Forests, Water and People

Drinking water supply and forest lands in Missouri

USDA Forest Service
Northeastern Area
State and Private Forestry

Project Description

In the Northeast and Midwest United States, forests are critically important to the supply of clean drinking water. Protecting and managing forests in source watersheds is an essential part of future strategies for providing clean safe drinking water that citizens can afford. The Forests, Water and People analysis identified private forests that are most important for drinking water supply and most in need of protection from development pressure. This fact sheet gives the results of the analysis for the State of Missouri. For more detailed description of methods, and results for the Northeast and Midwest United States, see the **full report.**

The Process

Through a 4 step GIS-based overlay analysis, four indices were developed for each watershed (see Figure 1).

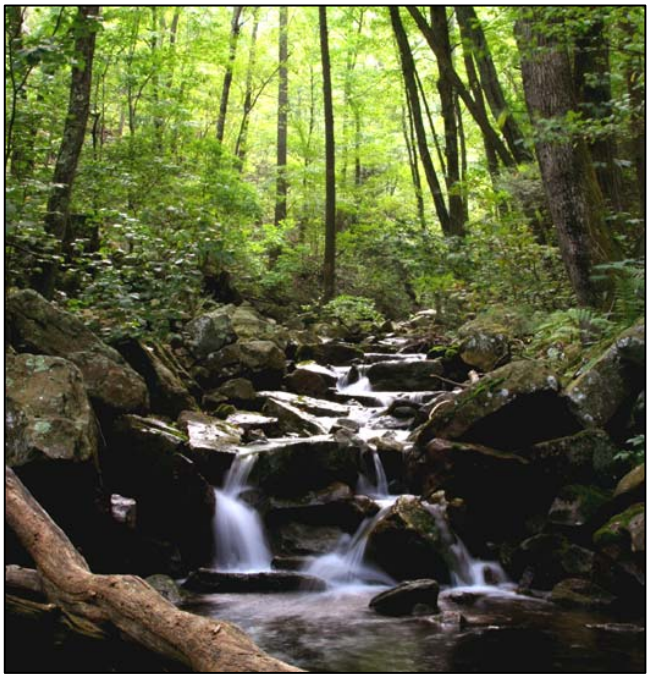
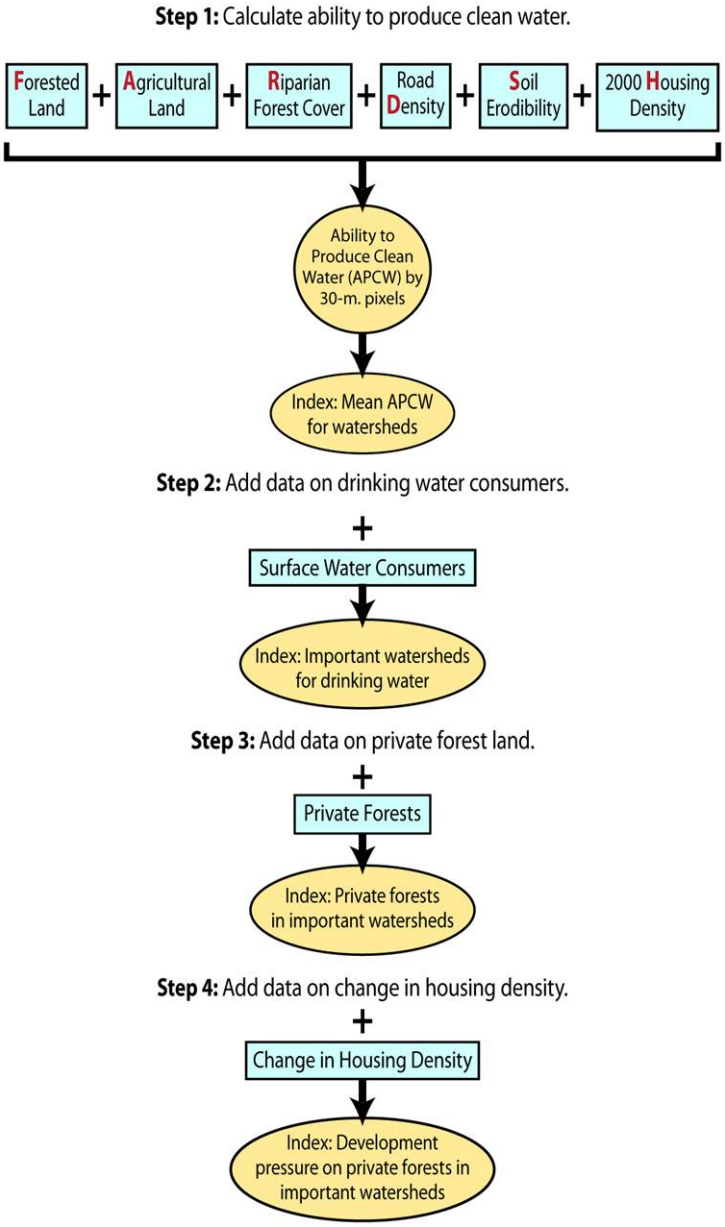


Photo by Michael Land.

"Water, in all its uses and permutations, is by far the most valuable commodity that comes from the forest land that we manage, assist others to manage, and/or regulate." Policy Statement, National Association of State Foresters

Figure 1. *Nine layers of GIS data (boxes) were combined in stepwise fashion, to produce four indices (ovals) of watershed importance for drinking water supplies and the need for private forest management to protect those supplies.*



Missouri Results

Highlights

- The watersheds to the west of St. Louis and in southern Missouri scored above average in each step of the analysis, with the highest scores in steps 1 and 4. The State contains large forest areas in the southeast, with more of a mix of agriculture and forested areas in the central part of the State and more agriculture in the north and far southeast. Development pressure is greatest around the cities of St. Louis, Kansas City and Jefferson City, and in the southwestern part of the State.
- Those Missouri watersheds that scored highest in their ability to produce clean water (step 1) are located in the southeastern part of the State, where there are large areas of forested land. The two highest scoring watersheds in step 1 are the Upper St. Francis and Current watersheds.
- In the ability of watersheds to provide drinking water to the most people (step 2), several Missouri watersheds scored above average across the State. Scores were highest around St. Louis, which in addition to Kansas City, has the highest number of surface water consumers. The Meramec, Lower Missouri and Cahokia-Joachim watersheds scored highest in this step.
- In the ability of watersheds to provide drinking water on private lands (step 3), the area west and south of St. Louis and southeastern Missouri in general scored highest. The top scoring watersheds are the Meramec, Lower Missouri and Spring watersheds. 87 percent of Missouri's forest land is privately owned and subject to conversion.
- Step 4 ranked watersheds based on their development pressure and land ownership status (private lands ranked higher because they are subject to conversion). The highest scoring watersheds are the Meramec and Lower Missouri watersheds, which ranked in the top fourteen percent of all the study area's watersheds, and are located west and south of St. Louis.

Table 1. Watershed results for Missouri

Watershed Name	Hydrologic Unit Code	Mean APCW for watersheds	Surface drinking water consumers	% private forest in watershed	% watershed with housing density increase	Index: Development pressure on private forests important for drinking water supply Score (Step 4)	Rank (Step 4)
Meramec	07140102	6 of 10	586,750	57 %	6 %	29 of 40	76 of 540
Lower Missouri	10300200	5 of 10	588,819	44 %	10 %	29 of 40	76 of 540
Big	07140104	7 of 10	16,000	67 %	8 %	27 of 40	109 of 540
Cahokia-Joachim	07140101	5 of 10	218,742	35 %	7 %	26 of 40	126 of 540
North Fork White	11010006	7 of 10	15,458	60 %	7 %	26 of 40	126 of 540
Beaver Reservoir	11010001	6 of 10	4,727	58 %	17 %	25 of 40	148 of 540
Spring	11010010	7 of 10	6,900	71 %	4 %	25 of 40	148 of 540
Lake of the Ozarks	10290109	6 of 10	0	70 %	12 %	25 of 40	148 of 540
Niangua	10290110	6 of 10	0	61 %	14 %	25 of 40	148 of 540
Lower Missouri-Moreau	10300102	5 of 10	98,009	33 %	10 %	24 of 40	169 of 540
Independence-Sugar	10240011	3 of 10	221,202	19 %	11 %	24 of 40	169 of 540
Upper St. Francis	08020202	8 of 10	6,541	58 %	4 %	24 of 40	169 of 540
Sac	10290106	4 of 10	120,829	29 %	10 %	24 of 40	169 of 540
Big Piney	10290202	6 of 10	24,000	50 %	4 %	24 of 40	169 of 540
Peruque-Piasa	07110009	2 of 10	61,528	24 %	18 %	24 of 40	169 of 540
Bull Shoals Lake	11010003	6 of 10	7,252	58 %	12 %	24 of 40	169 of 540
Lower Kansas, Kansas	10270104	2 of 10	368,452	18 %	12 %	22 of 40	229 of 540
Lower Missouri-Crooked	10300101	2 of 10	507,247	15 %	11 %	22 of 40	229 of 540
Lower Gasconade	10290203	6 of 10	0	62 %	4 %	22 of 40	229 of 540
Lower Osage	10290111	6 of 10	0	59 %	7 %	22 of 40	229 of 540
James	11010002	2 of 10	28,408	34 %	30 %	22 of 40	229 of 540
Lake O Cherokees	11070206	3 of 10	28,036	28 %	11 %	22 of 40	229 of 540
Bourbeuse	07140103	6 of 10	0	57 %	9 %	22 of 40	229 of 540
Pomme De Terre	10290107	5 of 10	0	42 %	14 %	21 of 40	264 of 540
Upper Black	11010007	7 of 10	19,308	47 %	2 %	21 of 40	264 of 540
Elk	11070208	3 of 10	200	48 %	17 %	21 of 40	264 of 540
Upper Mississippi-Cape Girardeau	07140105	5 of 10	62,067	35 %	3 %	21 of 40	264 of 540
Upper Casconade	10290201	6 of 10	0	51 %	6 %	21 of 40	264 of 540
Eleven Point	11010011	7 of 10	0	51 %	3 %	21 of 40	264 of 540

Watershed Name	Hydrologic Unit Code	Mean APCW for watersheds	Surface drinking water consumers	% private forest in watershed	% watershed with housing density increase	Index: Development pressure on private forests important for drinking water supply Score (Step 4)	Rank (Step 4)
Whitewater	07140107	6 of 10	0	55 %	5 %	21 of 40	264 of 540
Current	11010008	8 of 10	0	50 %	2 %	20 of 40	289 of 540
Lamine	10300103	4 of 10	39,587	26 %	4 %	20 of 40	289 of 540
Cuivre	07110008	4 of 10	23,004	25 %	8 %	20 of 40	289 of 540
Little Chariton	10280203	5 of 10	21,124	26 %	2 %	19 of 40	320 of 540
Lower Black	11010009	4 of 10	6,798	42 %	4 %	19 of 40	320 of 540
Lower Des Moines	07100009	6 of 10	82,686	27 %	1 %	19 of 40	320 of 540
The Sny	07110004	4 of 10	64,443	29 %	1 %	18 of 40	337 of 540
Spring	11070207	1 of 10	70,032	19 %	10 %	18 of 40	337 of 540
Lower Mississippi-Memphis	08010100	6 of 10	0	33 %	4 %	17 of 40	352 of 540
Blackwater	10300104	3 of 10	34,659	15 %	5 %	17 of 40	352 of 540
South Fork Salt	07110006	4 of 10	22,284	21 %	3 %	17 of 40	352 of 540
Salt	07110007	5 of 10	19,998	27 %	1 %	17 of 40	352 of 540
Bear-Wyaconda	07110001	6 of 10	31,667	28 %	0 %	17 of 40	352 of 540
North Fabius	07110002	6 of 10	19,210	26 %	0 %	16 of 40	380 of 540
South Fabius	07110003	6 of 10	11,364	25 %	0 %	16 of 40	380 of 540
North Fork Salt	07110005	4 of 10	19,392	20 %	1 %	16 of 40	380 of 540
South Grand	10290108	3 of 10	29,171	16 %	7 %	16 of 40	380 of 540
Harry S	10290105	5 of 10	0	35 %	1 %	15 of 40	394 of 540
Lower Marais Des Cygnes	10290102	2 of 10	39,464	19 %	3 %	15 of 40	394 of 540
Marmaton	10290104	4 of 10	8,113	20 %	2 %	14 of 40	407 of 540
Lower Chariton	10280202	5 of 10	11,109	24 %	0 %	14 of 40	407 of 540
Upper Chariton	10280201	3 of 10	38,620	18 %	0 %	14 of 40	407 of 540
Platte	10240012	3 of 10	7,868	11 %	5 %	14 of 40	407 of 540
Upper Grand	10280101	4 of 10	20,908	15 %	1 %	13 of 40	427 of 540
One Hundred and two	10240013	2 of 10	9,872	8 %	2 %	12 of 40	442 of 540
Thompson	10280102	4 of 10	18,209	16 %	0 %	11 of 40	454 of 540
Lower Grand	10280103	4 of 10	8,971	18 %	0 %	11 of 40	454 of 540
New Madrid-St. Johns	08020201	4 of 10	0	6 %	2 %	10 of 40	465 of 540
Lower St. Francis	08020203	1 of 10	0	14 %	3 %	10 of 40	465 of 540
Keg-Weeping Water	10240001	1 of 10	2,500	6 %	2 %	9 of 40	484 of 540
Cache	08020302	1 of 10	0	16 %	3 %	9 of 40	484 of 540
Nowaway	10240010	2 of 10	1,783	7 %	0 %	8 of 40	498 of 540
Little Osage	10290103	2 of 10	0	20 %	0 %	8 of 40	498 of 540
Little River Ditches	08020204	2 of 10	0	5 %	2 %	7 of 40	511 of 540
Tarkio-Wolf	10240005	2 of 10	0	7 %	0 %	6 of 40	528 of 540
Nishnabotna	10240004	1 of 10	0	8 %	0 %	5 of 40	535 of 540

Average or total value for all watersheds listed in Table 1

Mean APCW for watersheds:	4.3	of 10
Important watersheds for drinking water composite score:	8.2	of 20
Private forests in important watersheds composite score:	13.3	of 30
Development pressure on private forests in important watersheds composite score:	18.4	of 40
Forested Land (acres):	22,590,350.8	
Private Forest (acres):	19,741,992.3	
Private Forest Land under Development Pressure by 2030 (acres):	1,387,921.8	
(% private forest land):	7.0%	

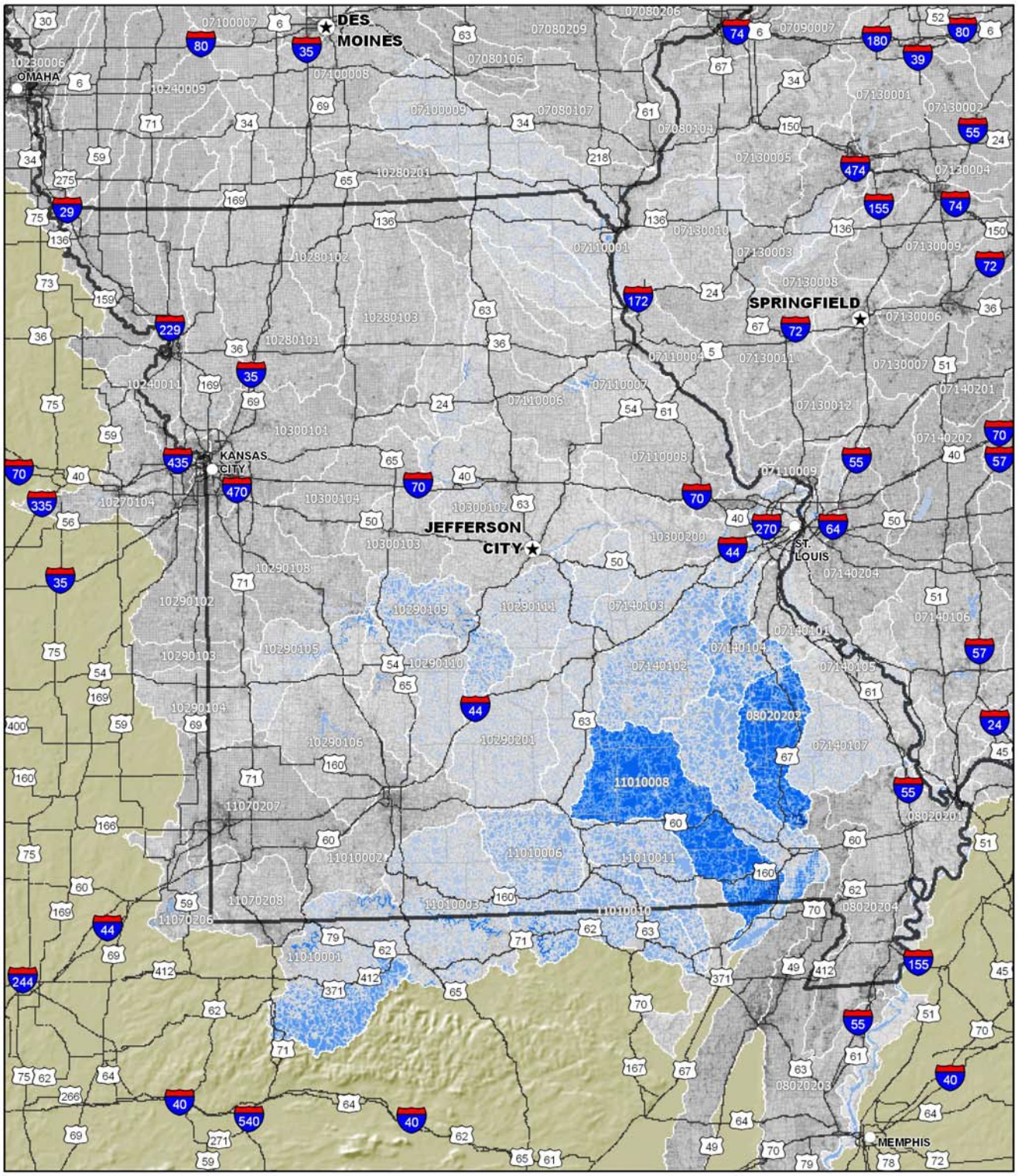
Note: If a watershed fell partially in Missouri, the whole watershed was considered for this project. State results reflect the total acreage for all watersheds that impact that State (this may account for a higher acreage figure than if only lands within State boundaries were considered).

Maps

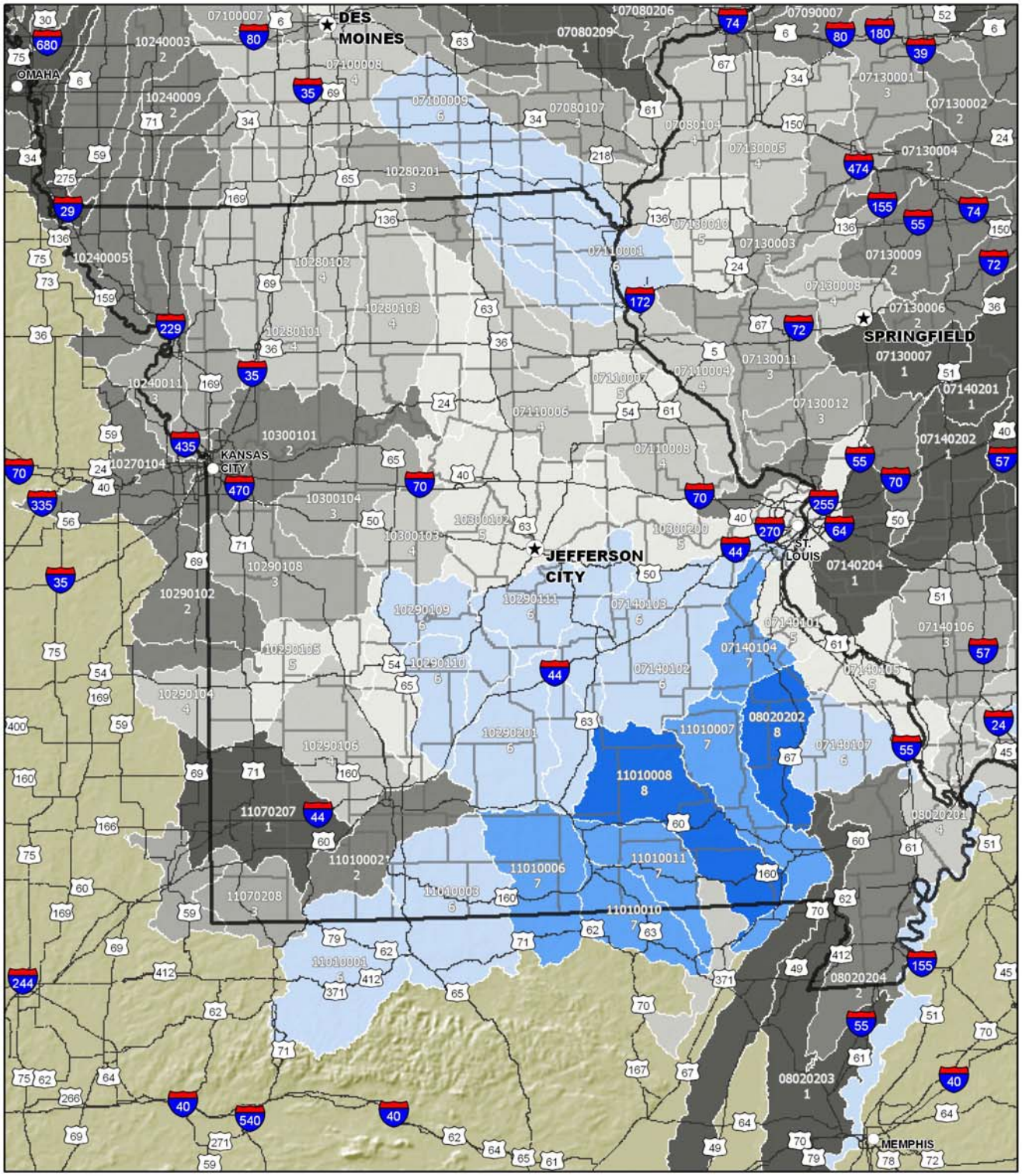
The following maps depict the results of each step in the Forests, Water and People analysis. Each watershed is labeled with the eight-digit HUC and the watershed composite score for the analysis step. (Note: the APCW, 30-m. pixel view does not have a watershed score)

All of the maps were produced by Rebecca Whitney Lilja, Office of Knowledge Management, Northeastern Area State and Private Forestry.

Ability to Produce Clean Water (APCW) (Step 1), 30-m View - Missouri

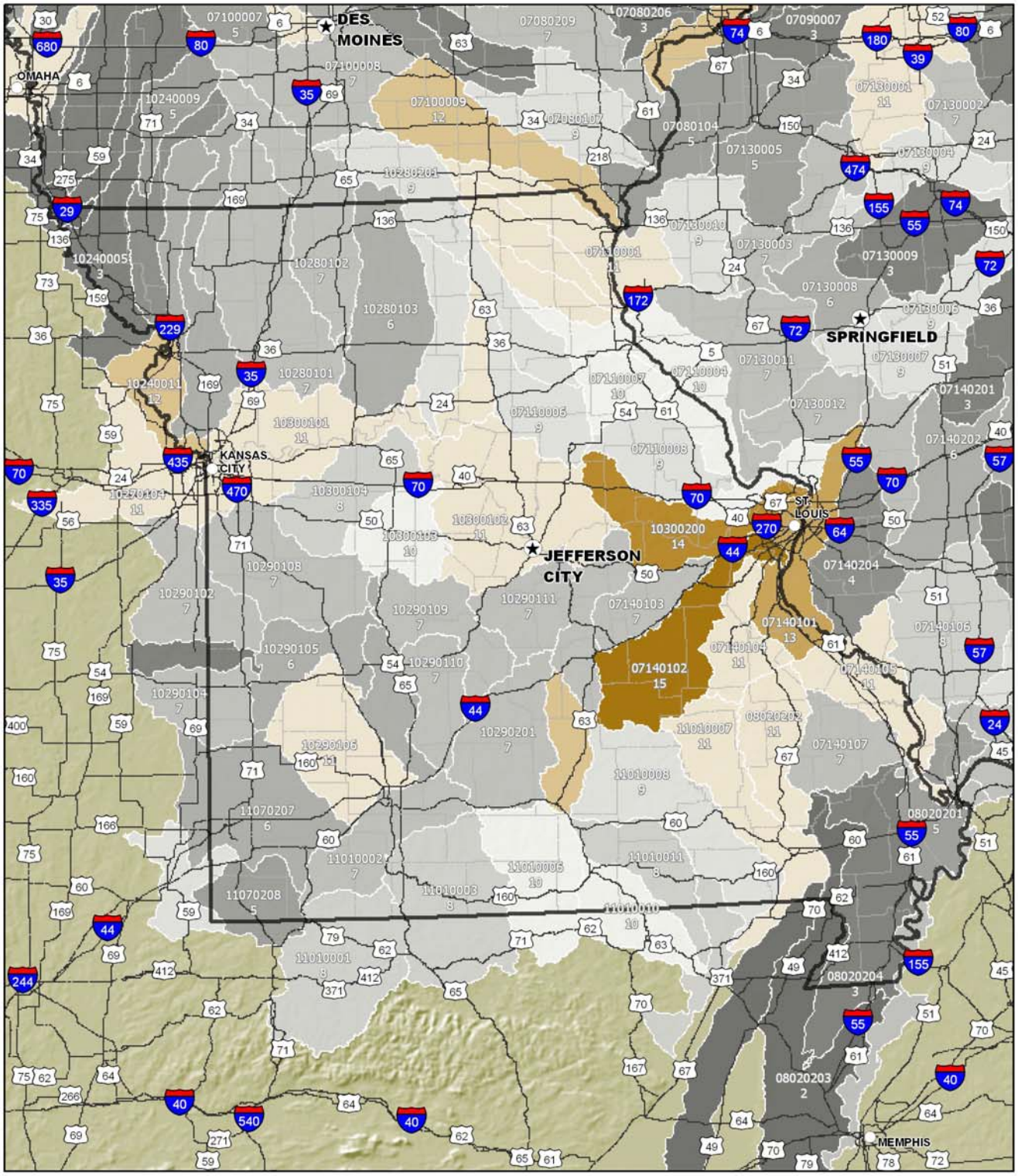


Mean Ability to Produce Clean Water (APCW) by Watershed (Step 1, Continued) - Missouri



STEP 1 COMPOSITE SCORE

Importance of watersheds for drinking water supply (Step 2) - Missouri



STEP 2 COMPOSITE SCORE

2 (Low APCW and Small number of water consumers) — 5 — 10 — 15 — 19 (High APCW and Large number of water consumers)

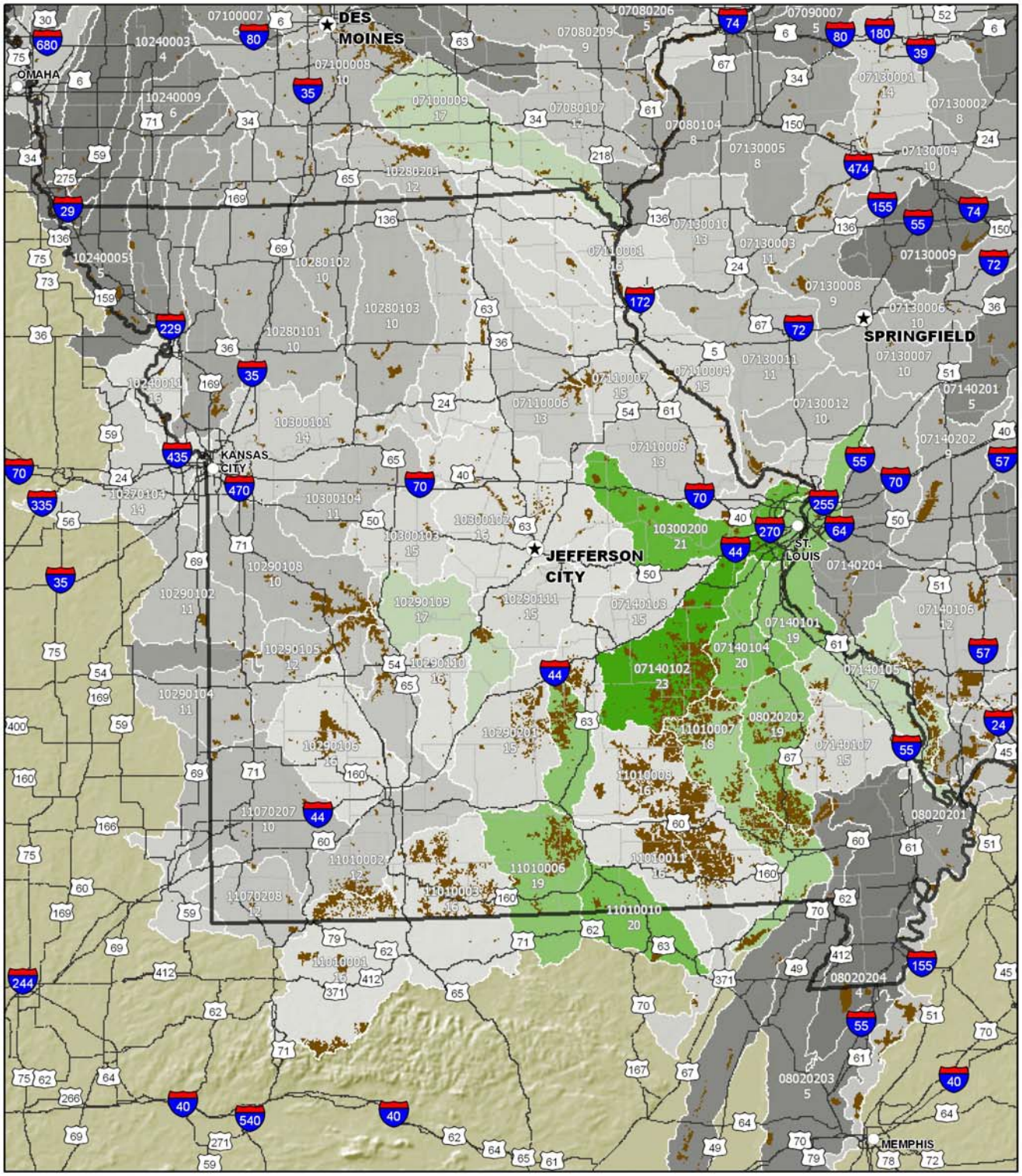
N W E S

Projection: Albers

Watershed labels describe the 8-digit hydrologic unit code (HUC) and watershed composite score

0 15 30 60 Miles

Importance of watersheds and private forest for drinking water supply (Step 3) - Missouri



STEP 3 COMPOSITE SCORE

3 5 10 15 20 25 29

(Low APCW; Small number of water consumers; and Low % private forest)

(High APCW; Large number of water consumers; and High % private forest)

Protected Land

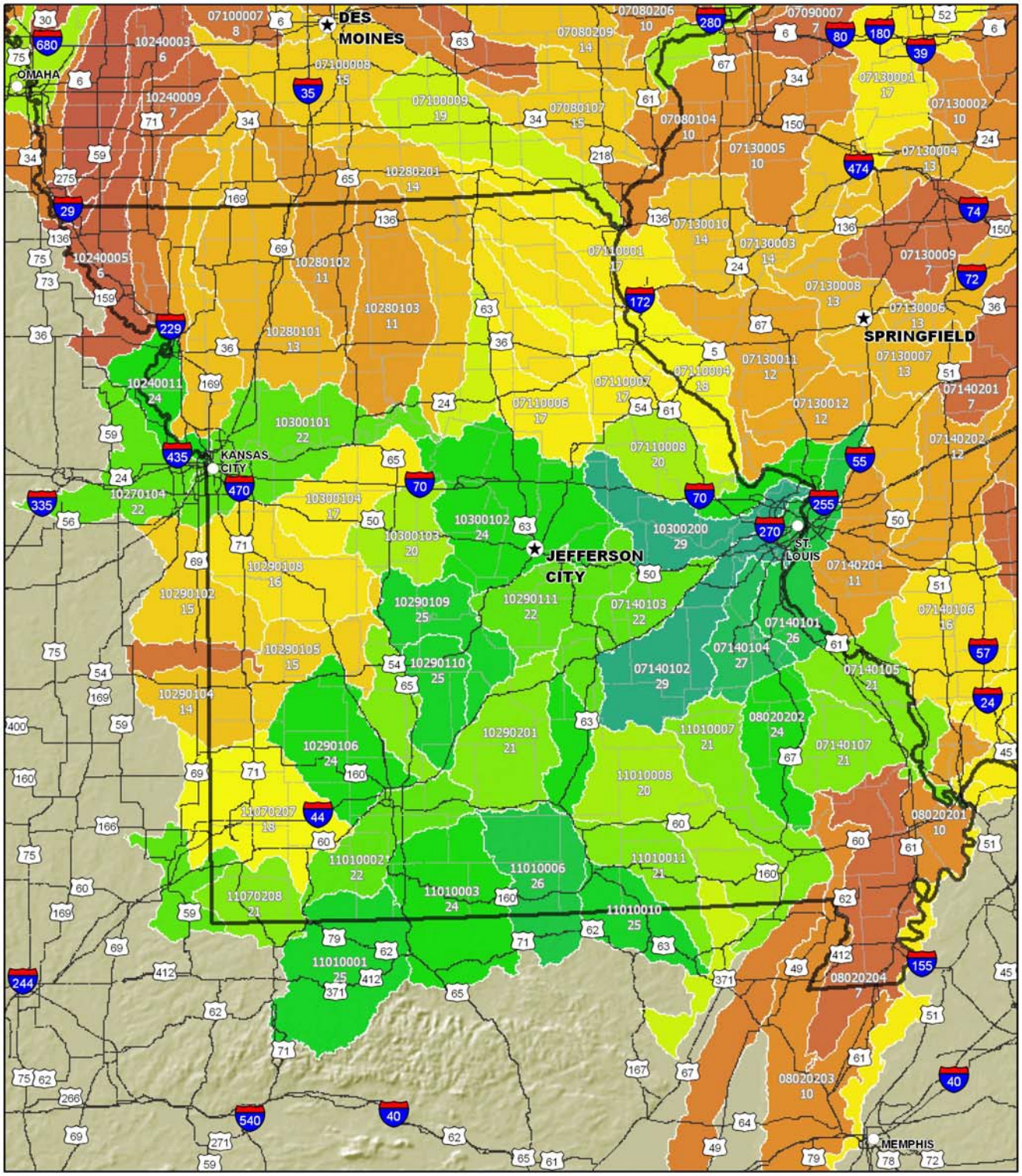
N W E S

Projection: Albers

Watershed labels describe the 8-digit hydrologic unit code (HUC) and watershed composite score

0 15 30 60 Miles

Development pressure on private forests in drinking water supply watersheds (Step 4) - Missouri



STEP 4 COMPOSITE SCORE

5 10 15 20 25 30 37

(Low APCW; Small number of water consumers; Low % private forest; and Low development pressure)

(High APCW; Large number of water consumers; High %private forest; and High development pressure)

N W E S

Projection: Albers

Watershed labels describe the 8-digit hydrologic unit code (HUC) and watershed composite score

0 15 30 60 Miles

References

Table 2. Datasets used in the Forests, Water and People Analysis

Attribute	Dataset	Source*
Forest land	1992 National Landcover Dataset	U.S. Geological Survey 1999
Agricultural land by watershed	1992 National Landcover Dataset	U.S. Geological Survey 1999
Riparian forest cover by watershed	1:100,000-scale National Hydrography Dataset, buffered to 30 meters	Hatfield 2005
Road density	2002 Bureau of Transportation Statistics (BTS) Roads	U.S. Department of Transportation 2002
Soil erodibility	STATSGO Soil Dataset, kffact	Miller and White 1998
Housing density by watershed	Housing density in 2000	Theobald 2004
Surface drinking water consumers per unit area	Public Drinking Water System (PWS) Consumers by eight-digit HUC; City Drinking water consumers for New York City, Philadelphia, St. Louis, St. Paul, and Washington DC	U.S. Environmental Protection Agency 2005
Private forest by watershed	Protected Areas Database, Version 4; Wisconsin Stewardship Data	Conservation Biology Institute 2006; U.S. Geological Survey, Upper Midwest Environmental Sciences Center 2005
Development pressure per unit area	Housing density in 2000 and 2030	Theobald 2004

*Note: See the **full report** for complete reference citations.

Watershed Resources

Northeastern Area Watershed— http://www.na.fs.fed.us/watershed

Forest-to-Faucet Partnership—http://www.wetpartnership.org/index.html

Trust for Public Land Source Water Stewardship Project—http://www.tpl.org/

Forests on the Edge—http://www.fs.fed.us/openspace/fote/index.html

American Water Works Association—Professional and Technical Resources—
http://www.awwa.org/Resources/index.cfm?&navItemNumber=1416

Source Water Collaborative—http://www.protectdrinkingwater.org/

Environmental Protection Agency—Surf Your Watershed—http://cfpub.epa.gov/surf/locate/index.cfm

Environmental Protection Agency—Safe Drinking Water Information System—

http://www.epa.gov/enviro/html/sdwis/sdwis_ov.html

This project was a collaborative effort between the Northeastern Area and Dr. Paul K. Barten, Associate Professor, University of Massachusetts-Amherst and Co-director of the Forest-to-Faucet Partnership.

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