

# Forests and Water

## Pinelands and Highlands Connections to Our Water Supply

### Forests: Critical Sources of Drinking Water

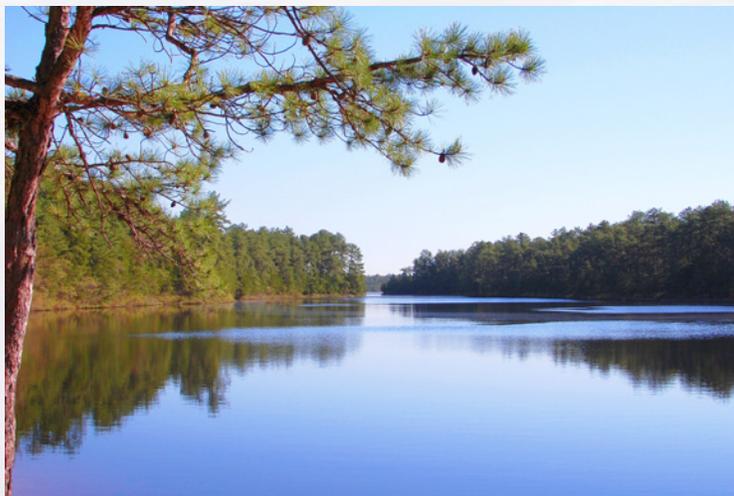


*"The forest is connected to the faucet: the cleanest water flows from healthy forested watersheds."  
George E. Dissmeyer, United States Forest Service*

The quality of drinking water in any location is a function of physical conditions, biological conditions, and land use cover of the source watershed. **Watersheds that are largely forested are much more likely to provide good water quality than watersheds with greater proportions of agricultural or urban lands.**<sup>1</sup> A forested watershed inherently provides ecosystem services like water filtration, flood and erosion reduction, stream flow maintenance, rain absorption and infiltration, and groundwater recharge. The conversion of forest land to other land uses leads to reduced water quality through increased runoff, soil erosion, lack of natural filtration, downstream flooding, and the transport of pollutants into waterways.<sup>1,4</sup> Even common activities in forests can lower drinking water quality; soil-disturbing practices such as road construction and timber harvesting can increase sediment loads in drinking water sources.<sup>5</sup>

A report by the World Bank and WWF Alliance for Forest Conservation and Sustainable Use found that approximately one-third of the world's 105 largest cities source a significant portion of their drinking water from protected forested watersheds.<sup>4</sup> Forests are particularly critical to the supply of drinking water in the northeastern and midwestern United States, protecting the water supply for more than 52 million people.<sup>1</sup> Despite the actions taken by several major cities to protect their drinking water by purchasing and preserving land in their source watersheds, most people remain unaware of the connection between forests, clean water, and the threats posed by watershed development pressure.<sup>5</sup>

**Clean drinking water sourced from a local or regional watershed is a precious resource that is immensely difficult and costly to substitute.** As a US Forest Service report states, "If forests fall into poor health or are converted to other uses, society has to invest billions in technological alternatives to replace the natural ecosystem services that the forests provided essentially for free."<sup>1</sup>



Wilma E. Frey

# The Cost of Clean Water

*“The economic value of watersheds is almost always under-estimated or unrecognized.”  
The World Bank / WWF Alliance for Forest Conservation and Sustainable Use*

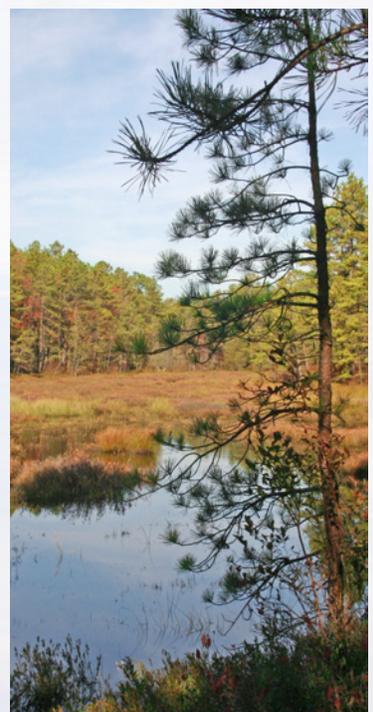
Clean water may be the most valuable resource provided by forest lands,<sup>1</sup> but its full economic value is rarely considered.<sup>4</sup> **As a watershed’s forests are destroyed and replaced by more intensive land use, water originating from that watershed is more likely to require treatment technologies to make it drinkable.** Such technologies are expensive and may themselves result in negative environmental impacts.<sup>2</sup> For example, a desalination facility can turn saltwater into drinking water, but its intensive energy use is expensive and can generate substantial carbon emissions.<sup>4</sup> Billions of dollars are spent in the construction and maintenance of water treatment facilities to clean water supplies degraded by land development.<sup>6</sup> Water utilities spend 19 times more money on water treatment chemicals than the federal government invests in protecting source watersheds.<sup>6</sup>

Maintaining healthy forested watersheds to prevent water contamination in the first place can be massively more cost-effective than treating water post-contamination.<sup>3</sup> New York City, for instance, has calculated a savings of \$6-8 billion in water treatment plant startup costs plus \$300-\$500 million per year in operating costs by instead choosing to protect forests in its upstate source watersheds at a cost of \$1-1.5 billion over ten years.<sup>4</sup>

Preserving source watershed forest land is a wise and cost-effective investment when considering the alternatives. A study conducted by the Trust for Public Land and the American Water Works Association<sup>5</sup> found that the more forest cover there is in a watershed, the lower the water treatment costs will be. **This study found that for every 10% increase in forest cover in the source area, water treatment costs decreased by about 20%.** It is estimated that treatment costs level off when forest cover is between 70-100%.

PROPORTION OF WATERSHED FORESTED	TREATMENT AND CHEMICAL COSTS PER MG	CHANGE IN COSTS	AVERAGE TREATMENT COSTS	
			PER DAY	PER YEAR
10%	\$115	19%	\$2,530	\$923,450
20%	\$93	20%	\$2,046	\$746,790
30%	\$73	21%	\$1,606	\$586,190
40%	\$58	21%	\$1,276	\$465,740
50%	\$46	21%	\$1,012	\$369,380
60%	\$37	19%	\$814	\$297,110

Average drinking water treatment costs in relation to watershed forest cover. From Ernst (2004): Protecting the Source: Land Conservation and the Future of America’s Drinking Water.



# The Pinelands and Highlands as Water Protection Areas

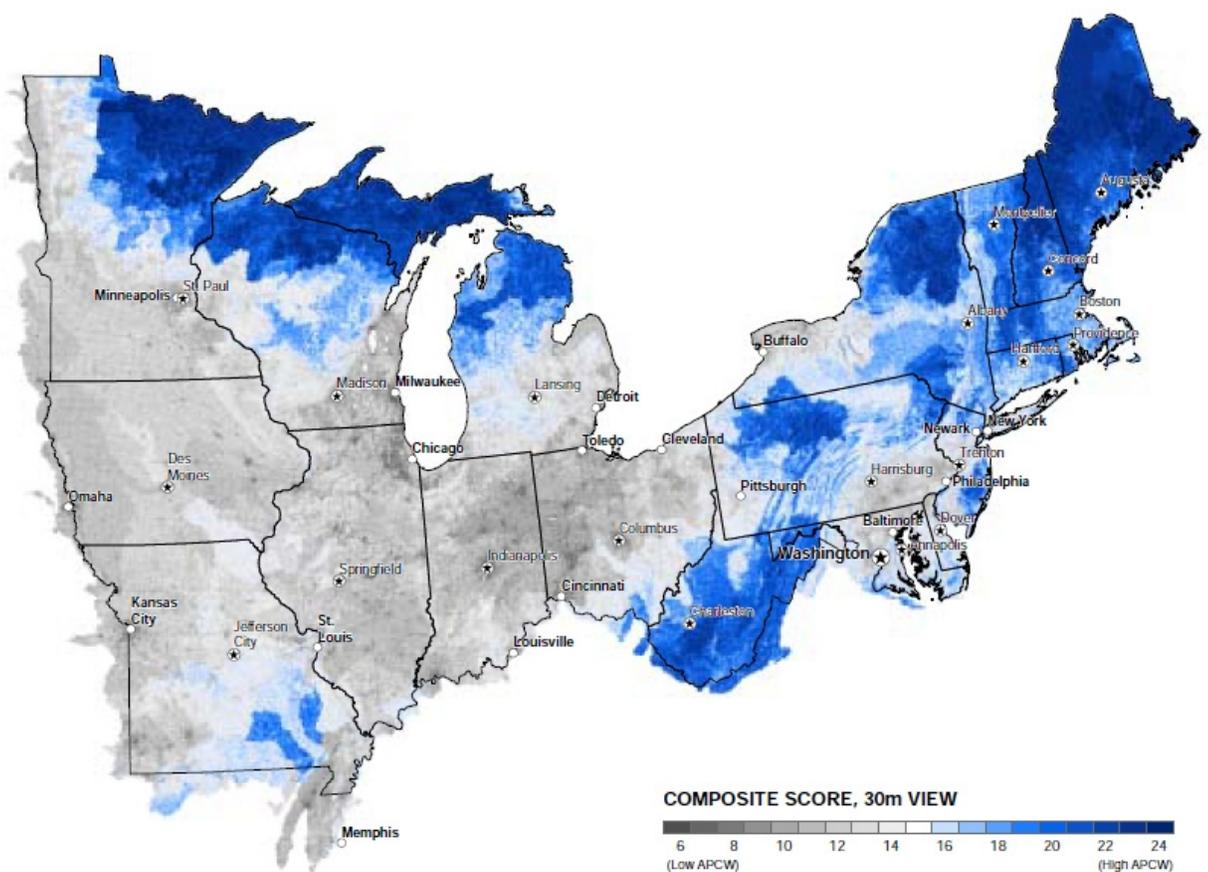
*"Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land."*

*Luna Leopold*

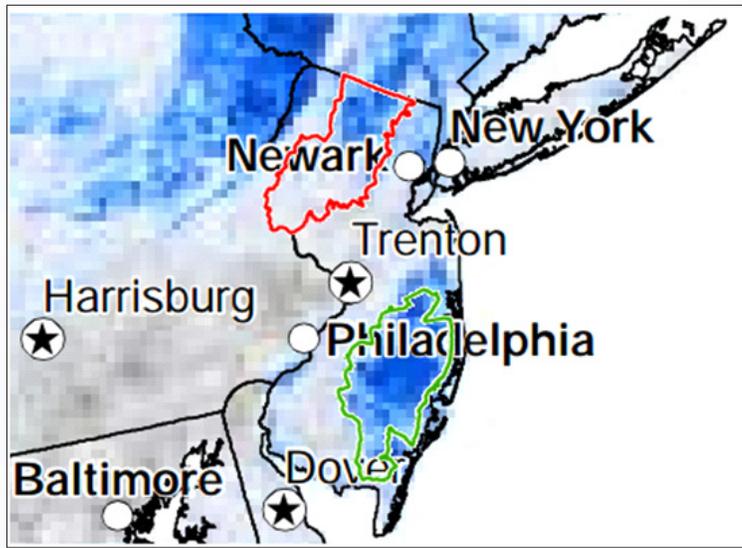
The United States Forest Service released a report in 2009 called "Forests, Water and People: Drinking water supply and forest lands in the Northeast and Midwest United States."

This report identified large-scale watersheds throughout the Northeast and Midwest US that are most critical to our water supply and are therefore in most need of protection to reduce the threat of forest clearing and land development.

In the figures below, the NJ Pinelands and Highlands regions are shown by this report to have a great ability to produce clean water – a measure based on percent forest land, percent agricultural land, percent riparian forest cover, road density, soil erodibility, and housing density. Together with the Middle Delaware-Monogaup-Brodhead watershed in the very northwestern part of the state, **the Pinelands and Highlands regions represent the top areas of clean water production ability in New Jersey.** The report states that this measure can best be used to identify areas where a focus on protection or restoration of the watershed is most important.



Index of the Ability to Produce Clean Water of areas across the Northeast and Midwest United States. Areas with higher scores, in darker shades of blue, have greater ability to produce clean water. Shades of gray indicate that intensive agriculture and impervious surfaces are likely to degrade water quality. From Barnes et al. (2009): Forests, Water and People: Drinking water supply and forest lands in the Northeast and Midwest United States.

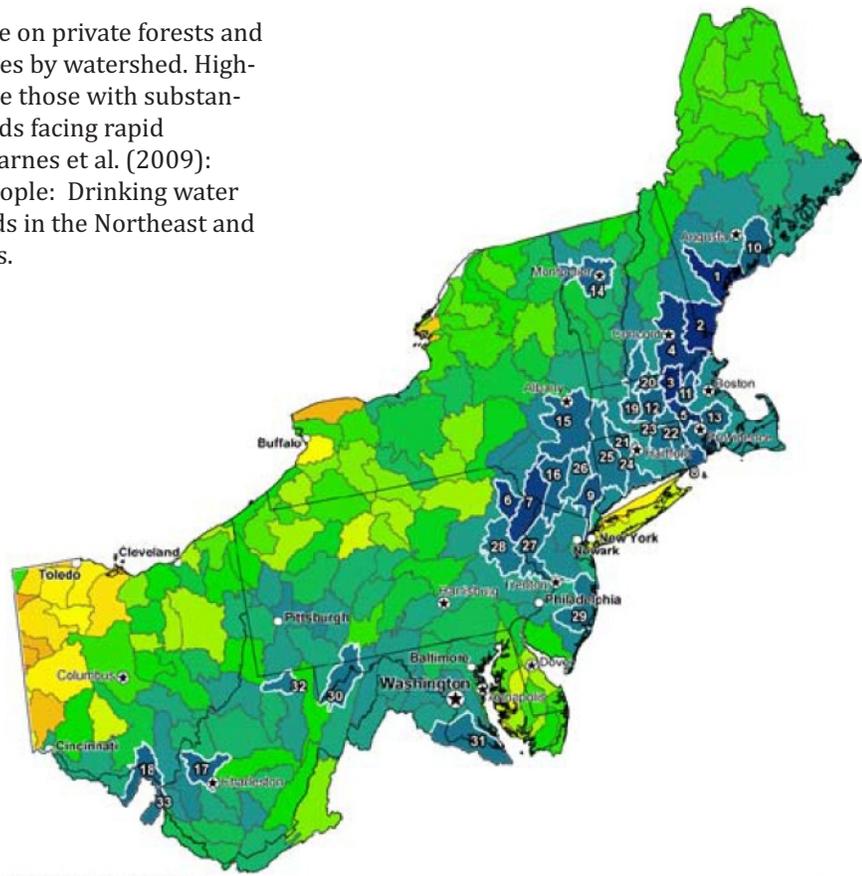


Magnified view of New Jersey with the Highlands region boundary (red) and the Pinelands region boundary (green). Darker shades of blue indicate areas with greater ability to produce clean water. Adapted from Barnes et al. (2009): Forests, Water and People: Drinking water supply and forest lands in the Northeast and Midwest United States.

The map below shows the ranking of north-eastern watersheds based on development pressure on private forests and drinking water supplies. Highlighted watersheds are those in which forested water supply areas are subjected to the greatest development pressure. The Mullica-Toms watershed (29) in the Pinelands and the Rondout and Middle Delaware-Musconetcong watersheds (16, 27)

in the Highlands are highlighted on this map as being among the top-ranking watersheds in the northeastern United States with the greatest development pressure on private forests important for drinking water supply. In fact, these watersheds are of comparable rank with the upstate New York watersheds that New York City relies on for its drinking water.

Development pressure on private forests and drinking water supplies by watershed. Highlighted watersheds are those with substantial existing forest lands facing rapid development. From Barnes et al. (2009): Forests, Water and People: Drinking water supply and forest lands in the Northeast and Midwest United States.



COMPOSITE SCORE



(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)

# Preserving Pinelands and Highlands Watershed Forests

*"For natural resource agencies, a renewed focus on forests and their connection to clean and abundant water will be critical."*

*Forests, Water, and People -United States  
Forest Service*

Caryn Ernst, in The Trust for Public Land and the American Water Works Association report, cautions that "By the time water quality degradation has become apparent and treatment methods need to be upgraded, it is often too late for municipalities and suppliers to choose source water protection as a means for addressing the problem." David Cassells, a senior environmental specialist at The World Bank, says, "**Protecting forests around water catchment areas is no longer a luxury but a necessity. When they are gone, the costs of providing clean and safe drinking water to urban areas will increase dramatically.**"<sup>4</sup>

Several cities are already facing problems with their water supply because of problems in the source watersheds, or use water from forests that are being considered for protection for their water supply value.<sup>4</sup>

The Pine Barrens ecosystem covers 1.1 million acres and is underlain by the 17 trillion gallon

Kirkwood-Cohansey aquifer. This aquifer supplies water to approximately one million people in the region, along with the highly valued economy of the Jersey Shore and Atlantic City. Water resource protection was among the primary motivations for the creation of the 1979 Pinelands Protection Act and the regional planning set forth by the Pinelands Comprehensive Management Plan. The NJ Highlands supplies water to more than 5.4 million people – more than half the State's population. The 2004 Highlands Water Protection and Planning Act protects this region from poorly planned development that would otherwise threaten the water supply. **Combined, at least 6.4 million New Jersey residents rely on the Highlands and Pinelands regional watersheds for their drinking water.**

The regional planning that seeks to protect our forests and water supplies from destruction by sprawling and uncontrolled development in both the Pinelands and Highlands goes a long way in protecting our water resources. It is absolutely critical that these protections remain in place and that Pinelands and Highlands forests stay intact to secure our supply of cost-effective, good quality water into the future.

## Sources

<sup>1</sup>Barnes, M.C., A.H. Todd, R.W. Lilja, and P.K. Barten. 2009. Forests, Water and People: Drinking water supply and forest lands in the Northeast and Midwest United States. United States Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry. Newton Square, PA.

<sup>2</sup>Brauman, K.A., G.C. Daily, T. Ka'eo Duarte, and H.A. Mooney. 2007. The Nature and Value of Ecosystem Services: An Overview Highlighting Hydrologic Services. Annual Review of Environment and Resources 32:67-98.

<sup>3</sup>Dissmeyer, G.E. 2000. Drinking Water from Forests and Grasslands: A Synthesis of the Scientific Literature. United States Department of Agriculture, Forest Service, Southern Research Station. General Report SRS-39. Asheville, NC.

<sup>4</sup>Dudley, N. and S. Stolton. 2003. Running Pure: The importance of forest protected areas to drinking water. World Bank / World Wildlife Fund Alliance for Forest Conservation and Sustainable Use.

<sup>5</sup>Ernst, C. 2004. Protecting the Source: Land Conservation and the Future of America's Drinking Water. The Trust for Public Land and the American Water Works Association. San Francisco, CA.

<sup>6</sup>Watershed Forestry Resource Guide. 2008. Center for Watershed Protection and United States Department of Agriculture, Forest Service, Northeastern Area State & Private Forestry. <[www.forestsforwatershed.org/forests-and-drinking-water/](http://www.forestsforwatershed.org/forests-and-drinking-water/)>

