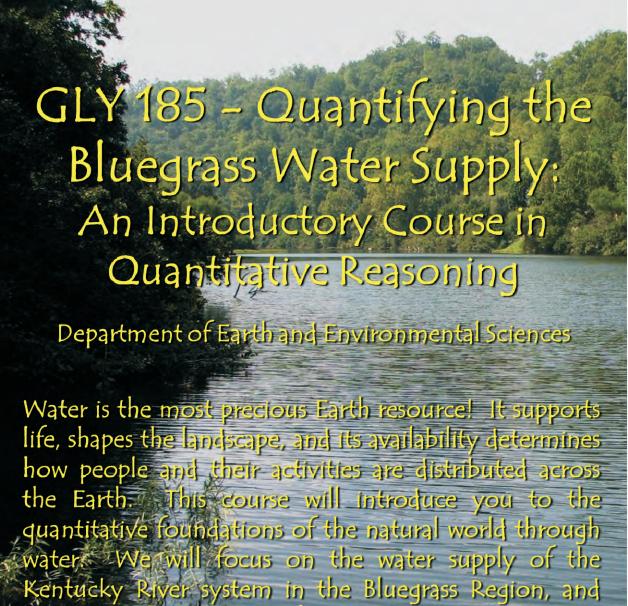
Assessing the Lower Kentucky River Public Water Supply in 2050: When an Undergraduate Class Project Returns Real Information J. Richard Bowersox^{1,2}, Catherine F. Skees², Trivette M. Baker², Jacqueline M. Fasano², Dayna L. Ferguson², and Danielle E. Randolph² ¹Kentucky Geological Survey, 228 Mining and Mineral Resources Building, University of Kentucky, Lexington, KY 40506-0053

Abstract

The lower Kentucky River (LKR) is the public water supply source for about 683,000 people residing in 15 counties in central Kentucky, 92% of the population in **2010.** The public water supply in these counties was about 107x106 gal/day in 2010, or about 2.3% of the average LKR flow of 4713x106 gal/day. As yet, however, there are no public reports assessing the future public water supply for the rapidly growing populations in these counties, although the existing public water supply infrastructure is expected to be adequate through 2030. As a class term project, students in an undergraduate quantitative reasoning course in the Department of Earth and Environmental Sciences at the University of Kentucky were asked to model the LKR public water supply in 2050. Their model considered the total water supply in the LKR, population demographics and public water supply demand, and precipitation as affected by climate change. Data and information were gleaned from municipal, State, and Federal sources, including regulatory agency filings and climate models from the literature. These data were compiled into a unified database, and a water supply forecast was developed. Population and demand in the LKR counties is forecast to increase 52% by 2050, with 98% of the population assumed to be using the public water supply by then. At an average historical per capita demand of 142 gal/day, the public water supply required by this population will be 157×10^6 gal/day. Climate model forecasts from the literature show a 5% increase in precipitation in central Kentucky by 2050, all of which was assumed as contributing runoff to the Kentucky River flow. Total forecast LKR water supply is 7070x106 gal/day in 2050, thus the public water supply demand is estimated to be 2.2% of the available supply, or comparable to the current demand. The conclusions of this project are that the volume of water available in the LKR will be adequate for public water supply demand, but the water supply infrastructure available in 2050 would be more likely to affect the deliverable supply.



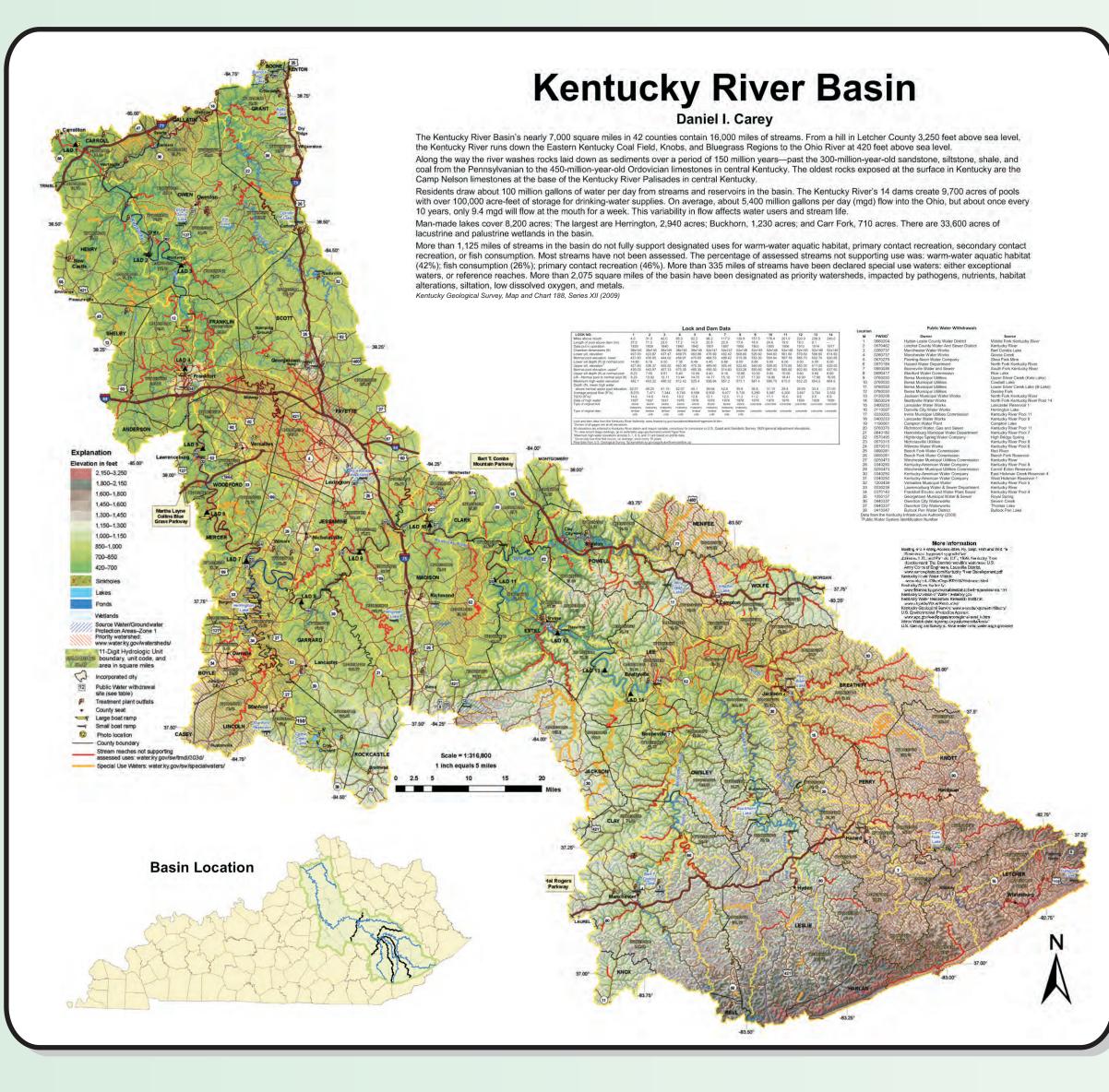
2012 Geological Society of America Annual Meeting Charlotte, North Carolina *November 4, 2012*

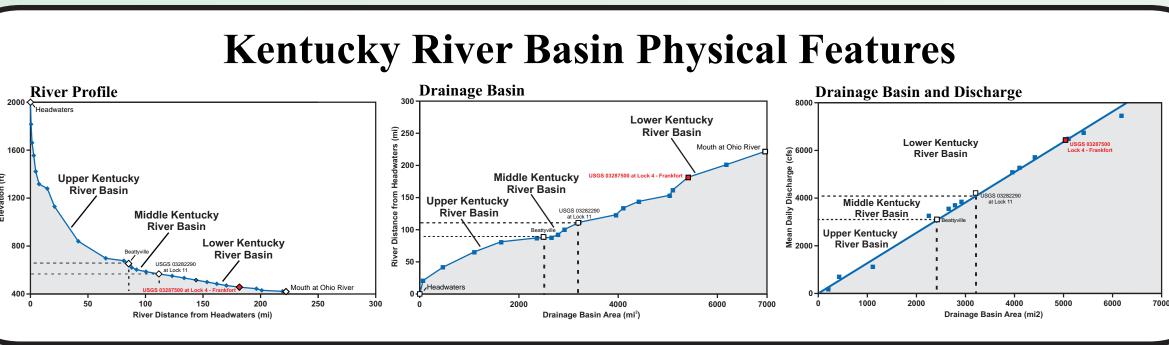


The goal of this course is for students to develop the ability to locate, identify, and valuate data: develop probabilis nodels: and present the results of their research. Statistical elements in this course equire basic skills in descriptive statistics eology provides important information n the origins of natural resources and the s available for exploitation and us used throughout the course rounding the water supply and demand i ntral Kentucky and the Kentucky River basir unties. Relevant data sets that have bee for use in this course include population censuses, precipitation, and Kentucky River discharge and use. The course will be taught in subject three

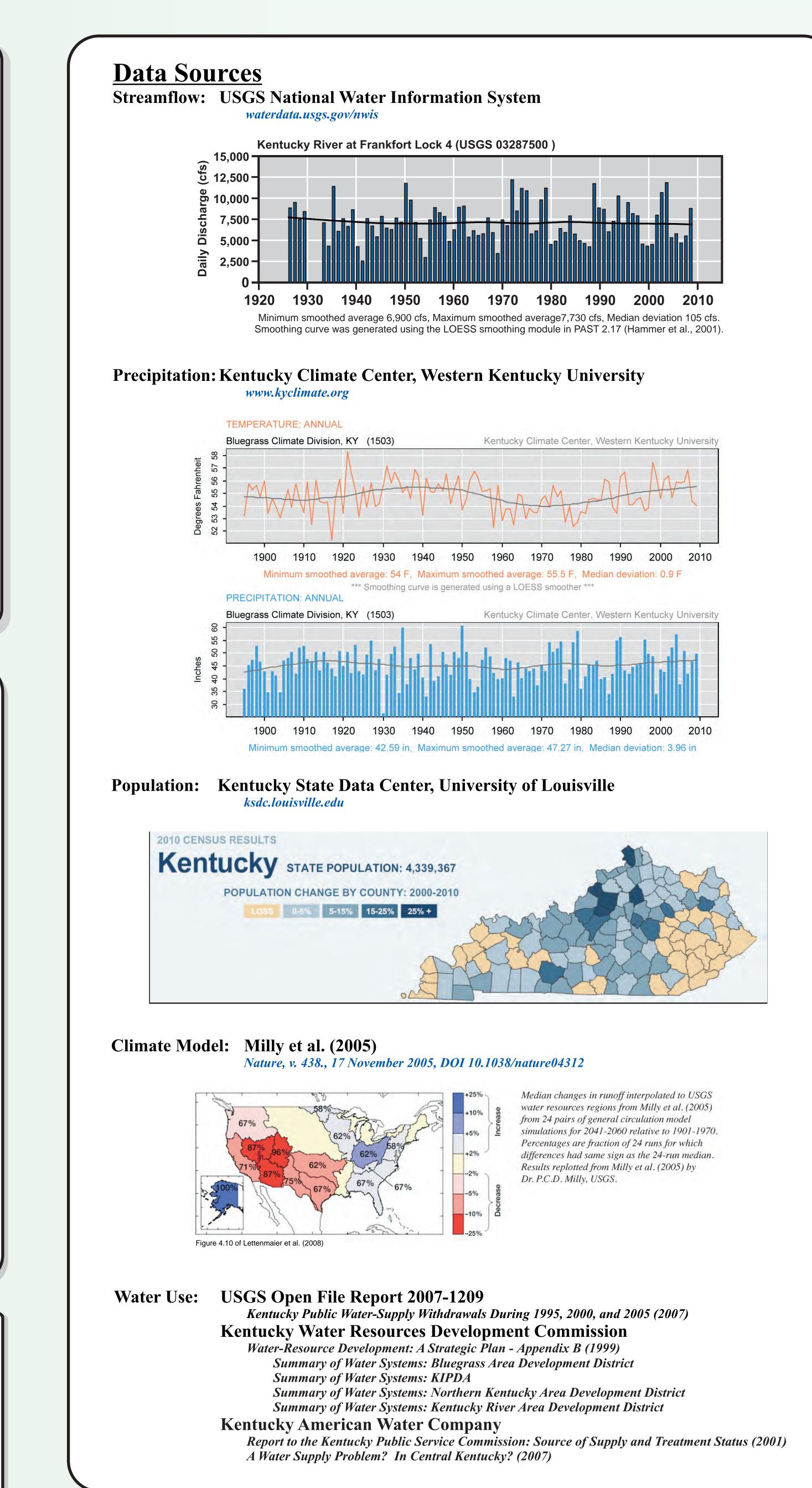
that outcomes of the first two modules are the skills applied to complete the third module But more than the "how?" of techniques students will learn the "what and why?," and that it is ok to ask, "How is that known?" and, "Why not?" alternatives. That is, students will learn to evaluate, interpret, and challenge data nd models of all kinds Students require access to computers with

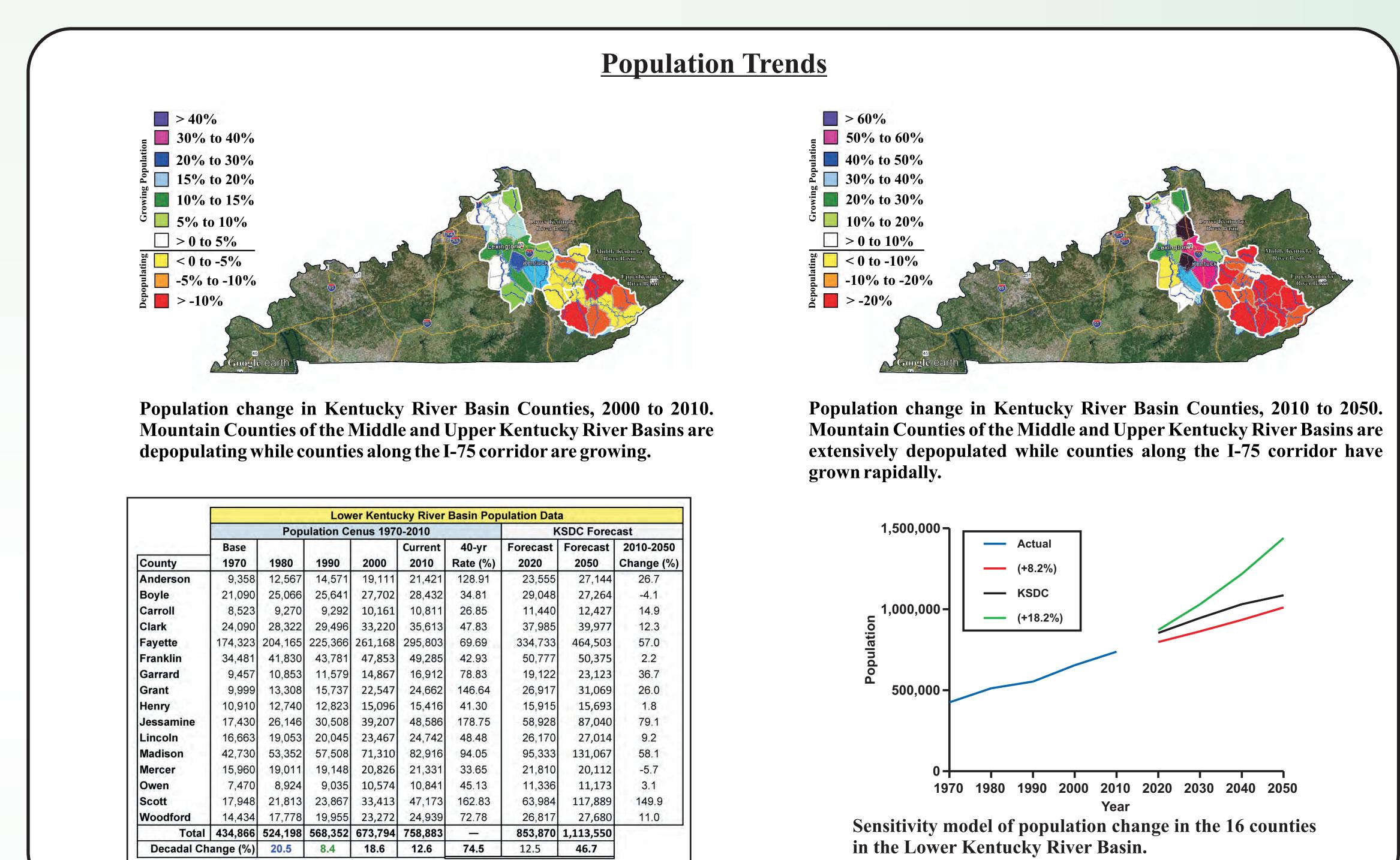
Course flyer and description, Spring Semester 2012. GLY 185 was a new course developed to teach students the fundamental concepts of quantitative reasoning using the water supply in the Kentucky River and the water demand in the Bluegrass region, the fastest growing region in Kentucky.

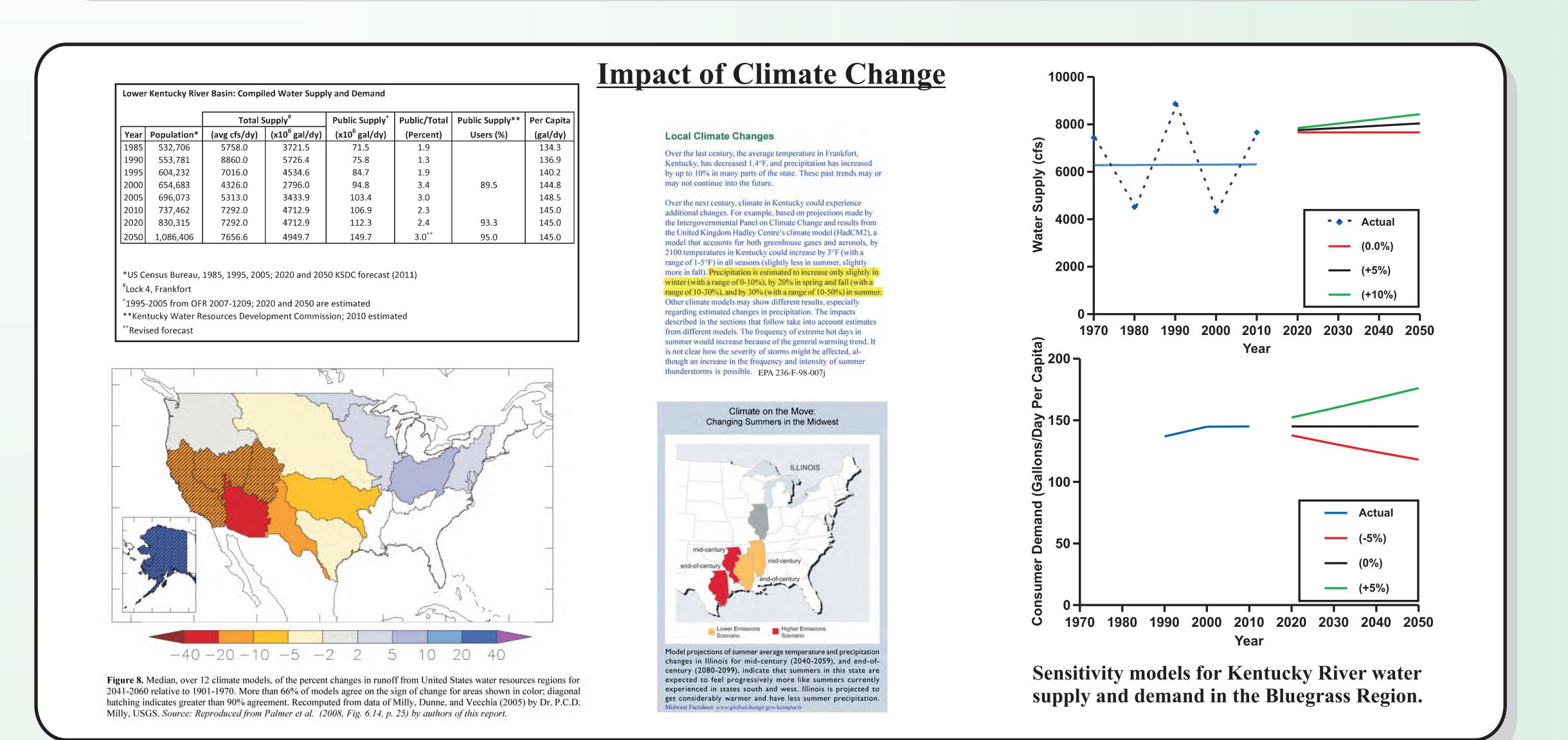


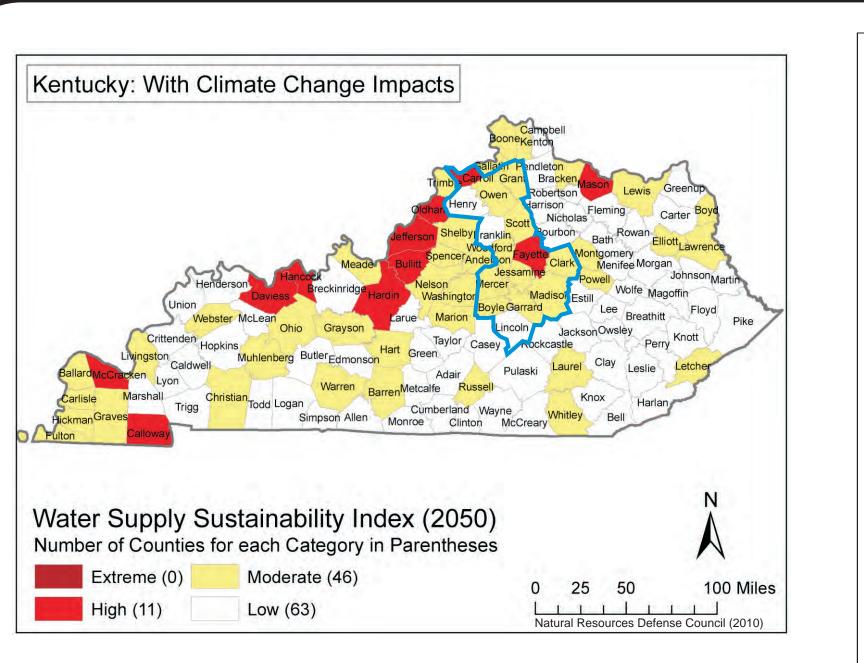


internet connection and a minimum software suite including Microsoft Office and oogle Earth for GIS exercises.









Water sustainability map from the Natural Resources Defense Council (2010). The 15 counties in the Lower Kentucky River Basin are outlined in blue. NRDC water sustainability forecast for counties in the Lower Kentucky River Basin is not supported by this study. Growing population in the region, however, will necessitate improvements and expansion of the water delivery infrastructure.

Right: Two pages from the Kentucky Public Service Commission news release announcing approval of Kentucky-American Water Company's application to expand their water delivery infrastructure. This expansion included construction of a 20-million gallon per day treatment plant and a 31-mile long pipeline to Pool 3 on the Kentucky River, north of Frankfort. This expansion should serve the Bluegrass Region's water needs until about 2030.

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Robert D. Vance, Environmental ar	nd Public	Commonwealth of Kentucky Public Service Commission		W. Clay
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			Public Service Commission (PSC
today approv treatment pla	ed the application on the Kentucky	f Kentucky-American Water River in Owen County and to	Co. to construct a new water build a pipeline from the pla	
		in Fayette County. the PSC said the new facilitie	es are needed to address a long	
		he company's central Kentuc		
			vater supply needs, the PSC sa f this decision, which will affe	
			e PSC said. "The Commission	
		ation of the issues in this case additional evidence in order t	e, going so far as to delay to more fully explore all option	ns."
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Acknowledgments

This project would not have been possible with out the support by the Kentucky **Geological Survey, Department of Earth** and Environmental Sciences, and the University of Kent College of Arts and Sciences of the University of Kentucky In particular we wish to thank Dan Carey of the Kentucky Geological Survey, who was able to get streamflow data for the Kentucky River at Lock 7, Frankfort. The input from the course TA and students, co-authors of this research. made this a better project all around

At this time there is no public information addressing the public water supply for the Lower Kentucky River Basin and Bluegrass Region in the mid-21st Century. We were able to piece this story together from disparate public records. so the information is out there.

