

# Valuing Drinking Water as an Ecosystem Service

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In his 1905, “A Primer of Forestry,” Gifford Pinchot wrote, “A forest, large or small, may render its service in many ways. It may reach its highest usefulness by standing as a safeguard against floods, winds, snow slides, or especially against the dearth of water in the streams. A forest used in this way is called a protection forest.”

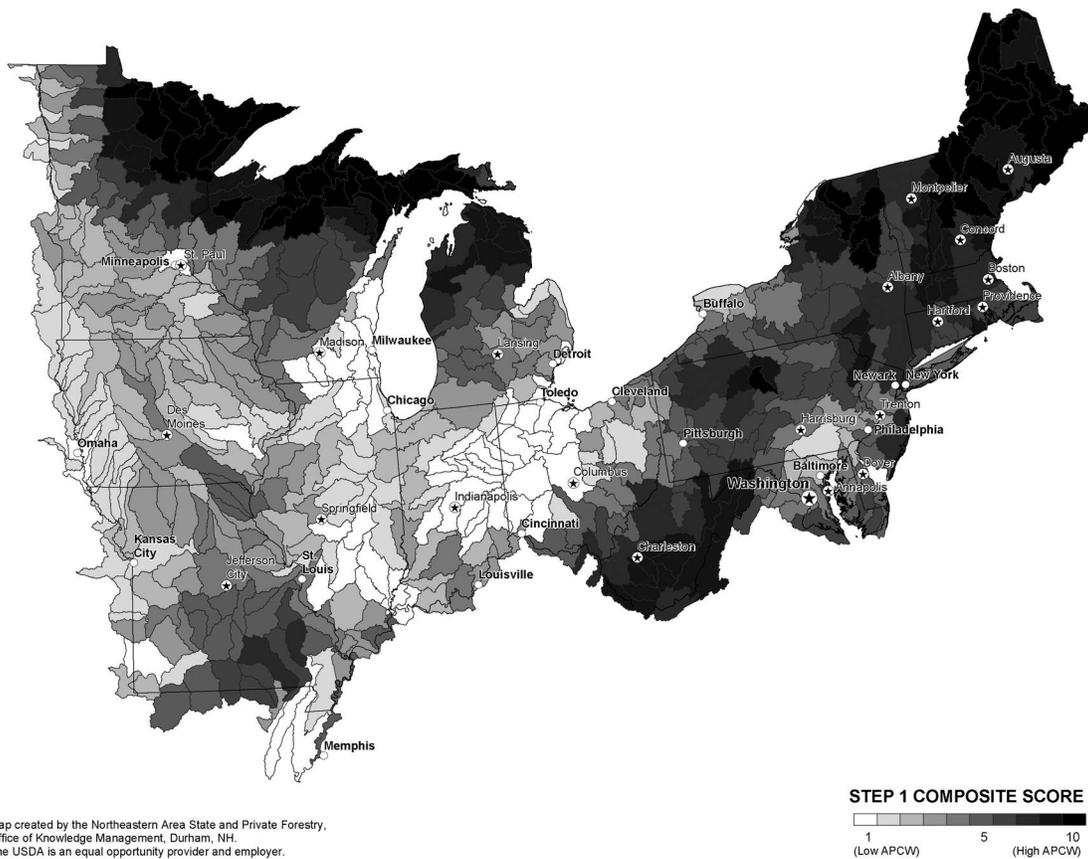
More and more these days we see recognition of what Pinchot knew 100 years ago, that clean water is one of the most important products of our forests. Forest lands are the

source of nearly two-thirds of water in the 48 contiguous states—the clean water that fills our rivers, streams, lakes and wetlands, sustains our fisheries, or flows from the taps of our homes and businesses. Forests serve as a living sponge to capture, store, and slowly release precipitation as well as trapping and transforming the chemicals and nutrient deposits that come in the rain or from adjacent runoff. Trees can also be used as a solution for existing pollution problems. This is especially true on farms where forest buffers can protect streams from fertilizers and pesticides,

or in urban areas where tree canopy helps to reduce storm water runoff and improve air quality. All the benefits that forests provide—like erosion and sediment control, maintenance of water quality, regulation of flows, and provision of clean drinking water—are called *ecosystem services*, and in this case can be called *watershed services*.

## Valuing Watershed Services

For many, managing land for watershed services is not without cost and may require significant, predictable, and continued funding. Without for-

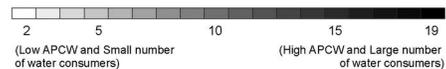


This map shows the ability of 540 watersheds in the Northeast and Midwest to produce clean water. This ability is represented by an index of water quality and watershed integrity that characterizes the biophysical conditions of each watershed. The greater a watershed's ability to produce clean water, the darker it appears on the map and the higher its score.



Map created by the Northeastern Area State and Private Forestry, Office of Knowledge Management, Durham, NH. The USDA is an equal opportunity provider and employer.

#### STEP 2 COMPOSITE SCORE



This map shows the importance of watersheds for drinking water supplies for each of 540 watersheds in the Northeast and Midwest. It highlights those areas that provide surface drinking water to the greatest number of consumers. The higher a watershed's ability to provide drinking water, the darker it appears on the map and the higher its score.

mal markets that reward landowners for their water protection efforts, watershed management of Gifford Pinchot's "protection forests" has historically fallen to government or been an act of altruism—stewardship by private landowners. Most family forest landowners cannot sustain their property long without generating some form of income from the land. Even if the land is paid for, annual taxes and upkeep can make forestland a liability, not an asset, especially when land values rise. Hence, the need for economic return may compete with watershed protection objectives.

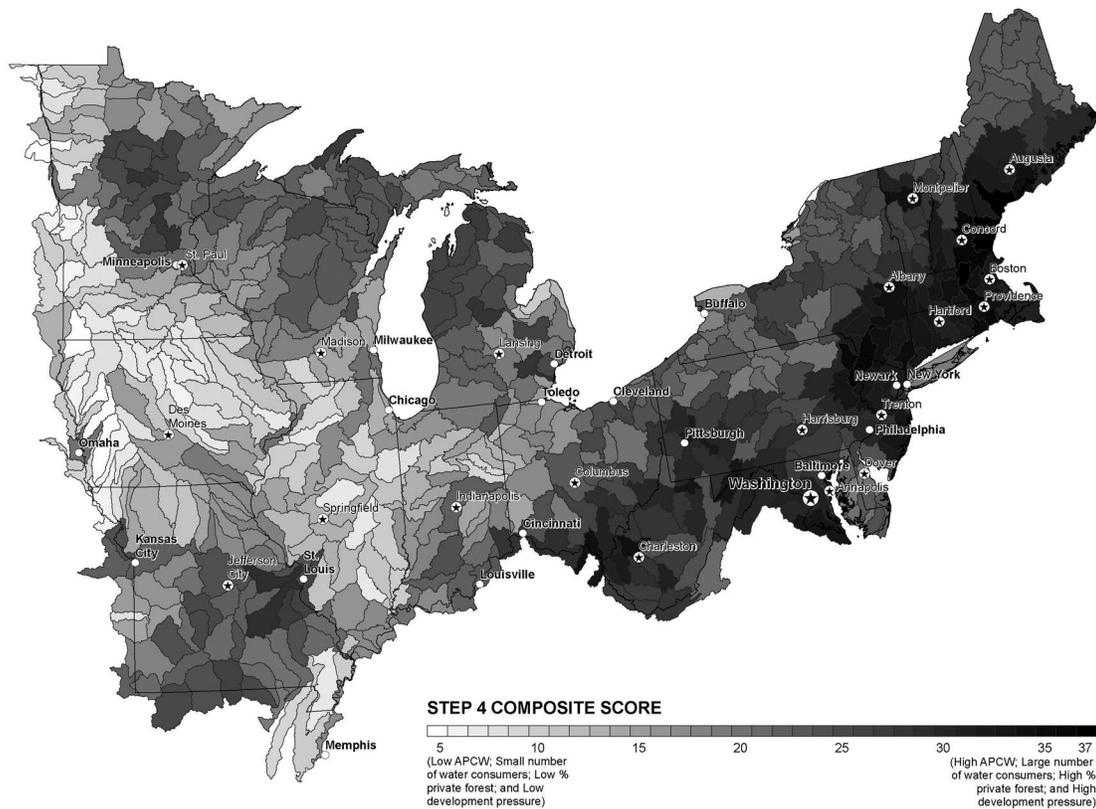
Compounding this financial disincentive to protect forests for drinking water quality is the fact that American water consumers have his-

torically paid very little if anything for their water. Utility bills generally reflect only the infrastructure needed to collect, purify, and distribute drinking water. No cost is assigned to the water itself or the costs associated with sustaining the watershed that provides the clean water supply. Excluding these real costs from water pricing undervalues the forest and reduces the consumers' concern with source water protection. In addition, the increased cost of water treatment that results from the loss of forests, is simply reflected in expenses of providing the water without the chance to connect these increased costs to land. In the end, forest owners bear the cost of water supply as a public service, and the positive externality of clean and abundant water is passed on to water consumers free of charge.

### Paying for Watershed Services

Market-based financing of watershed management through Payment for Watershed Services (PWS) schemes—a type of Payment for Ecosystem Services (PES) scheme, is emerging as a promising instrument to connect the forests to the faucet in clear economic terms. In a PWS scheme, landowners are financially compensated for the watershed services they provide. The payment for watershed services helps incentivize watershed protection and leads to net increases in forest protection and improved management.

For example, in New York City, the local government pays landowners for provision of watershed services directly and provides a suite of enhanced services to landowners, in part funded by water users downstream. Through



This map shows the development pressure on forests and drinking water supplies. The map combines maps of 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 darker it appears on the map, and the higher its score.

conservation easements, riparian restoration, and land purchase, the city has protected more than 35% of the watershed, and it remains in compliance with the drinking water quality standards put forth in the Surface Water Treatment Rule without the need of a modern filtration plant. The Watershed Forestry Program, run by the non-profit Watershed Agricultural Council in partnership with city, state and federal partners, including the Forest Service, provides the enhanced services and incentives to landowners.

The City of Santa Fe along with the Santa Fe National Forest have proposed a PWS scheme in which after a 5-year phase-in period, water customers will pay \$0.13 per 1,000 gallons per month, or an average monthly fee of \$0.54 into a fund that will support forest restoration in the watershed above the City's intake. Be-

cause the Santa Fe National Forest is threatened by catastrophic forest fire that could devastate the capacity to provide watershed services, the payments will support forest management that will carefully reduce the density of trees to more historic levels and reduce the potential for large fires. The payment will help ensure that the Forest Service will be able to continue its restoration activities at a higher rate within the watershed than would be possible otherwise.

### Forests, Water, and People

The Forest Service has long been interested in the connection between forests and water. Its recently publicized *Forests, Water, and People* report illustrates this connection and seeks to fill regional data gaps on the linkage of land use with demand and supply of clean water. Although it does

not establish detailed cause and effect relationships, it does paint the broad strokes of the most important landscapes to drinking water quality and those that are currently vulnerable to development threats across 20 states of the Northeast and Midwest.

The analysis itself is a GIS-based watershed assessment. First, it ranks watersheds (8-digit Hydrologic Unit Code) on their ability to produce clean water based on a combination of factors including percent of intact riparian forest cover, road density, soil erodibility, housing density and land cover. Next, each watershed's importance for drinking water supply was ranked by overlaying data on the number of surface drinking water customers. This step therefore ranks watersheds based on their ability to produce clean water and the demand for the water supply. Areas ranking

highest emerge as priority surface drinking water watersheds. Next, forest cover is overlaid to identify those watersheds where forests are providing protective services. Lastly, by adding data on development pressure (future housing density increases), the results show which priority surface drinking water watersheds also are highly threatened by future development.

To have a successful PWS scheme, there must be: (1) a clear connection between forest management and clean water to instill stakeholder confidence in the proposed management action, (2) a consumer demand for the clean water and a willingness to pay, and (3) a threat to the existing watershed services that can be avoided or averted through a payment designated for management or protection. On a macro scale, the *Forests, Water, and People* report identifies these areas—areas with a great ability to supply clean water, a large consumer demand for this water, and facing significant development threats. This assessment provides the groundwork for identifying potential sites for PWS schemes, and sets the stage for more site-specific analysis.

### Forests to Faucets

Currently, the Forest Service is working on a new *Forests to Faucets* assessment, which will expand upon the work reported in *Forests, Water, and People*. Moving beyond the 20 states, this work will expand to national coverage, incorporate additional threats and vulnerabilities, and uses smaller watersheds to enable better regional and local analysis. Using smaller watersheds requires more refined methods on determining the relative importance to drinking water quality. The final report is expected to be complete by September 2010.

In addition to providing insight on potential areas for PWS schemes, completion of the work provides:

1. *Tools for better decision-making:* The results from the assessments give insight to areas where it would be most wise to establish watershed forest management strategies and forest land protection efforts to benefit surface drinking water quality.
2. *Consistent data on priority watersheds:* At a watershed scale, data layers from these assessments can be utilized by states in future State Forest Resource Assessments and Strategies, and in the development of targeted source water stewardship demonstration projects that guide local actions in land protection and forest management.
3. *Improved Performance Measures:* The assessments provide a context for leaders to use in measuring the impact of their management actions and conservation projects. The data illuminates the number of people who may be affected by improvements in different areas.
4. *Heightened awareness of our dependency on forests for clean water:* These reports illuminate the link between forests and provision of watershed services. The maps and statistics provide easy to understand illustrations and talking points on watershed services.

### Conclusion

Abundant, clean water is a precious resource and one of the most valuable products provided by public and private forest lands. Drinking water is also one of most direct links between people and the valuable services that forests provide. Private forest owners and the Forest Service clearly have an important responsibility as stewards of not just the land but the nation's liquid assets as well.

The complete *Forest, Water, and People* report along with state-specific maps and fact sheets is available to the public from the U.S. Forest Service's

Northeastern Area website (See [http://www.na.fs.fed.us/watershed/fwp\\_preview.shtm](http://www.na.fs.fed.us/watershed/fwp_preview.shtm)). Watch [www.fs.fed.us/ecosystem\\_services/](http://www.fs.fed.us/ecosystem_services/) for more information on the national *Forest to Faucet* assessment. 

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### A "Watershed Protection Forest" is...

- ✿ Vigorous and diverse
- ✿ Multi-aged and irregular in structure
- ✿ Actively reproducing
- ✿ Accumulating biomass, assimilating nutrients
- ✿ Continuous with minimum opening sizes for desired species
- ✿ Regulating temperature and decomposition
- ✿ Deliberately patterned
- ✿ Resistant and resilient

