

Forests, Water and People

Drinking water supply and forest lands in Pennsylvania

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 Pennsylvania. For more detailed description of methods, and results for the Northeast and Midwest United States, see the [full report](#).

The Process

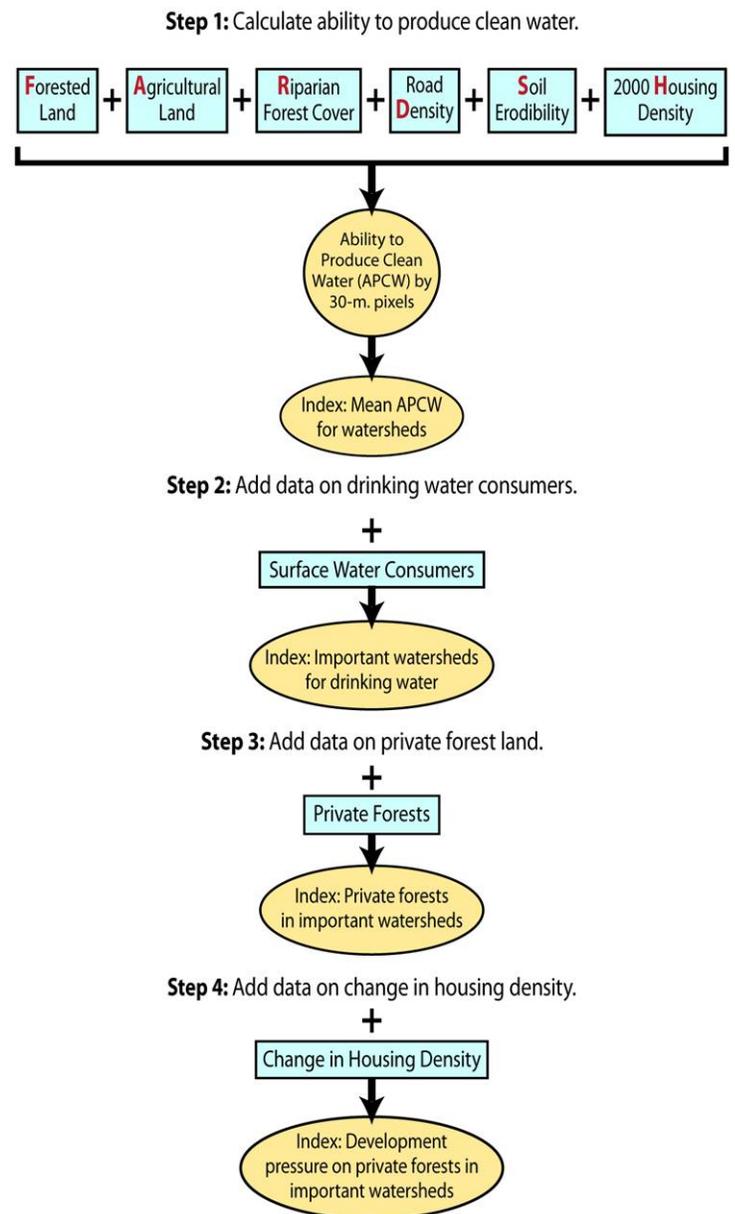
Through a 4 step GIS-based overlay analysis, four indices were developed for each watershed (see Figure 1).



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.



Pennsylvania Results

Highlights

- With a large percent of privately owned forest (81 percent), several watersheds serving more than one million drinking water consumers, and significant development pressure, Pennsylvania ranked very well in each step of the analysis, particularly in steps 2, 3 and 4.
- The watersheds with the highest ability to produce clean water (step 1) were in the northern portion of Pennsylvania, near the area with large protected forests, including the Allegheny National Forest. The Middle West Branch Susquehanna watershed received the highest possible score in this step.
- In the ability of watersheds to provide drinking water to the most people (step 2), the Middle Delaware-Mongaup-Brodhead and North Branch Potomac watersheds scored the highest. Overall Pennsylvania scored well in this step.
- In the ability of watersheds to provide drinking water on private lands (step 3), most of Pennsylvania scored well because the State has 81 percent privately owned forest land. Watersheds in the northeastern and southwestern parts of the State scored highest. Again, the two highest scoring watersheds are the Middle Delaware-Mongaup-Brodhead and North Branch Potomac watersheds.
- Many of the same areas of Pennsylvania scored well in step 4, which 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 were the Lackawaxen and the Middle Delaware-Mongaup-Brodhead watersheds. These watersheds averaged in the top one percent of the study area's watersheds. The greatest development pressure in Pennsylvania is located in the northeastern part of the State, near the Poconos.

Table 1. Watershed results for Pennsylvania

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)
Lackawaxen	02040103	8 of 10	91,053	76 %	14 %	36 of 40	4 of 540
Middle Delaware-Mongaup-Brodhead	02040104	9 of 10	708,183	69 %	11 %	36 of 40	4 of 540
Upper Monongahela	05020003	7 of 10	53,780	77 %	12 %	33 of 40	19 of 540
Lehigh	02040106	7 of 10	536,442	52 %	11 %	33 of 40	19 of 540
Middle Delaware-Musconetcong	02040105	6 of 10	550,665	50 %	21 %	33 of 40	19 of 540
North Branch Potomac	02070002	9 of 10	246,757	73 %	3 %	33 of 40	19 of 540
Lower Allegheny	05010009	6 of 10	482,319	62 %	9 %	32 of 40	34 of 540
Kiskiminetas	05010008	7 of 10	175,845	66 %	7 %	32 of 40	34 of 540
Upper Delaware	02040101	8 of 10	1,265,024	78 %	2 %	32 of 40	34 of 540
Cacapon-Town	02070003	9 of 10	172,470	66 %	4 %	31 of 40	50 of 540
Upper Susquehanna-Lackawanna	02050107	7 of 10	422,585	61 %	3 %	30 of 40	61 of 540
Lower Delaware	02040202	6 of 10	756,090	32 %	17 %	30 of 40	61 of 540
Schuylkill	02040203	4 of 10	1,163,973	44 %	15 %	30 of 40	61 of 540
Connoquenessing	05030105	6 of 10	102,299	53 %	10 %	30 of 40	61 of 540
Conemaugh	05010007	7 of 10	169,797	66 %	5 %	30 of 40	61 of 540
Beaver	05030104	7 of 10	45,421	60 %	4 %	30 of 40	61 of 540
Lower Monongahela	05020005	6 of 10	691,813	59 %	6 %	30 of 40	61 of 540
Conococheague-Opequon	02070004	6 of 10	508,521	42 %	14 %	30 of 40	61 of 540
Lower Susquehanna-Swatara	02050305	5 of 10	425,005	35 %	15 %	29 of 40	76 of 540
Crosswicks-Neshaminy	02040201	4 of 10	360,565	33 %	22 %	29 of 40	76 of 540
Youghiogheny	05020006	7 of 10	225,013	59 %	5 %	29 of 40	76 of 540
Upper West Branch Susquehanna	02050201	8 of 10	71,039	60 %	2 %	28 of 40	88 of 540
Bald Eagle	02050204	7 of 10	50,186	49 %	9 %	28 of 40	88 of 540
Upper Juniata	02050302	7 of 10	82,426	50 %	7 %	28 of 40	88 of 540
Upper Ohio	05030101	5 of 10	437,648	56 %	5 %	28 of 40	88 of 540
Gunpowder-Patapsco	02060003	3 of 10	919,011	29 %	19 %	28 of 40	88 of 540
Middle Allegheny-Redbank	05010006	7 of 10	57,987	68 %	4 %	27 of 40	109 of 540
Monocacy	02070009	3 of 10	232,606	27 %	34 %	27 of 40	109 of 540
Lower Susquehanna	02050306	2 of 10	1,400,479	28 %	20 %	27 of 40	109 of 540
Chemung	02050105	7 of 10	74,950	63 %	3 %	27 of 40	109 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)
Brandywine-Christina	02040205	3 of 10	54,000	35 %	16 %	26 of 40	126 of 540
Lower Juniata	02050304	7 of 10	40,486	55 %	5 %	26 of 40	126 of 540
Lower West Branch Susquehanna	02050206	7 of 10	102,075	48 %	2 %	25 of 40	148 of 540
Clarion	05010005	8 of 10	52,649	53 %	1 %	25 of 40	148 of 540
Lower Susquehanna-Penns	02050301	6 of 10	45,615	44 %	5 %	25 of 40	148 of 540
Upper Susquehanna	02050101	7 of 10	77,412	68 %	2 %	25 of 40	148 of 540
Upper Ohio-Wheeling	05030106	5 of 10	117,322	64 %	1 %	24 of 40	169 of 540
Chautauqua-Conneaut	04120101	6 of 10	21,357	51 %	5 %	24 of 40	169 of 540
Cheat	05020004	9 of 10	15,406	55 %	2 %	24 of 40	169 of 540
Mahoning	05030103	3 of 10	202,472	39 %	5 %	24 of 40	169 of 540
Shenango	05030102	4 of 10	158,646	43 %	3 %	24 of 40	169 of 540
Raystown	02050303	7 of 10	7,180	56 %	4 %	23 of 40	199 of 540
Upper Allegheny	05010001	8 of 10	38,425	67 %	1 %	23 of 40	199 of 540
French	05010004	7 of 10	9,023	55 %	3 %	22 of 40	229 of 540
Chester-Sassafras	02060002	5 of 10	12,978	32 %	11 %	22 of 40	229 of 540
Owego-Wappasening	02050103	7 of 10	0	65 %	3 %	21 of 40	264 of 540
Tioga	02050104	6 of 10	18,168	59 %	2 %	21 of 40	264 of 540
Upper Genesee	04130002	6 of 10	20,098	54 %	1 %	21 of 40	264 of 540
Middle West Branch Susquehanna	02050203	10 of 10	32,027	26 %	0 %	21 of 40	264 of 540
Conewango	05010002	6 of 10	10,299	58 %	1 %	20 of 40	289 of 540
Middle Allegheny-Tionesta	05010003	8 of 10	3,050	58 %	1 %	20 of 40	289 of 540
Pine	02050205	9 of 10	7,550	39 %	1 %	20 of 40	289 of 540
Ashtabula-Chagrin	04110003	5 of 10	0	47 %	9 %	20 of 40	289 of 540
Upper Susquehanna-Tunkhannock	02050106	6 of 10	0	60 %	3 %	20 of 40	289 of 540
Sinnemahoning	02050202	9 of 10	5,589	40 %	0 %	19 of 40	320 of 540

Average or total value for all watersheds listed in Table 1

Mean APCW for watersheds:	6.4	of 10
Important watersheds for drinking water composite score:	13.4	of 20
Private forests in important watersheds composite score:	21.0	of 30
Development pressure on private forests in important watersheds composite score:	26.7	of 40
Forested Land (acres):	29,300,042.3	
Private Forest (acres):	23,785,906.0	
Private Forest Land under Development Pressure by 2030 (acres):	1,473,305.6	
(% private forest land):	6.2%	

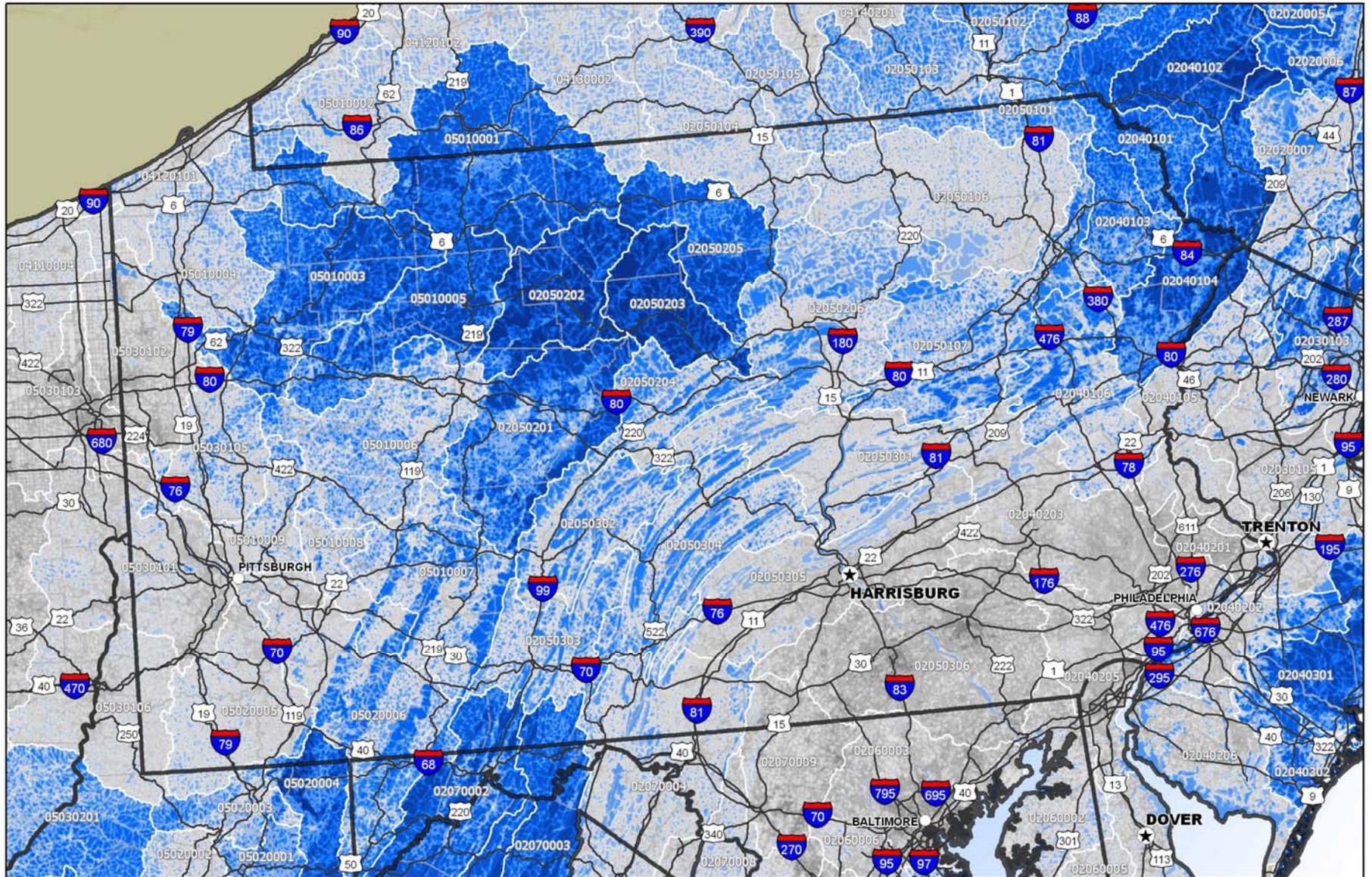
Note: If a watershed fell partially in Pennsylvania, the whole watershed was considered for this project. State results reflect the total acreage for all watersheds that impact that State (this may account for a higher acreage figure than if only lands within State boundaries were considered).

Maps

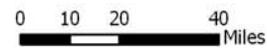
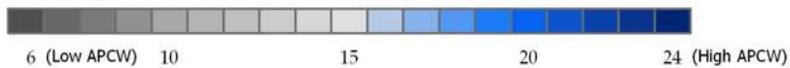
The following maps depict the results of each step in the Forests, Water and People analysis. Each watershed is labeled with the eight-digit HUC and the watershed composite score for the analysis step. (Note: the APCW, 30-m. pixel view does not have a watershed score)

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

Step 1 - Ability to Produce Clean Water, 30m View - Pennsylvania



STEP 1 COMPOSITE SCORE, 30m VIEW

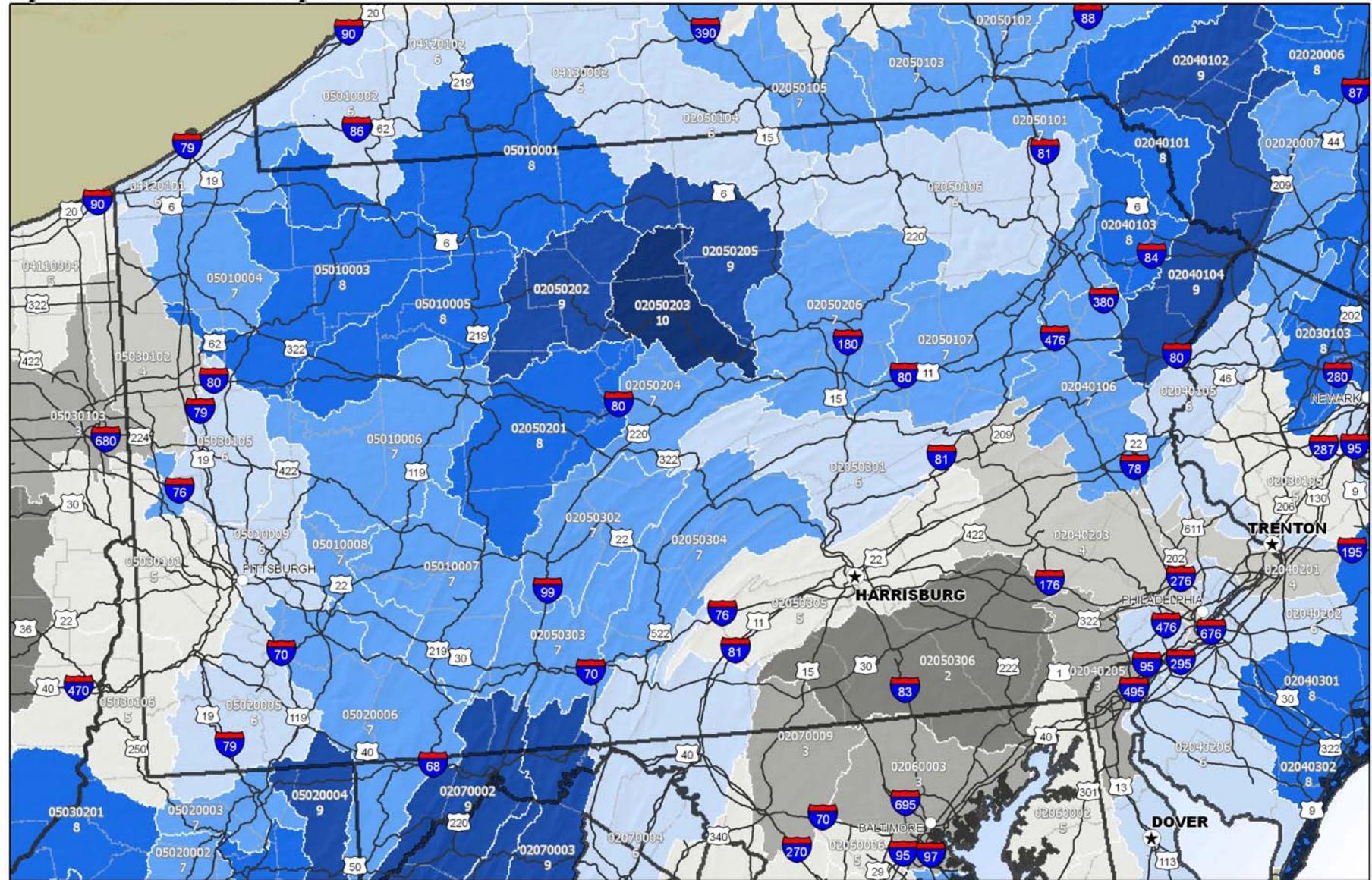


Projection: Albers

Watershed labels describe the 8-digit hydrologic unit code (HUC)

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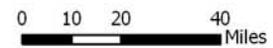
Step 1 (Continued) - Mean Ability to Produce Clean Water by Watershed - Pennsylvania



STEP 1 COMPOSITE SCORE



1 (Low APCW) 5 10 (High APCW)

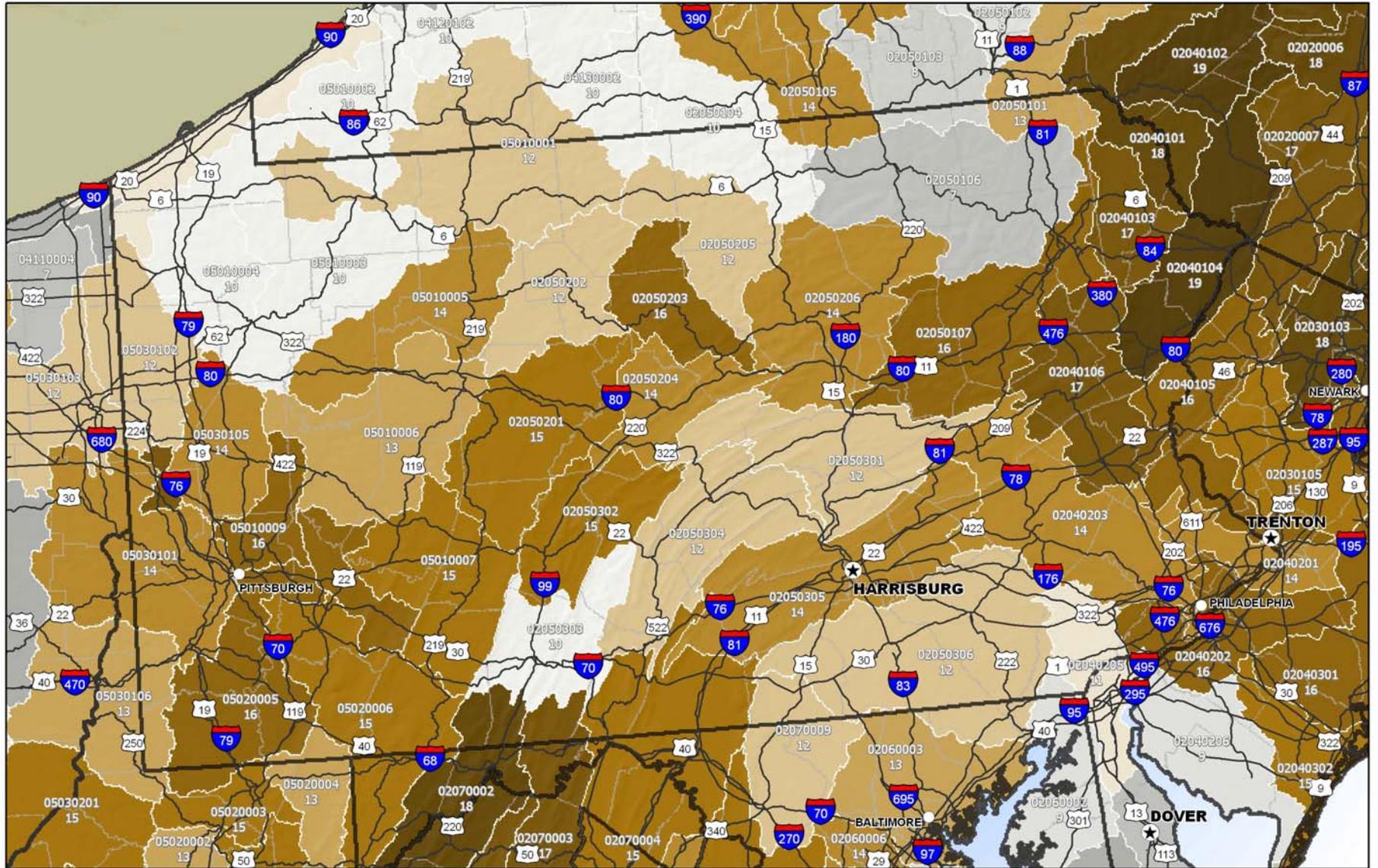


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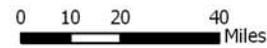
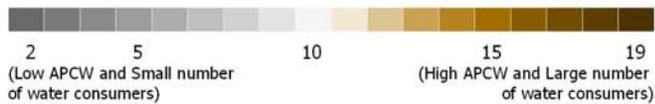
Watershed labels describe the 8-digit hydrologic unit code (HUC) and watershed composite score

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Step 2 - Importance of watersheds for drinking water supply - Pennsylvania



STEP 2 COMPOSITE SCORE

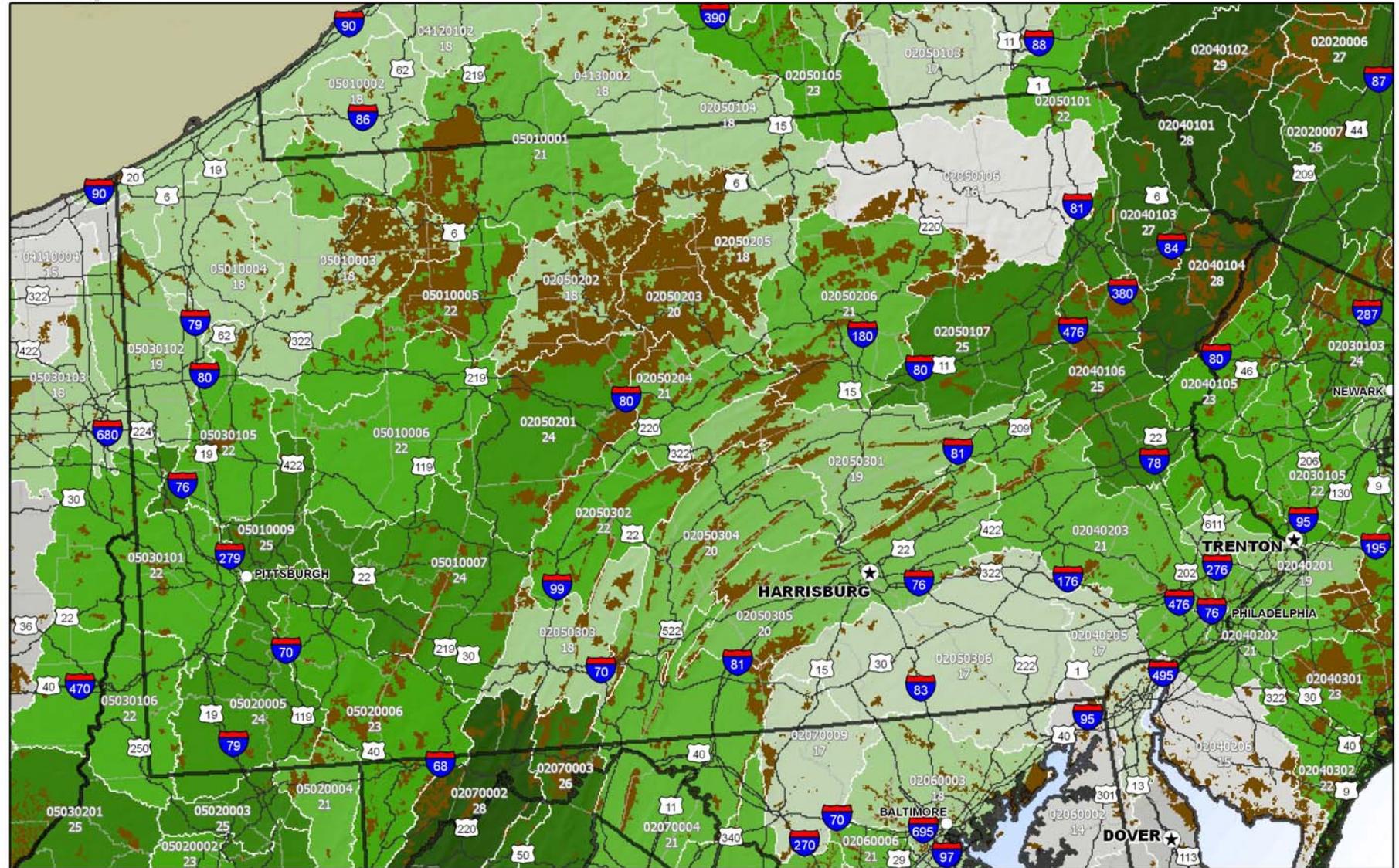


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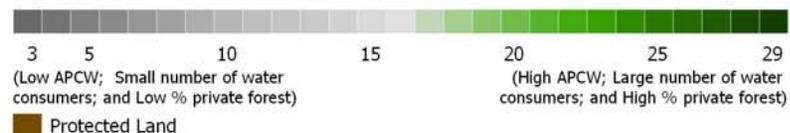
Watershed labels describe the 8-digit hydrologic unit code (HUC) and watershed composite score

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Step 3: Importance of watersheds and private forest for drinking water supply Pennsylvania



STEP 3 COMPOSITE SCORE



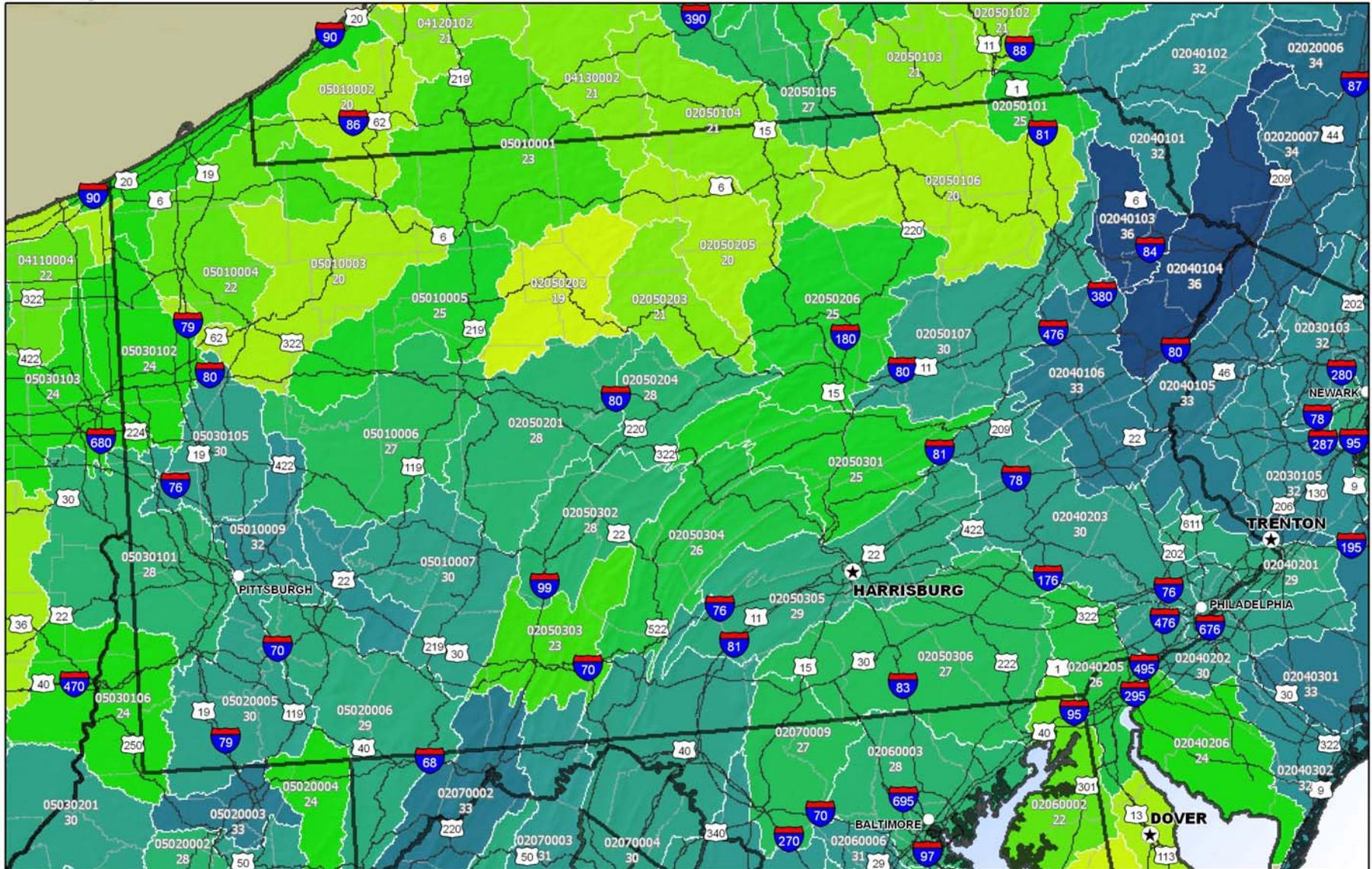
Projection: Albers

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

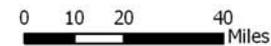
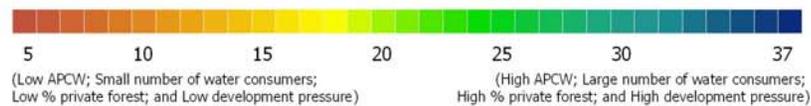


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Step 4: Development pressure on private forests in drinking water supply watersheds - Pennsylvania



STEP 4 COMPOSITE SCORE



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

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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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Kathryn Maloney, Director
11 Campus Blvd., Suite 200
Newtown Square, PA 19073
(610) 557-4103 (4177-FAX)
kmaloney@fs.fed.us

Albert H. Todd, Watershed Program Leader
(now Assistant Director
Ecosystem Services and Markets,
Washington, D.C.)
(202) 205-8528
atodd@fs.fed.us

Martina Barnes, Regional Planner
11 Campus Boulevard, Suite 200
Newtown Square, PA 19073
(610) 557-4217 (4136-FAX)
martinabarnes@fs.fed.us

www.na.fs.fed.us/watershed/

June 2009

