
Broadband Mapping:

Subtleties of Measurement and Interpretation

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Behavioral Economics Consulting Group
EMPIRICISM INFUSED WITH IMAGINATION

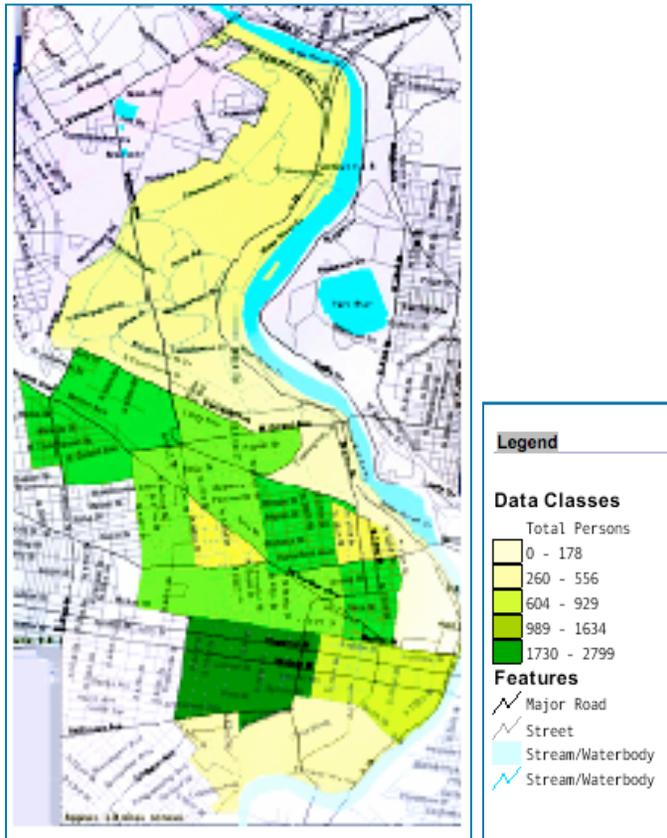
Purpose(s) of this Document

(Companion piece to my comment dated 4/23/2009.)

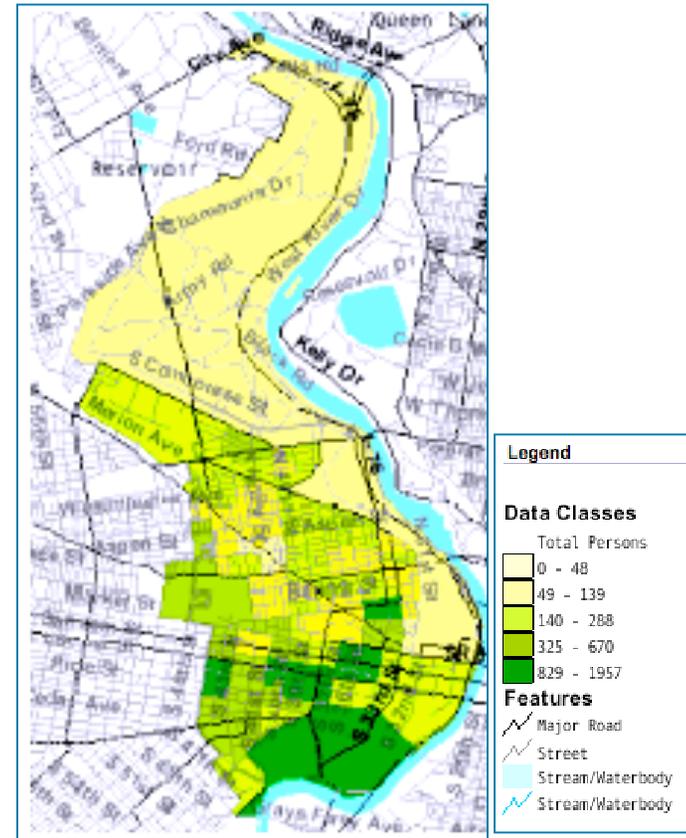
- ❖ Provide illustrative examples to demonstrate why it is so important to include questions about broadband access in the Decennial Census.
 - ❖ Demonstrate that populations are not evenly spread across standard geographic units of measurements, because
 - ☆ Real differences are obscured when the unit being measured is too large;
 - ☆ The Decennial Census includes *all* US residents, it is more precise and is therefore more accurate than a survey of a population sample;
 - ☆ That the density of a population frequently reflects the topography of the region; it is rarely even and almost always 'lumpy.'
 - ❖ Reinforce that no broadband mapping exercise will be complete if it does not include population statistics, gathered 'live,' from real people.
 - ❖ Suggest that mapping has a role to play - not just in locating unserved and under-served communities - but also in helping infrastructure providers develop build-out strategies that literally reflect the 'lay of the land.'
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Example: Zip Code 19104 (West Philadelphia - “University City”)

Population statistics show a very different picture of the same place, depending on size of the geographic unit under examination.



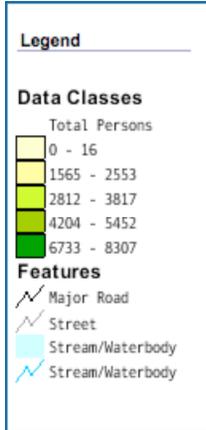
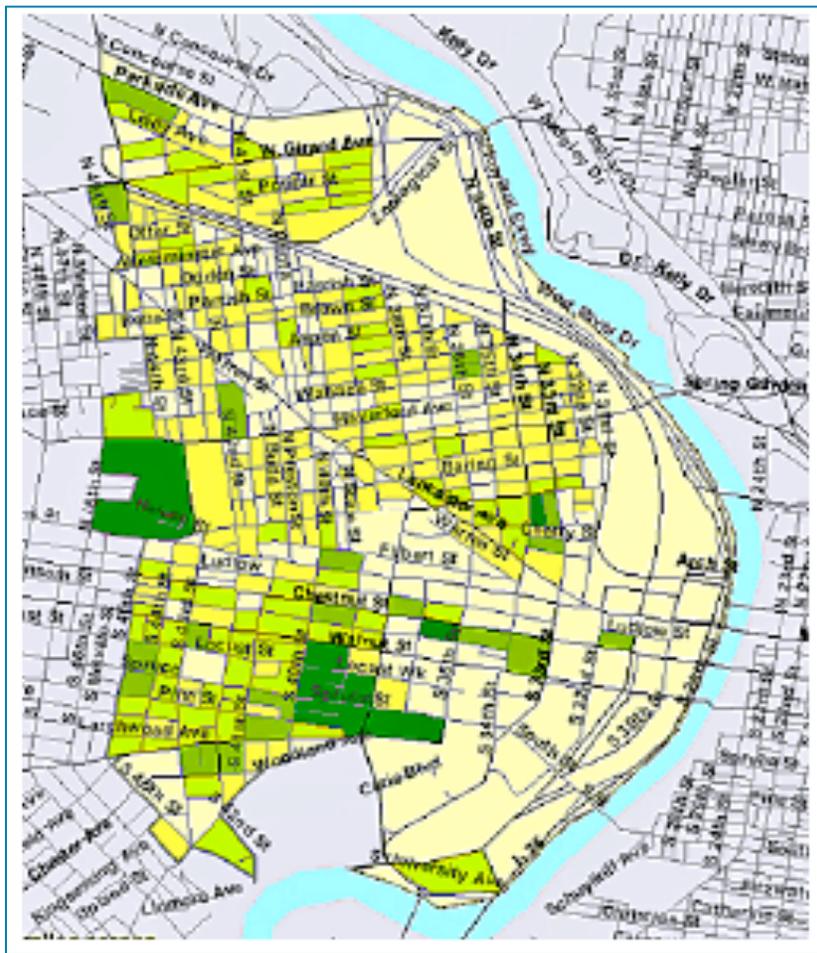
Population density: census tract view



Population density: block group view

Source US Census Bureau: 2000 Census; 100% population count

Zip Code 19104: At the block group level, it becomes clear that there are just a few areas 'driving' the population statistics for the zip code.



Population density: block - level view

Source US Census Bureau: 2000 Census; 100% population count

**Broadband penetration should not be expressed in percentages.
The reason? Population density.
~ A case study ~**

In other words, if someone tells you their state has Broadband Penetration of 96%, it makes sense to ask: "96% of how many people?"

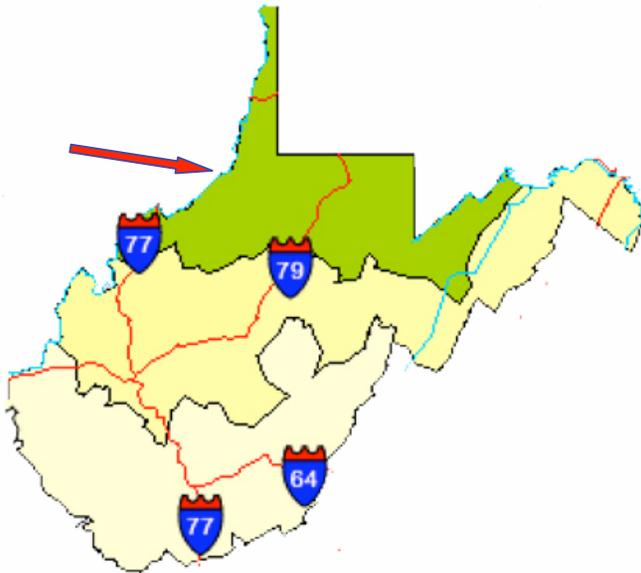
State	Urban		Large Rural		Small Rural		Isolated Small Rural		2006 Total Population*
	%	#	%	#	%	#	%	#	
California	93.30	34,128,627	4.45	16,277,855	1.47	5,377,179	.78	2,853,197	36,579,450
Wyoming	30.60	156,770	36.16	185,255	19.86	101,747	13.38	68,548	512,320

Unfortunately, the ACS can only provide us with percentages, since it is based on a sample, not a census. With the sample and the percentages come something called the "confidence interval," or "band of likely error,"¹ which is a measure of the range within the 'true' score is expected to fall. It is highly sensitive to the size of the sample, and it is very likely that the difference between one area's percentage of BB penetration and another's will fall within the band of error, meaning that there is no difference that cannot be ruled out by chance alone. This will happen if BB questions are only posed to a sample of the U.S. population.

Source US Census Bureau: 2000 Census; 100% population count

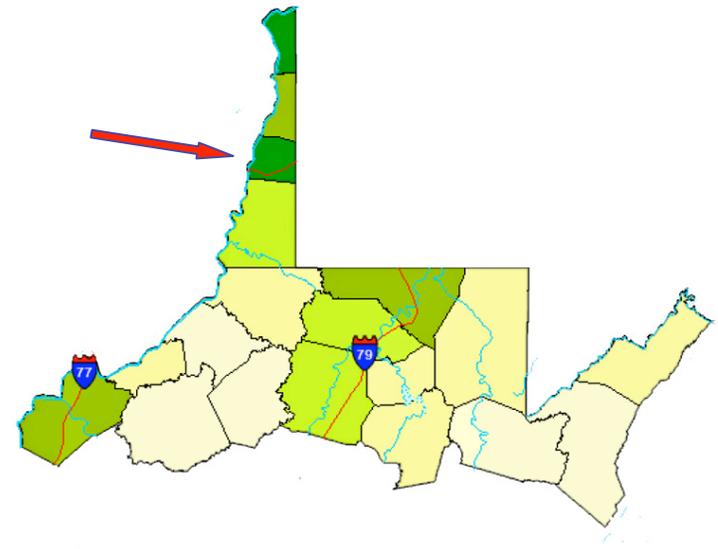
Why “averages” do not make sense. Case Study: West Virginia

Population density for the state as a whole: 75.1 people per square mile. (2000 Census)



Population density by Congressional District.
1st: 100/square mile; 2nd: 67/square mile;
3rd: 66/square mile.

Population density by county within District 1. **Ohio County** appears to be the most densely populated county (447 people per square mile).

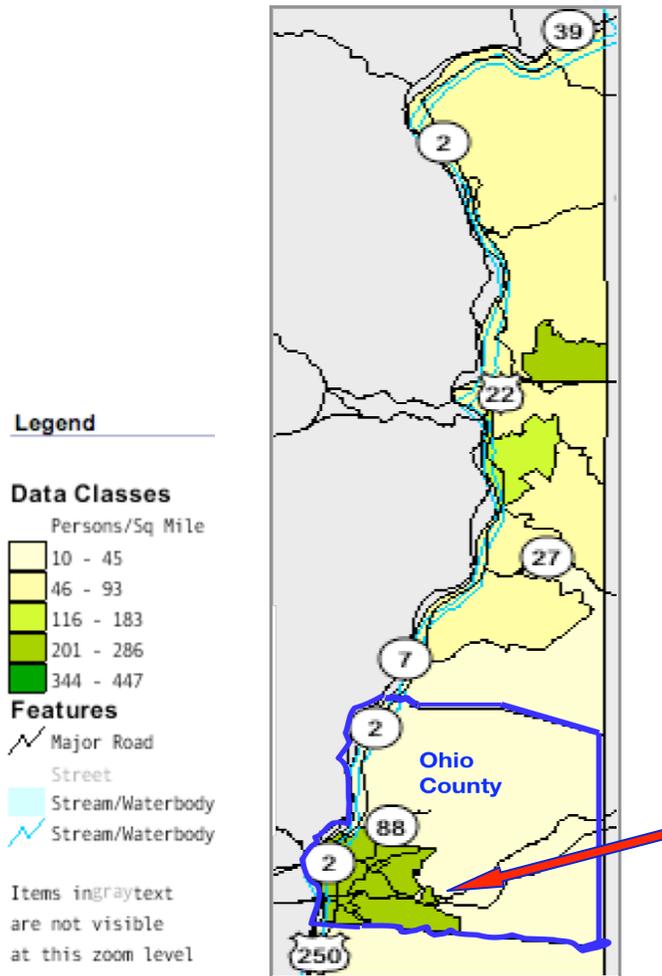


Source US Census Bureau: 2000 Census; 100% population count

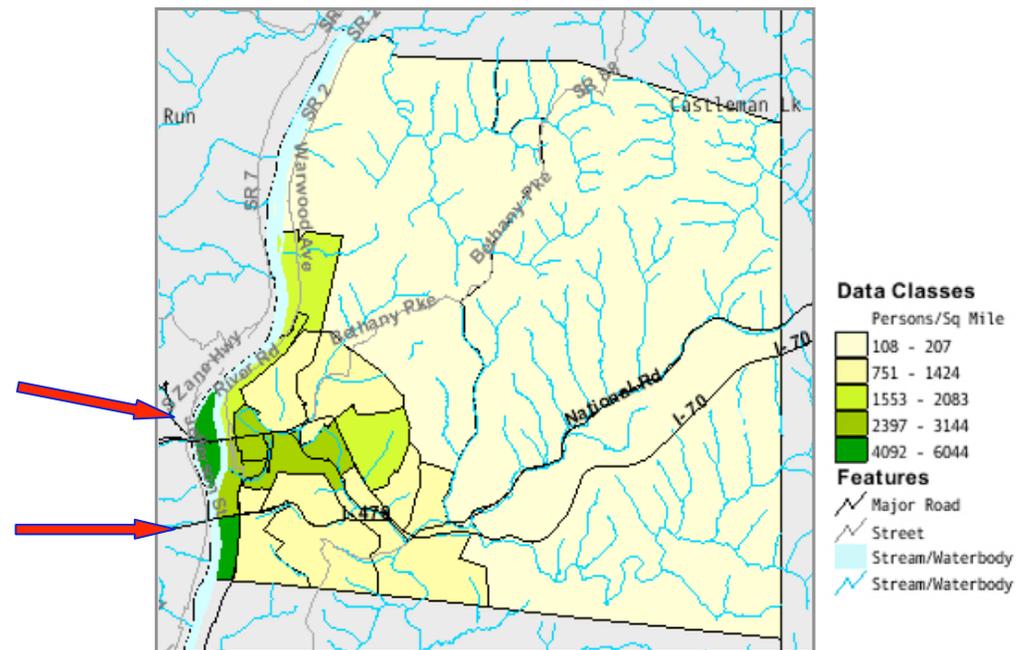
Yet, within Ohio County, only two areas are densely populated.

The rest are barely populated at all.

Ohio county by county subdivision: 1 subdivision seems to have the highest population density.

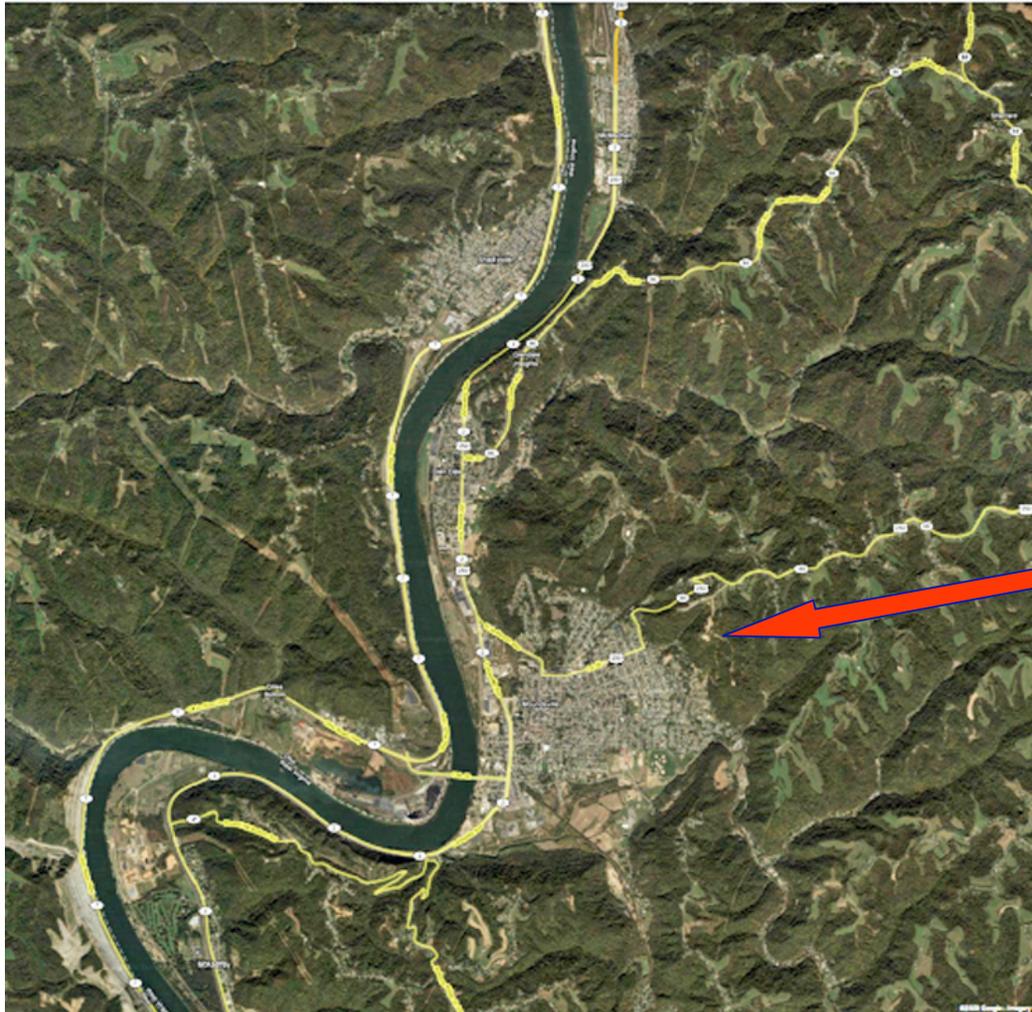


Ohio county by census tract: two tracts seems to have the highest population density.



Source US Census Bureau: 2000 Census; 100% population count

Case Study : Arial view of the Wheeling, West Virginia MSA



This **small area** actually accounts for most of the "population density in the Congressional District.

The subtext is that historically, urban centers have been located in river valleys, where they are protected from tornadoes, and where there is a 'geologic' infrastructure that facilitates communication and trade (in this case, the Ohio river).

Source: Google Earth

Unfortunately, the full census is not perfect: many people go uncounted.

Case study: Kansas City, MO

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FOR IMMEDIATE RELEASE: Feb. 6, 2009

City's appeal to U.S. Census Bureau nets 25,455 residents

City Manager Wayne A. Cauthen has announced that the City's appeal to the U.S. Census Bureau was successful and the official population of Kansas City, Mo., has been changed from 450,375 to 475,830.

Cauthen challenged the original number based on a DrillDown study conducted by Project Kansas City Urban Market Assets, which is a group that includes the University of Missouri-Kansas City Bloch School's Cookingham Institute for Urban Affairs and Center for Economic Information, and Social Compact, a non-profit coalition.

"The population of a City is important because it serves as a metric for the federal and state governments in allocating certain types of funding," Cauthen said. "I'd like to thank the University of Missouri-Kansas City and Social Compact for their work on this study."

The in-depth DrillDown study uses a multitude of city, state and commercial data records to create a more accurate picture of demographic and economic information in urban core neighborhoods.

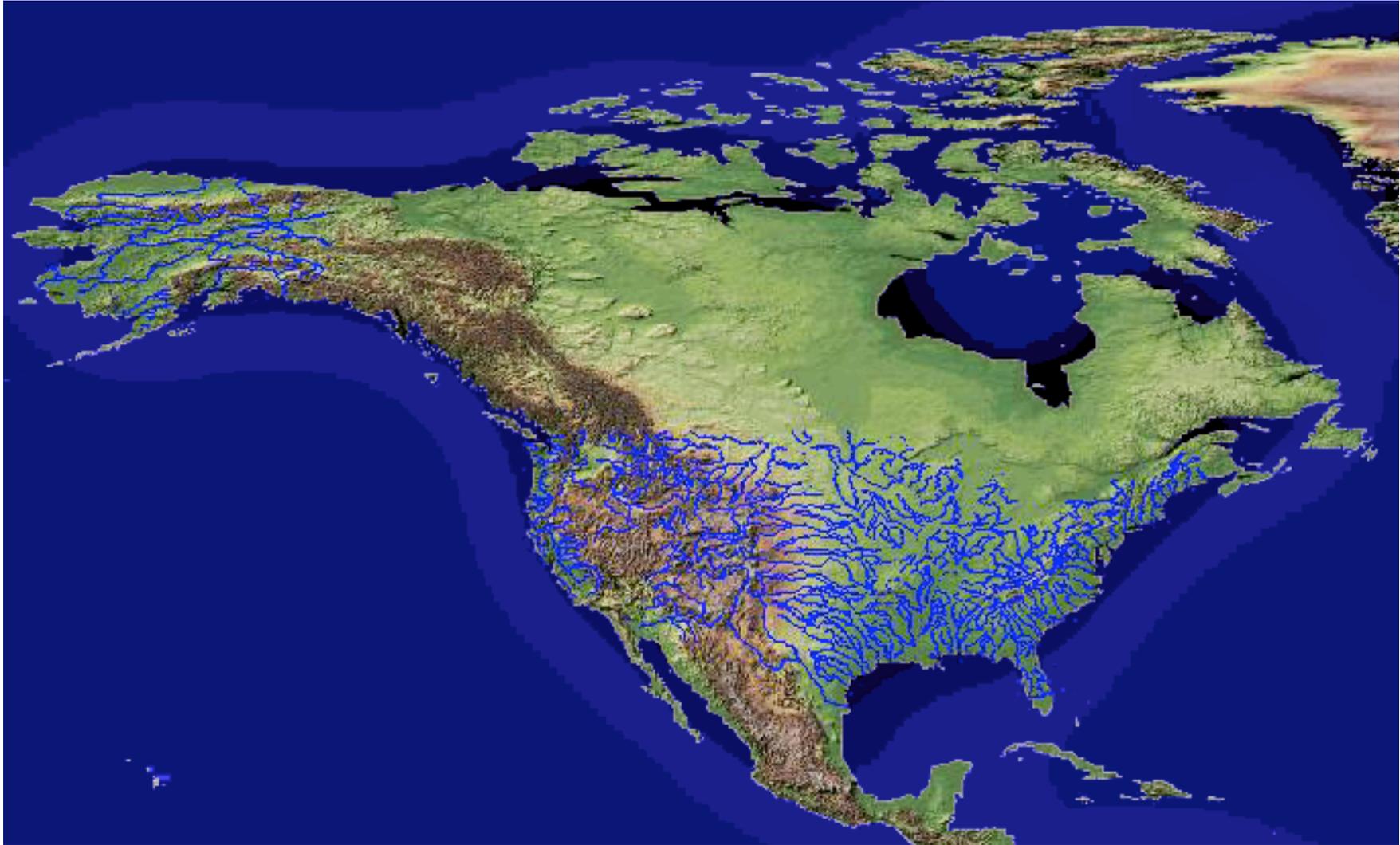
"It's a technical matter to get the count correct, but the City also has a moral and ethical duty to ensure all of its residents are represented equally," said Sharon Sanders Brooks, City Councilwoman, 3rd District. "Specifically, the study pointed out that the 3rd District is more densely populated than thought and has the second highest purchasing power per acre in the city, which is important information in attracting new development and retaining existing businesses." Moving forward, Councilwoman Sanders Brooks and the City have worked with the Census Bureau to set up Census job testing and placement services at the Health Department and the Robert J. Mohart Multipurpose FOCUS Center.

Source: Office of the City Manager, Kansas City, MO <http://www.kcmo.org/cco.nsf/web/020609>

What is the relationship between Broadband Mapping and population density?

- ❖ Population density is an important measure of the physical and social characteristics of a geographic area. It is far more precise than is a binary distinction between “urban” and “rural,” and is likely to play an important role in planning and implementing our country’s new Broadband initiative.
- ❖ This statistic is very effective in illustrating why it is so important to collect data about broadband access on a very granular level. If Broadband questions are *not* included in the Decennial Census, we run the danger of missing important population characteristics when they are ‘smoothed’ or out of existence because we used a sample, (as do the ACS, the CBP, the Economic Census, the Survey of Business Owners, the NES, etc.). Note: there is nothing wrong with surveys or samples, but for this type of planning, a census is better.
- ❖ Since the mere presence of broadband capability in a designated location is by no means a guarantee of access, we need to be able to look deeper, to develop hypotheses about what is preventing access. This will be possible as long as questions about availability and use are part of the Decennial Census. The Census includes a wealth of information about demographics, location, and more. When combined and properly analyzed, these data will enable us to identify patterns and points of leverage. This knowledge is, in turn, vital to crafting effective strategies for infrastructure installation and and technology adoption -- goals that embody the spirit and intent of the Stimulus itself.

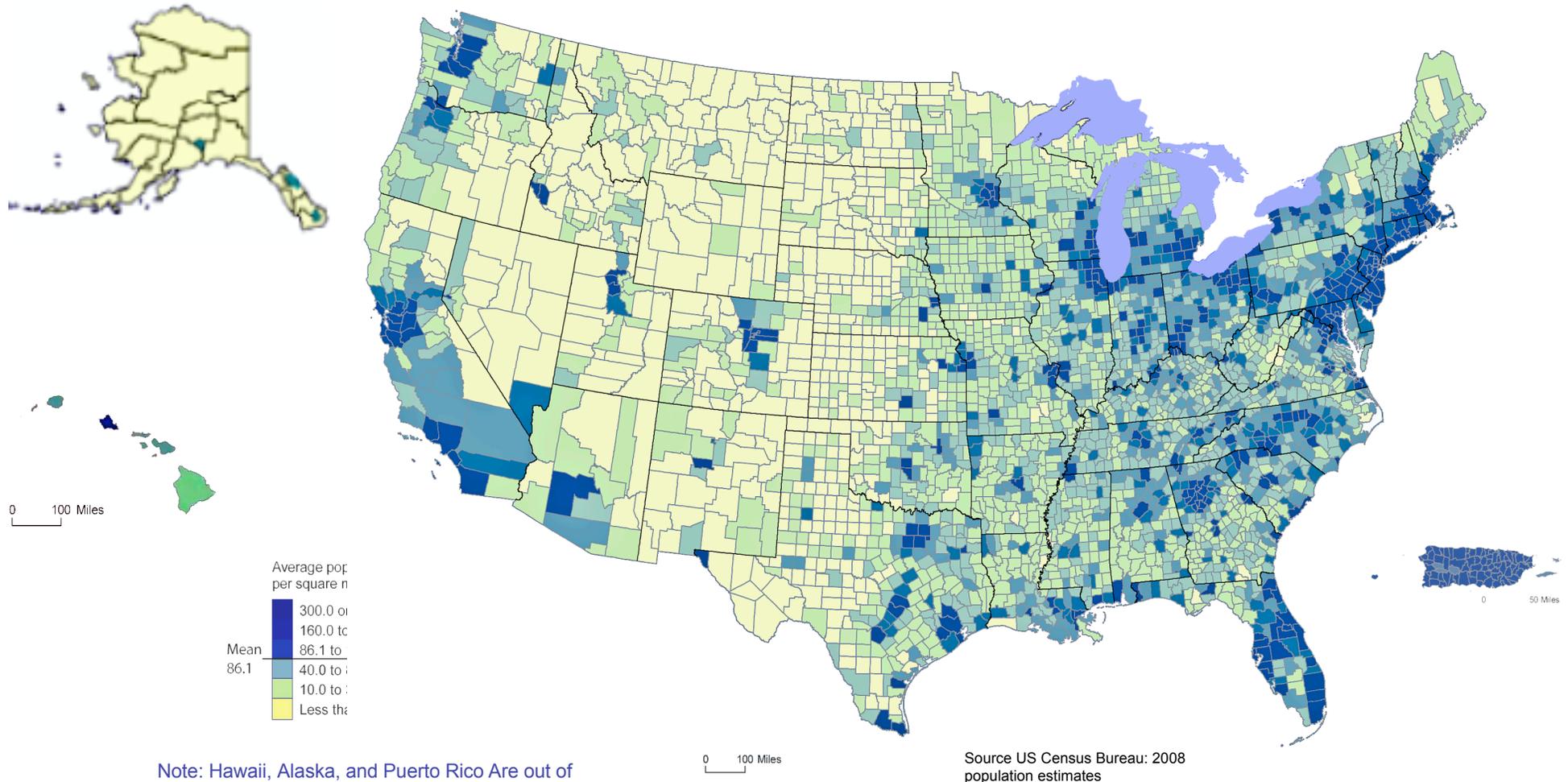
Waterways of the United States



Source US Geological Survey, 2009. <http://gos2.geodata.gov>

United States, Population Density by County

Given the dramatic variation within counties, zip codes, census tracts and block groups: why would we pass on getting a full picture of of broadband penetration when the upcoming Decennial Census makes it eminently feasible?



Note: Hawaii, Alaska, and Puerto Rico Are out of scale. This was done intentionally, to make the Variations in population density visible