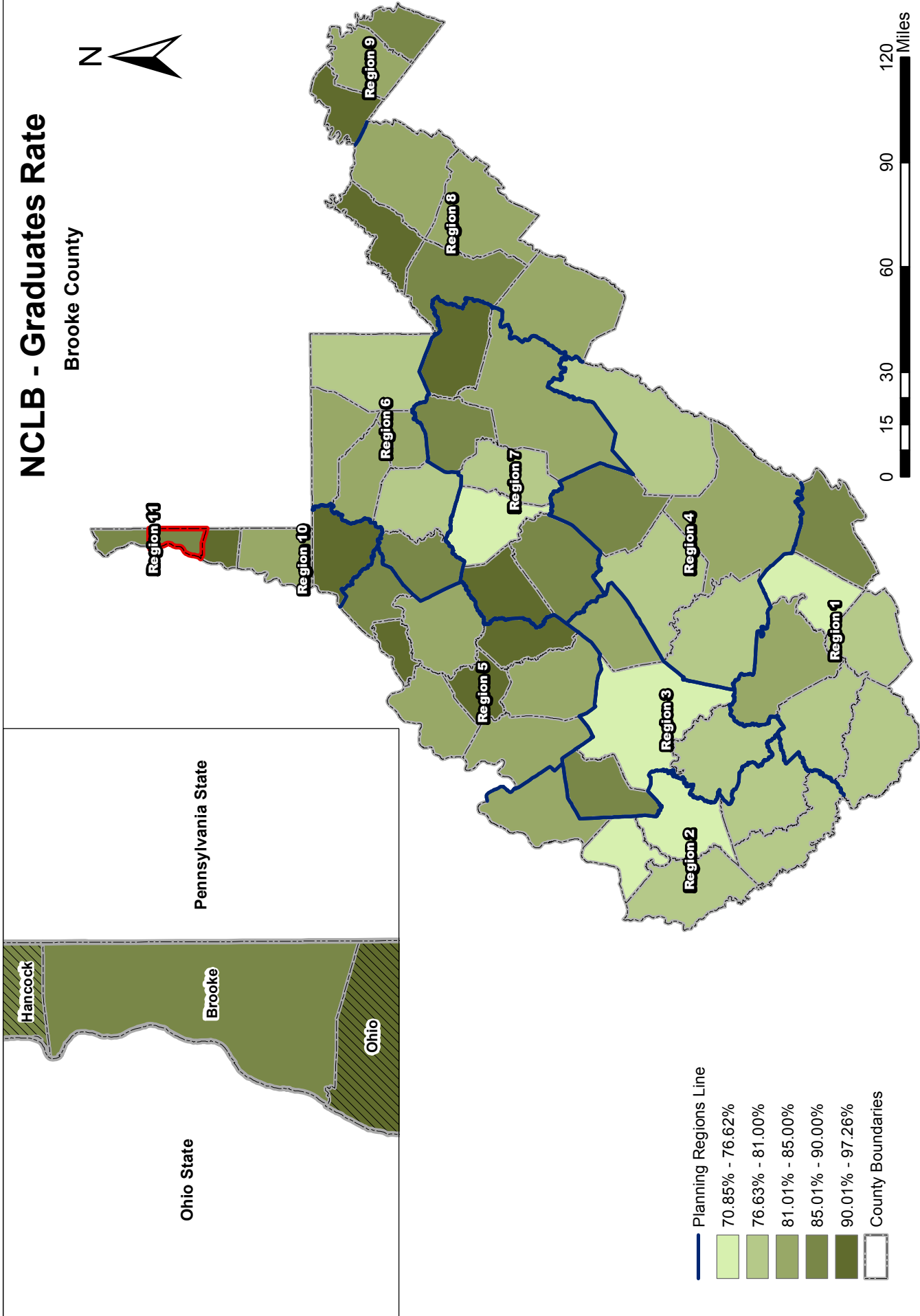


Source: West Virginia Department of Education 2013

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NCLB - Graduates Rate

Brooke County

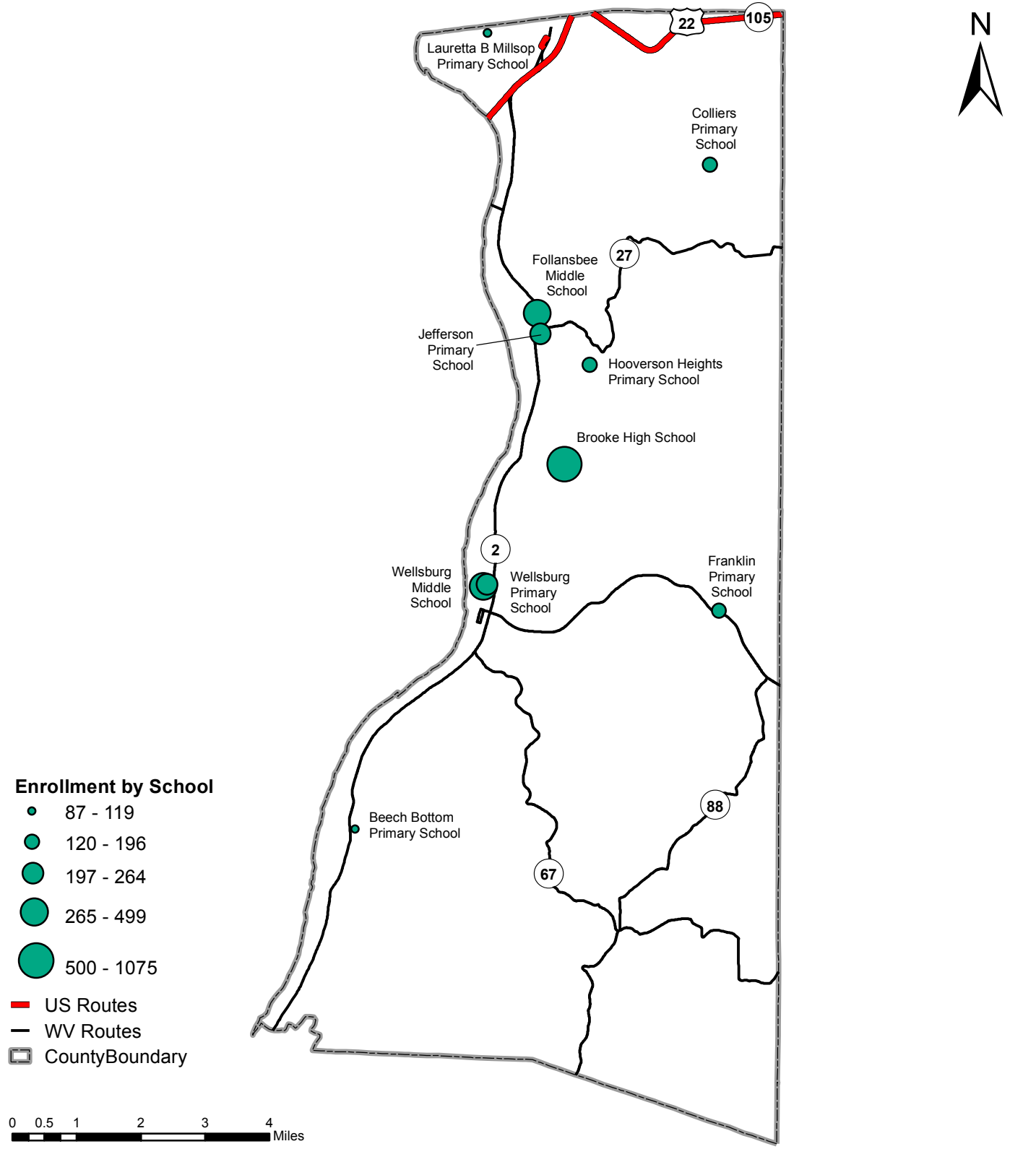


Source: West Virginia Department of Education 2014

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Total Attendance by School - 2014

Brooke County



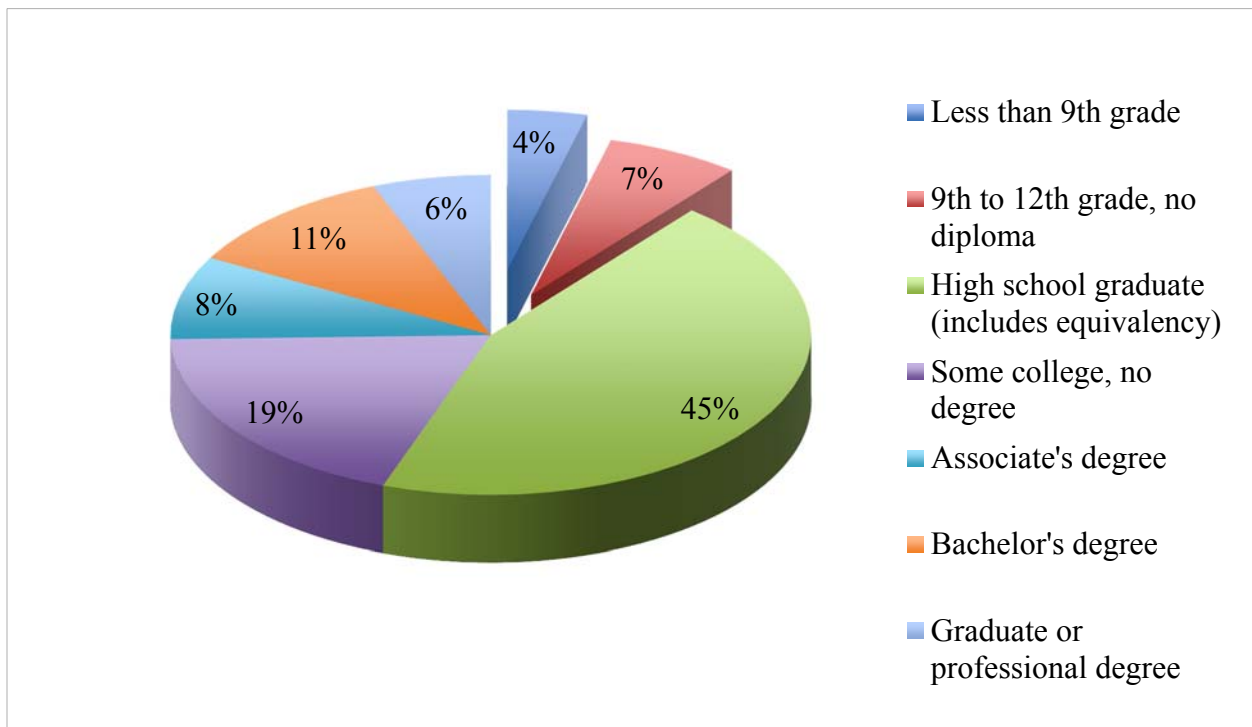
Source: West Virginia Department of Education 2014

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The ACS also maintains data on the educational attainment of the population that is 25 years and over. Forty-five percent of these residents have a high school diploma or equivalent. Only 11 percent has less than a high school education. This is a low number that indicates great success in educational achievement and may potentially pay dividends for the county in higher wages and better employment in the future.

Figure 13: Brooke County Educational Attainment



Source: 2012 American Community Survey 5-Year Estimates

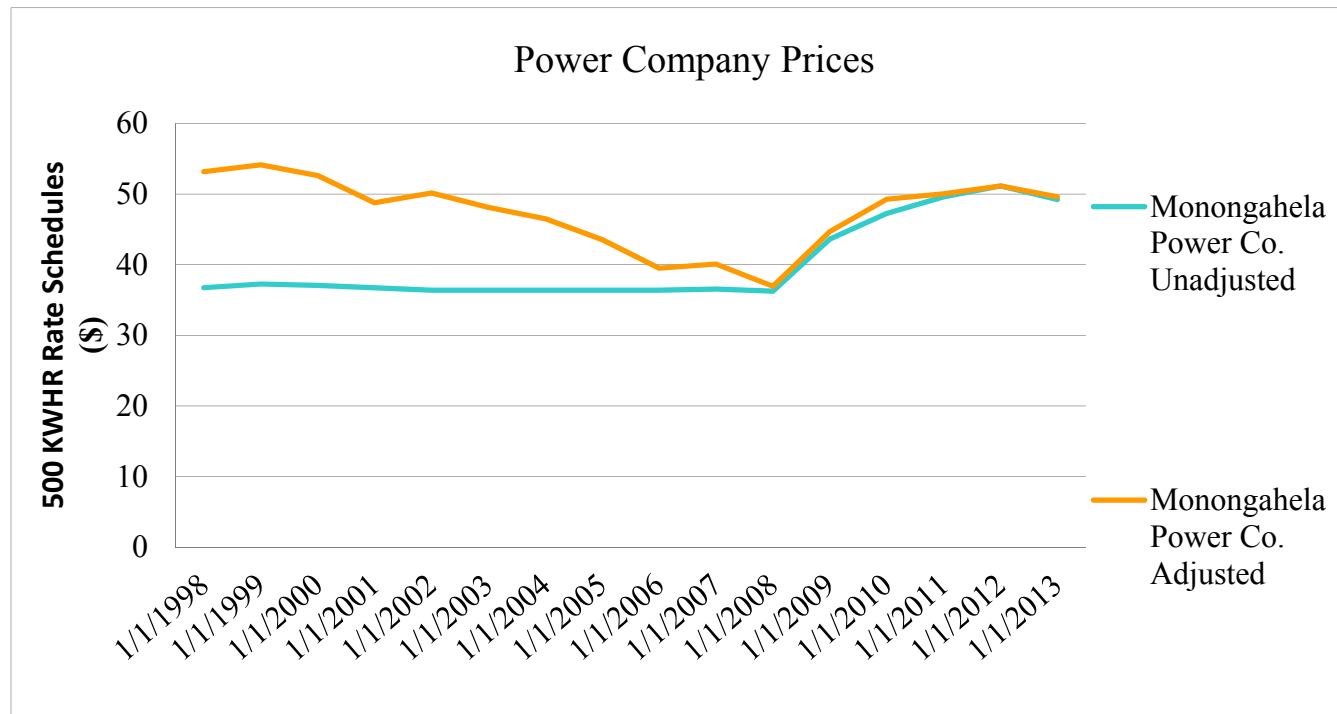
Utilities and Infrastructure

Brooke County has 18 utility companies according to the West Virginia Public Service Commission (PSC). Economic development depends on infrastructure, and Brooke County has several providers of water and sewer, and one provider of electricity. Monongahela Power Company provides residential, industrial, and large-capacity service to Brooke County.

The West Virginia Public Service Commission maintains tariff rates for all companies involved in providing utilities. Of particular importance are electricity tariffs; the monitoring of these tariffs is an ongoing project. To that end, the PSC observes the growth rate of tariffs and possesses a 20-year comparison based on the average residential utility rate of the State. This provides a significant overview of how electric prices behave in West Virginia as a whole. As Figure 14 shows, if the tariffs are not adjusted by the Consumer Price Index (CPI), it would appear that rates are constantly increasing. Viewing rates in such a manner would be a misunderstanding, and would be incorrect in reference to a State with the highs and lows of West

Virginia’s past. The Bureau of Labor Statistics has a CPI for electricity prices dating from 1998 to 2012. The adjusted and unadjusted prices are provided in Figure 14.

Figure 14: Power Company Prices



Source: WV Public Service Commission and United States Bureau of Labor Statistics

The graph shows that electricity rates steadily decreased in real terms through 2006 and remained fairly constant with adjustment. Both adjusted and unadjusted prices have increased since 2006. Many possible factors contributed to this rise, including the increased costs of energy and the increased demand. Map 12 also shows the distribution of power lines, plants, and substations within West Virginia and Brooke County.

The two other utilities of particular importance are water and sewer. Table 1 displays water and sewer metered rates for the providers of those services. They are all public services with varying rates and categories. Brooke County has 9 public sewer and water providers. Maps 13 and 14 show the water and sewer facilities and the served areas for each of these utilities, as well as the solid waste management facilities in West Virginia, including one operational landfill in Brooke County.

Table 1: Brooke County Water and Sewer Rates

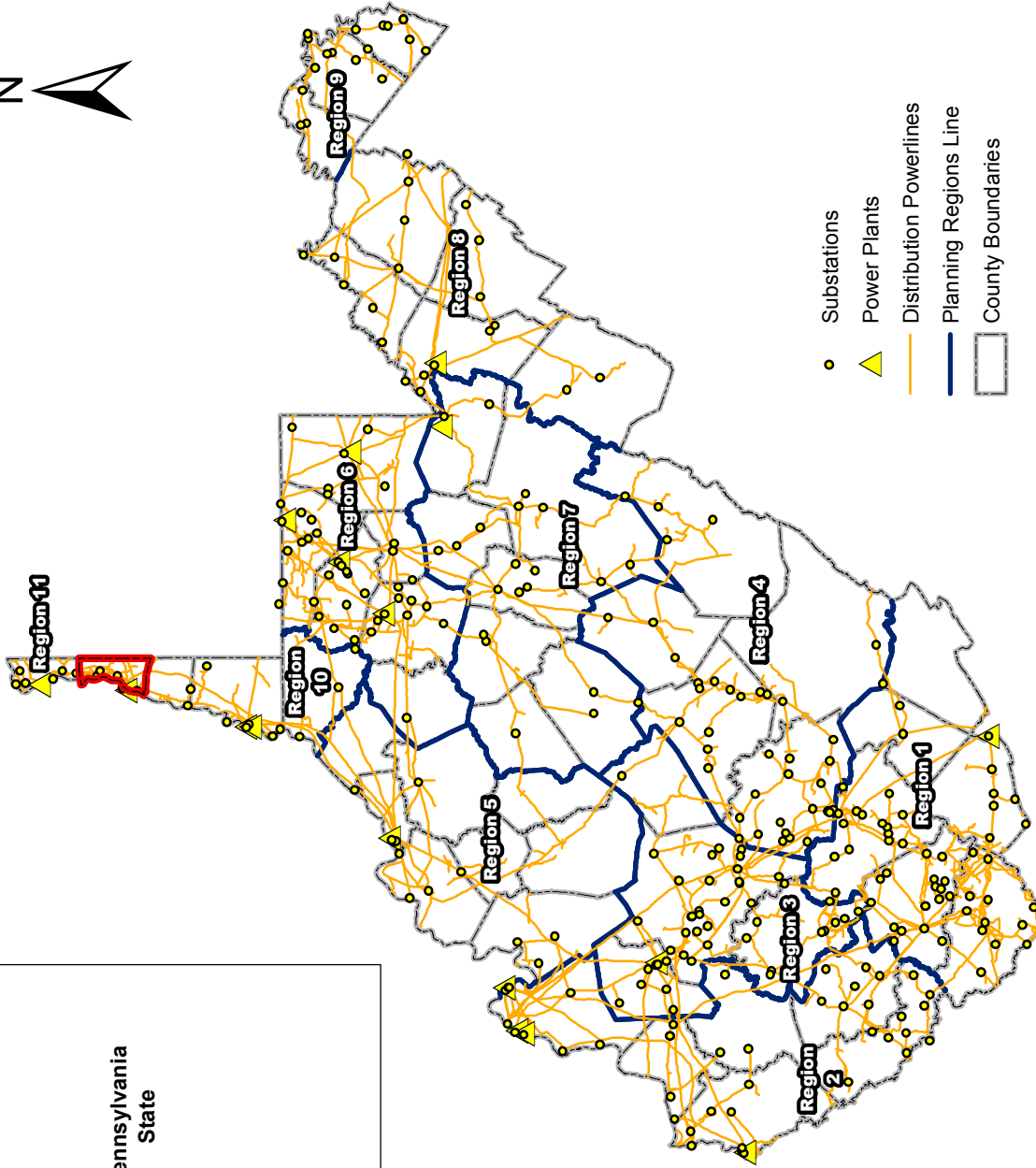
| Brooke County Public Service District | |
|---------------------------------------|-----------------------|
| Water Rates | |
| First 5000 gallons used per month | 9.64 per 1000 gallons |
| All Over 5000 gallons used per month | 7.74 per 1000 gallons |

| | |
|---|------------------------|
| Sewer Rates | |
| First 5000 gallons used per month | 9.04 per 1000 gallons |
| All Over 5000 gallons used per month | 7.27 per 1000 gallons |
| Ohio County Public Service District | |
| Water Rates | |
| First 3000 gallons used per month | 9.89 per 1000 gallons |
| Next 5000 gallons used per month | 7.51 per 1000 gallons |
| Next 92000 gallons used per month | 6.88 per 1000 gallons |
| Next 400000 gallons used per month | 6.55 per 1000 gallons |
| Next 500000 gallons used per month | 5.76 per 1000 gallons |
| Next 1000000 gallons used per month | 5.37 per 1000 gallons |
| Hammond Public Service District | |
| Water Rates | |
| First 3000 gallons used per month | 10.68 per 1000 gallons |
| Next 3000 gallons used per month | 9.07 per 1000 gallons |
| Next 4000 gallons used per month | 7.75 per 1000 gallons |
| Next 10000 gallons used per month | 5.41 per 1000 gallons |
| All Over 20000 gallons used per month | 3.94 per 1000 gallons |
| Washington Pike Public Service District | |
| Water Rates | |
| All amounts used per month | 5.86 per 1000 gallons |
| City of Follansbee | |
| Water Rates | |
| All amounts used per month | 5.33 per 1000 gallons |
| Sewer Rates | |
| All amounts used per month | 9.41 per 1000 gallons |
| City of Weirton | |
| Water Rates | |
| All amounts used bi-monthly | 5.50 per 1000 gallons |
| Sewer Rates (Sanitary Board) | |
| All amounts used bi-monthly | 3.61 per 1000 gallons |
| City of Wellsburg | |
| Water Rates (Municipal Water Department) | |
| First 2000 gallons used per month | 4.61 per 1000 gallons |
| Next 18000 gallons used per month | 4.28 per 1000 gallons |
| All Over 20000 gallons used per month | 2.71 per 1000 gallons |
| Sewer Rates (Sanitary Board) | |
| First 2000 gallons used per month | 10.70 per 1000 gallons |
| Next 3000 gallons used per month | 10.01 per 1000 gallons |

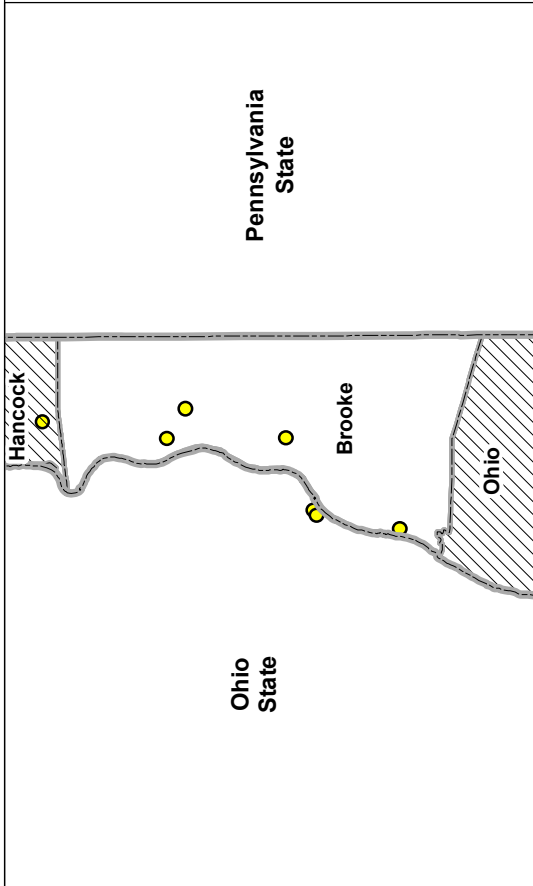
| | |
|--|-----------------------|
| Next 10000 gallons used per month | 9.32 per 1000 gallons |
| Next 10000 gallons used per month | 7.92 per 1000 gallons |
| Next 25000 gallons used per month | 6.22 per 1000 gallons |
| Next 50000 gallons used per month | 4.49 per 1000 gallons |
| All Over 100000 gallons used per month | 3.80 per 1000 gallons |
| Village of Beech Bottom | |
| Water Rates (Water Department) | |
| First 4000 gallons used per month | 6.64 per 1000 gallons |
| Next 6000 gallons used per month | 5.00 per 1000 gallons |
| All Over 10000 gallons used per month | 4.00 per 1000 gallons |
| Town of Bethany | |
| Sewer Rates (Sanitation Board) | |
| All amounts used per month | 8.26 per 1000 gallons |

Utilities - Electricity

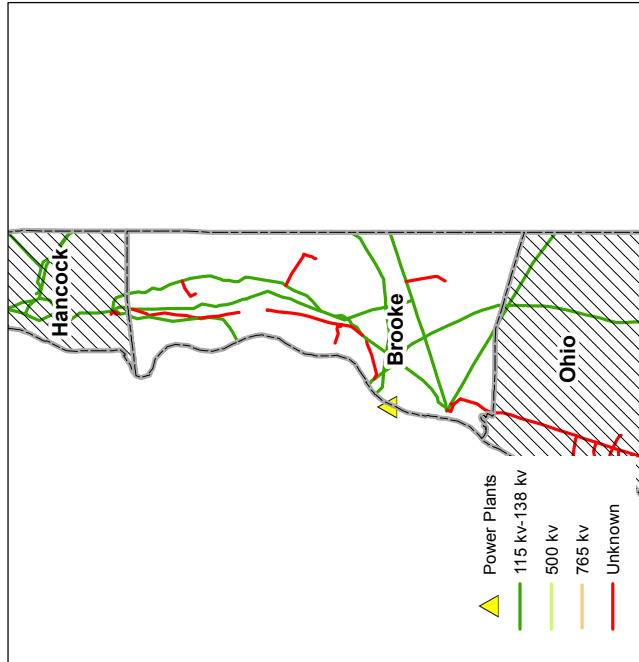
Brooke County



- Substations
- Power Plants
- Distribution Powerlines
- Planning Regions Line
- County Boundaries



● Electricity Substations



- Power Plants
- 115 kv-138 kv
- 500 kv
- 765 kv
- Unknown

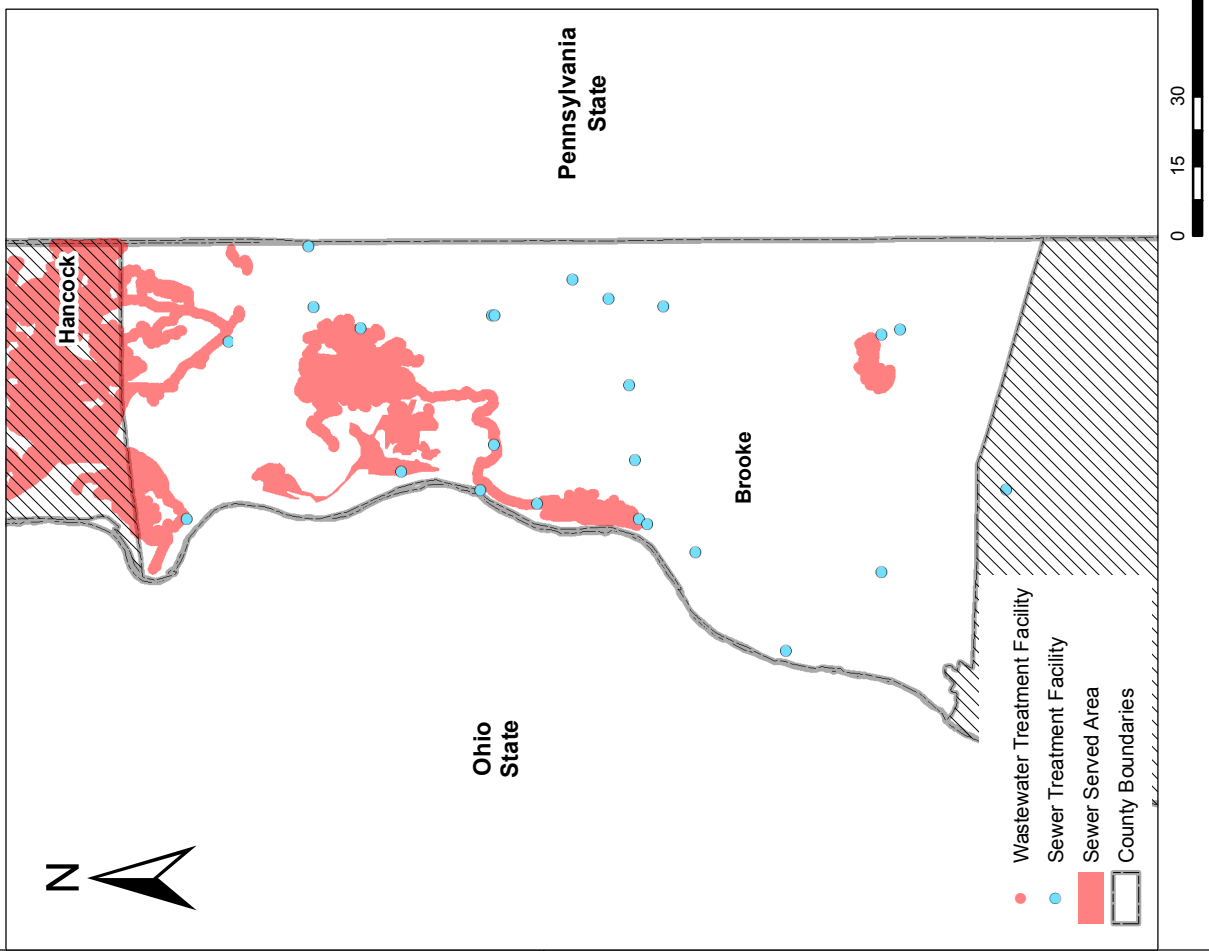
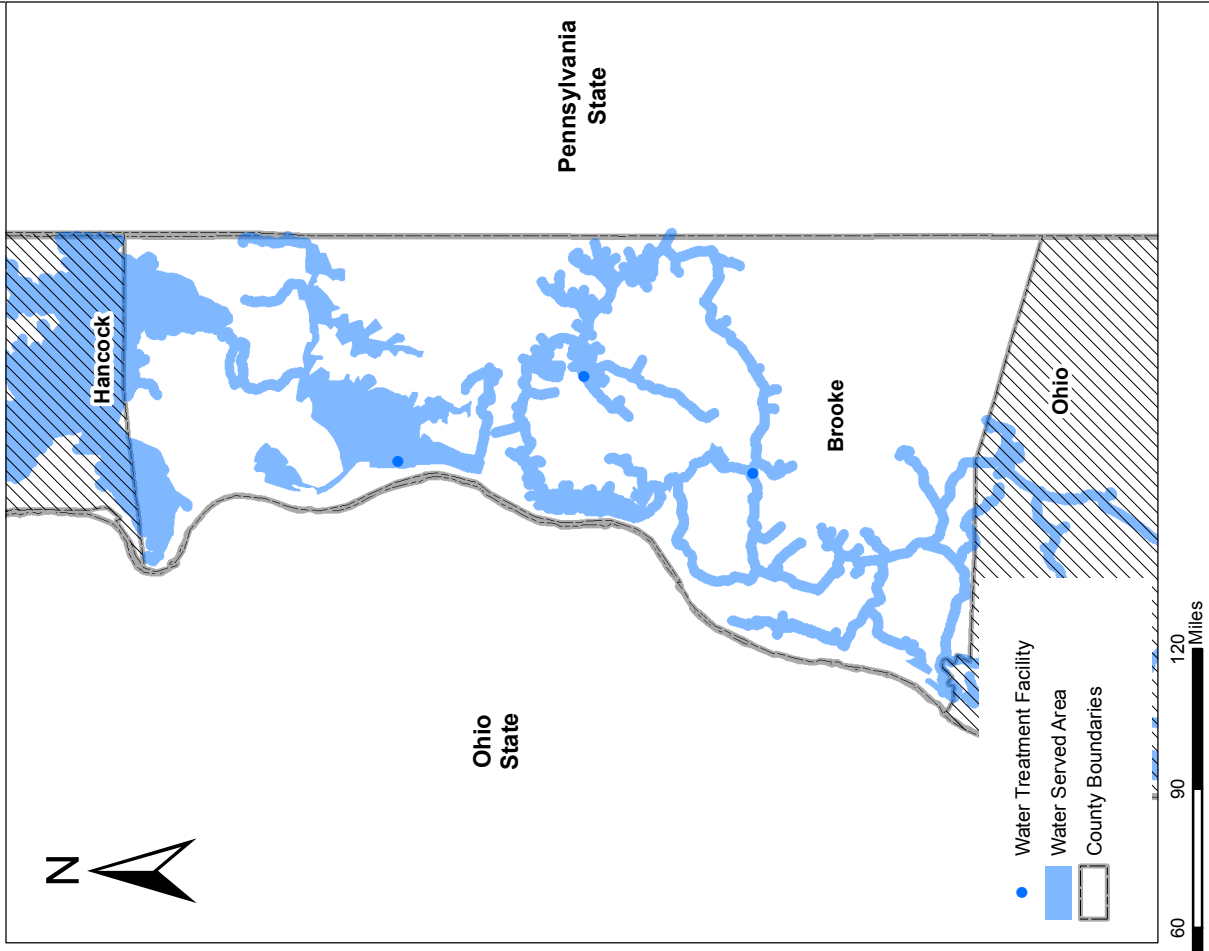
Source: West Virginia Division of Natural Resources, Statewide Addressing and Mapping 2008

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Utilities - Water and Sewer

Brooke County



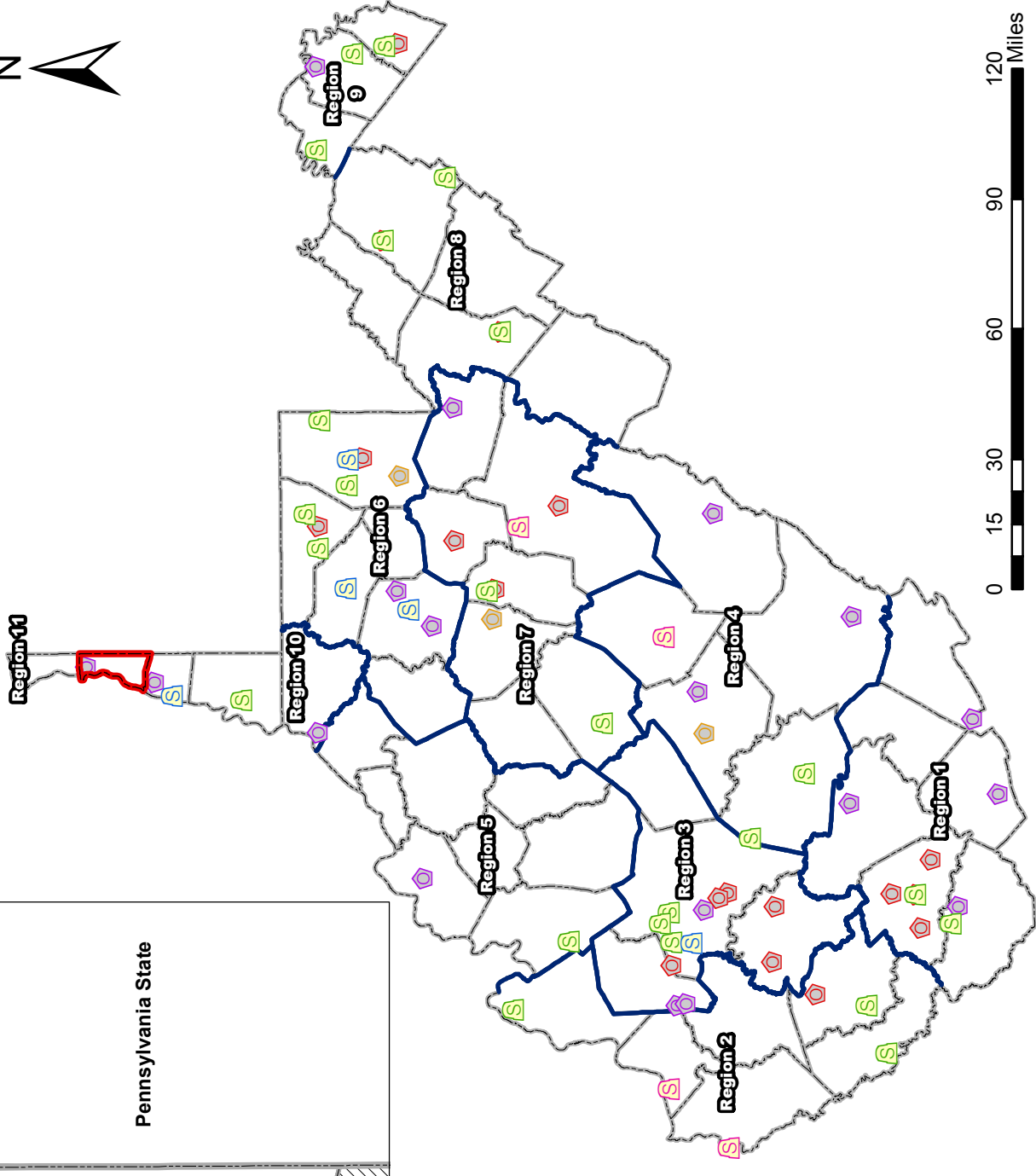
Source: West Virginia Infrastructure and Jobs Development Council N.A.

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Utility - Solid Waste Facility

Brooke County



Non Operational Facility

- Post-closure status
- Closure status
- A non LCAP** facility

Operational Facility

- Operational landfill
- Solid waste transfer station
- Operational tire monofill
- Planning Regions Line
- County Boundaries

** Landfill Closure Assistance Program

Source: West Virginia Solid Waste Management Board 2012

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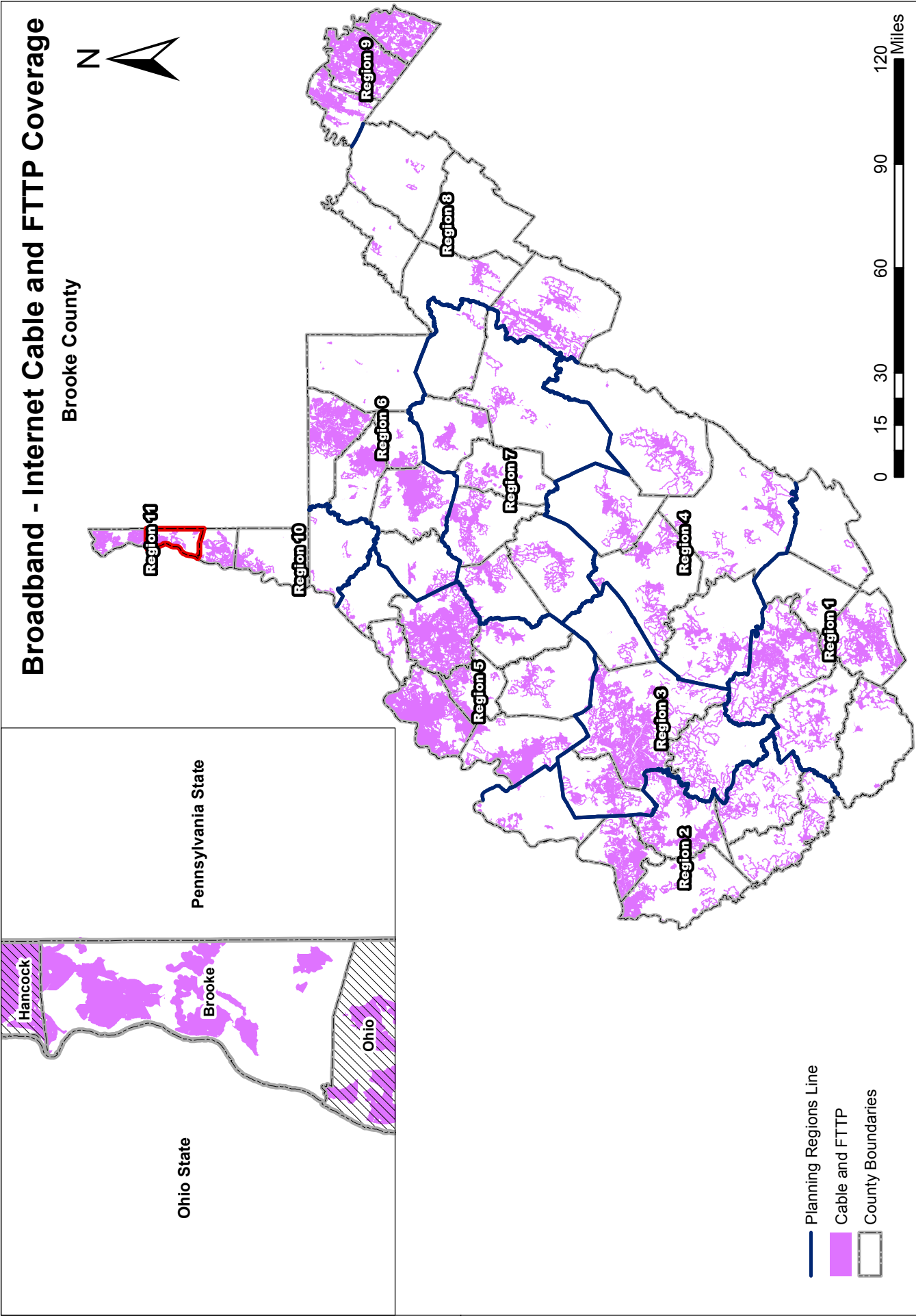
One essential modern convenience, now widely understood as an essential utility in a globalized world, is broadband access. The following 11 maps demonstrate Brooke County's broadband infrastructure in relation to the State's. The largest number of providers in Brooke County is five in areas with higher population density than the rest of the county, but very few places have less than three providers. Brooke County broadband infrastructure resembles few other counties in West Virginia. Of particular note is the spottiness of fixed wireless, the connection of two fixed points wirelessly by radio or other links, but the extensive existence of broadband and wireless coverage. This is uncommon in West Virginia counties, but is necessary for competition in the global marketplace.

Map 15 shows physical cable infrastructure running from ISPs to other structures. DSL, BPL, and other copper represent the transferal system of broadband (Map 16). Map 17 shows the entire wire system, represented by physical wires, while Maps 18 and 19 show the maximum uploading and downloading speeds for the system. Map 20 shows the total number of providers, which is denser in the more economically developed areas of the State. Map 21 has fixed wireless coverage, or the connection between two fixed points wirelessly by radio or other links, and the next two maps show the maximum uploading and downloading speeds in a given area (22 and 23). Map 24 shows the location of mobile wireless coverage, including for smartphones and tablets, and Map 25 shows areas where no broadband coverage is reported in any way.

All areas now need broadband service, and a complete inventory of these services is needed to plan for future investment in any given area. Brooke County appears to be well endowed with broadband infrastructure. Utilizing this infrastructure could turn the tide of some of the worse demographic characteristics, and combined with the educational attainment of the population could lead to a revival of the county's fortunes. Note also that the map data is for 2012, the most recent map available. Changes have been made since that time, thanks to broadband expansion programs encouraged by the state.

Broadband - Internet Cable and FTTP Coverage

Brooke County

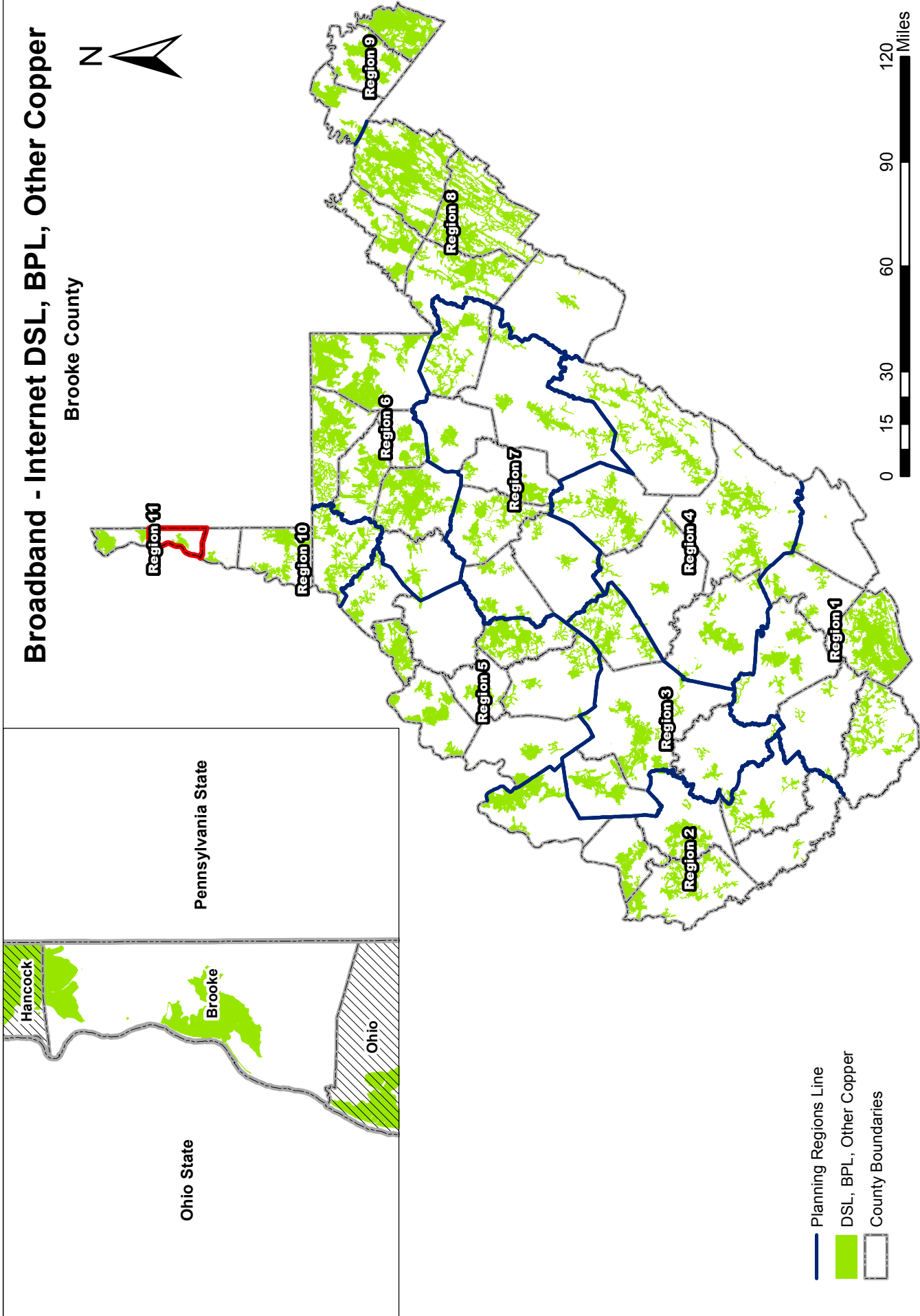



Source: West Virginia Broadband Mapping Program 2012

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Broadband - Internet DSL, BPL, Other Copper

Brooke County



-  Planning Regions Line
-  DSL, BPL, Other Copper
-  County Boundaries

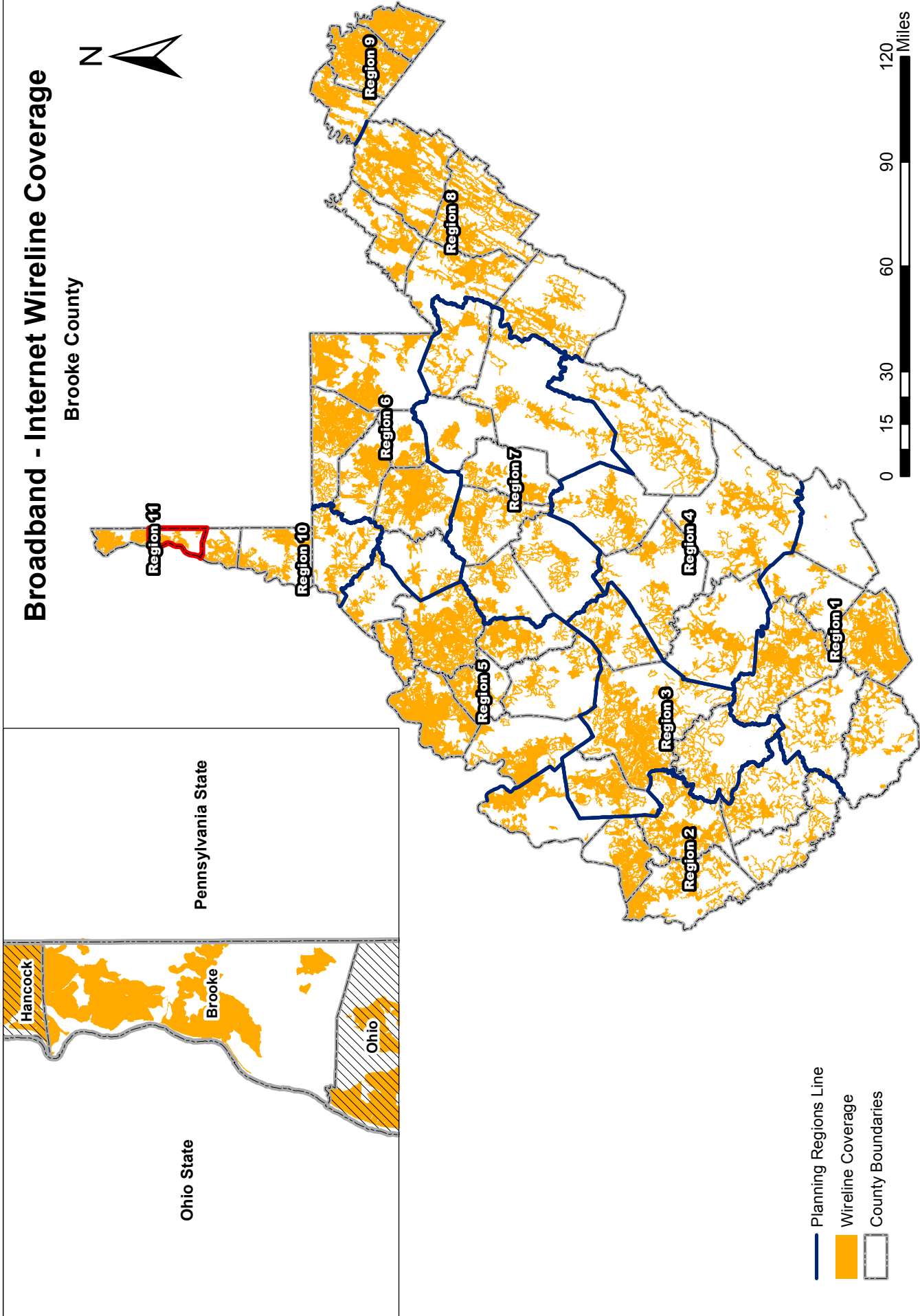
Source: West Virginia Broadband Mapping Program 2012

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Broadband - Internet Wireline Coverage

Brooke County



- Planning Regions Line
- Wireline Coverage
- County Boundaries

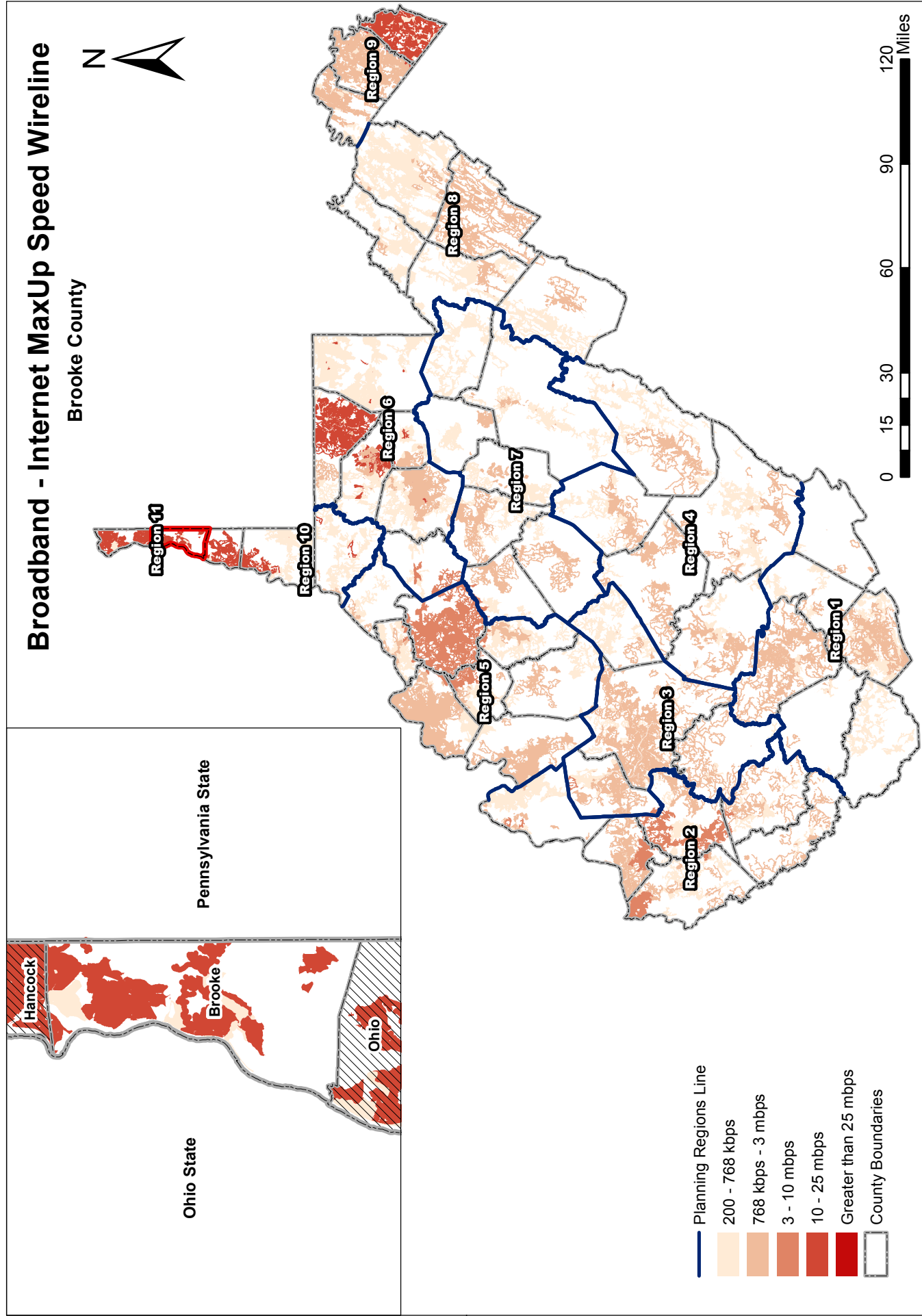
Source: West Virginia Broadband Mapping Program 2012

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Broadband - Internet MaxUp Speed Wireline

Brooke County



- Planning Regions Line
- 200 - 768 kbps
- 768 kbps - 3 mbps
- 3 - 10 mbps
- 10 - 25 mbps
- Greater than 25 mbps
- County Boundaries



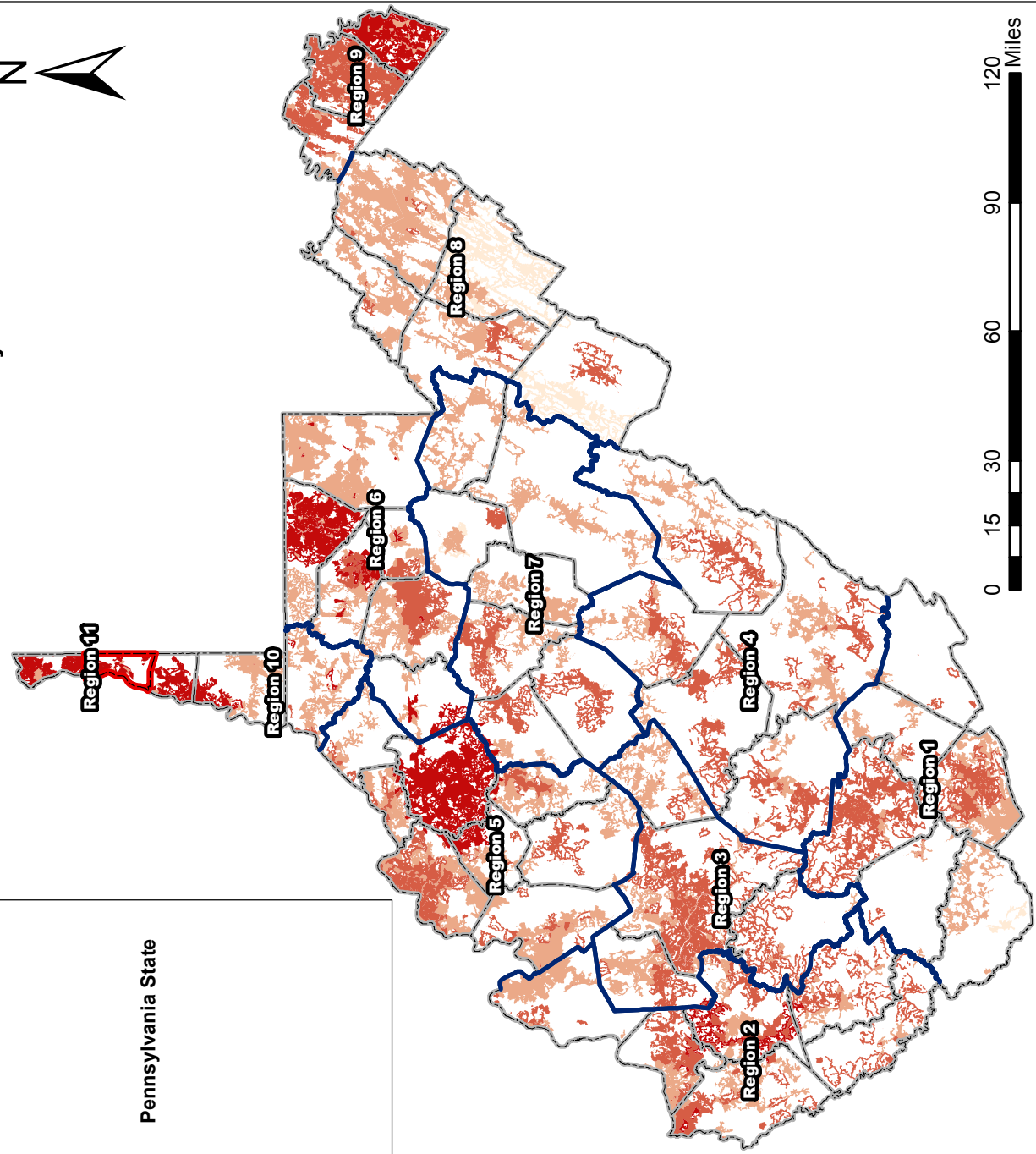
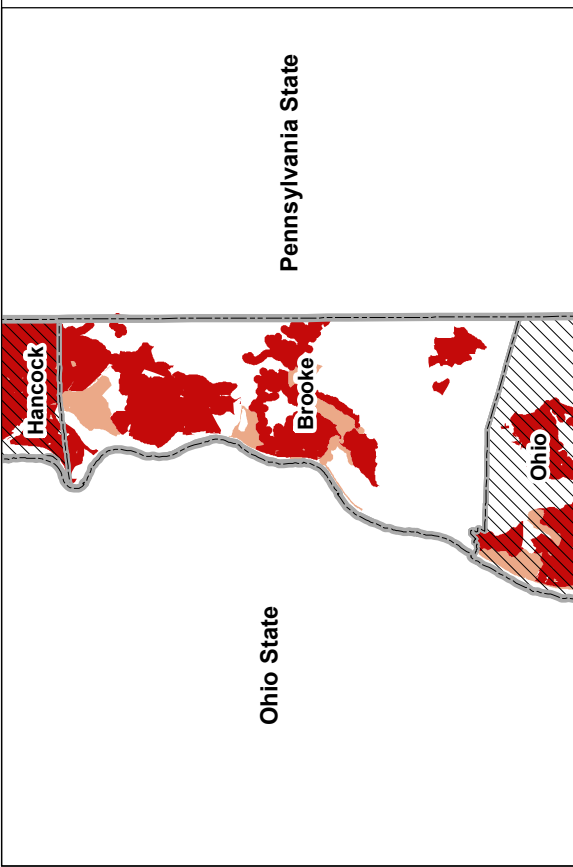
Source: West Virginia Broadband Mapping Program 2012

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Broadband - Internet MaxDown Speed Wireline

Brooke County



- Planning Regions Line
- 768 kbps - 3 mbps
- 3 - 10 mbps
- 10 - 25 mbps
- Greater than 25 mbps
- County Boundaries

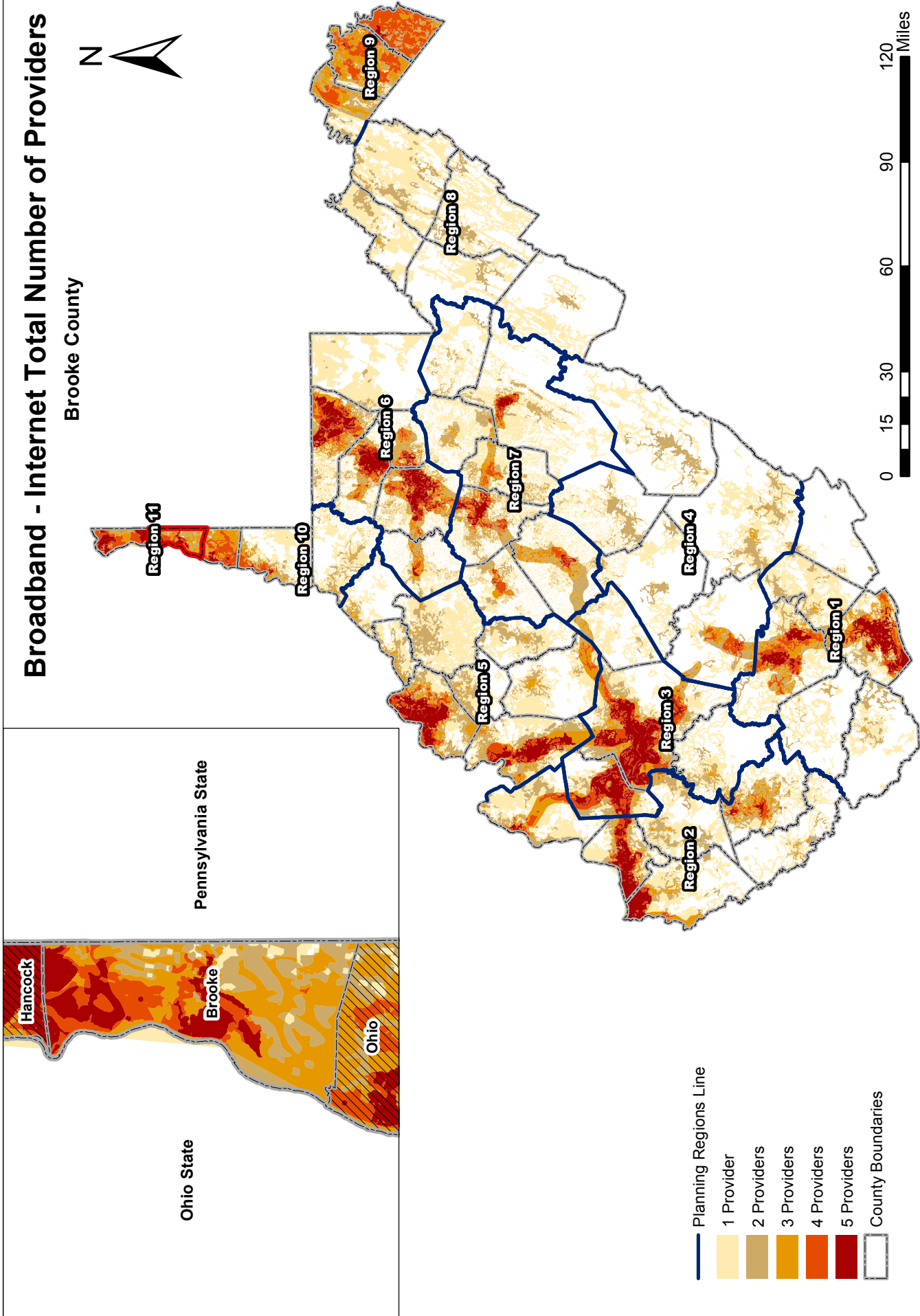
Source: West Virginia Broadband Mapping Program 2012

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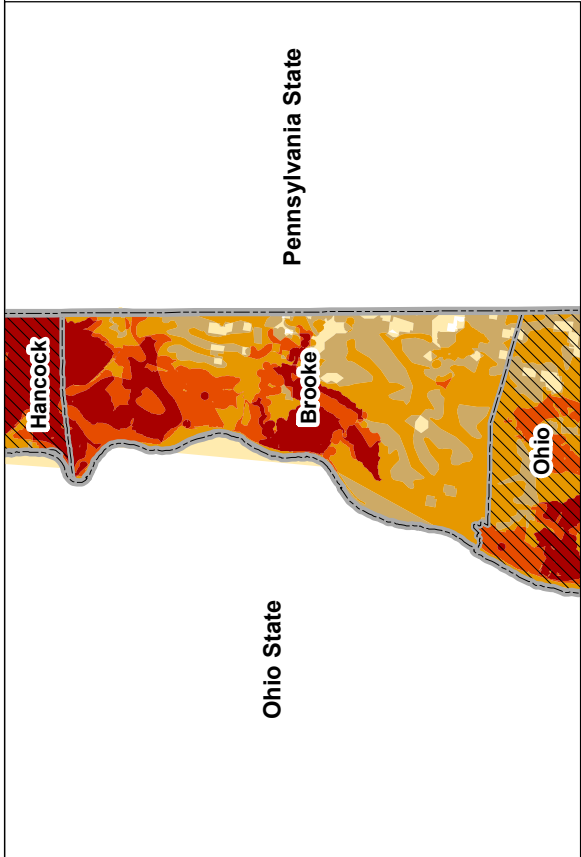


Broadband - Internet Total Number of Providers

Brooke County



- Planning Regions Line
- 1 Provider
- 2 Providers
- 3 Providers
- 4 Providers
- 5 Providers
- County Boundaries



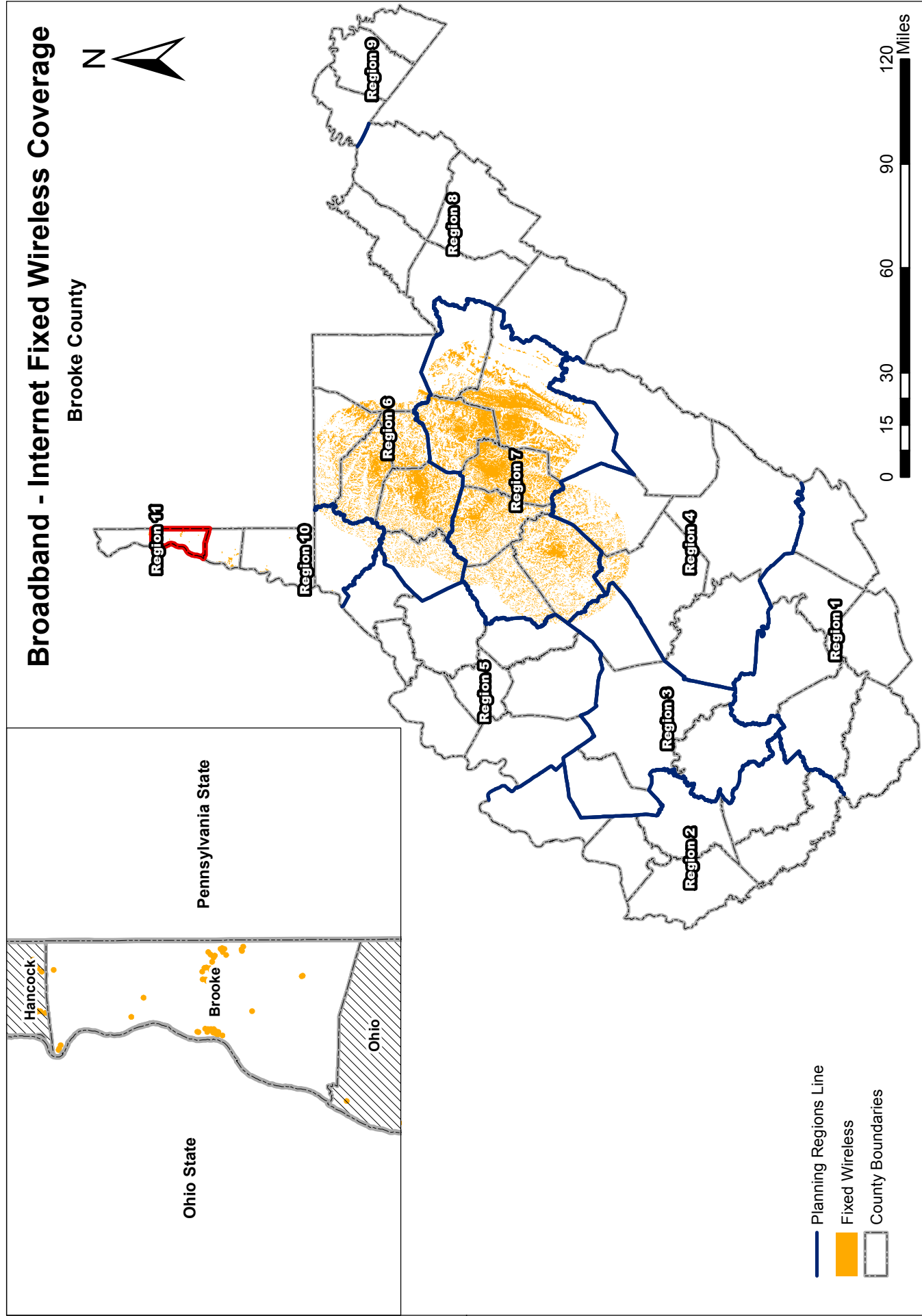
Source: West Virginia Broadband Mapping Program 2012

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Broadband - Internet Fixed Wireless Coverage

Brooke County



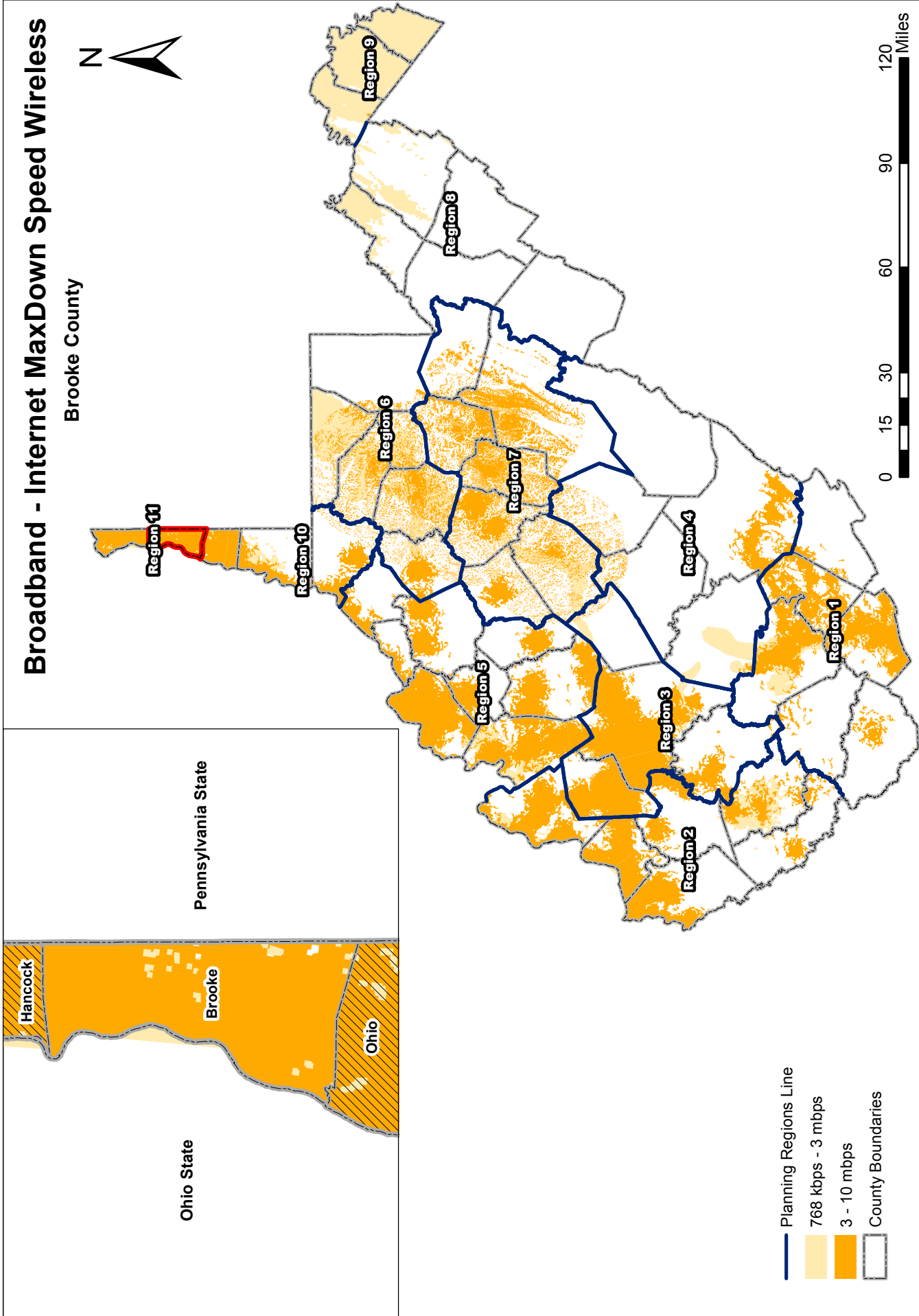
Source: West Virginia Broadband Mapping Program 2012





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Broadband - Internet MaxDown Speed Wireless

Brooke County



-  Planning Regions Line
-  768 kbps - 3 mbps
-  3 - 10 mbps
-  County Boundaries



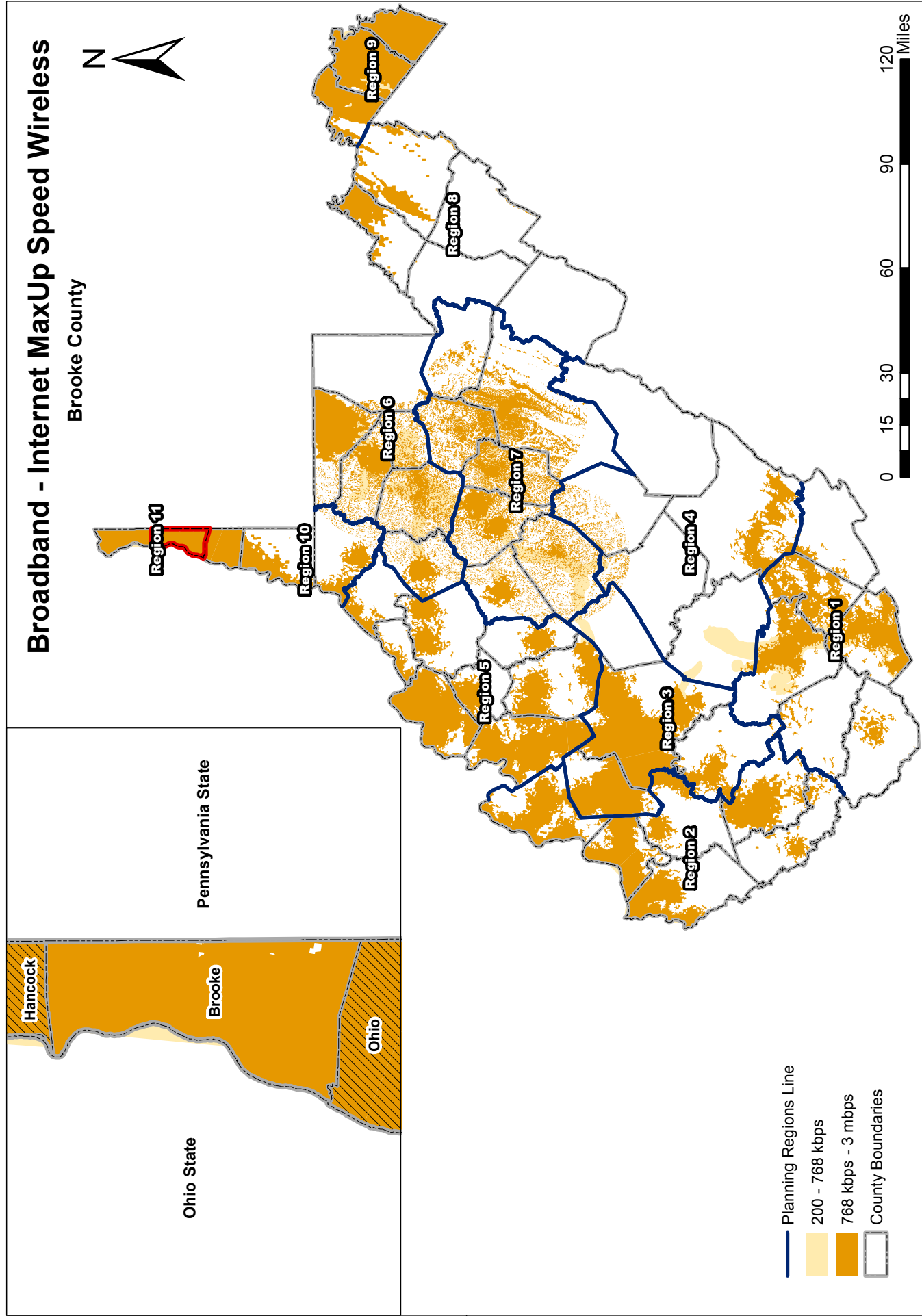
Source: West Virginia Broadband Mapping Program 2012





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Broadband - Internet MaxUp Speed Wireless

Brooke County



-  Planning Regions Line
-  200 - 768 kbps
-  768 kbps - 3 mbps
-  County Boundaries



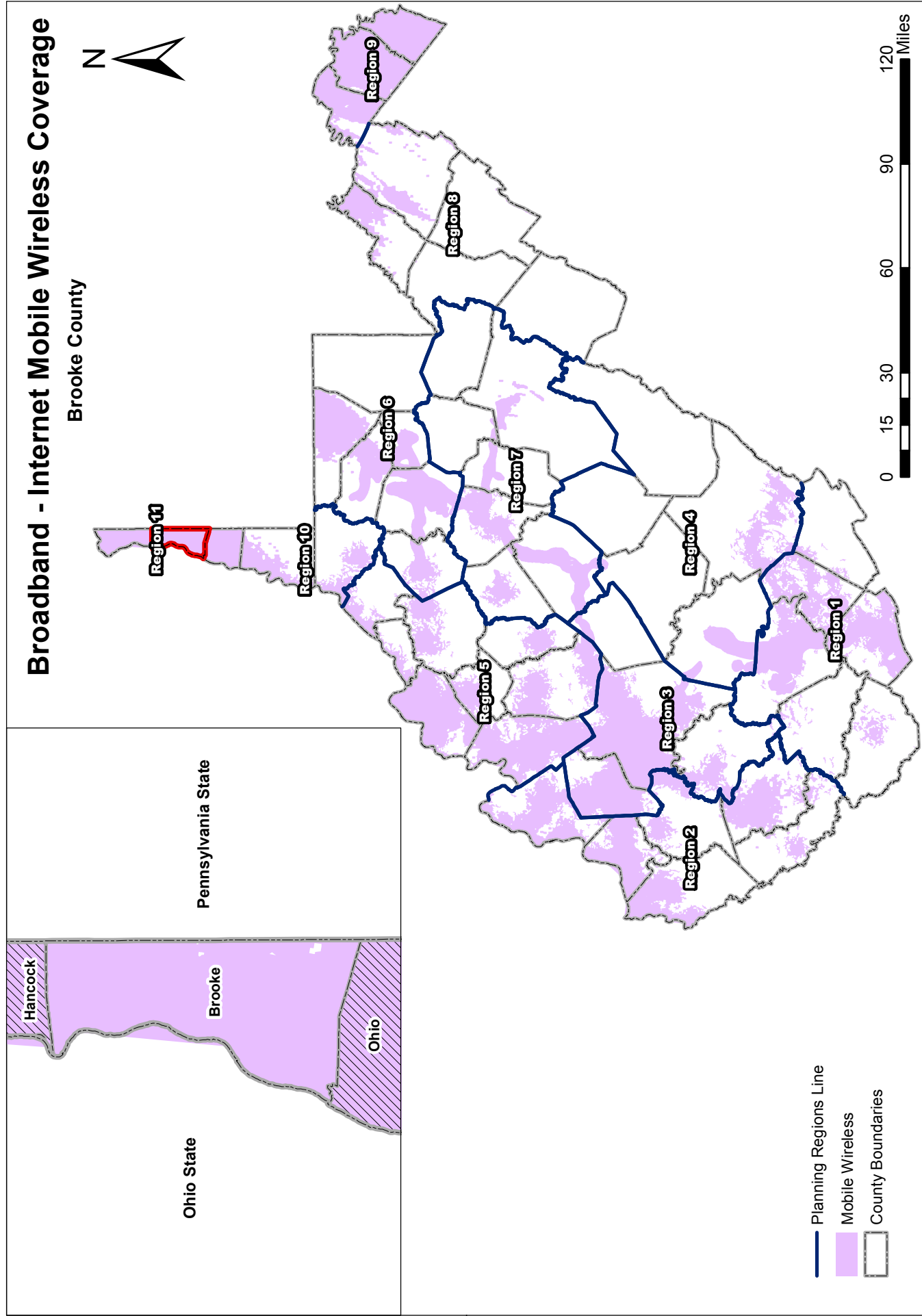
Source: West Virginia Broadband Mapping Program 2012

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Broadband - Internet Mobile Wireless Coverage

Brooke County



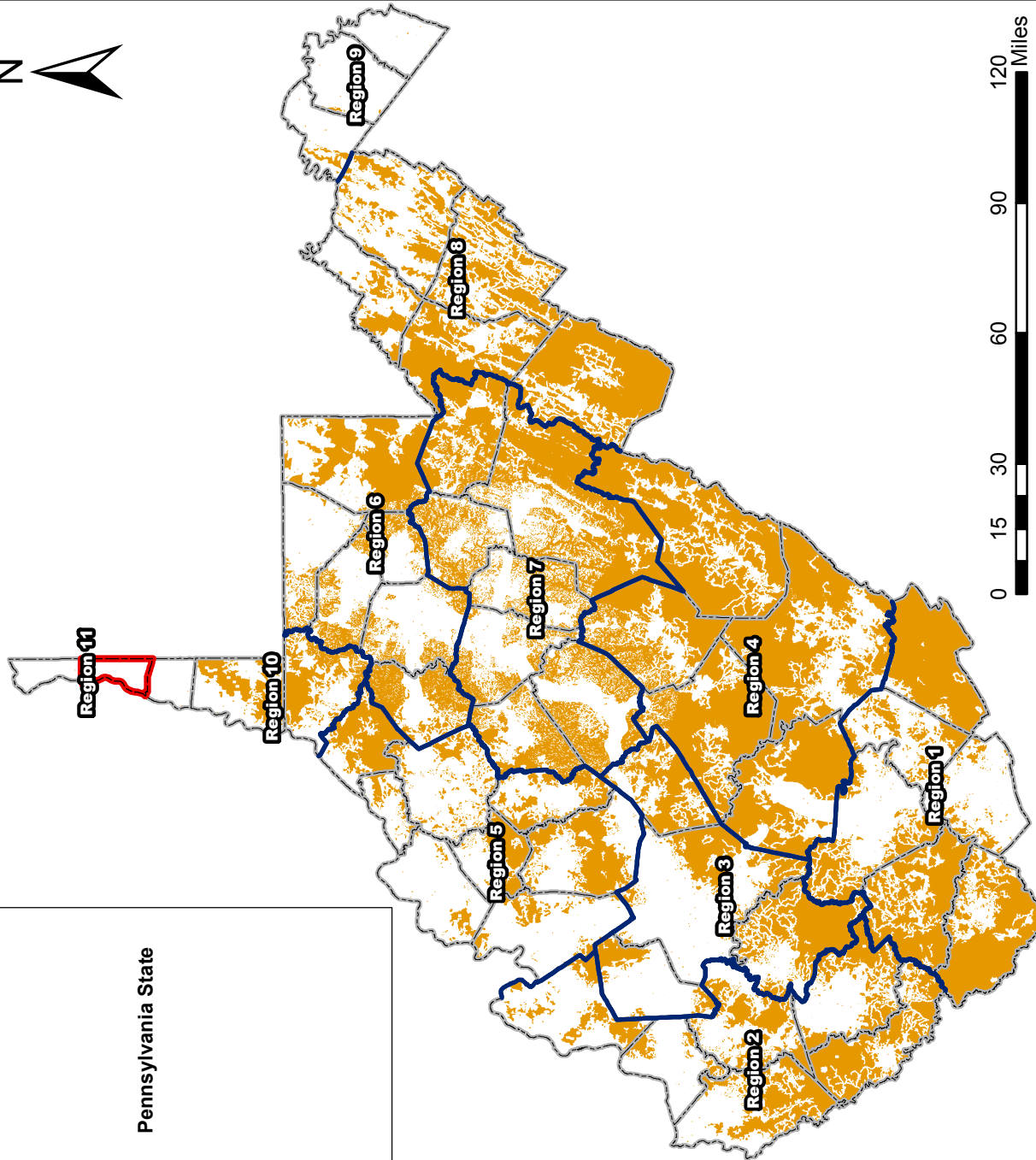
Source: West Virginia Broadband Mapping Program 2012




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Broadband - No Broadband Coverage

Brooke County



-  Planning Regions Line
-  No Coverage Reported
-  County Boundaries

Source: West Virginia Broadband Mapping Program 2012

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Transportation

Highways

Brooke County has no interstate, one US route, Route 22, and State Routes 2, 27, 67, 88, and 105 (Map 26).

Rail

Brooke County has an extensive rail system in the northern part of the county to complement its manufacturing activities.

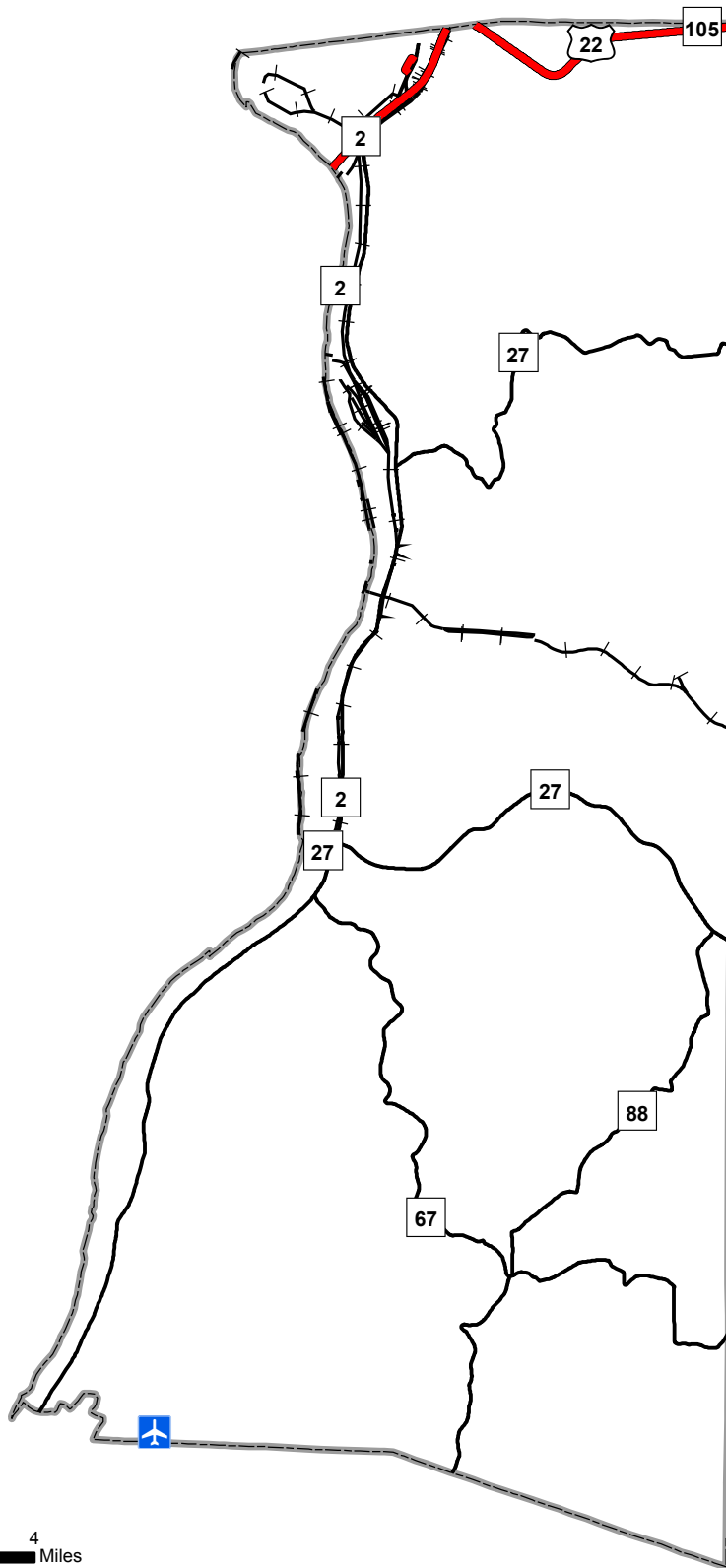
Air






Brooke County has one airport on its border with Ohio County. Wheeling Ohio County Airport is a 1,000 acre public airport owned by the Ohio County Commission. The airport operates over 46,000 aircraft as of 2014.⁷

⁷ “Wheeling Ohio County Airport,” GCR, Inc., Airport IQ 5010, May, 29, 2014, Accessed June 1, 2014, <http://www.gcr1.com/5010web/airport.cfm?Site=HLG&AptSecNum=0>.

Transportation

Brooke County



-  Airports
-  US Routes
-  WV Routes
-  Railroads
-  County Boundary

0 0.5 1 2 3 4 Miles

Source: Airports; United States Department of Transportation 2012; West Virginia GIS Technical Center; US Routes, West Virginia Routes; West Virginia Department of Transportation 2012; Railroads; Rahall Transportation Institute 2012

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Current Post-Mine Economic Development Sites

Weirton Medical Center

Weirton Medical Center is located in the Brooke County portion of the city of Weirton. It is a “238-bed, non-profit, acute-care, general community hospital” built in 1953. The Center has been rebuilt and reconverted many times, but the majority of the building sits on post-mine land.⁸ Weirton Medical Center was the largest employer for Brooke County in 2013, accounting for the large amount of health services employment seen in the county. Hospitals are just one example of the many job and revenue generating institutions that can be placed on post-mine land. It is important to utilize this available land to bring prosperity to counties.⁹

⁸ “About Weirton Medical Center Foundation,” Weirton Medical Center, Accessed June 1, 2014, <http://www.weirtonmedical.com/aboutwmcfoundation.php>

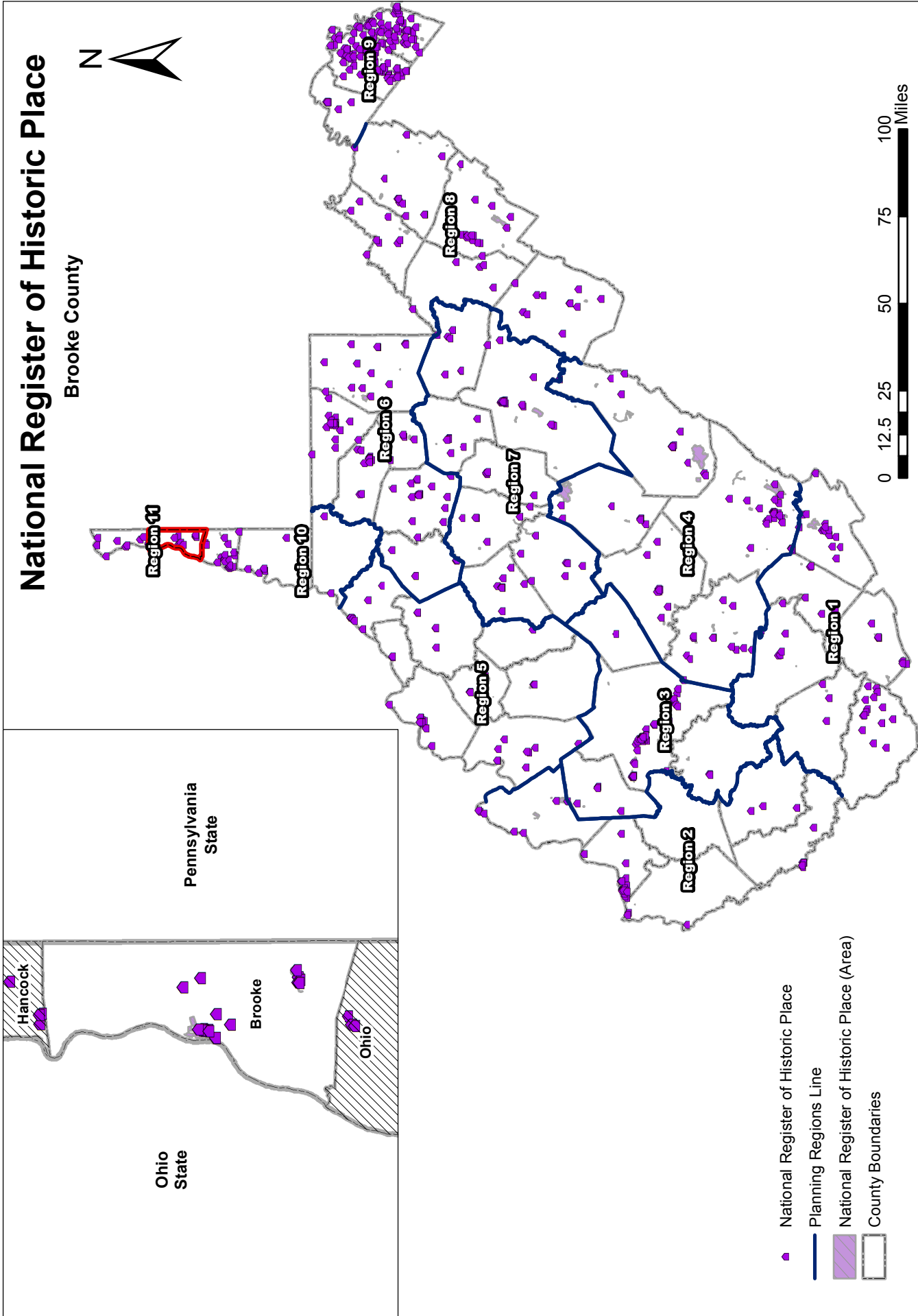
⁹ “Largest Employers for Selected Areas – Brooke County,” Workforce WV, March 2013, Accessed June 1, 2014, <http://workforcewv.org/lmi/EandWAnnual/TopTenEmployersByCounty.html>

Historic Preservation

Historic preservation will be essential in a county as old and steeped in manufacturing history as Brooke. Brooke County has 23 listings in the National Register of Historic Places. There are a number of historic buildings including the Bethany College campus, several houses and mansions, and two historic neighborhoods (Map 27). Other historic areas have been designated by West Virginia. Map 28 gives a spatial position to each designated State historic piece of architecture.

National Register of Historic Place

Brooke County



- National Register of Historic Place
- Planning Regions Line
- National Register of Historic Place (Area)
- County Boundaries



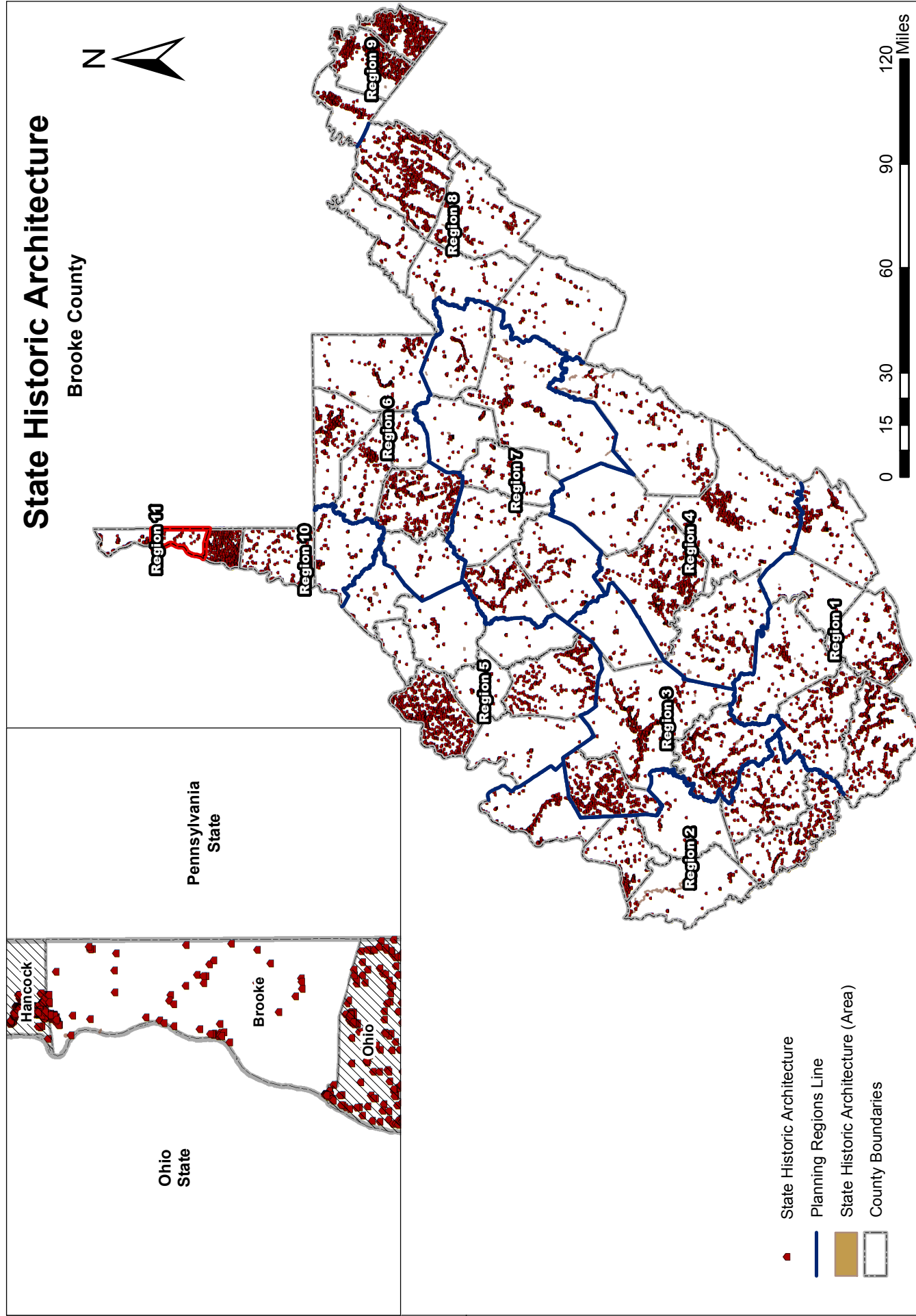
Source: West Virginia State Historic Preservation Office 2012

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State Historic Architecture

Brooke County



Source: West Virginia State Historic Preservation Office 2012

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Natural Resources, Environment, and Energy

Particular importance should be given to the spatial positions of natural resource areas, geographic environments, and potential energy resources in a county. This serves to inform potential investors about what possibilities the land provides for production of resources and energy. Brooke County has several advantages in these areas that can be utilized to the advantage of the citizens.

West Virginia has an extensive wetlands inventory, because of its extensive system of lakes, streams, and rivers. Wetlands provide many environmental benefits, including housing fish, replenishing groundwater, and relaying nutrients. Brooke County's system is not very extensive, but does have two major lines of wetlands (Map 29).

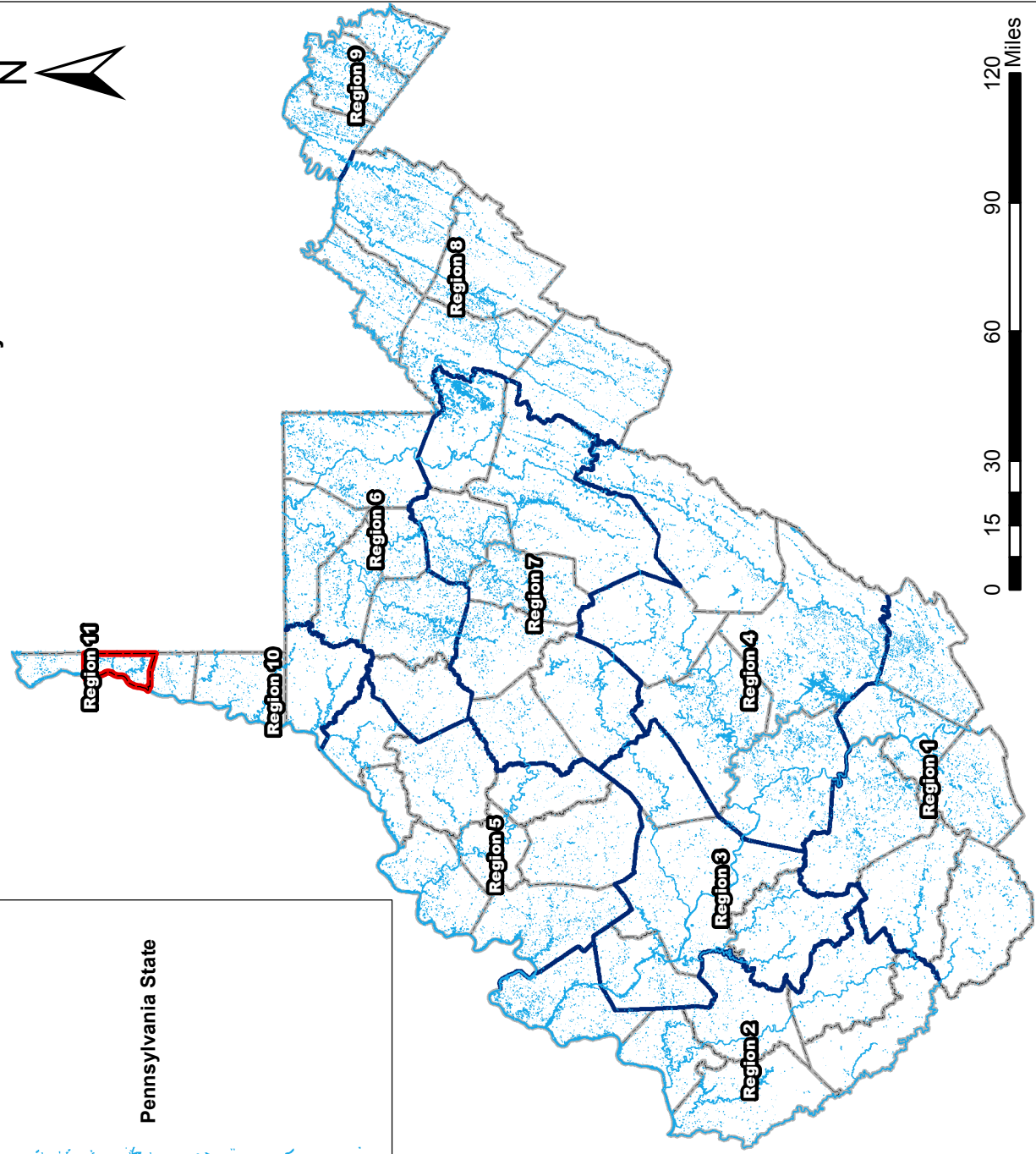
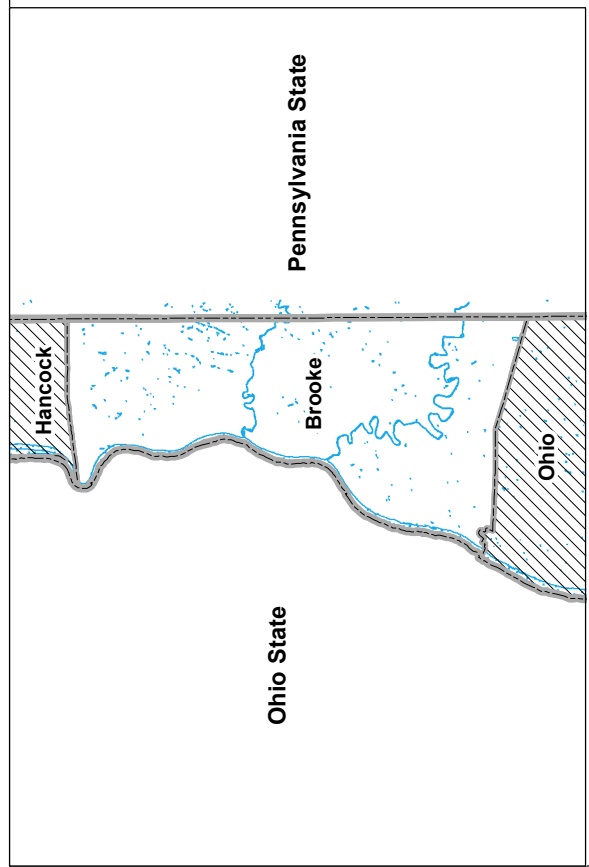
The State also possesses a respectable amount of park and forest land. Most of this land is located in the eastern portion of the State, the area that contains the main part of the Appalachian Mountain range. Brooke contains no national or state parks but has three wildlife management areas (Map 30).




Air quality is a necessary environmental health benchmark that can determine the health and vitality of an area's residents. The air pollution non-attainment areas are "areas of the country where air pollution levels persistently exceed the national ambient air quality standards."¹⁰ There are six full counties in West Virginia that are designated air pollution non-attainment areas, either in annual or 2006 24-hour standards as of the publication of this plan; Brooke County is one of those non-attainment areas, most likely due to the heavy manufacturing activity in the County. It is important to balance economic activity with concerns over the safety of residents and the air they breathe (Map 31).

¹⁰ "The Green Book Nonattainment Areas for Criteria Pollutants," Environmental Protection Agency, Accessed March 1, 2013, <http://www.epa.gov/oaqps001/greenbk/>.

Hydrology - National Wetlands Inventory

Brooke County



-  Planning Regions Line
-  National Wetlands Inventory
-  County Boundaries



Source: United States Fish and Wildlife Service 1996

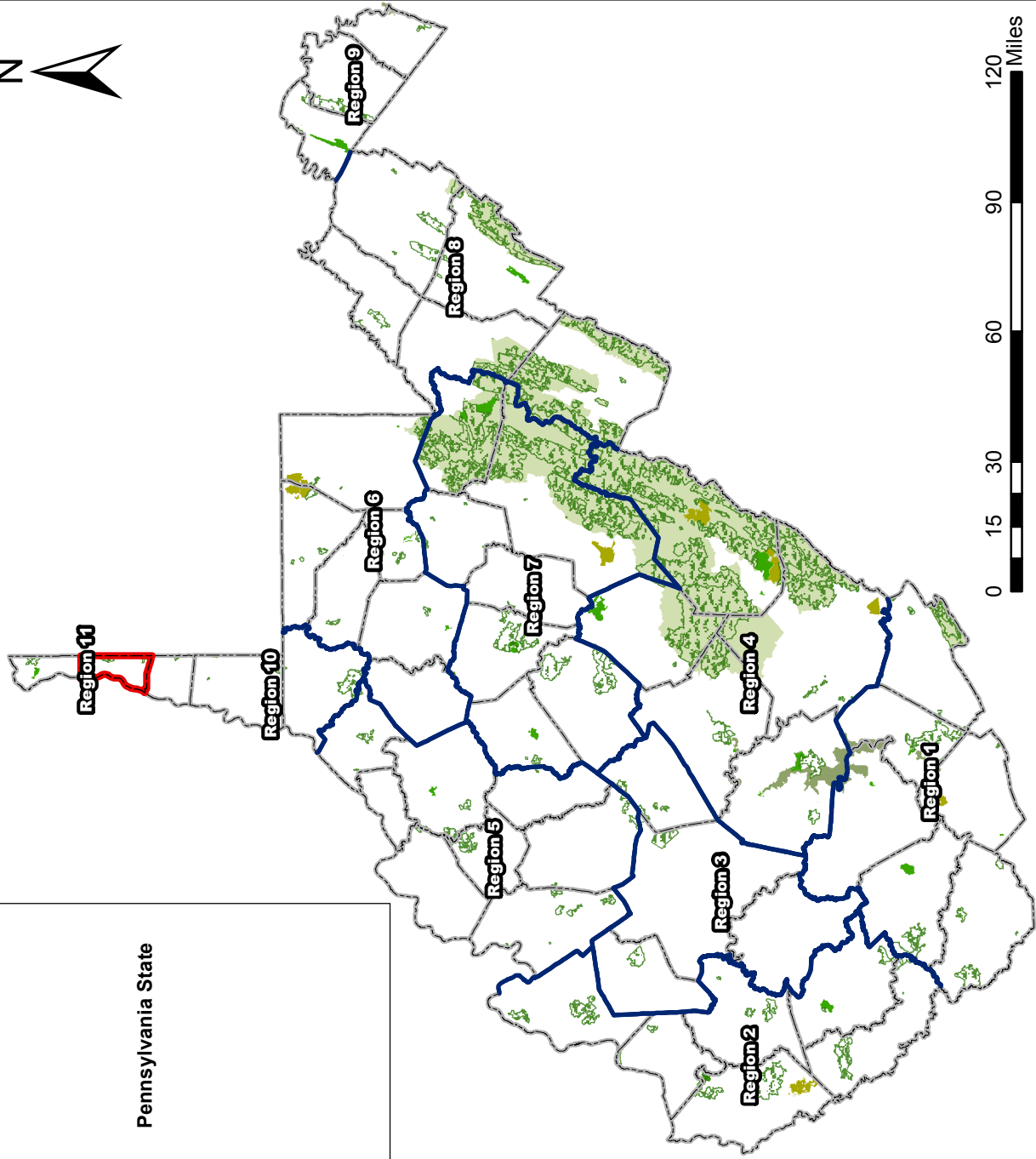
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www.rjtati.org

Public Land - Parks and Forests

Brooke County



- Planning Regions Line
- Wildlife Management Areas
- State Forest
- State Park
- National Forest
- National Park
- County Boundaries

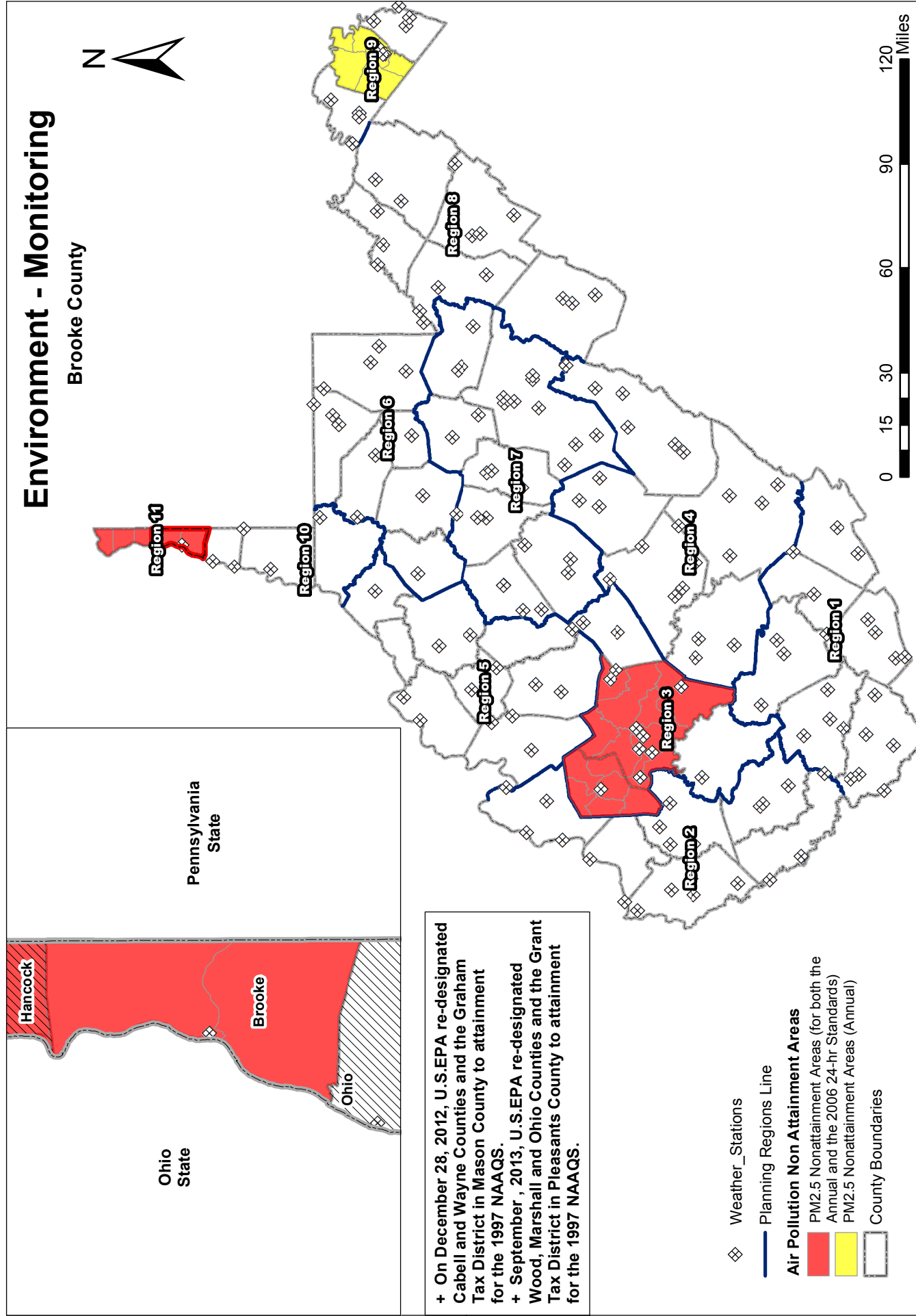


Source: Wildlife Management Areas; West Virginia Division of Natural Resources 2002; State Forest; West Virginia Division of Forestry 2004; State Park; West Virginia Division of Natural Resources; National Resource Analysis Center 2000; National Forest; United States Forest Service 2003; National Park; United States National Park Service 2003

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Environment - Monitoring

Brooke County



+ On December 28, 2012, U.S.EPA re-designated Cabell and Wayne Counties and the Graham Tax District in Mason County to attainment for the 1997 NAAQS.
 + September, 2013, U.S.EPA re-designated Wood, Marshall and Ohio Counties and the Grant Tax District in Pleasants County to attainment for the 1997 NAAQS.

- ◇ Weather_ Stations
- Planning Regions Line
- Air Pollution Non Attainment Areas**
 - PM2.5 Nonattainment Areas (for both the Annual and the 2006 24-hr Standards)
 - PM2.5 Nonattainment Areas (Annual)
- ▭ County Boundaries

Source: Weather Stations; National Oceanic and Atmospheric Administration 1999; Air Pollution Non Attainment Areas; West Virginia Department of Environmental Protection and United States Environmental Protection Agency, 2013

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West Virginia's past and most likely its future are defined by energy. Besides coal, other options for energy have been investigated in the State. Gas and oil are of course the main energy staples in the nation, and West Virginia has access to this energy in a number of ways. Brooke County has several oil fields and an extensive network of gas pipes (Map 32). Brooke County also has extensive play in the Marcellus Shale, with a number of completed and permitted wells (Map 33). The Marcellus Shale will continue to be a major player in West Virginia's energy layout for the foreseeable future, and as technology improves recoverability may also. Brooke County has developed its current system to take advantage of the surrounding natural resources and to market these activities.

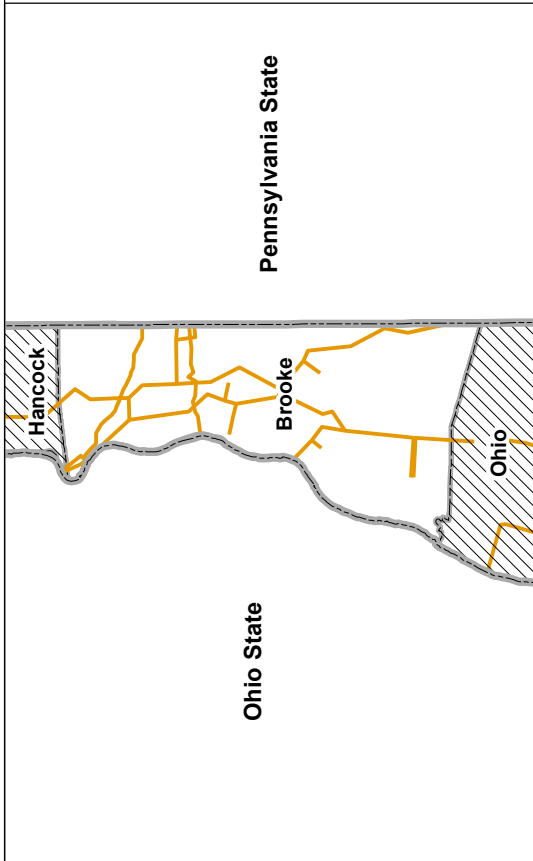
Potential renewable energy sources were also examined. Wood byproducts are a potential energy source classified as biomass energy. Naturally it is most useful in areas with a great deal of wood products. West Virginia is one of the most forested States in the country. Brooke County appears to be one of the least forested counties in West Virginia (Map 34). Therefore, it makes sense that Brooke also does not have much in the way of wood byproducts (Maps 35 and 36). Other potential renewable energy sources include geothermal (Map 37), solar (Map 38), and wind (Map 39). Each of these resources was examined in a recent report from the Center of Business and Economic Research at Marshall University.¹¹ None of these sources was "likely to provide fuel or electricity at a lower cost" than coal and oil. Subsidizing these resources appears to be the only way to encourage faster growth in consumption, and in some cases they still have very limited potential in West Virginia. Geothermal energy appears to have great potential in certain parts of the State, as shown in Map 37, but Brooke appears to be one of the counties least favorable for development. Brooke County does not appear to be a favorable location for solar development or wind development. Still, technology is not predictable, and improvements could occur in each of these resource areas that will make generation more feasible. Efforts to monitor research in all these areas should be undertaken to make use of any potential developments.¹²

¹¹ Kent, Calvin, Risch, Christine, and Pardue, Elizabeth. *Renewable Energy Policy: Opportunities for West Virginia*. Center for Business and Economic Research, Huntington, WV (2012).

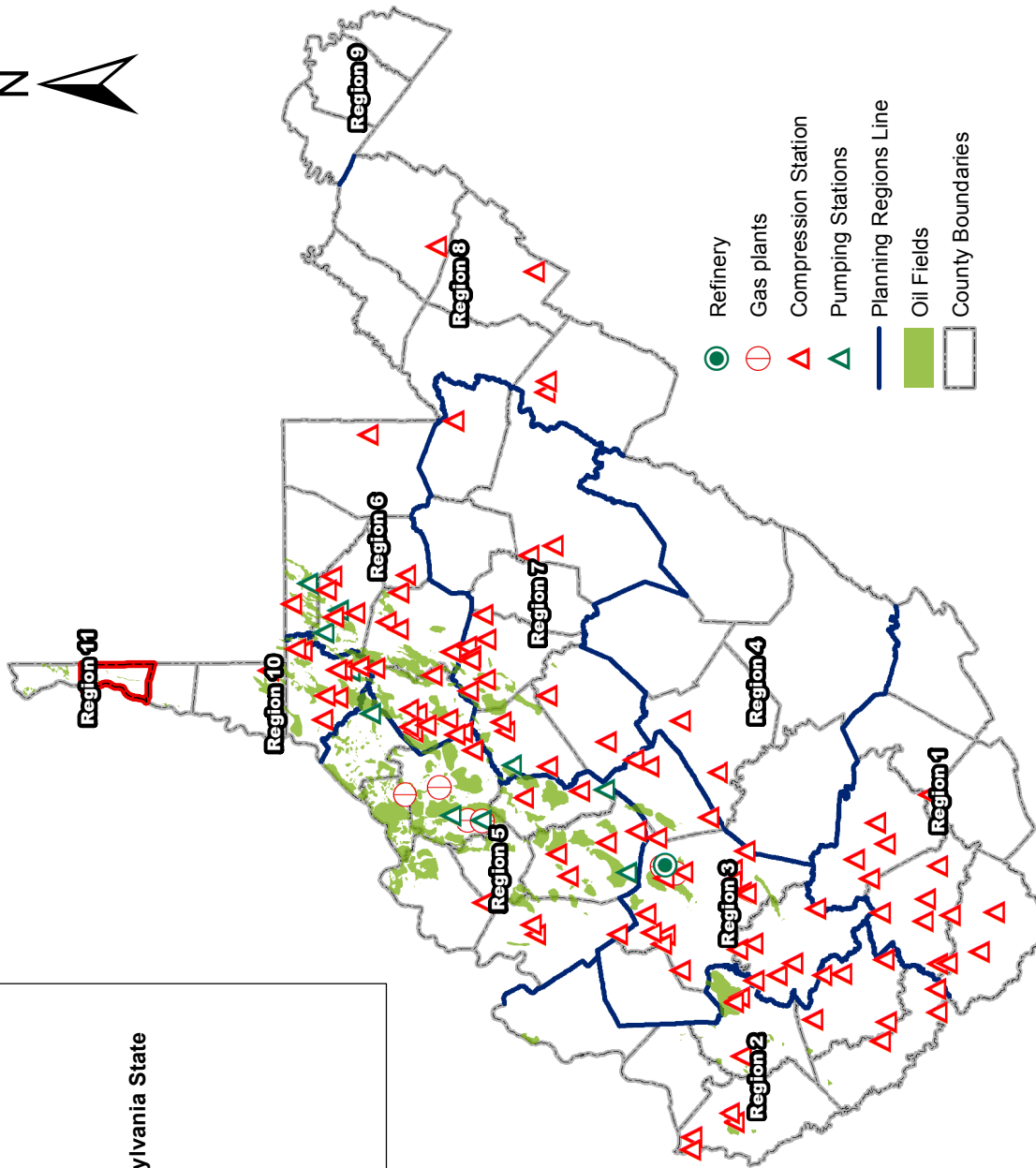
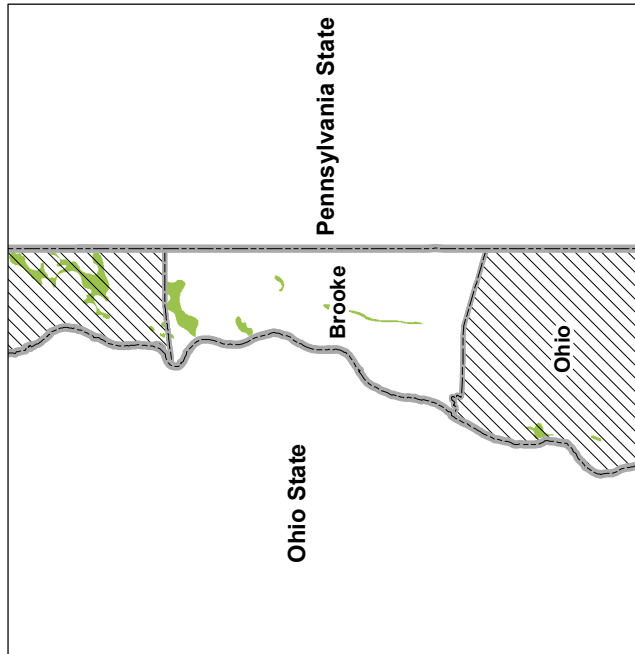
¹² Ibid.

Energy - Gas and Oil

Brooke County



Gas Pipe



- Refinery
- Gas plants
- Compression Station
- Pumping Stations
- Planning Regions Line
- Oil Fields
- County Boundaries



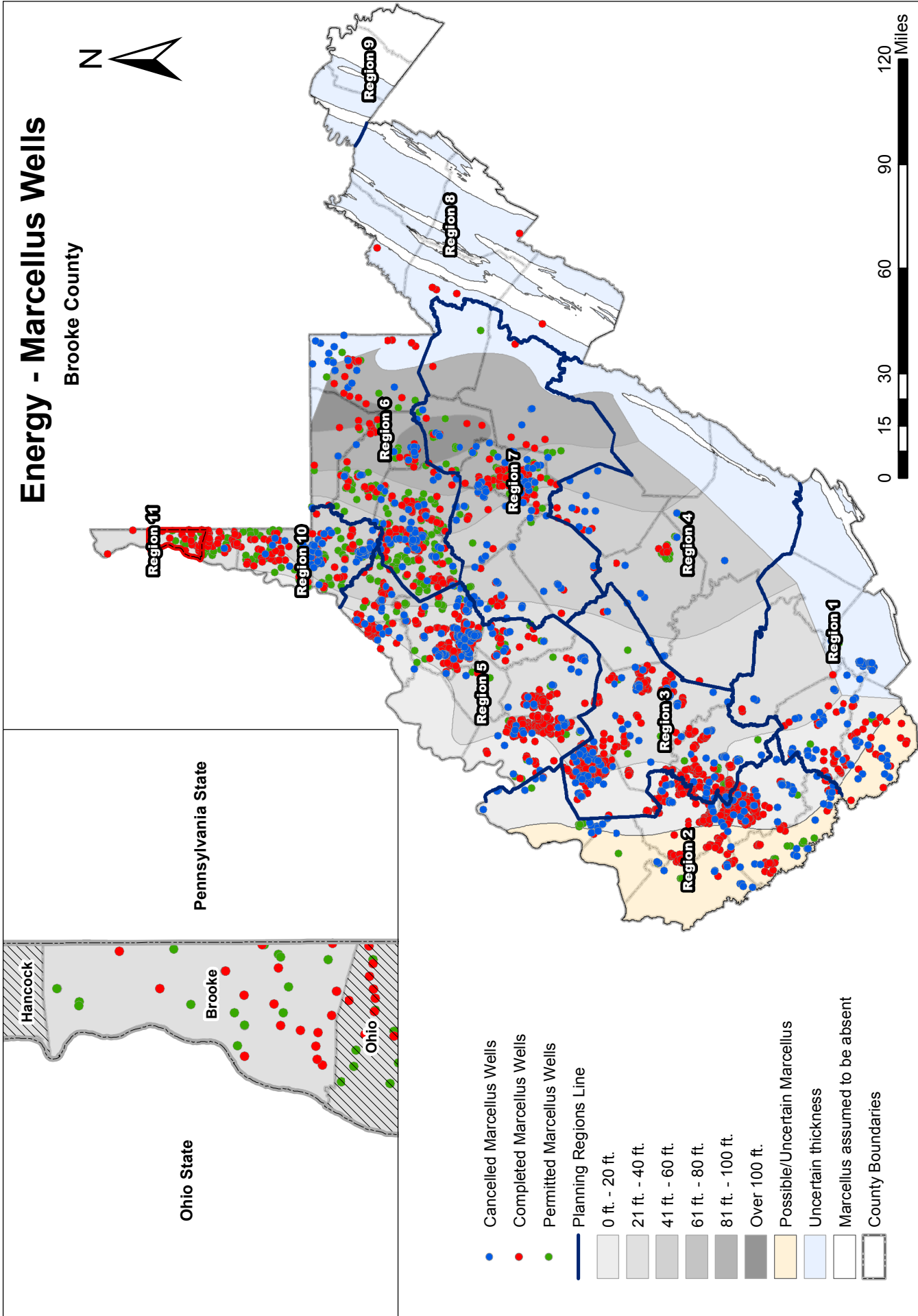
Source: West Virginia Geological and Economic Survey 2007

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Energy - Marcellus Wells

Brooke County



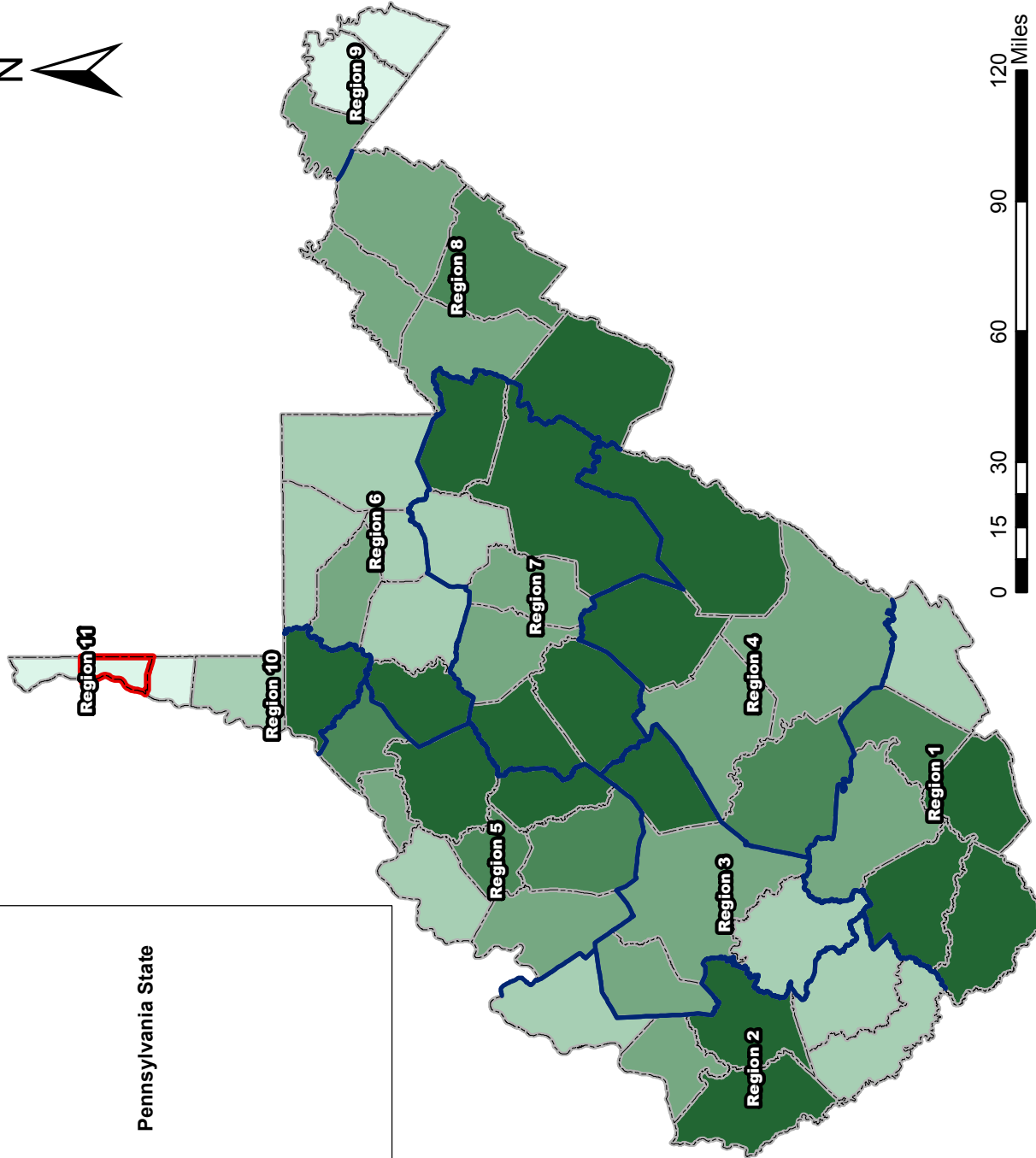
Source: West Virginia Geological and Economic Survey 2013

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Energy - Percent Forest Coverage

Brooke County



- Planning Regions Line
- 45.87% - 65%
- 65.01% - 75%
- 75.01% - 82%
- 82.01% - 85%
- 85.01% - 100%
- County Boundaries

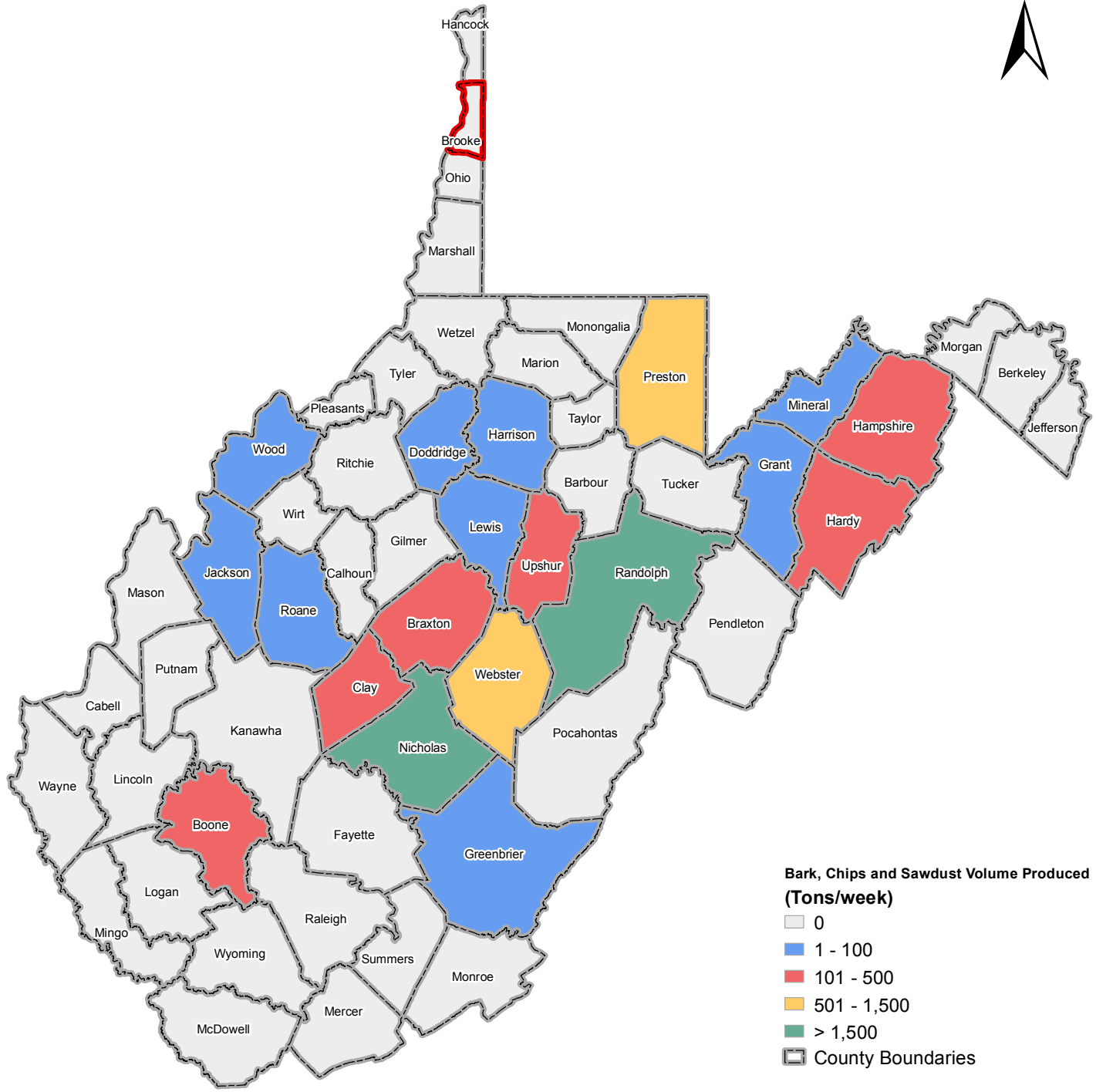
Source: Rahaal Transportation Institute 2013

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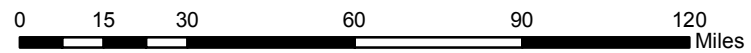
Renewable Energy - Wood By Products

Bark, Chip and Sawdust Volume Produced - Brooke County



Bark, Chips and Sawdust Volume Produced (Tons/week)

- 0
- 1 - 100
- 101 - 500
- 501 - 1,500
- > 1,500
- County Boundaries



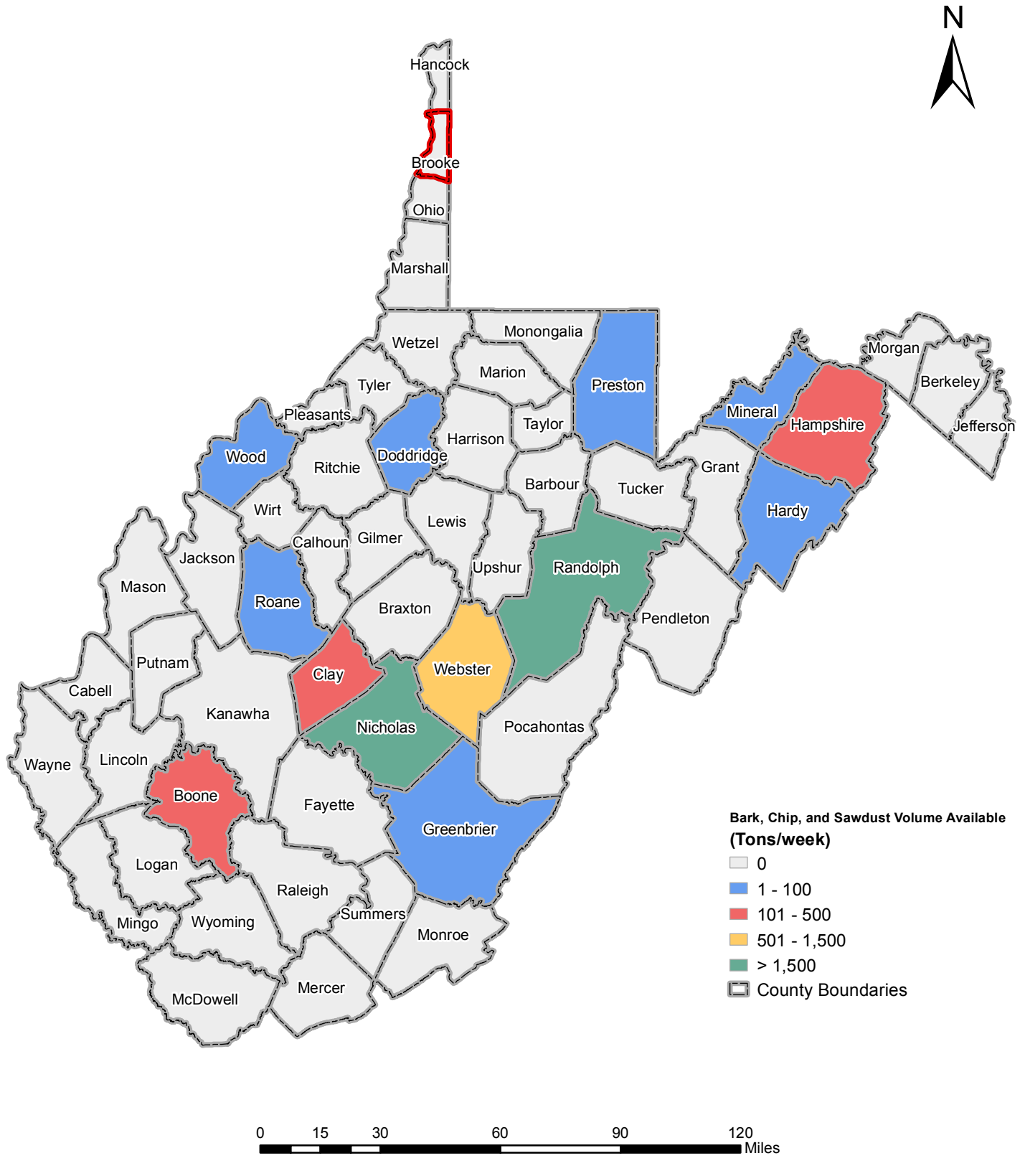
Source: Appalachian Hardwood Center 2011

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Renewable Energy - Wood By Products

Bark, Chip, and Sawdust Volume Available - Brooke County



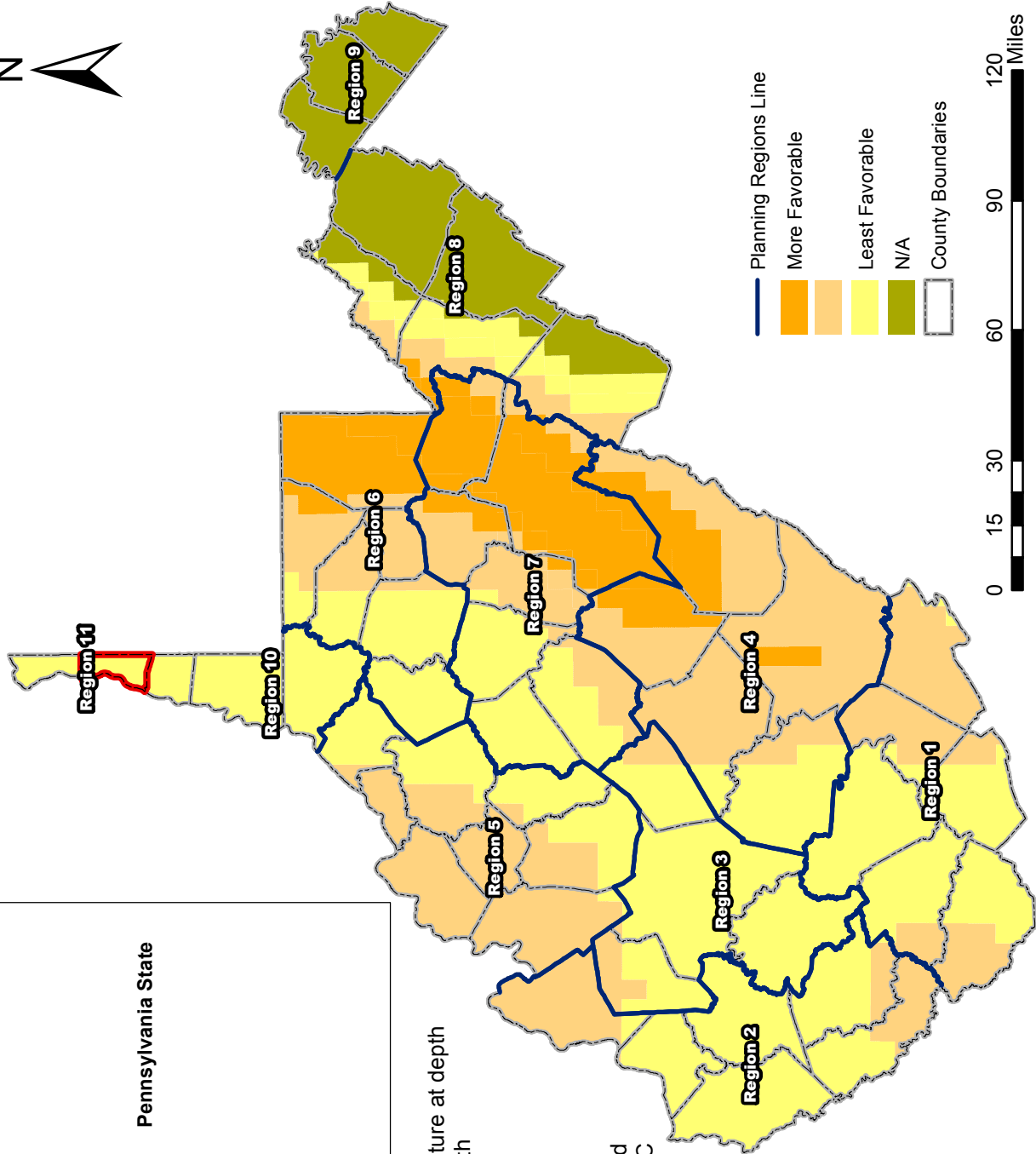
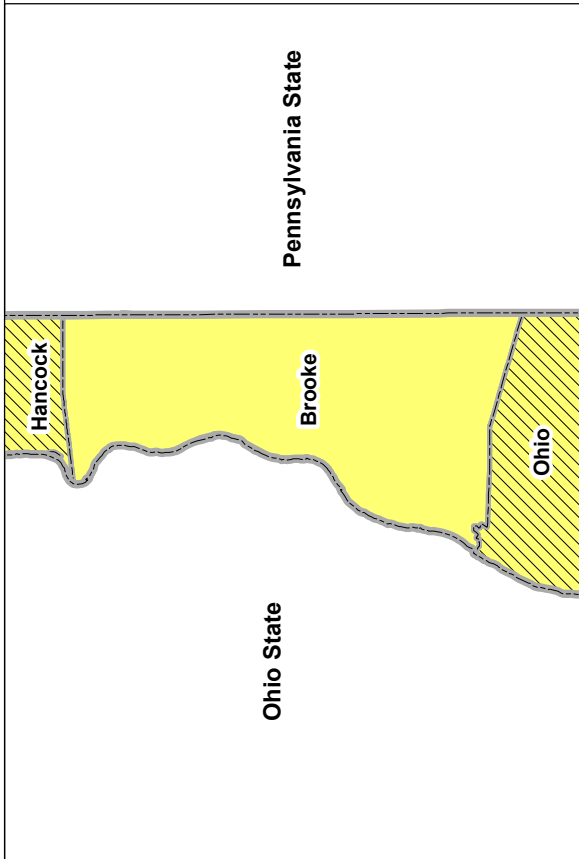
Source: Appalachian Hardwood Center 2011

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Energy - Geothermal Resource of Brooke County

Favorability of Deep Enhanced Geothermal Systems



— Source data for deep EGS includes temperature at depth from 3 to 10 km and analyses (for regions with temperatures \geq 150 degrees C).

— Class values reflect relative favorability, with 1 being more favorable, 3 being least favorable, and "N/A" regions not having been assessed due to temperatures less than 150 degrees C at 10 km depth.

- Planning Regions Line
- More Favorable
- Least Favorable
- N/A
- County Boundaries



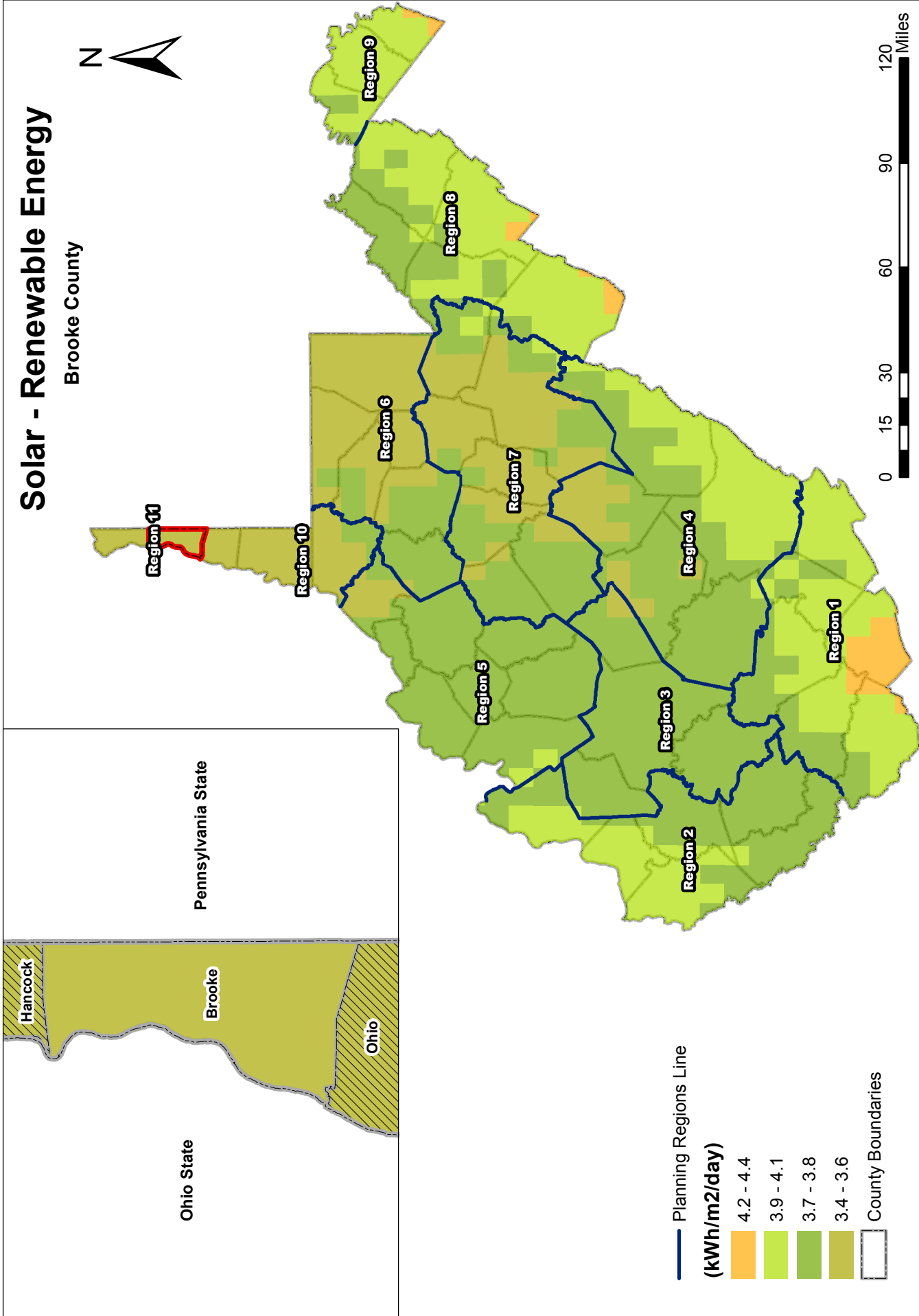
Source: National Renewable Energy Laboratory 2009

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Solar - Renewable Energy

Brooke County



- Planning Regions Line
- (kWh/m²/day)**
- 4.2 - 4.4
- 3.9 - 4.1
- 3.7 - 3.8
- 3.4 - 3.6
- County Boundaries

Source: National Renewable Energy Laboratory 2012

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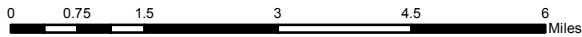
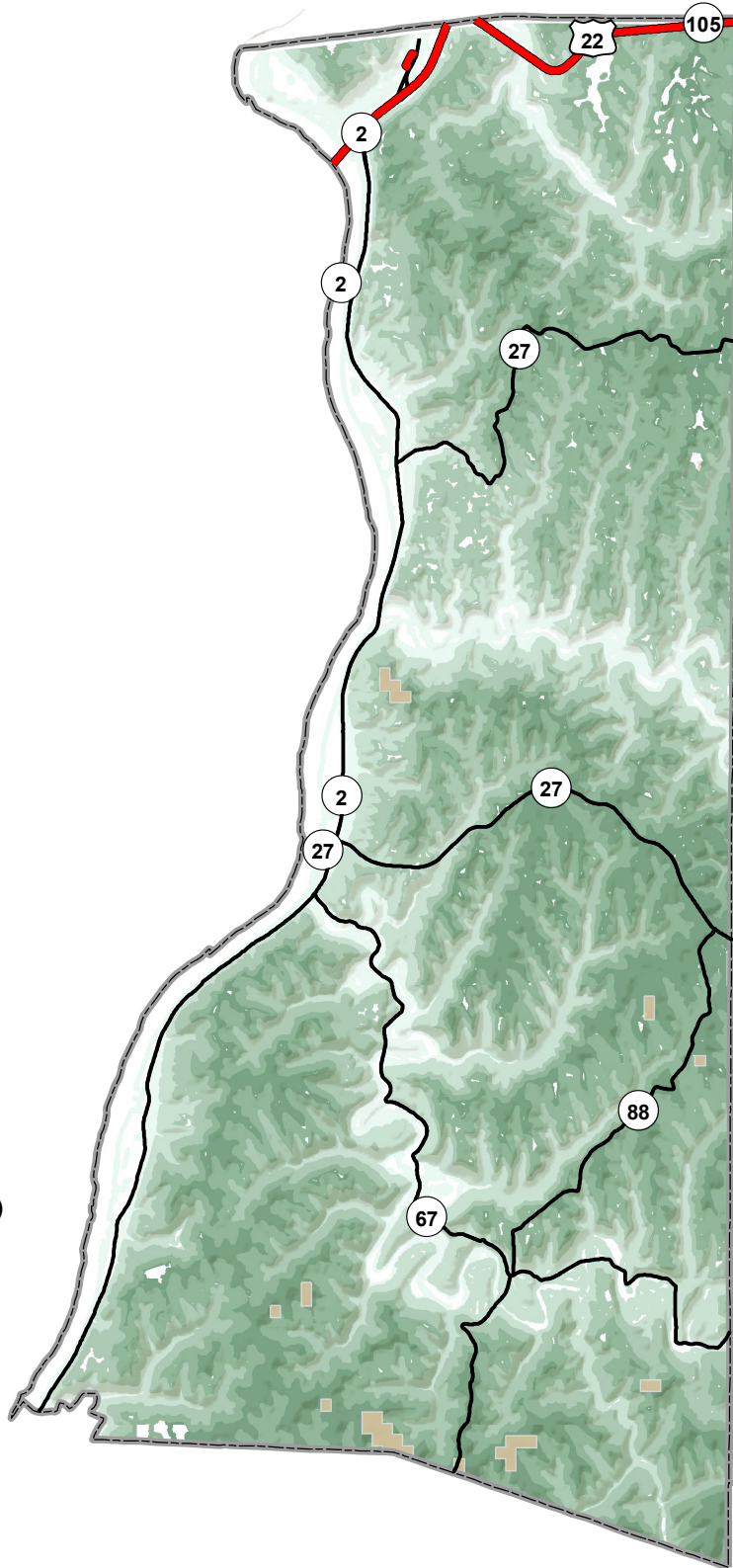


Renewable Energy-Wind

Brooke County



- US Routes
- WV Routes
- Elevation (Feet)**
- 660 - 780
- 781 - 940
- 941 - 1060
- 1061 - 1160
- 1161 - 1360
- Wind Power Class Potential Density (W/m²)**
- 0 - 200 Poor
- 200 - 300 Marginal
- 300 - 400 Fair
- 400 - 500 Good
- 500 - 600 Excellent
- 600 - 800 Outstanding
- > 800 Superb
- County Boundary



Source: National Renewable Energy Laboratory 2006, United States Geological Survey n.d., ESRI, 2013

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IV. Land Use Smart Planning

The research team constructed a smart planning criterion that would apply to each mine site in Brooke. Tax Districts were utilized and labeled based on a particular land use practice that has previously been incorporated into the site. This criterion allows researchers and policymakers to determine suitability after weighing all the factors mentioned in the plan. A range of potential utilizations is given to give optimal control to policymakers and investors.

The table below (Table 2) provides the categories and their areas. The Smart Planning Map (Map 40) showcases the geographies separated by utilization.

Table 2: Smart Planning Utilizations

| Name | Smart Planning Criteria |
|-----------------------------|---|
| Utilization Area 0-1 mile | Industrial, Commercial/Retail, Residential, Public Facility, Recreational |
| Utilization Area 1-2 miles | Industrial, Commercial/Retail, Residential, Public Facilities, Recreational |
| Utilization Area 2-3 miles | Industrial, Commercial/Retail, Residential, Recreational |
| Utilization Area 3-5 miles | Industrial, Residential, Recreational, Agriculture, Forestland |
| Utilization Area 5-10 miles | Industrial, Residential, Agriculture, Forest Land, Recreational |
| Utilization Area 10 miles + | Industrial, Residential, Agriculture, Forest Land |

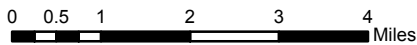
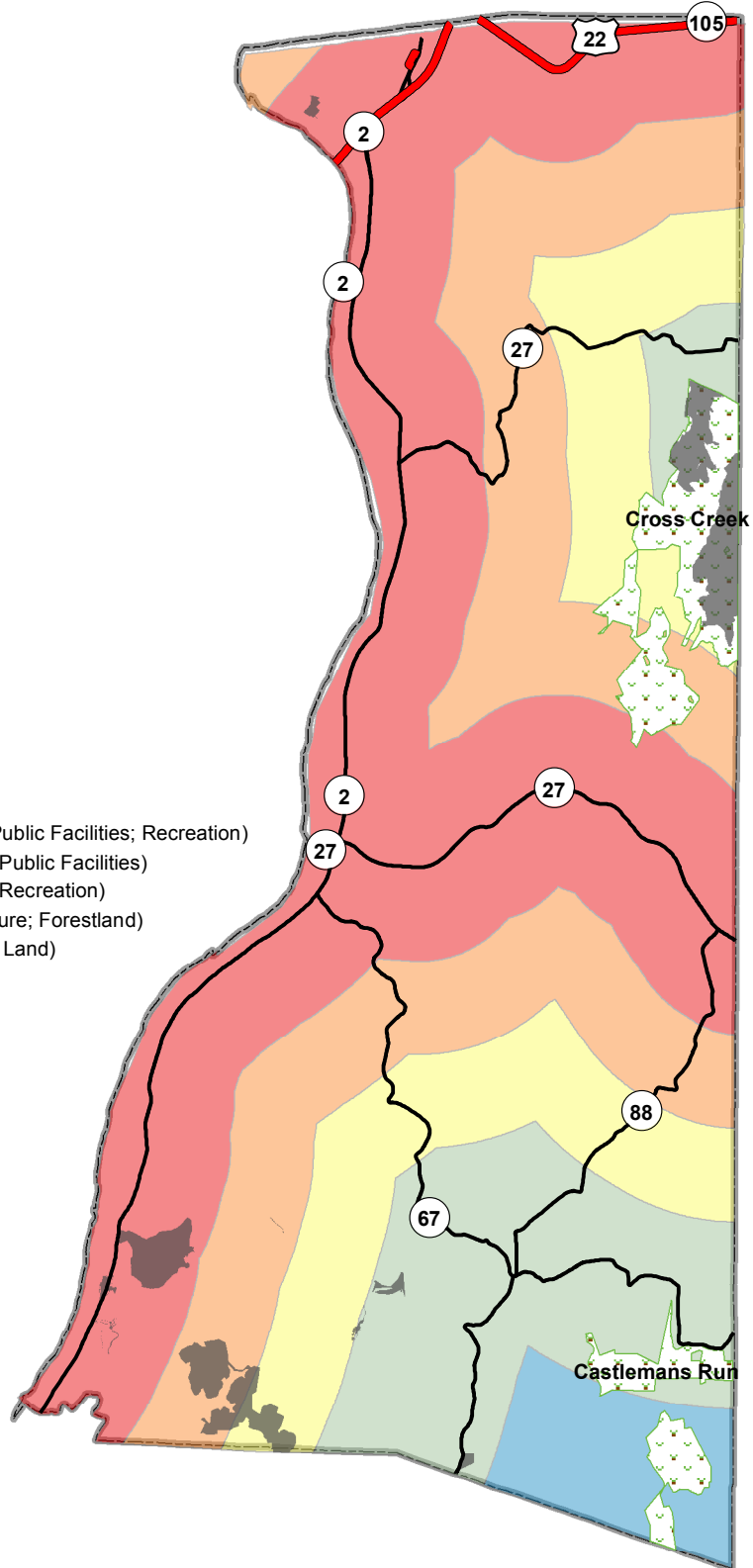
Land development or redevelopment options are determined through a review of the redevelopment authority's anticipated needs. The required infrastructure component standards are determined on a site by site basis by the county economic development authority as designated by West Virginia Code Chapter 05B Article 2A.

Landuse Criteria

Brooke County



- █ US Routes
- WV Routes
- Mining Permit Boundaries
- Wild Life Management
- 0 to 1 Mile (Industrial; Commercial/Retail; Residential; Public Facilities; Recreation)
- 1 to 2 Miles (Industrial; Commercial/Retail, Residential; Public Facilities)
- 2 to 3 Miles (Industrial; Commercial/Retail, Residential; Recreation)
- 3 to 5 Miles (Industrial; Residential; Recreation; Agriculture; Forestland)
- 5 to 10 Miles (Industrial; Residential; Agriculture; Forest Land)
- CountyBoundary



Source: Rahall Transportation Institute 2014

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V. Site Evaluation

Once the smart planning buffers have been created, the sites available for analysis are confirmed. This evaluation provides the county with an inventory of post mine sites that are suitable for development. The evaluation consists of existing infrastructure availability, which gives the most accurate assessment of a site’s physical capabilities for investment purposes. This will encourage strategic development and evaluation.

Initial Data Collection:

The consulting team collected all available data on surface mines sites located in Brooke County to produce an inventory of sites for analysis. The source for site information was primarily the West Virginia Department of Environment Protection (WV DEP) website, which allows permit searches by geographic location and mining type. The information provided by this source was used to develop a preliminary property database of all surface mines as well as general mapping.

The WV DEP permit database acts as a general clearinghouse for information, but is not infallible. The data is often updated by third-party sources, which increases the margin of error for site location. Because of this, the actual attributes being measured may not be at the distance stated because the mine site is not actually in the location given. The WV DEP has sought to minimize those errors, and RTI attempts to maintain the reliability of the measurements by observing their locations when mapping. RTI does not ensure the reliability of the site location or distances to the attributes. Any and all information should be verified for accuracy.

The initial data collection revealed all the mine sites in the county. Together, the team put together 27 sites for analysis. All of the sites and their distance attributes are listed below.

Table 3: Brooke County Potential Surface Mine Sites for Development

| Site_No | Permit_ID | Permittee | Facility Name | Issue Date | Expiration Date | Acres |
|---------|-----------|--------------------------|---------------|------------|-----------------|-------|
| 1 | S004582 | WEST VIRGINIA ENERGY INC | NA | 5/4/1982 | 5/4/1992 | 198.3 |
| 2 | Z007381 | WEST VIRGINIA ENERGY INC | NA | 8/3/1981 | 8/3/1992 | 67.25 |
| 3 | S004184 | WEST VIRGINIA ENERGY INC | NA | 7/13/1984 | 7/13/1989 | 47.7 |
| 4 | S107286 | WEST VIRGINIA ENERGY INC | NA | 1/13/1987 | 1/13/1992 | 5.4 |
| 5 | S007680 | RAYLE COAL CO. | NA | 6/10/1980 | 6/10/1992 | 141.8 |
| 6 | S005585 | WEST VIRGINIA ENERGY INC | NA | 6/25/1985 | 6/25/1990 | 78.5 |

| Site No | Permit ID | Permittee | Facility Name | Issue Date | Expiration Date | Acres |
|---------|-----------|---------------------------|--------------------------|------------|-----------------|--------|
| 7 | S200304 | OXFORD MINING COMPANY LLC | CROSS CREEK SURFACE MINE | 12/20/2004 | 12/20/2009 | 441.78 |
| 8 | S002684 | WEST VIRGINIA ENERGY INC | NA | 5/3/1984 | 5/3/1989 | 49.17 |
| 9 | Z005281 | WEST VIRGINIA ENERGY INC | NA | 1/18/1981 | 8/3/1992 | 110.19 |
| 10 | S005084 | RAYLE COAL CO. | NA | 8/3/1984 | 8/3/1994 | 83.1 |
| 11 | S011382 | STARVAGGI INDUSTRIES INC | NA | 11/16/1982 | 11/16/1997 | 169.7 |
| 12 | S003278 | WEST VIRGINIA ENERGY INC | NA | 2/3/1978 | 2/3/1983 | 43.44 |
| 13 | S101886 | WEST VIRGINIA ENERGY INC | NA | 3/17/1986 | 3/17/1991 | 170.8 |
| 14 | S016978 | WHEELING ENERGY CO | NA | 9/7/1978 | 9/7/1992 | 52 |
| 15 | S001882 | RAYLE COAL CO. | NA | 6/10/1982 | 6/10/1992 | 45.3 |
| 16 | S012482 | RAYLE COAL CO. | NA | 12/17/1982 | 12/17/1992 | 170 |
| 17 | S107186 | WEST VIRGINIA ENERGY INC | NA | 10/10/1986 | 10/10/1991 | 141.9 |
| 18 | S002083 | WEST VIRGINIA ENERGY INC | NA | 2/24/1983 | 2/24/1993 | 82.33 |
| 19 | S009379 | WEST VIRGINIA ENERGY INC | NA | 8/3/1982 | 8/3/1987 | 55.95 |
| 20 | S019178 | WEST VIRGINIA ENERGY INC | NA | 11/22/1978 | 11/22/1983 | 85.6 |
| 21 | S001983 | BOLOGNA MINING CO | NA | 2/24/1983 | 2/24/1993 | 30 |
| 22 | S006475 | BOLOGNA MINING CO | NA | 3/11/1975 | 3/11/1980 | 25.5 |
| 23 | S014077 | WEST VIRGINIA ENERGY INC | NA | 8/31/1977 | 8/31/1982 | 45.4 |
| 24 | S001585 | SAYCO DEVELOPMENT CO | NA | 2/27/1985 | 2/27/1990 | 77 |
| 25 | S001976 | STARVAGGI INDUSTRIES INC | NA | 1/23/1976 | 1/23/1981 | 44.9 |
| 26 | S009279 | WEST VIRGINIA ENERGY INC | NA | 8/15/1979 | 8/15/1984 | 128.2 |
| 27 | S014573 | BOLOGNA MINING CO | NA | 8/11/1973 | 8/11/1997 | 85 |

Site Analysis (Distance Analysis)

Once the surface mining sites in the county were identified each of the sites were evaluated by estimating the shortest distance from the site to a specified criteria (features which are important to development). There are two types of distance calculation in this analysis: road-path and Euclidean distance. Road-path distance is the distance when travelling on an actual roadway from the site to the feature; Euclidean distance is when the distance is a straight line from the site to the feature, without the necessity of following a roadway. Following are lists of criteria used in the analysis:

- Road-path Distances:
 - Distance to nearest roadway (Interstate, Existing Highway, and Proposed Highway)
 - Distance to major airports (Tri-State, Yeager)
 - Distance to Intermodal Terminal Facility and Huntington Port
 - Distance to nearest Sewer/ Solid Waste Treatment Facility

- Euclidean Distances:
 - Distance to Water Lines, Sewer Lines, Power Lines and Broadband
 - Distance to Gas Pipe and Oil Pipe
 - Distance to Railroad, National Waterway Network

The following tables illustrate the results of road-path and Euclidean distance assessments for all of the identified sites. Several distances were not analyzed for Brooke County as they were not within the scope of the County. All distances were recorded in miles.

Table 4: Assessment of Distances

| Site No. | Permit ID | Interstate (IS) | Sign - IS | Existing Highway (EH) | Sign - EH | Paved Road | Paved Road Name |
|----------|-----------|-----------------|-----------|-----------------------|-----------|------------|-------------------------|
| 1 | S004582 | 15.38 | I70 | 2.81 | S27 | 0.46 | McADOO RIDGE |
| 2 | Z007381 | 10.93 | I70 | 4.33 | S2 | 0.09 | WV 67 |
| 3 | S004184 | 13.73 | I70 | 3.22 | S2 | 0.56 | McCORD HILL ROAD |
| 4 | S107286 | 12.58 | I70 | 4.30 | S2 | 0.04 | LAZEAR RUN |
| 5 | S007680 | 14.04 | I70 | 1.47 | S27 | 0.01 | McADOO RIDGE |
| 6 | S005585 | 11.71 | I70 | 2.35 | S2 | 0.07 | OLD DELTA 6, BETH DRIVE |
| 7 | S200304 | 19.37 | I70 | 3.16 | S27 | 0.01 | AMSPOKER ROAD |
| 8 | S002684 | 15.50 | I70 | 2.98 | S27 | 0.28 | McADOO RIDGE |
| 9 | Z005281 | 10.17 | I70 | 4.75 | S27 | 0.02 | LOGAN COURT |

| Site No. | Permit_ID | Interstate (IS) | Sign - IS | Existing Highway (EH) | Sign - EH | Paved Road | Paved Road Name |
|----------|-----------|-----------------|-----------|-----------------------|-----------|------------|---------------------|
| 10 | S005084 | 9.32 | I70 | 3.59 | S2 | 0.23 | APPLE PIE RIDGE (B) |
| 11 | S011382 | 21.47 | I70 | 4.12 | S2 | 0.18 | TENT CHURCH |
| 12 | S003278 | 13.19 | I70 | 2.76 | S2 | 0.00 | McCORD HILL ROAD |
| 13 | S101886 | 14.30 | I70 | 1.74 | S27 | 0.02 | McADOO RIDGE |
| 14 | S016978 | 9.22 | I70 | 4.09 | S2 | 0.00 | LAZEAR RUN |
| 15 | S001882 | 9.66 | I70 | 4.53 | S2 | 0.20 | LAZEAR RUN |
| 16 | S012482 | 10.05 | I70 | 3.68 | S2 | 0.35 | GIRTY'S POINT |
| 17 | S107186 | 13.81 | I70 | 1.25 | S27 | 0.01 | McADOO RIDGE |
| 18 | S002083 | 9.10 | I70 | 1.57 | S2 | 0.12 | GIRTYS POINT ROAD |
| 19 | S009379 | 9.32 | I70 | 1.79 | S2 | 0.03 | GIRTYS POINT ROAD |
| 20 | S019178 | 10.57 | I70 | 0.33 | S2 | 0.37 | WV 2 |
| 21 | S001983 | 22.76 | I70 | 3.95 | U22 | 0.05 | RYLANDS HILL |
| 22 | S006475 | 23.02 | I70 | 3.94 | U22 | 0.21 | RYLANDS HILL |
| 23 | S014077 | 14.47 | I70 | 3.54 | S27 | 0.00 | Procellochs Lane |
| 24 | S001585 | 8.47 | I70 | 6.11 | S2 | 0.39 | WV 88 |
| 25 | S001976 | 12.05 | I70 | 3.85 | S2 | 0.40 | WV 67 |
| 26 | S009279 | 15.21 | I70 | 3.25 | S27 | 0.25 | McADOO RIDGE |
| 27 | S014573 | 22.42 | I70 | 4.46 | S2 | 0.50 | WV 27 Alt |

Table 5: Shortest Distances from Sites to Other Transportation Methods

| Site No. | Permit_ID | Railroad (RR) | Owner (RR) | Intermodal Terminal Facility | Ohio River Network |
|----------|-----------|---------------|------------|------------------------------|--------------------|
| 1 | S004582 | 3.96 | WE | 14.85 | 4.31 |
| 2 | Z007381 | 4.53 | NS | 14.23 | 4.13 |
| 3 | S004184 | 3.20 | NS | 12.99 | 2.45 |
| 4 | S107286 | 4.94 | NS | 14.81 | 3.40 |

| Site No. | Permit_ID | Railroad (RR) | Owner (RR) | Intermodal Terminal Facility | Ohio River Network |
|-----------------|------------------|----------------------|-------------------|-------------------------------------|---------------------------|
| 5 | S007680 | 3.27 | NS | 14.18 | 4.52 |
| 6 | S005585 | 3.70 | NS | 15.18 | 2.41 |
| 7 | S200304 | 0.82 | NS | 10.47 | 3.89 |
| 8 | S002684 | 3.92 | NS | 14.36 | 4.01 |
| 9 | Z005281 | 5.48 | NS | 15.33 | 5.18 |
| 10 | S005084 | 5.75 | NS | 16.52 | 2.77 |
| 11 | S011382 | 2.96 | NS | 7.85 | 4.01 |
| 12 | S003278 | 2.62 | NS | 12.53 | 2.00 |
| 13 | S101886 | 3.15 | WE | 14.44 | 4.23 |
| 14 | S016978 | 5.67 | NS | 17.02 | 3.37 |
| 15 | S001882 | 5.45 | NS | 17.46 | 3.49 |
| 16 | S012482 | 6.05 | | 16.50 | 2.01 |
| 17 | S107186 | 3.27 | NS | 13.95 | 4.74 |
| 18 | S002083 | 6.56 | | 17.06 | 1.69 |
| 19 | S009379 | 6.53 | | 17.28 | 1.92 |
| 20 | S019178 | 3.86 | | 13.08 | 0.01 |
| 21 | S001983 | 4.15 | NS | 7.41 | 4.50 |
| 22 | S006475 | 3.95 | NS | 7.40 | 4.32 |
| 23 | S014077 | 3.40 | NS | 13.34 | 3.30 |
| 24 | S001585 | 6.55 | NS | 17.19 | 4.42 |
| 25 | S001976 | 3.76 | NS | 13.62 | 3.45 |

| Site No. | Permit_ID | Railroad (RR) | Owner (RR) | Intermodal Terminal Facility | Ohio River Network |
|-----------------|------------------|----------------------|-------------------|-------------------------------------|---------------------------|
| 26 | S009279 | 3.80 | NS | 14.07 | 3.80 |
| 27 | S014573 | 3.06 | NS | 8.19 | 4.47 |

Table 6: Shortest Distances from Sites to Sewer Lines (SL) and Water Lines (WL)

| Site No. | Permit ID | SL | Public Utility - SL | WL | Public Utility - WL |
|----------|-----------|------|---------------------------------------|------|--|
| 1 | S004582 | 2.07 | Town of Bethany Sanitation Board | 0.36 | Washington Pike Public Service District |
| 2 | Z007381 | 0.85 | Town of Bethany Sanitation Board | 1.05 | Hammond Public Service District |
| 3 | S004184 | 2.59 | Town of Bethany Sanitation Board | 0.50 | Hammond Public Service District |
| 4 | S107286 | 1.69 | Town of Bethany Sanitation Board | 0.49 | Hammond Public Service District |
| 5 | S007680 | 2.76 | Town of Bethany Sanitation Board | 0.01 | Washington Pike Public Service District |
| 6 | S005585 | 2.66 | Town of Bethany Sanitation Board | 0.19 | Hammond Public Service District |
| 7 | S200304 | 1.84 | Brooke County Public Service District | 1.42 | Washington Pike Public Service District |
| 8 | S002684 | 1.91 | Town of Bethany Sanitation Board | 0.28 | Washington Pike Public Service District |
| 9 | Z005281 | 0.02 | Town of Bethany Sanitation Board | 1.39 | Hammond Public Service District |
| 10 | S005084 | 2.64 | Town of Bethany Sanitation Board | 0.23 | Hammond Public Service District |
| 11 | S011382 | 0.93 | Brooke County Public Service District | 0.70 | City of Follansbee Water |
| 12 | S003278 | 2.14 | Wellsburg Sanitary Board | 0.00 | Hammond Public Service District |
| 13 | S101886 | 2.88 | Town of Bethany Sanitation Board | 0.01 | Washington Pike Public Service District |
| 14 | S016978 | 2.02 | Town of Bethany Sanitation Board | 0.00 | Hammond Public Service District |
| 15 | S001882 | 1.79 | Town of Bethany Sanitation Board | 0.19 | Hammond Public Service District |
| 16 | S012482 | 3.55 | Town of Bethany Sanitation Board | 0.33 | Hammond Public Service District |
| 17 | S107186 | 2.79 | Town of Bethany Sanitation Board | 0.01 | Washington Pike Public Service District |
| 18 | S002083 | 4.29 | Town of Bethany Sanitation Board | 0.12 | Hammond Public Service District |
| 19 | S009379 | 4.05 | Town of Bethany Sanitation Board | 0.02 | Hammond Public Service District |
| 20 | S019178 | 3.52 | Wellsburg Sanitary Board | 0.28 | Village of Beech Bottom (Water Department) |

| Site No. | Permit_ID | SL | Public Utility - SL | WL | Public Utility - WL |
|----------|-----------|------|---------------------------------------|------|---|
| 21 | S001983 | 0.41 | City of Weirton Sanitary Board | 0.06 | City of Follansbee Water |
| 22 | S006475 | 0.24 | City of Weirton Sanitary Board | 0.21 | City of Follansbee Water |
| 23 | S014077 | 1.76 | Town of Bethany Sanitation Board | 0.00 | Washington Pike Public Service District |
| 24 | S001585 | 1.83 | Town of Bethany Sanitation Board | 0.42 | Hammond Public Service District |
| 25 | S001976 | 1.40 | Town of Bethany Sanitation Board | 0.59 | Washington Pike Public Service District |
| 26 | S009279 | 1.68 | Town of Bethany Sanitation Board | 0.19 | Washington Pike Public Service District |
| 27 | S014573 | 1.39 | Brooke County Public Service District | 0.67 | City of Follansbee Water |

Table 7: Shortest Distances from Sites to Broadband and Power Lines

| Site No. | Permit_ID | Broadband | Provider | Power Lines | Type | Size_kV |
|----------|-----------|-----------|------------------------------|-------------|--------------|---------|
| 1 | S004582 | 0.77 | Frontier West Virginia, Inc. | 0.20 | Transmission | 115-138 |
| 2 | Z007381 | 1.64 | Frontier West Virginia, Inc. | 0.58 | Transmission | 115-138 |
| 3 | S004184 | 0.79 | Frontier West Virginia, Inc. | 0.12 | Transmission | 115-138 |
| 4 | S107286 | 0.67 | Frontier West Virginia, Inc. | 0.57 | Transmission | 115-138 |
| 5 | S007680 | 0.04 | Frontier West Virginia, Inc. | 0.46 | Transmission | 115-138 |

| Site No. | Permit_ID | Broadband | Provider | Power Lines | Type | Size_kV |
|----------|-----------|-----------|-----------------------------------|-------------|------------------|---------|
| 6 | S005585 | 0.48 | Frontier West Virginia, Inc. | 0.14 | Transmission | 115-138 |
| 7 | S200304 | 1.16 | Comcast Cable Communications, LLC | 0.37 | Transmission | 115-138 |
| 8 | S002684 | 1.15 | Frontier West Virginia, Inc. | 0.21 | Transmission | 115-138 |
| 9 | Z005281 | 0.88 | Frontier West Virginia, Inc. | 0.69 | Sub-Transmission | Unknown |
| 10 | S005084 | 0.29 | Frontier West Virginia, Inc. | 0.12 | Transmission | 115-138 |
| 11 | S011382 | 0.18 | Frontier West Virginia, Inc. | 0.43 | Transmission | 115-138 |
| 12 | S003278 | 0.64 | Frontier West Virginia, Inc. | 0.28 | Transmission | 115-138 |
| 13 | S101886 | 0.34 | Frontier West Virginia, Inc. | 0.17 | Transmission | 115-138 |
| 14 | S016978 | 0.00 | Frontier West Virginia, Inc. | 0.50 | Transmission | 115-138 |
| 15 | S001882 | 0.17 | Frontier West Virginia, Inc. | 0.77 | Transmission | 115-138 |

| Site No. | Permit_ID | Broadband | Provider | Power Lines | Type | Size_kV |
|----------|-----------|-----------|-----------------------------------|-------------|------------------|---------|
| 16 | S012482 | 0.81 | Frontier West Virginia, Inc. | 0.50 | Transmission | 115-138 |
| 17 | S107186 | 0.18 | Frontier West Virginia, Inc. | 0.46 | Transmission | 115-138 |
| 18 | S002083 | 0.19 | Frontier West Virginia, Inc. | 0.70 | Sub-Transmission | Unknown |
| 19 | S009379 | 0.24 | Frontier West Virginia, Inc. | 0.93 | Sub-Transmission | Unknown |
| 20 | S019178 | 0.96 | Frontier West Virginia, Inc. | 0.36 | Transmission | 115-138 |
| 21 | S001983 | 0.41 | Comcast Cable Communications, LLC | 0.32 | Transmission | 115-138 |
| 22 | S006475 | 0.24 | Comcast Cable Communications, LLC | 0.51 | Transmission | 115-138 |
| 23 | S014077 | 0.98 | Frontier West Virginia, Inc. | 0.10 | Transmission | 115-138 |
| 24 | S001585 | 0.50 | Frontier West Virginia, Inc. | 0.26 | Transmission | 115-138 |
| 25 | S001976 | 1.59 | Frontier West Virginia, Inc. | 0.17 | Transmission | 115-138 |

| Site No. | Permit_ID | Broadband | Provider | Power Lines | Type | Size_kV |
|----------|-----------|-----------|------------------------------|-------------|--------------|---------|
| 26 | S009279 | 1.34 | Frontier West Virginia, Inc. | 0.13 | Transmission | 115-138 |
| 27 | S014573 | 0.65 | Frontier West Virginia, Inc. | 0.04 | Transmission | 115-138 |

Table 8: Shortest Distances from Sites to Sewer and Solid Waste Treatment Facilities

| Site No. | Permit_ID | Sewer Treatment (ST) | Facility Name (ST) | Solid Waste Treatment (SWT) | Facility Name (SWT) |
|----------|-----------|----------------------|------------------------------|-----------------------------|---------------------|
| 1 | S004582 | 3.64 | BROOKE HILLS PARK | 10.82 | North Fork Landfill |
| 2 | Z007381 | 2.04 | BETHANY TOWN OF | 6.83 | North Fork Landfill |
| 3 | S004184 | 2.85 | MAIN DRIVE SUBDIVISION | 8.20 | North Fork Landfill |
| 4 | S107286 | 3.01 | TRAILER COURT/APTS. | 6.80 | North Fork Landfill |
| 5 | S007680 | 2.30 | BROOKE HILLS PARK | 10.14 | North Fork Landfill |
| 6 | S005585 | 1.60 | TRAILER COURT/APTS. | 5.41 | North Fork Landfill |
| 7 | S200304 | 1.40 | STILLSON'S MOBILE HOME COURT | 6.54 | Brooke |
| 8 | S002684 | 3.81 | BROOKE HILLS PARK | 10.33 | North Fork Landfill |
| 9 | Z005281 | 1.55 | BETHANY TOWN OF | 6.28 | North Fork Landfill |
| 10 | S005084 | 1.42 | TRAILER COURT/APTS. | 3.30 | North Fork Landfill |
| 11 | S011382 | 0.95 | CESARE'S COURT | 3.92 | Brooke |
| 12 | S003278 | 2.32 | MAIN DRIVE SUBDIVISION | 7.67 | North Fork Landfill |
| 13 | S101886 | 2.57 | BROOKE HILLS PARK | 10.40 | North Fork Landfill |

| Site No. | Permit_ID | Sewer Treatment (ST) | Facility Name (ST) | Solid Waste Treatment (SWT) | Facility Name (SWT) |
|----------|-----------|----------------------|-----------------------|-----------------------------|---------------------|
| 14 | S016978 | 1.92 | TRAILER COURT/APTS. | 3.81 | North Fork Landfill |
| 15 | S001882 | 2.35 | TRAILER COURT/APTS. | 4.24 | North Fork Landfill |
| 16 | S012482 | 1.41 | TRAILER COURT/APTS. | 3.74 | North Fork Landfill |
| 17 | S107186 | 2.08 | BROOKE HILLS PARK | 9.92 | North Fork Landfill |
| 18 | S002083 | 2.62 | WEST LIBERTY ELEM. | 3.42 | North Fork Landfill |
| 19 | S009379 | 2.24 | WEST LIBERTY ELEM. | 3.32 | North Fork Landfill |
| 20 | S019178 | 0.33 | BEECH BOTTOM | 5.92 | North Fork Landfill |
| 21 | S001983 | 0.73 | SUNVIEW TRAILER COURT | 3.52 | Brooke |
| 22 | S006475 | 0.99 | SUNVIEW TRAILER COURT | 3.51 | Brooke |
| 23 | S014077 | 3.62 | Brooke High School | 9.30 | North Fork Landfill |
| 24 | S001585 | 2.12 | WEST LIBERTY ELEM. | 4.57 | North Fork Landfill |
| 25 | S001976 | 3.10 | TRAILER COURT/APTS. | 6.89 | North Fork Landfill |
| 26 | S009279 | 4.08 | BROOKE HILLS PARK | 10.04 | North Fork Landfill |
| 27 | S014573 | 0.60 | SUNVIEW TRAILER COURT | 4.26 | Brooke |

Table 9: Shortest Distances from Sites to Gas Pipe and Oil Pipe

| Site No. | Permit_ID | Gas Pipe (GP) | Company Name (GP) | Oil Pipe (OP) | Company Name (OP) |
|----------|-----------|---------------|---------------------------------|---------------|-------------------|
| 1 | S004582 | 0.52 | Columbia Gas Transmission Corp. | 0.19 | CL |
| 2 | Z007381 | 0.99 | Columbia Gas Transmission Corp. | 1.67 | CL |
| 3 | S004184 | 0.49 | Columbia Gas Transmission Corp. | 0.37 | CL |
| 4 | S107286 | 0.07 | Columbia Gas Transmission Corp. | 0.69 | CL |

| Site No. | Permit_ID | Gas Pipe (GP) | Company Name (GP) | Oil Pipe (OP) | Company Name (OP) |
|----------|-----------|---------------|---------------------------------|---------------|-------------------|
| 5 | S007680 | 0.04 | Columbia Gas Transmission Corp. | 0.53 | CL |
| 6 | S005585 | 0.79 | Columbia Gas Transmission Corp. | 0.00 | CL |
| 7 | S200304 | 0.81 | Columbia Gas Transmission Corp. | 1.02 | Unknown |
| 8 | S002684 | 0.92 | Columbia Gas Transmission Corp. | 0.58 | CL |
| 9 | Z005281 | 1.93 | Columbia Gas Transmission Corp. | 1.85 | CL |
| 10 | S005084 | 0.60 | Columbia Gas Transmission Corp. | 0.05 | CL |
| 11 | S011382 | 0.46 | Columbia Gas Transmission Corp. | 0.36 | CL |
| 12 | S003278 | 0.51 | Columbia Gas Transmission Corp. | 0.39 | CL |
| 13 | S101886 | 0.18 | Columbia Gas Transmission Corp. | 0.35 | CL |
| 14 | S016978 | 0.02 | Columbia Gas Transmission Corp. | 0.58 | CL |
| 15 | S001882 | 0.13 | Columbia Gas Transmission Corp. | 0.72 | CL |
| 16 | S012482 | 0.85 | Columbia Gas Transmission Corp. | 0.92 | CL |
| 17 | S107186 | 0.25 | Columbia Gas Transmission Corp. | 0.70 | CL |
| 18 | S002083 | 1.43 | Columbia Gas Transmission Corp. | 1.53 | CL |
| 19 | S009379 | 1.34 | Columbia Gas Transmission Corp. | 1.27 | CL |
| 20 | S019178 | 2.40 | Columbia Gas Transmission Corp. | 2.33 | CL |
| 21 | S001983 | 0.67 | Columbia Gas Transmission Corp. | 0.65 | Unknown |
| 22 | S006475 | 0.78 | Columbia Gas Transmission Corp. | 0.76 | Unknown |
| 23 | S014077 | 1.03 | Columbia Gas Transmission Corp. | 1.56 | CL |
| 24 | S001585 | 0.90 | Columbia Gas Transmission Corp. | 1.51 | CL |
| 25 | S001976 | 0.90 | Columbia Gas Transmission Corp. | 1.73 | CL |

| Site No. | Permit_ID | Gas Pipe (GP) | Company Name (GP) | Oil Pipe (OP) | Company Name (OP) |
|-----------------|------------------|----------------------|---------------------------------|----------------------|--------------------------|
| 26 | S009279 | 1.32 | Columbia Gas Transmission Corp. | 1.02 | CL |
| 27 | S014573 | 0.01 | Columbia Gas Transmission Corp. | 0.33 | CL |

Suitability Model

The suitability model for Brooke County is created with a weighted scoring method. The method scores options against a prioritized requirements list to determine which option best fits the selection criteria. Using a consistent list of criteria, weighted according to the importance or priority of the criteria to the researcher, a comparison of similar “products” can be completed. If numerical values are assigned to the criteria priorities (**weighting**) and the ability of the product to meet a specific criterion (**scoring**), a “score” can be derived. By summing the score (**total score**), the product most closely meeting the criteria can be determined.

Criteria are chosen and weighted based on published Land Use Master Plans (LUMPs) for several counties in West Virginia, RTI’s own research on the existing conditions in Brooke County and expert advice about important factors to site development.¹³ Then, scores for each site are given by comparing the closest distance from the site to all factors within given distance thresholds. There are three sets of scores in this suitability model: **absolute scores**, **relative scores**, and the **total score**.

Absolute scores are given by comparing certain distance thresholds with the results of GIS Distance Analysis. Thresholds are determined mainly based on the researcher’s experience, characteristics of the considered criteria and the priority given to the criteria. For example, if the closest distance from a site to an existing highway ranges from 5 to 10 miles, the site will be given 7 points for the Existing Highways Criteria. Absolute scores will directly affect the site selection. Different score categories may result in significant change in the cost of investment, and will thus impact the county’s decisions.

Relative scores, on the other hand, depend solely on the closest distances of sites to relative criteria features. Initially, statistical values will be computed according to distance values from all sites to a certain factor (criteria), including min, quartile 1 – Q1, quartile 2 – Q2, quartile 3 – Q3, and max. Then, distance values will be classified into four groups and given the scores shown in Table 12 (below). This score set is used to sharpen differences between all sites in a certain category and therefore aid the decision maker. For example, two sites may have the same absolute score (in the same range of miles) but may fall in different statistical groups. Then the two sites will have different relative scores.

¹³ Joseph, M. *A Decision-Support Model of Land Suitability Analysis for the Ohio Lake Erie Balanced Growth Program*. EcoCity Cleveland. (2006).

The total score is a combination of weights, absolute scores, and relative scores. The following equation is used to calculate the total score of a certain studied site:

$$\text{Total score of site A} = \sum (\text{absolute score} \times \text{relative score} \times \text{weight})_{ci} / 10 \quad (\text{ci: criteria i})$$

Sites with higher total scores reveal a higher chance of being developed. Total scores will vary according to a combination of three components: weights, absolute scores, and relative scores.

1. Weighting

Table 10 prioritizes post-mining land-use criteria for surface coal mining site selection in Brooke County. Criteria weights are assigned on a one-to-ten scale. According to Joseph, utilities (power, water, and sewer) and road networks are considered more important factors to development. Therefore, those factors receive higher weights (7-10) in the suitability model. On the other hand, decision-makers are less affected by factors such as airports, national waterways, and ports. Those factors may be good supplements but do not critically change the investments.

Table 10: Weighting Sites Selection Criteria

| No | Criteria | Weight |
|----|----------------------------------|--------|
| 1 | Interstate | 8 |
| 2 | Existing Highway | 8 |
| 3 | Sewer Treatment Facilities | 7 |
| 4 | Solid Waste Treatment Facilities | 8 |
| 5 | National Waterway Network | 4 |
| 6 | Intermodal Terminal Facilities | 6 |
| 7 | Sewer Lines | 8 |
| 8 | Railroads | 5 |
| 9 | Water Lines | 10 |
| 10 | Power Lines | 10 |
| 11 | Gas Pipes | 6 |
| 12 | Pipe Lines | 6 |
| 13 | Broadband | 9 |

2. Scoring

2.1 Absolute Scores:

The shorter the distance to a feature from a site, the higher absolute score the site receives. Table 11 describes the thresholds and score categories for each criterion, ranging from 1 to 10. In order to achieve a better comparison between sites, the score scale is evenly distributed between five distance groups (1-3-5-7-10).

As mentioned above, thresholds are mainly defined based on researcher experience, traveling method from a site to the features (road-path vs. Euclidean), and characteristic of criteria (type of feature, priority, and density). For example, distance thresholds for “Solid Waste Treatment Facilities” are much smaller than ones for “Intermodal Terminal Facilities”. This is because treatment facilities are much denser than intermodal terminal facilities. In addition, solid waste treatment facilities are considered more important in site selection (weight: 8 vs. 6).

Table 11: Absolute Scoring System

| Absolute Score | | 10 | 7 | 5 | 3 | 1 |
|--------------------------------------|----------------------------------|-----------|------------|------------|----------|----------|
| Criteria (Distances in miles) | Existing Highway | 0 - 5 | 5 - 10 | 10 - 15 | 15 - 20 | > 20 |
| | Intermodal Terminal Facilities | 0 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | > 40 |
| | Interstate | 0 - 5 | 5 - 14 | 14 - 22 | 22 - 30 | > 30 |
| | Sewer Treatment Facilities | 0 - 2.5 | 2.5 - 5 | 5 - 7.5 | 7.5 - 10 | > 10 |
| | Solid Waste Treatment Facilities | 0 - 5 | 5 - 14 | 14 - 22 | 22 - 30 | > 30 |
| | Broadband | 0 - 0.5 | 0.5 - 2 | 2 - 3 | 3 - 4 | > 4 |
| | Gas Pipe (Natural Gas) | 0 - 0.5 | 0.5 - 1.5 | 1.5 - 2 | 2 - 2.5 | > 2.5 |
| | National Network Waterway | 0 - 2.5 | 2.5 - 5 | 5 - 7.5 | 7.5 - 10 | > 10 |
| | Power Lines | 0 - 0.5 | 0.5 - 1.5 | 1.5 - 2 | 2 - 2.5 | > 2.5 |
| | Pipe Lines (Oil) | 0 - 0.25 | 0.25 - 0.5 | 0.5 - 0.75 | 0.75 - 1 | > 1 |
| | Railroads | 0 - 1 | 1 - 3 | 3 - 4 | 4 - 5 | > 5 |
| | Sewer Lines | 0 - 1 | 1 - 3 | 3 - 4 | 4 - 5 | > 5 |
| | Water Lines | 0 - 0.25 | 0.25 - 0.5 | 0.5 - 0.75 | 0.75 - 1 | > 1 |

2.2 Relative Scores:

Table 12 shows four statistical groups and their relative scores in the Brooke County land suitability model. The total number of coal mining sites will be equally distributed in each group. The relative score differs from the absolute score in two ways. First, thresholds for relative scores are derived only from real distances from the sites to the features (criteria). It is not affected by personal opinion and does not consider either traveling method or nature of criteria.

Table 12: Relative Scoring System

| | | Threshold (Distances in miles) | | | | |
|------------|----------------------------------|---------------------------------------|----------------|----------------|-----------------|------------|
| | | Min - Q1 | Q1 - Q2 | Q2 - Q3 | Q3 – Max | |
| | | Relative Score | 10 | 7.5 | 5 | 2.5 |
| No. | Criteria | Min | Q1 | Q2 | Q3 | Max |
| 1 | Interstate | 8.47 | 10.11 | 13.19 | 15.29 | 23.02 |
| 2 | Existing Highway | 0.33 | 2.56 | 3.54 | 4.11 | 6.11 |
| 3 | Sewer Treatment Facilities | 0.33 | 1.41 | 2.12 | 2.74 | 4.08 |
| 4 | Solid Waste Treatment Facilities | 3.30 | 3.87 | 6.28 | 8.75 | 10.82 |
| 5 | National Waterway Network | 0.01 | 2.61 | 3.80 | 4.32 | 5.18 |
| 6 | Intermodal Terminal Facilities | 7.40 | 13.04 | 14.23 | 15.92 | 17.46 |
| 7 | Sewer Lines | 0.02 | 1.54 | 1.91 | 2.71 | 4.29 |
| 8 | Railroads | 0.82 | 3.27 | 3.92 | 5.47 | 6.56 |
| 9 | Water Lines | 0.00 | 0.04 | 0.23 | 0.49 | 1.42 |
| 10 | Power Lines | 0.04 | 0.17 | 0.36 | 0.51 | 0.93 |
| 11 | Gas Pipes | 0.01 | 0.35 | 0.78 | 0.96 | 2.40 |
| 12 | Pipe Lines | 0.00 | 0.38 | 0.70 | 1.39 | 2.33 |
| 13 | Broadband | 0.00 | 0.24 | 0.64 | 0.92 | 1.64 |

3. Brooke County's Suitability Model:

Table 13 shows the total scores of all studied sites in Brooke County. Site No-6 (Permit ID = S005585) has the highest score of 647.75. The sites with higher total scores suggest better opportunities for development. Results in Table 13 are also plotted in the bar chart (Figure 15) for better visualization. Among 27 analyzed potential development sites of Brooke County, it is easy to notice the top 5 sites and determine the most suitable sites for investment.

Certainly, any change in weight values or the scoring system will result in different output and may change the decision. For better analysis and decision-making, the dynamic suitability model, which allows modification in criteria's weights, thresholds and scores is available for distribution through RTI's Geospatial Program.

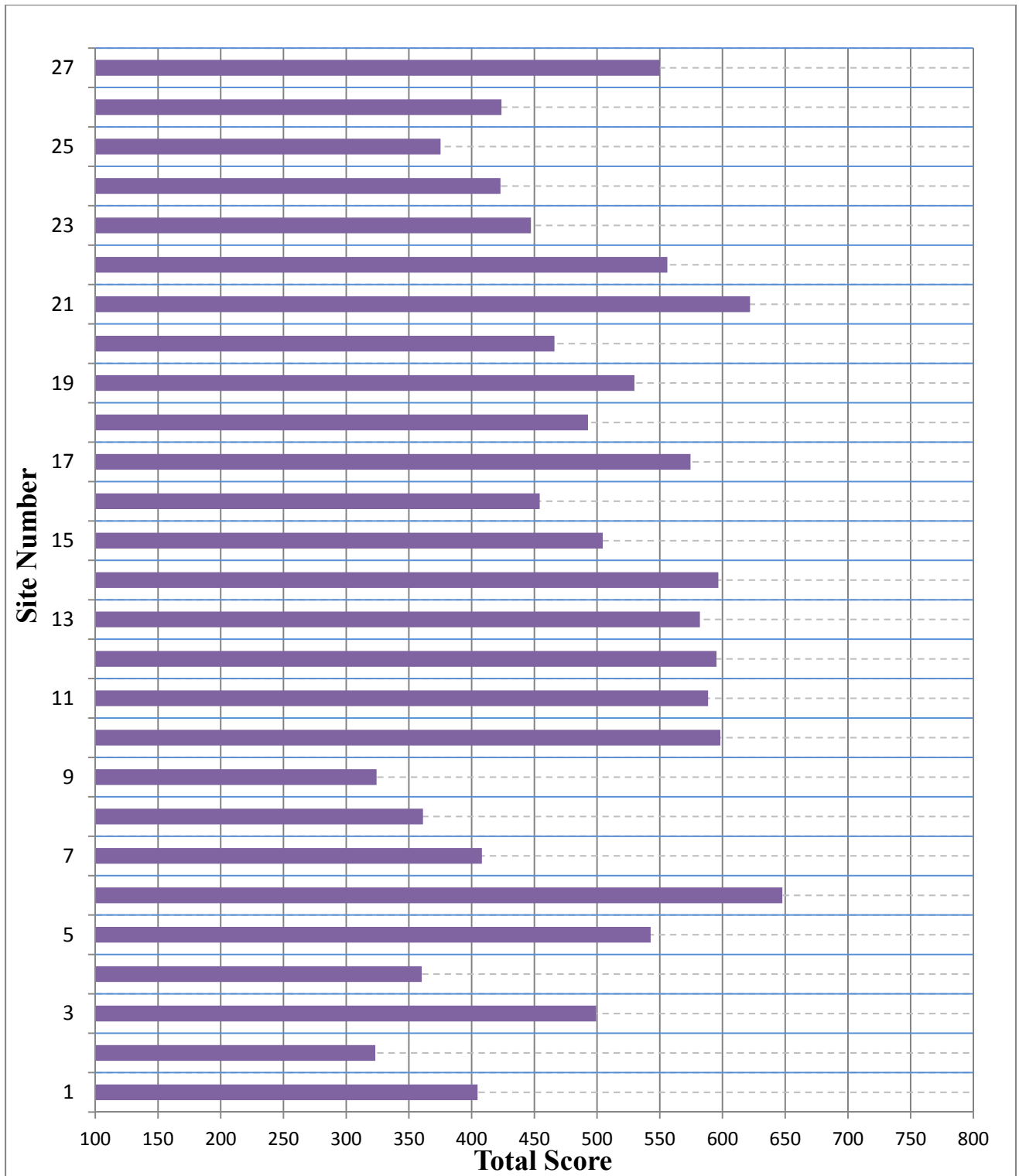
Besides a distance analysis, a suitability model for Brooke is supported by demographic data as well as two additional analyses, which are workforce analysis and retail location density (shown on Table 14 and Map 41). The best decision will be made with careful consideration of the suitability analysis as well as the demographic and economic information.

Table 13: Total Score of Mine Sites in Brooke County

| Site No. | Permittee | PermitID | Score |
|----------|---------------------------|----------|--------|
| 1 | WEST VIRGINIA ENERGY INC | S004582 | 404.75 |
| 2 | WEST VIRGINIA ENERGY INC | Z007381 | 323.25 |
| 3 | WEST VIRGINIA ENERGY INC | S004184 | 499.25 |
| 4 | WEST VIRGINIA ENERGY INC | S107286 | 360.25 |
| 5 | RAYLE COAL CO. | S007680 | 542.75 |
| 6 | WEST VIRGINIA ENERGY INC | S005585 | 647.75 |
| 7 | OXFORD MINING COMPANY LLC | S200304 | 408.25 |
| 8 | WEST VIRGINIA ENERGY INC | S002684 | 361.25 |
| 9 | WEST VIRGINIA ENERGY INC | Z005281 | 324.25 |
| 10 | RAYLE COAL CO. | S005084 | 598.25 |
| 11 | STARVAGGI INDUSTRIES INC | S011382 | 588.5 |
| 12 | WEST VIRGINIA ENERGY INC | S003278 | 595.25 |
| 13 | WEST VIRGINIA ENERGY INC | S101886 | 582 |
| 14 | WHEELING ENERGY CO | S016978 | 596.75 |
| 15 | RAYLE COAL CO. | S001882 | 504.5 |
| 16 | RAYLE COAL CO. | S012482 | 454.25 |
| 17 | WEST VIRGINIA ENERGY INC | S107186 | 574.5 |

| Site No. | Permittee | PermitID | Score |
|-----------------|--------------------------|-----------------|--------------|
| 18 | WEST VIRGINIA ENERGY INC | S002083 | 492.75 |
| 19 | WEST VIRGINIA ENERGY INC | S009379 | 529.75 |
| 20 | WEST VIRGINIA ENERGY INC | S019178 | 466 |
| 21 | BOLOGNA MINING CO | S001983 | 622 |
| 22 | BOLOGNA MINING CO | S006475 | 556 |
| 23 | WEST VIRGINIA ENERGY INC | S014077 | 447.25 |
| 24 | SAYCO DEVELOPMENT CO | S001585 | 423 |
| 25 | STARVAGGI INDUSTRIES INC | S001976 | 375.25 |
| 26 | WEST VIRGINIA ENERGY INC | S009279 | 423.75 |
| 27 | BOLOGNA MINING CO | S014573 | 550 |

Figure 15: Brooke County's Suitability Model (Total Score of Each Surface Coal Mining Site)



Work Force Analysis

A work force analysis estimates total employment and unemployment within a certain distance, providing potential labor sources if an investment is made on the site. According to Gary Langer, the average one-way commute time is 26 minutes or 16 miles.¹⁴ It is reasonable to consider unemployment within 15 miles of the site as an upper limit for a potential employer. This data set does not provide a skill set analysis however; therefore employers may not find the labor skills they need. This dataset provides the pool of labor resources from which to choose.

Table 14: Employment and unemployment within radius of 5, 10 and 15 miles from the site

| Rank | Permit_ID | Emp_05 | Unemp_05 | Emp_10 | Unemp_10 | Emp_15 | Unemp_15 |
|------|-----------|--------|----------|--------|----------|--------|----------|
| 1 | S004582 | 4451 | 556 | 9396 | 1387 | 10150 | 1569 |
| 2 | Z007381 | 3784 | 378 | 8429 | 1168 | 10150 | 1569 |
| 3 | S004184 | 4222 | 475 | 8916 | 1271 | 10150 | 1569 |
| 4 | S107286 | 3314 | 309 | 7878 | 1073 | 10150 | 1569 |
| 5 | S007680 | 4394 | 583 | 9643 | 1446 | 10150 | 1569 |
| 6 | S005585 | 3721 | 394 | 8626 | 1204 | 10150 | 1569 |
| 7 | S200304 | 6069 | 1040 | 9858 | 1545 | 10150 | 1569 |
| 8 | S002684 | 4618 | 571 | 9354 | 1376 | 10150 | 1569 |
| 9 | Z005281 | 3137 | 283 | 7920 | 1080 | 10150 | 1569 |
| 10 | S005084 | 2720 | 238 | 7012 | 928 | 10119 | 1561 |
| 11 | S011382 | 5949 | 1101 | 8712 | 1445 | 10150 | 1569 |
| 12 | S003278 | 4578 | 544 | 9202 | 1340 | 10150 | 1569 |
| 13 | S101886 | 4735 | 638 | 9760 | 1475 | 10150 | 1569 |
| 14 | S016978 | 2941 | 259 | 7208 | 960 | 10146 | 1568 |
| 15 | S001882 | 3055 | 271 | 7435 | 999 | 10150 | 1569 |
| 16 | S012482 | 2281 | 196 | 6482 | 840 | 10010 | 1535 |
| 17 | S107186 | 4147 | 545 | 9598 | 1435 | 10150 | 1569 |
| 18 | S002083 | 1899 | 160 | 5777 | 724 | 9770 | 1477 |
| 19 | S009379 | 1994 | 169 | 5862 | 738 | 9797 | 1484 |
| 20 | S019178 | 2382 | 239 | 8362 | 1157 | 10150 | 1569 |
| 21 | S001983 | 4993 | 941 | 8033 | 1385 | 10150 | 1569 |
| 22 | S006475 | 5022 | 949 | 8008 | 1383 | 10150 | 1569 |
| 23 | S014077 | 4824 | 579 | 9253 | 1352 | 10150 | 1569 |
| 24 | S001585 | 2622 | 232 | 6442 | 834 | 9988 | 1530 |

¹⁴ Gary Langer, "Poll: Traffic in the United States," ABC News Online, February 13, 2005, Accessed March 1, 2013, <http://abcnews.go.com/Technology/Traffic/story?id=485098&page=1>.

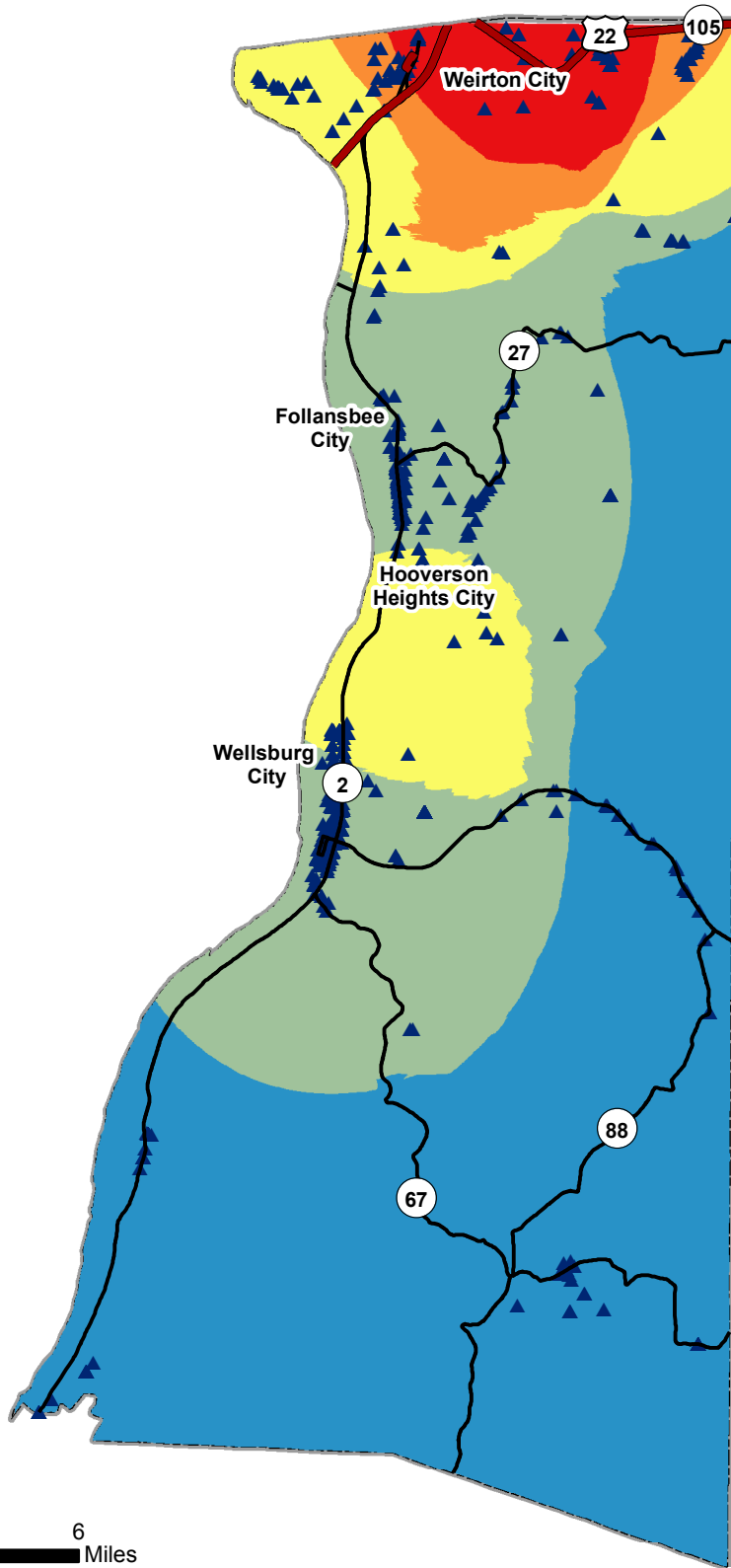
| Rank | Permit_ID | Emp_05 | Unemp_05 | Emp_10 | Unemp_10 | Emp_15 | Unemp_15 |
|------|-----------|--------|----------|--------|----------|--------|----------|
| 25 | S001976 | 4409 | 493 | 8901 | 1267 | 10150 | 1569 |
| 26 | S009279 | 4657 | 561 | 9258 | 1353 | 10150 | 1569 |
| 27 | S014573 | 5691 | 1049 | 8630 | 1439 | 10150 | 1569 |

Retail Location Analysis

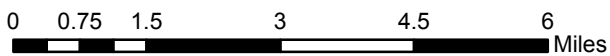
A retail location analysis is a hot spot analysis that depicts a number of retailers within 25 square miles of any certain location in the county (Map 41). The result, as shown on the map, is displayed in blue-to-red color for retail’s density from low to high. Normally, the area with a high density of retailers indicates an already developed and populated community, which possibly has the highest opportunity as well as the heaviest competition. The areas with low retail density showcase where population is lowest, but also where competition is lowest and which may provide retail opportunities.

Retail Location Density

Brooke County



- ▲ Retails Location
- US Routes
- WV Routes
- Retail Locations Density**
- Search Area = 25 Square Miles
- 0 < Retail Density < 5
- 5 < Retail Density < 11
- 11 < Retail Density < 17
- 17 < Retail Density < 25
- 25 < Retail Density < 34
- CountyBoundary



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VI. Conclusion

Brooke County is a rural but fairly developed county. The county has exceeded expectations in educational attainment and broadband infrastructure, creating an atmosphere conducive to learning and achievement. However, wages and employment levels are still low, and the decline in manufacturing appears to be heavily impacting the county. This plan could be useful in assisting Brooke County in creating a development plan using their post-mine sites.

This plan has identified and displayed the five post-mine sites that are most suitable for development. These sites have the integral tools that researchers have shown can assist in spatial development. Though success is not guaranteed, this overview combined with careful strategic planning can bring about the changes in the trends that are necessary for Brooke County to thrive.

Through a site distance analysis and complete demographic calculation, this plan provides the most comprehensive understanding of the economic state of Brooke County and the potential of its land. By analyzing specific infrastructures and demographics, policymakers can begin attracting investors to post-mine sites, and continue the process of developing the economy. This plan provides strategic information; the choice as to how to utilize this information belongs with the administrators and people of the county.