FORESTS TO FAUCETS

Protecting Upstream Forests for Clean Water Downstream

A Guide for Etowah River Communities, Water Providers and Forest Landowners

A REPORT BY:
American Rivers, The Forest Guild and Mountain Conservation Trust of Georgia

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TABLE OF CONTENTS

Executive Summary	5
Introduction	9
The Etowah River Watershed	11
Threats to Water Quality & Supply from Loss of Forests	14
The Values of Healthy Forests & Forested Watersheds	16
Forest Best Management Practices to Protect Clean Water Supply	20
Forest Conservation to Protect Clean Water Supply	22
Conclusion	28

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A REPORT BY:

Katherine Edmonds (American Rivers),
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The authors are responsible for any factual errors in this report. The recommendations are those of American Rivers, The Forest Guild, and The Mountain Conservation Trust of Georgia working in collaboration, and do not necessarily reflect the views of our funders, board members, advisory council members, or those who provided review.

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ABOUT AMERICAN RIVERS:

American Rivers is the leading organization working to protect and restore the nation's rivers and streams. Rivers connect us to each other, to nature, and to future generations. Since 1973, American Rivers has fought to preserve these connections, helping protect and restore more than 150,000 miles of rivers through advocacy efforts, on-the-ground projects, and the annual release of America's Most Endangered Rivers®. Headquartered in Washington, DC, American Rivers has offices across the country and more than 100,000 supporters, members, and volunteers nationwide. Visit **www.americanrivers.org**, **www.facebook.com/americanrivers** and **www.twitter.com/americanrivers**

ABOUT THE FOREST GUILD:

The Forest Guild is a national organization comprised of more than 800 forestry and allied natural resource professionals whose mission is practicing and promoting ecologically, economically, and socially responsible forestry as a means of sustaining the integrity of forest ecosystems and the human communities dependent upon them. **www.forestguild.org**

ABOUT THE MOUNTAIN CONSERVATION TRUST OF GEORGIA:

The Mountain Conservation Trust of Georgia (MCT), a regional land trust accredited by the Land Trust Alliance, is dedicated to the permanent conservation of the natural resources and scenic beauty of the mountains and foothills of North Georgia through land protection, collaborative partnerships, and education. The Trust's service area encompasses the Mountain region of north Georgia, predominantly within the Upper Coosa River Basin and the Southern Appalachians, with a focus on the Etowah River watershed. The Trust has protected over 2,000 acres to date, and has also contributed expertise and funding to the protection of over 1500 additional acres of State Wildlife Management Areas. **www.mctga.org**

ABOUT THE ETOWAH FOREST COLLABORATIVE:

The Etowah Forest Collaborative (consisting of American Rivers, The Forest Guild, and the Mountain Conservation Trust of Georgia) came together to promote clean water supplies by connecting downstream communities with private forestland protection and management upstream in the Etowah Watershed. The goal of the collaborative is to encourage all water users (including but not limited to utilities, municipalities, business owners, landowners, and residents) to recognize that they are stakeholders, and to issue a call to action that will galvanize more effective protection of water resources and forests by including specific ways these important resources can be conserved as well as ways better forest management can be financed. The Collaborative hopes to convey the need for increased funding for land acquisition, improved policies that support conservation, improved landowner incentives, better information on funding sources and technical assistance, and improved coordination between partners. The Collaborative has published this guide to demonstrate the critical role private forestlands play in providing irreplaceable benefits — clean and reliable drinking water, reduced flooding, and numerous other ecosystem services — to downstream communities. The Collaborative is further working to increase support for innovative investment in private forestland protection through stakeholder engagement, education, and outreach.

ETOWAH RIVER, GA | Joe Cook

EXECUTIVE SUMMARY

Forests and forested watersheds in the Southern Appalachian Mountains in the Southeastern U.S. are at serious risk, due to development pressure from regional population growth, and as a result of land management practices. Compared to other regions around the country, the Southeast has some of the most vulnerable forests in the U.S. in terms of potential loss to development over the next two decades. At the same time, abundant forested watersheds in this region help provide clean, dependable water supplies to millions of residents in downstream towns and cities by filtering nutrients and sediments, moderating water temperatures, and reducing flood risks. In the process, these forests significantly reduce the need for costly municipal water supply, control and treatment facilities and infrastructure.

Forests and forested watersheds in the region need to be protected and better managed to maintain the invaluable services natural infrastructure provides to local and downstream populations. Because the majority of forested lands in these watersheds are privately owned, upstream forest landowners can benefit from financial incentives and support to maintain forest cover on their property. Downstream water users — municipal governments, water providers, industrial, commercial and private facilities, and residential consumers — can invest in upstream forestland protection and management as a cost-effective alternative to construction of expensive, engineered water supply and treatment systems.

The Etowah River in north Georgia is a characteristic example of a Southern Appalachian forested watershed providing clean and abundant water to downstream users. It also illustrates the vulnerability of these watersheds to development and land use change. Rich in native biodiversity and still mostly forested, the watershed has experienced measurable loss of forest cover to development in the last several decades, and is projected to be substantially impacted by additional population growth in the future, due to its proximity to the Atlanta metropolitan area.

American Rivers, The Forest Guild and the Mountain Conservation Trust of Georgia have together established the "Etowah Forest Collaborative" to promote the concept of downstream benefits of upstream forestland conservation and management by educating forest landowners, forest managers, and water users about how they can work together to protect water quality and supply in this beautiful and important forested "source" watershed.

Although best management practices for private and public forestlands in Georgia have been available since 1981 and are widely used, more comprehensive and systematic application of some of these practices on forests in the Etowah watershed would contribute to improved water quality in creeks and streams. In particular, it is important to maintain forested riparian buffer areas of sufficient width and cover, to design and construct engineered stream crossings (e.g., culverts) appropriate to the stream size and flow volume, and to maintain such structures over time. Similarly, well-designed, constructed, and maintained

unpaved forest roads, and restoration of roads after harvest operations are complete, will minimize runoff of sediments and other materials into local waterways. More generally, thoughtful and comprehensive planning and implementation of harvest operations and overall site management activities are critical for minimizing impacts to local streams and rivers.

One of the keys to minimizing the likelihood that private forestlands in source watersheds will be sold for development is to provide financial alternatives to landowners to keep their property forested. Several federal and state agencies offer a number of technical assistance, cost-share and financial incentive programs to landowners for managing, protecting, and restoring forests on private property in Georgia. In addition, private landowners interested in conserving their forested properties may be eligible for a variety of tax and other financial incentives, including reductions in state and/or county property taxes, higher federal estate tax deductions, and transferable state tax credits when a conservation easement is granted on a private tract. Nonprofit local and national land trusts and conservancies will work with landowners interested in protecting their forestland property with a conservation easement. Such easements are voluntary, with the terms crafted to reflect the short and long-term management objectives of the landowner while also preserving the conservation values of the property. Local governments, too, can make a measurable contribution to protecting forests in source watersheds in Georgia, by acquiring forested tracts with revenue generated from property taxes, general obligation bonds, or special purpose local option sales tax receipts.

Finally, emerging "ecosystem services" markets, particularly "payments for watershed services" approaches, may provide additional tools to promote upstream forest conservation and management as a mechanism to ensure abundant clean water for downstream communities. But together with existing successful forest conservation and management programs, new thinking and new upstream-downstream partnerships offer hope that not only the Etowah River watershed, but other forested source watersheds throughout the Southeast — and the clean, abundant water flowing to communities downstream — will be protected into the future.

Definitions

Baseflow refers to a very important component of streamflow: the water that comes into rivers and their tributary streams through the shallow groundwater flow that is part of the natural water cycle. In undeveloped areas, this water starts as rainfall which is absorbed into topsoil, flowing slowly and gradually through the ground toward surface streams.[i]

Ecosystem services are defined as the benefits to people from the resources and processes supplied by natural ecosystems, including products like timber and clean drinking water, as well as, processes, such as filtration of pollutants and decomposition of waste.[ii]

Green infrastructure is an approach to water management that protects, restores, or mimics the natural water cycle.[iii]

Non-point source pollution refers to the diffuse pollution that results from runoff from agricultural land, residential lawns, and urban areas ending up in rivers and streams. Nonpoint source pollution is often reported as the leading cause of water quality problems.[iv]

Payment for Watershed Services (PWS) is a program that incentivizes forest landowners to sustainably manage or conserve forestland to provide ecosystem services that contribute to clean water downstream. Healthy forests provide ecosystem services such as filtration, flood mitigation, and improved base flow in rivers and streams. With PWS the downstream beneficiaries of the improved water supply provide the upstream forest landowners with these financial incentives or payments. Cities exploring this concept are finding that proactive investments in this type of "green infrastructure," such as healthy forests, can be more cost effective than repairs or expansions in traditional gray infrastructure.[v]

Riparian Zone is the land next to a river and the streamside trees and other vegetation and is often referred to as the riverbank. These areas provide valuable services like protection from erosion during floods and filtering polluted run-off from cities and farms. This is an important, nutrient-rich area for wildlife, replenished by the river when it floods.[vi]

Runoff is caused by rainfall or snowmelt moving over the ground.[vii]

Source water refers to the water from streams, rivers, lakes or underground aquifers that are used for drinking water supply purposes.[viii]

Source water protection ensures healthy, clean drinking water supplies through conservation, management and protection of source water streams, rivers, lakes, and underground aquifers as well as the surrounding source watersheds.[ix]

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[i] American Rivers and Flint River Keeper. 2013. *Running Dry Challenges and Opportunities in Restoring Healthy Flows in Georgia's Upper Flint River Basin.* Retrieved from **www.americanrivers.org/runningdry**

[ii] Postel, S. and Thompson, B. 2005. Watershed protection: Capturing the benefits of nature's water supply services. *Natural Resources Forum* 29, pp. 98–108. 99

[iii] American Rivers. *What Is Green Infrastructure?* Retrieved from **http://www.americanrivers.org/initiatives/pollution/green-infrastructure/what-is-green-infrastructure/#sthash.lvaTssxd.dpf**

[iv] United States Geological Survey. *Water Science Glossary of Terms.* Retrieved from **http://ga.water.usgs.gov/edu/dictionary.html#E**

[v] Hanson, C., Talberth , J., and Yonavjak , L. 2011. *Forests for Water: Exploring Payments for Watershed Services in the U.S. South.* World Resources Institute Issue Brief #2.

[vi] American Rivers. *River Anatomy.* Retrieved from **http://www.americanrivers.org/rivers/about/**

[vii] American Rivers. 2008. *Catching the Rain: A Resource Guide for Natural Stormwater Management in the Southeast.* Retrieved from **http://www.americanrivers.org/assets/pdfs/reports-and-publications/Catching_the_Rain_Southeast_Edition22cb.pdf**

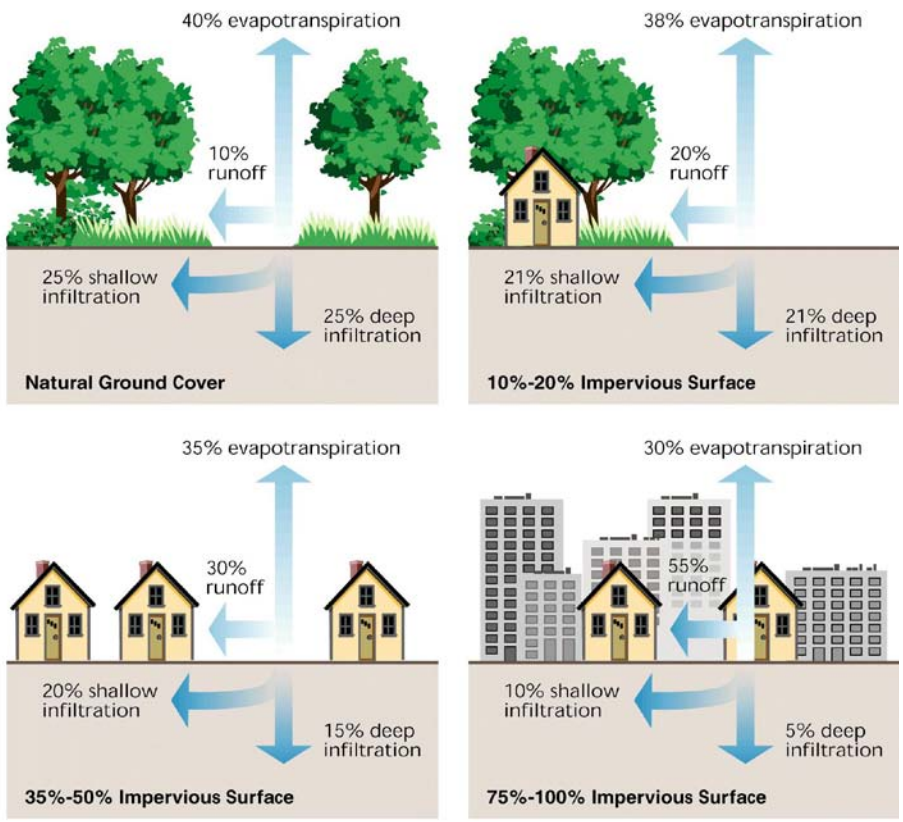
[viii] United States Environmental Protection Agency (EPA). 2002. *Consider the Source: A Pocket Guide to Protecting Your Drinking Water.* Retrieved from **http://water.epa.gov/infrastructure/drinkingwater/sourcewater/protection/upload/guide_swppocket_2002_updated.pdf**

[ix] United States Environmental Protection Agency (EPA). *Source Water Protection Case Studies.* Retrieved from **http://water.epa.gov/infrastructure/drinkingwater/sourcewater/protection/casestudies/index.cfm**

Introduction

Forests are a critical link in local and regional water cycles, absorbing, filtering, and slowly releasing precipitation into streams and rivers. They act as natural water infrastructure systems, effectively creating the largest water utility in the United States, covering 750 million acres and providing drinking water for 40 percent of municipalities.[1] Collectively, forests provide drinking water for 180 million Americans across the country.[2] Forests also play a vital role in protecting water quality, controlling nutrients and sediment, reducing erosion, and mitigating flooding.

Despite this, one of the largest threats to clean water supplies is the loss of forestland to development. Replacing forested lands with residential, commercial, or industrial development significantly increases levels of impervious surfaces (roads, parking lots, rooftops, etc.), creating much higher runoff volumes, which increases flood risks downstream. This runoff also washes significant amounts of nutrients, chemicals, sediments and solid materials (trash, debris, etc.) into local streams and waterways, threatening the quality and safety of water supplies downstream. Polluted runoff from development, a major form of nonpoint source pollution, is one of the most significant causes of water pollution across the country.



SOURCE: Environmental Protection Agency

Streams originating from hardwood forests in the Southern Appalachian Mountains support some of the most diverse assemblages of biodiversity in the United States and provide abundant clean water for countless downstream human communities. Southern Appalachian forests in the Southeast, however, are particularly at risk, due to the combined threats of population growth, development pressure, and intensive land management practices. With these forests threatened, drinking water supplies for millions of people are at risk. According to projections, by 2060 the Southeast will have lost close to 30 million acres of existing forestland to development.[3] This assessment also concluded that national hotspots for development that will continue to engulf high-quality forests into the future are concentrated within the Southern Appalachians, and include the metropolitan areas around Charlotte, Greenville, and Atlanta.[4]

Because of its proximity to the sprawling Atlanta metro area, the Etowah River watershed in north Georgia has one of the fastest growing populations in the country, and is particularly susceptible to increased pollution and threats to drinking water supplies. The Etowah watershed has abundant hardwood forests currently. But with steep slopes subject to erosion and an extensive network of small streams and creeks, this watershed serves as an excellent example to illustrate the potential vulnerability of Southern Appalachian forests to the detrimental effects of land conversion.

Land Ownership in Georgia

Forest landowners of Georgia are providing essential ecosystem services such as water filtration, wildlife habitat, and flood buffering. In contrast to the other regions of the United States, The Southeast has the highest percentage of private forests at 87%. In Georgia, much of the forested land is privately owned (22 million acres), but landowners also include public landowners, such as the U.S. Forest Service (USFS), Georgia Department of Natural Resources, local county governments, and other federal and state organizations. These forests are under different levels of production and protection. Some forests are used for timber production, while others are under permanent protection.

Helping private landowners pay for permanent conservation and responsible forest management is one of the most cost-effective ways to protect forest health while also providing clean, abundant water. Recognizing this need, the Etowah River Collaborative ("Collaborative") came together to work with both forest landowners and water users on how they can help finance forest conservation and management, and thereby facilitate more effective protection and maintenance of water quality and healthy watersheds. To develop broader support for this work, the Collaborative is promoting the concept of downstream benefits as an important component of upstream forestland conservation and management.

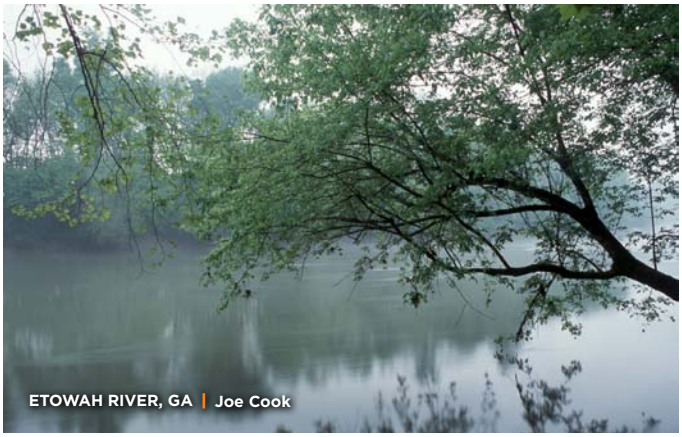
More specifically, this guide:

- provides an introduction for community leaders, including water providers and forest managers, as they seek to protect, manage and maintain source-water forests;
- outlines the economic and environmental benefits of well-managed forests for drinking water protection;
- describes the forest best management practices that optimize water quality and quantity benefits to downstream communities;
- reviews the funding sources, financial incentives, and technical assistance programs available to landowners and managers to protect forests and implement best management practices;
- highlights case studies of other communities using unique investment strategies for upstream forest protection, management and restoration.

The approach outlined here can serve as a model for other communities across the Southeast facing similar challenges. In partnership with public and private forestland owners, communities should begin to prioritize source water protection as part of a long term water-supply management strategy. Communities that do will reap multiple benefits, including reliable access to clean water and lowered drinking water infrastructure costs, while supporting private upstream landowners who bear the financial costs of managing their forested land. Downstream communities that recognize the protective value of forests should take the first step and implement a plan to invest in upstream forest protection and management.

The Etowah River Watershed

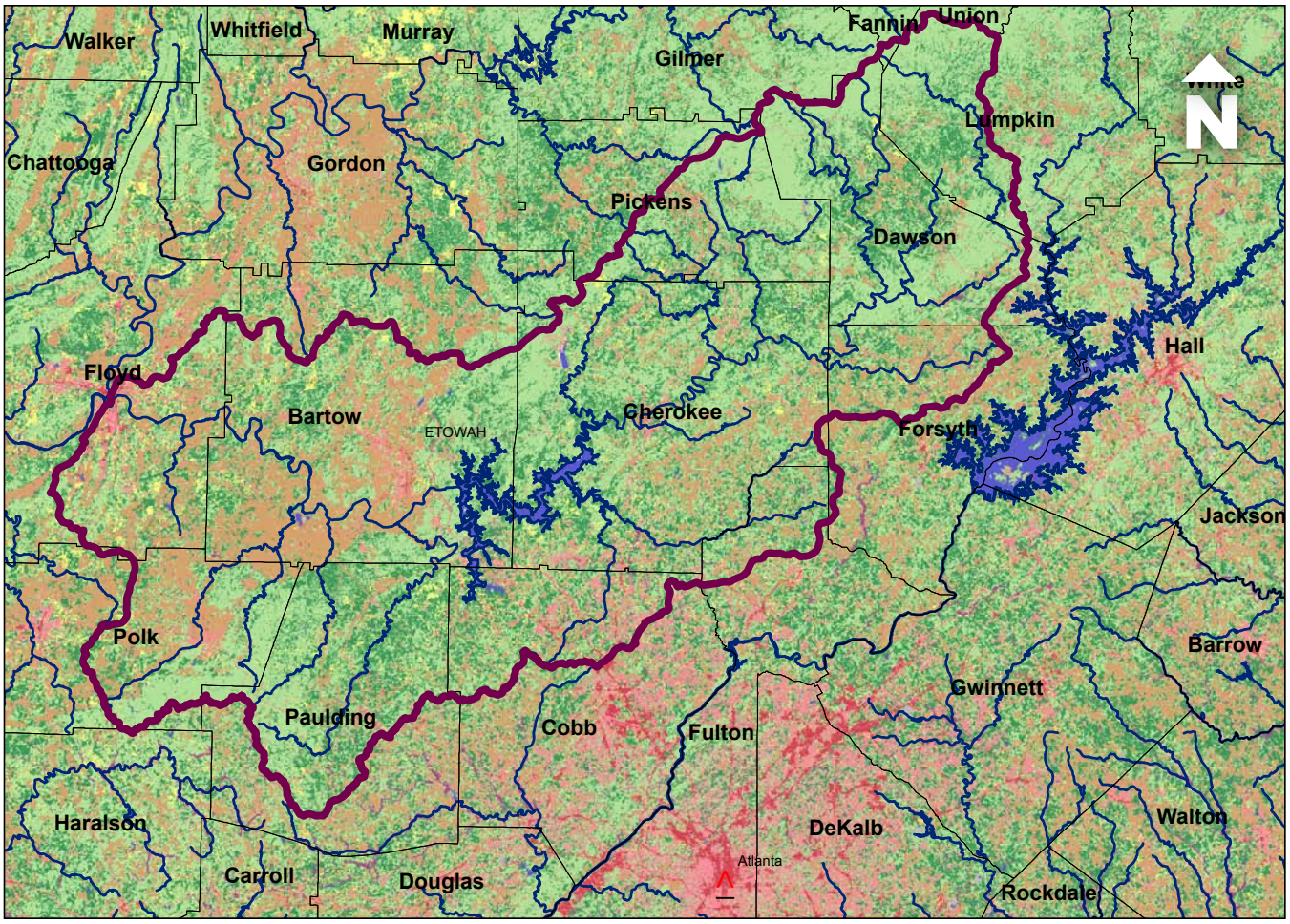
The Etowah River watershed in north Georgia is representative of the challenges facing Southern Appalachian Mountain forests. With abundant hardwood forests, steep slopes, and extensive networks of scenic small streams and creeks, the Etowah is characteristic of Southern Appalachian forested watersheds. But these features also make this region vulnerable to development, with all of the associated impacts. The Etowah watershed is one of the fastest growing areas in the country due to its proximity to the sprawling Atlanta metro area. North Georgia's scenic beauty and natural resources offer amenities much sought-after by industry, residents, and visitors. But the very resources that attract people are threatened by over-development and overuse. Given the threats to the river posed by development, the Etowah River watershed has been identified as a priority watershed for protection by a variety of federal and state agencies and non-governmental organizations.


ETOWAH RIVER, GA | Joe Cook

Quick Facts:

- The Etowah River watershed has a high percentage (66%) of forestland cover.[5]
- 75 species of native fish live in streams and creeks in the Etowah watershed, including the federally Endangered Etowah darter, the amber darter, and the federally threatened Cherokee darter.[6]
- Lake Allatoona, a reservoir located in the center of the watershed, is managed by the US Army Corps of Engineers, and provides drinking water to over 600,000 residents in Georgia, both within the watershed and in the greater Atlanta metropolitan area.[7]
- The watershed has already experienced a steady and rapid increase in low-density urban land uses, from 5% of the area in 1974 to 28% of the area in 2008.[8]
- The Etowah watershed has experienced an 8% decrease in forested land in the last 10 years, with a large proportion of that decrease being in deciduous forest cover.[9]
- The Etowah is ranked in the top fifteen watersheds in the country expected to experience the largest increases in housing density on forested land in the next 20 years.[10]
- The U.S. Forest Service has identified the Etowah as a top-ranked Southeastern watershed for forests at risk from the following factors: water consumers per watershed, private forest versus public forest, and development pressure.[11]

Georgia Land Use Trends: Etowah River Basin 1974

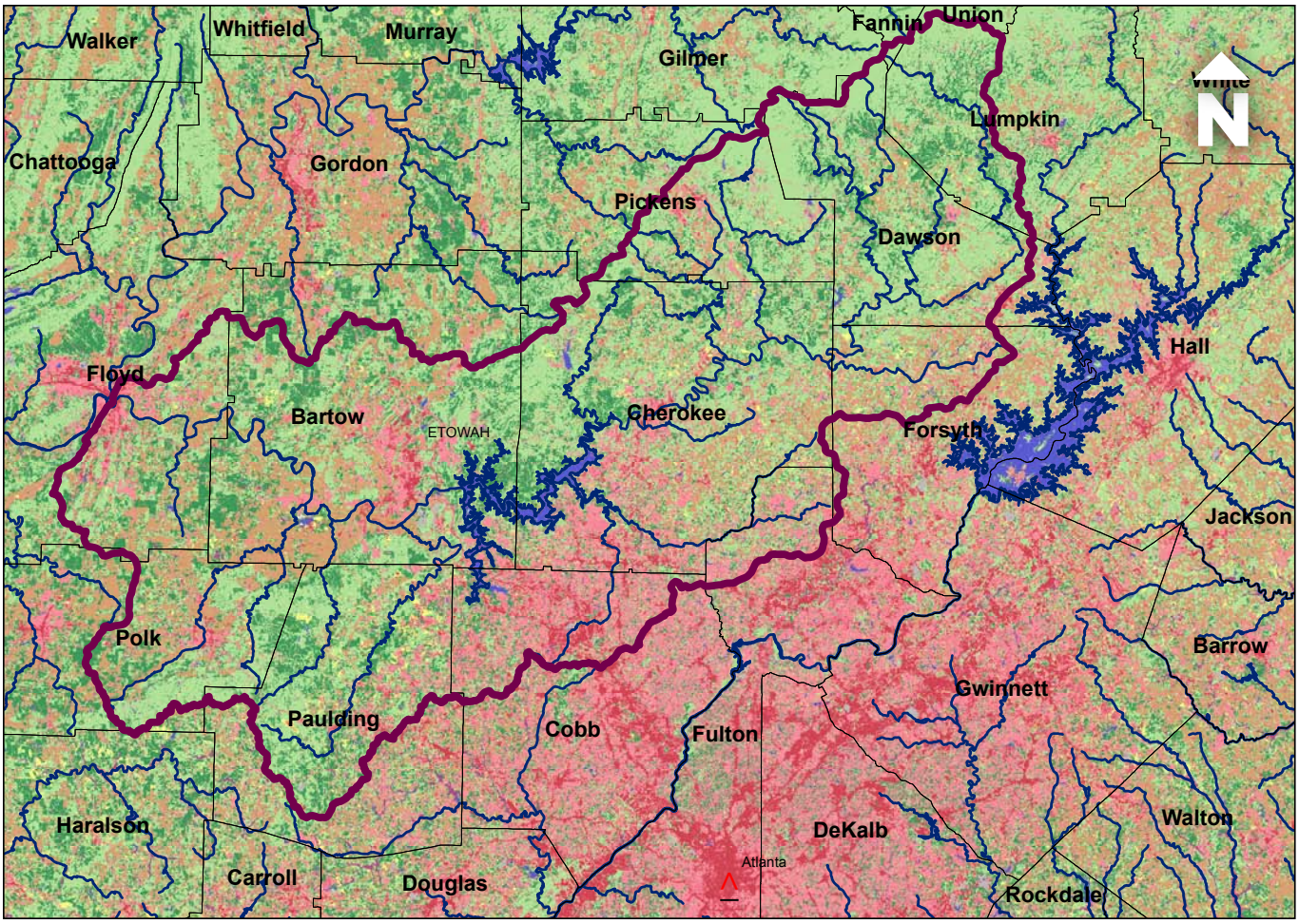


0 5 10 15 20 Miles

LEGEND

- Counties
- Rivers and Lakes
- Open Water
- Low Intensity Urban
- High Intensity Urban
- Clear Cut and Sparse
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Row Crops
- Forested Wetland
- Non-forested Wetland(freshwater)

Georgia Land Use Trends: Etowah River Basin 2008



0 5 10 15 20 Miles

These maps show the difference in land use over the last 34 years with a significant increase of high and low intensity urban, and a decrease in forest cover.

Data obtained from Natural Resources Spatial Analysis Lab, University of Georgia (www.narsal.uga.edu)

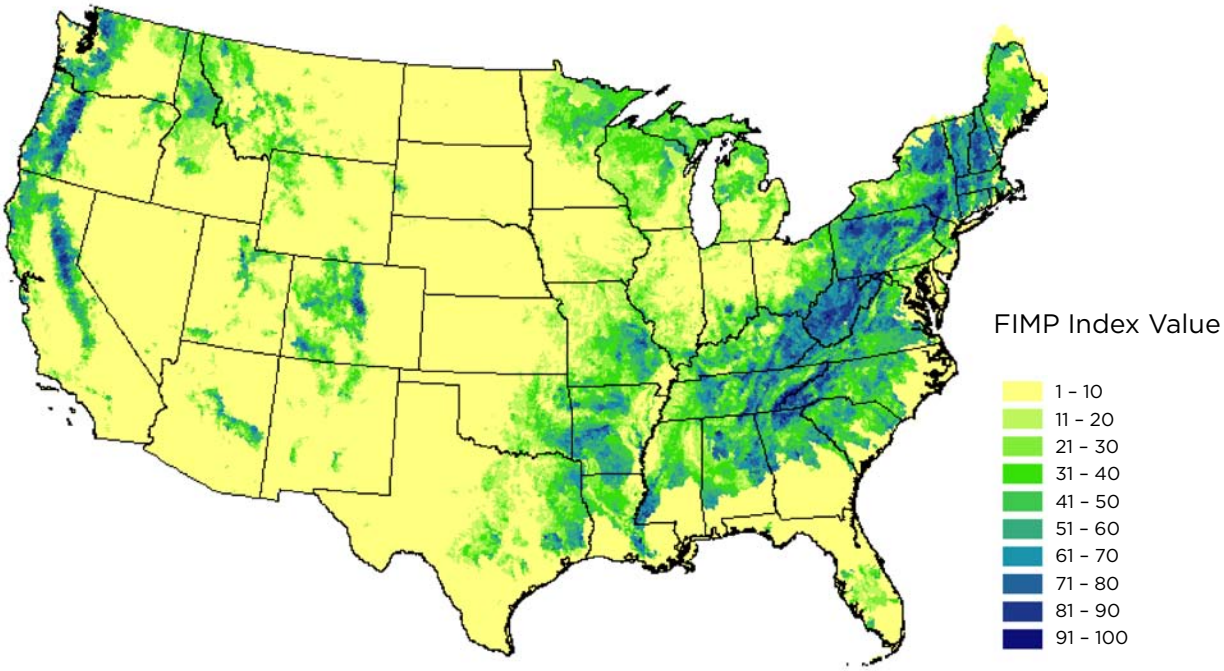
Threats to Water Quality & Supply from Loss of Forests

Studies project that of the 365 million acres of private, unprotected forest in the United States today, 15 percent (57 million acres) will experience substantial additional increases in housing density by 2030.[12] Georgia's population alone is projected to increase to 12 million by 2030, making it the eighth most populous state.[13] The conversion of forests and farms to industrialized and developed areas is a significant threat to clean water supply in the Etowah River basin, and for communities throughout the Southeast.[14] Even forests that are not converted to other uses but that are managed for timber production without sufficient stormwater runoff safeguards can contribute to decreased water quality. Development and land use in source watersheds can increase the flow of nutrients, sediment, and bacteria into streams, rivers, and lakes—contaminants that pose serious threats to clean water. These three types of pollutants are responsible for over 60 percent of pollution to rivers, lakes, and streams across the country.[15]

- **Nutrients** are a problem associated with agricultural lands, residential lawns, and other developed areas with high runoff volume. Phosphorus and nitrogen are necessary nutrients in healthy terrestrial and aquatic ecosystems, but become harmful at high concentrations. At high levels they cause excessive algal blooms and bacterial growth in surface waters, which then leads to significantly reduced dissolved oxygen content when these organisms decompose. Fish, invertebrates and other aquatic animals die when dissolved oxygen levels fall too low.[16]

- **Sediments** in excess are a major concern for water supply and treatment systems. Excessive sediment is primarily caused by erosion, which increases when forests are cleared or managed without sufficient safeguards. Too much sediment in water leads to increased turbidity, lower light levels and decreased aquatic community productivity and function. Sediment particles can also bind with contaminants on land, including metals, nutrients, and toxic chemicals, and then release those contaminants into surface waters.[17] Excessive sedimentation behind dams in water-supply reservoirs can significantly reduce the stored volume, and shorten the lifespan of those systems.

- **Bacteria**, viruses, and parasites common in human waste enter surface waters during sewage overflows. These microorganisms can cause diarrhea, vomiting, gastroenteritis, respiratory infections, hepatitis, dysentery, and other water-borne illnesses, as a result of drinking or contact with contaminated water, or ingestion of contaminated fish or shellfish.[18] Exposure to sewage has also been linked to long term, chronic illnesses such as cancer, heart disease, and arthritis.[19]



Forests Important for Surface Drinking Water

The index of forest importance to surface drinking water (FIMP) identifies those sub-watersheds where forest lands are most important in protecting surface drinking water.

United States Department of Agriculture Forest Service. *Forests to Faucets.*
Retrieved from **http://www.fs.fed.us/ecosystemservices/FS_Efforts/forests2faucets.shtml**

San Francisco, California Case Study: Innovative Stormwater Solutions

Communities around the country are recognizing forest conservation as a cost-effective strategy to better protect and manage their water supplies. Stormwater runoff is a common problem in both urban and agricultural areas. Lake Merced serves as an emergency water supply for San Francisco, but as ground water extraction and stormwater runoff increased, the lake was becoming increasingly contaminated with E. coli.[i] An innovative approach in San Francisco diverted polluted stormwater runoff through a 130 foot forested buffer, protecting Lake Merced from fecal bacteria contamination.[ii] The process of filtering water through a forested buffer reduced the fecal coliform loads entering the lake. This example showcases the services that forested riparian buffers can provide, even in highly populated urban areas.

[i] Casteel, M. J., et al. 2005. *Removal of bacterial indicators of fecal contamination in urban stormwater using a natural riparian buffer.* International Conference on Urban Drainage. 2005.

[ii] Ibid.

The Values of Healthy Forests & Forested Watersheds

Forests and forested watersheds provide a wide range of economic and ecosystem services, both to species and natural communities, and to local and downstream human communities. They filter both water and air, moderate local weather impacts, and provide habitat for countless species of plants and animals. The total, true value of forests goes well beyond their value providing forest products, although the many non-forest product values are not always easily quantifiable.

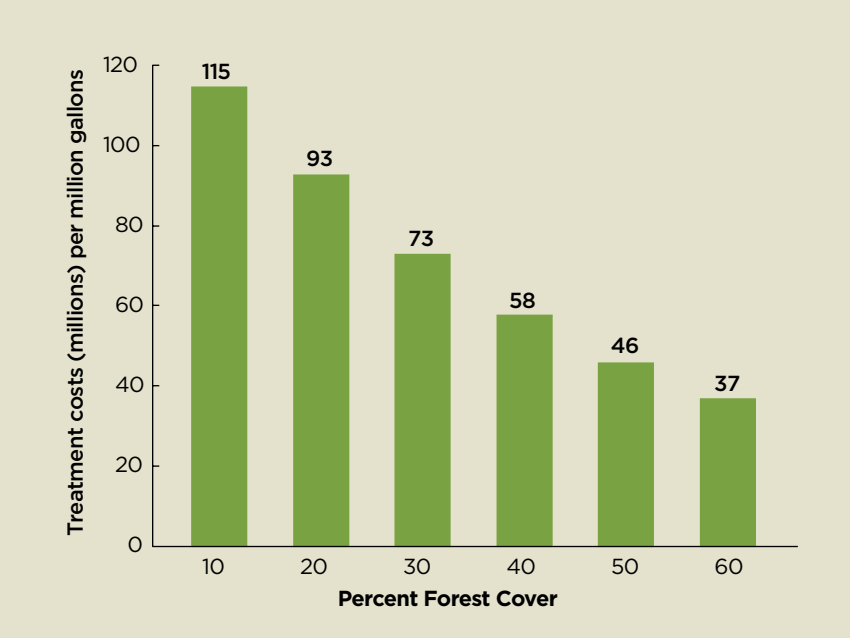
Economic Benefits: Ecosystem Services and Avoided Costs

Healthy natural and well-managed forests provide a wide range of services and benefits for downstream communities. Serving as a form of "natural infrastructure," forests filter pollutants, sediment, and harmful bacteria out of the water, absorb water into soils to be slowly released as base flows into streams and rivers, and provide protection to downstream communities by buffering potential flood waters. Critically, too, forests along stream banks ("riparian forests") provide abundant shade, keeping surface waters much cooler than they would be without adjacent tree cover. Dissolved oxygen is an important indicator of water quality; most forms of aquatic life, including fish and aquatic invertebrates, require dissolved oxygen to survive. As water temperature increases, the amount of dissolved oxygen water can hold decreases. Not coincidentally, many water utilities are required to ensure that their treatment plants release water with a certain amount of dissolved oxygen.[20] By shading rivers and streams, riparian forests moderate water temperatures, to the benefit of both natural and human communities.

The natural benefits provided by healthy forests are often referred to more broadly as "ecosystem services," defined as natural processes that sustain human life.[21] A recent study estimated that ecosystem services from Georgia's 22 million acres of private forestland, including water filtration and wildlife habitat, were valued at $37.6 billion per year.[22]

The avoided economic costs associated with protecting and maintaining forested watersheds that serve as sources of water for human communities can be significant. Research demonstrates that water providers that receive water from mostly forested watersheds have cheaper annual treatment costs than providers in watersheds with less forest cover. Cities are finding that investing in upstream forest conservation can save considerable costs in infrastructure; this investment in forest conservation is often referred to as "Payment for Watershed Services." A 2011 study found that for every $1 invested in forest and watershed protection, $7.50 to $200 is saved in treatment and filtration costs.[23] For example, in a study of 27 U.S. water supply systems, watersheds with 60% forest cover required an average annual water system treatment cost of $297,110, compared to watersheds with only 10% forest cover which had an annual average cost of $923,450, three times that of the mostly forested watershed.[24] Approximately one-third of the world's largest cities take advantage of protected areas and well-managed forests in acquiring their drinking water.[25] Based on the avoided cost of stormwater storage alone, one assessment estimated that forests near Atlanta save the city $420 per forested acre per year.[26]

FIGURE 1: **Water Treatment Cost vs Percent Forest Cover**



Adapted from Ernst, C. 2004. *Protecting the Source. Land Conservation and the Future of America's Drinking Water.* Report by The Trust for Public Land and the American Water Works Association. San Francisco, CA.

TABLE 1: **Cities Invested in Source Water Forest Protection**

City	Cost of protection	Avoided cost	Acres Protected
New York City	$1.5 billion spent on watershed protection over 10 years	Approx. $6 billion in capital costs and $300 million in annual operating costs.	96,000 acres[i]
Portland, Maine	$729,000 spent annually to protect watershed	$25 million in capital costs and $725,000 in operating costs	2,500 acres[ii]
Syracuse, New York	$10 million watershed plan	$70 million in capital costs and $7 million in annual operating costs[iii]	858 acres[iv]
Auburn, Maine	$570,000 spent to acquire watershed land	$30 million capital cost and $750,000 in annual operating cost	1,975 acres or 21% of the watershed[v]

Adapted from Postel and Thompson 2005[vi]

[i] New York City Department of Environmental Education. September 2009. Long-Term Land Acquisition Plan 2012 to 2022. Report Prepared by NYC DEP Bureau of Water Supply Division of Watershed Lands & Community Planning Land Acquisition Program. Retrieved from **www.nyc.gov/html/dep/pdf/resources/lt_plan_final.pdf**

[ii] Portland Water District. Watershed Protection. Retrieved from **http://www.pwd.org/environment/tapwater/watershed.php**

[iii] Skanaeteles Lake Watershed Protection Program. Retrieved from **http://www.behanplanning.com/bpafiles/syracuse/awardnomination.pdf**

[iv] Ibid.

[v] Wagner, K. March 2013. Lake Auburn Watershed Commission Report. Report prepared by Comprehensive Enviromental, Inc. Retrieved from **www.awsd.org/Lake_Auburn_Report_March_2013.pdf**

[vi] Postel, S. and Thompson, B. 2005. Watershed protection: Capturing the benefits of nature's water supply services. Natural Resources Forum 29, pp. 98–108. 99

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In addition, with healthy intact riparian forests, communities do not need to invest as much in constructing stormwater control infrastructure. The infiltration and storage capacity of forests, particularly forested floodplain wetlands, can reduce flooding by slowing down floodwaters. By reducing runoff during rainstorms, forests reduce the volume of water that municipal stormwater containment facilities and retention ponds might otherwise store.

Compared to drinking water treatment plants and other built water treatment systems, forests are also more resilient. They are "decentralized" and can be managed more cost-effectively at regional and local scales.[27] Often referred to as "gray infrastructure," traditional engineered approaches to protecting water quality and managing supply, such as dams and stormwater/sewer networks, cost millions of dollars to build and maintain, and require years to complete. Once they are finished, it can be difficult or expensive to alter their capacity or function to adapt to changing conditions. Also, from the moment dams and pipelines are built, they begin to depreciate in value, while the value of forests increases with time, as they grow and mature. The natural infrastructure, also known as green infrastructure, of healthy forests is more flexible and able to adapt to a wider range of climatic conditions and weather events over time. Thus, forested watersheds can reduce risks associated with extended droughts and intense storms, which are projected to become increasingly common and extreme.

Protecting forestland and forested watersheds, then, not only offers solutions to meeting some of our future water demands in the face of scarcity and climate change, but also offers a compelling economic case for utilities facing difficult decisions about costly water treatment and stormwater infrastructure. Forest conservation and well-managed forests are cost-effective methods to provide clean, abundant water to downstream communities, by protecting water quality and flows into rivers, lakes, and streams used as source waters.

Other Benefits

The many economic, environmental, social, cultural, and aesthetic values of intact, healthy forests are well-known. Forests provide habitat for an endless variety of native animal species, including birds, mammals, reptiles and amphibians, and an astonishing diversity of invertebrate species. Leaf litter and other woody debris falling into streams becomes the organic material that makes up the base of the aquatic food web, especially in headwater streams.[28] Managed sustainably, forests provide a wide variety of economically valuable products, such as game species for hunting, food (plants, fruits, mushrooms, etc.), medicinal herbs, and so on.[29] Healthy forests can be used for numerous other important social and aesthetic activities, including passive recreation (e.g., hiking, bird watching, photography), environmental education (e.g., school field trips), artistic creativity (e.g., painting), and other pursuits that improve physical and mental health.[30] All of these additional benefits accrue when forests and forested watersheds are protected and sustainably managed as natural infrastructure to maintain water quality and quantity for human communities downstream.

Catskills, New York Case Study: Avoided Costs

New York City is an example of downstream water users paying for upstream forest protection, also known as "Payment for Watershed Services." For many decades, New York City has obtained 90 percent of its drinking water from the Catskill Mountains watershed. However, by the 1990s, growing housing developments, septic systems, and agriculture significantly degraded water quality in the watershed.[i] New York City managers were faced with the decision to either build a $6 billion water filtration plant that would cost $300 million a year to operate, or spend $1.5 billion to protect the source watershed. City managers chose to conserve 80,000 acres of forested land in the Catskill Mountains and secure a clean water supply for far less money.

In 1997, the City formed the Land Acquisition Program (LAP), which acquires land and conservation easements.[ii] These decisions set the stage for the purchasing of development rights and payments to landowners for the protection of water quality through a nine percent increase on water bills. This is a fraction of what it would have cost to build a new water filtration plant. The 96,000 acres of watershed the city now owns provide a reliable supply of clean drinking water to nine million residents from a natural source that is more cost-effective than built infrastructure.[iii] A 15 year water supply permit renewed in 2011 will continue this commitment and devote $100 million to the improvement of land management.[iv]

Denver, Colorado Case Study: Holding the Dirt Back

Forested watersheds currently supply water to 1.3 million residents in Denver, Colorado. Insect infestation and other factors led to a high risk of wildfire in the watershed. Severe wildfires burned almost 200,000 acres in Denver's drinking water supply watershed during the Hayman and Buffalo Creek fires in 1996 and 2002, costing $237 million and shutting down drinking water supplies.[v] Forests ravaged by wildfires are at a much greater risk of erosion, and significant amounts of sediment can wash out and reduce storage capacity in reservoirs. Denver Water spent more than $10 million to restore the water supply, and yet sediment continues to erode into the reservoir during every storm.

Rather than continue to implement short term solutions like spending $20 million to dredge the reservoir, the utility has decided to implement a combination of water conservation and watershed protection strategies, such as tree thinning and clearing, as well as creating fire breaks to reduce wild fire intensity.[vi] Denver Water collected fees from water users, charging every resident a $0.14 fee per bill. In 2010 they entered into an agreement with the Forest Service to invest $33 million, half from resident fees, to restore 33,000 acres of forests to ensure clean water into the future.[vii] Notably, Santa Fe, New Mexico, adopted this same strategy after discovering the practice would save $21 million through the avoidance of costs associated with wildfires.[viii]

[i] Postel, S. and Thompson, B. 2005. Watershed protection: Capturing the benefits of nature's water supply services. *Natural Resources Forum* 29, pp. 98–108. 99

[ii] New York City Department of Environmental Education. September 2009. *Long-Term Land Acquisition Plan 2012 to 2022.* Report Prepared by NYC DEP Bureau of Water Supply Division of Watershed Lands & Community Planning Land Acquisition Program. Retrieved from **www.nyc.gov/html/dep/pdf/resources/lt_plan_final.pdf**

[iii] Ibid.

[iv] Ibid.

[v] Denver Water. *From Forests to Faucets: U.S. Forest Service and Denver Water Watershed Management Partnership.* Retrieved from **http://www.denverwater.org/supplyplanning/watersupply/partnershipUSFS/**

[vi] Ibid.

[vii] The Conservation Registry. Denver Water Forest to Faucet Partnership. Retrieved from **http://www.conservationregistry.org/projects/15792**

[viii] Sante Fe Watershed Association. *Santa Fe Municipal Watershed 20 Year Protection Plan 2010-2029.* Retrieved from **http://www.santafenm.gov/DocumentView.aspx?DID=8948.**

Forest Management Practices to Protect Clean Water Supply

Best management practices (BMPs) are minimum practices designed to prevent non-point source pollution and thermal pollution from forestry operations. Georgia's BMPs were first developed in 1981 as required by the Federal Water Pollution Control Act, more commonly known as the Clean Water Act. Georgia's BMPs were last revised in 2009. A 2011 survey of BMP implementation indicated a compliance rate of 95.3 percent.[31] While BMPs are effective strategies to protect water quality, enhanced management practices, as described below, that go beyond minimal BMPs yield additional water and ecosystem benefits. Understanding the costs and benefits of implementing improved management practices is necessary for their implementation, particularly as the costs and benefits can be highly variable depending on ground conditions.

As development and land use change continues in watersheds like the Etowah, it will become increasingly important to implement management practices that protect clean water supply and provide vital ecosystem services for the communities that depend upon them. The following enhanced management practices are the most likely to yield improved water benefits.

Riparian Management Zones

Riparian management zones, (RMZ's), are buffer strips adjacent to streams or other bodies of water (lakes, ponds, reservoirs, etc.) that should be managed with special considerations to protect water quality. Riparian management zones slow water runoff, catch sediment before entering a watercourse, and keep water cool.[32] One key challenge for the retention of trees within RMZs is that riparian zones are currently utilized for timber harvesting in the Southeast. Reducing harvesting near water bodies would reduce the volume of merchantable timber from a harvest, but would provide important water quality and potentially water supply benefits. Establishment of voluntary buffers within the most sensitive area of RMZs would maintain the benefits of riparian forests.

Management Options:

- Establish no harvest zones adjacent to perennial streams and intermittent water bodies
- Increase the size of forested buffers within RMZs based on slope and presence of special management areas. Offer landowner and logger training for harvesting within RMZs

Stream Crossings

Stream crossings represent the largest source of sediment to water bodies from forestry operations.[33] Stream crossings with poorly located or maintained structures (culverts, bridges) can be a significant source of sediment entering streams and can degrade aquatic habitat and block the passage of aquatic organisms. A 2011 survey of BMP implementation in Georgia found areas for improvement in stream crossing design, to include sizing culverts with respect to storm flow, culvert placement with respect to migration of aquatic species, and stream crossing approach design.[34]

Management Options:

- Install culverts greater than two times bankfull width, meaning two times the width of the river at high water.
- Replace culverts less than two times bankfull width, meaning two times the width of the river at high water.
- Install bottomless arched culverts to allow safe passage of aquatic species
- Maintain culverts for 15 years post construction

- Utilize culvert design, installation and maintenance standards provided by Georgia Forestry Commission

Forest Roads

Forest roads are another source of sediment entering water bodies from forestry operations.[35] A 2011 survey found compliance with forest road BMPs in Georgia was at 95 percent, but identified the proper installation of water diversions and the stabilizing and re-shaping of forest roads after activities are completed as remaining challenges.[36] Road infrastructure problems caused by degraded roads or blocked stream crossings can be a significant cause of sediment input to the stream channel. Monitoring programs followed by proper maintenance are necessary to identify and address conditions such as rutting and blocked culverts that can lead to sedimentation.

Management Options:

- Adequately install and maintain water diversions on forest roads
- Stabilize and reshape forest roads after harvest operations are complete
- Monitor and maintain structures for 15 years post-harvest
- Close roads that are no longer needed

Planning

Management and pre-harvest plans prepared by a professional forester with clear water quality objectives represent critical management practices that can reduce negative impacts to water resources from timber harvesting.[37] Pre-harvest planning conducted by a professional forester is necessary to identify road locations, skid trails, and sensitive sites that require more care or protection. Investing in upfront harvest planning ensures that management practices are identified to protect water quality, meet landowner objectives, and avoid costly problems down the line.

Management Options:

- Develop a forest stewardship management plan prepared by a professional forester
- Conduct on-the-ground planning and communications by a professional forester before, during and after harvest operations

Boston, Massachusetts Case Study: Healthy Forest Management

Storms can knock down trees, stir up soil, and degrade water quality. But a diverse forest of different ages and species of trees is more resistant to damage and can recover more quickly. In Boston's water supply watershed, managers are harvesting timber to improve water quality and to make the area more resistant to the effect of hurricanes and other disturbances. Watershed managers have developed a plan to regenerate a small area each year so that over time the forest becomes more diverse and more resilient. Boston's Metropolitan District Commission manages forestland that surrounds the Quabbin Reservoir, Boston's main water supply reservoir. In the 1990s, the Commission investigated sustainable timber harvesting as a method of watershed protection. Studies have found that forests that are not cut over long periods of time cannot retain high levels of nitrogen entering the watershed.[i] [ii] In other words, they lose their ability to store nutrients and filter out pollutants. Boston's watershed plan includes timber management that will provide diverse tree species and age composition, as well as healthy forest cover able to retain and filter nutrients and provide resilience from disturbance.[iii]

[i] Barten, Paul K., et al. 1998. *Massachusetts: managing a watershed protection forest.* Journal of Forestry 96.8 (1998): 10-15.

[ii] Murdoch, P., and Stoddard, J. 1992. *The role of nitrate in the acidification of streams in the Catskill Mountains of New York.* Water Resources Research 28.10 (1992): 2707-2720.

[iii] Massachusetts Department of Conservation and Recreation. December 2008. *Watershed Protection Plan Update Volume IIB; Ware River Watershed.* Report by Massachusetts Department of Conservation and Recreation, Division of Water Supply Protection, Office of Watershed Management. Retrieved from **http://www.mass.gov/dcr/watersupply/watershed/documents/2008dcrwppv2bware.pdf**

Forest Conservation to Protect Clean Water Supply

Forest landowners are often faced with difficult decisions when planning for the future of their land. Competing development interests can often be at odds with conservation efforts. This outside pressure can make the decision to keep forests as forests difficult. As housing and supporting infrastructure demands increase along with landowner holding costs, the pressures to sell only increase. Higher taxes based on development potential place financial burdens on landowners that make it more difficult to hold private forest land. In particular, smaller tracts lack the economy of scale to support traditional forestland uses when the land is being taxed for its greater development value. Small tracts are especially vulnerable, and are often ultimately sold for development and absorbed into sprawl. Estate taxes can lead to the break-up, sale and development of family-owned farm, ranch and forest lands, even when landowners would prefer to keep these lands intact.

Long term protection of forested wetland and riparian buffers are important priorities for ensuring clean and abundant water supplies, along with permanent conservation of "working" forests (i.e., actively sustainably managed and income-producing forestlands). Land trusts play a key role in identifying priority watershed forest tracts and implementing conservation plans and strategies to protect such land from development before it is too late. Land trusts work directly, and often proactively, with willing land owners and with other conservation organizations to conserve land through acquisition or voluntary conservation easements.

Conservation easements are a tool for landowners to protect forest land from development permanently, while reducing their property and estate taxes. These voluntary agreements enable landowners to maintain private ownership and reserve limited development or other rights of use that fit their particular goals and interests. These uses can include income producing enterprises associated with working forests, or other sustainable private land use activities. Land with a conservation easement can be sold to future conservation buyers who wish to enjoy the land's natural amenities and benefits at a more affordable purchase cost compared to land appraised at higher, full-development values. Conservation easement donations as part of estate planning can substantially reduce tax liability for heirs, and keep family forests in the family.

The Land Trust Alliance recently conducted a study identifying key strategies for effectively protecting privately-owned forestland. The most important factors were increased public awareness and support for private forestland protection, additional public funding, and incentives to increase the effectiveness of collaborative conservation work.[38]

Forest Landowner Incentive Programs

There are incentive programs and mechanisms available to landowners to protect and promote healthy forests and enhanced forestry best management practices. Technical assistance, cost-share programs, and funding for temporary or permanent conserva-

tion easements serve as important tools and mechanisms to subsidize forest landowners and promote conservation goals.

Since private forest protection benefits the whole watershed community, forest landowners can receive substantial federal and state tax benefits for donating permanent conservation easements to qualified land trusts and government entities. These easement incentives can be combined with funding programs and mechanisms to offset transaction costs of conservation easements and assist landowners with forest management practices. Tracts with particularly high forest conservation value are often eligible for funding that supports permanent acquisition of development rights at competitive real estate market values.

The following programs have the potential to protect or enhance forest resources to better protect clean water supply:

- **Forest Stewardship Program** — This program, which provides written management plans at no cost to the landowner, is administered by the Georgia Forestry Commission (GFC) with help from GA Department of Natural Resources Wildlife Resources Division (WRD). Private, non-industrial forestlands of at least 25 acres are eligible for a forest stewardship plan. A stewardship plan will provide recommendations on managing timber, wildlife, soil & water resources, recreation and aesthetics according to the landowner's objectives.
- **Forest Legacy Program** — The Forest Legacy Program (FLP) protects environmentally important working forests threatened by conversion to non-forest uses. It assists states and private forest landowners in maintaining working forests through matching grants (up to 75:25) for permanent conservation easement and fee acquisitions. Landowners may continue to own their land and use it within the guidelines of the program or sell it to someone who wants undeveloped forestland. Georgia has identified areas that have multiple public benefits in addition to water quality protection, such as wildlife habitat, outstanding recreation opportunities or scenic views and provides the opportunity to continue traditional forest uses such as timber harvesting and wildlife management. Public access is not required, but can be allowed if the landowner chooses. A written forest management plan is developed by the Georgia Forestry Commission to address the landowner's specific goals.
- **USDA Natural Resources Conservation Service Programs (NRCS)** — The NRCS, through local USDA Farm Service Agencies and the Georgia Forestry Commission, offers numerous cost share, conservation rental agreements, and easement incentive programs for forest landowners to maintain healthy forests.

  Both the Environmental Quality Incentives Program (EQIP) and the Wildlife Habitat Incentive Program (WHIP) offer compensation for a range of conservation practices designed to benefit forest land. EQIP helps promote farm and forest production by enhancing the environmental quality of soil, water, air, plants and animals. WHIP helps improve fish and wildlife habitat and restore natural ecosystems. Private forest land owners who have forest management plans can apply for NRCS forestry assistance. Forestry-related conservation practices eligible for financial compensation through EQIP and WHIP include erosion control on existing forest access roads, forest stand improvement, riparian forest buffers, and others.

  Easement programs administered by NRCS include the Healthy Forests Reserve Program (HFRP) and the Wetland Reserve Program (WRP). The former assists landowners, on a voluntary basis, with restoring, enhancing and protecting forestland resources on private lands through easements, 30-year contracts and 10-year cost-share agreements, while the latter protects, restores, and enhances wetlands through similar agreements and easements.

These incentives are subject to landowner eligibility, property ranking criteria, available funding pools and other variables determined by the individual organizations or agencies. More information can be obtained through the local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app).

Forest land owners can receive more information on forest conservation incentives, including technical assistance and cost share for management, through forest landowners associations, local soil conservation and farm service agencies, the Georgia Forestry Commission, as well as local land trusts and conservancies. Mountain Conservation Trust of Georgia (www.mctga.org) can provide more details on incentive programs specific to the Upper Etowah Watershed.

Forestland Conservation Tax Incentives

In addition to federal conservation tax incentive programs, there are a number of state and local incentive programs available to forest landowners in Georgia. Tax incentives provide financial support to assist forest landowners in achieving conservation goals that provide public benefits associated with the ecosystem services provided by the conserved forests.

- **Federal Tax Deductions** — Congress recently renewed through 2013 an incentive that enhances the income tax benefits of protecting land by donating a voluntary conservation easement. The incentive raises the maximum deduction for donating a conservation easement from 30 percent of adjusted gross income (AGI) to 50 percent, allows qualifying farmers or ranchers to deduct up to 100 percent of AGI, and increases the number of years over which the deduction can be used from 6 years to 16 years. Section 2031(c) of the Internal Revenue Code provides an estate tax exclusion of up to 40 percent of the encumbered value of land (but not improvements) protected by a "qualified conservation easement." That exclusion is capped at $500,000 and is further reduced if the easement reduced the land's value by less than 30 percent at the time of the contribution.
- **Georgia Conservation Tax Credits** — Georgia offers significant tax benefits to landowners who donate qualifying land or conservation easements to qualifying organizations such as a land trust or government agency.[39] The state's incentives are in the form of transferable income tax credits. The landowner who donates qualifying land or a conservation easement to a qualified entity may be granted a Conservation Tax Credit of up to $250,000 or 25 percent of the fair market value of the donation. If the landowner is a partnership, then the partnership can receive benefits up to $500,000. Landowners who cannot utilize these tax credits fully, may sell or transfer their tax credits to a Georgia income tax payer.
- **Conservation Use Valuation Assessment (CUVA)** — Certain properties, including agricultural lands, forestlands, and environmentally sensitive areas, may also be eligible for reduced county property tax rates through conservation use valuation assessment (CUVA). These properties are assessed according to a combination of soil type, productivity and a reduced fair market value factor. This typically results in a significant reduction of property taxes. For example, conservation use property is assessed at 40 percent of current use value, compared to non-conservation property, which is assessed at 40 percent of fair market value. This favorable tax treatment is designed to protect these property owners from being pressured by the property tax burden to convert their land from agricultural or forestry use to residential or commercial use.
- **Georgia Forestry Commission** — The Georgia Forest Land Protection Act of 2008 (O.C.G.A. 48-5-7.7) provides for an ad valorem tax exemption, which is a reduction in property taxes made possible by the reduced value assessment of forestry use versus a higher-value use. This voluntary tax program is for large tracts of forest land that are not eligible to enroll in the existing Conservation Use Valuation Assessment program due to acreage and ownership restrictions. In Georgia, this tax exemption applies to property primarily used for the good faith subsistence or commercial production of trees, timber, or other wood and wood fiber products and excludes the entire value of any residence located on the property. Forest land conservation use property may include land that has been certified as environmentally sensitive by the Georgia Department of Natural Resources, or that is managed in accordance with a recognized sustainable forestry certification program.

  The property may have secondary uses such as the promotion, preservation, or management of wildlife habitat; carbon sequestration in accordance with the Georgia Carbon Sequestration Registry; mitigation and conservation banking that results in restoration or conservation of wetlands and other natural resources; or the production and maintenance of ecosystem products and services such as, but not limited to, clean air and water.

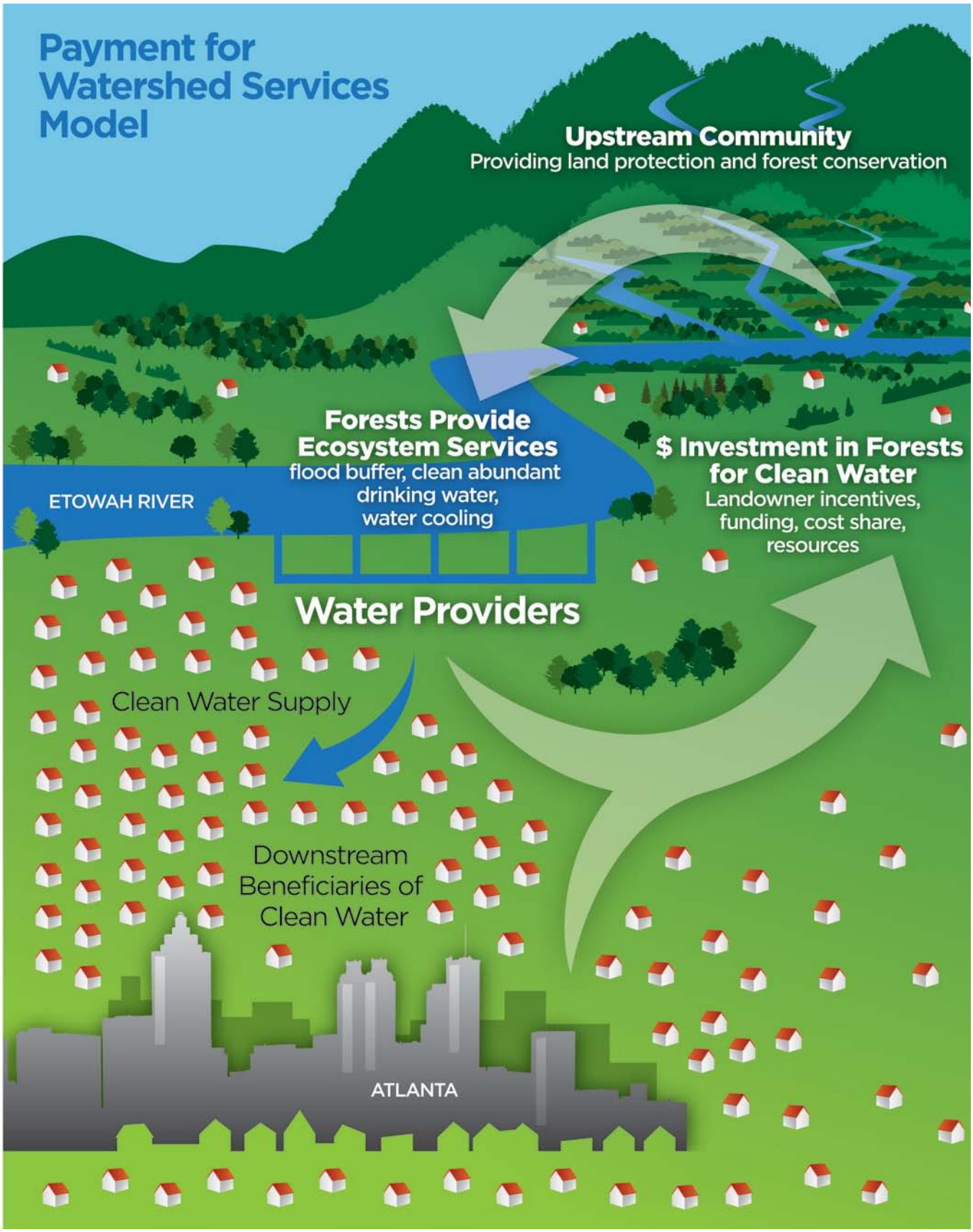
Forest Conservation Finance Options for Local Governments

In Georgia, the four major local financing options that exist for the acquisition of parks and greenspace are the property tax, general obligation bonds, the special purpose local option sales tax (SPLOST), and Community Forest Program.

- **Property Tax** — Every county and municipality in Georgia has the authority under the Constitution to create a separate, countywide (or municipal) tax district, to levy a property tax, or issue a general obligation revenue bond for the provision of parks and recreation (or any government service).
- **General Obligation Bonds** are a type of bond that secures a loan, which a local government is obligated to repay through a pledge of anticipated tax revenues. If the tax payer is delinquent, the government entity has to make up the difference. These bonds are one of the more popular finance mechanisms for funding land conservation across the State.
- **Special Purpose Local Option Sales Tax (SPLOST)** is the most widely used financing vehicle for Georgia counties to pay for major capital improvements. Although the SPLOST has been used most commonly to fund road construction, jails and county buildings, a handful of counties have used the SPLOST to fund land conservation.
- **Community Forest Program (CFP)** authorizes the U.S. Forest Service to provide financial assistance in the form of grants to local governments, tribal governments, and qualified nonprofit entities to establish community forests that provide continuing and accessible community benefits. Full fee acquisition is required. Conservation easements are not eligible. The program pays up to 50% of the project costs and requires a 50% non-federal match. Public access is required for CFP projects. The local government is involved in the establishment of the community forest, as well as in long-term management decisions.

Additional Government Funding Sources

- **Georgia Land Conservation Program (GLCP)** — The primary function of the GLCP is to provide flexible financing to local governments, state agencies, and conservation organizations for permanent land conservation projects that advance water quality protection for rivers, streams, and lakes; flood protection; wetlands protection; reduction of erosion through protection of steep slopes, areas with erodible soils, and stream banks; and other conservation purposes. Grants and low interest loans are available to state government agencies to pay for due diligence expenses incurred while facilitating conservation easement donations.
- **Section 319(h): Georgia's Nonpoint Source Implementation Grant** — Under Section 319(h) of the Clean Water Act, the U.S. Environmental Protection Agency (USEPA) awards a Nonpoint Source Implementation Grant to the Georgia Environmental Protection Division (GAEPD) to fund projects in support of Georgia's Nonpoint Source Management Program. Funding is distributed via a competitive process to select projects that will lead to a direct reduction in pollutant loads and measurable improvements to water quality. The maximum amount of individual federal awards is $400,000 over a maximum timeline of three years. Public agencies such as local, regional or state governments, authorities that operate service or delivery programs (e.g. sewer, water), regional development centers, agricultural conservation councils, and school and university systems are eligible. Grant proposals must address nonpoint sources of pollution and can include: TMDL implementation, watershed restoration, technical and financial assistance, building local capacity, certain local enforcement programs not under NPDES permits, water quality monitoring, demonstration projects, groundwater activities, drinking water reservoir non-point source pollution control projects, and updating nonpoint source pollution initiatives.


Payment for Watershed Services Model
Upstream Community
Providing land protection and forest conservation
Forests Provide Ecosystem Services
flood buffer, clean abundant drinking water, water cooling
$ Investment in Forests for Clean Water
Landowner incentives, funding, cost share, resources
ETOWAH RIVER
Water Providers
Clean Water Supply
Downstream Beneficiaries of Clean Water
ATLANTA

Current and Emerging Markets as a Conservation Finance Tool

- **Mitigation Banks** — Landowners can restore and protect forest land around streams and wetland areas through mitigation banking markets which provide credit offsets for unavoidable development that impacts clean water resources. The banking site must be approved by the U. S. Army Corps of Engineers and meet regulatory requirements under the Clean Water Act. Funding may be available through the Georgia Wetlands and Stream fund and through partnerships with commercial mitigation bankers.
- **Conservation Banks** — Conservation banking for species is a rapidly emerging market in the Etowah Watershed under the Endangered Species Act. Landowners in specific areas identified by the U. S. Fish and Wildlife Service can receive income for protection of forested upland habitats adjacent to habitats of endangered aquatic species, through species conservation banks. Like better-known wetland mitigation banks, conservation banks sell credits that can be purchased to offset unavoidable water quality impacts of development elsewhere.
- **Payment for Watershed Services (PWS)** — PWS is another emerging market-based tool to promote forest conservation and stewardship.[40] Payment for Watershed Services specifically refers to innovative markets that place a value on the ecosystem services provided by healthy forests, such as clean water. Downstream communities and water users that recognize the value of forests for the protection of their source watersheds could unlock the potential for forest conservation by investing in a market for payment for watershed services. Payments compensate landowners who implement and maintain best management practices voluntarily. Where costs and lack of funding limit land conservation efforts, PWS presents a viable "new path" for achieving long-term conservation benefits.[41] With its combination of forests and freshwater challenges, the Etowah is ripe for using this new market approach.

Upper Neuse Basin, North Carolina Case Study: Thinking Outside City Boundaries

The Upper Neuse River Basin provides 535,000 residents of North Carolina with water, including the city of Raleigh. Although 60 percent of this watershed is forested, the population of the region is expected to grow by one million people by 2030.[i] In addition, Falls Lake (the sole source of drinking water at the time) was experiencing significant water quality degradation. Fortunately, the City of Raleigh Public Utilities Department, with the assistance of the local land trusts and the Mayor at the time, recognized the potential implications this growth could place on a limited water supply.

Using the Payment for Watershed Services model, Raleigh implemented a "watershed protection fee" ($0.0748 per 100 cubic feet of water) to acquire, protect, and manage forests important to drinking water supplies.[ii] As of 2011, nearly $3.1 million had been secured for these purposes. Working with local land trusts as part of the Upper Neuse Clean Water Initiative (UNCWI), Raleigh has invested more money into land protection outside than inside of its own boundaries. This investment is paying off: for every $1 invested by the utility, $17 worth of land is protected. So far this program has protected 5,200 acres of forests and 53 miles of streams, valued at $50 million in total.[iii]

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Conclusion

Protection, restoration and sustainable management of forests are vital to address a changing and at-risk water supply in the Southeast. In partnership with public and private forest landowners, communities can begin to prioritize source water protection as part of a long term water management strategy. Forests and stream ecosystems intertwine to provide essential benefits for maintaining both water quality and quantity, including filtering pollutants, recharging groundwater, and reducing the intensity and frequency of floods. As a result, forest conservation serves as one of the most cost-effective methods to provide clean, abundant sources of drinking water. Well-managed forests act as a first line of defense in protecting water quality and flows into rivers and streams used as drinking water supplies, or source waters.

The Etowah River watershed, the focus of the Etowah Forest Collaborative and of this guide, highlights a representative watershed of the Southern Appalachians with rising development pressure, increasingly variable precipitation patterns, and susceptibility to erosion and polluted runoff.

As demonstrated in this guide, source water forests in the Etowah River watershed provide significant and irreplaceable benefits to ensure clean and reliable drinking water as well as reduce flooding. By reducing polluted runoff and promoting natural water storage, source water forests protect both water quantity and quality. They can reduce thermal pollution and protect dissolved oxygen levels by shading streams and rivers. Importantly, protecting forests also results in avoided costs of drinking water treatment. Source water forests help to improve air quality, provide habitat to protect biodiversity, and particularly in urban areas, offer access to green space and recreational opportunities to improve community wellness and quality of life.

There are a number of best management practices that forest landowners can implement to protect source water forests such as developing streamside management zones, also known as riparian management zones (RMZs), carefully planning and developing stream crossings and forest roads to reduce erosion, and harvest planning. These practices and others can be implemented using different tools and mechanisms from land trusts that provide educational outreach, technical support, and can purchase conservation easements to temporarily or permanently protect source water forests. Other landowner incentive programs such as the Forest Stewardship Program or the Forest Legacy Program, as well as tax incentives like the federal estate tax deduction, provide financial assistance for conservation minded land owners to protect their forests and implement forest management practices they otherwise would not be able to afford. Lastly, opportunities to explore emerging markets in watershed services through mitigation or conservation banks can unlock funding for landowners for forest protection and restoration in the future.

With innovative management, investment and support for forest land protection, communities can move forward to protect and restore their source water forests to sustainably manage clean water supply. Communities can reap multiple benefits from this approach, including reliable access to clean water, lower drinking water infrastructure costs, and support for landowners who bear the financial cost of maintaining forests as forests.

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[40] For a description of payment for watershed services, see American Rivers and Ceres, Restoring the Flows: Financing the Next Generation of Water Systems (2012) available at **http://www.americanrivers.org/assets/pdfs/green-infrastructure-docs/restoring-flows-may.pdf**

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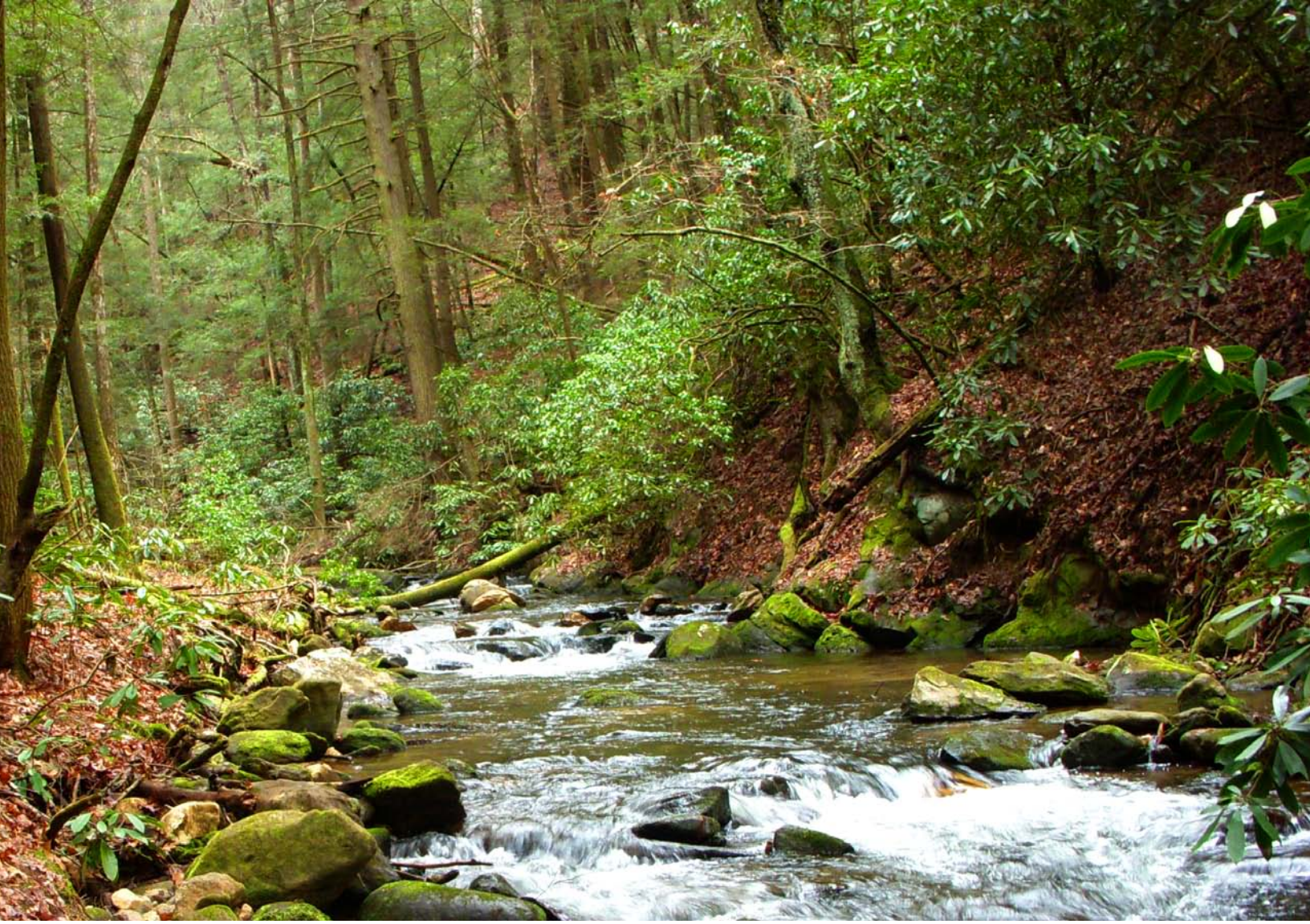

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