

## 10. Soil and water quality in forested areas

Identifying impairments is one way of determining water quality in Wisconsin. Another way water quality is assessed is by determining whether water resources are achieving the designated use standards for fish and aquatic life described in the Wisconsin Administrative Code. As reported in Wisconsin's 2006 Water Quality Report to Congress, 56% of the assessed rivers and streams and 71% of the assessed lakes, ponds and reservoirs were identified as impaired for the state designated use for fish and aquatic life (Table 10.i). However, of the water bodies that have been individually assessed and documented in the state's data system, the majority are perceived as the most degraded or impaired, thus skewing the overall picture of statewide river and stream conditions.

**Table 10.i: Percent impaired water for fish and aquatic life state designated use**

<b>Rivers and Streams</b>		<b>Lakes, Ponds, and Reservoirs.</b>	
Total Miles Assessed	Percent Impaired (of those assessed)	Total Acres Assessed	Percent Impaired (of those assessed)
14,978 (~18% of 85,000 river/stream miles)	56%	670,362 (~36% of 1.8 million lake acres)	71%

Source: Wisconsin 2006 Water Quality Report

## 11 Area of forest land adjacent to surface water and forest land by watershed

### 11.1 Percentage of forested riparian area

Riparian areas are lands next to lakes and streams. In a forested condition, these areas help to slow and filter runoff, regulate water temperatures, and provide habitat for wildlife. In watersheds dominated by agriculture, forested riparian areas are especially valuable in intercepting nonpoint source pollution (nutrients, sediments, chemicals, and pesticides) and reducing the input of these pollutants into water resources. Forested riparian zones also directly provide important food and habitat for aquatic systems, as well as indirect benefits like shade, which can aid in maintaining water temperature. Forested riparian areas are essential to wildlife habitat and provide corridors for resident and migratory wildlife movement.

**Table 11.a: Watersheds per percentage of riparian area forested**

Percentage of Riparian Area Forested	Watersheds
0% - 10%	19
11% - 20%	49
21% - 50%	168
51% - 100%	132

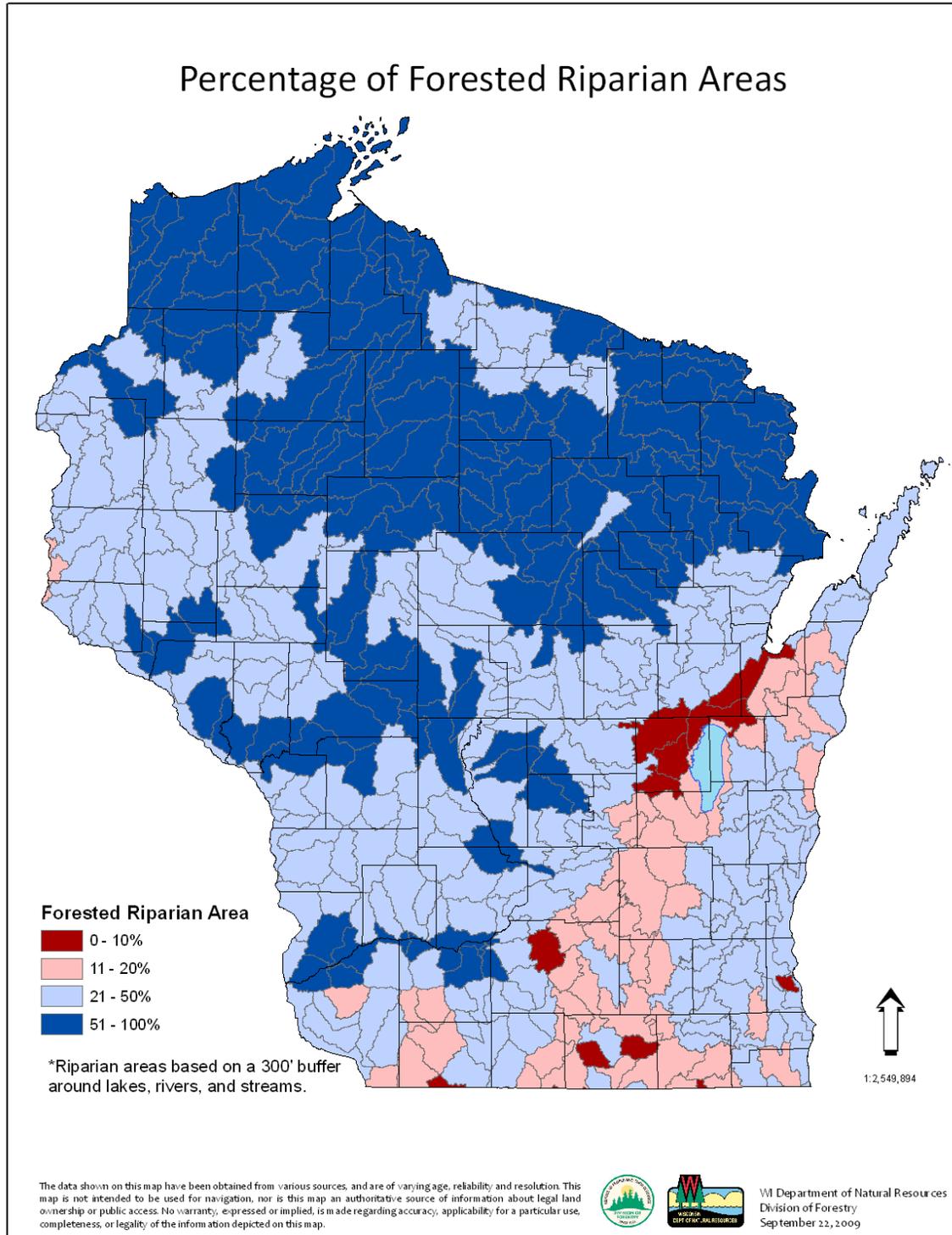
Source: WDNR

## 11. Area of forest land adjacent to surface water and forest land by watershed

It is important to note that not all of Wisconsin's watersheds were historically heavily forested. In some areas of the state, especially below the tension zone (the border of ecological sections—roughly the transition between northern and southern forests), open forest or grassland communities were common, while north of the tension zone, more heavily forested communities were dominant.

Based on a 300-foot buffer, 19 watersheds have fewer than 10% of their riparian areas forested (Table 11.a). Looking in particular at the watersheds for Bull Creek-Des Plaines River in Waukesha County and Bass Creek in Rock County, which had over 25% of their streams designated as impaired (Map 10.d), Bull Creek has less than 20% of its riparian areas forested and Bass Creek has between 21% and 50% of its riparian areas forested (Map 11.a). In watersheds with similar conditions, one goal may be to reforest riparian areas. In areas with higher percentages of riparian forests, the focus may be to maintain these forested buffers.

11. Area of forest land adjacent to surface water and forest land by watershed



**Map 11.a Percentage of forested riparian areas**

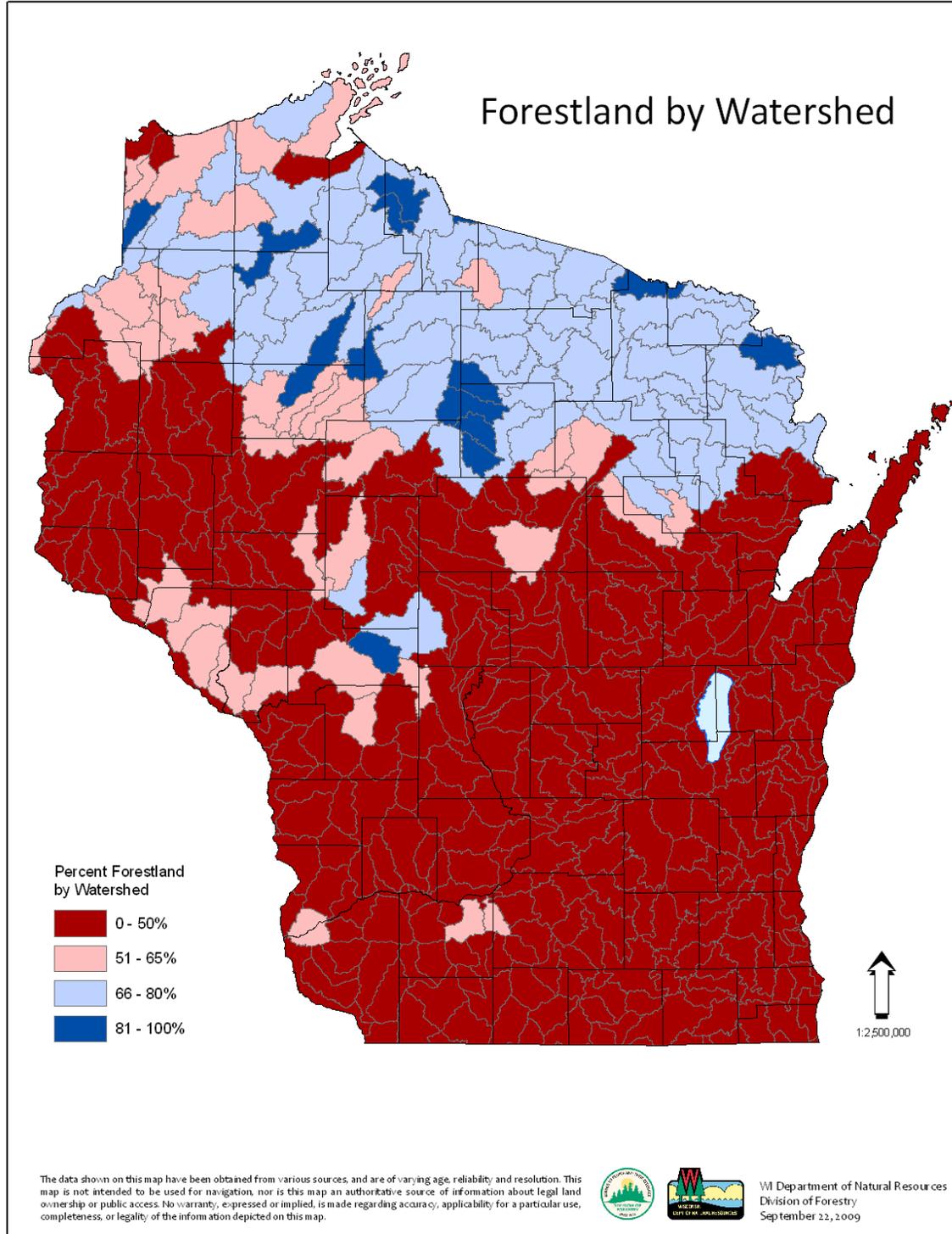
Source: DNR, 2009

## 11. Area of forest land adjacent to surface water and forest land by watershed

### **11.2 Amount of forested riparian areas**

Maintaining a watershed in a forested condition can help to protect water quality and maintain aquatic habitat many species depend upon. Studies conducted in Wisconsin found that when 80% or more of a watershed is in a forested condition, streams have a high IBI (index of biological integrity) and maintain aquatic habitat features (Wang et al 1997). Other studies have found that if a watershed can be maintained at 65% forest cover and less than 10% impervious surfaces, the hydrology of that watershed is maintained, especially the stability of those streams (Booth 2000).

## 11. Area of forest land adjacent to surface water and forest land by watershed



**Map 11.b: Forest land by watershed**

Source: DNR, 2009

Criterion 4: Conservation and maintenance of soil and water resources

## 11. Area of forest land adjacent to surface water and forest land by watershed

In Wisconsin, only 15 watersheds (4% of watersheds) are more than 80% forested (Map 11.b). Maintaining forest cover will help to ensure these watersheds support healthy populations of aquatic species as well as the habitat and clean water they depend on.

There are also 251 watersheds (nearly 70%) with less than 50% of their land cover forested. Looking again at Bass Creek and the Bull Creek-Des Plaines River watersheds, both have less than 50% of their watersheds forested. The goals in these watersheds and similar watersheds may be to increase the amount of forested land cover, consistent with historic vegetation communities and wildlife habitat objectives.

### 11.3 Amount of impervious surfaces

Impervious surfaces, like roofs, parking lots, and roads prevent rainwater and snow melt from soaking into the ground. Water runs off of impervious surfaces and can increase the quantities of water that flows into lakes, rivers, streams, and wetlands. One result is more “flashy” streams with water levels that rise dramatically during runoff events with much lower water levels during dry periods. In watersheds with low levels of impervious surfaces, the flow pattern is typically less “flashy” because runoff can soak into the ground and be slowly released to lakes, streams, and wetlands over time, maintaining a more stable base flow.

Studies in Wisconsin have found that when more than 10% of a watershed is urbanized, index of biotic integrity (IBIs) drop to poor or very poor (Wang et al 1997). A more recent study in the eastern United States has found sensitive fish species, such as darters, begin to disappear from watersheds when impervious surfaces rise to as little as 2% of a watershed (Wenger et al 2008).

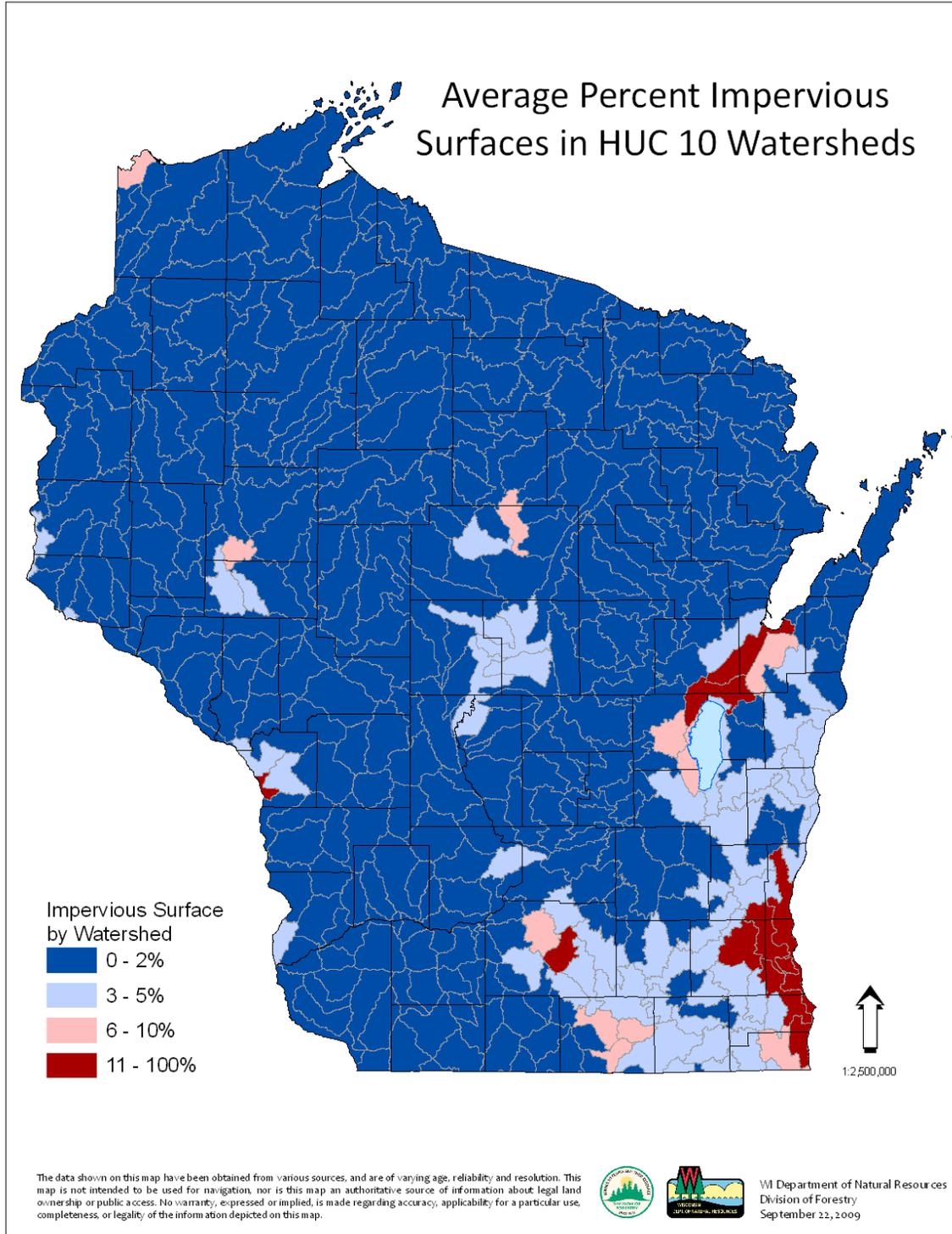
Percentage of Impervious Surfaces	Watersheds
0% - 2%	322
3% - 5%	29
6% - 10%	6
11% - 100%	11

Source: WDNR

Based on 2001-2002 data, over 85% of Wisconsin watersheds are likely to be in very healthy condition with less than 2% of the watershed area in impervious surfaces (Table 11.b). A small number (11) of watersheds have greater than 11% of their land cover in impervious surfaces. Bass Creek has 6%-10% of its land area in impervious surfaces while Bull Creek-Des Plaines River has more than 11% of its watershed in impervious surfaces (Map 11.c).

Specifically in urban areas, it has been found that as urban areas keep growing, the amount of impervious surfaces also increases. With this growth, the urban forest coverage also increases (Table 11.c). This trend is consistent regardless of whether the urban growth is measured by a change in population density or in jurisdictional boundaries.

11. Area of forest land adjacent to surface water and forest land by watershed



**Map 11.c: Average percent impervious surfaces in HUC 10 watersheds**

Source: DNR, 2009

## 11. Area of forest land adjacent to surface water and forest land by watershed

Urban land area can be defined several ways. In this section, the term “urban” is defined by population density and delimited using the United States Census definitions of urbanized areas and urban clusters. A second way of measuring urban is to measure land within a city or village, as defined by jurisdictional or political boundaries of communities based on United States Census definitions of incorporated or census designated places. This is referred to as “community” in this report

Urban land area increased from 2.5% in 1990 to 3.0% in 2000. Impervious surface typically covers 24.3% of urban land statewide. Community land increased from 4.3% of Wisconsin’s land area in 1990 to 4.9% in 2000. Impervious surfaces typically cover 17.2% of community jurisdiction land. Overall impervious surfaces cover 1.5% of Wisconsin’s land area.

Based on the Wang et al study, a threshold of 10% “urban” area, or 17% to 24% “community” area, will drop IBIs to poor or very poor. Green infrastructure, such as forested buffers, can help to minimize the effects of impervious surfaces on water quality and improve IBI scores.

**Table 11.c: Statewide summary of area, green space, and impervious surface land cover in urban, community, and urban or community areas**

		Statewide	Urban <sup>a</sup>	Community <sup>b</sup>	Urban or Community <sup>c</sup>
Land area	km <sup>2</sup> (2000)	140,236.7	4,197.0	6,843.7	7,849.8
	% Land area (2000)	100.0	3.0	4.9	5.6
	km <sup>2</sup> (1990)	140,236.7	3,565.4	6,034.8	6,878.5
	% Land area (1990)	100.0	2.5	4.3	4.9
	% Change (1990-2000)	0.0	17.7	13.4	14.1
Total green space (2000) <sup>d</sup>	km <sup>2</sup>	138,140.0	3,178.8	5,666.4	6,575.3
	% Land area	98.5	75.7	82.8	83.8
Impervious surface cover (2000)	km <sup>2</sup>	2,096.8	1,018.2	1,177.3	1,274.5
	% Land area	1.5	24.3	17.2	16.2
	Per capita (m <sup>2</sup> /person)	390.9	277.9	310.7	n/a

a. Urban land is based on population density and was delimited using the United States Census definitions of urbanized areas and urban clusters.

b. Community land is based on jurisdictional or political boundaries of communities based on United States Census definitions of incorporated or census designated places.

c. Urban or communities is land that is urban, community, or both. Communities may include all, some, or no urban land within their boundaries.

d. Total Green Space = Total Area – (Impervious Surface Area + Water Area)

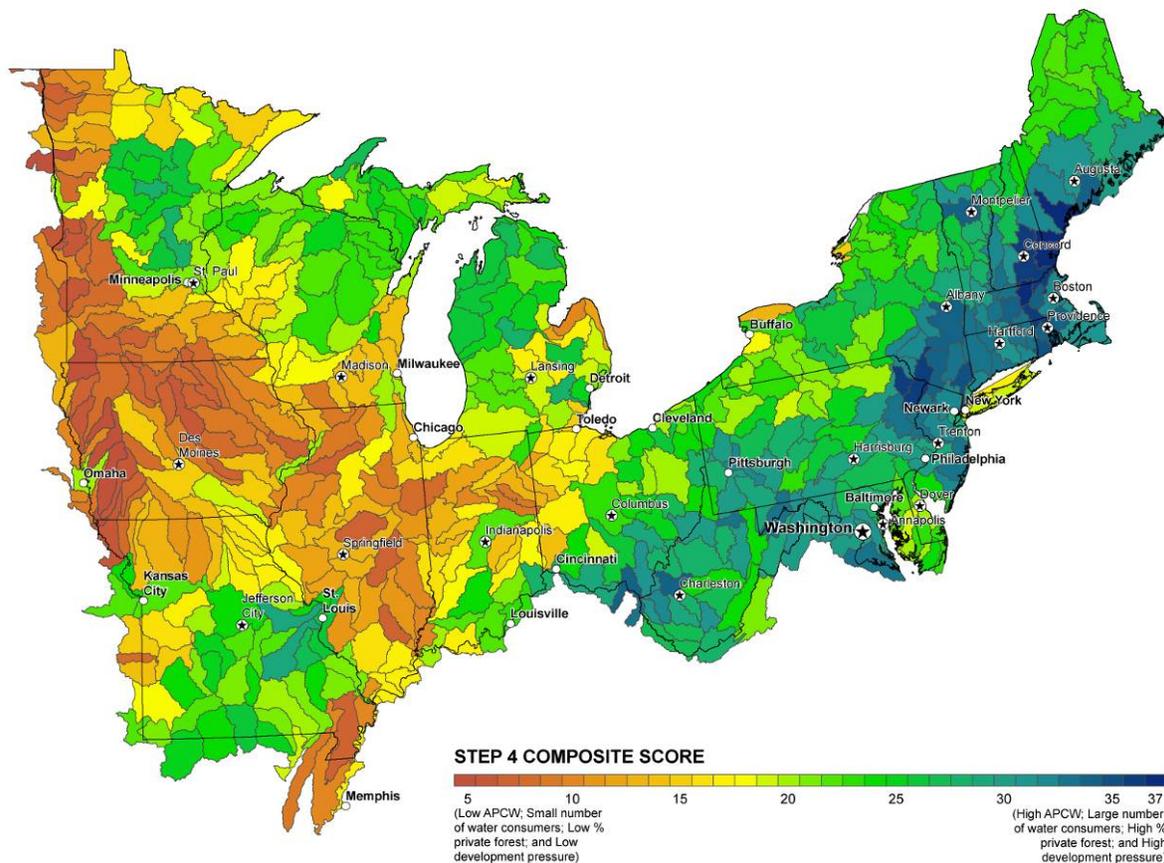
Source: NLCD and US Census

## 11. Area of forest land adjacent to surface water and forest land by watershed

### Forests, water, and people analysis

Forests play a critical role in preserving clean water supplies by maintaining a protective forest floor that prevents soil erosion, and filters and infiltrates water. Protecting and responsibly managing forests should be an essential part of future strategies to ensure clean water supplies in Wisconsin.

In order to identify watersheds in the Northeastern Area that are threatened by land use change or in need of management to sustain and improve forests that protect water supplies, the US Forest Service State and Private Forestry conducted a GIS analysis that identified private forests that are most important for drinking water supply and most in need of protection from development pressure. The final report for the Northeastern Area, which documents the analysis procedure and results, can be found at [http://www.na.fs.fed.us/watershed/fwp\\_preview.shtm](http://www.na.fs.fed.us/watershed/fwp_preview.shtm). This report analyzed Wisconsin's watersheds in the context of all watersheds in the Northeastern Area (Map 11.d).



**Map 11.d: Northeastern Area Development Pressure on Forests and Drinking Water Supplies**

Source: Northeastern Area State & Private Forestry

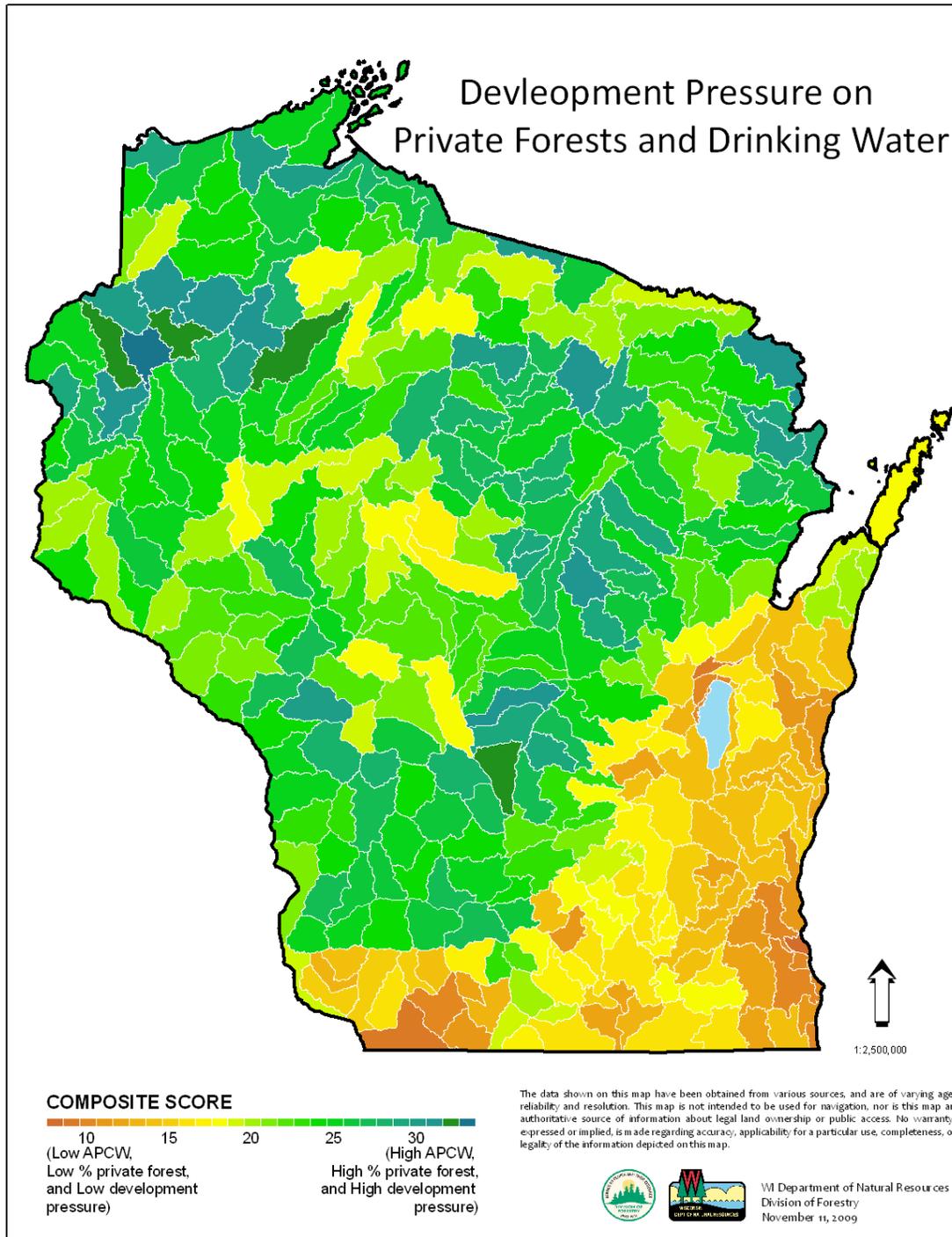
In order to evaluate the importance of watersheds within Wisconsin, the DNR Division of Forestry repeated this analysis for the state with finer resolution data (Map 11.e). A slight modification was also made to the analysis because some people get their drinking from groundwater rather than surface water in Wisconsin. This resulted in the watersheds being rated

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the same in Step 2 of the analysis, because it was determined that, in Wisconsin, all watersheds are equally important for drinking water.

The map combines data on the ability to produce clean water, surface drinking water consumers served, percent private forest land, and housing conversion pressure, to highlight important water supply protection areas that are at the highest risk for future development. The greater a watershed's development pressure, the more blue it appears on the map, and the higher its score.

11. Area of forest land adjacent to surface water and forest land by watershed



**Map 11.e: Development pressure on private forests and drinking water in Wisconsin**  
Source: DNR, 2009

The results of this analysis identified watersheds that have large areas of private forests that are important for maintaining clean water and in need of protection from development pressures. These are the high scoring watersheds in the analysis. Low scoring watersheds either have a large percentage of protected forestland or have low percentage of forestland. A low score does not mean a watershed is unimportant, rather depending on why it is ranked low, it may be an example of a successfully managed and protected forested watershed or it may be a priority for reforestation and other efforts.

The highest and lowest ranking watersheds are:

Highest Ranking Watersheds		Lowest Ranking Watersheds	
Score	Watershed	Score	Watershed
33	North Fork Clam River	8	Kinnickinnic River
32	Duck and Plainville Creeks	9	Fox River – Appleton
32	Shell Lake and Upper Yellow River	9	Galena River
32	Clam River	10	Little Lake Butte des Morts
32	Weirgor Creek and Burnett River	10	Menomonee River
31	Pemebonwon and Middle Menominee Rivers	10	Middle Pecatonica River
31	Big Roche-A-Cri Creek	10	Lake Winnebago – North and West
31	Upper Little Wolf River	10	Root River
31	Upper Apple River	10	Pike River – Kenosha
31	Pelican River	10	Oak Creek
31	Lower Namekogan River	10	Wind Point
31	Couderay River		
31	Trego Lake – Middle Namekogan River		