

Forests, Water and People

Drinking water supply and forest lands in Ohio

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

The Process

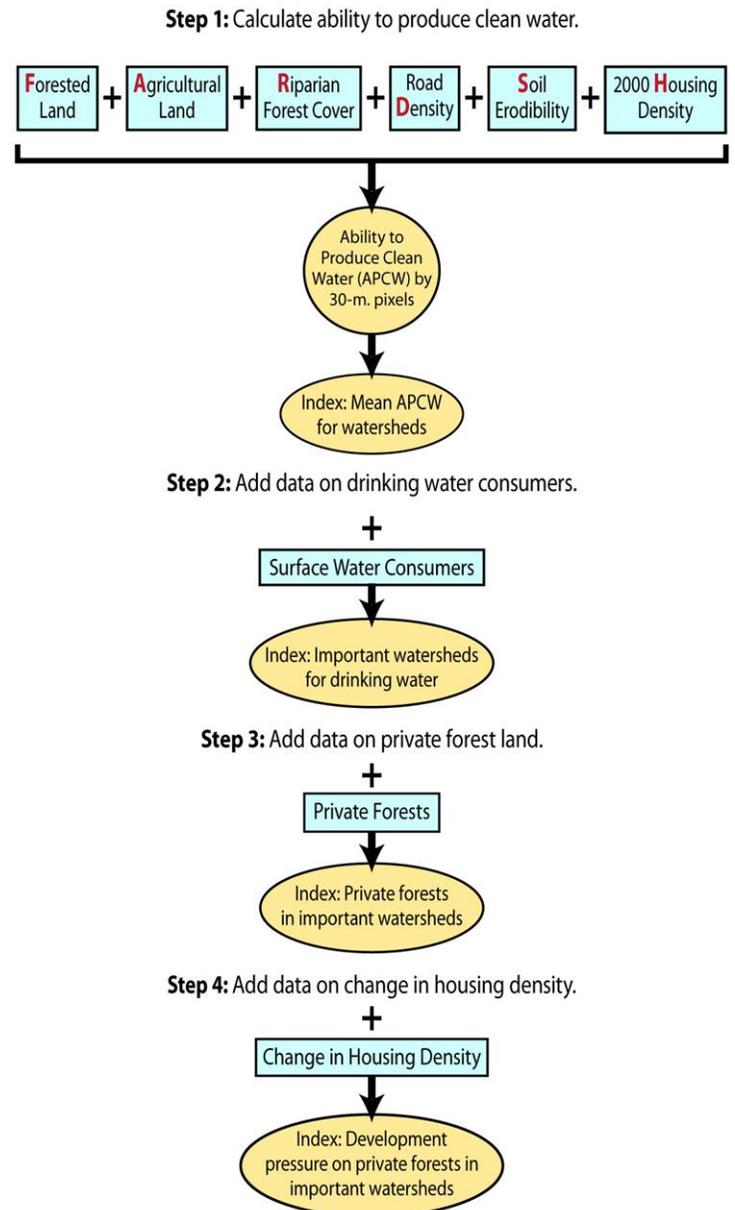
Through a 4 step GIS-based overlay analysis, four indices were developed for each watershed (see Figure 1).



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.



Ohio Results

Highlights

- Most of the watersheds in southeastern Ohio scored above average in each step of the analysis. The State contains large agricultural areas in the west and areas of forest in the east, particularly the southeast, and has high development pressure throughout the State, especially in the area around Columbus and Cincinnati.
- Those Ohio watersheds that ranked highest in their ability to produce clean water (step 1) are located in the southeastern part of the State, where there is the most forested land. The three highest scoring watersheds in step 1 are the Little Scioto-Tygarts, Little Musringum-Middle Island, and Raccoon-Symmes.
- In the ability of watersheds to provide drinking water to the most people (step 2), several Ohio watersheds scored above average across the State. Scores were highest in the east and southeast, where there is the most forested land. The Little Scioto-Tygarts, Little Musringum-Middle Island, and Raccoon-Symmes watersheds scored highest in this step.
- In the ability of watersheds to provide drinking water on private lands (step 3), the east and southeastern corner of Ohio scored highest. The top scoring watersheds are the Little Scioto-Tygarts, Little Musringum-Middle Island, and Raccoon-Symmes. 93 percent of Ohio'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). Due to the high development pressure in Ohio, several watersheds in southeastern Ohio ranked well. The highest scoring watershed is Little Scioto-Tygarts, which ranked in the top 2 percent of all the study area's watersheds, and is located in the southern part of the State.

Table 1. Watershed results for Ohio

| 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) |
| Little Scioto-Tygarts | 05090103 | 8 of 10 | 89,519 | 71 % | 12 % | 34 of 40 | 10 of 540 |
| Raccoon-Symmes | 05090101 | 7 of 10 | 141,340 | 59 % | 11 % | 31 of 40 | 50 of 540 |
| Little Musringum-Middle Island | 05030201 | 8 of 10 | 84,011 | 74 % | 3 % | 30 of 40 | 61 of 540 |
| Ohio Brush-Whiteoak | 05090201 | 6 of 10 | 84,643 | 53 % | 17 % | 29 of 40 | 76 of 540 |
| Hocking | 05030204 | 5 of 10 | 51,539 | 50 % | 24 % | 29 of 40 | 76 of 540 |
| Upper Ohio | 05030101 | 5 of 10 | 437,648 | 56 % | 5 % | 28 of 40 | 88 of 540 |
| Middle Ohio-Laughery | 05090203 | 4 of 10 | 61,059 | 44 % | 21 % | 28 of 40 | 88 of 540 |
| Upper Ohio-Shade | 05030202 | 6 of 10 | 56,096 | 66 % | 9 % | 28 of 40 | 88 of 540 |
| Wills | 05040005 | 5 of 10 | 25,269 | 57 % | 12 % | 27 of 40 | 109 of 540 |
| Lower Scioto | 05060002 | 6 of 10 | 21,128 | 46 % | 17 % | 26 of 40 | 126 of 540 |
| Cuyahoga | 04110002 | 4 of 10 | 295,550 | 34 % | 9 % | 26 of 40 | 126 of 540 |
| Mohican | 05040002 | 4 of 10 | 62,488 | 35 % | 11 % | 25 of 40 | 148 of 540 |
| Muskingum | 05040004 | 5 of 10 | 9,293 | 51 % | 14 % | 25 of 40 | 148 of 540 |
| Mahoning | 05030103 | 3 of 10 | 202,472 | 39 % | 5 % | 24 of 40 | 169 of 540 |
| Chautauqua-Conneaut | 04120101 | 6 of 10 | 21,357 | 51 % | 5 % | 24 of 40 | 169 of 540 |
| Black-Rocky | 04110001 | 3 of 10 | 84,245 | 31 % | 12 % | 24 of 40 | 169 of 540 |
| Upper Ohio-Wheeling | 05030106 | 5 of 10 | 117,322 | 64 % | 1 % | 24 of 40 | 169 of 540 |
| Shenango | 05030102 | 4 of 10 | 158,646 | 43 % | 3 % | 24 of 40 | 169 of 540 |
| Licking | 05040006 | 2 of 10 | 50,000 | 33 % | 24 % | 24 of 40 | 169 of 540 |
| Little Miami | 05090202 | 1 of 10 | 436,846 | 19 % | 19 % | 24 of 40 | 169 of 540 |
| Upper Scioto | 05060001 | 1 of 10 | 1,204,882 | 13 % | 27 % | 23 of 40 | 199 of 540 |
| St. Joseph | 04100003 | 2 of 10 | 250,000 | 15 % | 17 % | 23 of 40 | 199 of 540 |
| Grand | 04110004 | 5 of 10 | 1,650 | 54 % | 7 % | 22 of 40 | 229 of 540 |
| Huron-Vermilion | 04100012 | 1 of 10 | 53,516 | 21 % | 10 % | 21 of 40 | 264 of 540 |
| Walhonding | 05040003 | 2 of 10 | 172 | 36 % | 24 % | 20 of 40 | 289 of 540 |
| Raisin | 04100002 | 3 of 10 | 26,504 | 16 % | 17 % | 20 of 40 | 289 of 540 |
| Ashtabula-Chagrin | 04110003 | 5 of 10 | 0 | 47 % | 9 % | 20 of 40 | 289 of 540 |
| Tuscarawas | 05040001 | 2 of 10 | 42,200 | 40 % | 11 % | 20 of 40 | 289 of 540 |
| Paint | 05060003 | 2 of 10 | 20,568 | 17 % | 16 % | 19 of 40 | 320 of 540 |
| Whitewater | 05080003 | 1 of 10 | 43,540 | 21 % | 9 % | 18 of 40 | 337 of 540 |
| Blanchard | 04100008 | 1 of 10 | 44,367 | 6 % | 10 % | 18 of 40 | 337 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) |
| Lower Maumee | 04100009 | 1 of 10 | 55,711 | 7 % | 7 % | 17 of 40 | 352 of 540 |
| Cedar-Portage | 04100010 | 1 of 10 | 23,484 | 6 % | 13 % | 17 of 40 | 352 of 540 |
| Upper Great Miami, Indiana, Ohio | 05080001 | 1 of 10 | 58,606 | 9 % | 17 % | 17 of 40 | 352 of 540 |
| Tiffin | 04100006 | 1 of 10 | 22,144 | 12 % | 9 % | 16 of 40 | 380 of 540 |
| Auglaize | 04100007 | 1 of 10 | 89,345 | 7 % | 6 % | 16 of 40 | 380 of 540 |
| Sandusky | 04100011 | 1 of 10 | 94,832 | 9 % | 5 % | 16 of 40 | 380 of 540 |
| Ottawa-Stony | 04100001 | 1 of 10 | 995 | 16 % | 13 % | 15 of 40 | 394 of 540 |
| Lower Great Miami, Indiana, Ohio | 05080002 | 1 of 10 | 0 | 16 % | 17 % | 14 of 40 | 407 of 540 |
| Upper Wabash | 05120101 | 1 of 10 | 11,520 | 8 % | 9 % | 13 of 40 | 427 of 540 |
| St. Marys | 04100004 | 1 of 10 | 0 | 7 % | 14 % | 13 of 40 | 427 of 540 |
| Upper Maumee | 04100005 | 1 of 10 | 0 | 6 % | 11 % | 12 of 40 | 442 of 540 |
| Mississinewa | 05120103 | 1 of 10 | 0 | 7 % | 4 % | 9 of 40 | 484 of 540 |

Average or total value for all watersheds listed in Table 1

| | | |
|--|--------------|-------|
| Mean APCW for watersheds: | 3.1 | of 10 |
| Important watersheds for drinking water composite score: | 8.8 | of 20 |
| Private forests in important watersheds composite score: | 13.9 | of 30 |
| Development pressure on private forests in important watersheds composite score: | 21.7 | of 40 |
| Forested Land (acres): | 12,489,184.8 | |
| Private Forest (acres): | 11,567,786.9 | |
| Private Forest Land under Development Pressure by 2030 (acres): | 1,390,847.3 | |
| (% private forest land): | 12.0% | |

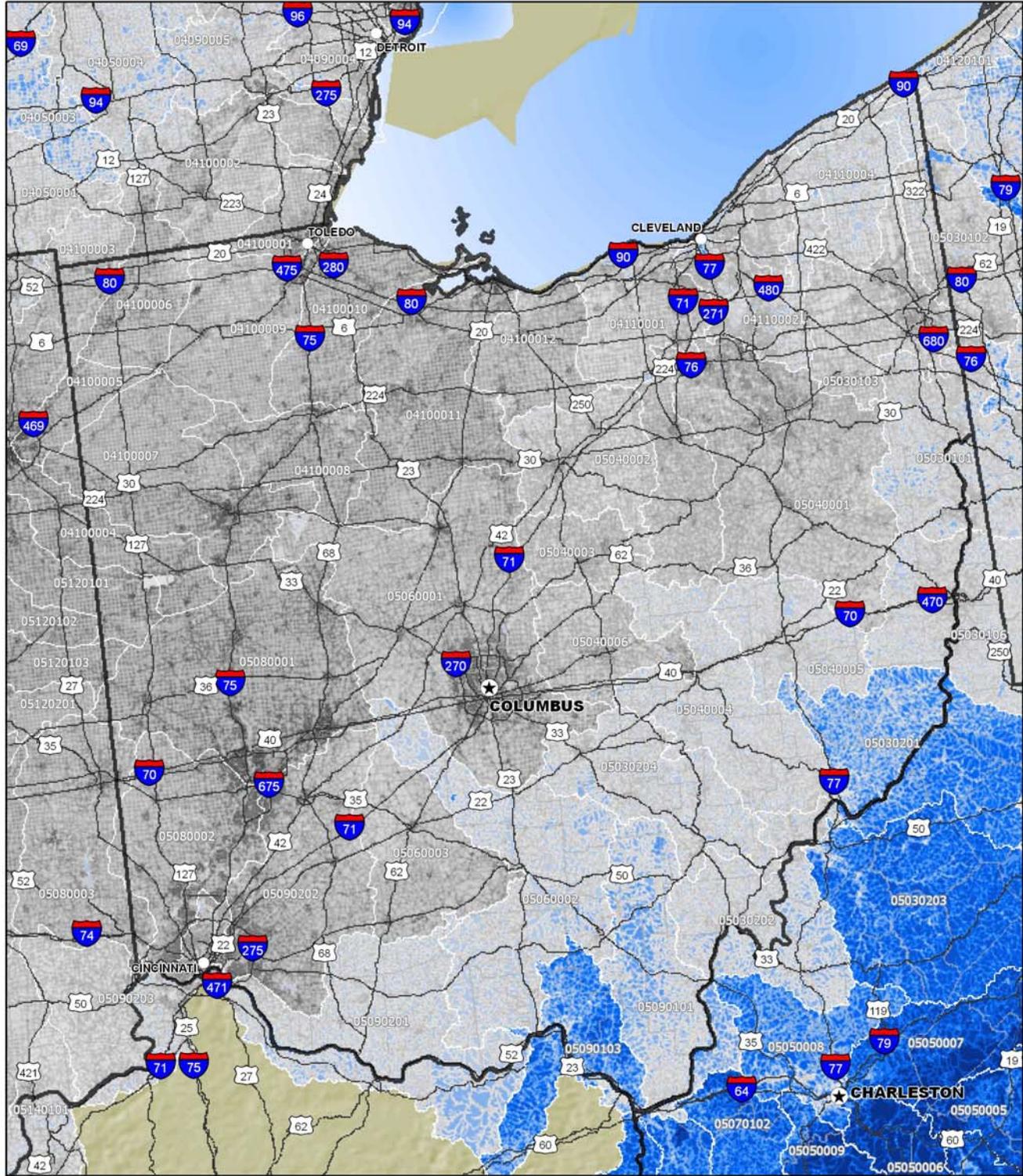
Note: If a watershed fell partially in Ohio, the whole watershed was considered for this project. State results reflect the total acreage for all watersheds that impact that State (this may account for a higher acreage figure than if only lands within State boundaries were considered).

Maps

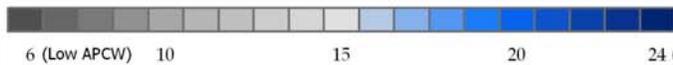
The following maps depict the results of each step in the Forests, Water and People analysis. Each watershed is labeled with the eight-digit HUC and the watershed composite score for the analysis step. (Note: the APCW, 30-m. pixel view does not have a watershed score)

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

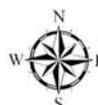
Ability to Produce Clean Water (APCW) (Step 1), 30-m View - Ohio



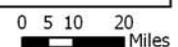
STEP 1 COMPOSITE SCORE, 30-m VIEW



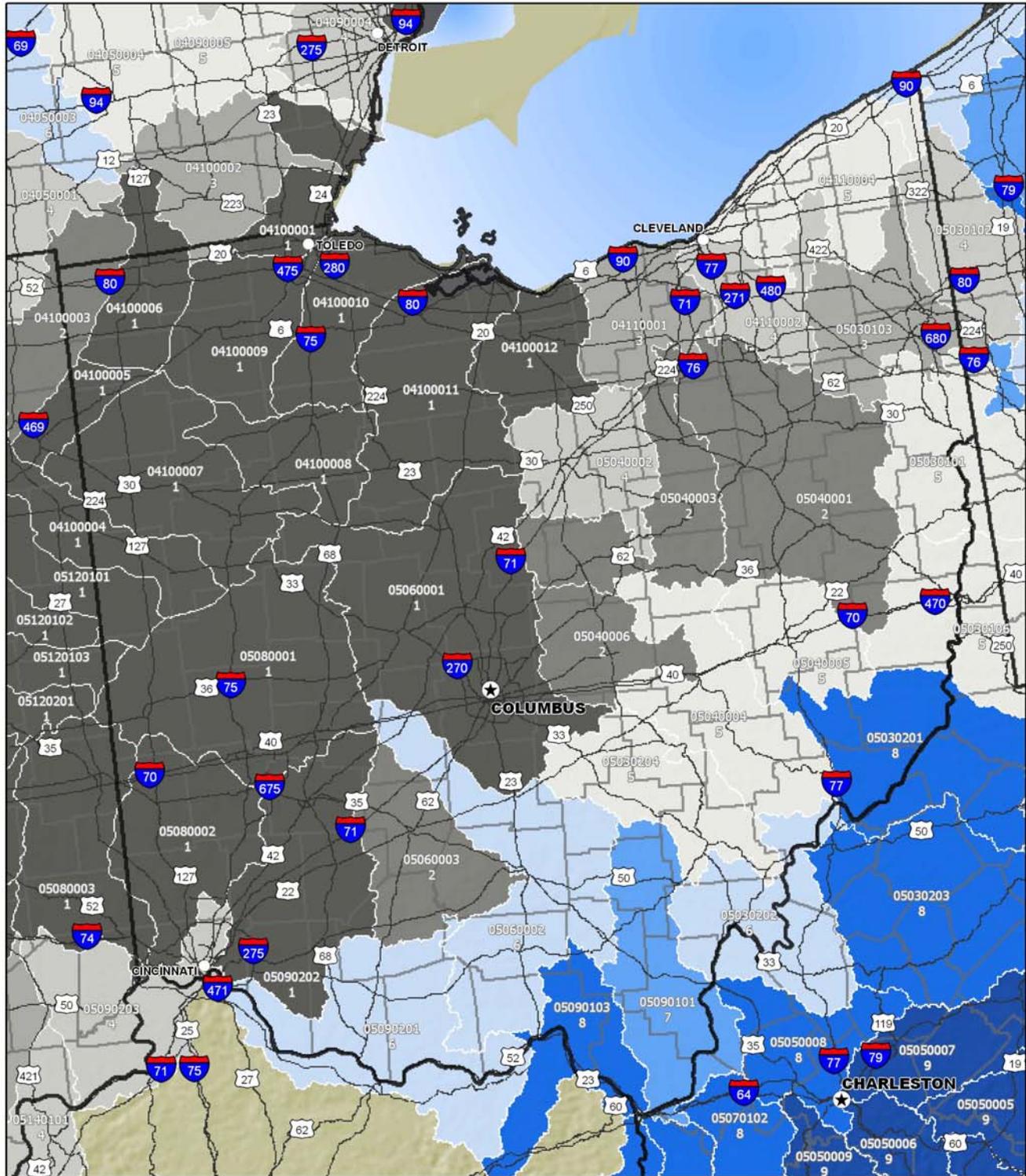
Projection: Albers



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



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



STEP 1 COMPOSITE SCORE

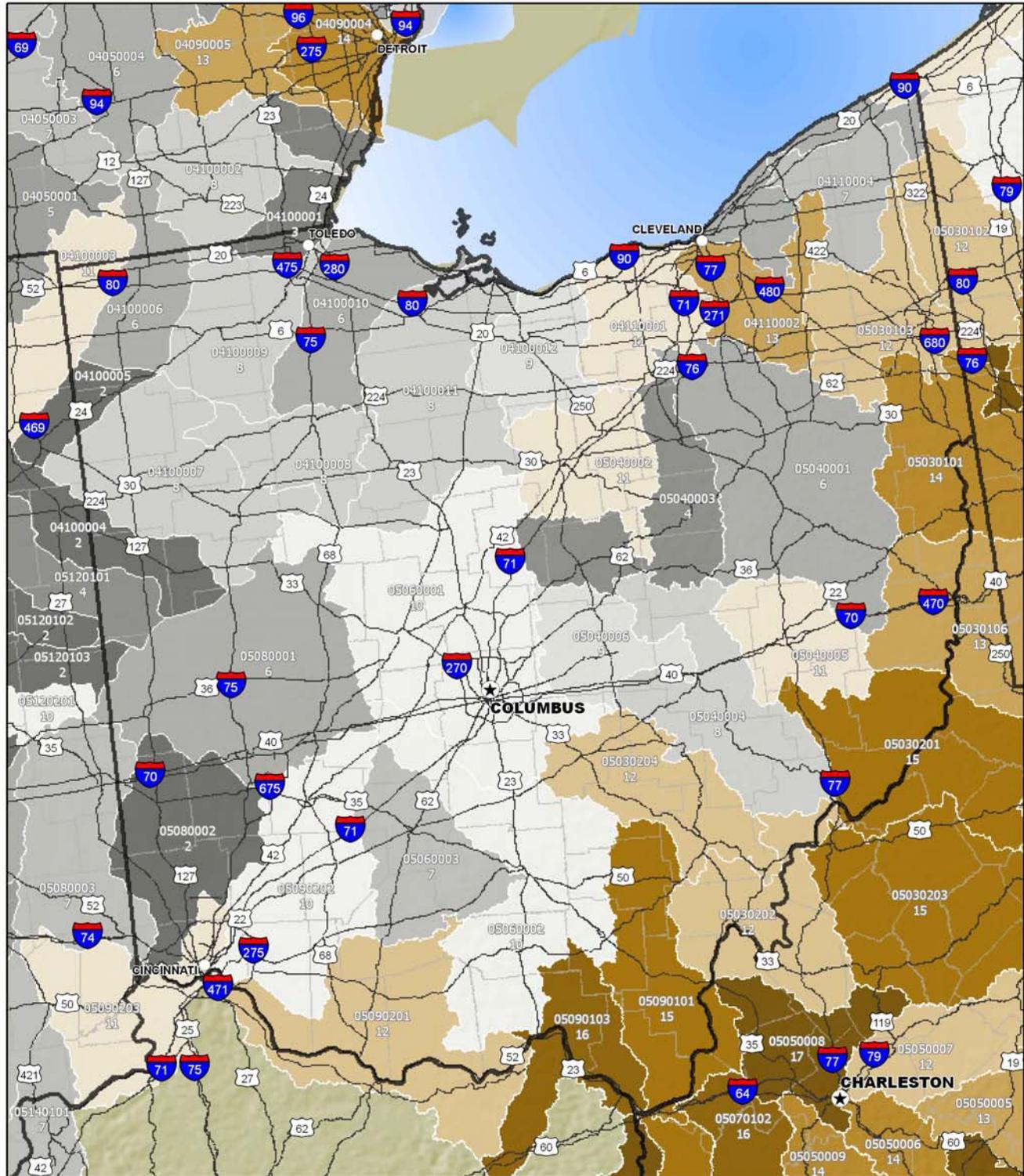


Projection: Albers

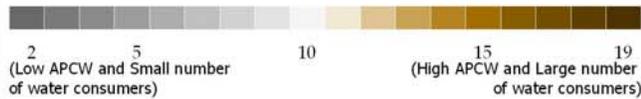
Watershed labels describe the 8-digit hydrologic unit code (HUC) and watershed composite score

0 5 10 20 Miles

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

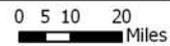


STEP 2 COMPOSITE SCORE

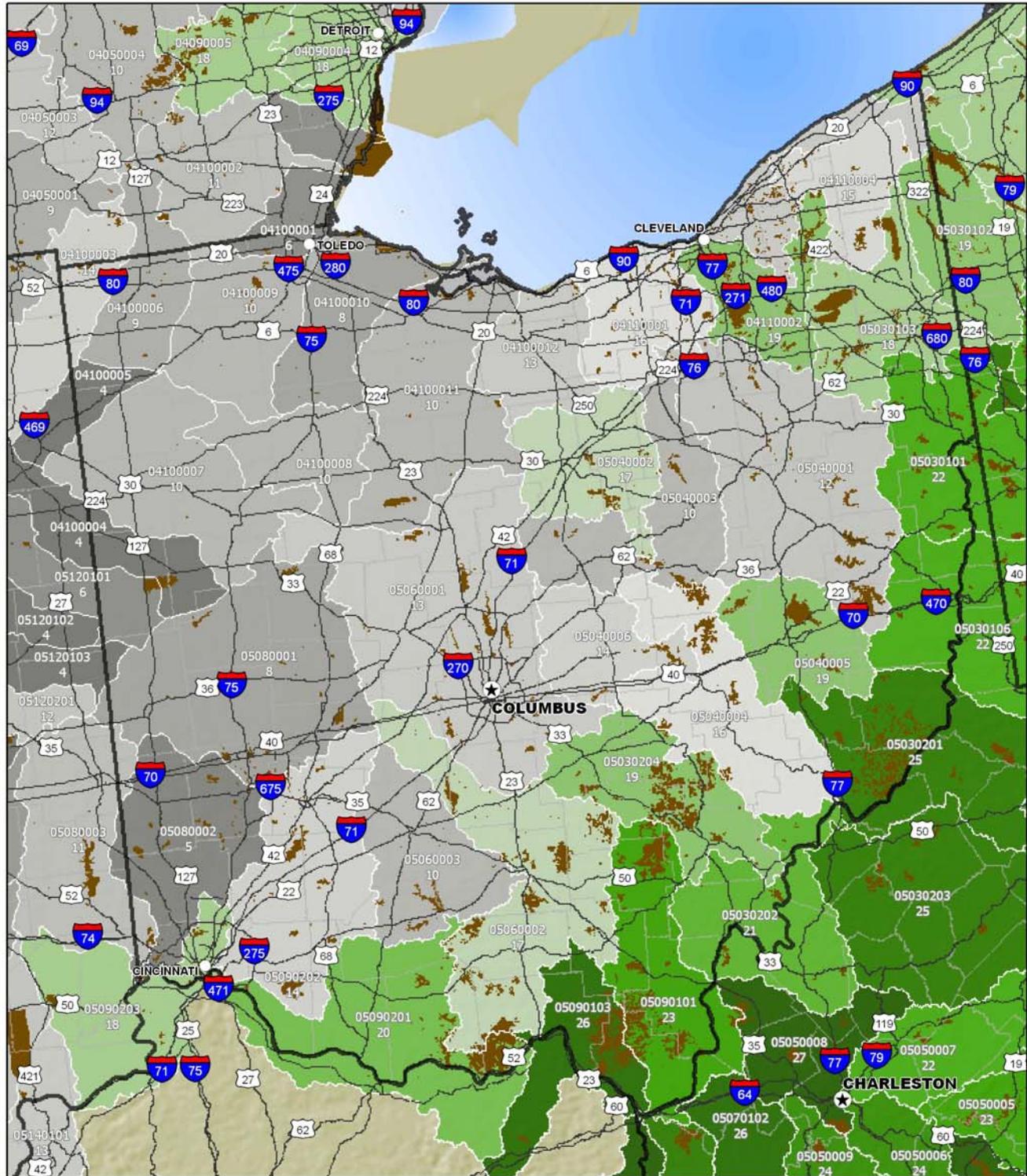


Projection: Albers

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



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

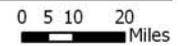


STEP 3 COMPOSITE SCORE

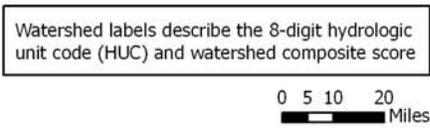
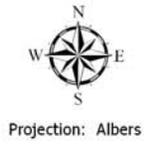
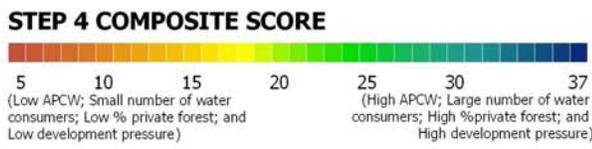
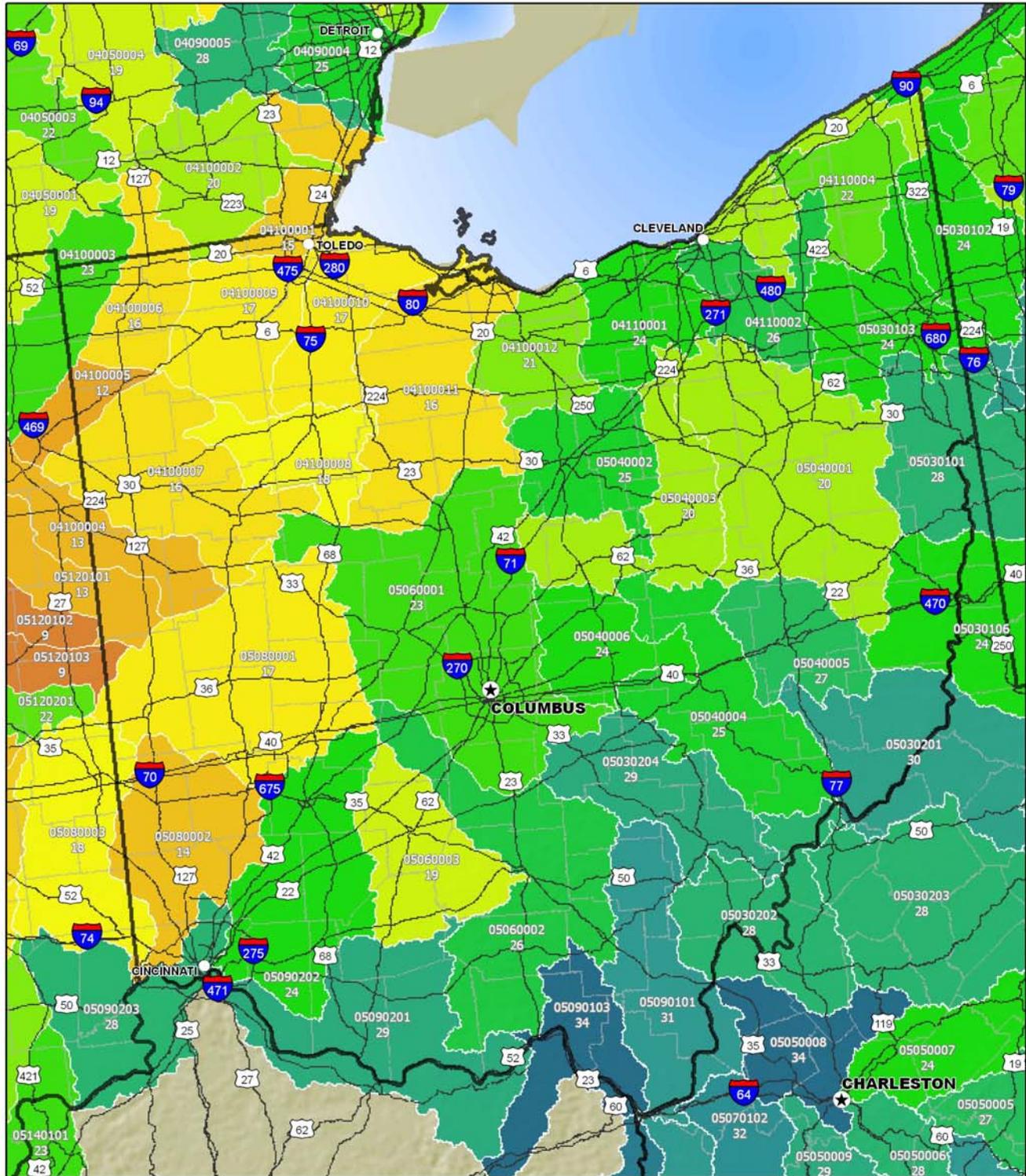


Projection: Albers

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



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



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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