Understanding Payments for Ecosystem Services:
Opportunities for Forests, Water and Private Landowners in Georgia and the Southeastern United States

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Project Partners and Collaborators:

Georgia Forestry Foundation (GFF) is a 501(c)3 organization that is focused on the long-term sustainability of Georgia's working forests. Founded in 1989 and headquartered in Forsyth, Georgia, GFF's research, outreach and education efforts are focus on reconnecting youth and adults to the land and demonstrating the environmental and economic importance of working forests to the state. www.gfagrow.org

Dovetail Partners, Inc. is a Minnesota-based nonprofit organization that fosters sustainability and responsible behaviors through collaboration to develop unique concepts, systems, models, and programs. Dovetail excels at solving complex problems and helping responsible organizations succeed. www.dovetailinc.org. TBL Consultants, LLC also contributed to the research team for the project.

Keeping Forests is a regional partnership with the common mission to keep forests as forests. One voice alone cannot speak for southern forests, and a single entity cannot ensure its conservation. Our partners represent a range of interests. From environmental experts and private landowners to global corporations and government agencies, each of our partners illuminate the critical ecological, economic, and social importance of the region's forests. www.keepingforests.org

U.S. Endowment for Forestry & Communities works collaboratively with partners in the public and private sectors to advance systemic, transformative, and sustainable change for the health and vitality of the nation's working forests and forest-reliant communities. www.usendowment.org

Georgia Forestry Commission is a state agency focused on protecting and conserving Georgia's forest resource through leadership, service, and education. www.gatrees.org

University of Georgia Warnell School of Forestry & Natural Resources exists to prepare leaders in the conservation and sustainable management of forests and other natural resources; to discover ways to restore and better use the earth's natural resources; and to put into practice forestry and natural resources knowledge. www.warnell.uga.edu

Georgia Sustainable Forestry Initiative Implementation Committee works across the forestry community to support programs that improve the practice of sustainable forestry on all lands. http://sfi-georgia.org/about/program-overview/

Georgia Tree Farm Program is a program for woodland owners who are committed to sustainably managing their woods for wood, water, wildlife and recreation. The state program is run by a diverse group of partners, such as state agencies, nonprofit organizations, volunteers, foresters and landowners.

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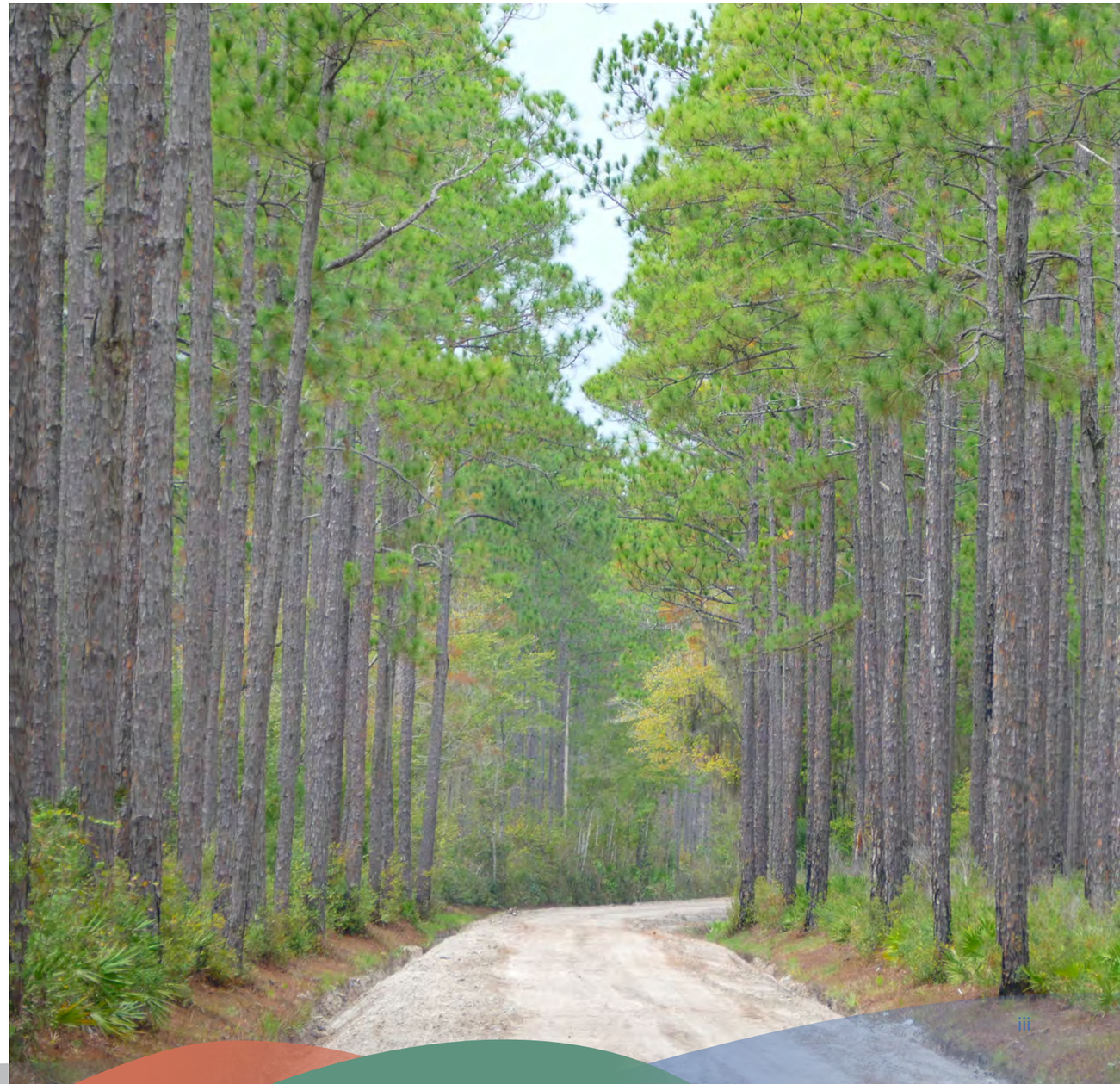

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Executive Summary

For over 20-years, the concept of Payments for Ecosystem Services (PES) has been evolving. During this time, an enhanced understanding of supporting sciences, potential frameworks, and protocol methods has emerged and continues to improve.

The Georgia Forestry Foundation (GFF) invested in this work to broaden the understanding of PES programs, identify potential opportunities, and to increase engagement with private forest landowners. PES programs offer a means to assist private forest landowners by providing technical and financial assistance deemed necessary to reduce forestland conversion to other land uses, improve or protect water quality, and sustain water quantity. This literature review, also informed by expert interviews and focus groups, identifies and opens the door to proven forest-to-water PES frameworks. It provides a context for developing a PES program addressing forests and water in the state of Georgia, and potentially other areas located in the Southeastern United States. It addresses the relevance of forest hydrology, engagement with private forest landowners, ecosystem service opportunities, and PES mechanisms and case studies that illustrate potential frameworks with a focus on needs and opportunities with the target region. The design of key influential PES program components is also addressed, including performance expectations, operation protocols, legal agreements, and payment terms.

This work builds upon previous research in Georgia that explored and quantified ecosystem services and market opportunities. A key piece of prior work is Moore, et al.[1] which identified the many ecosystem services that forests in Georgia provide. This work also builds upon established watershed level projects and partnerships, including the startup and advancement of the Savannah River's Clean Water Fund (SRCWF),[2] the first of its kind in the region. The partnerships established by the Southeastern Partnership for Forests and Water in the Oconee, Middle Chattahoochee, and Savannah River watersheds greatly enhance the opportunities to develop payment for ecosystem services programs.

The chapters in this report build upon the existing foundational knowledge and address many dimensions of forest-water PES program opportunities in Georgia as briefly described below:

- **Chapter 1: Introduction:** This chapter provides background information about PES programs in general and additional context for the current work.
- **Chapter 2. Linking forests to water in Georgia:** Throughout Georgia, and the Southeastern United States, drinking water is drawn from regions that are dependent on the health of forests and proper forest management. This chapter highlights why forest land use matters and is organized to address hydrology, geology, land use, and the forest to water connection.
- **Chapter 3. Connecting with private landowners:** Georgia has approximately 24 million acres of forest covering 67% of the state's land area. These forests are primarily privately owned (22 million acres). However, there are many categories and characteristics of private land ownership that make it impossible and inappropriate to treat this as a homogenous group. This chapter explores forest ownership in Georgia with a focus on the various types of private forest landowners, their interests and needs, and effective engagement strategies and tools.
- **Chapter 4. Models of PES programs for water resource protection:** This chapter addresses approaches to water resource protection, including a discussion of the urgency of the situation in Georgia. Case study examples of PES programs from around the U.S. are described and categorized by surface water and groundwater priorities and method of conservation (i.e., land acquisition, easements, and/or management agreements). The case studies provide insight from existing program experiences, including benefits and outcomes that can inform opportunities in the Southeast.

[1] Moore, R.; Williams, T.; Rodrigues, E.; and Hepinstall-Cymmerman, J. 2011. Quantifying the value of non-timber ecosystem services from Georgia's private forests. http://gatrees.net/utilization/ecosystem-services/index.cfm.

[2] Savannah River Clean Water Fund. 2020. The Nature Conservancy Water Funds Toolbox. https://waterfundstoolbox.org/regions/north-america/savannah-river-clean-water-fund-georgia.

- **Chapter 5. Integrating Source Water Protection Planning and Target Area Prioritization for PES Program Development:** This chapter's discussion follows the Source Water Protection standard and guidance manual provided by the American Water Works Association (ANSI/AWWA, 2014;[3] AWWA 2016[4]) as a strong platform for watershed assessment programs that include an element of source water assessment planning. The examples of assessment techniques, including those already in use in Georgia, are provided for consideration in the design and development of a PES program.
- **Chapter 6. Structuring options for legal agreements to enhance private forest landowner engagement:** This chapter addresses various models and recommended approaches for legal agreements and operational structures with landowners engaged in PES programs. Additional information about legal agreements is included in Appendix C.
- **Chapter 7. Forum Results:** This chapter shares the results of watershed forums (focus groups) held in January and February 2021 to gather additional information to inform the project and to test receptivity to various potential frameworks for PES program design. Additional information about the forum design and a list of participants is included in Appendix D.
- **Chapter 8. Considerations, Recommendations, and Conclusions:** This chapter provides the outcomes resulting from this project, including general considerations, recommendations for next steps, and conclusions. Several near-term and longer-term opportunities exist for Georgia and other states in the Southeastern U.S. to advance and hold a leadership position on PES program design and implementation; however, time is of the essence.

[3]American Water Works Association. 2014. AWWA Management Standard, Source Water Protection. ANSI/AWWA G300-14.

[4]American Water Works Association. 2016. Source Water Protection Guide to ANSI/AWWA Standard G300. Operational Guide to ANSI/AWWA G300-14.

Summary of Findings

Linking Forests to Water

Georgia is a state with substantially diverse regional characteristics in land use, geologic structure, and precipitation rates. Analysis completed by the Georgia Forestry Commission (GFC) found that 60.5% of the watersheds used for drinking water in the state are forested with these forests cleansing the water utilized by most of Georgia's residents and visitors. The state's hydrologic intensities and seasonal differences combine to create different water circulation dynamics, storage and yield capacity, and susceptibility to pollutant impacts. Some of the regional characteristics can be influenced by human activities and land use conversion (e.g., vegetative cover), while other characteristics are more difficult to influence (e.g., geology and how it relates to an aquifer's water yield). Each of the individual forest attributes (i.e., canopy evapotranspiration, soils, and duff layers) contribute to regulating water quantity and quality. Hydrology from dominantly forested watersheds is typified by streams with lower peak flows and higher baseflow than streams generated by runoff from other land uses. The water quality from dominantly forested watersheds also tends to be better (i.e., less sediment and other contaminants). A study by Ferguson and Suckling (1990)[5] around Atlanta, Georgia documented that conversion to urbanized land use increased peak flows and total discharge in wet years and decreased low flows in dry years. Forested land use effectively managed can be used to protect drinking water supplies. The nationwide data available through the Forests to Faucets 2.0 (F2F2)[6] program helps in identifying these opportunities.

Connecting with Private Forest Owners

Most forests in Georgia are privately owned by individuals and corporations. While corporate ownership has been increasing, private individual ownership remains the largest category. Approximately 58% of forestland in the south is in individual private ownership. Individuals owning private forestland are also referred to as 'family forest owners' and are the subject of the National Woodland Owner Survey (NWOS).[7] The NWOS found that more than 70% of family forest owners in Georgia indicated 'protecting water resources' as an important reason for owning forestland. It is estimated that 2 million acres of forest in Georgia have the potential to be lost through conversion to non-forest land uses between 2030 and 2060, primarily due to urban growth.[8] Being able to provide a targeted marketing approach to engage landowners involves designing programs to persuade a specific group of people to take a specific action. By definition, this requires an understanding of the audience(s) through a marketing lens, which requires market segmentation. Applying this kind of thinking to landowner engagement may be useful for developing a PES program in Georgia.

Models of PES Programs

The urgency of water resource protection has been recognized in Georgia and efforts have been made over the years to address the situation, especially through water conservation strategies and in response to the threat of drought. Statewide data indicates Georgia is in the top quartile in the U.S. in water conservation (use/capita/day). However, the projected population growth rates for many parts of the state may still overwhelm the water supply systems in the coming years. For many counties, the projected growth will double or triple the current population between 2050 and 2065 and water supply issues could occur well before then.[9] A variety of additional strategies, including diverse PES program methods may be warranted. Case study examples of PES programs from other states and regions that face similar water resource threats show that there are a variety of ways to approach surface water or groundwater resource protection, including varied conservation methods (i.e., land acquisition, easements, and/or management agreements). A review of these case studies shows the PES program method(s) that is used will impact

[5] Furguson, B.K.; Suckling, P.W. 1990. Changing rainfall runoff relationships in the urbanizing Peachtree Creek watershed, Atlanta, Georgia. Water Resource Bulletin. 26:313-322.

[6] U.S. Forest Service. 2020. Forest to Faucets 2.0 Factsheet. https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1584445&ext=pdf.

[7]U.S. Forest Service. National Woodland Owner Survey. https://www.fia.fs.fed.us/nwos/.

[8] Greene, R.E.; Evans, K.O.; Gray, M.T.; Jones-Farrand, T.; Wathen, W.G. 2018. Mapping the South's Forests of the Future. https://static1.squarespace.com/static/5c90083492441b41cbebb288/t/5f513f61e66e48772df8c03c/1599160165938/mapping-the-souths-forests-for-the-future.pdf.

program cost, scalability, and impact. Also, collaboration is key, as is patience, and understanding the unique concerns associated with local water resources. Identifying the phase of development for a specific watershed program is an important strategy for aligning with the lessons learned from other existing programs and the identification of appropriate actions.[10] Lastly, water is not the only value to consider. Many PES programs recognize the importance of encompassing other ecosystem service benefits. Examples include public safety, flood reduction, recreation, scenic beauty, and wildlife habitat. Marketing all the PES program's forestry ecosystem service benefits, including drinking water supplies, increases the attractiveness and perceived urgency of the program to many more landowners, partners, audiences, conservation programs, and funders.

Integrating Source Water Protection Planning and Target Area Prioritization for PES Program Development

The Source Water Protection standard and guidance manual provided by the American Water Works Association (ANSI/AWWA, 2014;[11] AWWA 2016[12]) is a strong platform for a full range of watershed assessment programs that include elements of a Source Water Assessment Plan (SWAP). These plans identify the contributing area of the source water watershed considered in a surface water protection situation, or the extent of land acreage within a wellhead (groundwater) protection program, and the potential sources of contamination. The SWAPs also provide the intended protection methods to be used in the watershed. A PES program can build on the SWAPs by integrating additional information about ecosystem services and protection methods, including forest management related actions and benefits. Source water protection planning and assessment techniques for identifying priority areas, including those already in use in Georgia, provide examples that can be replicated, adapted, and efficiently applied to inform PES program design and development.

Structuring Options for Legal Agreements

- To connect and engage private landowners in PES programs, legal agreements and supporting materials must be easily understood, with conditions of the agreements structured to be clear and constructive. Existing models of PES programs have offered different types of legal agreements, operational frameworks, contract terms, and/or performance requirements to appeal to a wide variety of private forest landowners. The various models and recommended approaches allow PES collaborating teams to explore options and arrive at legal structures and language that will best fit any given situation. Intuitively, each increase in rigor and specificity raises the direct and/or indirect cost of administering the agreement, leaving less funding available to implement projects. In the end, the buyer has the right to be assured the purchase results in the ecosystem service(s) paid for, and the seller has the right to fair compensation and treatment. Engagement with formal legal counsel in the development of these agreements is necessary and an essential element of PES program development.

[9]Governor's Office of Planning and Budget. 2020. County Residential Population, 2020-2065. https://opb.georgia.gov/census-data/population-projections.

[10]Ozment, S.; Gartner, T.; Huber-Stearns, H.; DiFrancesco, K.; Lichten, N.; Tognetti, S. 2016. Protecting Drinking Water at the Source: Lessons from Watershed Investment Programs in the United States. World Resources Institute. https://files.wri.org/d8/s3fs-public/Protecting_Drinking_Water_at_the_Source.pdf

[11]American Water Works Association. 2014. AWWA Management Standard, Source Water Protection. ANSI/AWWA G300-14.

[12]American Water Works Association. 2016. Source Water Protection Guide to ANSI/AWWA Standard G300. Operational Guide to ANSI/AWWA G300-14.

Forum Results

A series of nine virtual forums were hosted in January and February 2021 to educate stakeholders and to solicit feedback on potential PES program scenarios that could be deployed in targeted watersheds in Georgia. Although this work was intended to occur in-person, the COVID-19 pandemic forced this work into an online format, and the nine sessions were all held remotely via Zoom video conferencing. The first 'kick-off' forum served as an introductory event for stakeholders throughout the state to gain broad knowledge on the project and PES program elements. The following eight forums specifically targeted landowners or water users and providers in four select watersheds: Lower Savannah, Middle Chattahoochee, Upper Oconee, and Lower Flint. These watersheds were selected based on the level of interest and engagement that already exists combined with their geographic and resource diversity. More than 200 individuals registered for the statewide forum and nearly 350 registered for the watershed forums. Top concerns with PES program development from a landowner perspective were the risk of overcomplicated agreements or restrictions on harvests or land use, whereas water users had a top concern of identifying and/or convincing stakeholders of the value of the PES program.

Considerations for PES Program Development

Based upon the work of this project, there are several insights and findings for GFF and the project partners to consider within the next steps to support the development of PES programs in Georgia and other parts of the Southeastern U.S. There are general considerations for PES program development as well as specific opportunities to be further explored within the targeted watersheds of interest in Georgia.

General Considerations for PES program development:

- **Collaborate and share understanding:** For PES Programs to be effective, there needs to be collaboration and alignment with multiple activities and interests. There needs to be support within regulatory structures, funding sources and markets. Activities must be undertaken and maintained to develop and grow landowner networks and program awareness; all while creating an operating program complete with legal agreements, payment systems, and oversight for accountability. Accomplishing all of this requires a strong, collaborative team. To establish a shared understanding across collaborators, it is important to consider formalization of the initiative with partner commitments, membership structures, a Memorandum of Understanding (MOU), regular events or meetings, an Advisory Council, branding, and/or other strategies to signal commitment to the work and a basis for collaboration.
- **Plan and invest :** Over the long run, PES programs can provide significant financial benefits over alternatives, but in the short run, there are trade-offs to consider because these programs need investment, resources, and personnel to get them started and operational. Investment is an essential component of PES program design and development. There needs to be sufficient investment for capacity as well as project payment funds. The research by Ozment, et al.[13] identified three development phases for watershed investment programs: Building Momentum, Designing the Program, and Implementing the Action Plan. An evaluation of the business case for investment and the identification of investors and financing mechanisms for initial and long-term funding are essential to the designing the program phase. To ensure PES program success it is essential that there be adequate funding support, assignment of key leadership and staff, and a game plan. Development of a 5-year plan, including fundraising targets and strategies, is a place to start.
- **Follow the science:** The foundational work by Moore, et al.[14] and the results of this current project continue to build the scientific basis for PES program development in Georgia and the Southeastern U.S. Additional research consolidation would assist in validating the value of maintaining managed forests for drinking water source protection in the region. These efforts could include further review of the science supporting forest and water quality and quantity dynamics as well as consideration of the economic value, land use comparison and additional research needs to demonstrate potential short- and long-term savings for water utilities' water treatment costs.

[13]Ozment, S.; Gartner, T.; Huber-Stearns, H.; DiFrancesco, K.; Lichten, N.; Tognetti, S. 2016. Protecting Drinking Water at the Source: Lessons from Watershed Investment Programs in the United States. World Resources Institute. https://files.wri.org/d8/s3fs-public/Protecting_Drinking_Water_at_the_Source.pdf

- **Geek out:** A PES program includes scientific understanding, modeling, GIS mapping, and all kinds of technology and analysis. While not everyone involved with the program needs to be an expert in these details, it is recommended that PES program managers become familiar with the interactive mapping tool options and that the entire team invest at a reasonable level in understanding the proper metrics to advance decision making and sharing of insights. It is recommended that water utilities evaluate their options and identify the situations and scenarios where a PES program is the optimum choice as a cost avoidance measure.
- **Know your watershed:** A PES program for water source protection requires and can serve as an impetus for gaining a deep and meaningful understanding of many aspects of the source area. Therefore, it is recommended PES program managers develop and seek out this knowledge, including consideration of their watershed's forested land use and its threats from conversion to urban land uses, wildfire, and insect and disease.
- **Know your neighbor:** Although a PES program is built on science and is all about protecting environmental functions, at the end of the day the success of the program relies on people, including the willing and interested participating landowners. A PES program team should get to know their local forest landowners, develop an understanding of the mix of interests they hold, and utilize best practices in communications and marketing to influence behaviors and outcomes within the prioritized groups of people. Specific tools like WoodsCamp can make landowner engagement more efficient, targeted, and scalable.

[14] Moore, R.; Williams, T.; Rodrigues, E.; and Hepinstall-Cymmerman, J. 2011. Quantifying the value of non-timber ecosystem services from Georgia's private forests. http://gatrees.net/utilization/ecosystem-services/index.cfm.

Considerations for the Targeted Watersheds of Interest in Georgia:

As detailed in Chapter 4, case study examples of existing PES programs illustrate responses to similar water resource threats and offer a variety of ways to approach surface water or groundwater resource protection, including varied conservation methods (i.e., land acquisition, easements, and/or management agreements). A review of these case studies shows the PES program method(s) that is used will impact program cost, scalability, and impact. Also as summarized in Chapter 4, it is important to identify the phase of development for a given watershed initiative to then align with appropriate and relevant actions. The identified phases to consider are "Building momentum", "Designing the Program", and "Implementing the Action Plan."[15] For each targeted watershed of interest in Georgia, general considerations are provided as a result of this project along with identification of the specific PES program approach that may be best suited and a reference to a case study example of the tool.

Middle Chattahoochee - *Develop a strategy for engagement with military presence is the watershed as a key partner*

Many stakeholders in this watershed believe that reforestation is a logical pathway to address nutrient challenges, although there was not a strong consensus on how to make that happen, including differing ideas on the details of a program structure. It was noted that BMP compliance is strong in the watershed, but additional incentives may need to be provided as developers have approached landowners and have gone as far as to encourage them to break contracts. To support an initiative, the military base presence in the watershed should be leveraged; both for program funding and for program leadership.

Based upon the ongoing efforts and the existing prioritization study that has been conducted in this watershed (see Chapter 5 for additional information), this watershed is in a "Building Momentum" phase of development. The tool that may be most appropriate for this watershed is Land Management Service Agreements or structured conservation easements that include support and incentives for desired land use practices. This approach is illustrated by the existing programs in Denver, CO.[16] The military is identified as a key potential partner and stakeholder within the Middle Chattahoochee. The focus on working forests, and a large Federal land use presence in this watershed can learn a great deal from the Denver Water project for some components. For instance, how the state engaged with the US Forest Service and rollout of working lands service agreements and addressing risks to forest health. For other topics, the forum suggested investigating the Bonneville Environmental, Beaver Lake Watershed (AR).

Lower Flint River - *Take a step back to identify partners, research needs, champions, and subject matter experts given unique conditions and situation in the watershed*

Turnout and engagement during this pair of watershed forums may indicate a lack of awareness or general hesitation towards PES programs. Furthermore, there appeared to be quite a disconnect between the sentiments from the landowner and water user forums. Landowners would like an opportunity to diversify revenue streams (and/or lessen tax burden) from lands, but they are unwilling to tie them up in long-term easements. The unique focus on groundwater and its relevance to agriculture and water supply may necessitate further investigation to ensure program success.

The tool that may be most appropriate for this watershed is Land Management Service Agreements that address Best Management Practices (BMPs) for forest and agricultural lands within targeted priority groundwater protection areas. This approach is illustrated by the experience with the American Farmland Trust BMP Challenge. Targeted Land Acquisition or Conservation Easements may be necessary to provide greater stability in protections overtime as illustrated by existing aquifer protection programs in Austin and San Antonio, TX.[17] This watershed is also in a "Building Momentum" phase of development.

[15] Ozment, S.; Gartner, T.; Huber-Stearns, H.; DiFrancesco, K.; Lichten, N.; Tognetti, S. 2016. Protecting Drinking Water at the Source: Lessons from Watershed Investment Programs in the United States. World Resources Institute. https://files.wri.org/d8/s3fs-public/Protecting_Drinking_Water_at_the_Source.pdf

[16] The Rio Grande program and the Denver water program are similar. However, the risk to human safety was much higher in the Rio Grande program. Not only was the risk of wildfire high like Denver Water, but flood and associated road and property damages were higher and impacted the political and financial development of the program.

Private landowners, including farmers, are key stakeholders to engage in this phase and for this watershed. The Flint River Mitigation Bank[18] comprised of three mitigation sites covering 840 acres in Fayette, Clayton and Spalding Counties may also offer important opportunities. The focus on working forest land presence is strong throughout the forum discussion, which again indicates lessons can be learned from the Denver Water experience. Groundwater protection (assuming the extent is the wellhead protection zones) could possibly benefit from exploring how the BMP challenge and TNC Forest Bank could be adapted to this watershed. Studies like the Bawa, Dwivedi 2019 paper could inform the watershed about how to implement alternative cropping methods to protect unconfined aquifers from nitrogen leaching. If the wellhead protection area is small, offering a mix of long-term conservation easements, short-term conservation easements, and fee simple purchase can also be considered (see the case study for San Antonio, TX).

Savannah River - *Need to develop further understanding of next steps and opportunities to build on existing work*

This watershed provides a unique opportunity to work within the coastal wetlands and communities as there is some skepticism that traditional reforestation across the landscape will provide enough benefit where BMP compliance is already quite high. The Savannah Port Authority has a vested interest in keeping shipping channels navigable, so leveraging that interest and targeting restoration of ecosystem health in those coastal areas is a great opportunity to address sediment challenges in the basin. Furthermore, the potential to continue work with the Savannah Clean Water Fund should not be ignored (see Chapter 5 for a description of these efforts). Based upon the existing efforts, this watershed is moving through the "Designing the program" phase of development.

The tools that may be most appropriate for this watershed includes easements for targeted priority areas and Land Management Service Agreements that support desired land use practices. The Port Authority and existing activities related to the Savannah Clean Water Fund and wetland banking are key considerations for this watershed. Raleigh Water is a very good match for many of the Lower Savannah desired approaches. Investigating the Raleigh Water approach would provide a deeper insight for how they work with multiple water supply utilities, and their unique blend of funding source types and conservation goals. Their surface drinking water source protection goals are designed around nine reservoirs and target both sediment and nutrients. The program has a notable high interest in implementing or protecting riparian forested corridors and land use conversion back into forested buffers. The program also applies a unique potential site weighted prioritization ranking system that considers many ecosystem services benefits, in part due to the wide variety of program collaborators.

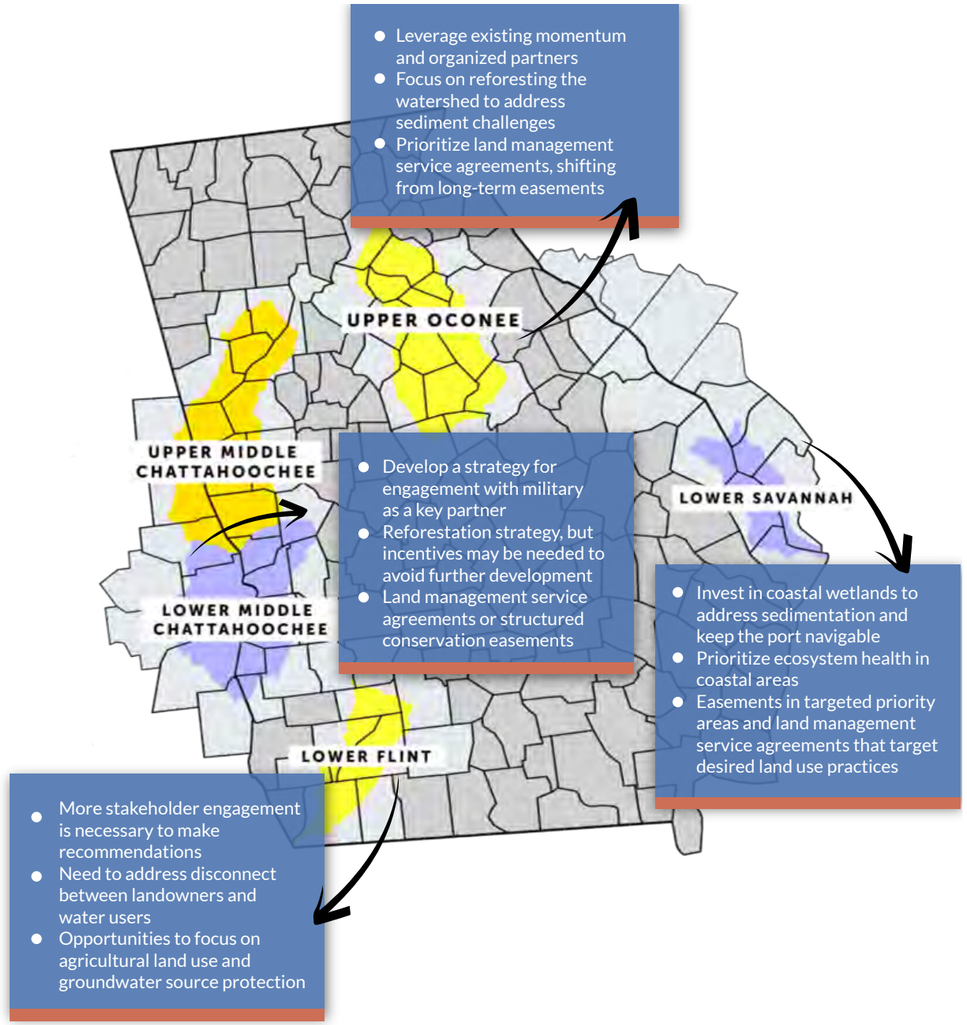
Upper Oconee - *Get going! All the pieces are in place to take action!*

This watershed's greatest asset is an existing coalition of partners (the Upper Oconee Watershed Partnership) that are motivated and trusted to carry out a PES program. Consensus was reached on sediment posing the most significant challenge to the watershed from both landowners and water users; likewise, both groups saw great opportunity in tree planting and forestry as a solution to that problem. Combatting pressures from developers and seizing opportunities for getting more trees on the ground should be the PES program focus, and the recreational interests in the basin should be leveraged for funding and broader program awareness. This strong existing practice and assessment results (see Chapter 5 for additional information) put this watershed closest to the "Implementing the action plan" phase of development.

The tool to add to the ongoing efforts in this watershed that may be most appropriate is Land Management Service Agreements as illustrated by the existing programs in Denver, CO and the Rio Grande Water Fund in New Mexico. It is important to move beyond the limitations of land acquisitions and permanent conservation easements to engage additional target priority areas within the watershed. The existing partnerships and the interests of recreational users and tourism organization should be prioritized within the next steps. Raleigh Water is once again a very good match for many of the Upper Oconee desired approaches. Investigating the Raleigh Water approach would provide a deeper insight for how they work with multiple water supply utilities, and their unique blend of funding source types and conservation goals. Their surface drinking water source protection goals are designed around 9 reservoirs and target both sediment and nutrients. The program has a notable high interest in implementing or protecting riparian forested corridors and land use conversion back into forested buffers. The program also applies a unique potential site weighted prioritization ranking system that considers many ecosystem services benefits, in part to the wide variety of program collaborators. In addition, the discussion emphasis on working forest land indicates learning more about Denver Water approaches would benefit the Upper Oconee watershed.

[17]San Antonio, Texas and Austin, Texas both draw water from the same aquifer, thou separated by many miles; and that aquifer is a karst aquifer. Karst features means that water transmission times are very fast.

[18]Flint River Mitigation Bank: http://www.wetlandcredits.com/



Conclusion

The State of Georgia is rich in both forest and water resources. It is a growing state that attracts people from all over the world to its economic opportunities and quality of life. With continued thoughtful planning and strategic actions related to understanding and protecting the relationships between forests and water in the state and region, there is every opportunity for benefits to accrue to landowners and water utilities. The foundational elements are already in place for successful payment for ecosystem services (PES) markets to develop, and the time is right to scale up the investment and impact. Likewise, this work has the potential to be foundational for program development throughout the states of the Southeast U.S.

Chapter 1. Introduction

Background

For over 20-years, the concept of Payments for Ecosystem Services (PES) has been evolving. During this time, an enhanced understanding of supporting sciences, potential frameworks, and protocol methods has emerged and continues to improve. One of the first PES programs was launched in Costa Rica in 1996 around the goal of reforesting large portions of the country. Since then, many PES program managers from around the globe have either studied the Costa Rica experience or launched their own efforts. Over time, PES programs have realized success, due in part to improvements in components like how to measure services, targeting of high value land, and implementation of efficient frameworks. Startups now can learn valuable lessons from past and existing programs.

This literature review provides a context for developing a PES program addressing forests and water in the state of Georgia and other areas of the Southeastern United States. It lays the foundation to understand the relevance of forest hydrology, addresses how best to connect and engage with private forest landowners for participation, identifies ecosystem service opportunities within Georgia's private forests, and finally, outlines PES mechanisms and provides case studies that illustrate potential frameworks.

Each component of a PES program influences potential participation. Key influential PES program components include performance expectations, operation protocols, legal agreements, and payment terms. To improve program participation by landowners and other partners, an understanding of each of their short-term needs and long-term goals is needed.

PES programs and their design are intended to be collaborative efforts. These programs can work alongside other conservation efforts to preserve good operations and foster improvements where necessary in order to achieve a triple bottom line benefit. A triple bottom line, as applied in this context, means the participants on both sides of the purchase either profit or save financial resources, and both the watershed community and the environment benefit from the program. Over time, by investing in the development of a large list of collaborators, the effort to connect and understand landowner and other participant's interests, needs, and long-term plans will be easier to achieve.

A watershed moment for advancing payments for ecosystem services

In the early years of national and international consideration of PES program options, the United Nations kicked off a series of science-based reports to help inform the understanding of ecosystem services. The United Nations established working groups consisting of more than 1,360 experts who met from 2001 to 2005. These working groups released the Millennium Assessment (MA) reports (United Nations, 2005).[19] The United Nation's MA reports emphasize that human well-being is directly tied to ecosystem health; and unfortunately, conducting business as usual is degrading the very ecosystem services on which we are dependent. The assemblage of MA reports emphasizes a consistent theme of the urgent need for ecosystem services to be protected and restored. The reports gave all nations a strong warning that the very ecosystems we depend on to provide goods and services are being degraded at levels that could result in limiting how ecosystem services provide for human well-being, and this trend will continue if there is not a substantial change in the way business is conducted.

[19]United Nations. 2005. Millennium Ecosystem Assessment. https://www.millenniumassessment.org/en/About.html#9.

[20]United Nations. 2005. Millennium Assessments: Ecosystems and Human Well-being: Synthesis. http://www.millenniumassessment.org/en/Synthesis.aspx

As stated in the reporting:

"Because many ecosystem services are not traded in markets, markets fail to provide appropriate signals that might otherwise contribute to the efficient allocation and sustainable use of the services."[20]

The MA reports define ecosystem services as "the benefits provided by ecosystems". The definition is further expanded in one MA report entitled Millennium Assessments: Ecosystems and Human Well-being: Synthesis (2005),[21] explaining four separate categories of service types provided:

- Provisioning services: food, fiber, fuel, genetic resources, medicines, ornamental resources, and fresh water
- Regulating services: the regulation of air quality, climate, water purification, disease, pest, pollination, and natural hazards
- Cultural services: cultural diversity, spiritual and religious values, knowledge systems, educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, and recreation and ecotourism
- Supporting services: soil formation, photosynthesis, primary production, nutrient cycling, and water cycling

Provisioning of clean, abundant water is one of the most universal and important ecosystem services discussed by the MA experts and other researchers. Because many production and market systems have not traditionally included valuing ecosystem services, investments made today to sustain these services must be designed to provide protection for, or restoration of, healthy ecosystems (Salzman 2010).[22] In a growing number of locations, communities are facing shortages in services like clean drinking water, or support for the provisioning of goods, such as water used in agricultural irrigation.

The MA reports provide constructive guidance on how to correct the threats to ecosystems services and identify promising and effective responses for specific sectors, including agriculture, fisheries and aquaculture, water resources, and forestry.

The MA reports describe effective and promising ecosystem service responses as:

- A response is considered effective when it enhances the target ecosystem services and contributes to human well-being without significant harmful impacts on other groups of people.
- A response is considered promising if it does not have a long track record to assess but appears likely to succeed or if there are known ways of modifying the response so it can become effective.

Protecting forestry land use, discouraging improper forest management, and preventing land use conversion away from forestry, are listed in several instances in the MA report guidance. Not only is forestry in the list of effective and promising responses, but forest management is also woven into many discussions in the water category, which lists using a PES approach first in its illustrative list of effective and promising responses.

[21]United Nations. 2005. Millennium Assessments: Ecosystems and Human Well-being: Synthesis. http://www.millenniumassessment.org/en/Synthesis.aspx

[22]Salzman, J. 2010. Designing Payments for Ecosystem Services. PERC Policy Series, No. 48, 2010. https://www.perc.org/2010/10/27/designing-payments-for-ecosystem-services-2/.

Project purpose

The Georgia Forestry Foundation (GFF) invested in this work to broaden the understanding of PES programs, identify potential opportunities, and to increase engagement with private forest landowners. PES programs offer a means to assist private forest landowners by providing technical and financial assistance deemed necessary to reduce forestland conversion into other land uses, improve water quality, and sustain water quantity. This literature review, informed by expert interviews and focus groups, identifies and opens the door to proven forest-to-water PES frameworks for resource and environmental managers. This work builds upon previous research and studies in Georgia that explored and quantified ecosystem services and market opportunities. A key piece of prior work is Moore, et al.[23] which identified eight Georgia ecosystem services that forests provide (MA categorization provided in parenthesis):

- Timber and forest production (provisioning)
- Recreation (cultural)
- Greenhouse gases (GHG) and climate regulation (regulating)
- Water quantity and quality (provisioning + regulating)
- Soil formation and stability (supporting)
- Pollination (supporting)
- Habitat/refugia (supporting)
- Aesthetic, cultural, and passive use (cultural)

This work also builds upon established watershed level projects and partnerships in Georgia. Existing investments from the State of Georgia and the Georgia Forest Foundation include financially supporting the startup and advancement of the Savannah River's Clean Water Fund (SRCWF).[24] This PES program is the first of its kind in the region and includes portions of Georgia and South Carolina. The program includes five drinking water utilities participating as buyers in efforts to sustain the local forest's ability to provide water ecosystem service benefits for communities and companies operating in the Savannah River Watershed.[25] Recently, International Paper became the first partner from the private sector to join the list of buyers participating in this Clean Water Fund.[26]

Additional foundational knowledge for building PES program capacity within Georgia include the Georgia Forestry Foundation report entitled: Quantifying the value of non-timber ecosystem services from Georgia's private forests[27] and the Georgia Forestry Commission's reports entitled Conservation and Restoration Priorities in the Middle Chattahoochee River Basin,[28] and Conservation and Restoration Priorities in the Upper Oconee River Basin.[29] These reports and many other sources of information are referenced throughout this literature review and a full listing of references can be found in the appendix.

[23] Moore, R.; Williams, T.; Rodrigues, E.; and Hepinstall-Cymmerman, J. 2011. Quantifying the value of non-timber ecosystem services from Georgia's private forests. http://gatrees.net/utilization/ecosystem-services/index.cfm.

[24]Savannah River Clean Water Fund. 2020. The Nature Conservancy Water Funds Toolbox. https://waterfundstoolbox.org/regions/north-america/savannah-river-clean-water-fund-georgia.

[25]Personal communication; Lisa Lord. (Program Manager, Savannah Clean Water Fund). 3 September 2020.

[26]International Paper Joins Savannah River Clean Water Fund. 3BL: CSR Wire. 06 August 2020. https://www.csrwire.com/press_releases/45536-international-paper-joins-savannah-river-clean-water-fund

[27]Moore, R.; Williams, T.; Rodrigues, E.; and Hepinstall-Cymmerman, J. 2011. Quantifying the value of non-timber ecosystem services from Georgia's private forests. http://gatrees.net/utilization/ecosystem-services/index.cfm.

[28]Elkins, D.; Gerrin, W. 2019. Conservation and Restoration Priorities in the Middle Chattahoochee River Basin. https://gatrees.org/wp-content/uploads/2020/04/Final-Report-Middle-Chattahoochee_WMPI_PriorityAreas-Aug2019.pdf.

[29]Dwivedi, P.; Benez-Secanho, F.J.; Skaggs, J.; Elkins, D.; Gerrin, W.; Lord, C. 2020. Conservation and Restoration Priorities in the Upper Oconee River Basin. https://gatrees.org/wp-content/uploads/2020/04/Upper_Oconee_Watershed_GIS_Mapping_Analysis_Report_UGA_Dwivedi_March192020.pdf.

Report outline

The chapters in this report build upon the foundational knowledge about PES program opportunities in Georgia by providing additional details about forest hydrology, how best to connect and engage with private forest landowners, ecosystem service opportunities within Georgia's private forests, and finally, outlining PES mechanisms and case studies that illustrate potential frameworks.

The following chapters in this report build upon the existing foundational knowledge and address many dimensions of forest-water PES program opportunities in Georgia as briefly described below:

- **Chapter 2. Linking forests to water in Georgia:** Throughout Georgia, and the Southeastern United States, drinking water is drawn from regions that are dependent on the health of forests and proper forest management. This chapter highlights why forest land use matters and is organized to address hydrology, geology, land use, and the forest to water connection.
- **Chapter 3. Connecting with private landowners:** Georgia has approximately 24 million acres of forest covering 67% of the state's land area. These forests are primarily privately owned (22 million acres). However, there are many categories and characteristics of private land ownership that make it impossible and inappropriate to treat this as a homogenous group. This chapter explores forest ownership in Georgia with a focus on the various types of private forest landowners, their interests and needs, and effective engagement strategies and tools.
- **Chapter 4. Models of PES programs for water resource protection:** This chapter addresses approaches to water resource protection, including a discussion of the urgency of the situation in Georgia. Case study examples of PES programs from around the U.S. are described and categorized by surface water and groundwater priorities and method of conservation (i.e., land acquisition, easements, and/or management agreements). The case studies provide insight from existing program experiences, including benefits and outcomes that can inform opportunities in the Southeast.
- **Chapter 5. Integrating Source Water Protection Planning and Target Area Prioritization for PES Program Development:** This chapter's discussion follows the Source Water Protection standard and guidance manual provided by the American Water Works Association (ANSI/AWWA, 2014;[30] AWWA 2016[31]) as a strong platform for watershed assessment programs that include an element of source water assessment planning. The examples of assessment techniques, including those already in use in Georgia, are provided for consideration in the design and development of a PES program.
- **Chapter 6. Structuring options for legal agreements to enhance private forest landowner engagement:** This chapter addresses various models and recommended approaches for legal agreements and operational structures with landowners engaged in PES programs. Additional information about legal agreements is included in Appendix C
- **Chapter 7. Forum Results:** This chapter shares the results of watershed forums (focus groups) held in January and February 2021 to gather additional information to inform the project and to test receptivity to various potential frameworks for PES program design. Additional information about the forum design and a list of participants is included in Appendix D.
- **Chapter 8. Considerations, Recommendations, and Conclusions:** This chapter provides the outcomes resulting from this project, including general considerations, recommendations for next steps, and conclusions. Several near-term and longer-term opportunities exist for Georgia and other states in the Southeastern U.S. to advance and hold a leadership position on PES program design and implementation; however, time is of the essence.

[30]American Water Works Association. 2014. AWWA Management Standard, Source Water Protection. ANSI/AWWA G300-14.

[31]American Water Works Association. 2016. Source Water Protection Guide to ANSI/AWWA Standard G300. Operational Guide to ANSI/AWWA G300-14.

Chapter 2. Linking Forests to Water in Georgia

Introduction

Throughout Georgia and the Southeastern United States, drinking water is drawn from regions that are dependent on the health of forests and proper forest management. This chapter highlights why forest land use matters and addresses hydrology, geology, land use, and the forest to water connection.

Hydrology

The science of hydrology deals with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere. Georgia is a state with substantially diverse regional characteristics in land use, geologic structure, and precipitation rates. Georgia is also distinguished by its biodiversity, including approximately 400 unique species of trees and other plants growing in forest types that range from humid-subtropical to temperate, sub-alpine and alpine zones across the state.[32] Analysis completed by the Georgia Forestry Commission (GFC) found that 60.5% of the watersheds used for drinking water in the state are forested with these forests cleansing the water utilized by most of Georgia's residents and visitors. The state's hydrologic intensities and seasonal differences combine to create different water circulation dynamics, storage and yield capacity, and susceptibility to pollutant impacts. Some of the regional characteristics can be influenced by human activities and land use conversion (e.g., vegetative cover), while other characteristics are more difficult to influence (e.g., geology and how it relates to an aquifer's water yield). The following summary of literature provides the science-based logic supporting responsible forest management as a vital supplier of water ecosystem services.

Precipitation and Climatic Variability

At the statewide scale, the amount, intensity, magnitude, and duration of rainfall is the fundamental regional determinant of hydrologic cycles, influencing all large-scale delineations of geographic zones. While geographic zones also contain differences in characteristics such as geology, land management, and vegetative cover, these secondary characteristics are limited to influencing the conveyance, storage, and rate of the precipitation provided. An exception to this tenant is found in coastal areas where a large body of water (i.e., the Atlantic Ocean) saturates coastal soils to the extent that the shallow groundwater becomes a dominant source of both surface and groundwater that alters the zone's hydrology.

According to a recent review of data, average annual rainfall in the Southeastern U.S. has remained relatively constant from 1951 to 2014 and ranges from approximately 48 to 80 inches across the region (Figure 2.1).[33,34,35]

In addition, Ingram, et al. (2013)[36] illustrated a method first published by Kunkel, et al. (2003)[37] to produce an extreme precipitation index graph from 1900 to 2013 (Figure 2.2). T he analysis of extreme precipitation events highlights the biggest precipitation events have been increasing in magnitude for over a century. The index trends include a running average for both 1-day and 5-day events. The 5-day event trend line indicates that while annual average results remain about the same over the past 60 years, the extreme events have continued to increase. The increase in extreme events can create ancillary impacts from increased erosion and riverbank destabilization when soil surfaces are not protected.

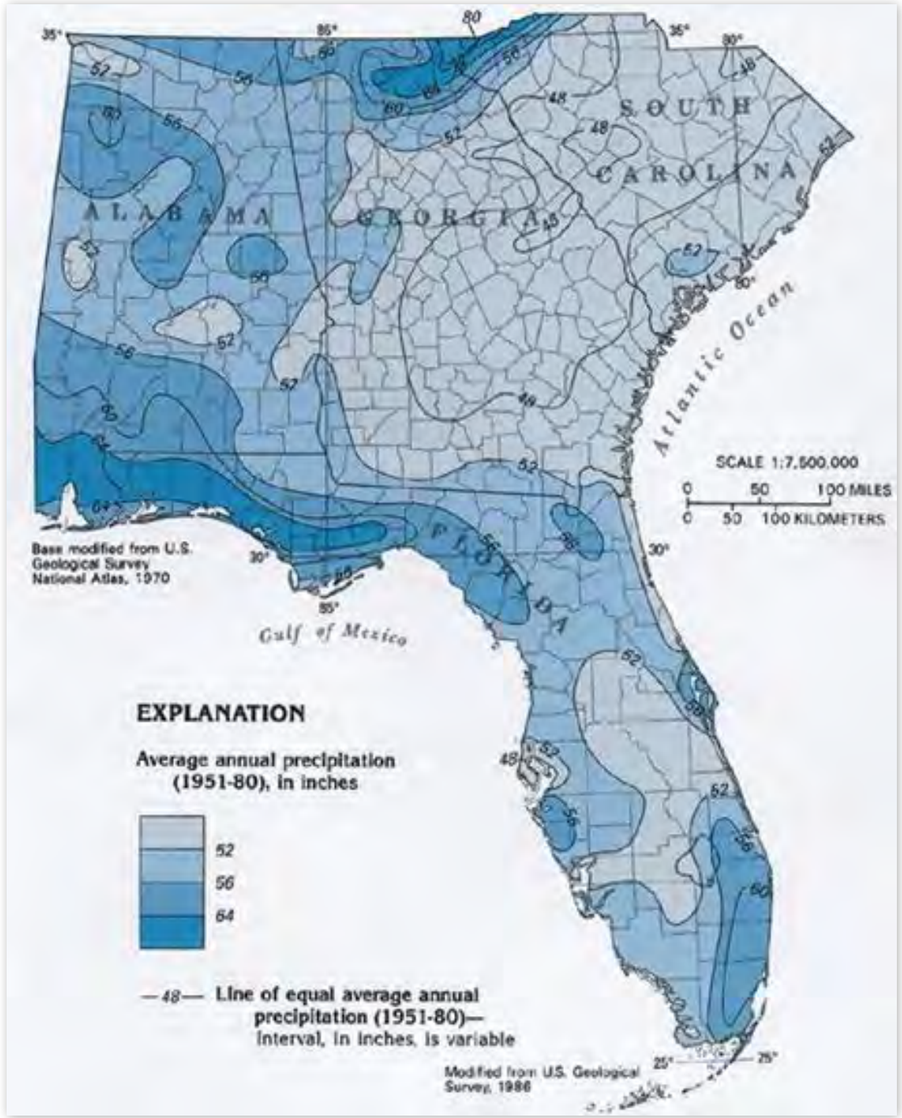


Figure 2.1. Average annual precipitation (1951 - 1980) ranges from approximately 48 to 80 inches (USGS, 1990)

[32]Patarkalashvili, T. Forest biodiversity of Georgia and endangered plant species. Annals of Agrarian Science, Volume 15, Issue 3, 2017, Pages 349-351, ISSN 1512-1887, https://doi.org/10.1016/j.aasci.2017.06.002. (https://www.sciencedirect.com/science/article/pii/S1512188717301070)

[33]U.S. Geological Survey. 1990. Ground Water Atlas of the United States; Segment 6, Alabama, Florida, Georgia, and South Carolina. https://pubs.usgs.gov/ha/730g/report.pdf.

[34]Oregon State University. 2014. Average Annual Precipitations (1981-2010) Georgia. https://prism.oregonstate.edu/projects/gallery_view.php?state=GA.

[35]Southeast Regional Climate Center. 2014. Prism Precipitation Maps for the Southeast U.S. http://152.14.35.221/prism.

[36]Ingram, K.; Dow, K.; Carter, L.; Anderson, L. 2013. Climate of the Southeast United States: Variability, change, impacts, and vulnerability. Washington DC: Island Press.

[37]Kunkel, K.E.; Easterling, D.R.; Redmond, K.; Hubbard, K. 2003. Temporal variations of extreme precipitation events in the United States: 1895-2000. Geophysical Research Letters 30; doi:10.1029/2003GL018052.

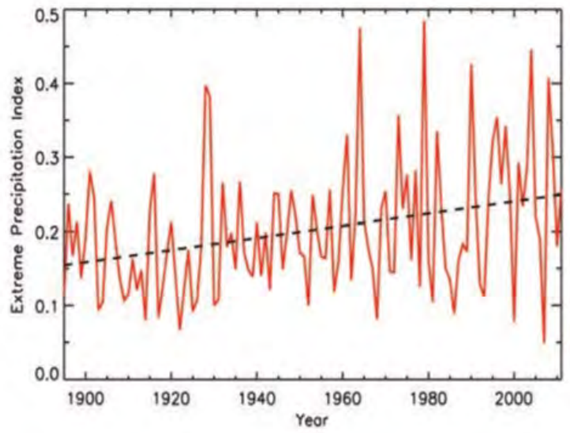


Figure 2.2. Time series (1900-2013) of the extreme precipitation index (using a 5-year running average) for the southeast 1-day occurrence, 1 in 5-year extreme precipitation events (red/gray line and a 5-day, 1 in 5-year events black/dashed line) (Ingram, et al., 2013

Forest hydrology

The National Research Council illustrates forestry hydrology in Figure 2.3. According to the National Research Council (2008),[38] based on a water balance approach, the amount of precipitation is the dominant control on the amount of runoff. The timing and type of precipitation directly affect the amount and timing of runoff. A second major control on runoff is the transfer of water to the atmosphere by evaporation and transpiration (evapotranspiration, or ET) from vegetation, including trees. A third controlling factor on the volume of runoff is the amount and rate of water that can be infiltrated and stored in soils or flow through soils as groundwater. Although surface and groundwater hydrology are undoubtedly connected, forest hydrology typically includes less surface flow, and higher sub-surface flow within a few meters of the ground surface, as influenced by the soil's infiltration rates and canopy and duff layers' ability to retain water.

Of interest in Figure 2.3 is the inserted graphic illustrating a delay in the downstream hydrograph as compared to the timing of rainfall. Forest hydrology has a runoff and shallow groundwater timing delay before the point in time where water enters a stream. This benefits stream hydrology by dampening downstream hydrographs, meaning there are lower peak flows. Lowering the peak flows reduces the stream's power to move channel sediment, which in turn assists with bank and channel stability.

[38]National Research Council. 2008. Hydrologic Effects of a Changing Forest Landscape. Washington, DC: The National Academic Press. https://doi.org/10.17226/12223.

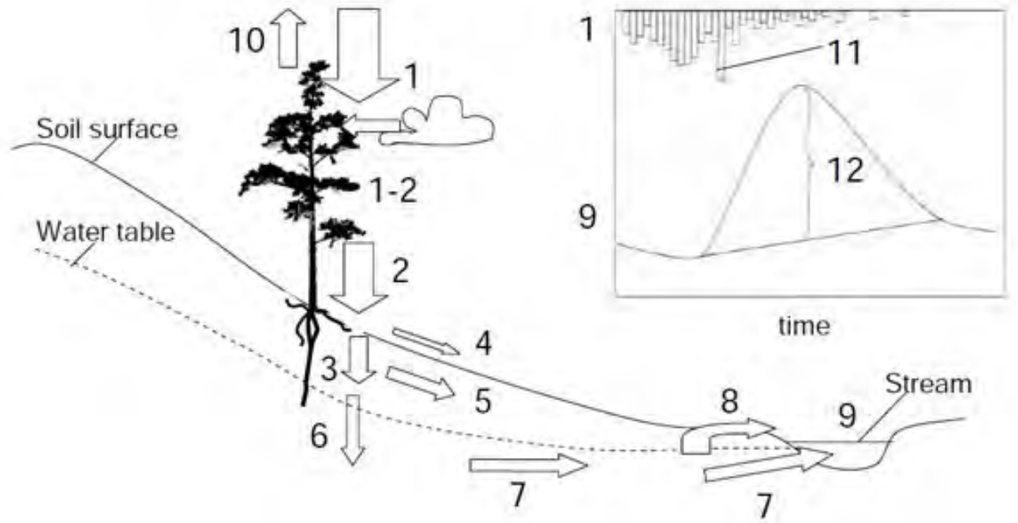


Figure 2.3. Elements of the water balance in a forest: 1 = precipitation (rain, snow, cloud water deposition); 2 = net precipitation; 1- 2 = interception; 3 = infiltration; 4 = surface runoff, or infiltration excess (Horton) overland flow; 5 = subsurface flow, or lateral subsurface flow; 6 = groundwater recharge; 7 = groundwater flow; 8 = saturation excess overland flow; 9 = discharge or streamflow; 10 = evapotranspiration; 11 = precipitation intensity; 12 = peak flow or peak discharge. Although it is not shown, understory vegetation also contributes to these processes. (National Research Council, 2008).

The U.S. Forest Service Handbook of Applied Hydrology (2016)[39] uses a water balance/water budget approach to explain the unique features in the forest hydrology process. The handbook explains the forestland use hydrology comparison with that of other land uses succinctly: "Crop cultivation, silvicultural activities, and urbanization alter watershed hydrology by influencing both soil properties and vegetation transpiration processes;" (quote attributed to another article by Sun and Luckaby, 2012).[40] Compared to the majority of agricultural and urban settings, forests have relatively large above-ground and below ground biomass and perennial woody plants with long life spans. Sun, et al. go on to state that mature forests have lower ratios of reflected radiation, higher canopy surface roughness, leaf area index, and deeper roots compared to crops and grass. These plant properties have a strong influence on the energy and water balance. Forested areas have relatively higher evapotranspiration along with lower water yield, groundwater tables, and surface temperatures than other land covers.

Local forest hydrology in headwater systems provides a more stable flow that has lower peak flows in wet periods and higher low flows during dry periods. The soil structures under the forest land cover typically have high organic matter, large networks of macropores and animal burrows, and topsoil covered by thick leaf litter (duff layer). Consequently, forests have an extremely high infiltration capacity that often exceeds rainfall intensity, resulting in little runoff and surface erosion. Finally, forests have deeper root networks than crops and most grasses; therefore, trees are rarely under water stress and forest evapotranspiration rates are generally stable, except under prolonged droughts.

[39]Sun, Ge.; Amatya, D.; McNulty, S. 2016. Forest Hydrology; Chapter 85 Forest Hydrology; Part 7 Systems Hydrology, Handbook of Applied Hydrology, Ed. V.V. Sing, 85-1:85-8. https://www.srs.fs.usda.gov/pubs/52800.

[40]Sun, Ge; Lockaby, B. Graeme. 2012. Water quantity and quality at the urban-rural interface. In: Laband, D.N.; Lockaby, B.G.; Zipperer, W., eds. Urban-Rural Interfaces: Linking People and Nature. American Society of Agronomy, Crop Science Society of America, Soil Science Society of America. Madison, WI. 29-48. https://www.fs.usda.gov/treesearch/pubs/41266

Some of these forest attributes could appear to be a detriment to water quantity in scarce times. Furthermore, one could believe the local hydrology is not necessarily beneficial if they do not understand forest hydrology is substantially different from traditional hydrology applied to other land uses where surface flow (runoff) is the dominant source of water for streams. Sun, et al. and Amatya, et al. (2015)[41] refers to forest hydrology sciences that have documented the potential of overland flow is reduced, as is the potential for lower total streamflow, and lower peak flows. Forest streamflow generally originates from subsurface flow or groundwater discharge at headwater streams. The research by Hewlett and Hibbert (1967)[42] explains the forest stream hydrology as a variable source area concept. They state that stormflow in forested watersheds is generated from surface inflow in stream channels and subsurface quick flows. The area of forested land that contributes to streamflow can expand and shrink over time, and streamflow is sustained by soil moisture (Hewett, 1982).[43]

As a narrative to illustrate how forest hydrology works: as it rains sufficiently for precipitation to reach the forest floor, the forest soils fill with moisture. As the soils become saturated, the shallow groundwater flows downhill to adjacent streams. During rainfall periods, the contributing soils that recharge streams expand in total area because the groundwater is flowing through soil micro and macro pores where the soil structure itself regulates the release rate of water to the stream. Overtime, when precipitation is no longer supplying water through soil infiltration, the area of soils saturated in water shrinks, only to expand again in the next large rainfall. This variable source area concept replaces the stream dynamics of surface runoff causing potentially higher hydrograph peaks and variability (flashiness) by dampening the water's release to the stream at any one time, because the soils regulate the water release and create a more stable headwaters flow with lower peaks and higher base flows.

Each of the individual forest attributes (i.e., canopy evapotranspiration, soils, and duff layers) contribute to regulating water quantity and quality. Hydrology from dominantly forested watersheds is typified by streams with lower peak flows and higher baseflow than streams generated by runoff from other land uses and the water quality tends to be better (i.e., less sediment and other contaminants).

Georgia geology and hydrology

Georgia and other Southeastern states enjoy a highly productive countryside and robust economy driven in part by geology. The USGS Ground Water Atlas; Region 6 (1990),[44] speaks to the physical dynamics of Georgia's groundwater and surface water as it relates to bedrock and the presence, or lack of, confining layers. Figure 2.4 provides the surface mapping for the physiographic provinces in several Southeastern states that influence groundwater sources.

[41]Amatya, D.M.; Sun, G.; Rossi, C.G.; Segane, H.S.; Nettles, J.E.; Panda, S. 2015. Forests, land use change, and water, Impact of Climate Change on Water Resources in Agriculture, edited by R. Rodrigues, CRC Press/Taylor & Francis, 2015. Boca Raton, FL.

[42]Hewlett, J.D.; Hibbert, A.R. 1967. Factors affecting the Response of Small Watersheds to Precipitation in Humid Areas. Forest Hydrology, 275-290, 1967.

[43]Hewlett, J.D. 1982. Principles of Forest Hydrology. University of Georgia Press, Athens, GA, 1982

[44]U.S. Geological Survey. 1990. Ground Water Atlas of the United States; Segment 6, Alabama, Florida, Georgia, and South Carolina. https://pubs.usgs.gov/ha/730g/report.pdf.

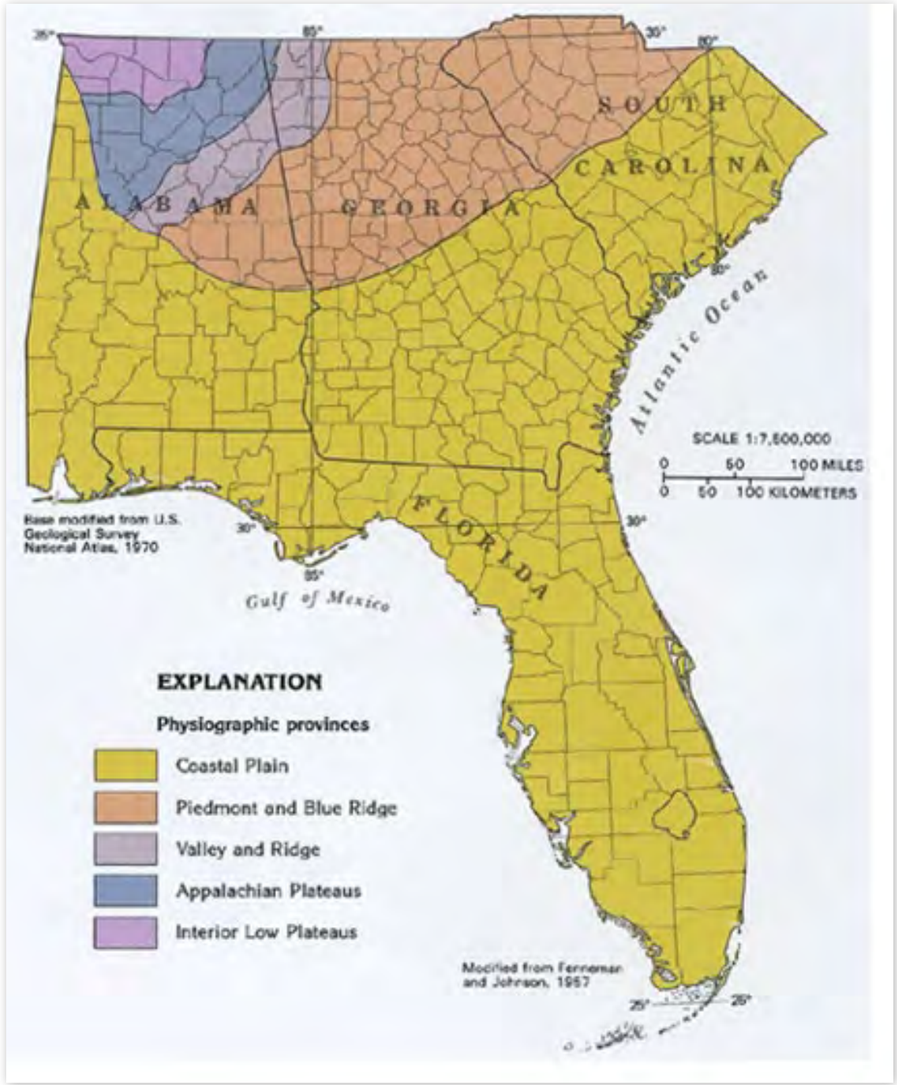


Figure 2.4. Six physiographic provinces are represented in Southeast U.S. (USGS, 1990)

Two of the physiographic provinces are grouped together in Figure 2.4, Piedmont and Blue Ridge (shown in orange and dominating North Georgia). These two provinces are combined because of similarity in geology and hydrology. In Georgia, the headwaters located within the Piedmont and Blue Ridge Provinces contribute significantly to the surface water supply for water utilities. These headwaters are linked to downstream water consumers even in the Coastal Plain watersheds which are known for their groundwater sources. Geology and groundwater flow are a three-dimensional science. It is not uncommon for groundwater to flow against the surface water flow direction which is based on land elevations. As Figure 2.5 illustrates for Southeastern states, infiltrated water has many pathway options, and the pathway at any one location is predicated by evaporation, transpiration, multiple layers of soil (each with their own hydraulic capacity), confining layers, and confined aquifer water pressure. As is often illustrated, the groundwater flow path rises back to the surface as evapotranspiration or inflow into streams.

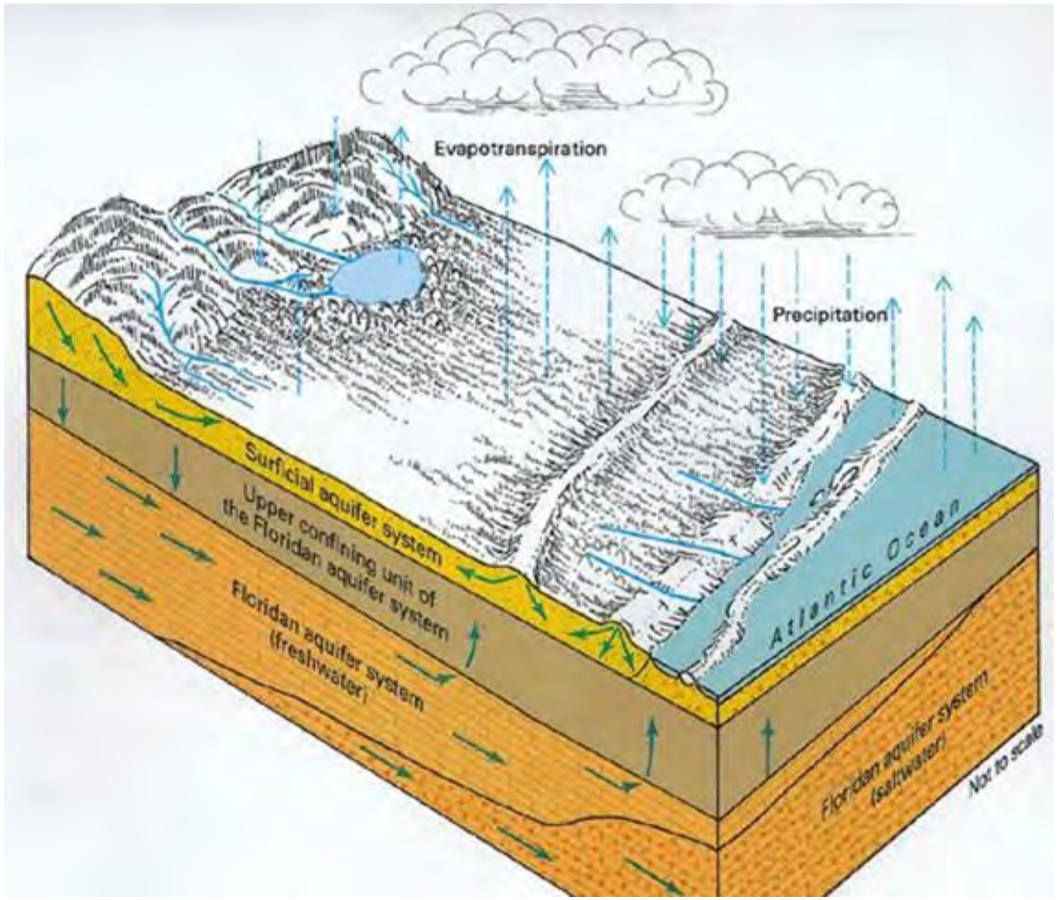


Figure 2.5. Water moves quickly in and out of the surficial aquifer system. Some water leaks between the system and the underlying Florian aquifer system. The solid arrows show the general direction of groundwater movement (USGS Ground Water Atlas, 1990).[45]

The major aquifer systems in Georgia are illustrated in Figure 2.6 and further detailed in the USGS Ground Water Atlas (1990).

[45]Available here: https://pubs.usgs.gov/ha/730g/report.pdf

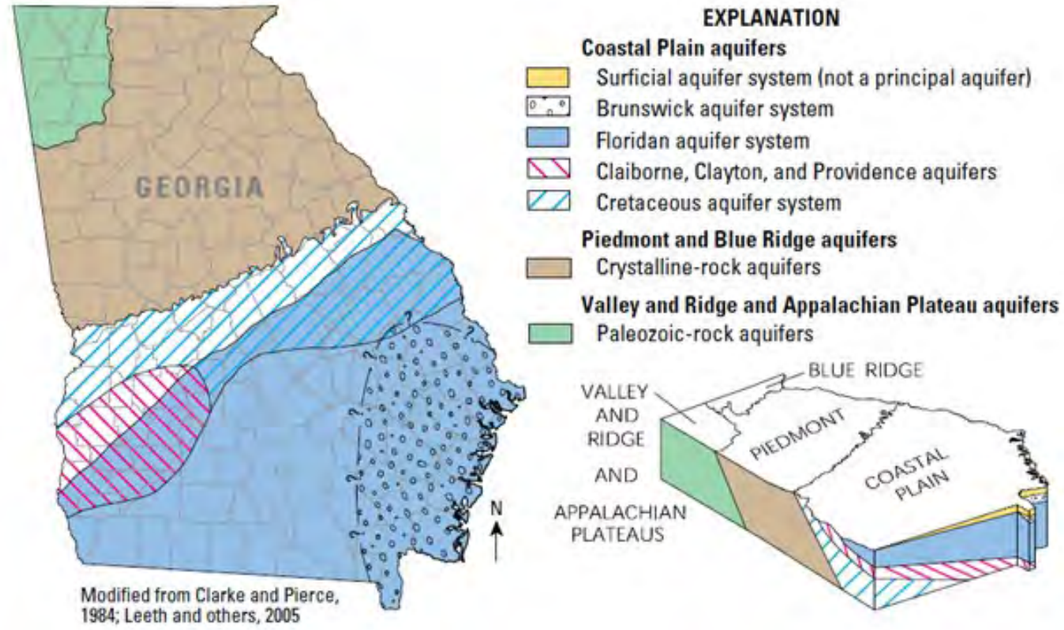


Figure 2.6. Seven major aquifers within Georgia (USGS Fact Sheet 2006-3077)[46]

In Figure 2.7, the USGS illustrates the Floridan Aquifer, which is a dominant supply source for well water fed municipal water utilities below the Piedmont, from the Coastal Plain south (i.e., below the "fall line")[47] . In Figure 2.7, the USGS focuses on the area where this aquifer is at or near the surface (i.e., lacking a confining layer). Where there is a lack of a confining layer, the measure of protection that would have been provided by the tighter clay layers is missing (confining layers are illustrated in Figure 2.5). Having an upper confining layer requires more water travel time before reaching the drinking source aquifer, which adds more time for nitrate redox to occur. Nitrate redox is a biochemical reaction driven by anaerobic bacteria that converts nitrates into N2 gas or ammonia. Unconfined aquifers have aerated soils near the surface which do not allow anaerobic bacteria to exist, and the depth to groundwater can also reduce the amount of redox that occurs due to shorter travel times. Inversely, groundwater located in confined aquifers typically has been anoxic groundwater for much longer periods of time, which allows for more anaerobic bacteria reduction of nitrate-nitrogen to occur. Additionally, multiple sources of leachable pollutants exist at the surface; synthetic or organic fertilizers, irrigation either with high chemical concentrations or that result in soil water pH changes that influence other mineral releases (e.g., sodium), rural water softeners, and septic systems. Unconfined or thinly confined aquifers are at greater risk of contamination associated with land use changes and conditions of increased surface runoff and overland flow.

[46]U.S. Geological Survey. 2006. Fact Sheet 2006-2077: Georgia's Ground-Water Resources and Monitoring Network. https://pubs.usgs.gov/fs/2006/3077/pdf/fs2006-3077.pdf

[47]For more information, see: https://www.georgiaencyclopedia.org/articles/geography-environment/fall-line

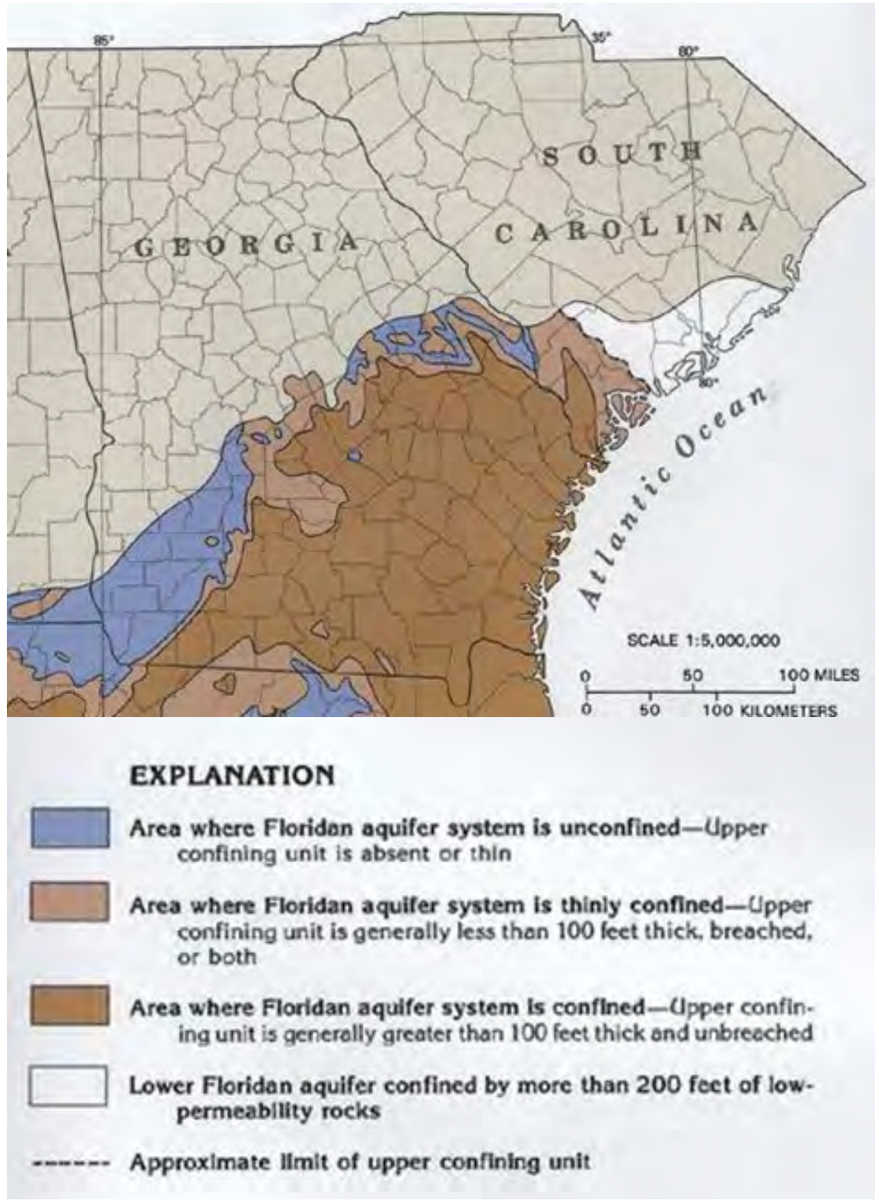


Figure 2.6. The clayey rocks of the upper confining unit of the Floridan Aquifer system have been eroded away completely in places and are just under 100 feet thick in other places. Large solution openings, some of which cause sinkholes, are developed in the Floridan chiefly where this confining unit is thin or absent (USGS Ground Water Atlas, 1990).

A state's hydrology and hydrogeology regulate flow paths and water yields of drinking water aquifers and stream recharge. Understanding how the forested land interacts with the physiographic characteristics sets the level of water quantity and quality that forestland use can provide as a benefit. Gathering a base understanding of the physiographic setting, land use ratios, and hydrology is an important starting point for forestry-based PES programs (also see Chapter 5 for further discussion of assessment techniques).

Land use and impact to hydrology

Within Georgia, there are over 36.6 million acres of land and approximately 1.4 million acres of water (NRCS, 2016).[48] Figure 2.8 details the distribution of land use types in the state and shows that forests are a clearly dominant land use at nearly 60% (approximately 22 million acres).

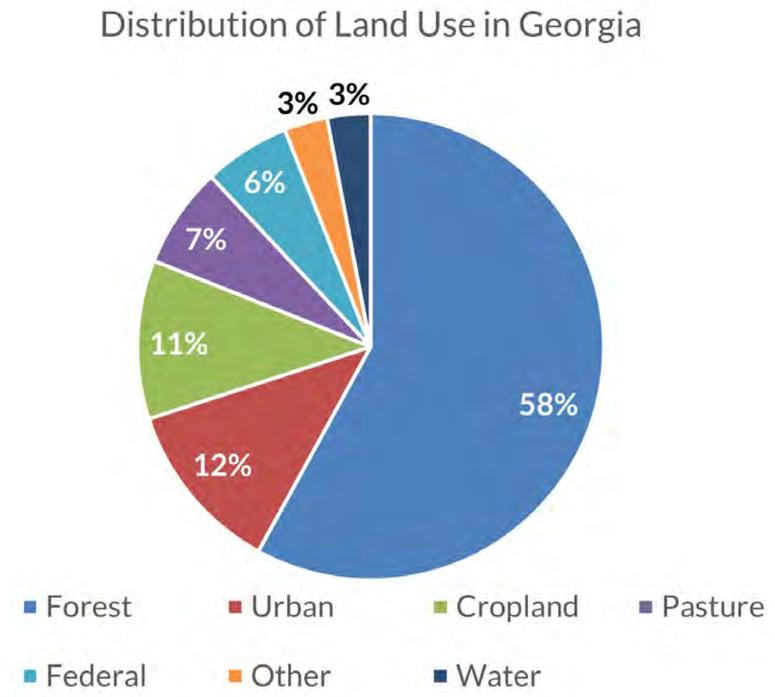


Figure 2.8. State of Georgia land use distribution (USDA NRCS, 2016)

Forestry provides fiber, wood products, renewable energy, wildlife habitat, recreation opportunities and many other benefits. Agricultural operations provide our food supply, improve our economy, and bring other quality of life values to our country. Urban areas are necessary to support many of our family needs, giving us access to jobs, homes, education, and medical services. A successful PES program strategy acknowledges the value of these land uses while supporting land use conditions and trends that maintain ecosystem services. Maintaining a stable, forested land cover has an important influence on water. The NRCS reviewed land use changes from 1982 to 2012 (30-years) and found that urban development in Georgia increased by 2.35 million acres, with the highest land use conversion being from forested land. Further land use changes are projected for Georgia and the Southeastern U.S. (Chapter 3 discusses land use change and trends in greater detail within the context of private land ownership, and Chapter 4 examines the urgency of Georgia's growing water demand in the context of urban development). Converting land use impacts how forest hydrology performs.

Several paired watershed studies are summarized in Sun and Lockaby (2012) that can inform managers on the balance between forest, agriculture, and urban land uses in a watershed. Boggs and Sun (2011)[49] compared a North Carolina 0.7 km2 urban area with 44% impervious surface, to an adjacent fully forested 2.95 km2 watershed. The results of this study found that discharge divided by precipitation (mean annual

[48]U.S. Department of Agriculture. 2016. Georgia's Land: Its Use and Condition Fourth Edition, Natural Resources Conservation Service, Athens GA, and Center for Survey Statistics and Methodology, Iowa State University Ames, Iowa.

[49]Boggs, J.; Sun, G. 2011. Urbanization Alters Watershed Hydrology in the Piedmont of North Carolina. Ecohydrology 4:256-264. https://onlinelibrary.wiley.com/doi/abs/10.1002/eco.198.

discharge coefficient) was double for the urban area. Stormwater flows from the urban area were 75 times higher than the forested area, with peak flows and storm volumes 13 times higher. Another study by Ferguson and Suckling (1990)[50] around Atlanta, Georgia in the Piedmont physiographic province, documented that conversion to urbanized land use (at 35% of total impervious area) increased peak flows and total discharge in wet years, and decreased low flows in dry years.

These concepts are illustrated in Table 2.1 by using a simple hydrology model to develop a land use runoff table for side-by-side comparison purposes.[51] The model used for Table 2.1 runoff results from forested, cropped, or residential land uses is the USDA NRCS, Technical Release-55 (1986).[52] The assumptions used for each land use estimate are held constant (same soils, rainfall amount and hydraulic condition) according to the model document table of inputs. In all rainfall categories, forested land created at least an order of magnitude less runoff than other land use types.

Table 2.1. USDA NRCS TR-55 modeling results as an illustration of surface runoff (in) by rainfall (in) for different land use types.

Land Use[1]	Runoff Curve Number	Rainfall Amount (inches)					
		1.5	2.	2.5	3	4	5
Forest	55	0.002	0.015	0.082	0.195	0.530	0.980
Cropland SR[2]	78	0.233	0.484	0.788	1.129	1.887	2.712
Cropland SR & CR[3]	75	0.167	0.381	0.651	0.961	1.667	2.449
Urban Residential[4,5]	75	0.167	0.381	0.651	0.961	1.667	2.449
Urban Commercial[5]	92	0.801	1.237	1.693	2.161	3.118	4.089

[1]All land uses are in good hydrologic condition, on B Hydrologic Soil Group soils.
[2]SR stands for straight row; regarding farm equipment passes (i.e., no contouring of rows).
[3]CR stands for use of crop residue tillage operations (e.g., mulch till or no-till).
[4]Quarter acre lot sizes for residential units.
[5]Average percent impervious area for residential lots is 38%, for commercial lots is 85%.

The changes in hydrology, combined with the anthropogenic introduction of pollutants, results in a decline in stream water quality. Schueler, et al. (2009),[53] working in the Chesapeake Bay, documented streams are at risk as the impervious surface percentage in a watershed increases. Schueler, et al. adapted the Impervious Cover Model based on review and evaluation of 35 research papers. They concluded that overall, there is evidence of a general trend of declining stream water quality due to the dominant negative influencing factor of increasing impervious cover (and corresponding loss of quality and extent of vegetative cover) in riparian networks (Figure 2.9).

[50]Furguson, B.K.; Suckling, P.W. 1990. Changing rainfall runoff relationships in the urbanizing Peachtree Creek watershed, Atlanta, Georgia. Water Resource Bulletin. 26:313-322.

[51]This is an uncalibrated model and therefore likely contains a sizable margin of error.

[52]U.S. Department of Agriculture Natural Resource Conservation Service. 1986. Urban Hydrology for Small Watersheds; Technical Release – 55. (210-VI-TR-55, Second Ed., June 1986).

[53]Schueler, T.T.; Fraley-McNeal, L.; and Cappiella, K. 2009. Is Impervious Cover Still Important? Review of Recent Research. J. of Hydrologic Engineering. Vol. 14, No. 4. April 1, 2009.

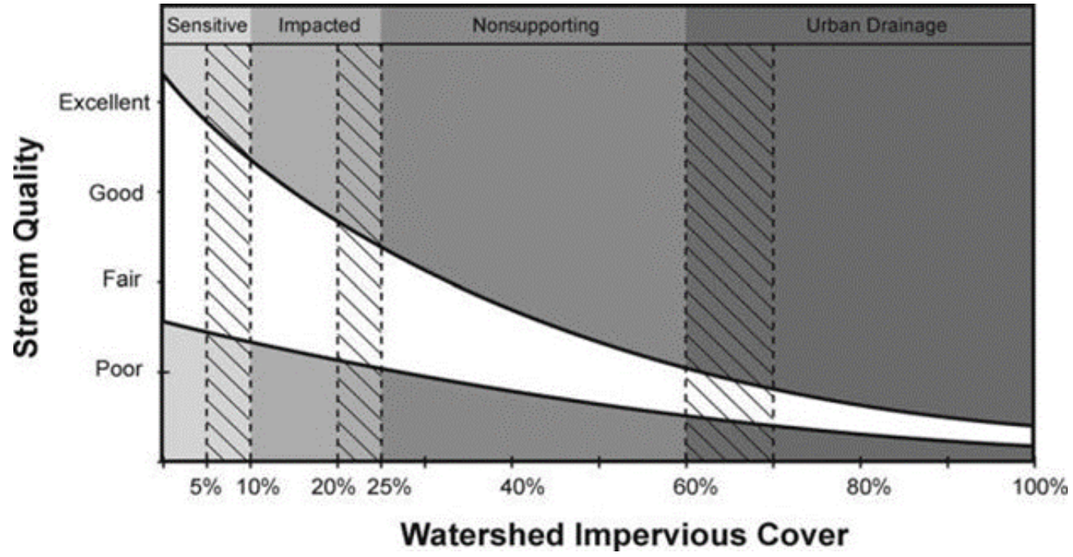


Figure 2.9. Reformulated Impervious Cover Model (Figure Credit: Scheuler et al, 2009)

Sun and Lockaby (2012) also reviewed studies comparing water quality impact differences between paired watersheds. Table 2.2 presents the results of their water quality study literature review.

Table 2.2. Reformulated Impervious Cover Model (Figure Credit: Scheuler et al, 2009)

Parameter	Urban compared to forested	Location	References
Sediment	5,000x higher export during construction	Baltimore, MD Washington, D.C.	Woman and Schick, 1967
	3x higher conc. well after construction period	Appalachian Mtn., NC	Price and Leigh, 2006
Nitrate	2x higher conc.	Columbus, GA	Schoonover et al., 2005
	7x higher conc.	Appalachian Mtn., NC	Price and Leigh, 2006
Phosphorus	9x higher conc.	Northeast USA	de la Cretaz and Barten, 2007
	0x higher	Columbus, GA	Schoonover et al., 2005
Fecal coliform	4-5x higher	Appalachian Mtn., NC	Bolstad and Swank, 1997
	10x higher	Pittsburgh, PA	Gibson et al., 1998
E. coli	6x higher	Columbus, GA	Crim, 2007
Pesticides	Present in ⅓ of urban creeks	Pacific NW USA	Weston et al., 2011
Pharmaceuticals	Present in 80-91% of urban creeks	Iowa (IA)	Kolpin et al., 2004

[54]Sun, Ge; Lockaby, B. Graeme. 2012. Water quantity and quality at the urban-rural interface. In: Laband, D.N.; Lockaby, B.G.; Zipperer, W., eds. Urban-Rural Interfaces: Linking People and Nature. American Society of Agronomy, Crop Science Society of America, Soil Science Society of America. Madison, WI. 29-48. https://www.fs.usda.gov/treesearch/pubs/41266

The hydrologic pathway differences between forestry and other land uses contribute to protecting or restoring water quality. Forest hydrology is also influenced by stand age, species, forest structure, and composition characteristics. For instance, multilayered canopies can evaporate 10-30% of precipitation. Regarding differences in tree species, Brandley and Golladay (2020)[55] state that on average, a stand of longleaf pine managed with prescribed fire to control hardwood encroachment and maintain native ground cover typically uses 15% less water than a typical mixed pine-hardwood forest without fire management, and about 30% less water than a typical loblolly or slash pine plantation (Brantley, et al., 2017).[56] Age of loblolly softwood plantation cycles have been found to play a substantial role in evapotranspiration rates (Domec, et al., 2011).[57] However, when Table 2.2 results above are combined with watershed yield evaluations, together they illustrate that forest hydrology benefits gained do not substantially minimize the total watershed water yield in Georgia. Research published in April 2021,[58] confirmed that certain silvicultural operations enhance the flow of ecosystem services derived from forestlands, and modifications to thinning and planting density rates are likely to generate enhanced water flow to downstream users. The study design included use of a growth-and-yield model to estimate physical changes in water yield and assign monetary values to these changes under different management regimes in a loblolly pine stand located in South Georgia. Results show the marginal costs associated with producing an extra liter of water (per unit area) decrease as thinning intensifies and planting density declines. Based upon the associated changes in management and potential timber revenues, private landowners may have to be compensated for providing improved water services because such operations impose costs to landowners. In certain settings, forested land use effectively managed can be used to protect drinking water supplies. One way to identify these settings is to utilize the data available through the Forests to Faucets program related to forest hydrology and water resource connections, as described in the next section.

[55]Brantley, S.; Golladay, S.W. 2020. Longleaf Pine Restoration for Water Resources. Research Notes; The Jones Center at Ichauway. https://issuu.com/thelongleafleader/docs/longleaf-leader-summer-2020-final/s/10703662.

[56]Brantley, S.; Vose, James M.; Wear, David N.; Band, Larry. 2018. Planning for an uncertain future: Restoration to mitigate water scarcity and sustain carbon sequestration. In: Kirkman, L. Katherine; Jack, Steven B., eds. Ecological restoration and management of longleaf pine forests. Boca Raton, FL: CRC Press: 291-309. www.fs.usda.gov/treesearch/pubs/55968.

[57]Domec, J.; Sun, G.; Noormets, A.; Gavazzi, M.J.; Treasure, E.A.; Cohen, E.; Swenson, J.J.; McNulty, S.G.; King, J.S. 2012. A Comparison of Three Methods to Estimate Evapotranspiration in Two Contrasting Loblolly Pine Plantations: Age Related Changes in Water Use and Drought Sensitivity of Evapotranspiration Components. Forest Science 58(5) 2012. http://dx.doi.org/10.5849/forsci.11-051.

[58]Bawa, R.; Dwivedi, P. 2021.Estimating Marginal Costs of Additional Water Flow from a Loblolly Pine Stand in South Georgia, United States. Journal of Forestry. https://doi.org/10.1093/jofore/fvab010.

Applying Forests to Faucets to PES program development in Georgia

The Forests to Faucets 2.0 (F2F2)[59] program and resources (available at: https://www.fs.fed.us/ecosystemservices/FS_Efforts/forests2faucets.shtml) are tailored to support PES program development throughout the U.S. The program is described as follows:

> *Forests to Faucets 2.0 builds upon the national Forests to Faucets program (2011) by updating its base data and adding new and forecasted threats (e.g., climate change). The purpose of this project is to quantify, rank, and illustrate the geographic connection between forests and other natural cover (private and public), surface drinking water supplies, and the populations that depend on them – the ecosystem service of water supply. The Forests to Faucets 2.0 project also evaluates a watershed's natural ability to produce clean water and quantifies the risk to watersheds from land use change, wildfire, invasive pests, and future stresses such as climate change induced changes in hydrologic systems.*[60]

Using data from a variety of existing sources and maps generated through GIS analyses, the F2F2 program describes the relative importance of forestlands to surface drinking water supplies across the U.S. The data produced by this assessment can help identify opportunities for the development of PES programs related to forests and water resources. Identifying the downstream population that relies on forested water sources is a major factor in the analysis tool. The F2F2 analysis output is often presented as a percentile, a percent rank from 0 (zero dependence) to 100 (full dependence), as compared to every HUC-12[61] watershed in the continental 48 states.[62] The F2F2 output maps define Important Watersheds (Figure 2.10) and identify those serving the most people on public water systems drawn from forested surface water sources (i.e., the highest percentile of dependence is shown in dark blue). The future development risk to important watersheds for 2010-2040 and 2010-2090 are provided in Figures 2.11 and 2.12. The high emissions category was selected over the low emissions option due to the extremely high Governor's Office (2020) population growth projections in the northern watersheds of Georgia. In the map provided in Figure 2.10, it is observed that the northern provinces provide surface water to large populations even into the central and southern regions of Georgia. The map indicates the Savannah River and Ocmulgee River provide important sources for surface water intakes lower in the state. North Georgia has the importance of forested watershed results that fall within the top tenth and twentieth percentiles, indicating high levels of dependence on surface source waters, while many watersheds in the south are in the bottom tenth percentile (0 - 10) indicating forest fed surface source waters are not in use. The Flint River feeding the City of Albany is also highlighted as an important watershed. However, following recent changes, Albany is now completely served by groundwater wells without any influence from surface waters. The recent change in supply sources by Albany is a good reminder that all water uses, and issues, have a temporal nature and need to be confirmed with local partners and other valid data sources.

[59]U.S. Forest Service. 2020. Forest to Faucets 2.0 Factsheet. https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1584445&ext=pdf.

[60]U.S. Forest Service. 2020. Forest to Faucets 2.0. https://www.fs.fed.us/ecosystemservices/FS_Efforts/forests2faucets.shtml.

[61]A Hydrologic Unit Code (HUC) system is used to identify water resources at varying scales. HUC-12 refers to subwatershed level classifications.

[62]The inputs, when provided, are represented as a percent (for example percent of acres in the watershed). The map results are presented in groups of 10 percentile ranks. But provided commentary present a HUC-12's actual rankings.

[63]Even though the F2F2 website was launched in 2020, the currently available outputs are based on surface water consumption data that was collected in 2018. Based on the 2018 US EPA dataset, F2F2 listed Albany because several wells used at that time were influenced by the Flint River. PES managers can check the current source types, amounts and list of utilities by using the U.S, EPA interactive website: www.epa.gov/sourcewaterprotection/dwmaps. This site provides the use information for both groundwater and surface water sources.

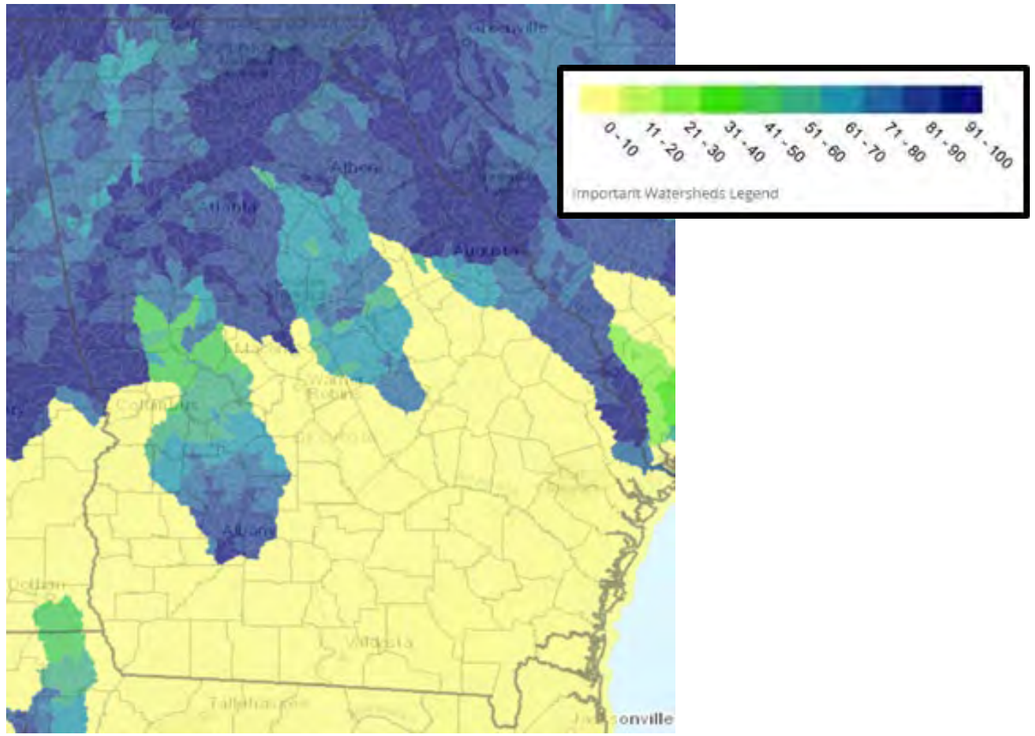


Figure 2.10. Forest to Faucets 2.0 maps of Georgia's Important Watersheds (U.S. Forest Service, 2020)

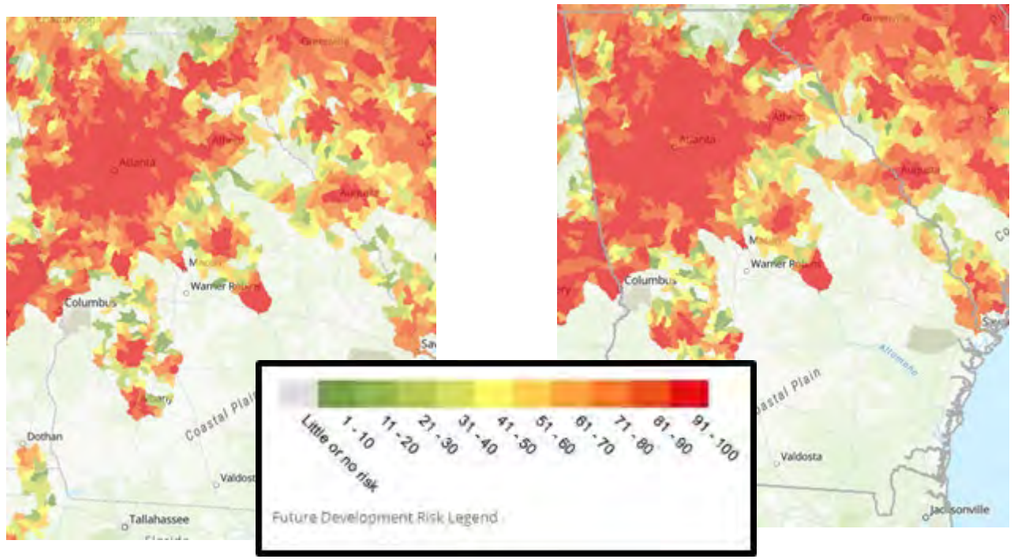


Figure 2.11. Future Development Risk – 2010-2040 at High Emissions (left) and Figure 2.12. Future Development Risk – 2010-2090 at High Emissions (right). High emissions output selected due to the extremely high population growth projections in northern Georgia (U.S. Forest Service, 2020).

F2F2 results provide a quantified forestry specific risk analysis output that can help inform the source watershed plan assessments (see Chapter 5 for further discussion of Source Water Protection Planning and assessment tools).

Six example 12-digit Hydrologic Unit Codes (HUC-12) F2F2 2.0 outputs are listed in Table 2.3. Comparing each HUC-12 watershed's results, it can be seen that as the percent of forested land cover increases in each province, so does the long-term average water yield.

Figure 2.3. USFS Forest to Faucets 2.0 land use inputs and mean annual water yield results for six 12-digit Hydrologic Unit Code watersheds. Weather station data was added to the USFS Forest to Faucets 2.0 data as a reference to the region's average annual precipitation (rainfall data source: https://www.usclimatedata.com/).

HUC-12 Name & Number	Physio-graphic Province	Forest, Grassland and Shrubland (%)	Ag Land (%)	Impervious Cover (%)	Mean Annual Water Yield (mm/yr)	Mean Annual Water Yield (in/yr)	Long-term Annual Average Rainfall*
Emery Creek 031501010401	Appalachian Plateaus	95.93	0.09	0.07	802.3	31.59	56.53 (Dalton, GA)
Mill Creek 031501010402	Appalachian Plateaus	83.49	12.21	0.41	772.2	30.40	56.53 (Dalton, GA)
Goldmine Branch 031501010403	Appalachian Plateaus	61.58	14.85	5.67	645.7	25.42	56.53 (Dalton, GA)
McIntosh Creek 030601080303	Southeastern Coastal Plain	64.14	24.86	3.04	363.20	14.30	47.80 (Waynesboro, GA)
Walnut Branch 030601080302	Southeastern Coastal Plain	74.50	20.22	1.10	383.60	15.10	47.80 (Waynesboro, GA)
Beaver Dam 030601080301	Southeastern Coastal Plain	79.17	17.85	0.27	383.60	15.10	47.80 (Waynesboro, GA)

*at Closest Long-term Weather Station (in/yr)

The F2F2 baseline data provides the watershed's rated importance, ability to produce clean water, and current percentages of key land uses (e.g., the percentages of natural area, privately owned forest, agricultural lands, and impervious surface).

The F2F2 tool also ranks the watershed's risk from wildfires, insect and disease, and conversion to urban development. In the context of wildfire, the F2F2 provides an analysis of relative scores for forest wildfire risk. The scores combine: A) the risk of a wildfire occurring with B) the size of the water consuming population depending on that source of water. Like the ranking scores provided in relation to the importance for surface drinking water supplies, the relative wildfire risk rankings are also a national percentile rank provided from conducting the same analysis on all continental US HUC-12 watersheds. Two PES programs discussed in Chapter 4 outline applications of the F2F2 analysis in response to wildfire impacts, including post-fire precipitation and erosion events (see: Denver Water and the Rio Grande Water Fund). These wildfire experiences in the Western U.S. are different than what is likely to happen in Georgia, but nonetheless, the magnitude helps illustrate consequences associated with prolonged droughts and fuel loading. Insect infestation and associated increases in tree mortality were a common wildfire contributing factor in Western regions. See pages 30 through 32 for a discussion of wildfire risk in Georgia and Figure 2.14 for the F2F2 analysis.

Using F2F2 to Assess Wildfire and Drought Impact in Georgia

Although wildfires are not as strongly associated with Georgia as other states, it remains a risk nonetheless and the state has established strategies to reduce and mitigate wildfire risk and prevent conditions that have developed in other regions. The state of Georgia has an extensive list of completed Community Wildfire Protection Plans (CWPPs). The Georgia Forestry Commission (GFC) has an active and robust program for providing prescribed burn permits, guidance, and an emergency response program.

The GFC's Wildfire Public Viewer tracks historic wildfires since 2012 (Figure 2.13). The highest annual acreage burned in Georgia was 71,085 acres in 2017. Given the presence of 24 million acres of forests, this represents highly effective wildfire prevention and suppression efforts. Another source, the USDA Forest Inventory and Analysis (FIA) National Program, states that approximately 492,000 acres of forested land in Georgia is disturbed by fire annually, an indication of the widespread use of prescribed fire as a forest management tool.

According to the Southern Wildfire Risk Assessment, Georgia has 11,768 communities at risk of wildland fire of which 5,066 (43%) are rated at high or very high risk from wildfires. 25% of Georgia's landscape, or 9 million acres, is categorized as Wildland Urban Interface (WUI). In FY19, there were 56 homes lost or heavily damaged by wildfire in Georgia with another 2,024 saved by direct suppression actions. A key risk with wildfire is fuel loading from the accumulation of vegetative growth. Each year, Georgia's timberlands grow 48% more wood than can be utilized through annual harvesting demand, highlighting the need for new markets for forest products from private lands as part of a strategy to continue to support forest management and address wildfire risks.

Long-term drought could challenge the effectiveness of Georgia's wildfire protection measures when landowners have not maintained an appropriate level of fuel removal, fire breaks, and tree thinning as recommended (GFC, 2019).[64] The last significant drought in Georgia began in the fall of 2005 (Manuel, 2008).[65] The U.S. Drought Monitor[66] tracked this as the longest Georgian drought since the inception of the program and reported that it officially lasted 161 weeks beginning April 11, 2006 and ending May 5, 2009. The most intense period of drought occurred the week of December 11, 2007 where D4 (exceptional drought) affected nearly 50% of Georgia's land area. This type of drought stress may result in wildfires that test the preparedness of the state.

Using F2F2 to Assess Insect and Disease Impact in Georgia

Forest areas with high insect and disease pressures can degrade both water quantity and quality as forest health declines impact the hydrology through changes in evapotranspiration, infiltration, runoff rates, and other factors. While the decline in forest health can exhibit itself in many ways (e.g., invasive species, excessive undergrowth, and increased tree mortality), insect and disease infestations can be very damaging and are a rising concern in Georgia. Examples of infestations tracked by the USDA Forest Service that are present in Georgia include: [67]

- Southern Pine Beetle; present statewide
- Emerald ash borer; present in 19 counties, 7 new at damaging levels
- Laurel Wilt Disease, Rebay Ambrosia Beetle; present in 44 counties
- Armillaria Root Disease; present statewide
- Heterobasidion Root Disease p-type; present statewide

The F2F2 identified HUC-12 Insect and Disease risk map is presented in Figure 2.15.

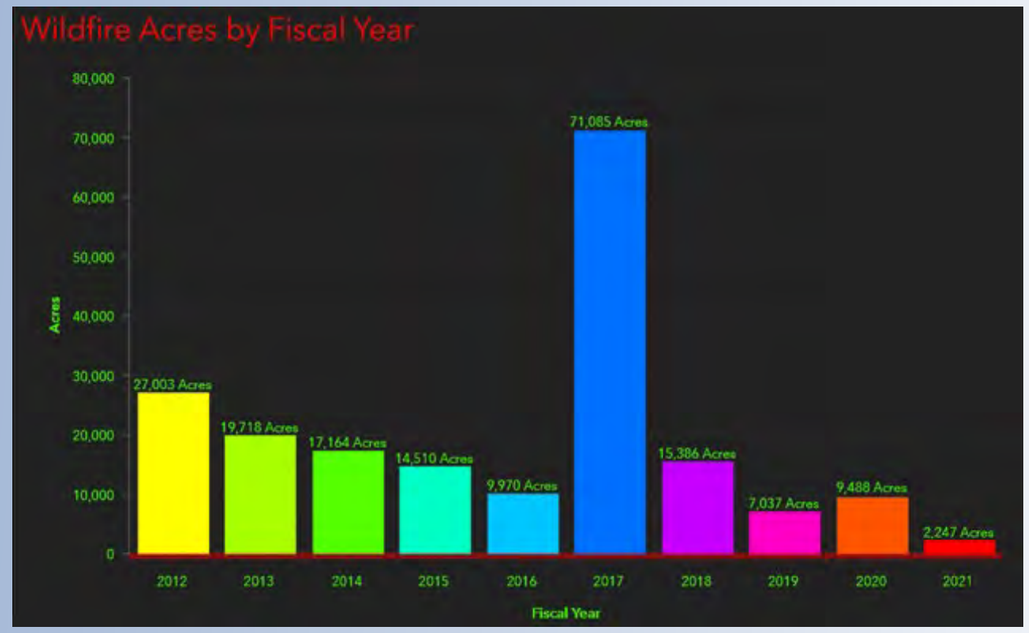
[64]Georgia Forestry Commission. 2019. Sustainability Report for Georgia's Forests: January 2019. https://gatrees.org/wp-content/uploads/2020/01/Sustainability-Report-for-Georgias-Forests-January-2019-WEB.pdf

[65]Manuel, J. 2008. Environews; Spheres of Influence; Drought in the Southeast, Lessons for Water Management. Environmental Health Perspectives, Vol. 116, No. 4.

[66]National Integrated Drought Information System. 2021. Drought in Georgia. https://www.drought.gov/drought/states/georgia.

[67]U.S. Forest Service. 2017. Major Forest Insect and Disease Conditions in the United States: 2015. Forest Service Publication FS-1093. https://www.fs.fed.us/foresthealth/publications/ConditionsReport_2015.pdf.

Figure 2.13. GFC wildfire acres by fiscal year (Georgia Forestry Commission, 2020)



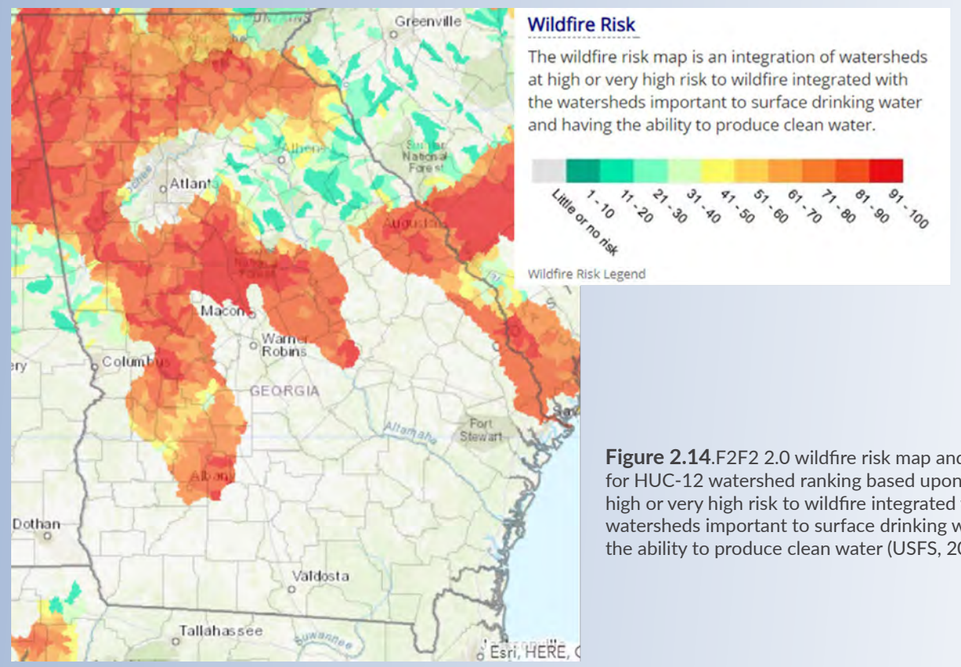


Figure 2.14.F2F2 2.0 wildfire risk map and legend for HUC-12 watershed ranking based upon having a high or very high risk to wildfire integrated with the watersheds important to surface drinking water and the ability to produce clean water (USFS, 2020).

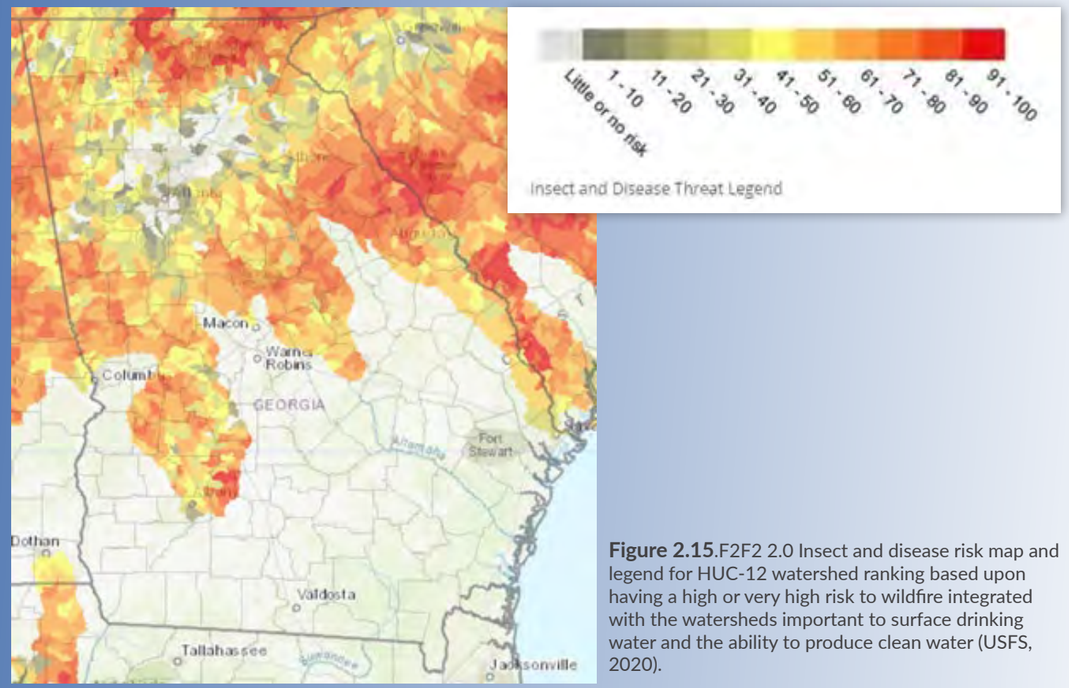


Figure 2.15.F2F2 2.0 Insect and disease risk map and legend for HUC-12 watershed ranking based upon having a high or very high risk to wildfire integrated with the watersheds important to surface drinking water and the ability to produce clean water (USFS, 2020).

Conclusion

Throughout Georgia and the Southeastern United States, drinking water is drawn from regions that are dependent on the health of forests and proper forest management. As discussed in this chapter, forest soils are a sponge, regulating the release of water, minimizing peak stormflow, and slowly releasing the water during drier periods. Forest soils also are a filter, removing sediment and other contaminants before reaching aquifers and surface water. Finally, forests are an umbrella, intercepting and minimizing the power from precipitation events to reduce erosion concerns. These three ecosystem services of forests provide a holistic method of addressing water resource protection.

Georgia is a state with substantially diverse regional characteristics in land use, biodiversity, geologic structure, and precipitation rates. The state's hydrologic intensities and seasonal differences combine to create different water cycle dynamics, storage and yield capacity, and susceptibility to pollutant impacts. Some of the regional characteristics can be influenced by human activities and land use conversion (e.g., vegetative cover), while other characteristics are more difficult to influence (e.g., geology and how it relates to an aquifer's water yield). Each of the individual forest attributes (i.e., canopy evapotranspiration, soils, and duff layers) contribute to the forest's ability to regulate water quantity and quality. Hydrology from dominantly forested watersheds is typified by streams with lower peak flows and higher baseflow than streams generated by runoff from other land uses and the water quality tends to be better (i.e., less sediment and other contaminants). A study by Ferguson and Suckling (1990)[68] around Atlanta, Georgia documented that conversion to urbanized land use increased peak flows and total discharge in wet years and decreased low flows in dry years. Forested land use effectively managed can be used to protect drinking water supplies. The nationwide data available through the Forests to Faucets 2.0 (F2F2)[69] program helps in identifying these opportunities.

[68]Furguson, B.K.; Suckling, P.W. 1990. Changing rainfall runoff relationships in the urbanizing Peachtree Creek watershed, Atlanta, Georgia. Water Resource Bulletin. 26:313-322.

[69]U.S. Forest Service. 2020. Forest to Faucets 2.0 Factsheet. https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1584445&ext=pdf.

Chapter 3. Connecting with Private Forest Landowners

Introduction

Georgia has approximately 24 million acres of forest, covering 67% of the state's land area. These forests are primarily privately owned (22 million acres). However, there are many categories and characteristics of private land ownership that make it impossible and inappropriate to treat this as a homogenous group. This chapter explores forest ownership in Georgia with a focus on the various types of private forest landowners, their interests and needs, and effective engagement strategies and tools.

Georgia's Private Forest Landowners

It is important that PES programs are designed to encourage private forest landowner participation. Designing a program that is not overly restrictive for participants and flexible enough to accommodate multiple objectives, is very desirable. A program that allows harvests and places minimal restrictions on landowner use and access are important considerations. In the context of Georgia and this project, two of the forestry experts interviewed stated that the right to sell timber and the right to use or lease land for hunting are often the two top priorities of private forest landowners.[70]

Most forests in Georgia are privately owned by individuals and corporations, with public lands accounting for just 10% of the forest area (Figure 3.1). While private forest ownership represents about 90% of the forestland in Georgia, there are multiple sub-categories of private owners. Within the category of private forest ownership, there are private individuals (55% of Georgia's forests), corporate owners (29%), and the forest industry (six percent). Forest-based recreation, economic benefits, and ecosystem services are provided from these private lands and their management. The variety of benefits include a $36.2 billion annual economic impact from a diversified forest industry.[71] The forest industry is the state's second largest employer (just behind the food processing sector), with payroll exceeding $9.1 billion while generating an estimated $977 million per year in state government revenues. Estimated annual payments to landowners by the forest industry exceed $14.5 million. [72]

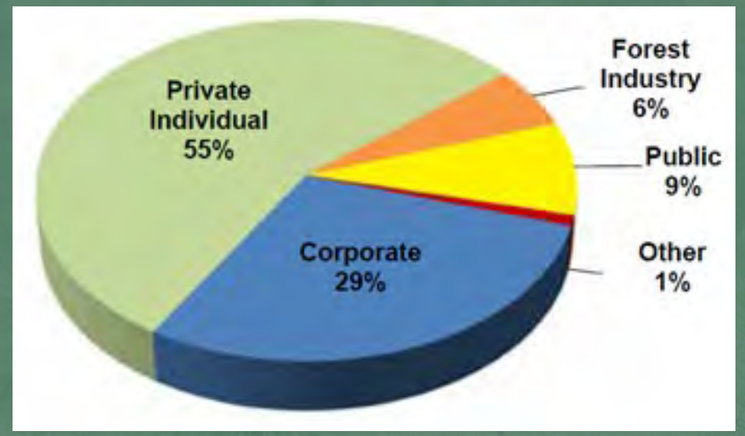


Figure 3.1 F2F2 2.0 wildfire risk map and legend for HUC-12 watershed ranking based upon having a high or very high risk to wildfire integrated with the watersheds important to surface drinking water and the ability to produce clean water (USFS, 2020).

[70]Personal communication; David Foil (President, Forestry Resources Consultants). 4 September 2020.

[71]Georgia Forestry Commission. 2019. Economic Benefits of the Forest Industry in Georgia: 2018. https://gatrees.org/wp-content/uploads/2020/01/Economic-Benefits-of-the-Forestry-Industry-in-Georgia-2018-.pdf.

[72]Georgia Forestry Commission. 2015. Georgia Statewide Assessment of Forest Resources. https://gatrees.org/wp-content/uploads/2020/03/GAStatewideAssessmentofForestResources2015.pdf.

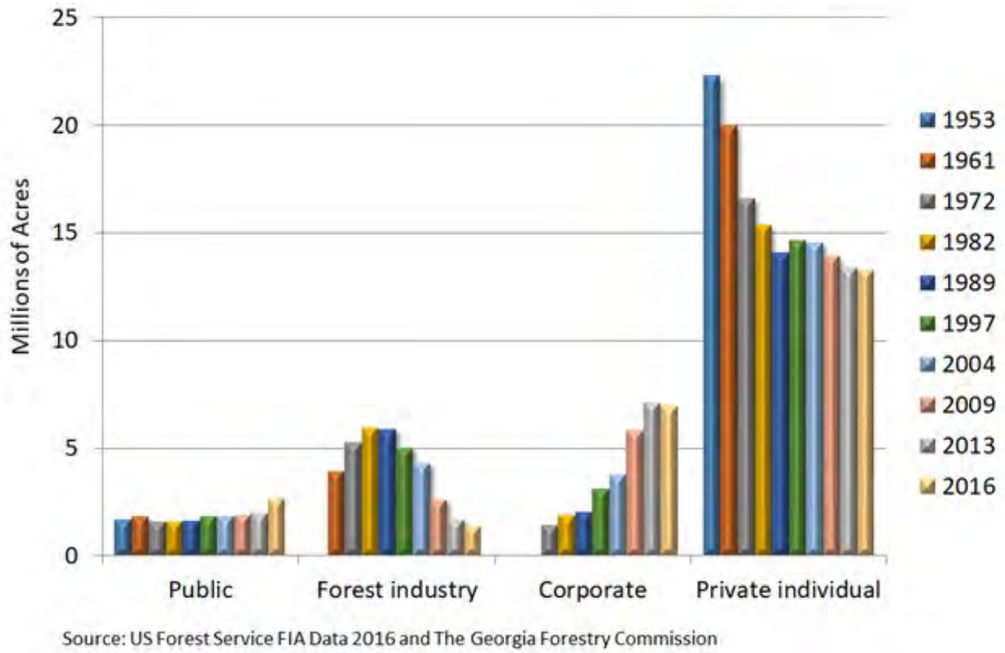


Figure 3.2 Forest Ownership Trends in Georgia, 1953-2016 (Georgia Forestry Commission, 2021).

As shown in Figure 3.2, the forest ownership in Georgia has evolved.[73] While public forest ownership has been stable, ownership by the forest industry and private individuals has been declining while corporate ownership has been increasing for many decades. Private individual ownership remains the largest category by a significant margin (Figure 3.1). Forest industry expanded their ownership in the 1960-80s, but this trend began to change in the 1990s as industry sold lands to private holders as well as corporate entities, such as Real Estate Investment Trusts (REITs) and Timber Investment Management Organizations (TIMOs) largely in response to tax law changes.

Explained by Mendell (2016),[74] the Cigar Excise Tax Extension signed into law in 1960 provided a new income tax structure for industrial investment, specifically the opportunity to invest in large, diversified portfolios of income producing real estate. This led to changes in the forest industry ownership structure. In 1969, fourteen of the fifteen largest U.S. timberland owners were vertically integrated, mill-owning forest industry firms. As of 2016, only two remain. In the late '70s the stock prices for these industry firms were undervalued; their trees were worth more than their shares. The Cigar Tax structure allowed REITs to provide these firms with a means to generate cash in tough times. By 2016, two hundred REITs had a combined market value of nearly $1 Trillion, as traded on the New York Stock Exchange. Also, in February 2016 approximately 20 TIMOs managed 25 million forested acres across the US. And, while TIMOs provide management services and do not always own the forested land, REITs are known to make purchase investments that may later be divested (sold). Forestland owned by REITs can be at risk for land conversion if the sale of land for development offers a profit potential. Inversely, TIMOs operate forestlands for large companies and family-owned holdings which often have a different context for owning forested land for multiple benefits.

[73]Land sale transactions will continue to occur, for example the recent (January 2021) expansion of ownership by the Ingka Group (parent company to Ikea) in southeast Georgia which includes conservation protections, see: https://www.furnituretoday.com/furniture-retailer/ikea-parent-company-acquires-more-than-10000-acres-of-forestland-in-georgia/.

[74]Mendell, B. 2016. From Cigar Tax to Timberland Trusts, a Short History of Timber REITS and TIMOS. https://foresthistory.org/wp-content/uploads/2017/10/Mendell_REITSandTIMOS.pdf.

[75]Personal communication; David Foil (President, Forestry Resources Consultants). 4 September 2020.

[76]Wear, David N.; Greis, John G.; eds. 2013. The Southern Forest Futures Project: Technical Report. Gen. Tech. Rep. SRS-178. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 542 p. https://www.srs.fs.fed.us/pubs/gtr/gtr_srs178.pdf.

[77]For further discussion, see; https://www.forest2market.com/blog/timberland-ownership-in-the-us-south

In an interview with David Foil, president of Forestry Resources Consultants (FRC), he indicated companies like his provide a turnkey operation for their clients. One third of the company's clients are large family ownerships, and two thirds are institutional owners like foundations, pension funds, investment groups, TIMOs, REITs and trusts. FRC's clients always have timber production and revenue as one of their top three land ownership values, including plantation forestry. Hunting and recreational use are also near the top of the list. According to Foil, forest owners may be skeptical of entering into a PES program at first and will ask the question: "What are the encumbrances?" early in the discussion. But if there is a payment involved, they will listen to the PES program pitch. Allowing property right uses like hunting leases, and providing stipends to offset property taxes, are examples of benefits that could keep these working lands in forested cover. Likewise, the corporate ESG concept (Environmental, Social, and Governance considerations) is being brought up by institutional landowners. They are interested in doing things that secure their brand's environmental reputation. Companies are also likely to respond in a positive and receptive manner if the PES program does not encumber the land significantly. These landowners may be more interested in shorter-term easements rather than permanent conservation easements.

According to The Southern Forest Futures Project (Wear et al., 2013), TIMOs represented at least 827,000 acres and REITs accounted for approximately 2.3 million acres of forest ownership in Georgia as of 2008. The decline in forest products industry ownership has altered land management and planning in the region. Separating forest management from the forest processing industry influences both the long-term objectives of owners and the structure of forest investments. While all corporate and industry affiliations are assumed to prioritize economic performance, the distinct methods for earning revenues through real estate transactions and/or timber assets are an important consideration when working to keep forested lands as forests.

Private landowners hold 86% of the forest area in the South, and 66% of this area is owned by families or individuals (Wear, 2013). On average, families and individuals own two out of every three acres of private forestland in the region. The size of these ownerships varies significantly (Figure 3.3). Most owners (59%) have less than 10 acres of land while most land (60%) is in ownerships greater than 100 acres in size. Research has also found that most of these owners participate in timber markets with 66% having harvested and sold trees.

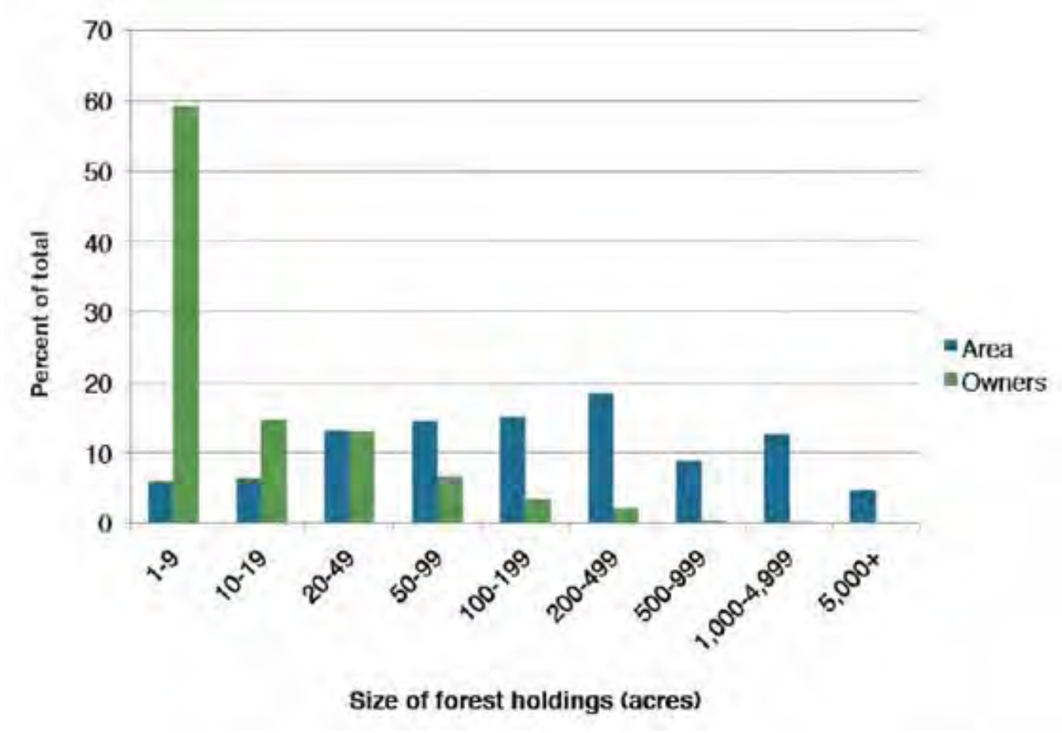


Figure 3.3 Percent of individual forest ownerships by total area (in 2006) and number of owners for the Southern United States (Wear, et al., 2013)

Individuals owning private forestland are also referred to as "family forest owners"[78] and are the subject of the National Woodland Owner Survey (NWOS).[79] There are approximately 118,000 family forest owners of 10 or more acres in Georgia for a total of 12.6 million acres in the state. The average land tenure for these owners is more than 23 years with just 16% of landowners having owned their land less than 10 years. Most have the forestland as part of their home (63%).[80] According to the NWOS, the primary reasons for owning land can vary depending on several factors, including property size. As shown in Table 3.1, all acreage sizes identified "to pass on to heirs" and "to enjoy beauty/scenery" as two of the top three reasons for owning forestland. However, owners with less than 100 acres identified a top reason as "part of home", owners of 100 to 500 acres included "land investment", and owners of more than 1,000 acres included "timber production".

[78]Family forest owners are defined as: Families, individuals, trusts, estates, family partnerships, and other unincorporated groups of individuals that own forestland.

[79]U.S. Forest Service. National Woodland Owner Survey. https://www.fia.fs.fed.us/nwos/.

[80]Absentee landowners (i.e., forest ownerships that are not associated with a home) can present additional challenges for engagement. As noted in interviews (L. Lord, M. Masters, D. Foil), absentee landowners may be less connected to the land, new to forest ownership, and in need of basic educational information to understand the funding programs and technical assistance that is available.

Table 3.1 Reasons for owning forestland in Georgia by acreage (Source: NWOS, 2013)

	Rank	Acreage Owned		
		10-100	100-500	1000+
Reasons for owning forestland	1st	Part of home	To pass on to heirs	Timber production
	2nd	To pass on to heirs	To enjoy beauty/scenery	To pass on to heirs
	3rd	To enjoy beauty/scenery	Land investment	To enjoy beauty/scenery

Wear, et al. (2013)[81] summarizes the reasons for family forest ownership and their wide range of concerns. Figure 3.4 presents the findings regarding reasons for owning family forests as a percentage of the total area and total number of owners.

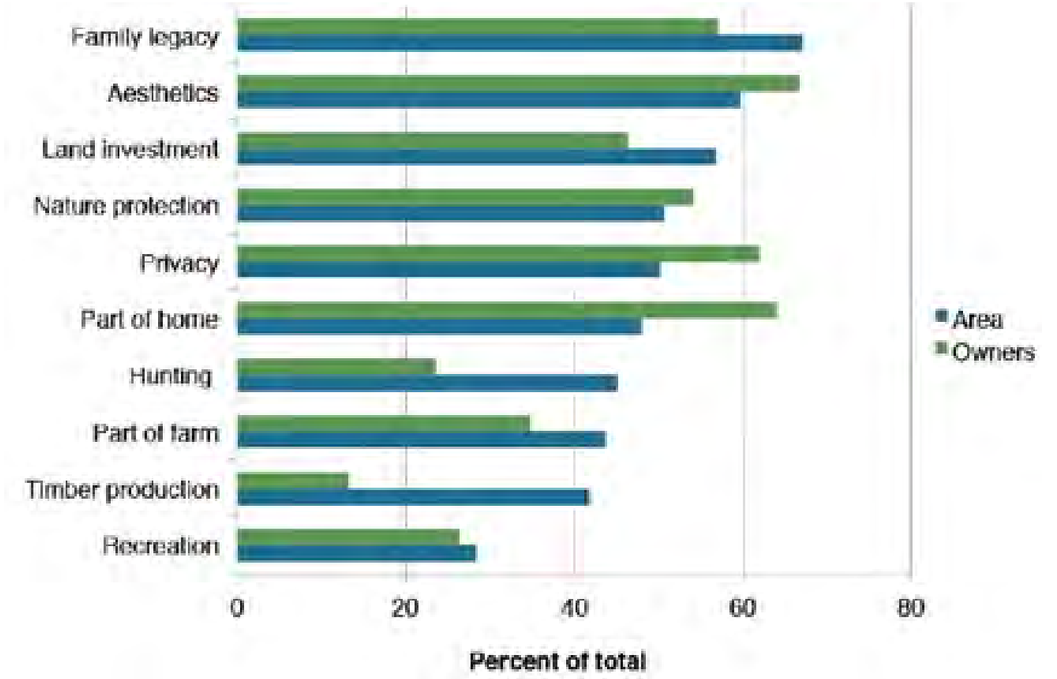


Figure 3.4 2006 finding regarding reasons for owning southern family forests as a percent of total area and total number of owners (Wear, et al., 2013)[82]

The NWOS also found that more than 70% of family forest owners in Georgia indicated "protecting water resources" as an important reason for owning forestland. However, more than 80% of family forest owners in Georgia do not have a management plan. Both Wear (2013) and the Georgia Forestry Commission's sustainability report (GFC, 2019) indicate the current trend shows an increase in land liquidity rates associated with reductions in acres per

[81]Wear, David N.; Greis, John G.; eds. 2013. The Southern Forest Futures Project: Technical Report. Gen. Tech. Rep. SRS-178. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 542 p. https://www.srs.fs.fed.us/pubs/gtr/gtr_srs178.pdf.

[82]Wear, David N.; Greis, John G.; eds. 2013. The Southern Forest Futures Project: Technical Report. Gen. Tech. Rep. SRS-178. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 542 p. https://www.srs.fs.fed.us/pubs/gtr/gtr_srs178.pdf.

family forest owner. These trends can create forest management challenges because of the inefficiencies and lack of economic viability in managing small parcels as well as the impacts from increases in land conversion. Many family holdings of smaller sizes do not have forest management plans. This is further complicated by the shortage of professional foresters available to assist with forest management planning (GFC, 2019). While many private forest landowners are concerned with maintaining the right to harvest timber as an important PES consideration (Thackston, 2020), timber sales are not the only land use goal that forest management plans address. Other personal uses and values are addressed in forest management plans, including activities to sustain a healthy forest, manage wildfire risk, and conduct disease and insect control. The GFC sustainability report identified the emerging trend of shrinking forest parcel sizes and the concern that small parcels can be more difficult to manage. The shrinking parcel size trend is accompanied by an increase in the number of owners and therefore the demand for professional forestry consultants is increasing and surpassing capacity.

Although the research insights from the NWOS and other sources help to identify values, priorities, and interests of family forest owners, they only do so at a broad scale. It is difficult to apply this information within smaller jurisdictional areas such as counties or watersheds where statewide generalizations may not fit. There is also a lack of information addressing the interests and priorities for other categories of private forest ownership besides family forest ownerships that are well researched in the NWOS. While corporate forest owners may be more likely to be held accountable to specific financial goals by owners, shareholders, or investors, it is also likely that individual companies have varying objectives for management that will influence their willingness to participate in ecosystem service markets. These differences are evidenced in the varying corporate positions and actions related to third-party certification, participation in emerging carbon markets, announced sustainability commitments, and other activities.

The development of a PES program requires a strong understanding of the forest ownership patterns and values within the specific target region. This insight is commonly supported by survey work and research once the area of interest has been identified and the potential scenarios for the PES have been proposed. This investigation can support scenario prioritization and final design while informing communication and engagement strategies as discussed in the next section.

Forest land use trends in Georgia

Forest acreage in Georgia has stayed relatively stable over the last 50 years according to the USDA Forest Inventory and Analysis (FIA) data.[83] As previously mentioned, forests cover 67% of Georgia's total land area and about 90% of the forestland is privately owned. While the total statewide forested area remains stable, local trends in forest cover can be identified within watersheds. Greene, et al. (2018)[84] predicts 2 million acres of forest in Georgia have the potential to be lost through conversion to non-forest land uses between 2030 and 2060, primarily due to urban growth. The FIA program also reports that approximately 121,000 acres of forest in Georgia are converted annually to non-forest land uses, while about 65,500 are converted into forested uses for a net change of approximately 55,500 acres. The document Georgia's Land: Its Use and Condition (USDA NRCS, 2016), explains how the land use acreages are being periodically converted between rural land use categories like cropland, pasture, and forest or converted into developed land more permanently (Figure 3.5). The NRCS reviewed land use changes from 1982 to 2012 (30-years) and found that urban development increased by over 2 million acres, with the highest land use conversion being from forested land at 1.7 million acres. Furthermore, cropland declined by about 2 million acres mainly through conversion to forestry land use (1.34 million acres) during this time. A key consideration in this analysis is the influence of markets on the conversions between productive alternative land uses which are largely reversible and flexible over time, as compared to the expansion of development which is generally a permanent change in land use and conditions. As shown in Figure 3.5, conversion of forest to developed land is a strong trend in Georgia, in part driven by the aesthetic appeal of housing within forested landscapes as well as the economics of land values and development costs.

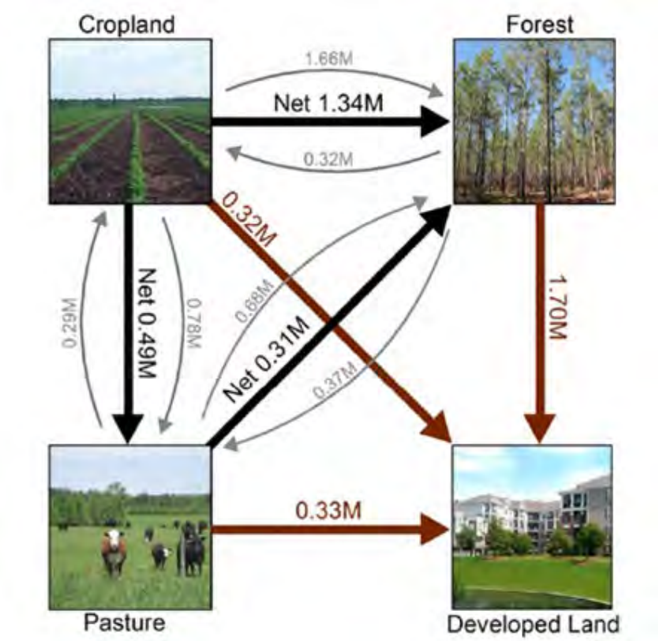


Figure 3.5 Millions of acres converted between and to other land uses in Georgia between 1982-2012 (USDA NRCS, 2016)

[83]U.S. Department of Agriculture. 2018. Forest Industry and Analysis National Program. Forests of Georgia, 2018 (Factsheet). https://public.tableau.com/views/FIA_OneClick_V1_2/Factsheet?%3AshowVizHome=no.

[84]Greene, R.E.; Evans, K.O.; Gray, M.T.; Jones-Farrand, T.; Wathen, W.G. 2018. Mapping the South's Forests of the Future. https://static1.squarespace.com/static/5c90083492441b41cbebb288/t/5f513f61e66e48772df8c03c/1599160165938/mapping-the-souths-forests-for-the-future.pdf.

Current understanding of the level of engaged landowners

There are several existing mechanisms for understanding the current level of engagement with private landowners in Georgia. These include the insights of forest management professionals and service providers, outreach and education organizations, and community-based programs.

The forest management companies, consultants, and service providers in Georgia provide technical services to a range of forest owners in the state, including family ownerships as well as corporate and institutional owners. Services include forest management inventory and planning as well as timber appraisal, harvest administration, and other activities. Some large service providers report that two-thirds of their clients are institutional owners (foundations, pension funds, investment groups, trusts, TIMOs, REITS, etc.) while about one-third are family ownerships (private, non-industrial from several hundred acres to up to 200,000 acres).[85] The clients that are institutional owners can include publicly traded companies and are more commonly associated with "turnkey" services. Cost-share programs are an important part of providing technical assistance, but landowners must have some of their own resources to pay their share. Many landowners cannot afford to participate in cost-share programs and the paperwork involved can be a significant barrier. Larger landowners with financial resources and consultants that can help with the paperwork tend to participate repeatedly in the cost share programs.

Given the large size of ownership most engaged in professional forestry services, and as illustrated in Table 3.1, timber production and revenues are commonly high priorities for management. The willingness to participate in conservation programs may largely depend upon the associated requirements or restrictions and how they will impact overall management activities (i.e., expansion of set-aside areas, restrictions on clear-cutting or plantation management, limits on pesticide use, etc.). A shorter-term easement or a management contract approach may be more appealing than permanent restrictions. For example, a management contract could include meeting the water utilities' expectations (e.g., keeping the watershed forested and managing water flows and water quality) with associated restrictions on harvest opening size or other factors but still allowing for harvesting in a sequence that considers the overall watershed conditions and impacts (i.e., percentage of the watershed in specific age classes, cover types, or stocking levels, etc.). This approach could be supported through a process of identifying priority areas and a GIS mapping exercise to identify management opportunities within them. With careful and thoughtful design this approach may align with the ESG commitments made by an increasing number of companies and their strategies for securing their environmental reputation with investors, customers, and other stakeholders.

Federal, state, and local agencies and other partnering organizations assist with cost-share programs and provide general advice and management planning.[86] Concentrations of services to landowners vary in different regions of the state. In Southwest Georgia, there is a greater focus on cost-share programs and activities like tree planting, thinning, and herbicide application for improving forest health and growth. South Georgia tends to have larger ownership tracts, a more rural landscape, and the land is viewed as something to utilize to make a living. North Georgia has more expensive properties and more first-time landowners with an interest in seeking a rural lifestyle. There are fewer large landowners and less of a focus on timber production as an ownership goal. In North Georgia, the services are more focused on general advice and management planning, and landowners may be motivated to engage in programs that can reduce tax bills while also improving the property for wildlife, aesthetics, and other values.

[85] Personal communication; David Foil (President, Forestry Resources Consultants). 4 September 2020.

[86] National Alliance of Forest Owners. 2020. In Your State. https://nafoalliance.org/in-your-state/.

South Georgia has the strongest focus on timber and productive forest ownerships, middle Georgia has a mix, and North Georgia is more focused on recreation and aesthetics. There are some interests that are more statewide, including wildfire and prescribed burning. Wildlife is also a high interest for a lot of landowners, and for many, this is a reference to hunting and fishing opportunities. Larger landowners, more typical of South Georgia, often have the resources to hire a consultant while smaller landowners often turn to the state first for technical assistance. Smaller tracts of property (i.e., less than 50 acres) may not be viable for timber management. Depending on markets and forest conditions, a landowner may need 50 or more acres for viable on-going timber management (may even need to be 100 acres or more). However, some of the smaller land ownerships can be more open to ecosystem services and management opportunities for multiple values and should not be overlooked.

Community programs can be developed to support forestry practices and address watershed goals. An example in Arkansas includes the use of water utility fees (just a few cents per bill) to support forestry practices, limiting development, and watershed management.[87] Funds raised through the fees have been used to purchase lands and place easements with different options for the time scale (perpetual, 10-20 years, etc.). The flexibility in easement length is important because it is clear some landowners will not agree to a perpetual easement. It is also important to many community stakeholders to see working forest easements with continued timber management and not "set-asides". One downside of short-term easements is that the lands will cycle out of the program after a period of time and the landowners may or may not re-enroll (i.e., easy in; easy out). This uncertainty in future land protection can impact the long-term effectiveness of the PES program. It may be necessary to increase incentives or provide additional benefits to improve the likelihood that landowners will choose to re-enroll at the end of the easement period. Chapter 4 includes additional case studies and examples of PES program models.

In addition to agencies and organizations that engage private landowners through technical assistance programs, there are also entities that operate at a national scale to serve the interests of landowners. An example is the National Alliance of Forest Owners (NAFO) that is a national advocacy organization advancing federal policies related to working forests. The member companies in NAFO own and manage more than 46 million acres of forest across the U.S., including 2.7 million acres in Georgia.[88]

Although it can be appealing to focus engagement strategies on large landowners as a "bigger bang for the buck" effort, it is also important to recognize where forestland loss is occurring. For a variety of economic reasons, it is likely that forest loss is more strongly associated with smaller tracts and ownerships, especially those near cities and towns with development pressures. Conversion of forestland to agricultural cropping may occur in some rural areas due to land conditions, declining forest productivity due to past unsustainable practices, or changing forest product markets. The design of a PES program aimed at keeping forests as forests to protect water resources needs to consider not only the number of acres and landowners to be engaged but also the level of risk of conversion associated with those acres and ownerships. Consideration of priority areas within the landscape must also be part of the evaluation (i.e., for wellhead protection, or proximity to streams). Chapter 5 includes additional discussion of assessment and prioritization methods for PES program development.

Potential methods to connect with landowners

Public and private organizations have been working to connect with landowners in the U.S. for more than 100 years, including the work of agricultural extension which dates to 1914. Over this time, a great deal has been learned about effective tools and strategies for engagement with landowners, including forest owners.

Tools for Engaging Landowners Effectively (TELE) is a leading strategy for connecting with private forest owners.[89] The TELE system is grounded in social science research and draws on marketing and program planning tools and techniques to develop outreach programs that yield meaningful results on the ground. To date, TELE techniques have been taught nationwide to more than 1,400 professionals from 400 organizations. As described in the TELE guide, "Education alone is not enough to get people to take action…the main difference between educating and marketing is that marketing includes motivation and persuasion." The changes proposed through a TELE approach to landowner engagement are shown in Figure 3.6.

[87] Chawla, P.; ed. 2019. Engaging Landowners in Conservation: A Complete Guide to Designing Programs and Communications. Tools for Engaging Landowners Effectively (TELE). Center for Nonprofit Strategies. May 2019.

[88] National Alliance of Forest Owners. 2020. In Your State. https://nafoalliance.org/in-your-state/.

[89] Chawla, P.; ed. 2019. Engaging Landowners in Conservation: A Complete Guide to Designing Programs and Communications. Tools for Engaging Landowners Effectively (TELE). Center for Nonprofit Strategies. May 2019.

TABLE: ELEMENTS OF THE PROPOSED CHANGES IN LANDOWNER PROGRAMMING

FROM...	TO...
• Education orientation	• Action orientation
• Outputs-based planning and metrics	• Outcomes-based planning and metrics
• Knowledge-focused outreach	• Persuasive, motivational communication using principles of marketing
• Organization-centered outreach	• Landowner-centered outreach
• Broad-brush marketing: trying to reach everyone	• Targeted marketing: reaching specific groups of people in targeted ways
• Repetitive, ongoing outreach	• Focused efforts over a defined time period and geographic area
• Accounting mindset: Post hoc evaluation of each outreach effort to report on outputs and outcomes	• Learning mindset: Integrating tracking and evaluation over multiple efforts to inform future work

Figure 3.6 Improving Connections with Landowners (TELE, 2019)

Being able to provide a targeted marketing approach as recommended by TELE, involves designing programs to persuade a specific group of people to take a specific action. By definition, this requires an understanding of the audience(s) through a marketing lens, which requires market segmentation. The Sustaining Family Forest Initiative (SFFI) developed landowner attitudinal segments to aid in effective landowner engagement.[90] Using NWOS data, the SFFI segmentation for Georgia shows that 41% of family forest owners can be categorized as "Woodland Retreat" while 28% are "Working the Land", 19% are "Supplemental Income" and 12% are "Uninvolved" (Table 3.2). Additionally, 89% of family forest owners in Georgia are classified as "Prime Prospects", meaning they have good stewardship attitudes but are not highly engaged in managing their lands.

[90]Tools for Engaging Landowners Effectively. 2020. Landowner Segments. https://www.engaginglandowners.org/landowner-data/landowner-segments.

Table3.2 Excerpts of Descriptive Characteristics of Landowner Market Segments (TELE, 2019)

Landowner Segment	% in Georgia	Orientation in the Woods	Current Stewardship Behaviors	How to reach this segment
Woodland Retreat	41%	Own woodland primarily for its beauty, and conservation and recreational value. Many love nature and animals and appreciate ecological benefits of woods	Despite their s… orientation, they… the lowest rate… management b… as having a ma… consulting fore… share program…	• Give them specific, easy, low-cost actions to achieve their objectives (e.g., attracting wildlife). • Challenge their belief that woods are best left alone. • Help them understand the ecological significance of all woods (even small parcels). • Appeal to their sense of responsibility and stewardship.
Working the Land	28%	Tend to be pragmatic, value aesthetic and recreational benefits of woodland but also see woods as a financial asset	The most likely… participate in a… or have a mana… likely to have t… improve wildlif…	• Affirm their outdoorsy lifestyle and traditional values. • Give them information but do not tell them what to do—accept their independence and cautiousness. • They actively seek information on land management; most like getting information through word of mouth, relevant publications, and direct mail.
Supplemental Income	19%	Tend to own land primarily for timber income and investment	Second most li… to participate i… programs and … plans (but still … Most likely to … forester, typica…	• Emphasize ways to enhance financial gains or maintain land value for future generations. • Ready to learn more about land management—especially if it yields immediate or long-term financial benefits. • Most keyed to the forest industry and "forestry" community, including landowner associations, trade publications, and events
Uninvolved	12%	Tend not to care about woods; assign low importance to their financial, recreational, and aesthetic benefits. More likely than the other segments to be willing to sell their land and less likely to want to see it stay woodland	Along with Wo… Owners, least … management p… cost-share pro…	• Not an easy target for conservation or woodland management campaigns. • Messages should identify direct financial benefits, preferably without too much effort on their part. • May be more receptive to incentives and programs that benefit both farms and woods. • Can be reached by direct mail and traditional channels used to reach the farming community.

As shown in Table 3.2, the 'Working the Land' and 'Supplemental Income' types of landowners are most likely to already be engaged in forest management. These landowners are often represented in the membership of landowner associations and other groups. The strategies and communication methods that have been effective for engaging these types of landowners are not the same approaches that are needed to attract the largest group in the 'Woodland Retreat' segment or the small but potentially critical 'Uninvolved' segment.

There are several examples of innovative technologies and targeted efforts that apply the strategies identified by TELE to ensure effective engagement. Examples include WoodsCamp, an internet tool that helps private woodland owners in the United States connect with programs, services, and professionals to help them care for their land.[91] With answers to just five simple questions, the WoodsCamp technology identifies landowner segments and prepares a customized woodland report for the property that reflects the landowners' values and priorities while providing science-based and actionable management information. Currently, WoodsCamp is available in six states, including Florida, Alabama, and South Carolina. Availability of WoodsCamp in Georgia is anticipated in 2021.

Another option to consider when attempting to enhance private forest landowner's PES engagement is providing small forestland holders prioritized access to local foresters to develop management plans and assist with implementation. In large PES programs, a dedicated natural resource professional on staff to assist with forestry management plans and program audits may be an effective strategy to build landowner engagement.

One component of landowner engagement is designing PES programs that address barriers to participation, especially those associated with historic disadvantages and discrimination. A specific example of efforts that acknowledge and address systemic barriers is the work of the Center for Heirs' Property Preservation that protects heirs' property and promotes its sustainable use to provide increased economic benefit to historically under-served families.[92] Heirs property and associated title issues disproportionately affect African American landowners and the Center provides educational services, legal assistance, and technical assistance to resolve the challenges and enable participation in sustainable forest management. The Sustainable Forestry and African American Land Retention (SFLR) program launched in 2012 and has also yielded significant results in helping to stem land loss, increase forest health, and build financial assets in the African American landowner community across the Southeastern U.S.[93] The NWOS reports that 98% of family forest owners in Georgia are white while approximately two percent identify as Black/African American. The population of Black family forest owners in Georgia may represent approximately 2,000 properties and 160,000 acres.

Conclusion

Most forests in Georgia are privately owned by individuals and corporations. While corporate ownership has been increasing, private individual ownership remains the largest category. Approximately 58% of forestland in the south is in individual private ownership. Individuals owning private forestland are also referred to as 'family forest owners' and are the subject of the National Woodland Owner Survey (NWOS). The NWOS found that more than 70% of family forest owners in Georgia indicated 'protecting water resources' as an important reason for owning forestland. It is estimated that 2 million acres of forest in Georgia have the potential to be lost through conversion to non-forest land uses between 2030 and 2060, primarily due to urban growth. Being able to provide a targeted marketing approach to engage landowners involves designing programs to persuade a specific group of people to take a specific action. By definition, this requires an understanding of the audience(s) through a marketing lens, which requires market segmentation. There are several examples of innovative technologies and targeted efforts that apply this thinking and that will be useful for developing a PES program in Georgia.

[91] WoodsCamp. 2021. https://woodscamp.com/.

[92] Center for Heirs Property Preservation. 2021. https://www.heirsproperty.org/

[93] U.S. Endowment for Forestry and Communities. 2019. Sustainable Forestry and African American Land Retention Program Set to Grow. https://www.usendowment.org/sustainable-forestry-and-african-american-land-retention-program-set-to-grow/

Chapter 4. Models of PES Programs for Water Resource Protection

Introduction

Water resource protection can take on many different forms ranging from traditional policy to voluntary PES programs. This chapter addresses policy approaches to water resource protection, including an existing example and a discussion of the urgency of the situation in Georgia. Case study examples of PES programs from around the U.S. are described and categorized by surface water and groundwater priorities and method of conservation (i.e., land acquisition, easements, and/or management agreements).

Policy Approaches

Policy is an important tool for water resource planning and protection and can play a critical role in PES program design. Salzman (2010)[94] discusses traditional environmental policy for watersheds and explains the need for collaboration across conventional and PES programs. Salzman lists traditional regulatory program methods and examples of some established requirements to protect drinking water, and illustrates how policies for buffers, for example, have included prescriptive regulation, more flexible property right regulations with tradable options, taxation, persuasion (i.e., via education), and incentive payments (Table

Figure 4.1 Policy approaches to water resource protection using buffers (Salzman 2010)

Regulatory Program Method	Example of Resulting Requirement
Prescriptive	Regulations requiring riparian buffers
Property Rights	Combining regulations with tradeable right of buffers (where portions of reduced sediment or nutrient loading from buffers can be sold as credits)
Tax Penalties	Taxes imposed on landowners who do not have buffers
Persuasion	Educational efforts to demonstrate the benefits of buffers through pilot projects
Payments	Pay for the establishment of buffers

Salzman advocates for PES programs because they can be more efficient than using gray infrastructure to address the impacts and deliver key services. In some cases, such as landscape management, a PES program may prove to be a better public and private investment strategy.

Smith, et al. provided a report to the Department for Environment Food & Rural Affairs, U.K. entitled: Payments for Ecosystem Services: A Best Practice Guide (2013)[95] which states (emphasis added):

> *"For a PES [program] to work it must represent a win for both buyers and sellers. PES [programs] may be positive from a buyer's perspective if the payments are less than those associated with any alternative means of securing the desired service. For example, it may be less expensive for a water utility to pay landowners for improved catchment management than to pay for additional water treatment. PES [programs] may be positive from a seller's perspective if the level of payment received at least covers the value of any returns foregone as a result of implementing the agreed interventions. For example, a farmer may be willing to create ponds for enhanced water storage if the payments received at least cover the costs of doing so, including the costs associated with any lost agricultural production."*

[94] Salzman, J. 2010. Designing Payments for Ecosystem Services. PERC Policy Series, No. 48, 2010. https://www.perc.org/2010/10/27/designing-payments-for-ecosystem-services-2/.

[95] Smith, S.; Rowcroft, P.; Everard, M.; Couldrick, L.; Reed, M., Rogers, H.; Quick, T.; Eves, C.; White, C. 2013. Payments for Ecosystem Services: A Best Practice Guide. Defra, London.

This underscores the difference between Salzman's (2010)[96] definition of a prescriptive approach and the PES approach. Smith, et al. also stress that the PES approach is one means to increase the supply of an ecosystem service or services. Many environmental market-based guidance documents address sellers having requirements for baseline stewardship and water quality trading (Smith, 2013;[97] Willamette Partnership, 2015[98]). However, PES programs are only one instrument among many for combating ecosystem degradation.[99]

Policy Approach Example in Carroll County, Georgia

County officials in Carroll County, Georgia have begun blending traditional policy with PES alternatives in their Comprehensive Plan Update (2018).[100] In this plan, county officials intend to manage impacts to water resources from continued growth by combining prescriptive riparian buffer policies with PES options. For instance, the plan incorporates the Chattahoochee Corridor Plan, adopted by the Atlanta Regional Commission, which prescribes a requirement for 2,000-foot buffers on rivers with average annual flows of at least 400 cubic feet per second and extends the requirement to the Little Tallapoosa River even though that waterway does not meet the average annual flow requirement. At the same time, the plan includes a voluntary PES approach with a program offering to purchase development rights' (PDR) by governments (i.e., county or municipality). A PDR program like this can involve significant expenditure of government funds that are often raised via a bond being issued (i.e., for agricultural preservation). The Carroll County plan also acknowledges that other funding mechanisms may be included, and PDR efforts can work in collaboration with fee simple land acquisition. As stated in the plan:

> *"State, federal, and nonprofit conservation organizations (land trusts) can purchase development rights or provide supplemental funding for local or nonprofit conservation efforts. Mitigation fees also may be used to fund PDR programs. The purchasing of development rights through conservation easements is less expensive than fee simple acquisition. If fee simple acquisition occurs, the PDR holder may sever the development rights and sell the land for agriculture purposes."*

The term fee simple means the purchase transfers full ownership of the property, including underlying title, to another party. Fee simple acquisition may also be the result of a donation, with the landowner realizing tax benefits from the donation.[101]

Projections of future water resource demands in Georgia indicate that the state will likely experience many growing pains regarding safe water supplies adequate to meet demand. The approach taken in Carroll County may have broader statewide relevance as the scale and urgency of this situation will need a comprehensive approach, including both prescriptive and voluntary approaches.

[96]Salzman, J. 2010. Designing Payments for Ecosystem Services. PERC Policy Series, No. 48, 2010. https://www.perc.org/2010/10/27/designing-payments-for-ecosystem-services-2/.

[97]Smith, S.; Rowcroft, P.; Everard, M.; Couldrick, L.; Reed, M., Rogers, H.; Quick, T.; Eves, C.; White, C. 2013. Payments for Ecosystem Services: A Best Practice Guide. Defra, London.

[98]Willamette Partnership, World Resources Institute, and the National Network on Water Quality Trading. 2015. Building a Water Quality Trading Program: Options and Considerations. http://willamettepartnership.org/wp-content/uploads/2015/06/BuildingaWQTProgram-NNWQT.pdf.

[99]Others include regulation; the provision of services by government; voluntary efforts on the part of businesses, communities, and individuals; and incentivized market-based mechanisms, including PES programs.

[100]Carroll County, GA. 2018. Comprehensive Plan Update. https://carrollcountyga.com/DocumentCenter/View/2554/Comprehensive-Plan-2018-Final.

[101]University of Wyoming. 2020. Conservation Toolkit Land Conservation and Acquisition Tools. https://www.uwyo.edu/toolkit/land-conservation/fee-simple.html#:~:text=Land%20acquisition%20includes%20the%20%E2%80%9Cfee,tax%20benefits%20from%20the%20donation.

Georgia's Pending Water Demand Challenge

The Georgia Forestry Commission's sustainability report (GFC, 2019) states that 60.5% of the surface source water supply[102] in the state comes from forested areas. The Piedmont and Blue Ridge Provinces[103] are dominated by surface source water intakes and forested land use. The statewide population growth is projected to increase 12% this decade, 30% by 2050 and 44% by 2065.[104,105] The largest growth is expected in many counties in northern Georgia and will add to the drinking water demand challenges for many existing water utilities. In each projected time period, the top growth counties are in the Piedmont and Blue Ridge province eight (8) out of ten (10) times. Tables B.1, B.2, and B.3 found in Appendix B present the top ten growing counties according to population projections from the Governor's Office of Planning and Budget for 2030, 2050, and 2065, respectively.

The urgency of water resource protection has been recognized in Georgia and efforts have been made over the years to address the situation, especially through water conservation strategies and in response to the threat of drought. According to the National Integrated Drought Information System (NIDIS),[106] since the U.S. Drought Monitor started in 2000, the longest duration of drought in Georgia lasted 161 weeks beginning April 11, 2006 and ending May 5, 2009. The most intense period of drought occurred the week of December 11, 2007 where D4 (exceptional drought) affected nearly 50% of the state's land area. After this intense drought, the state legislature passed the 2010 Water Stewardship Act which outlined key requirements on public water utilities that include water loss audits, changes in plumbing codes, and adding further outdoor use restrictions to "create a new culture of water conservation" (UGA, 2014).[107]

Statewide data indicates Georgia is in the top quartile in the U.S. in water conservation according to the American Water Works Association (AWWA)[108] 2019 State of the Water Industry Report. Based on 2016 data, the average home water use in Georgia is 79 gallons per capita per day (g/c/d) (NEEF, 2020).[109] The Georgia Water Planning Regional Report for Coosa-North Georgia (2017)[110] estimates 75 g/c/d. The estimated use 15 years earlier was 93 g/c/d (Hamilton Project).[111] Lowering the per capita water consumption rate from 93 to 75 g/c/d is approximately a 20% improvement and represents a significant change in household behaviors and systems of water consumption in the state. The Water Stewardship Act is a valuable prescriptive method for water resource protection in the state and will continue to help address the growing pains Georgia faces as the future water demand would be much higher without the Act. However, a comparison of the Act's 20% consumption reduction success to the Office of Planning and Budget's growth projection of 30% by 2050, underlines Smith's (2013) point that combining many partial solutions will be necessary. The projected population growth rates for the top ten counties range from 24 to 38%, and even at the new lower rates of consumption, the growth in population will overwhelm the water supply systems. For many counties, the projected growth will double or triple their current population sometime between 2050 and 2065.

While the situation in Georgia is urgent and many responses are already underway in the state, there is also value in looking to other states and regions that face similar water resource threats. The following sections provide case study examples of PES programs from around the U.S. These examples are described and categorized by surface water and groundwater priorities and method of conservation (i.e., land acquisition, easements, and/or management agreements).

[102]Surface water withdrawals commonly come from lakes, reservoirs, or stream diversions to constructed treatment impoundments which also provide benefit from trapping sediments and dampening the hydrographs low flows.

[103]See Chapter 2, Figure 4 for a map of ecological provinces in Georgia, including the Piedmont and Blue Ridge Provinces that dominate North Georgia.

[104]Governor's Office of Planning and Budget. 2020. County Residential Population, 2020-2065. https://opb.georgia.gov/census-data/population-projections.

[105]The projected growth is not even across the state and some counties are projected to lose population.

[106]National Integrated Drought Information System. 2021. Drought in Georgia. https://www.drought.gov/drought/states/georgia.

[107]University of Georgia Extension. 2014. The Georgia Water Stewardship Act. Circular 995. https://extension.uga.edu/publications/detail.html?number=C995&title=The%202010%20Georgia%20Water%20Stewardship%20Act#Acknowledgements.

[108]American Water Works Association. 2019. 2019 State of the Water Industry Report. https://www.awwa.org/Portals/0/AWWA/ETS/Resources/2019_STATE%20OF%20THE%20WATER%20INDUSTRY_post.pdf.

[109] Blount, S. 2020. National Environmental Education Foundation. Home Water Use in the United States. https://www.neefusa.org/weather-and-climate/weather/home-water-use-united-states.

[110]Georgia Water Planning. 2017. Coosa-North Georgia Regional Water Plan. https://waterplanning.georgia.gov/coosa-north-georgia-regional-water-plan.

[111] The Hamilton Project. 2005. Domestic Water Use per Capita (in gallons per day) by State, 2005. https://www.hamiltonproject.org/charts/domestic_water_use_per_capita_in_gallons_per_day_by_state_2005.

Case Study Examples of PES Programs in the United States

These case studies illustrate approaches taken in various parts of the U.S. that may help inform PES program development in Georgia and other Southeastern states that have similar priorities related to keeping forests and protecting water resources. Featured case studies were chosen because of their relevance to the situation in Georgia, diversity of approaches, and track records demonstrating progress toward desired outcomes. Additional PES programs are listed by Armistead (2016) in a table (Table 4.7) at the end of the chapter.

Programs are split into two categories: 1) surface water protection and 2) groundwater and wellhead protection. They are then outlined by the methods applied to conserve parcels while recognizing that many programs offer two or more agreement options in their program. The methods include: 1) land acquisition and land purchase programs, 2) easements of varying length, and 3) land management service agreements (Table 4.2). Not all program reviews resulted in the same level of information provided regarding program structures and cost/pricing details.

Figure 4.2 U.S. PES program case study examples categorized by intake source and conservation methods

Intake Source	Methods Applied to Conserve Parcels	Legal Agreement Duration	Case Studies that Include This Applied Method
Surface Water	Land Acquisitions	Permanent	Bellingham, WA – Lake Whatcom
			Raleigh, NC - Upper Neuse River Basin
			Portland, ME – Lake Sebago Watershed
	Conservation Easements	Permanent	Bellingham, WA – Lake Whatcom
			Raleigh, NC - Upper Neuse River Basin
			Portland, ME – Lake Sebago Watershed
		Short-term	Bellingham, WA – Lake Whatcom
	Land Management Service Agreements	Short-term	Denver, CO – Denver Water & Forest to Faucets; Forested River Basin Water Supplies: South Platte River, Blue River, Williams Fork River, & Fraser River
		Short-term	Albuquerque & Santa Fe, NM Rio Grande Water Fund; San Juan-Chama Watershed
		Short-term	Forest Bank, IN – Non-watershed Specific
Groundwater	Land Acquisitions	Permanent	Austin, TX – Barton Springs Aquifer Protection Program
	Conservation Easements	Permanent	San Antonio, TX – Edwards Aquifer Protection Program
	Land Management Service Agreements	Short-term	American Farmland Trust, BMP Challenge – Operated in 16 States including Shenandoah Valley, VA; PA; NY; CA; and other Mid Atlantic and Midwest Locations

The summarized case studies present common PES program services by service type, administering entity, program delivery, and cost per unit. The program categories are further discussed regarding pros and cons according to the potential to meet private forest landowner's short-term needs and long-term plans. The order of presentation runs from expected higher upfront per acre costs to lower cost methods to obtain land rights, with land acquisition being presented as the most expensive method. However, multiple cycles of short-term conservation easements or forest management service contracts may result in higher long-term and cumulative costs. Also note that any one case study may contain multiple methods to obtain land rights.

Surface Water Supply Protection

The following case studies illustrate surface water PES programs in North Carolina, Washington, Maine, Indiana, Colorado, and New Mexico.

Land Acquisition Programs for Surface Water Protection

The following programs in North Carolina and Washington illustrate the land acquisition method to obtain land rights and protect surface waters.

Upper Neuse Clean Water Initiative, North Carolina[112,113,114,115,116]

The City of Raleigh, North Carolina working with 10 other governmental and non-governmental organizations created the Upper Neuse Clean Water Initiative in 2006. The initiative helps protect nine (9) drinking water reservoirs that serve eight (8) municipalities in the state. The area of interest is 770 square-miles in extent, with 20% in urban development, 16% in agriculture, three percent wetlands, and 60% forested. The Initiative assessed the watershed for high priority protection acres and used GIS comparisons to determine the current level of protection. In 2006, the remaining unprotected high priority areas resulting from the analysis included 23,635 acres (six percent of the basin).

- Administrator: Raleigh Water; a collaboration of government and land trust/conservancy organizations (i.e., public-private partnership, P3).
- Water Ecosystem Services Provided: Prevention of forest land use conversion and conservation to reduce impacts from intensive land management practices to address excessive sediment and nutrient loading located in nine water supply reservoirs.
- Legal Agreement Type(s): Land acquisition and conservation easements implementing forest protection in high priority riparian areas
- Status: As of 2016, The Upper Neuse Clean Water Initiative had successfully protected 88 properties (7,658 acres) representing 84 miles of streambank. The Upper Neuse Clean Water Initiative 2015 - 2045 Conservation Strategy extended the goal to protect another 30,000 acres over the next 30-years. The most recent information from 2019 reports 115 total properties protected, representing 113 miles of streambank and 10,491 acres. The investments by the City of Raleigh total approximately $14.7 million.
- Water Consumers: over 510,000
- Method to Raise Funding: A drinking water utility dedicated volumetric fee, set at $0.15 per 1,000 gallons in 2016, as well as grant funding from state and federal programs
- Water Utility Client Fee Increases: $0.1122 per 100 cubic feet of water provided (CCF) for Raleigh, Garner, Rolesville, Wake Forest, and Knightdale water customers, averaging $1.02/household/month

[112]Hart, K. 2006. The Upper Neuse Clean Water Initiative Conservation Plan. Trust of Public Land. https://www.triangleland.org/cms/wp-content/uploads/2015/12/UNCWI-Conservation-Plan-small-.pdf.

[113]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.

[114]Allen, W.; Birch, A.; Burke, C.; Buchan, E.; Hammerbacher, L.A. 2016. Upper Neuse Clean Water Initiative; 2015 - 2045 Conservation Strategy. https://issuu.com/rebeccahankins/docs/2015-2045_conservation_strategy.

[115]Raleigh Water. 2020. Watershed Protection Fee. https://raleighnc.gov/services/content/FinUtilityBilling/Articles/UtilityBillingDepositFees.html#:~:text=The%20Watershed%20Protection%20Fee%20is,Forest%20and%20Knightdale%20water%20customers.

[116]The Conservation Trust for North Carolina. 2019. News update: "UPPER NEUSE INITIATIVE BOASTS IMPRESSIVE ACCOMPLISHMENTS," https://ctnc.org/category/uncwi/.

[117]City of Bellingham. 2020. Lake Whatcom Reservoir Property Acquisition Program. https://cob.org/services/environment/lake-whatcom/lw-property-acquisition-program.

[118]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.

Lake Whatcom Watershed Property Acquisition Program, Washington[117,118]

The City of Bellingham, Washington is working with Whatcom County, Whatcom Land Trust, and the Sudden Valley Community Association as the Administrator of the Lake Whatcom Watershed Property Acquisition Program. The Lake Whatcom watershed is 31,127 acres in size, and the City of Bellingham is the water utility within the watershed. In 2007, Lake Whatcom's watershed had 4,007 acres of land developed and 5,552 more acres zoned for development.

- Administrator: City of Bellingham, WA working with other governmental and non-governmental organizations (i.e., public-private partnership, P3).
- Water Ecosystem Services Provided: Prevention of forest land use conversion to assist with addressing phosphorus, bacteria, and low dissolved oxygen impairments
- Legal Agreement Type(s): Land acquisition and permanent and short-term conservation easements or restrictive covenants[119]
- Status: As of June 2020, the City of Bellingham has purchased 2,229 acres at a cost of $33.7 million (~$15,100/acre). The City also has acquired protection through 164 acres of conservation easements or restrictive covenants.
- Water Consumers Served: 95,000
- Method to Raise Funding: Flat drinking water fee increase ($5/month), plus volumetric fee ($0.64 per 100 ft3)
- Water Utility Client Fee Increases: $5/month + $0.64 per 100 cubic feet of water provided (CCF) averaging $10.81/household/month.

Programs Including Conservation Easements for Surface Water Protection

In addition to the Bellingham, WA example above, the following program example from Maine emphasizes conservation easements as part of their program to obtain land rights to implement the desired surface water resource protection.

Sebago Clean Water Fund, Maine[120,121,122]

Sebago Lake supplies the Portland Water District (PWD) clean water that needs no filtration. A report entitled An Economic Case for the Sebago Watershed Water & Forest Conservation Fund by Daigneault, et al., (2018)[123] estimated a capital cost of $100 to $200 million if filtration treatment equipment would be required in the future. These costs would include operation and maintenance costs, and the filtration plant cost of $15 million annually would need to be passed on to water consumers. The PWD serves 11 communities in Maine and more than 200,000 people. The Sebago Lake watershed is 234,000 acres in size and 84% forested. Only 10% of the watershed acres are enrolled in permanent conservation easements or in public ownership for conservation purposes. The watershed is exposed to development pressure in one of Maine's fastest growing regions. Sebago Clean Water Fund's mission is to increase the conservation protection for at least 25% more land (35,000 acres) in the next 15-years by raising at least $15 million. The PWD works with both the Sebago Clean Water Fund and its own Land Conservation Program which supports qualifying land trust organizations' projects by funding 25% of the total cost. Land costs for the conservation program are estimated to be between $800 and $2,450 per acre.

- Administrator: A public-private partnership (P3) collaborative effort with Sebago Clean Water Fund, Open Space Institute (OSI), and the Highstead Foundation
- Water Ecosystem Services Provided: Prevention of forest land use conversion as a cost avoidance strategy associated with reducing the potential for future requirements to add filtration treatment equipment at the Portland Water District.
- Legal Agreement Type(s): Land acquisition and permanent conservation easements
- Status: As of 2018, OSI has worked with eight (8) land trust organizations, State Departments, The Nature Conservancy (TNC), and U.S. Department of Interior to protect 25,062 acres in fee simple land acquisitions and conservation easements.
- Water Consumers Served: 200,000
- Method to Raise Funding: Voluntary donations, community dedicated funds, and grants – the most recent grant was an $8 million USDA NRCS Regional Conservation Partnership Program (RCPP) grant awarded in September of 2020. This brings the total funding raised to $18.5 million.

Land Management Service Agreements for Surface Water Protection

Land Management Service Agreements (LMSAs) can be used to achieve healthier forests, reduce soil erosion, improve or maintain beneficial hydrology, and reduce the risk of insect and disease infestations or wildfire. Service agreements provide forest landowners access to skilled professionals and contractors who perform land management activities like:

- Application of appropriate pesticides
- Reduction of hazardous fuels
- Thinning forest stands
- Implementing prescribed burns
- Providing mature forest management and maintenance
- Improving forest road maintenance
- Providing sustainable timber harvesting and reforestation

A forest landowner benefits from having a registered forester work with them to create a Forest Management Plan (FMP) for their property. The FMP identifies the landowner's land management needs and the goals and objectives that they will use when engaging in forestry service agreements. Drinking water source protection PES programs and the surrounding community benefit from providing key service agreements resulting in the desired outcomes and resource protections. The resulting healthy forests help secure drinking water source supplies, increase adjacent land values, and reduce risks to neighboring forests. Legal agreements and funding sources can be written in the form of grants or cost share contracts, or as part of a forest protection conservation easement. However, LMSAs do not generally provide for permanent protection for keeping forests as forests unless the service agreement is part of a conservation easement or other long-term binding legal agreement that states the forest preservation goals and restricts land use conversion. PES programs in Georgia and the Southeastern U.S. can use service agreements to enhance private forest landowner adoption and participation in the PES program. Service agreements typically require adding to or strengthening existing layers of collaborating entities, including new funding sources, engagement with registered foresters, service contractors, and non-profits with a mission to implement forestry practices.

Land Management Service Agreements (LMSAs) can be a desirable approach to PES program development because of the potential flexibility, cost efficiency, and improved attractiveness to participating landowners. Unlike land acquisition and permanent conservation easements, LMSAs can be established for a specific and limited period (i.e., a timber rotation length). This approach may be more attractive to landowners that do not want to sell their property or are resistant to placing permanent restrictions on their land uses. This approach may also be a good fit for Georgia which is dominated by private landownership, diverse landowner objectives, and existing public and private technical service providers than can assist in delivering land management services. As noted, LMSAs do not provide a guarantee of long-term protection because enrolled lands may cycle out of the program over time, and there is the additional administrative burden of compliance monitoring and administering rolling sign-up periods. A variety of LMSAs programs are in use across the U.S. as a widespread practice to influence farming and forestry land use activities.

The following program examples from Indiana, Colorado, and New Mexico emphasize land management service agreements as part of their programs to implement the desired surface water resource protection.

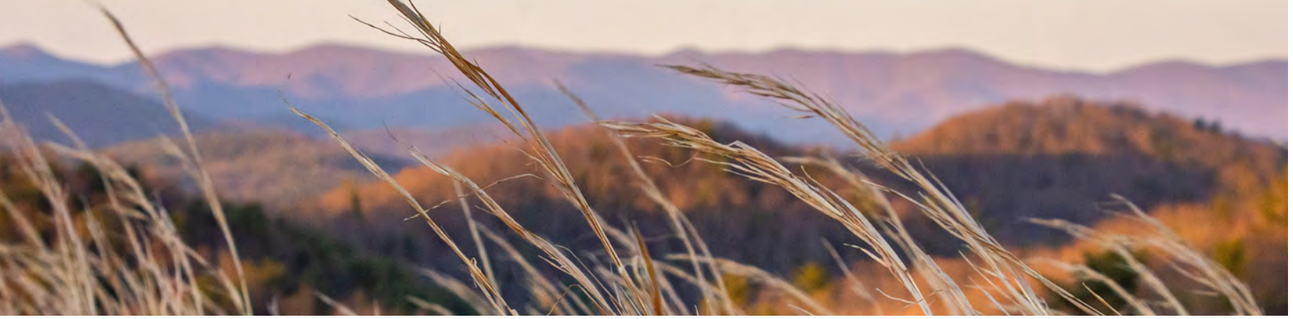
[119]The City of Bellingham's program indicated that short-term easements were allowed. When reviewing annual fact sheets with conserved acreage totals it was noticed that a minor loss of conserved acres occurred in this program. The lost acreage was a size that could have easily been one easement contract, and this reduction in conserved acres highlights a program management challenge and a limitation of short-term easement approaches.

[120]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.

[121]Sebago Clean Waters. 2020. https://www.sebagocleanwaters.org/.

[122]Portland Water District. 2020. https://www.pwd.org/land-conservation.

[123]Daigneault, A.; Strong, A.L. 2018. An Economic Case for the Sebago Watershed Water & Forest Conservation Fund. https://www.sebagocleanwaters.org/invest/.



The Forest Bank, Indiana[124]

The Forest Bank is a program of The Nature Conservancy (TNC)[125] in Indiana to conserve working woodlands while preserving opportunities for recreation, wildlife habitat, natural beauty, and solitude. The Forest Bank[126] provides an annual payment to the landowner based upon a timber valuation, and landowners have access to the expertise of foresters, biologists, botanists and other TNC scientists to manage their woodlands for multiple benefits. Financial returns from the management and sale of timber from participating properties helps fund the program.

Woodlands enrolled in The Forest Bank remain private property. Landowners can still use their woodland just as they normally would if the health and growth of timber is not hampered. Forest Bank Agreements are for either 10 or 30 years. The 10-Year Management Agreement includes fee-based professional forest and wildlife management services. A forest stewardship plan is developed to guide forest management work on the property and all work to be completed is approved in advance by the landowner. The landowner can get out of the agreement with 30 days' notice. Under the 30-Year Agreement, TNC pays four percent of the land's timber value per year. The Conservancy covers the up-front costs of controlling invasive plants, posting the boundaries, erosion control on roads, and other types of timber stand improvement (TSI) treatments. When a timber harvest occurs the proceeds of the sale pay TNC back for the annual payments and the cost of managing the property, and remaining proceeds from the timber sale go to the landowner. At the end of 30 years, the landowner and TNC can choose to enter into a new agreement. Timber is reappraised every 10 years and the annual payment is adjusted accordingly. As of 2020, forest owners in parts of Clark, Crawford, Floyd, Harrison, Washington, and Orange Counties owning at least 15 acres of forest or have a standing timber value of at least $15,000 met the minimum deposit requirements of the Bank.[127]

- Administrator: Nonprofit organization (The Nature Conservancy-TNC)
- Water Ecosystem Services Provided: Prevention of forest land use conversion to protect all forestry ecosystem services, including water quality and quantity for both surface and groundwater.
- Legal Agreement Type(s): Land Management Service Agreements, 10 or 30-year contract lengths
- Status: There are currently about 8,000 acres and 60 landowners enrolled in The Forest Bank in 12 counties in Indiana. The lands enrolled in the program are certified to the standards of the Forest Stewardship Council (FSC) through a group certificate administered by TNC.
- Water Consumers: Not estimated
- Method to Raise Funding: forestland timber valuation, proceeds from management activities and timber sales
- Water Utility Client Fee Increases: Not applicable/None

[124]The Nature Conservancy. 2020. The Forest Bank; Conservation options for woodland owners. https://www.nature.org/content/dam/tnc/nature/en/documents/Forest-Bank-Fact-Sheet-Nov2020.pdf.

[125]The Nature Conservancy. 2020. Forest Bank; Professional Assistance is Available to Help with Forest Management. https://www.nature.org/en-us/about-us/where-we-work/united-states/indiana/stories-in-indiana/forest-bank/.

[126]Indiana Woodland Steward. 2000. The Southern Indiana Forest Bank. Summer 2000, Volume 9, Number 2. http://www.inwoodlands.org/storage/past-issues/southern.htm.

[127]An illustration of a Forest Bank appraisal process and agreement: For example, if a forest owner has 40 acres of timber appraised at $500 per acre, the owner could deposit the total value ($20,000) in The Forest Bank. This deposit would pay the woodland owner regular annual payments of 4%, or in this case $800 per year. While the timber is deposited in the bank neither the forest owner nor The Forest Bank may harvest the timber unless both agree. At some point in time, if the forest owner decides to withdraw the remaining deposit, this would cause the annual payments to cease, and The Forest Bank retains the right to manage and harvest the forest within limits.

Denver Water, Colorado[128,129,130]

In 2010, Denver Water formed a partnership with the U.S. Forest Service's Forest to Faucet program supported by a $16.5 million grant on a 1:1 match basis to reforest and manage the forest for reduced wildfire risks and incidences over 48,000 acres. The partnership program was triggered by two catastrophic fires, the 1996 Buffalo Creek and 2002 Hayman fires that resulted in water utility expenses of $27.7 million dollars in key water supply watersheds and required additional water treatment and debris removal and disposal in key reservoirs. Friends of the Verde River[131] estimate that Denver Water incurred over $40 million in costs for treatment and sediment dredging and removal. Significant differences have been found in fire behavior and watershed impacts in managed and unmanaged areas of Colorado. Areas where Community Wildfire Protection Plans (CWPPs) have been developed and implemented have contributed to effective wildfire containment and reduced impacts to watersheds. Furthermore, a Colorado study (2004)[132] indicated that in a mountain snowpack water supply setting, forest thinning was a means to increase streamflow annual yield without sizably reducing water quality. Today, Denver's watershed protection program coordinates equipment and professional and volunteer assistance to provide thinning and hazardous fuel removal, prescribed burning, firebreaks, noxious weed treatments, and tree planting. Best management practices were developed by a steering committee and subject matter experts and are implemented to protect against contamination from chemical spills, inadequate septic systems, nutrients from agriculture, mine contamination, oil and gas development, and forest fires. Due in part to these efforts, the wildfires that occurred in Colorado during 2020 did not substantially impact Denver Water's source supply.

Since being established, the program has expanded to include the South Platte (2013) and Fraser River (2015) and partnership with the USFS, Colorado State Forest Service, and Natural Resources Conservation Service (NRCS). The plan for the Upper South Platte Watershed serves as a guide and template for the development of plans in other watersheds upon which Denver Water's customers depend.

The South Platte River is one of the mountain streams that feed surface water to Denver Water's drinking water intakes from reservoirs. A sophisticated suite of models has been developed by the project partners to assess wildfire risk to communities and post wildfire debris and sedimentation loading to drinking water reservoirs. In partnership with Colorado State University, a Collaborative Watershed Assessment (2016)[133] was developed. The source water opportunity assessment (characterization) and treatment prioritization included:

- Fire behavior models (model FlamMap[134] , data LANDFIRE[135])
- Assessing burn probability (model FlamMap), including active crown fire potential (model FlamMap, data from RAW: local remote automated weather stations)
- Post-fire soil erosion and deposition (models: GeoWEPP[136] , RUSLE[137])
- Wildland urban interface (WUI) (data from CO-WRAP, a Colorado specific housing density GIS data layer)
- Landscape Treatment Designer (Ager et al., 2012)[138] operated at the HUC-12 scale

[128]Denver Water. 2020. Watershed Protection & Management. https://www.denverwater.org/your-water/water-supply-and-planning/watershed-protection-and-management.

[129]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.

[130]Colorado State University, Colorado Forest Restoration Institute. 2016. Forest to Faucets Website. https://cfri.colostate.edu/projects/forests-to-faucets/.

[131]Friends of the Verde River. 2019. Case Study – Denver Water Forest to Faucet Partnership. https://verderiver.org/case-study-denver-water-forest-to-faucet-partnership/.

[132]MacDonald, L.H.; Stednick, J.D. 2004. Forests and Water: A State-of-the-Art Review for Colorado. Colorado State University. https://www.fs.usda.gov/treesearch/pubs/59257.

[133]Colorado State University, Colorado Forest Restoration Institute. 2016. Forest to Faucets Website. https://cfri.colostate.edu/projects/forests-to-faucets/.

[134]USDA U.S. Forest Service, Rocky Mountain Research Station. 2020. FlamMap6. Accessed online January 8, 2021, at: https://www.firelab.org/project/flammap

[135]U.S. Department of Agriculture. 2020. LANDFIRE Program. https://landfire.gov/.

[136]Haoyi, F.X.; Goergen, J.; Yasumiishi, M.; Renschler, C.S. 2014. GeoWEPP for ArcGIS 10.x Version Overview Manual. http://geowepp.geog.buffalo.edu/wp-content/uploads/2014/01/GeoWEPP_ArcGIS10_Overview.pdf.

[137]U.S. Department of Agriculture. 2005. Revised Universal Soil Loss Equation (RUSLE, RUSLE 1, and RUSLE 2). https://www.ars.usda.gov/southeast-area/oxford-ms/national-sedimentation-laboratory/watershed-physical-processes-research/docs/revised-universal-soil-loss-equation-rusle-welcome-to-rusle-1-and-rusle-2/

In addition, Colorado State University et al., (2004)[139] published a review of forest and water attributes specific to Colorado.[140]

- Administrator: Denver Water in partnership with U.S. Forest Service - Forest to Faucets program
- Water Ecosystem Services Provided: Forest management for wildfire protection/reduction, insect and disease management for water source supply catastrophic event management, water quality and public health and safety with water reservoir and treatment cost avoidance
- Legal Agreement Type(s): Land Management Service Agreements - private forest landowners can obtain BMP implementation grants and in-kind service agreements to conduct wildfire fuel reduction treatments
- Status: The effort includes investment of more than $64 million to conduct fuel reduction and forest management activities on 73,000 acres of National Forest System lands in Denver Water Zones of concern by 2021. The Denver Water Source Water Protection Plan for the Upper South Platte River estimates the proposed source water protection area is 37% private ownership, 59% state and federal ownership, two percent local city or county ownership, and two percent water system ownership.[141]
- Water Consumers served: over 1.5 million
- Method to Raise Funding: Denver Water utility fee surcharge and USFS grant ($16.5 million)
- Water Utility Client Fee Increases: Denver Water utility fee surcharge, of $27 per household over five years (Friends of the Verde River); or $0.40 per 1,000 gallons, $/household/month = $0.272 (Walls, 2019)

Rio Grande Water Fund, New Mexico[142,143,144,145,146]

The Rio Grande Water Fund was established to achieve the vision of healthy forests and watersheds that provide a reliable supply of high-quality water for the Rio Chama River and other benefits for New Mexico. The Rio Chama River is a tributary to the Rio Grande River. The goal of the water fund is to protect storage, delivery and quality of Rio Grande water and key river tributaries in New Mexico through landscape-scale forest restoration treatments in tributary forested watersheds, including the San-Juan Chama Watershed Partnership. The objectives of the water fund are to:

- Restore watershed functions by improving the health of streams and riparian areas
- Mitigate the downstream effects of flooding and debris flows after wildfires
- Reduce forest fuels in areas identified as high risk for wildfire and debris flow
- Support forest products industries' use of wood by-products from forest fuel reduction
- Maintain the reduced wildfire hazard in treated areas
- Secure sustainable financing from water users, government, investors, and donors, and facilitate payments to upstream land managers

The Rio Grande, Rio Chama, and their forested tributaries and headwaters encompass an area with roughly 1.7 million acres of fire-adapted ponderosa pine and mixed conifer forests. Research findings have resulted in a recommendation that one to two percent of fire-adapted forest landscapes should be treated each year to change damaging wildfire behavior. For an area of this size, meeting this recommendation would result in the annual restoration of 17,000 to 34,000 acres. The Nature Conservancy estimates the current annual rate of treatment is between 3,000 and 5,000 acres. The Rio Grande Water Fund aims to ramp up and sustain treatments over 20 years on 30,000 acres per year for a total of 600,000 acres restored in the Rio Grande, Rio Chama, and tributary watersheds. A quantitative wildfire risk assessment was completed to set priorities for forest and watershed restoration that targets investments in watershed health with the greatest expected return on investment. This tool was developed by the U.S. Forest Service scientists. The wildfire risk assessment framework considers and prioritizes:

- Wildfire simulations (wildfire likelihood and intensity hazard)
- Exposure analysis and GIS mapping (assessing wildfire intensity and burn probability where highly valued resources and assets, HRVAs, are present)
- Effects analysis (prediction of fire effects, good and bad)

This process considers multiple ecosystem services in the Rio Grande Water Fund and considers forest disease, insects, and invasive species. The assessment characterization tool is also scalable to different land sizes. Importantly, the characterization tool informs decision makers on post-wildfire hazards like debris flows that could potentially threaten water sources.

[138]Ager, A.A.; Vaillant, N.; Owens, D.E.; Britten, N.S.; Hamann, J. 2012. Overview and Example Application of the Landscape Treatment Designer. (PNW-GTR-859). USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

[139]MacDonald, L.H.; Stednick, J.D. 2004. Forests and Water: A State-of-the-Art Review for Colorado. Colorado State University. https://www.fs.usda.gov/treesearch/pubs/59257.

[140]The water yield response to deforestation and thinning summarized in this research is region specific, as such, Colorado findings are not necessarily transferable to Georgia or other regions. Evaristo et al. (2019) performed a global analysis of streamflow response to forest management and the findings define some general trends to consider in Georgia.

[141]Denver Water. 2015. Denver Water Source Water Protection Plan for the Upper South Platte River. https://www.denverwater.org/sites/default/files/2017-05/upper-south-platte-source-water-protection-plan-report.pdf.

[142]Rio Grande Water Fund. 2014. Rio Grande Water Fund, Comprehensive Plan for Wildfire and Water Source Protection. 2014. http://riograndewaterfund.org/wp-content/uploads/2017/01/rgwf_compplan.pdf.

[143]Rio Grande Water Fund. 2020. Rio Grande Water Fund, A Wildfire and Water Source Protection Project. http://riograndewaterfund.org/.

[144]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.

[145] City of Santa Fe Water. 2020. https://www.santafenm.gov/water_division.

[146]The Nature Conservancy. 2020. Rio Grande Water Fund. https://www.nature.org/en-us/about-us/where-we-work/united-states/new-mexico/stories-in-new-mexico/new-mexico-rio-grande-water-fund/?vu=r.v_riogrande.local.na.nm.

[147]The Nature Conservancy. 2020. Rio Grande Water Fund Wildfire and Water Source Protection - Annual Report 2020. https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_RioGrandWaterFund_AnnualReport_2020_FINAL.pdf.

[148]New Mexico State Forestry and The Nature Conservancy. 2020. 2020 Forest Action Plan, Statewide Natural Resource Assessment and Forest Action Plan for New Mexico. http://nmfap.org/threats/.

[149] Scott, J.H.; Thompson, M.P.; Calkin, D.E. 2013. A wildfire risk assessment framework for land and resource management. Gen. Tech. Rep. RMRS-GTR-315. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 83 p. https://doi.org/10.2737/rmrs-gtr-315.

There are four focal areas identified in the comprehensive water fund plan which represent broad regions for restoration treatments and economic development. Data utilized in the identification of the focal areas included forest conditions, water supplies and users, potential for wood use, and social and economic importance to the state. Forest management provides water quality and public health and safety benefits and cost avoidance of stream and water reservoir clean outs, and cost avoidance from impacts to lives and property as associated with wildfire and flooding impacts.

- Administrator: Rio Grande Water Fund, public-private partnership led by The Nature Conservancy
- Water Ecosystem Services Provided: Forest management for wildfire protection/reduction, and insect and disease management for water source supply protection and minimization of wildfire associated sediment runoff and debris dam formations which have previously caused substantial localized catastrophic flooding.
- Legal Agreement Type(s): Land Management Service Agreements - individual private forest landowners can obtain NRCS Resource Conservation Partnership Program implementation funding. Larger organizations can participate in the USFS Stewardship Contracting program.
- Status: Completed a pilot project in Santa Fe, New Mexico, protecting 8,400 acres. Since 2014, the Water Fund has treated 140,000 acres of forest.
- Water Consumers served: over 690,000 in Santa Fe and Albuquerque alone (2020)
- Method to Raise Funding: $5.3 million in private funding invested, $49 million in public funding leveraged (including water utility funds)
- Water Utility Client Fee Increases: Santa Fe pilot program: $0.13/1,000 gallons, = $0.884 $/household/month (Walls, 2019)

Groundwater Source Protection

The following case studies illustrate groundwater protection PES programs in Texas and a 16-state multi-regional effort.

Land Acquisition Program for Groundwater and Wellhead Zone Protection

The following project in Texas illustrates the land acquisition method for groundwater and wellhead zone protection.

Barton Springs Aquifer Protection Program, Texas[150,151,152]

Austin, Texas has operated the Water Quality Protection Lands Program (WQPL) for over 20 years and purchased or secured conservation easement for 28,354 acres at a cost of over $153.5 million. The protected lands comprise 25% of the Edwards Aquifer recharge zone. The mission of the WQPL program is to purchase land and conservation easements in the Barton Springs contributing and recharge zone to conserve and maintain the safety of part of the City's water supply. The objective is to produce the optimum level of clean, high quality water from these lands to recharge the Barton Springs segment of the Edwards Aquifer.

- Administrator: City of Austin, TX
- Water Ecosystem Services Provided: Land management over Edwards Aquifer for Barton Springs water withdrawal
- Legal Agreement Type(s): Land acquisition; secure and manage land over aquifer recharge area
- Status: As of 2014, $153.5 million has been applied to land purchases covering 28,354 acres
- Water Consumers: 912,000
- Method to Raise Funding: City bonds and an undisclosed funding source (providing less than one-fifth of the total funding amount)
- Water Utility Client Fee Increases: Not applicable/none

Conservation Easement Program for Groundwater and Wellhead Zone Protection

The following project in Texas illustrates the conservation easement method for groundwater and wellhead zone protection.

Edwards Aquifer Protection Program, Texas[153,154, 155]

The Edwards Aquifer provides San Antonio, TX with an abundant source of groundwater vital to the livelihood of a growing population and an expanding economy. It stretches across thousands of acres over several counties in South Central Texas. Roughly 70% of San Antonio's drinking water originates as recharge occurring west of Bexar County. Rainfall enters the aquifer through fractures, caves, sinkholes, and other features and replenishes the aquifer. However, rapid growth and development continue to impact the aquifer, reducing the number of recharge features needed to maintain San Antonio's primary water resource. While rules are in place to regulate development and pollution, the best way to protect the aquifer is to conserve the sensitive and irreplaceable land located over its recharge and contributing zone. In 2000, the City of San Antonio implemented a voter approved sales tax increase of 1/8th of one percent (0.125 percent). This sales tax increase is reevaluated and voted on every five years. In 2020, this funding source was replaced by a City commitment of $100 million over ten years (2023 to 2033). As of 2020, the program has conserved 161,511 acres in the target area. 94% of property conserved is under a conservation easement.

- Administrator: City of San Antonio, Texas; Conservation Advisory Board
- Water Ecosystem Services Provided: Protection of Edwards Aquifer, a wellhead protection program
- Legal Agreement Type(s): Conservation Easements
- Status: Through 2033 authorized spending was $425 million in total funding,
- Water Consumers: 1.3 million
- Method to Raise Funding: Sales tax revenues; municipal funds
- Water Utility Client Fee Increases: Not applicable/none

[150]Austin Texas, Austin Water. 2019. District 8 News blog. https://www.austintexas.gov/blog/water-quality-protection-lands.

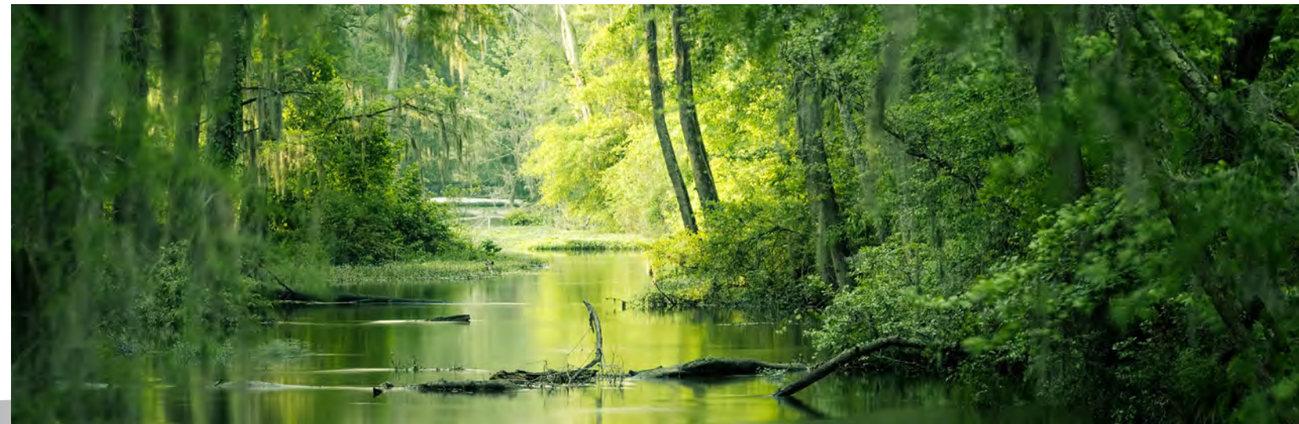
[151]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.

[152] LMI. 2014. Assessment of the Current Status and Long-term Viability of the City's Edwards Aquifer Protection Program. https://www.researchgate.net/publication/272023526_ASSESSMENT_OF_THE_CURRENT_STATUS_AND_LONG-TERM_VIABILITY_OF_THE_CITY'S_EDWARDS_AQUIFER_PROTECTION_PROGRAM.

[153]City of San Antonio. 2020. Edwards Aquifer Protection Program (EAPP) - Alternative Funding Plan. https://www.sanantonio.gov/ParksAndRec/News-Events/News-Press-Releases/Detail-Page/ArtMID/16253/ArticleID/19562/Edwards-Aquifer-Protection-Program-EAPP-Alternative-Funding-Plan.

[154]LMI. 2014. Assessment of the Current Status and Long-term Viability of the City's Edwards Aquifer Protection Program. https://www.researchgate.net/publication/272023526_ASSESSMENT_OF_THE_CURRENT_STATUS_AND_LONG-TERM_VIABILITY_OF_THE_CITY'S_EDWARDS_AQUIFER_PROTECTION_PROGRAM.

[155]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.



Land Management Service Agreement for Groundwater and Wellhead Zone Protection

The following 16-state multi-regional effort illustrates the land management service agreement method for groundwater and wellhead zone protection.

BMP Challenge[156, 157, 158]

The BMP challenge was initiated under a Great Lakes Protection Fund Grant in 2002 and concluded in 2015 and operated in 16 states as part of agricultural watershed protection efforts. The BMP Challenge program provided a risk-free opportunity for producers to see proof on their own farm that new practices could be profitable. Farmers initially entered more than 15,000 acres of corn (grown for grain or silage) into the program and later included sweet corn and tomato crops. The impact of BMP use was significant. Nitrogen usage dropped by an average of 41 pounds per acre (total estimated reduction of 200,000 pounds of nitrogen from 2002 to 2009).

The project included voluntary signups and utilized a comparison of net profit loss/gain between agronomic rate applications and a field's historic nitrogen application rates. The program established a check strip within a field where the farmers applied their historic rate of nitrogen and would then apply reduced rates of nitrogen across the remaining portions of the field. The reduced rates were at or near the local land grant universities' nitrogen application rate recommendations. At harvest, the yield of each section was measured, and the BMP Challenge program would provide a refund/payment for the sum of 1) net nitrogen input cost difference for the field, plus 2) any yield loss at that year's commodity price. If the farmer made a profit (i.e., did not experience a yield loss), they also kept the money. In this way, the BMP Challenge allowed nutrient testing to be completed without risking landowner profits. As described here, the BMP Challenge has been used for surface water protection, but this approach can easily be adapted for aquifer protection. For example, the risk guarantee payments can serve as an insurance mechanism when converting high nitrogen cropping systems to productive forest (i.e., planted pines) so that nitrate-nitrogen focused wellhead protection may be provided. These benefits only apply if the nutrient management with the forestry land use minimizes groundwater nitrate impacts.

- Administrator: American Farmland Trust
- Water Ecosystem Services Provided: Agricultural nitrogen management program to reduce risk of yield loss and associated financial losses when following agronomic rate recommendations
- Legal Agreement Type(s): Land Management Service Agreement
- Status: No longer in operation (period of operation 2002-2015)
- Water Consumers: Not estimated/Not applicable
- Method to Raise Funding: Watershed management funding and grants
- Water Utility Client Fee Increases: None/Not applicable
- Case Study Lessons Learned
- A review of the findings and results of these case studies provides many salient points including examples of program cost, time periods, collaborating parties, and the pros and cons of blending different methods. Cost is a key consideration in evaluating PES program alternatives. Table 4.4 presents total cost/acre estimates for each PES case study provided.[159]

[156]American Farmland Trust. 2012. What is the BMP Challenge? http://blog.farmland.org/what-is-the-bmp-challenge/.

[157]Great Lakes Protection Fund. 2020. BMP Challenge – A Financial Safety Net for Farmers to Adopt Great Lakes-friendly Practices. http://30years.glpf.org/bmp-challenge/.

[158]Personal Communication; Brian Brandt (Conservations Innovations Director, American Farmland Trust). 3 December 2020.

[159]The available information did not allow for an exact cost/acre estimation in all cases; in all cases an approximate value is provided. The cost/acre rates are influenced by different real estate land values, the level of donated conservation easements, and the prices paid for conservation easements or blending easements with land acquisitions.

Figure 4.4 Case study program size and approximate cost per acre summary results

Program Name	Location or Main Entity	Watershed / Aquifer Area (acres)	Area Protected (acres)	Most Common Agreement Type	Approximate $/acre[1]
Upper Neuse Clean Water Initiative	Raleigh, NC	493,692	7,658	Conservation easements and land acquisition	$1,900.00
Lake Whatcom Watershed Property Acquisition Program	Bellingham, WA	31,127 - only 5,552 acres zoned for development	2,229	Land acquisition	$15,100.00
Sebago Clean Water Fund	Lake Sebago; Portland, ME	234,000	25,062	Land acquisition, conservation easements	$420.00
The Forest Bank[2]	Indiana	Targeted counties within Indiana	8,000	Land management, service agreement	Not Available
Denver Water	South Platte River & Frazer River watersheds, CO	Not provided	73,000	Land management, service agreement	$876.71
Rio Grande Water Fund	Rio Grande River and Tributaries, NM	1.7 million	140,000 treated, 330,000 underway	Land management, service agreement	~$140 to $385 Available data limited estimation
Barton Springs Aquifer Protection Program	Edwards Aquifer; Austin, TX	Not Provided	28,354	Land acquisition	$5,756.93
Edwards Aquifer Protection Program	San Antonio, TX	Not Provided	161,511	Conservation easement	$ 2,012.25

[1]Data provided in public documents did not always provide tabular expenditures; estimates based upon information available related to funding and program impact.

[2]Forest Bank, a TNC project, is funded primarily through timber futures.

As shown in Table 4.4, San Antonio's easement cost per acre was less than half of a similar Austin program that used a land acquisition approach. Because the two programs operated over many years, it is hard to determine an accurate land cost because land values change over time. The 2020 average cost for small land sales around Austin, Texas in Travis County is $4,000 per acre,[160] versus San Antonio's average 2020 cost per small land sale is $3,800 per acre. Both programs have been operating approximately 20 years. In that time, San Antonio has spent approximately twice as much but conserved about six times the amount of land. This comparison helps demonstrate the cost-effective nature of a conservation easement approach over a land acquisition approach in Texas for relatively comparable counties.

[160]Texas A & M Real Estate Center. 2020. Rural Land Prices for South Texas. https://www.recenter.tamu.edu/data/rural-land/#!/state/Texas/region/South_Texas.

Table 4.5 presents the water utility's rate increases per residential customer, for those programs that included this component and as provided by Walls (2019).[161]

Table 4.5 Water utility fee increase rates when utility bills were a funding mechanism used. (Walls et al., 2019[162])

Program Name	Water Consumer Population	Water Utility Fee Structure Used	Fee Rate Increase Formula	Average Annual Total Increase per Household
Lake Whatcom Watershed Property Acquisition Program (Bellingham, WA)	95,000	Flat Rate, plus Volumetric Fee Increase	$5/month + $0.64/CCF	$129.72
Upper Neuse Clean Water Initiative (Raleigh, NC)	Over 510,000	Volumetric Fee Increase	$0.1122/CFF	$12.24
Denver Water, CO	1.5 million	Volumetric Fee Increase	$0.04/1,000 gallons	$3.26
Rio Grande Water Fund, NM (Santa Fe Pilot Study)	32,000	Volumetric Fee Increase	$0.13/1,000 gallons	$10.61

The fee rate increase formula is influenced by considering a variety of factors, including the number of customers and other sources of program funding. The City of Bellingham has the smallest population served of the two land purchase programs, and greatly exceeds all other utility fee increases, which illustrates a working example of the cost increase associated with not having an economy of scale benefit when collecting dedicated water fee increases from a smaller client base. The fire and timber management programs, Denver Water and the Santa Fe pilot study, both operated on lower consumer rate increases. Economy of scale again is likely a factor for Denver Water. However, Santa Fe's land management services approach highlights the lower cost of implementing forest management structures instead of land acquisition or permanent easements.

The case study materials identified the following leveraged funding sources:

- Water utility dedicated increases in:
  - Utility bill flat fees
  - Utility bill volumetric fees
- City budget water utility allocation
- Dedicated increase in community or regional sales tax
- Drainage fees, based on percent impervious surface
- Municipal bonds
- Federal and state agency programs and grants
- Philanthropic foundation grants
- Corporate donations or corporate foundation grants
- Private investment organizations
- Private donations (e.g., cash donations and donated conservation easements)
- Leveraged local programs (e.g., new parks, land trust organizations, associations, programs with overlapping management goals and requirements)
- Timber sales and forest product proceeds
- Shared (in-kind) administrative resources with non-profits and other partners

Lastly, in reflecting on the findings of the case studies, the BMP Challenge provides a particularly interesting case to consider. The core structure of the BMP Challenge is to compensate the grower for the possible net loss that occurs when implementing an alternative operation that the buyer/program manager selects. With minor changes to the BMP Challenge model, water utilities with a groundwater source from unconfined aquifers could protect the aquifer's recharge area by providing risk assurance agreements, i.e., exchanging agricultural crop production with softwood production or other forestry operations using the same payment approach to guarantee equal or better annual net profits from the alternative crop. A wellhead protection program could be created by completing an economic analysis and nitrogen loss to groundwater analysis comparing softwood enterprise budgets versus the commodity crops currently grown and then implementing the BMP Challenge approach to guarantee equal or slightly greater profits to landowners.[163] Although annual revenues from agricultural crops and forest product production may be significantly different, the small target area generally required for wellhead protection may still make the program economically feasible. See Chapter 5 for additional information about the design of wellhead and groundwater source protection programs.

Key Takeaways from Case Studies:

- **Scale matters, but collaboration matters more:** No matter the size of the watershed or target protection area, all groundwater and surface water PES programs are structured to collaborate and leverage funding with other conservation programs. This form of stacking provides for a greater acreage of protected watershed. Noticeable in the case studies is that small scale programs still found multiple partners. Each case study program presented collaborated with at least three other organizations.
- **Methods impact costs:** The land purchase programs typically have the highest cost/acre, but land value greatly influences the variability in program costs. Cost/acre can be correlated with the reduction in management opportunities associated with the details of an easement agreement. Some programs encourage landowners to donate easements or include them as part of their estate arrangements.
- **Methods impact scale:** Land management service agreements (i.e., forestland timber management options) are in the process of enrolling many more acres than programs that require turning over landowner's rights to their land.
- **Methods impact the impact:** Short-term easements and service agreement approaches provide a valuable level of flexibility and may be lower cost and more scalable initially, but they are potentially an unstable option for protecting water resources. Lands may leave the program over time and costs for future easements or agreements may rise. Enabling re-enrollment and keeping projects in the pipeline for enrollment are essential strategies for managing these risks.
- **Patience is a virtue:** Most of the programs in these case studies took years to mature. PES programs using land acquisition or long-term easements often must wait until landowner decisions and funding availability coincide to complete a negotiation.
- **Groundwater protection presents unique opportunities and challenges:** Groundwater recharge zones are typically smaller in area than surface water supply watersheds and may be more efficiently targeted by a PES program. However, groundwater contamination is unforgiving. Having a high concentration of a pollutant, one that approaches or exceeds the drinking water maximum concentration level, requires either expensive treatment systems or complete well replacement moving to a deeper depth or an entirely different aquifer. The BMP Challenge provides a particularly interesting case to consider for wellhead protection.
- **Water is not the only value:** Many programs recognize the importance of listing other ecosystem service benefits. Examples include public safety, flood reduction, recreation, scenic beauty, and wildlife habitat. With thoughtful PES program design and engagement with water utilities as partners, drinking water concerns may bring a new level of excitement and commitment to these and other more traditional natural resource concerns. An easement to protect wildlife habitat may take on an additional sense of urgency when linked to drinking water needs for a nearby community.

[161]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.

[162]Walls, M.; Kuwayama, Y. 2019. Evaluating Payment for Watershed Services Programs in the United States. Water Economics and Policy, (2019) 1950003. World Scientific Publishing Company.

[163]The U.S. EPA website Estimated Nitrate Concentrations in Groundwater Used for Drinking, estimates two percent (2%) of the state land area in Georgia has groundwater nitrate concentrations above 5 mg/L. The estimated population with self-supplied drinking water is 18%.

Other recent evaluations of existing PES programs have resulted in similar and reenforcing findings, for example the work by the World Resources Institute (WRI) and several partners examining thirteen watershed investment programs provided the following summary of lessons learned (Table 4.6).

Table 4.6 Lessons from Each Phase of Watershed Investment Program Development (WRI, 2016)[164]

Phase of Program Development	Description	Lessons
Building momentum	Identifying a clear need and purpose for a watershed investment program; securing commitment from key stakeholders	1. Identify risks (wildfire, drought, etc.) and seize opportunities to rally support 2. Build partnerships to fill essential roles and responsibilities 3. Articulate a clear vision of success 4. Cultivate champions and advocates to build support (from water utilities, local government, NGOs, landowners, etc.)
Designing the program	Assessing the scientific and economic underpinnings of the program; creating a strategy to achieve program goals	5. Develop a scientifically informed watershed plan 6. Evaluate the business case for investment 7. Identify investors (water utilities, companies, foundations, etc.) and financing mechanisms for initial and long-term funding
Implementing the action plan	Actively and adaptively managing the program to make investments; tracking the results of those investments	8. Engage landowners and public managers to conserve, restore, and sustainably manage natural infrastructure 9. Define roles and plans for program administration 10. Monitor and evaluate performance (acres of forestland protected, acres treated for fire risk reduction, pounds of sediment avoided from filling waterways, etc.)

As shown in Table 4.6, it is important to identify the phase of development to then align with appropriate lessons and relevant actions. Within Georgia, efforts in some targeted watersheds are in the "Building momentum" phase, including the Middle Chattahoochee and Lower Flint. The work in the Savannah River watershed may be characterized as moving into the "Designing the program" phase. While the work underway within the Upper Oconee is closest to being characterized as "Implementing the action plan". (More discussion of the needs and opportunities for these specific watersheds is included in Chapter 8.) Also, as shown in this table, lessons 6 and 7 within the design phase emphasize the importance of making the business case and engaging with investors. These are essential elements of program success that begin with thoughtful design.

The programs identified in Table 4.5, and the assessment methods they used for their design, are further discussed in Chapter 5. Table 4.7 below provides results from Armistead, et al., 2016[165] with a cost update for U.S. water utility programs that invested fees into natural capital source water protection efforts.

[164]Ozment, S.; Gartner, T.; Huber-Stearns, H.; DiFrancesco, K.; Lichten, N.; Tognetti, S. 2016. Protecting Drinking Water at the Source: Lessons from Watershed Investment Programs in the United States. World Resources Institute. https://files.wri.org/d8/s3fs-public/Protecting_Drinking_Water_at_the_Source.pdf

[165]Armistead, C.; Delgado-Perusquia, S.; Kraft, J.; Schmidt, R.; Stangel, P. 2016. 2016 Updated: Communicating and Investing in Natural Capital Using Water Rates. Earth Economics, Tacoma, WA & U.S. Endowment for Forestry and Communities.

Table 4.7 2016 update of water utility watershed management programs in the U.S. (Armistead, 2016)[166]

Location	Number of Water Users	Dedicated Fee	Fee Type	All Fund Sources $ (Millions)	Years in Operation
Conservation Easements					
Raleigh, NC	40,000	$0.40	meter/month	$7.500	5
San Francisco, CA	2,500,000	None		$30.000	11
Aurora, CO	325,000	None		$0.550	5
Marin County, CA	187,500	$4.40	meter/month	N/A	0
Seattle, WA	1,400,000	None		$33.000	16
Involving Land Acquisition					
Little Rock, AR	400,000	$0.45	meter/month	$7.000	9
Bellingham, WA	88,000	$12.00	meter/month	$25.300	15
Dennis, MA	15,000	$1.67	meter/month	$2.500	10
Portland, ME	200,000	None		$490.728	8
Salt Lake City, UT	400,000	$1.50		$5.380	28
Portland, OR	900,000	None		$7.460	9
Providence, RI	600,000	$0.02920	per 100 gallons	36.1% Retained by Prov. Water	25
Payouts to Landowners in Watershed Protection Areas					
Boston, MA	2,500,000	None		$133.000	31
Ashland, OR	20,000	$1.39	meter/month	$0.175	1
Colorado Springs, CO	430,000	None		$6.000	3
Denver, CO	1,300,000	$0.14	meter/month	$16.500	6
Santa Fe, NM	32,000	$0.13	per 1,000 gallons	$0.660	3
Program for Groundwater Protection					
Austin, TX (land acquisition)	912,000	$9.80	meter/month		34
San Antonio, TX (conservation easements)	1,500,000	$0.00125	sales tax (renewed every five years)	$90.000	16

[166]Armistead, C.; Delgado-Perusquia, S.; Kraft, J.; Schmidt, R.; Stangel, P. 2016. 2016 Updated: Communicating and Investing in Natural Capital Using Water Rates. Earth Economics, Tacoma, WA & U.S. Endowment for Forestry and Communities.

Conclusion

The urgency of water resource protection has been recognized in Georgia and efforts have been made over the years to address the situation, especially through water conservation strategies and in response to the threat of drought. Statewide data indicates Georgia is in the top quartile in the U.S. in water conservation; however, the projected population growth rates for many parts of the state may still overwhelm the water supply systems. For many counties, the projected growth will double or triple their current population sometime between 2050 and 2065. While the situation in Georgia is urgent and many responses are already underway in the state, there is also value in looking to other states and regions that face similar water resource threats. Case study examples of PES programs from around the U.S. can be categorized by surface water and groundwater priorities and method of conservation (i.e., land acquisition, easements, and/or management agreements). A review of these case studies shows that the method(s) that is used will impact program cost, scalability, and impact. Also, collaboration is key as is patience and understanding the unique concerns associated with surface and groundwater resources. Lastly, water is not the only value to consider when designing a program and attracting investment. Many PES programs recognize the importance of listing other ecosystem service benefits, including public safety, flood reduction, recreation, scenic beauty, and wildlife habitat. Marketing all the PES program's forestry ecosystem service benefits increases the attractiveness of the program to many more landowners, partners, audiences, conservation programs, and funders.

Chapter 5. Integrating Source Water Protection Planning and Target Area Prioritization for PES Program Development

Introduction

This chapter addresses source water protection and options for prioritizing target areas (i.e., parcel ranking methods). The discussion follows the Source Water Protection standard and guidance manual provided by the American Water Works Association (ANSI/AWWA, 2014;[167] AWWA 2016[168]). AWWA guidance is derived from the Safe Drinking Water Act (SDWA) and rules. The SDWA requires that utilities assess and develop a protection plan for their source watersheds. The general concept is that source water protection includes multiple barriers of defense against contamination (treatment, trained staff, and a protected and managed source watershed). This concept is known as the "Multiple Barrier Approach" to source water protection, and the AWWA guidance follows SDWA requirements. While these AWWA materials were created mainly for water utilities, the documents provide a strong platform for a full range of watershed assessment programs that include elements of a Source Water Assessment Plan (SWAP). These plans identify the contributing area of the source water watershed considered in a surface water protection situation, or the extent of land acreage within a wellhead protection program, and the potential sources of contamination. The SWAPs also provide the intended protection methods to be used in the watershed. The SWAPs will vary in how they address land uses and the influence of land management on the water resource concerns, and PES program managers are encouraged to use locally available SWAPs as baseline information in program design. The PES program can build on the SWAPs by integrating additional information about ecosystem services and protection methods, including forest related actions and benefits. The following examples of source water protection planning and area prioritization options, including those already in use in Georgia, are provided for consideration in the design and development of a PES program. This chapter includes information addressing ANSI/AWWA guidance and prioritization options for surface water intakes; and information addressing ANSI/AWWA guidance for wellhead protection zone delineations and prioritization options as incorporated by the Georgia Department of Natural Resources, Environmental Protection Division (EPD).

The American Water Works Association G300 Standard's Source Water Assessment

The American Water Works Association (AWWA) Management Standard for Source Water Protection (G300-14 Edition)[169] and the AWWA accompanying Source Water Protection Operational Guide to AWWA Standard G300[170] are applicable for both groundwater and surface water drinking water supplies. This approach can easily be adapted to fit most water source protection assessments. The standard and guidance manual have a national focus, and many of the terms are generic enough to be applicable to non-forested and forested watersheds alike.[171,172] Assessment techniques can be used statewide and will be greatly enhanced by adjustments made to fit the local data/setting. More accurate and sophisticated methods are often associated with increased data requirements and higher costs. Consultation with local USGS district office staff, state geological survey staff, university faculty members and researchers, and USEPA regional water staff can help in determining the level of accuracy and sophistication needed.

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[167] American Water Works Association. 2014. AWWA Management Standard, Source Water Protection. ANSI/AWWA G300-14.

[168] American Water Works Association. 2016. Source Water Protection Guide to ANSI/AWWA Standard G300. Operational Guide to ANSI/AWWA G300-14.

[169] American Water Works Association. 2014. AWWA Management Standard, Source Water Protection. ANSI/AWWA G300-14.

[170] American Water Works Association. 2016. Source Water Protection Guide to ANSI/AWWA Standard G300. Operational Guide to ANSI/AWWA G300-14.

[171] The authors of this report have taken the liberty to expand the national AWWA terminology used to identify source water risks to include specifics regarding loss of forestland, diminished health of forestland, and associated introduced nonpoint source pollution increases when forest land use is converted into urban or agricultural uses.

[172] At time of publishing (2014), Source Water Protection (SWP) areas and Source Water Protection Plans (SWAPs) were implemented in various parts of the U.S. However, because states had limited time frames and resources, water utilities should be aware these baseline assessments done prior to 2014 were usually developed with readily available data and therefore may be lacking local data of sufficient detail. The 2000-era land use data and other changes may not reflect current conditions and therefore render the early plans out of date.

[173] American Water Works Association. 2016. Source Water Protection Guide to ANSI/AWWA Standard G300. Operational Guide to ANSI/AWWA G300-14.

Drinking water utility source water protection planning methods already in use in Georgia align well with the Source Water Protection standard and guidance manual provided by the American Water Works Association (ANSI/AWWA, 2014; AWWA 2016). The AWWA uses a data driven assessment process and because land use and water quality data availability can be limited, they allow for an adaptive process to incorporate new information and analysis techniques over time. The ANSI/AWWA guidance was created for state and water utilities and is based on a strong understanding of the water source, whether it is surface intakes or understanding an aquifer's hydrogeology for wellhead protection. The AWWA guidance provides an approach that implements the collection of critical information, gathers expert opinions, and may include investing in source water modeling. The Source Water Assessment Plan (SWAP) is then used to develop the Source Water Protection Plan (SWPP) which explains targeted sources, costs and leveraged funding, and alignment with state policies and rules. While a SWAP is based on gathering information and gaining a watershed level understanding, the AWWA guidance for SWPPs also considers affordability as a critical component in plan development. In current SWPPs, PES programs are not likely to be included in the list of identified actions. To be added to such a list, PES managers are encouraged to align their programs with information provided in the SWPPs, and to do so in a manner that offers an attractive funding or investment advantage. A PES program can be a cost-effective approach to source water protection in the right setting and can be further enhanced using an appropriate method to prioritize which parcels have the highest potential for positive water conservation impacts amongst the SWPP's broadly defined target locations.

The ANSI/AWWA G300 standard[173] is commonly used by water utilities for the characterization of source water and Source Water Protection (SWP) areas, as stated in the introduction to the standard:

> "Characterization and assessment of the source water, the land or subsurface area from which the source water is derived, and the potential sources of contamination (PSCs) in those areas is essential for obtaining the understanding and knowledge needed to develop the goals and plans that will realize the source water protection vision. Using that information, a risk assessment of susceptibility analysis is conducted to identify and prioritize the key water quality and SWP issues and contamination sources. In some cases, it will be appropriate and expected that users of this standard will have gone beyond state-performed source water assessments to better define watershed characteristics and have obtained extensive public participation in defining and implementing components of the source water protection program."

The AWWA assessment process begins with the selection of an appropriate Source Water Protection (SWP) area. For surface water systems, some states delineated SWP areas as entire watersheds upstream of the intakes and up to the watershed/hydrologic boundaries or to the state boundaries. Given that some watersheds are very large, smaller 'critical areas' can be identified as high-priority areas for contaminant source inventories and susceptibility determinations. However, a utility may also decide to expand existing critical areas because monitoring data and other information indicate that important potential contamination sources lie outside the narrowly defined critical areas.

Generally, one of the following four approaches is used to delineate critical areas for surface water intakes (USEPA, 2006): [174]

- An area defined by an arbitrary distance upstream or around the intake
- A stream time-of-travel distance upstream of an intake (stream only, not adjacent lands)
- A buffer zone setback
- A stream time-of-travel area (stream plus watershed land)

Once a SWP area has been selected, information on land use and potential contamination sources is collected. The AWWA guidance[175] suggests that the characterization of SWP areas may involve the creation of maps and databases and the use of models and geographic information systems (GIS) to make collected data usable for the characterization process and for decision-making.

Sources of information for assessing current conditions and contamination sources in an SWP area include the following:

- Zoning analysis and build-out analysis
- Sanitary surveys
- Water quality monitoring data
- Citizen group activities
- National Pollutant Discharge Elimination System (NPDES) permits
- Resource Conservation Recovery Act reporting
- USEPA's Drinking Water Mapping Application to Protect Source Waters system[176]

For groundwater SWP assessments, the AWWA guidance manual refers to the U.S. EPA guidance documents and identifies additional methods for delineating groundwater based SWP areas as follows (USEPA 1987,[177] 2006[178]):

- Arbitrary fixed radii
- Calculated fixed radii
- Simplified variable shapes
- Analytical methods (e.g., uniform flow equation)
- Hydrogeologic mapping
- Numerical flow/transport models (e.g., US Geological Survey's MODFLOW model)

The AWWA standard and accompanying guidance document provide a strong example platform as a Source Water Assessment Plan (SWAP) and approach for all entities interested in sustaining current water sources.

Applying the AWWA Standard and Guidance in Georgia

Georgia is relatively up to date for sources of decision-making information for source water protection assessments, plans, and containment source inventories (CSI) (see inserted information on the following page for a specific example) (GWP, 2017[179]). Georgia is also improving its sources of decision-making information with on-going research (Lord, 2020;[180] GFC, 2019;[181] Dwivedi et al., 2020[182]). However, more local data refinement may be needed to include the possibility of PES options in appropriate watersheds and may require additional understanding of headwater forested water supply sources, private forest landowner short-term needs and long-term desires, and to optimize PES program design.

[174]U.S. Environmental Protection Agency. 2006. How-to manual: Update and Enhance Your Local Source Water and Drinking Water. https://www.epa.gov/sourcewaterprotection/how-manual-how-update-and-enhance-your-local-source-water-protection.

[175]American Water Works Association. 2016. Source Water Protection Guide to ANSI/AWWA Standard G300. Operational Guide to ANSI/AWWA G300-14.

[176]U.S. Environmental Protection Agency. 2020. Drinking Water Mapping Application to Protect Source Waters (DWMAPS). https://www.epa.gov/sourcewaterprotection/drinking-water-mapping-application-protect-source-waters-dwmaps.

[177]U.S. Environmental Protection Agency. 1987. Guideline for Delineation of Wellhead Protection Areas. EPA 440-6-87/010. Washington D.C.: USEPA Office of Ground-Water Protection.

[178]U.S. Environmental Protection Agency. 2006. How-to manual: Update and Enhance Your Local Source Water and Drinking Water. https://www.epa.gov/sourcewaterprotection/how-manual-how-update-and-enhance-your-local-source-water-protection.

[179]Georgia Water Planning. 2017. Coosa-North Georgia Regional Water Plan. https://waterplanning.georgia.gov/coosa-north-georgia-regional-water-plan.

The Georgia Department of Natural Resources, Environmental Protection Division (EPD) implements the community-municipal drinking water programs for the state.[183] The EPD's Source Water Assessment Implementation Plan [184] addresses drinking water protections and is also incorporated into the decisions used in wellhead protection.[185] As described in this plan, the protection aspects of the program address potential nonpoint pollution sources found near groundwater sources used for drinking water. The EPD plan also lists multiple programs to help with surface source water protection including the Nonpoint Source Management Strategies. For groundwater wells, depending on the wellhead location, the EDP requires three different zones of control. The first zone is a 15-foot radius from the wellhead and is protective of the well and well external piping and is a control zone for all wells. The radius of the second zone, the inner-management zone, depends on aquifer type:

- Karst 500-foot radius from the wellhead
- Piedmont Fractured Crystalline Rock 250-foot radius from the wellhead
- Coastal Plain Unconfined 250-foot radius from the wellhead
- Coastal Plain Confined 100-foot radius from the wellhead

The final zone, the outer-management zone, can range from 100 feet to several miles depending on the well construction and geology of the wellhead protection area. In these wellhead protection zones, the PES program techniques described in the case studies in Chapter 4 can be further evaluated for the likelihood of cost-effective ecosystem service enhancements.

[180]Personal communication; Lisa Lord. (Program Manager, Savannah Clean Water Fund). 3 September 2020.

[181]Elkins, D.; Gerrin, W. 2019. Conservation and Restoration Priorities in the Middle Chattahoochee River Basin. https://gatrees.org/wp-content/uploads/2020/04/Final-Report-Middle-Chattahoochee_WMPI_PriorityAreas-Aug2019.pdf.

[182]Dwivedi, P.; Benez-Secanho, F.J.; Skaggs, J.; Elkins, D.; Gerrin, W.; Lord, C. 2020. Conservation and Restoration Priorities in the Upper Oconee River Basin. https://gatrees.org/wp-content/uploads/2020/04/Upper_Oconee_Watershed_GIS_Mapping_Analysis_Report_UGA_Dwivedi_March192020.pdf.

[183]In the second half of 2020, EPD began taking comments to update the state requirements. The comment end date for the adjusted program changes was January 15, 2021.

[184]Natural Resources, Environmental Protection Division. 2000. Source Water Assessment Implementation Plan. https://epd.georgia.gov/eservices/online-resources/documents.

[185]Natural Resources, Environmental Protection Division. 2016. Wellhead Protection / New Well / Spring Application Sheet. https://epd.georgia.gov/eservices/online-resources/documents.

[186]Coosa-North Georgia Regional Water Planning. 2017. Coosa-North Georgia Regional Water Plan. https://waterplanning.georgia.gov/coosa-north-georgia-regional-water-plan.

Coosa-North Georgia Water Planning

An example of possible near-term collaboration to generate useful PES program data is the Coosa-North Georgia Water Planning Region that has identified the County of Dawson in their Regional Water Plan (2017)[186] as a "need". The plan defines a "need" as a condition where the current permitted capacity of water facilities is less than the future forecasted demand. This is a facility expansion issue where water quality treatment may result in additional costs. The plan also identifies Catoosa, Chattooga, and Dade Counties as having a "Surface Water Availability Potential Gap" (a gap in the ability to supply an adequate amount of water for proposed demand). Currently, the plan does not directly discuss the forest-based ecosystem services that may contribute to water quantity and quality, although the referenced modeling may take this into account. Where the report discusses water quality protection, the forestry discussions consist of existing land use acreages and the use of forest buffers and their benefits as Best Management Practices (BMP). It is possible the plan could go further, and that the supporting data may already exist in the modeling, but there are likely several barriers to this collaborative approach that need to be considered.

Across the many layers of local jurisdiction that exist in Georgia, the use of home rule is a much-appreciated approach by local governmental units. "A core feature of local self-government under home rule is the ability of local people to determine the basic features of their government", (National League of Cities, 2020). During the interview with Pam Burnett, Executive Director of the Georgia Association of Water Professionals (2020), home rule was discussed:

> "Cooperation and collaboration between municipalities is not common. The exception to this is the 15-county metro Atlanta area that is required by state law to coordinate supplies, facilities, discharges, etc. through the Metropolitan North Georgia Water Planning District established by law in 2001. The Georgia Comprehensive Statewide Water Plan (2008) was created by the Georgia Environmental Protection Division (EPD) and adopted by the General Assembly. The statewide plan consists of regional water plans for the 10 water planning regions in the state to ensure sustainable water management through at least 2050."

Currently, discussions about land use conversion are more likely to be in regional water planning reports as references to local county or community efforts. Land uses in unincorporated areas fall under the jurisdiction of each county, while incorporated communities govern their incorporated footprint. Therefore, the Regional Water Planning Councils and local water utilities can influence, but not control changes in land uses. This is reflected in the language used in the Coosa-North Georgia Regional Water Plan, for example:

> "7.2.4 Implementation of Water Quality Management Practices…
>
> Each community will need to evaluate the management practices to determine which are appropriate for implementation in their community. Communities with Resource Assessment gaps or infrastructure needs, or shortages are strongly encouraged to implement these management practices to address their gaps, needs, or shortages. All communities will need to report on their implementation activities to the Council and to the GAEPD to help determine the effectiveness of the plan. …"

Discussing land use authority and governance in any jurisdiction setting can be difficult and results in many recommendations (Table 5.1). Instead of entering regulatory control solutions for land use conversions, many of the PES programs utilize public-private-partnerships (P3) as an approach to add conservation efforts focused on protecting high priority forested parcels in a watershed from being converted to urban land uses.

Table 5.1 Recommendation to the State, Coosa-North Georgia Regional Water Plan (2017)

Recommendations	
Funding	Identify long-term funding mechanism, beyond grants, to assist responsible parties with implementation of water supply projects.
Coordination	The RCs should continue to serve as the clearinghouse and coordinator for ongoing CNG Council planning activities.
	Enhance the opportunity for ongoing CNG Council input during implementation of Regional Water Plan Management Practices and establish a process for involvement in the 5-year Regional Water Plan update.
	Improve coordination with organizations, such as the ACCG, GMA, GRWA, and GAWP to develop templates and materials that each council, with the assistance of DCA or the RCs noted in Section 2.3, can adapt for regional/local implementation.
	Support local monitoring and allow volunteer sampling data to be used to assess watershed conditions.
	Coordinate CNG planning efforts and ACT Basin negotiations.
Policy / Programmatic	Develop a program to consistently meter and report agricultural water withdrawals.
	Provide support to study the effects of septic systems on water quality.
	Develop regulatory framework/guidelines for water quality credit trading and alternative permitting strategies.
	Develop guidelines for appropriate use of interbasin transfers of water.
	Explore opportunities for Georgia to expand use of the Tennessee River as a water supply source.
	Support efforts to develop regional reservoir projects to meet both in-stream and off-stream needs.
	Develop regulatory framework/guidelines for aquifer storage recovery.
	Support efforts to give authority to enforce Regional Plans.
	Support and expand water quality monitoring programs.
Implementation	Develop or support BMP demonstration projects to evaluate their effectiveness in the CNG Region.
	Support and coordinate additional commercial water audits.
Next 5-Year Update	Refine Resource Assessment models to report results at a finer resolution.
	Review the technical assumption that LAS is considered to be a consumptive use so that this can be correctly accounted for in the future.
	Partner with the counties to obtain better information on future forecasts of non-crop (and less than 100,000 gallons per day) uses through planning period.

PES Prioritization Methods for Ranking Parcels for Conservation Targeting

The following discussion provides examples of approaches that can be used by PES programs to rank parcels according to an order of importance in relation to conservation benefits provided by each parcel. The PES program should select the option that is the best fit for their unique source water setting and that aligns with other key programs and goals in the target area. The following list of options should be evaluated within the context of the information contained in the water utilities' existing Source Water Protection Program (SWPP). It is essential that the PES program can accommodate the buyer's need for assurance that effective actions will be implemented on the parcels with the highest potential for delivering a positive impact on source water protection. All the prioritization methods discussed in this chapter include some use of Geographic Information Systems (GIS). As such, GIS use is implied and not listed as its own category, although for a small watershed the management team may consider GIS analysis to be sufficient in and of itself.[187] There may also be regional water planning collaboration opportunities that could be explored through the assessment and prioritization process. An example of possible near-term collaboration to generate useful PES program data is the Coosa-North Georgia Water Planning Region that has identified the County of Dawson in their Regional Water Plan (2017)[188] as a "need" (see inserted textbox/highlight on previous pages).

Prioritization methods summarized in this chapter are:

- Prioritization Option 1, Watershed Management Priority Index (WMPI) GIS model (as illustrated with three case studies of WMPI applications in Georgia)
- Prioritization Option 2, Land Preservation Ranking Sheet (as used in Bellingham, WA Lake Whatcom)
- Prioritization Option 3, USGS SPARROW Mapper,[189] for assisting in determination of downstream sediment and nutrient pollutant loading persistence
- Prioritization Option 4, InVEST, Integrated Valuation of Ecosystem Services and Tradeoffs, suite of models used to map and value the goods and services from nature

These 4-options address surface water resource protections. Prioritization methods for groundwater wellhead protection zones are also addressed briefly in this chapter.

Prioritization Option 1 - Watershed Management Prioritization Index (WMPI)

The following examples from Georgia provide WMPI references for PES program managers to consider, with website listings for more information.

Savannah River Clean Water Fund[190]

This program operates in Georgia and South Carolina, in both the Lower Savannah River (HUC: 03060109) and Middle Savannah River (HUC: 03060106) watersheds. The upstream location of the delineated source water protection (SWP) area is the Clark Hill-J. Strom Thurmond Dam and hydropower facility which provides the final substantial flood controls and storage basin for the downstream Savannah River's flow. Just downstream from the hydropower facility is the New Savannah Bluff Lock and Dam which is a smaller dam, and the lock was retired in 1979. The dam at New Savannah Bluff is the last dam on the river before the Savannah River outlets into the Atlantic Ocean. The dam reservoirs provide sediment and particulate settling. The 2.8-million-acre watershed is approximately 78% forested.

According to The Nature Conservancy (TNC) Assessment Report (2016),[191] the primary threat (risk) to the watershed is urban development and the emerging threat is contaminants. The assessment report included selecting a goal of keeping 60% of the watershed in forest cover.

To address source water characterization The Nature Conservancy (TNC) developed a GIS map to evaluate sub-basin land use statistics and the Watershed Management Priority Index (WMPI). The project delineated area is below Thurmond Dam and consists of approximately 2.8 million acres. Of the three WMPI submodules: Conservation Priority Index (CPI), Restoration Priority Index (RPI), and Stormwater Management Priority Index (SMPI), the modeling team selected the CPI due to the large percentage of existing forested cover. The WMPI ranks seven (7) categories from 1 to 3, for each 30x30 meter GIS pixel. The seven categories are:

1. Land use (forested, natural land cover equals 3; this category is a nonfactor since only this land use is considered in the CPI submodule)
2. Proximity to streams (three 30-meter distance groups with the closest distance equal to 3)
3. Proximity to ponds/wetlands (three 30-meter distance groups with the closest distance equal to 3)
4. Soil hydrologic group (a four-letter descriptor of the soils infiltration capability from A to D where A is the fastest infiltrating soils, such as sands)
5. Soil erodibility (the soil's vulnerability to erosion, high = 3, moderate = 2, low = 1)
6. Slope (greater than 18% = 3, 8 to 18% = 2, less than eight percent = 1
7. 100-yr floodplain (if the cell is in the 100-yr floodplain it is assigned a 3)

The WMPI tool provided results for the watershed using four (4) priority levels (Table 5.1). The assessment applied a filter to remove parcels less than 100 acres in size. The selection of the 100-acre filter was driven by economy of scale decisions and to manage the amount of personnel or resources needed to execute land protection transactions. The WMPI modeling team used the natural breaks in results to identify score ranges to set priority levels. Upon further consideration the team reduced the delineated area by subdividing the basin using the east-west highway of US 301 as the upper boundary of the protection area. The sub-basin downstream of US 301 is 598,469 acres with 142,471 acres of protected lands. Reviewing the CPI results and selecting priority 1 and 2 unprotected lands in the area south of US Hwy 301 results in setting a goal of protecting 201,991 additional acres (58,559 priority 1 and 143,132 priority 2 acres as shown in bold, Table 5.1).[192]

Table 5.1 Savannah River Watershed Management Priority Index's Conservation Priority Index (CPI) Results. Total acreage is less than the project area due to the 100-acre filter.

Acreage Distribution by Tract-Accumulated CPI Priority (≥ 100 acres)				
Tract CPI Score Range	Priority Level	Watershed Protected Acres	Unprotected Acres	Unprotected Acres South of US Hwy 301
11 – 14	Priority 1	44,787	117,923	**58,859**
9 – 10	Priority 2	75,201	340,401	**143,132**
7 – 8	Priority 3	132,727	952,336	
5 - 6	Priority 4	249,727	284,137	

[187]For example, the City of Raleigh, North Carolina uses GIS analysis to inform site selection decisions. The parcels are identified and ranked according to both a water quality protection score, and an overall protection score to facilitate multiple funder interests. The prioritization process behind the GIS analysis can be found in The Upper Neuse Clean Water Initiative Conservation Plan, found here: http://cloud.tpl.org/pubs/landwater-nc-upper-neuse-full-report.pdf

[188]Coosa-North Georgia Regional Water Planning. 2017. Coosa-North Georgia Regional Water Plan. https://waterplanning.georgia.gov/coosa-north-georgia-regional-water-plan.

[189]U.S. Geological Survey. 2012. Spatially Referenced Models of Streamflow and Nitrogen, Phosphorus, and Suspended-Sediment Loads in Streams of the Southeastern United States, 2012 base year. SIR 2019-5135. SPARROW online Mapper accessed February 26, 2021, at: https://www.usgs.gov/mission-areas/water-resources/science/sparrow-mappers?qt-science_center_objects=0#qt-science_center_objects.

[190]Savannah River Clean Water Fund. 2016. Executive Summary. https://gatrees.org/forest-management-conservation/water-quality-protection/.

[191]The Nature Conservancy. 2016. Preserving Water Quality in the Savannah River. https://s3.amazonaws.com/tnc-craft/library/Savannah-Potable-White-Paper-Final-091614.pdf?mtime=20180822151837.

Interviews[193] with people involved with the Clean Water Fund revealed the program is considering ways to adapt multiple frameworks to streamline the program (i.e., Clean Water Fund 2.0). The list of adaptations being considered include how buyer/funder representatives participate and how the watershed assessment characterization tool is used as well as potentially adding other characterization tools.

To date, the WMPI tool has not been sufficient for narrowing down the list of priority parcels to a manageable and actionable number. The Clean Water Fund 2.0 strategy potentially would operate using a narrower method for selection criteria and have a pre-approved funding mechanism. Achieving this change would require changes in the characterization tool that provides a finer resolution. One WMPI tool resolution concern is that most priority 1 properties were ranked high due to their proximity to wetlands, and wetlands are already protected from development. The Clean Water Fund is also considering working with a focus on larger parcels and riparian parcels, by dividing landowner payments into the acre ratios for upland and riparian wetland payment schedules. The Fund could also become more strategically focused on specific localized water quality benefits and have less of an overall landscape orientation (which the land trust collaborators prefer).

Improved methods could provide more specific benchmarks or metrics tailored to the needs of program partners (e.g., water quality metrics for water utilities, acres conserved for others). Achieving these adaptations would also require changes in how buyers and funders participate. The program's original goals (i.e., keeping 60% of the watershed forested, securing 200,000 acres of conservation easements, and considering linear feet along water resources) may need to be updated to expand from a water quality focused initiative to include forest ecosystem objectives.

The resolution of the selected prioritization tool currently limits the site selection process. Adding another tool is being considered, as are steps to improve the site selection and funding decision frameworks.

Conservation and Restoration Priorities in the Middle Chattahoochee River Basin

The Chattahoochee River originates above Helen, Georgia and consists of four 8-digit HUC watersheds with a total of 13 reservoirs above in-channel dams. The middle portion of the Chattahoochee River system has 56% forest cover as of 2011 and is projected to experience additional urban growth pressure in the coming decades. The projected growth rates of 23 to 38% are modeled to cause a change from 11.4% urban cover currently to 29.6% urban cover in 2050.

A study[194] was conducted with the objective of identifying priority areas within the Middle Chattahoochee watershed where forested land uses could be maintained, or hay and pastureland could be reforested to reduce sediment and nutrients in water sources and thereby reduce water utility treatment costs. The study specifically sought to identify parcels which, if conserved or restored, are expected to contribute the most to the protection of surface water quality in the Middle Chattahoochee basin. The intention of the study was to inform land conservation and restoration decisions that maximize surface water quality and minimize future water treatment costs. The watershed delineation area for the study was approximately 950,000 acres. The City of Columbus, Georgia uses the West Point Dam as the upper boundary as the reservoir resets the river's suspended sediment and nutrient concentrations. With only 37,306 forested acres protected in the project area (four percent), the project's goal was to identify high priority forested and potential areas for reforestation to meet a 60% forested land cover goal for maintaining reduced water utility treatment costs.

[192]The assessment report also indicates that protecting these acres at the 2016 conservation easement price of $250/acre generates a financial need of $52 million.

[193] Personal communication; Lisa Lord. (Program Manager, Savannah Clean Water Fund). 3 September 2020.

[194]Elkins, D.; Gerrin, W. 2019. Conservation and Restoration Priorities in the Middle Chattahoochee River Basin. https://gatrees.org/wp-content/uploads/2020/04/Final-Report-Middle-Chattahoochee_WMPI_PriorityAreas-Aug2019.pdf.

[195]Elkins, D.; Gerrin, W. 2019. Conservation and Restoration Priorities in the Middle Chattahoochee River Basin. https://gatrees.org/wp-content/uploads/2020/04/Final-Report-Middle-Chattahoochee_WMPI_PriorityAreas-Aug2019.pdf.

[196]Warziniack, T.; Sham, C. H.; Morgan, R.; Feferholtz, Y. 2016. Effects of forest cover on drinking water treatment costs. American Water Works Association.

[197] Freeman, J.; Madsen, R.; Hart, K. 2008. Statistical analysis of drinking water treatment plant costs, source water quality, and land cover characteristics. Washington, DC: US Environmental Protection Agency.

[198] Eastman, J.R. 2016. TerrSet Geospatial Monitoring and Modeling System - Manual. Clark Labs.

The team for the Middle Chattahoochee study chose to use the WMPI GIS based model following the Savannah River TNC setup as the characterization tool. The WMPI scoring for the Middle Chattahoochee, like the Savannah River WMPI, was also filtered by the 100-acre size limitation (the filter resulted in the removal of 389,593 acres). Because the study included the identification of reforestation opportunities for prioritized acres in addition to the CPI results, the model also informs the future conservation programs by providing the RPI (restoration priority index) results. To implement reforestation, the study results also include a recommendation to work with an existing group that is already monitoring reservoir bay eutrophication parameters throughout the entire Chattahoochee River. The programs can use the RPI results to select parcels in contributing tributaries to the identified eutrophic bays. The study team reported confidence that the projected growth in the region can be accommodated in non-prioritized areas.

Conservation and Restoration Priorities in the Upper Oconee River Basin

The Upper Oconee watershed is projected to experience approximately 20,000 acres of net decrease in forest cover by 2040 due to urban growth, while water demand will increase by approximately 36% by 2050. The primary threat (risk) associated with these changes is increased sediment and nutrient loading and related eutrophication issues. The study of the Upper Oconee was structured after the approach used in the Lower Savannah River WMPI setup and the Middle Chattahoochee's use of CPI (Conservation Priority Index) and RPI (Restoration Priority Index) results. The study objective was to identify priority areas to maintain forested land use or reforest hay and pastureland to reduce levels of sediment and nutrients in source water, thereby reducing water utility treatment costs. The entire Oconee River basin has three reservoirs, two of which are at the lower end of the Upper Oconee River Basin forming Lake Oconee and Lake Sinclair. The downstream location of the reservoirs and the presence of large water utilities upstream from them greatly limits any potential benefit from reservoir resetting to reduce the sediment and nutrient concentrations. Therefore, selecting a 60% forested cover goal was determined using Warziniack, et al. (2016) and Freeman, et al. (2008) across the entire Upper Oconee 8-digit HUC watershed. The Upper Oconee River Basin is approximately 2,916 square miles (1,866,000 acres) in size of which the 2016 forest land cover estimate is 58%. Forested land in permanent conservation is currently 157,400 acres.

The Land Change Modeler (LCM), part of the TerrSet Geospatial monitoring and modeling System (Eastman, 2016) was used to project future land use changes and inform the WMPI CPI and RPI assessment setup. The assessment team reduced the minimum acreage limit down to 50-acres instead of the 100-acre limit used in the prior studies. The WMPI CPI results prioritized 167 parcels covering 19,039 acres for conservation with a current market value of $171 million. The WMPI RPI results included 14,699 acres prioritized for restoration within 121 parcels, worth $115 million in current market value. There were 69 parcels with mixed land use that were identified by both selection methods, with a total value of $71 million. The modeling process predicted which parcels (~33,000 acres) are most likely to be converted from natural cover to developed land uses and concluded with the statement that: "…there is a clear opportunity to preserve water quality, while still maintaining a substantial level of development options for local communities and citizens, through targeted protections and perhaps judicious restorations in high-scoring parcels that are currently poised for land use conversion." The assessment further indicates that although the upper portions of the river basin in Clarke and Oconee counties are severely impacted by urbanization, it is still possible to protect the rural landscape for much of the remaining basin's water users.

The conclusion's final note is that stakeholders can use the results as a shopping list for surface water quality protection priority sites, and that the study's findings can be combined with other stakeholders' interests in identification of site selection for parks, wildlife habitat, and expanding current protected areas like community trails.

Key Lessons Learned from Georgia's Use of Prioritization Tools and the Watershed Management Priority Index (WMPI)

- The WMPI tool processes physical data for soil and proximity characteristics with land use categories to sort parcels into valuable water and water quality impact prioritization tiers that can be used alone for small, delineated areas, or as part of a larger combined list of water and water quality characterization tools (e.g., monitoring programs, watershed models, etc.).
- The WMPI tool does not provide quantified loading estimates for sediment and nutrients.
- The WMPI tool's use in large source water delineated areas can result in too many prioritized parcels to be beneficial for use in decision-making without changing the tool's setup or adding results from other water or water quality focused assessments.
- The WMPI results can provide a prioritized list of water or water quality parcels that can easily be one layer in stacked ecosystem service benefit goals (e.g., wildlife habitat, recreation areas, etc.).
- Establishing WMPI assessments with upper boundaries at reservoir dam locations is considered an appropriate procedure, as the reservoir is considered to provide an accepted "reset" of river conditions.
- Careful consideration of how wetland proximity influences parcel prioritization is recommended.
- A tiered approach can be considered for either payments or eligibility for mixed land use parcels or larger parcels with notable proximity differences.

Key Lessons Learned on Schedules and Costs

- The identified goals of conserving or restoring prioritized areas to maintain 60% forested cover are accompanied by forecasted costs in the tens or hundreds of millions of dollars.
- Current funding streams face challenges to achieve the prioritized conservation goals within the time period during which the source water protection area is expected to experience the impacts from projected population growth.
- Expanding the program collaborator list to include other funders, and possibly other ecosystem service benefits, can be an important program attribute to address funding shortfalls.

Prioritization Option 2 - Land Preservation Ranking Sheet

As described in Chapter 4, the PES program in Bellingham, WA for Lake Whatcom sought to protect an additional 5,552 acres (circa 2007). The spatial scale of the program is by far the smallest acreage of the case studies summarized in Chapter 4. The scale allows the City of Bellingham to use a Lake Whatcom Land Preservation Ranking Sheet. The ranking sheet applies weighting factors to common nonpoint source pollutant loading factors that include:

- Proximity to water bodies
- Proximity to Lake Whatcom
- Soil Erodibility Factor and Soil slope
- Forest cover
- Proximity and/or adjacent acquired properties
- Current land use
- Property zoning designation

Because of the small program scale the ranking spreadsheet approach keeps the direct overhead regarding site prioritization low while providing an adequate prioritization approach for buyers. The Lake Whatcom Land Preservation Ranking Sheet is available online at: https://cob.org/wp-content/uploads/ranking-form-master-2013.pdf.

Prioritization Option 3 - USGS SPARROW Mapper for Southeastern States

The USGS SPARROW Mapper for Southeastern states is not intended to be a standalone parcel prioritization method but can be used to augment other parcel prioritization methods by providing information to determine the pollutant persistence downstream. For the Southeastern states, the USGS provides the following free information online:

- Mapper: 2012 SPARROW Models for the Southeast: Total Phosphorus, Total Nitrogen, Suspended Sediment, and Streamflow
- Report: Spatially Referenced Models of Streamflow and Nitrogen, Phosphorus, and Suspended-Sediment Loads in Streams of the Southeastern United States (SIR 2019-5135)
- Model Data Release: SPARROW model inputs and simulated streamflow, nutrient and suspended sediment loads in streams of the Southeastern United States, 2012 base year

The USGS SPARROW Mapper provides suspended sediment results for

- All Sources
- Urban Land*
- Agricultural Land*
- Transitional Land*
- Forested Land
- Channel Sources

*The sources highlighted with an asterisk allow users to sort results by surficial geology classes (e.g., fine and medium grained sediments, residuum in alluvium, residuum in carbonated and fine – grained sedimentary rock). Where the term "residuum" is used to describe the material derived from the in-place weathering of bedrock.

The model can evaluate 4, 8 and 12-digit HUC watersheds down to a reach catchment area that is much smaller than the 12-digit HUC size. A PES manager can decide what each output provides in regard to their watershed questions.

The following are examples of results of the USGS SPARROW Mapper.

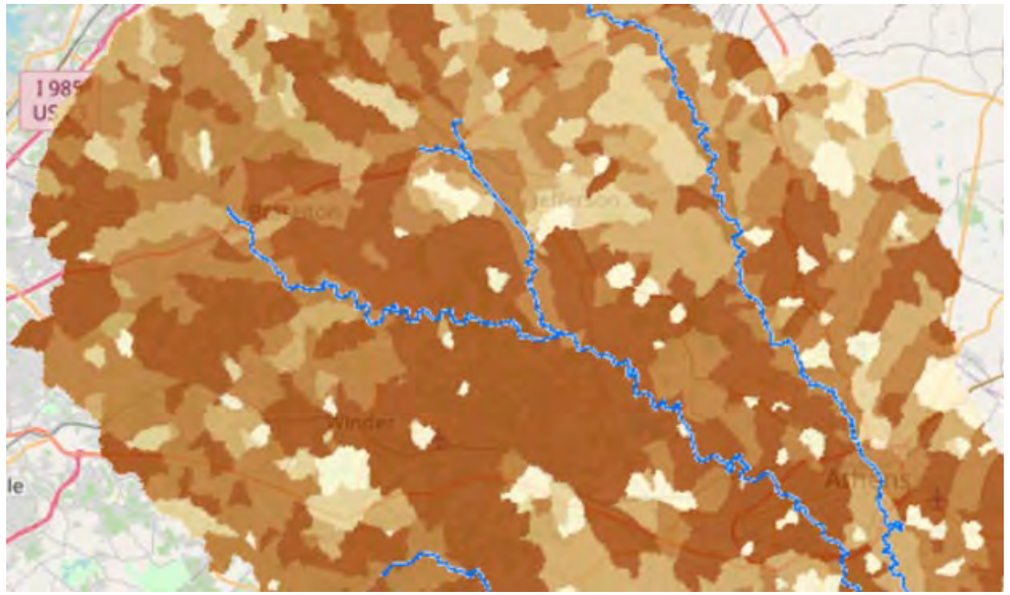

Figure 5.2a SPARROW Model suspended sediment concentration estimates in the Middle Oconee River, above the Athens Middle Oconee Intake.

The map of catchment based accumulated load is color coded according to a gradation of total load in metric tons for sediment (darker shades indicate higher loads) (Figure 5.2a). The modeler can zoom into different levels of detail to evaluate potential protection areas (Figures 5.2b). Furthermore, the model's output can be used to provide a source water protection project candidate's potential yield of sediment and nutrients to their individual source water intake HUC-12 watersheds. This information can be used to unify decisions by informing individual buyers about the common value of certain sites.

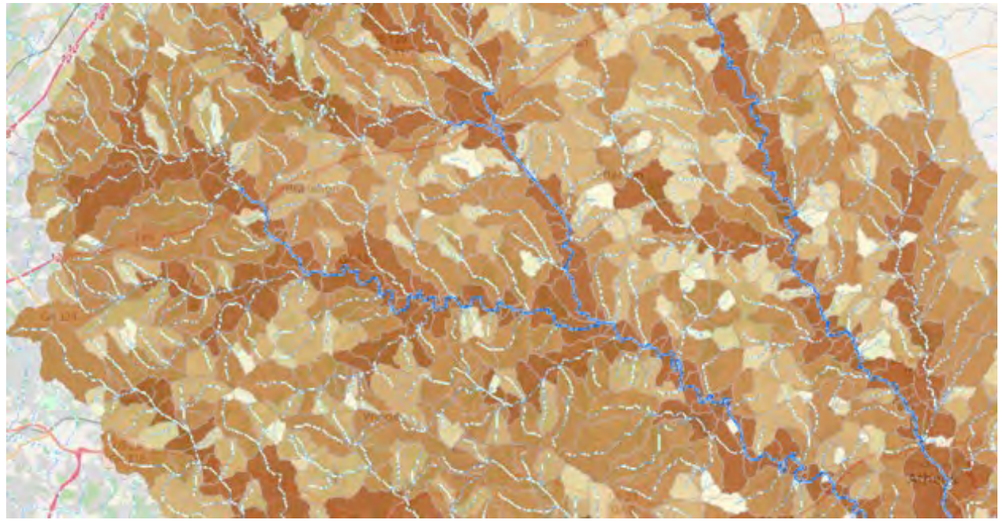

Figure 5.2b. Catchment Accumulative Loading (MT). For the Upper Oconee – Middle Oconee Branch above Athens, Georgia.

Prioritization Option 4 - InVEST Suite of Models

The InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs)[199] is a suite of free, open-source software models used to map and value the goods and services from nature. The InVEST model suite is a product from Stanford University's involvement in the Natural Capital Project. The models provide an extensive list of possible ecosystem services that can be assessed at the user's discretion. InVEST models are distributed as a standalone application that is independent of GIS software. However, mapping software such as QGIS or ArcGIS is needed to display the results spatially. Running InVEST effectively does not require knowledge of Python programming, but it does require basic to intermediate skills in GIS software. The costs of using InVEST include gathering local input data and providing a knowledgeable modeler.

By utilizing the economic models in InVEST, and loading land costs, the Lake Sebago, Maine modeling team was able to provide cost projections along with their prioritized list of parcel options.[200] The Sebago Clean Water Fund worked with the University of Maine and Hamilton College to prepare an economic case study[201] for The Nature Conservancy and Highstead (a regional conservation nonprofit), to assess priority lands and land costs to provide buyers assurances regarding program integrity.

The assessment team used the InVEST model[202] to assess ecosystem service benefits of forestland conservation, based on:

- economic valuation,
- land use change scenarios, and
- land acquisition costs to develop a cost benefit analysis.

The process also included valuation results for other ecosystem services (i.e., fiber and fuel provision, climate regulation, air quality, recreation and ecotourism, and habitat). The project team recognized smaller tracts of land in the analysis data but alluded to an economy of scale issue with transaction costs when working with conservation easements.

Prioritization Methods for Groundwater Wellhead Protection Zones

While much of the focus of source water protection and parcel prioritization methods is on surface water resources, there are also approaches to be considered for groundwater wellhead protection zones.

As noted previously, the Georgia EPD requires an inner management zone ranging in size from a 100-foot radius circle to a 500-foot radius circle depending on aquifer type. The final zone, the outer-management zone, can range from 100 feet to several miles depending on the well construction and geology of the wellhead protection area. Table 5.2 provides examples of the number of acres within the outer-management zone, based on the radius determined by the EPD Source Water Assessment Implementation Plan.

As noted previously, the Georgia EPD requires an inner management zone ranging in size from a 100-foot radius

[199]Stanford University. 2006. InVEST, integrated valuation of ecosystem services and tradeoffs. https://naturalcapitalproject.stanford.edu/software/invest.

[200]Daigneault, A.; Strong, A.L. 2018. An Economic Case for the Sebago Watershed Water & Forest Conservation Fund. https://www.sebagocleanwaters.org/invest/.

[201]Daigneault, A.; Strong, A.L. 2018. An Economic Case for the Sebago Watershed Water & Forest Conservation Fund. https://www.sebagocleanwaters.org/invest/.

[202]Stanford University. 2006. InVEST, integrated valuation of ecosystem services and tradeoffs. https://naturalcapitalproject.stanford.edu/software/invest.

[203]Bawa, R., Dwivedi, P. 2019. Impact of Land Cover on Groundwater Quality in the Upper Floridan Aquifer in Florida, United States. Environmental Pollution: 252 (2019) 1828–1840.

circle to a 500-foot radius circle depending on aquifer type. The final zone, the outer-management zone, can range from 100 feet to several miles depending on the well construction and geology of the wellhead protection area. Table 5.2 provides examples of the number of acres within the outer-management zone, based on the radius determined by the EPD Source Water Assessment Implementation Plan.

Figure 5.2 Acres within the wellhead protection outer-management zone based on radius distance.

Outer-management Zone Radius	Number of Acres in Outer Zone
100 ft Radius	0.7
500 ft Radius	18.0
1/2 Mile Radius	502.7
1 Mile Radius	2,011
2 Mile Radius	8,043

A variety of available research supports the use of conservation and forestry practices for wellhead protection. A study by Bawa et al. (2019)[203] found that shallow well nitrate-nitrogen and potassium concentrations vary according to the proportions of agriculture, forest, and urban land uses. These relationships were further evaluated using multivariate regression models which showed significant associations between land cover type, water table height, and groundwater quality parameters. Consistently, agricultural cover was associated with larger increases in groundwater pollutant loads as compared to urban and forested land cover. This study and pending follow up studies indicate that forest land cover can be used in wellhead protection zones to mitigate nitrate-nitrogen contamination. Because of slow groundwater velocities and the delayed timing of travel through wellhead protection zones, this type of protection would be a preventative management practice. This practice is not likely to be able to reduce existing already high concentrations of nitrate-nitrogen approaching the Maximum Contaminant Level nitrate-nitrogen standard of 10 mg/L.

There are also cautions to be considered with forest land uses and potential impacts on groundwater recharge. A study by Domec et al.[204] tested three different water usage estimation methods on two different loblolly pine plantations with different ages of stands with similar sandy loam soils. In the results of the water mass balance comparison, the 4-year-old stand had a negative soil water storage value in 2007 precipitation conditions (-79 mm/yr) and positive values in 2008 and 2009 (8 and 138 mm/yr respectively). Whereby, the 19-year-old stand estimations for soil storage had a larger negative impact. The 2007 precipitation conditions estimated a -371 mm/yr, 2008 estimations were -63 mm/yr and only 2009 was a positive increase in soil storage of 78 mm/yr. These findings indicate softwood plantations managed for maximum production (shorter term rotations and maximum stocking) may not be the preferred wellhead protection zone management practice. Even though nitrate-nitrogen is applied less to forest stands, the long-term drop in groundwater recharge should be considered.

Like the spatial scale of work for surface water protection in Bellingham, WA for Lake Whatcom, the prioritization of conservation areas for wellhead protection can generally be managed with a ranking spreadsheet and a sophisticated prioritization process may not be necessary. The first question to resolve is if the pollutant(s) of concern can be controlled by a PES ecosystem management approach. Key influencing factors may be the land use type, management intensity and landowner's cooperation. A spreadsheet tracking approach for parcel land use, operation information, and landowner's interest may be adequate. Attempting to provide a more sophisticated approach would likely require conducting further hydrogeology studies.

[204]Domec, J.; Sun, G.; Noormets, A.; Gavazzi, M.J.; Treasure, E.A.; Cohen, E.; Swenson, J.J.; McNulty, S.G.; King, J.S. 2012. A Comparison of Three Methods to Estimate Evapotranspiration in Two Contrasting Loblolly Pine Plantations: Age Related Changes in Water Use and Drought Sensitivity of Evapotranspiration Components. Forest Science 58(5) 2012. http://dx.doi.org/10.5849/forsci.11-051.

A PES program for wellhead protection may be more effective if it includes several different protection methods ranging from land acquisition and transfer of property right to easements, and land management services agreements that may include tree planting and forestry operations. Adaptations of programs such as the TNC Indiana's Forest Bank or AFT's BMP Challenge (both described in Chapter 4) may be appropriate models to consider. Forest land use and agroforestry practices can be used to safeguard wellhead protection zones and adapting the AFT's BMP Challenge approach to transition agricultural croplands to agroforestry and forestry land uses can be a moderate to long-term PES approach.

Conclusions

The Source Water Protection standard and guidance manual provided by the American Water Works Association (ANSI/AWWA, 2014;[205] AWWA 2016 [206]) is a strong platform for a full range of watershed assessment programs that include elements of a Source Water Assessment Plan (SWAP). These plans identify the contributing area of the source water watershed considered in a surface water protection situation, or the extent of land acreage within a wellhead protection program, and the potential sources of contamination. The SWPPs also provide the intended protection methods to be used in the watershed. The PES program can build on the SWAPs and SWPPs by integrating additional information about ecosystem services and protection methods, including forest related actions and benefits. Source water protection planning and area prioritization options, including those already in use in Georgia, provide examples that can be replicated, adapted, and efficiently applied to inform PES program design and development.

[205]American Water Works Association. 2014. AWWA Management Standard, Source Water Protection. ANSI/AWWA G300-14.

[206]American Water Works Association. 2016. Source Water Protection Guide to ANSI/AWWA Standard G300. Operational Guide to ANSI/AWWA G300-14.

Chapter 6. Structuring Options for Legal Agreements to Enhance Private Forest Landowner Engagement

Introduction

To connect and engage private landowners in PES programs, legal agreements and supporting materials must be easy to understand, with conditions of the agreements structured to be clear and constructive. This chapter addresses various models and recommended approaches that are presented for PES collaborating teams to explore options and arrive at legal structures and language that is most successful, for both implementing the terms and conditions desired while encouraging participation by private forest landowners. Intuitively, each increase in rigor and specificity raises the direct and/or indirect cost of administering the agreement, leaving less funding available to implement projects. In the end, the buyer has the right to be assured the purchase results in the ecosystem service(s) paid for, and the seller has the right to fair compensation and treatment. Engagement with formal legal counsel in the development of these agreements is necessary and an essential element of PES program development.

Guidance for PES Program Requirements and Legal Agreements

Contracts and other legal agreements exist to protect the rights and interests of the buyers and sellers of ecosystem services. Greiber led a team in 2009 that included the International Union for Conservation of Nature (IUCN) and the Katoomba Group in the development of a report entitled: Payments for Ecosystem Services, Legal and Institutional Frameworks.[207] Greiber, et al. identifies important considerations regarding how to develop easy to deliver program requirements. The report also stresses the need to fully and clearly communicate requirements of the agreement. The audiences for the report are global, and the range of countries that the Greiber team references include countries with diverse legal structures regarding property rights for individuals and communities. Therefore, some discussion topics do not apply in the U.S. The PES programs Greiber presents also include those that benefited from having supporting government legislation for PES efforts (i.e., public sector initiatives), which is not the focus of this report.

Within the U.S. context, it is important to recognize the existence of a robust legal system for determining property rights and the transfer of those rights. Also, there are existing mechanisms for contract enforcement and contract law that apply to considerations for liability between parties to any agreement. These existing legal systems provide significant beneficial foundations, and within a strongly regulated environment like the U.S., PES programs must be careful that their legal agreements align with federal, state, and local regulatory frameworks.

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[207]Greiber, T.; ed. 2009. Payments for Ecosystem Services. Legal and Institutional Frameworks. IUCN, Gland, Switzerland. xvi + 296 pp.

[208]Food and Agricultural Organization of the United Nations. 2002. Land Tenure and Rural Development. FAO Land Tenure Studies 3. Rome.

The discussion provided by Greiber, et al. sets the foundation for how property rights can be separated into different elements in a PES legal agreement.

> "Property rights regulate the relationship among people as individuals or groups with respect to a determinate thing, which can be any physical or intangible entity (e.g., land and its natural resources which provide ecosystem services). As a general concept, property rights comprise ownership and a subset of rights which follow from the ownership.
>
> Rights following from ownership can be distinguished as follows (FAO 2002): [208]
>
> - Access and use rights which give the right to access the land in order to use its natural resources;
> - Control rights which give the right to make decisions how the land and its natural resources should be used; and
> - Transfer rights which give the right to sell, to convey or to mortgage the land to others through contracts, to transmit the land to heirs through inheritance, and to reallocate access, use and control rights.
>
> These rights can be inseparably attached to the right of ownership or exist as separate, transferable rights. Certain rights, like the right to use a piece of land, can be further split into more specific use rights, such as use rights for natural resources but also ecosystem services."

And, Greiber, et al. stresses:

> "Clearly defined property rights enable parties to enter into PES contracts and ensure the sustainability of PES schemes."

Finally, Greiber, et al. encourage PES managers to use:

> "Flexible approaches to property rights and open criteria for participation...[which] contribute to the success of PES schemes and their sustainability."

These statements highlight important tenets for legal agreements, operational protocols, and determining the program's organizational framework.

Content of Common Legal Agreements

The following list (Textbox 6.1) identifies elements to consider in legal agreements as derived from the reviewed literature and with a focus on the U.S. context. Each of these legal agreement elements have presentation options that will enhance or detract from private forest landowner engagement.

(Textbox 6.1) Elements to Consider in Legal Agreements for PES Programs

- **Preconditions**
  - Clear authority to engage in the agreement and perform ecosystem service requirements
  - Mechanisms for dispute resolution, enforcement
- **Agreement Structure Selection**
  - Purchase agreements (including rights of first refusal)
  - Service agreements – where either the buyer or seller takes actions to lead to restoration or enhancement
- **Define Transaction Units (Units of Trade), options:**
  - Credits (commonly a mass/period of time)
  - Measurement metrics (e.g., acres of forest, acres with implemented Forest Management Plan, stream bank distance, etc.) (Also see call out box for further discussion)
- **Payment Verification of Services Options**
  - Measurement of services performed (e.g., tree planting, thinning to a target basal area, etc.)
  - Verified reimbursement requirements
  - Performance requirements (rigorous – sophisticated characterization methods, to casual justification "very likely")
- **Levels of Contractual Formality (to be considered between program representatives and between seller and buyer)**
  - Memorandum of Understanding
  - Legally-binding
- **Contract Elements (i.e., Preamble, Terms and Conditions, Payments and Payment Schedules, ...)**
  - Clearly defined rights and obligations; site visits for audits/verification
  - Payment amounts, schedules, and performance required
  - Definition of performance and consequences for failure to perform
- **Negotiating the Contract**
  - Identifying what is negotiable and what is not negotiable
  - Determination to use flexible templates, or use fixed templates
  - Identify up front that the purchaser's lawyer does not represent both parties
- **Special Considerations**
  - Monitoring (balancing transaction cost with need for accuracy or certainty)
  - Verification (balancing selection of standards/staff time/admin costs)
  - Long-term obligations (ability to reopen at scheduled times to adjust terms and conditions due to unforeseen ecosystem disruptions, seller's successors, etc.)
  - Consequences of default (small holding seller is likely unable to pay damages or repair unforeseen disruptions)

Water Credits, Mitigation Banking, and Metrics

In order to select an appropriate metric for the PES program one has to understand environmental metric options and how they are used in other programs. Metrics are the measurement of an environmental impact or an influence on an impact, where impacts can be either positive or negative. Different metrics are defined specific to the environmental market needs. Several environmental markets use the term "credit", but the definition of a credit is different between markets. Mitigation banks, such as wetland or stream banking, define transactions using the term "credits" for mitigation replacements, and "debits" for damages or negative impacts. The credit and the replacement trade ratio are specific to the location and type of wetland impacted, the mitigation wetland, and the mitigation wetland's standard operating procedure overseeing the design and monitoring requirements. Water Quality Trading also uses the term credit, in these programs a credit is the measured or modeled mass of pollutant reduced at a site over a set period of time. The credit is also adjusted by a trade ratio that accounts for introduced uncertainties and differences as well as site location influences regarding issues like delivery ratios and a source's nutrient bioavailability. The reduction times applied in the trade ratio define the credit (e.g., total phosphorus lbs / year). Greenhouse gas (GHG) trading uses one ton of carbon dioxide emission as a standard, and all other GHG types are adjusted to this standard base on an equivalent impact.

Because drinking source water protection has to address many possible source types and pollutant concerns, it is expensive and challenging to measure the protection value provided by an acre of forest versus an urban or agricultural acre. In addition, ag and urban per acre discharges can vary widely due to acres being operated differently and influenced by factors like percent of impervious surface, fertilizers and pesticide management, and whether or not conservation practices are implemented. Therefore, forestry water protection metrics have been as simple as an acre of forest preserved. This metric assumes the forest is healthy and the water coming off of such an acre has a better quality and/or quantity than other land use types. Some PES programs add models or assessments to further identify high priority sites. As discussed in Chapter 5, the Natural Capital Model InVEST, is used to define how changes in an ecosystem structure are likely to affect the flows or ecosystem services across a landscape. The Watershed Management Priority Index (WMPI) GIS analysis is used to identify priority parcels in the watershed based on using a list of science-based land use characteristics that are known to generally influence hydrology and pollutant discharges. These may not change the acre of forest to another measurement, instead they are applied in order to provide more assurance that the selected acres of healthy forest are a good investment.

There are well-established approaches to water credits and mitigation banking in the U.S. and within Georgia. As defined in federal policy, a mitigation bank is a wetland, stream, or other aquatic resource area that has been restored, established, enhanced, or (in certain circumstances) preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources permitted under Section 404 of the Clean Water Act or a similar state or local wetland regulation (https://www.epa.gov/cwa-404/mitigation-banks-under-cwa-section-404). A mitigation bank may be created when a government agency, corporation, nonprofit organization, or other entity undertakes these activities under a formal agreement with a regulatory agency.

There are an estimated 160 public and private mitigation banks in Georgia, protecting more than 45,500 acres in perpetuity, including more than 265 miles of streams and over 21,300 acres of wetland and upland buffer areas (www.garestoration.org and https://gaswcc.georgia.gov/sites/gaswcc.georgia.gov/files/related_files/site_page/Mitigation%20Management.pdf) Examples within Georgia include The Flint River Mitigation Bank comprised of three mitigation sites covering 840 acres in Fayette, Clayton and Spalding Counties (http://www.wetlandcredits.com/).

Examples of Clearly Defining an Individual Property Right Transaction

There are specific individual property rights that will likely need to be addressed in a PES program's legal agreement. Examples of these rights include land management obligations, right to access, right of first refusal, and impacts to other benefits of ownership.

Land Management Obligations

Land management obligations involve the definition of management actions and the roles and responsibilities of third-party service providers. When a PES legal agreement is predicated upon following a forest management plan, the PES program must clearly define the obligations of each party, including the landowner, plan writer, and any additional technical service providers who will be involved with implementing the plan. For example, various questions must be addressed, including who will be eligible to write the plan and what content is required in the plan. If a registered forester is required to be involved in the development and/or approval of the plan, there may be professional qualifications and competencies that can be defined without having to be thoroughly explained in the landowner's legal agreement (i.e., reference can be made to existing laws or guidance for professional qualifications or licensing). Options for plan development and/or approval include having a PES program dedicated staff member who prepares plans and conducts audits, or a forester selected by the landowner who is registered by the Georgia Board of Foresters.[209]

The program will also have to define steps taken when the registered forester or other professional service provider willfully violates the intent of the program, either through deception, negligence, or incompetence. Addressing these issues may include requirements for liability insurance, contractor oversight, and other business practices that help protect the interests and rights of participating landowners and other parties.

In a personal conversation with Dr. Current (2020)[210] which discussed his involvement with the Costa Rica reforestation PES program, he provided a report entitled: Costa Rica's Payments for Ecosystem Services Programme Case Study Module 2[211] that includes information about the program's legal agreements. The program's approach includes the signing of legal contracts with the landowners agreeing to land uses presented in a forest management plan and with professional foresters monitoring compliance. Dr. Current stated that the regentes forestales (professional foresters) face enforcement penalties if false verification is provided.

Program frameworks like those used in Costa Rica and in U.S. water quality trading programs, are examples of the use of third parties for site applications, review of project plans (e.g., forest management plans), implementation oversight and site certification. The use of independent and highly credible third parties can be advantageous for defensibility purposes and provide additional benefits, such as building trust and reducing burdens to the landowners. Both benefits can enhance landowner participation. Third parties can build trust that program activities will be performed by forest management professionals that may already have a solid reputation or relationships within the community. Trusted relationships are a vital component of success for both the seller and program buyers. According to the National Network on Water Quality Trading,[212] another advantage of including third parties is that the increased trust and credentials can provide justification for limiting the amount of seller's personal information or other sensitive information in the program's record keeping and reporting. Where appropriate, a third-party can

[209]"The Georgia General Assembly created the Georgia State Board of Registration for Foresters in 1951 for the purpose of protecting the public health, safety, and welfare by regulating those who engage in the practice of professional forestry. The Board has the authority to adopt rules, set standards for licensure, adopt mandatory standards of professional conduct, and investigate and discipline unauthorized, negligent or incompetent practice." Georgia Board of Foresters. 2021. Georgia Board of Foresters Website. https://sos.ga.gov/index.php/licensing/plb/23.

[210]Personal conversation; Dr. Dean Current (Program Director, Center for Integrated Natural Resource and Agricultural Management; Department of Forest Resources University of Minnesota). 13 October 2020.

[211]Porras, I.; Chacon-Cascante, A. 2018. Costa Rica's Payments for Ecosystem Services Programme Case Study Module 2. Ecosystems, poverty alleviation and conditional transfers. International Institute for Environment and Development, London.

[212]National Network on Water Quality Trading. 2020. http://nnwqt.org/.

[213]Greiber, T.; ed. 2009. Payments for Ecosystem Services. Legal and Institutional Frameworks. IUCN, Gland, Switzerland. xvi + 296 pp.
Institutional Frameworks. IUCN, Gland, Switzerland. xvi + 296 pp.

[214]Willamette Partnership, World Resources Institute, and the National Network on Water Quality Trading. 2015. Building a Water Quality Trading Program: Options and Considerations. http://willamettepartnership.org/wp-content/uploads/2015/06/BuildingaWQTProgram-NNWQT.pdf.

[215]Specifically, the legal contract's language references a performance obligation to continuously meet the requirements the farmer already agreed to completing in another environmental program. In other words, if you are enrolled in the existing program and maintain those standards, then you are automatically in compliance with the new program.

"vouch" for participants and provide a system of accountability and aggregation that protects an individual's sensitive information and may provide operational efficiency. Being required to make personal information like names and addresses or property locations public can present a substantial discouragement when deciding whether to engage, or not, in environmental markets like PES programs. Also, setting up a formal site registration for the program can add assurance that double dipping of parcels does not occur (Greiber, 2009;[213] National Network of Water Quality Trading, 2015[214]). However, the use of publicly available registries or public ledgers are not a universal program requirement. A registry and sharing of public information are more common among programs that are concerned about paying for services that are additional to business as usual and that often require a formal project registration.

To further address land management obligations, PES program legal agreements can often leverage existing activities, requirements, guidelines, or even other programs. As an example, a PES program that was piloted from 2017 to 2019 in Minnesota entitled Field Stewards heavily leveraged another operational evaluation process from an existing program, namely the Minnesota Agricultural Water Quality Certification Program (MAWQCP). By using MAWQCP referenced conditions for the Field Stewards PES program (see Text box), the program saved on overhead expenses and the farmers did not fill out duplicate information for two different programs. [215]

Textbox 1. The Field Steward's PES program contract references:

RECITALS

A. ADMINISTRATOR, in cooperation with "Assisting Organization" and the Minnesota Agricultural Water Quality Certification Program ("MAWQCP") operated by the Minnesota Department of Agriculture, has developed the Field Stewards program, which is intended to reward farmers for reaching and maintaining a high level of water quality protection on their farms, help food brands address sustainability challenges in their crop supply chains, and provide consumers an opportunity to support cleaner water with their purchases.

B. The Field Stewards program functions as follows: (1) the Department of Agriculture certifies that a farmer's practices with respect to specified acres meet the MAWQCP standards of environmental protection; (2) food companies ("Buyers") "purchase" certificates for the certified acres by paying ADMINISTRATOR an amount per acre in support of farms complying with MAWQCP standards; (3) ADMINISTRATOR passes through to farmers an amount based on the farmers' certified corn and soybean acreage. As a result, farmers receive income from implementing farm operations in a manner that protects water quality, participating food companies can promote their support of such practices in the labeling of food products, and consumers are able to make informed food purchasing decisions.

C. Farmer has been certified through the MAWQCP, and desires to participate in Field Stewards, under the terms and conditions set forth in this Agreement.

Using the reference to the existing program's plan as a performance condition in a second program facilitated ease of adoption. This type of contract reference can be easily transferred to the creation and implementation of a variety of PES program elements

Forest Management Plans

Forest management plans commonly include a site description with maps, prescribed management activities like timber harvests, reforestation, water quality best management practices, protection and maintenance practices, and many other relevant objectives. A forest management plan provides the landowner access to multiple ancillary benefits as well, for instance, compliance with environmental regulations, financial considerations like taxation treatment, preserving the estate, cost share and forest certification.

[216]Jackson, B.; Irwin, K.M.; Dickens, D.; Shelton, J.; McConnell, M. 2017. Writing a Forest Management Plan. Outreach Warnell School of Forestry & Natural Resources, University of Georgia, WSFNR-17-50 December 2017.

[217]Georgia Forestry Commission. 2019. Sustainability Report for Georgia's Forests: January 2019. https://gatrees.org/wp-content/uploads/2020/01/Sustainability-Report-for-Georgias-Forests-January-2019-WEB.pdf

A forest management plan can be tailored to the landowner's intended uses as well as the PES program's legal agreement obligations. According to Jackson, et al. (2017),[216] a forest management plan allows landowner objectives and PES requirements to both be selected as goals. If the registered forester understands the PES program conditions, they can be entered into the plan using language that is easier to understand and prescriptive terms can be avoided. Additionally, because the plan is created collaboratively with the landowner, the conditions of the plan can allow more flexibility; that is, if program requirements allow.

The GFC (2019)[217] states, "professional consulting foresters alone cannot meet the needs of the 200,000 forest landowners (owning at least 10 acres) across the state," and tend to serve larger landowners, making the delivery of technical information a tremendous obstacle. Compounding the issue of small tract size is professional forester availability. GFC notes that:

> "These logistical challenges, coupled with the diverse management goals characteristic of small forest landowners, have contributed to recent declines in replanted acres. Smaller tracts also present challenges to wildfire suppression, a priority for GFC. Reduced management (e.g., thinning) contributes to higher wildfire risks, and protection of homes becomes more difficult within a network of small woodlots."

Offering priority access to a registered forester, or directly providing PES program trained registered foresters to write forest management plans and oversee implementation may be an appealing benefit for landowners who are considering PES program enrollment.[218] Georgia, through the GFC, has effective water quality[219] and wildfire prevention and suppression programs[220] that can be leveraged as existing guidelines and requirements to be met by participants in a PES program. The state's BMP surveys demonstrate high overall compliance rates while identifying some opportunities for improvement in stream crossings and streamside management zones. [221]

Right to Access

Another important example of an individual property right that should be clearly defined in the PES program's legal agreement is the need for PES program administrative representatives to have the right to access the site for management activities, evaluations, and other program related functions. Clear explanations of the program representatives that are likely to visit the site, why they need to visit the site, how often, and methods for proper notice can help ease landowner concerns. Also, clarifying in the legal agreement that participation in the PES program does not include requiring access for the public is important to prevent confusion and alleviate concerns.

First Right of Refusal

The first right of refusal can be used to hedge against the property being sold and converted into a different land use at the end of a short-term agreement. This clause positions the PES buyer to be first in line to purchase the property when the landowner lists it for sale or has an offer. An example clause is provided by Law Insider[222] (Textbox).

Textbox 2. Sample clause for First Right of Refusal

"The Optionor shall grant to the Optionee the first right of refusal to purchase or option the Optionor's interest in the Property on terms which shall have been offered by any third party. The Optionor shall notice Optionee of his intent to sell and the Optionee shall have 30 days to meet the terms of agreement to sell and to pay any consideration required thereunder."

This type of clause leaves open the ability to combine first right of refusal with other PES structures (i.e., short-term easements), and it assures buyers that there are options available over the long-term to address keeping the land forested. With this clause in place, some forest landowners may also be more agreeable to short-term obligations requiring less transfer of property owner rights.

[218]This is a benefit provided to landowners enrolled in The Forest Bank, included in the Chapter 4 case studies.

[219]Georgia Forestry Commission. 2019. Georgia's Best Management Practices for Forestry. https://gatrees.org/wp-content/uploads/2020/02/BMP-Manual-2019-Web.pdf.

[220]Georgia Forestry Commission. 2020. Fire Prevention and Suppression. https://gatrees.org/fire-prevention-suppression/wildfire-prevention/.

[221]Georgia Forestry Commission. 2019. Sustainability Report for Georgia's Forests: January 2019. https://gatrees.org/wp-content/uploads/2020/01/Sustainability-Report-for-Georgias-Forests-January-2019-WEB.pdf

[222] Law Insider. 2021. First Right of Refusal Sample clauses. https://www.lawinsider.com/clause/first-right-of-refusal.

Impacts to other benefits of ownership

Participation in a PES program can raise concerns about the removal of rights from owners of forestland to use their land for various activities and benefits. How forest harvesting and reforestation are managed regarding the right to harvest and who receives the timber sales income need to be addressed in PES legal agreements. Another right to consider keeping in the private forest landowner's domain is the ability to lease land to hunting or fishing enthusiasts. Retaining these types of property rights can lower the negotiated payments made by buyers while helping landowners address short-term needs and long-term goals. If a forest management plan is used as a PES program governing document, the landowner will have a better understanding of the transfer of rights after having worked alongside a registered forester who can explain the "if this, then that" relationships required to manage the forest appropriately.

Fact Sheets as a Method to Increase the Clarity of Communication

Legal language can be confusing. Efforts to consider reducing legal language (jargon) or taking the time to explain jargon can be greatly beneficial.

Greiber, et al. speak to this directly:

> "–– Terminology
>
> Effective implementation of and compliance with legal provisions depends to a large extent on how well they can be understood. Especially when introducing a new legal instrument, such as PES, it is important to precisely define the terms which will be key for their development and implementation, and to avoid jargon.
>
> For example, the very idea of payments for ecosystem services needs to be explained. This will require differentiating ecosystem services (the benefits to nature and human welfare provided by ecosystems) from environmental services (services related to sanitation and waste management which are provided by humans). The different types of ecosystem services recognized within the legal framework should also be clearly defined so that misinterpretations of what qualifies as a service under a PES scheme can be avoided. Further definitions can help to distinguish the different types of PES schemes: private PES schemes, public PES schemes and trading schemes …"

By creating a series of fact sheets for private forest landowners, individuals and families can review glossaries, the purpose and intent of the PES program, and the individual legal agreement elements – with simple to read explanations. Also, creating a table comparison or summary of example payment terms, payment schedules, and what to expect if the legal elements are noncompliant will help lay out the financial expectations of the buyer and seller. This is especially important for explaining any lost opportunity (i.e., opportunity cost). Opportunity cost is not a well understood issue for many individuals or families who are not economists by training and who may be working in the ecosystem service market for the first time. One might think it is intuitive, that if a landowner enrolls in a PES program to maintain forest cover, then renting out land for agricultural crop or livestock production clearly would not be allowed. However, what one person considers to be obvious may not be so obvious to another. A fact sheet that defines whether common property rights associated with opportunities are limited by the legal agreement and how they are limited prevents misunderstandings and minimizes complications with enforcing the legal agreement.

Plus, for programs that offer one type of legal agreement structure (e.g., land purchase) to one landowner and another option to others (e.g., conservation easement), having fact sheets that explain the benefits and limitations of each structure can help landowners better understand what works for their needs.

Important Terms and Conditions to Consider for Smaller Individual and Family Forest Landowners

Smaller landholders may be interested in participating in a PES program if the payments provide a way to meet tax obligations and/or improve their land's ability to provide the uses they are interested in. However, in some cases the regular elements of a well-structured legal agreement can detract from private forest landowner participation.

A sampling of items that may detract from landowner engagement in a PES program and options to consider addressing them are presented in Table 6.1.

Table 6.1 . Legal agreement elements that can detract from landowner engagement and options to address them

Legal Agreement Element	Description	Options that Might Help Address the Element
Catastrophic Events (A.K.A. Acts of God)	When water quality practices, forest cover, or other management requirements are lost due to flood, fire, disease, insects, or weather.	1. PES program allows a reasonable reestablishment window (e.g., 3-years for reforestation to reach a given stocking level or other prescribed target)
		2. Cost of corrections are shared between private forest landowner and the PES program
		3. Cost of corrections are borne by the PES program
Enforcement Actions for Deficiencies of Obligations	When negligence, unforeseen consequences of introducing activities that harm or otherwise impact the ecosystem service(s), or willful violation of terms and conditions arise, what are the enforcement options	1. Clearly explaining and linking the benefits associated with a landowner's performance obligation upfront during the negotiation and legal agreement.
		2. Creating a beneficial tiered structure for landowners that responsibly report deficiencies and their corrective measures, versus stiffer consequences for those landowners that do not responsibly work with the PES program.
		2. Creating a tiered structure of enforcement actions (i.e., first notice including a reminder of pending stiff enforcement actions, then after inaction begin the enforcement).
		3. Using annual payments instead of upfront payments as a kind of "Pay for Performance Approach" where withholding payments introduces an additional incentive to comply when obligations are not met.
		4. For hardship cases consider including in the original legal agreement's terms and conditions reopeners that allow restructuring the agreement to provide for reestablishing compliance with stronger oversight and scheduled milestones.
		4. In hardship cases considering the use of property liens and other monetary means of working with the landowner.
		5. Upfront introduction of emerging technologies[223] into the program's operation that can cost-effectively be used in planning enforcement, used to identify troubling conditions prior to becoming a widespread problem and let the landowner know this type of monitoring is occurring. Examples include: Monitoring with satellite imagery Visual inspections using Aerial photos or drones, where if the site is indicated as not compliant a more formal and detailed site inspection will occur
Use of Scheduled Long-term agreement reopeners	When signing a long-term contract, private forest landowners often wrestle with family inheritance rights, unknown tax obligations and other concerns that may arise making the contract less beneficial in the future.	Offering a scheduled shorter-term reopener (say every ten-years like in the TNC Indiana Forest Bank[224] program) that allows the adjustment of payment terms based on existing conditions with adequate supporting information.

[223]Harris, N. 2015. The Use of Surveillance Technologies in Planning Enforcement, Planning Practice & Research. 30:5, 528-547, DOI: 10.1080/02697459.2015.1076133.

Some of these suggested methods to enhance private forest landowner engagement may not be acceptable when there are strict due process requirements, governing legal statutes, project performance standards for public sector funding, or other priorities that conflict with the method. These conflicts may be a factor to consider in the partnerships that are supporting the PES program and requires a better understanding of the concerns that may be specific to each participating public agency, private interests, nonprofit organizations, and others. For instance, when working with land trusts to contract and manage private lands under a permanent conservation easement, the convenience of their oversight at a reasonable cost can limit the PES program's flexibility in many framework options discussed above. Likewise, when working with government programs, the government's due process and contracting methods apply.[225]

Payments or In-Kind Services

An important aspect of performance agreements is that they can be structured either as payments or in-kind services (i.e., a services agreement). Performance agreement payment schedules can be flexible, for example they may be made according to program needs, upfront as an incentive to enroll, provided as reimbursements for protection measures as they are implemented, and/or as regular annual payments. Annual payments or reimbursements are types of pay for performance agreements that can avoid the hassles associated with claw-back clauses. Claw-back clauses are agreement mechanisms that provide the right for a purchaser to be compensated for breach of contract or other performance failures. These clauses must go through a legal process to be enforced. In-kind service agreements can be even more flexible than payment schedules and are customized in terms of the types of services provided, their duration and frequency. PES program structures that set up cash payments and/or in-kind services to address forest health can add an important benefit to the private landowner struggling to understand the value of proper management.

Key Takeaways for Engaging Landowners via PES Legal Agreements

A menu of options and methods to enhance engagement opportunities can include using either short-term or moderate-term legal agreements. The development of a PES program approach can also consider:

- Fee simple land purchase agreements and permanent conservation easements according to landowner desires
- Shorter-term agreements, or separate long-term agreements that include "First Rights of Refusal" clauses that provide assurance to the program that when the land goes up for sale, they are the first in line to purchase the parcel
- Engaging interested corporate land holders with a dedicated interest in keeping forestry holdings and long-term working lands with legal agreements that have conditions on keeping the operation's performance as stated in an agreed upon and approved forest management plan, and offering reasonable annual payments
- Engaging small individual land holders with performance contracts that offer either in-kind services or payment schedules that align with reimbursement needs and performance expectations of the agreement, including consideration of a Forest Bank approach

Conclusion

To connect and engage private landowners in PES programs, legal agreements and supporting materials must be easy to understand, with conditions of the agreements structured to be clear and constructive. As illustrated in Chapter 4, several successful PES programs have decided to offer different types of legal agreements, operational frameworks, lengths of contracted terms, and/or performance requirement options to appeal to a wider variety of private landowners. The various models and recommended approaches allow PES collaborating teams to explore options and arrive at legal structures and language that will best fit a given situation. Intuitively, each increase in rigor and specificity raises the direct and/or indirect cost of administering the agreement, leaving less funding available to implement projects. In the end, the buyer has the right to be assured the purchase results in the ecosystem service(s) paid for, and the seller has the right to fair compensation and treatment. Engagement with formal legal counsel in the development of these agreements is necessary and an essential element of PES agreement development.

Additional information, including PES program legal agreement templates are provided in Appendix C.

Chapter 7. Forum Feedback - Forest & Water Connection Initiative

Background

A series of nine virtual forums were hosted in January and February 2021 to educate stakeholders[226] and to solicit feedback on potential PES program scenarios that could be deployed in targeted watersheds in Georgia. In addition to the Georgia Forestry Foundation (GFF), Georgia Forestry Association (GFA), and Dovetail Partners (Dovetail), additional partners assisted in forum design and delivery, including Keeping Forests, the Georgia Forestry Commission, the Georgia Sustainable Forestry Initiative Implementation Committee, and the University of Georgia Warnell School of Forestry. Although this work was intended to occur in-person, the COVID-19 pandemic forced this work into an online format, and the nine sessions were all held via video conferencing (Zoom).

The first 'kick-off' forum that was hosted served as an all-encompassing event for stakeholders throughout the state to gain broad knowledge of the project and PES program elements. That forum then queued up 8 additional forums that specifically targeted landowners or water users and providers in 4 select watersheds: Lower Savannah, Middle Chattahoochee, Upper Oconee, and Lower Flint (Figure 7.1). These watersheds were selected based on the level of interest and engagement that already exists combined with their geographic and resource diversity. More than 200 individuals registered for the statewide forum and nearly 350 registered for the watershed forums (Table 7.1). Recordings were posted online (https://www.forestsandwater.org/) and distributed to those who were registered.

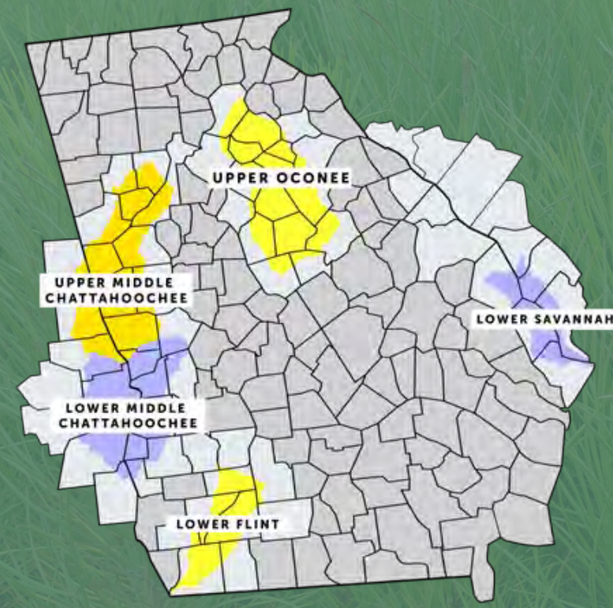

Figure 7.1 Forest and Water Connection Initiative selected watersheds

[224]The Nature Conservancy. 2020. The Forest Bank; Conservation options for woodland owners. https://www.nature.org/content/dam/tnc/nature/en/documents/Forest-Bank-Fact-Sheet-Nov2020.pdf.

[225]For instance, the USDA NRCS Regional Conservation Partnership Program (RCPP) offers access to grant dollars for land management, land rental, easements (U.S.-held), easements (entity-held) and public works/watersheds. However, federal contract language and templates are used if the option to fully partner with NRCS is selected.

[226]List of affiliations of forum attendees can be found in Appendix D

Table7.1 Forum attendance

Forum	Date	Registered
Statewide	1/28/2021	200+
Lower Savannah Sub-Basin Landowners	2/3/2021	37
Lower Savannah Sub-Basin Water Provider & Users	2/3/2021	24
Middle Chattahoochee Sub-Basin Landowners	2/3/2021	53
Middle Chattahoochee Sub-Basin Water Provider & Users	2/3/2021	38
Upper Oconee Sub-Basin Landowners	2/4/2021	100
Upper Oconee Sub-Basin Water Provider & Users	2/4/2021	33
Lower Flint Sub-Basin Landowners	2/4/2021	36
Lower Flint Sub-Basin Water Provider & Users	2/4/2021	26

Each forum included presentations from GFF and project contractors, Dovetail Partners. GFF focused on the importance of forests to water quality and quantity in the state and what threats those forested lands are under. This content set the stage for introducing opportunities associated with ecosystem service markets, and more specifically, payments for ecosystem services programs. Dovetail provided a basic introduction on what ecosystem services are, how programs can be structured, and the importance in combining these opportunities with other conservation efforts including easements and traditional conservation practices.

To make the online forums interactive and to provide opportunities for manageable feedback, the Sli.do platform was integrated into the presentation which allowed for live polling, brainstorming, Q&A, and rankings. Sli.do proved to be much more effective than just standard Zoom polling and general notetaking given the ability to focus questions and responses around elements for which feedback was being sought. Notes were also taken during each session to ensure all feedback was received and considered.

Statewide Forum

The statewide forum was hosted virtually on Thursday, January 28th at 9 am EST and the recording of the event is available online.[227] The results in Figure 7.2. describe the audience composition and primarily address the knowledge of the attendees, their willingness to engage in PES programs, and what challenges or opportunities exist within program structures.

[227]Georgia Forestry Foundation & Association. 2021. Forest and Water Connection Initiative Statewide Forum. https://www.youtube.com/watch?v=zW802QBygHk&feature=youtu.be.

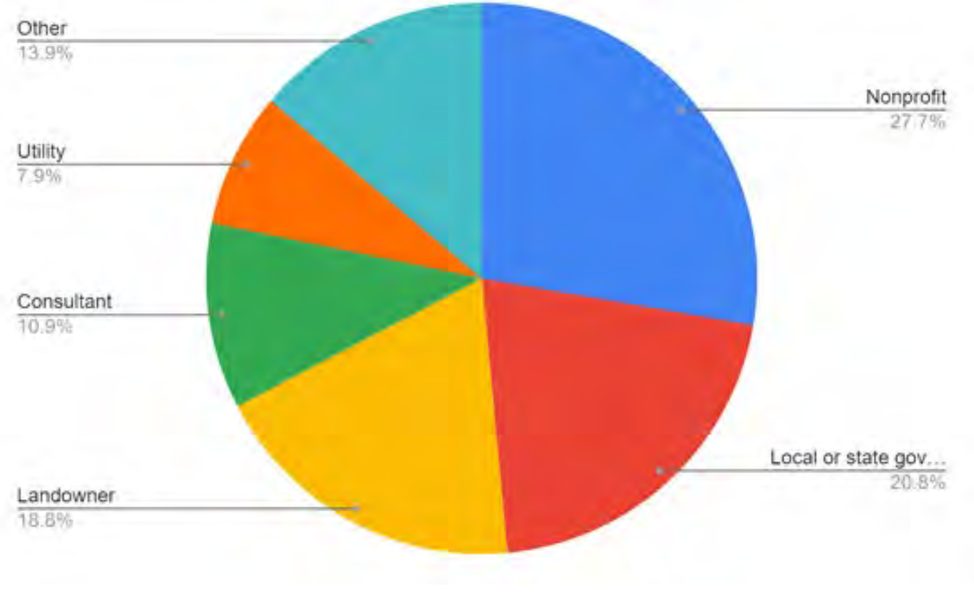

Figure 7.12 Forest and Water Connection Initiative Statewide Forum attendance by affiliation hosted virtually on January 28, 2021

As shown in Figure 7.2, audience composition for the statewide forum was distributed across a variety of public and private sector interests with the largest representation from non-profits (nearly 28%), followed by local or state government (21%), and landowners (19%). The audience was asked to identify ecosystem services that they know of that are provided by forests. The result of this exercise is the word cloud shown below (Figure 7.3.) where the words mentioned most by the participants show up larger than those mentioned less frequently. This information demonstrates an existing awareness of the connection between forests and clean water services as an ecosystem service. Over three-fourths of the participants also expressed a strong awareness of programs that provide incentives to link forest and water resources.

Figure 7.3 . Statewide forum activity (January 28, 2021) that asked participants to identify ecosystem services provided by forests

When asked for a preference about the potential administering party for PES programs, the top ranking was for nonprofit/NGO administrators followed by state or local government. The data was collected using the ranked poll feature in Sli.do.

1. Nonprofit/NGO
2. State or local government
3. Water provider
4. Private business
5. Federal government

The participants were also asked to identify what they perceived to be the leading challenge to PES program adoption, which clearly came through as the challenge to convince the public of the value and/or return on investment of these types of programs. That was followed by anticipated challenges with landowner comfort with agreements.

1. Convince public of value, return on investment
2. Landowner comfort with agreements
3. Long-term funding sustainability
4. Agreement length and terms

To inform the parameters of a developed PES program, specifics were asked about potential contract details, including agreement lengths. The preference most selected by participants was for an alignment with timber rotations and the second highest agreement length preference was ten years (Figure 7.4).

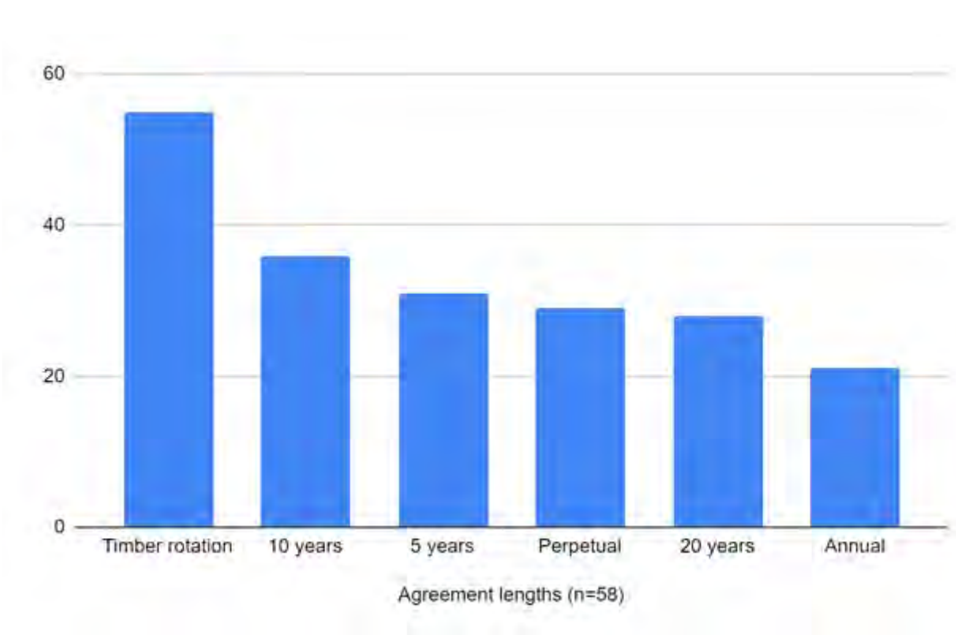

Figure 7.4 . Preference for agreement lengths of Statewide forum participants (attendees were asked to select all options that appealed to them)

Questions were also asked related to payments and funding sources. The attendees indicated a top choice of direct payments for compensation method followed by tax incentives. Bond initiatives were viewed as a feasible option for funding a PES program by 52% of respondents (Figure 7.5).

1. Direct payments
2. Tax incentives
3. Cost share assistance
4. Tradeable (water) credit
5. Technical assistance

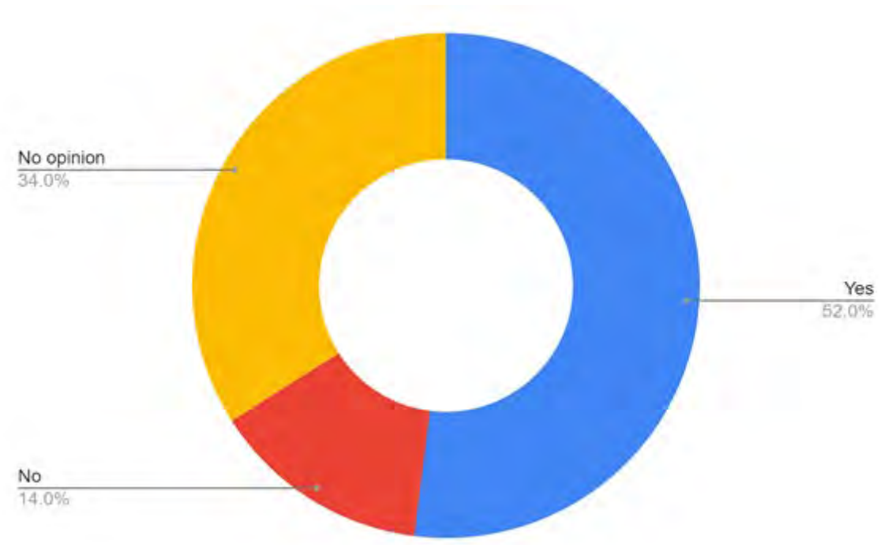

Figure 7.5 . Statewide forum participants willingness to consider bond initiatives as a feasible option for funding a PES program

Lastly, the top concerns with PES program development from a landowner perspective was the risk of overcomplicated agreements, restrictions on harvests or land use, and having to deal with the government, whereas water users had a top concern of identifying and/or convincing stakeholders of the value of the PES program.

Watershed Forums

Two forums were hosted in each targeted watershed to focus one session on landowners and one on water users or providers. As done in the statewide forum, introductory content was shared with the attendees, although the recording from the statewide forum was also made available and attendees were encouraged to view it ahead of their watershed event. The primary goal of these events was to present a potential PES program scenario, gauge interest, and then gather feedback on how the program scenario could be improved. Sli.do was used to gather that feedback in a pre and post nature as feelings on feasibility and willingness were collected when the scenario was first presented and then after it was revised to reflect the group discussions. In addition, some basic questions on threats and solutions to the watershed needs were deployed. Each forum utilized virtual breakout rooms to ensure a manageable size of attendees during the facilitated discussion around how to improve the PES program scenarios. Each scenario is outlined below, along with the polling data and main takeaways from each session. Table 7.2 summarizes top concerns and strategies identified by each forum, along with the feasibility and willingness indicators of the potential scenarios presented.

Table 7.2. Watershed forum data summarized

Forum	Top Concern	Top Strategy	Feasibility Before	Feasibility After	Landowner Willingness Before	Landowner Willingness After
Lower Savannah Landowners	Nutrients	Reforestation	3.4	3.8	3.4	3.5
Lover Savannah Water Users	Sediment	Reforestation	3.4	3.5	3.2	3.2
Middle Chattahoochee Landowners	Nutrients	Reforestation	3.7	3.9	3.7	3.9
Middle Chattahoochee Water Users	Sediment	Reforestation	2.9	3.8	3.4	3.4
Upper Oconee Landowners	Sediment	Reforestation	3.6	3.3	3.7	3.6
Upper Oconee Water Users	Sediment	Reforestation	4.0	3.8	3.3	4.0
Lower Flint Landowners	Sediment	Reforestation	3.7	3.4	3.6	3.4
Lower Flint Water Users	Other pollutants	Other practices	3.3	3.8	2.2	3.3

As shown in Table 7.2, "sediment" was a top concern for both landowners and water users in the Upper Oconee, but in the other watersheds there were differences between landowner and water users top concerns. The water users consistently identified sediment as the top concern in each watershed, except for the Lower Flint where they identified "other pollutants". Landowners were more concerned about nutrients in the Lower Savannah and Middle Chattahoochee. The top strategy identified in all watersheds and by all groups was "reforestation" with the single exception of the water users group in the Lower Flint that identified "other practices". Also, as shown in the summary, the feasibility rankings improved between the before and after in the Lower Savannah and Middle Chattahoochee and for water users in the Lower Flint. However, the Upper Oconee groups and the Lower Flint landowners ranked feasibility slightly lower after the group discussions. Lastly, the feasibility rankings improved or stayed the same in most instances, except for a slight decrease for landowners in the Upper Oconee and Lower Flint.

[228]For an example of this, see: Family Forest Landowners' Interest in and Perceptions of Forest Certification: Focus Group Findings from Minnesota. Jessica E. Leahy, Michael A. Kilgore, Calder M. Hibbard, Jacob S. Donnay. Northern Journal of Applied Forestry, Volume 25, Issue 2, June 2008, Pages 73–81, https://doi.org/10.1093/njaf/25.2.73. 01 June 2008

While these results reflect a small and non-scientific sampling process, it does highlight some of the challenges with marketing and engagement to promote ecosystem services. It is also worth noting that it is not entirely uncommon for focus group member interest in a new program to decline after hearing more about it or for attitudes (for or against) to become more entrenched.[228]

The following sections provide additional summaries of the scenarios that were presented in the forums and the results of the group discussions for each watershed.

Lower Savannah

Potential PES Program Scenario: A consortium of water and port authorities leverage the existing Clean Water Fund framework and the Southeastern Partnership for Forests and Water Network, supported by a mixed funding model to keep forests as forests and encourage reforestation to minimize sedimentation challenges

Potential Program Structure:

- Buyers: Water utilities or authorities, port authority
- Sellers: Landowners of forested and non-forested land
- Administrator: NGO or conservation consortium
- Contract length: 20-year
- Landowner requirements: Keep forests as forest, reforest non-forested lands, require forest management plan written by qualified forester
- Funding mechanism: Source water protection fee, corporate foundation grant, investment from port
- Payment schedule: One-time upfront payment, with annual payments thereafter

Lower Savannah Landowners

Concerns & Opportunities

- Focus on data showing forests not being a significant contributor to pollutants - BMP compliance is very high
- More buffers need to equal higher compensation, but do more buffers do more?
- Fertilization perception?
- Development and ag - forestland conversion threats
- How can this work with Conservation Use Value Assessment (CUVA) and the Forest Land Protection Act (FLPA)?
- Developers buying off landowners to break PES contract
- More education needed - need to see ROI

Program Structure Alternatives and Considerations

- Buyer potential: corporations, port authority, water utilities, conservation easements
- Funding mechanism: real estate fee to fund forest expansion, water protection fee, green bonds (focus on carbon)
- Administrator: Need to be independent and transparent. There may be potentially more trust with a local or state agency. The wrong NGO could turn folks away – an alliance strategy may be better.
- Contract length options: Landowners differ on preference. Not permanent but needs to be long enough to make difference (20-year?). Need to provide incentives for longer terms.
- Contract requirements: BMPs are working - leery of going beyond that, need to align with wildlife habitat goals, and need to keep it simple. Need to define who would oversee the management plan and consider transferable agreements. Consider third-party certification requirement.
- Payment schedule: flexibility needed – upfront, verify with performance annually

Lower Savannah Water Users & Providers

Concerns & Opportunities

- What type of work will actually make a difference?
- Work with the existing Savannah Clean Water Fund instead of multiple programs
- Opportunities with oxbows and other wetlands, floodplains

Program Structure Alternatives and Considerations

- Buyer potential: conservation groups, NGOs, local and state agencies, or private corporations
- Seller potential: local, state, and federal landowners as well (land along tributaries)
- Administrator: need to make sure they are fairly compensated for oversight and enforcement. Options may include public/private partnerships with local, state, or federal agencies and NGOs (The Nature Conservancy, National Fish and Wildlife Foundation, etc.). The mixed model will build accountability and alignment with state agencies.
- Contract length: need for flexibility, but not less than 10-year – potentially 20-years or longer. Tie lengths with permitting cycles (stormwater, water supply, etc.). Perpetual does not work.
- Contract requirements: Think about acreage requirements - need to accept all but may need to consolidate. Certification could serve as a proxy for good management
- Payment schedule: Need flexibility, performance-based payments, and proof of performance with audits (need funding to cover cost)

Middle Chattahoochee

Potential PES Program Scenario: Build upon the work of the Southeastern Partnership for Forests & Water, leveraging the local military presence to support a mixed funding model to keep forests as forests, encourage reforestation, and support sustainable harvests to minimize sediment and nutrient loading from upstream sources

Potential Program Structure:

- Buyers: Columbus water utility, Atlanta-based corporations with CSR commitments
- Sellers: Landowners of forested and non-forested land
- Administrator: NGO or conservation consortium
- Contract length: 20-year
- Landowner requirements: Keep forests as forest, reforest non-forested lands, require forest management plan written by qualified forester, harvests utilize SFI or other certified procurement operations
- Funding mechanism: Source water protection fee, corporate foundation grant, leverage military presence (federal grant)
- Payment schedule: Annual, with verification

Middle Chattahoochee Landowners

Concerns & Opportunities

- A lot of education/outreach still needed
- Certification costs money
- Need competitive markets with multiple buyers
- Consider prescribed fire
- Need clear contract specifics - ensure benefits are delivered
- Competing land uses
- Keep forests as forests

Program Structure Alternatives and Considerations

- Buyer potential: corporations – not just Atlanta based, utilities - not just Columbus, recreational user fees (access based, like state parks, etc.)
- Sellers: may need additional benefits to sell
- Administrator potential: alliance/coalition of parties; needs to be stable, able, have capacity to manage financials and seek investment with low overhead cost. Trust is important – potential partnership with Georgia Forestry Commission and USDA-NRCS.
- Contract length: need flexibility with options; 20-year too long - need ability to pivot for future generations; perhaps 10-year intervals.
- Contract requirements: management plans can be expensive – how do we keep that from becoming a barrier; easements may work; align with state BMP requirements
- Payment: tiered system with compensation; cost assistance for management and assistance welcomed; tax deferral; cost share for reforestation on marginal land; annual payments keep people focused

Middle Chattahoochee Water Users & Providers

Concerns & Opportunities

- BMPs are working, and are already doing a great job
- May need a regulatory drive to keep work focused
- How to place value on long-term BMP implementation
- Developers pressuring landowners with money to break contract - penalty needed
- Examples: Bonneville Environmental, Beaver Lake Watershed (AR)

Program Structure Alternatives and Considerations

- Buyer potential: corporations; utilities, including consortium of smaller utilities; ag users; Regional Conservation Partnership Program (RCPP); green bonds
- Seller potential: landowners of all types (including small); state and federal landowners; fish and wildlife focus
- Administrator potential: NGO consortium; trust and transparency critical; need a partner that is eager and diverse
- Contract length: need flexibility, utilities may want longer contracts (20 years+), consider tiered system that awards longer contracts
- Contract requirements: keep it simple and focus on watershed specific needs, balance where you need to maintain quality vs. improve quality, and consider third-party verification
- Payments: annual

Upper Oconee

Potential PES Program Scenario: Work with Southeastern Partnership for Forests and Water, Oconee River Watershed Network, and landowners within riparian corridors to protect critical resources while supporting recreational access through a mixed funding model including a water utility tax and recreation access fees to encourage water quality best management practices in riparian buffers

Potential Program Structure:

- Buyers: water utility or authority, corporations with recreation interest
- Sellers: landowners within riparian corridors of significance
- Administrator: leverage Oconee watershed network (NGO)
- Contract length: 15-year
- Landowner requirements: forested parcels adjacent to streams have forest management plans that include water quality BMPs, other land uses install forested riparian buffers adjacent to streams in key parcels
- Funding mechanism: source water protection fee, recreation access fees within managed riparian corridor, corporate foundation grant
- Payment schedule: upfront payment for riparian BMP establishment, annual payment for maintenance

Upper Oconee Landowners

Concerns & Opportunities

- Need to prevent development, especially on forestland
- Focus on sedimentation
- Provide incentives to plant more trees
- Consider watershed vehicle license revenue or bonds
- Stack payments with carbon market opportunities

Program Structure Alternatives and Considerations

- Buyer potential: counties with wellhead protection interests; public – intrinsic motivation to protect resources; corporations - data centers; UGA; factories; developers - impact fees; utilities - stormwater fee; recreation groups or corporations with recreation focus, with promise to enhance water access
- Seller potential: all landowners need opportunities - big and small (may need to aggregate); go beyond the riparian corridor; identify critical resources areas and target implementation there
- Administrator potential: NGO disconnected from government; include governance that allows landowner engagement (or advisory group); engage Farm Service Agency (FSA)
- Contract length: 10-15 years fine; align with NRCS programs
- Contract requirements: flexible and variable - provide options; align with forest practices, harvest schedules, etc.; need mix of incentives and provisions; need third party verification

Upper Oconee Water Users & Providers

Concerns & Opportunities

- Tax adverse
- Do not penalize people for doing the right thing - reward those that are already going above and beyond
- Opportunity to collaborate with NRCS
- Are there downstream users interested in investing in this?

- Encourage motivations for fish and wildlife habitat
- Prescribed fire
- Build upon work already being done

Program Structure Alternatives and Considerations

- Buyer potential: water utilities and authorities - stormwater fee; corporations; conservation organization, easements
- Seller potential: landowners beyond riparian corridors
- Administrator potential: Upper Oconee Watershed Partnership; engagement with local or state-level government; utilities; regional water authorities; leverage existing agencies already working with stakeholders
- Contract length: sync with CRP or other existing programs; align with timber rotations or other permitting cycles (stormwater); 15-year length; illustrate how contract length impacts water quality improvements
- Contract requirements: forest management plans are critical – use existing agencies/technical support
- Payment mechanism: annual

Lower Flint

Potential PES Program Scenario: Leverage opportunity on forest and agricultural land to improve forests or reforest to minimize sedimentation and impacts to stream flow and groundwater aquifer, supported by a corporate partnership including bottlers and other industries, bolstered by federal funding and multi-state interests

Potential Program Structure:

- Buyers: corporations (bottlers), other industries
- Sellers: agriculture and forest landowners
- Administrator: local or state government agency experienced working with agricultural stakeholders
- Contract length: 10-year contract aligned with other conservation programs
- Landowner requirements: maximize management of existing forest stands, convert ag land in riparian buffers to forests, explore cover type conversion to longleaf pine with modified rotations and stocking (supporting reduction in water demand and recharge opportunity)
- Funding mechanism: corporate partnership including bottlers and the other industries, support from federal funding (leverage existing conservation programs), out-of-state investment
- Payment schedule: upfront, one-time payment for planting and annual payment for maintenance thereafter

Lower Flint Landowners

Concerns & Opportunities

- Desire to manage property
- Tax burden increasing
- Desire to engage
- Do not want to give the appearance we are admitting to industry problems
- Longleaf is not the only answer - need to pair best species with best site
- Unique focus on groundwater - tougher sell (aquifer vs. surface water)
- Most of the riparian land is already protected in buffers - may not be a large opportunity (focus on tributaries - creeks and streams)
- Dirt road contribution

Program Structure Alternatives and Considerations

- Buyer potential: beer industry, other bottlers; irrigators
- Seller potential: landowners (forest and ag)
- Contract length: high desire for 10-year; corporations may push for 20-25 year; variable length; against long-term easements (hinder next generation ownership)
- Payments: annual preferred; structure similar to EQIP

Lower Flint Water Users & Providers

Concerns & Opportunities

- Many resource professionals wanting to learn more and take back to their clients
- Already a lot of buffers, focus on headwaters
- Lengthen longleaf rotation?
- Identify/focus marginal lands
- Wetland protection

- Program Structure Alternatives and Considerations
- Buyer potential: government, including military; bottlers; corporations; upstream water users (Atlanta); supported by private foundations with conservation focus; green bonds
- Administrator potential: mix of local and state agencies, NRCS too
- Contract requirements: management plan; certification requirement (proxy for good forestry); prescribed fire
- Contract length: permanent is the way to go, landowners likely will not agree; mortgage length; work with other programs
- Payments: upfront and annual; focus on maintenance; need incentive to re-up; act of God clause; tiered focusing on maintenance and performance

Conclusion

A series of nine virtual forums were hosted in January and February 2021 to educate stakeholders and to solicit feedback on potential PES program scenarios that could be deployed in targeted watersheds in Georgia. Although this work was intended to occur in-person, the COVID-19 pandemic forced this work into an online format, and the nine sessions were all held remotely via Zoom video conferencing. The first 'kick-off' forum served as an introductory event for stakeholders throughout the state to gain broad knowledge on the project and PES program elements. The following 8 forums specifically targeted landowners or water users and providers in 4 select watersheds; the Lower Savannah, Middle Chattahoochee, Upper Oconee, and Lower Flint. These watersheds were selected based on the level of interest and engagement that already exists combined with their geographic and resource diversity. More than 200 individuals registered for the statewide forum and nearly 350 registered for the watershed forums. Top concerns with PES program development from a landowner perspective was the risk of overcomplicated agreements or restrictions on harvests or land use; whereas, water users had a top concern of identifying and/or convincing stakeholders of the value of the PES program.

Chapter 8. Considerations, Recommendations, and Conclusions

Considerations for PES Program Development

Based upon the work of this project, there are several insights and findings for GFF and the project partners to consider within the next steps to support the development of PES programs in Georgia and other parts of the Southeastern U.S. There are general considerations for PES program development as well as specific opportunities to be further explored within the targeted watersheds of interest in Georgia.

General Considerations for PES program development:

- **Collaborate and share understanding:** For PES Programs to be effective, there needs to be collaboration and alignment with multiple activities and interests. There needs to be support within regulatory structures, funding sources and markets. Activities must be undertaken and maintained to develop and grow landowner networks and program awareness; all while creating an operating program complete with legal agreements, payment systems, and oversight for accountability. Accomplishing all of this requires a strong, collaborative team. To establish a shared understanding across collaborators, it is important to consider formalization of the initiative with partner commitments, membership structures, a Memorandum of Understanding (MOU), regular events or meetings, an Advisory Council, branding, and/or other strategies to signal commitment to the work and a basis for collaboration.
- **Plan and invest:** Over the long run, PES programs can provide significant financial benefits over alternatives, but in the short run, there are trade-offs to consider because these programs need investment, resources, and personnel to get them started and operational. Investment is an essential component of PES program design and development. There needs to be sufficient investment for capacity as well as project payment funds. The research by Ozment, et al.[229] identified three development phases for watershed investment programs: Building Momentum, Designing the Program, and Implementing the Action Plan. An evaluation of the business case for investment and the identification of investors and financing mechanisms for initial and long-term funding are essential to the designing the program phase. To ensure PES program success it is essential that there be adequate funding support, assignment of key leadership and staff, and a game plan. Development of a 5-year plan, including fundraising targets and strategies, is a place to start.
- **Follow the science:** The foundational work by Moore, et al.[230] and the results of this current project continue to build the scientific basis for PES program development in Georgia and the Southeastern U.S. Additional research consolidation would assist in validating the value of maintaining managed forests for drinking water source protection in the region. These efforts could include further review of the science supporting forest and water quality and quantity dynamics as well as consideration of the economic value, land use comparison

[229]Ozment, S.; Gartner, T.; Huber-Stearns, H.; DiFrancesco, K.; Lichten, N.; Tognetti, S. 2016. Protecting Drinking Water at the Source: Lessons from Watershed Investment Programs in the United States. World Resources Institute. https://files.wri.org/d8/s3fs-public/Protecting_Drinking_Water_at_the_Source.pdf

[230]Moore, R.; Williams, T.; Rodrigues, E.; and Hepinstall-Cymmerman, J. 2011. Quantifying the value of non-timber ecosystem services from Georgia's private forests. http://gatrees.net/utilization/ecosystem-services/index.cfm.

and additional research needs to demonstrate potential short- and long-term savings for water utilities' water treatment costs.

- **Geek out:** A PES program includes scientific understanding, modeling, GIS mapping, and all kinds of technology and analysis. While not everyone involved with the program needs to be an expert in these details, it is recommended that PES program managers become familiar with the interactive mapping tool options and that the entire team invest at a reasonable level in understanding the proper metrics to advance decision making and sharing of insights. It is recommended that water

Considerations for the Targeted Watersheds of Interest in Georgia

As detailed in Chapter 4, case study examples of existing PES programs illustrate responses to similar water resource threats and offer a variety of ways to approach surface water or groundwater resource protection, including varied conservation methods (i.e., land acquisition, easements, and/or management agreements). A review of these case studies shows the PES program method(s) that is used will impact program cost, scalability, and impact. Also as summarized in Chapter 4, it is important to identify the phase of development for a given watershed initiative to then align with appropriate and relevant actions. The identified phases to consider are "Building momentum", "Designing the Program", and "Implementing the Action Plan." [231] For each targeted watershed of interest in Georgia, general considerations are provided as a result of this project along with identification of the specific PES program approach that may be best suited and a reference to a case study example of the tool.

Middle Chattahoochee - Develop a strategy for engagement with military presence is the watershed as a key partner

Many stakeholders in this watershed believe that reforestation is a logical pathway to address nutrient challenges, although there was not a strong consensus on how to make that happen, including differing ideas on the details of a program structure. It was noted that BMP compliance is strong in the watershed, but additional incentives may need to be provided as developers have approached landowners and have gone as far as to encourage them to break contracts. To support an initiative, the military base presence in the watershed should be leveraged; both for program funding and for program leadership.

Based upon a review of PES program approaches and development phases, this watershed is in a "Building Momentum" phase and the tool that may be most appropriate for this watershed is Land Management Service Agreements or structured conservation easements that include support and incentives for desired land use practices. This approach is illustrated by the existing programs in Denver, CO.[232] The military is identified as a key potential partner and stakeholder within the Middle Chattahoochee. The focus on working forests, and a large Federal land use presence in this watershed can learn a great deal from the Denver Water project for some components. For instance, how the state engaged with the US Forest Service and rollout of working lands service agreements and addressing risks to forest health. For other topics, the forum suggested investigating the Bonneville Environmental, Beaver Lake Watershed (AR).

Lower Flint River - Take a step back to identify partners, research needs, champions, and subject matter experts given unique conditions and situation in the watershed

Turnout and engagement during this pair of watershed forums may indicate a lack of awareness or general hesitation towards PES programs. Furthermore, there appeared to be quite a disconnect between the sentiments from the landowner and water user forums. Landowners would like an opportunity to diversify revenue streams (and/or lessen tax burden) from lands, but they are unwilling to tie them up in long-term easements. The unique focus on groundwater and its relevance to agriculture and water supply may necessitate further investigation to ensure program success.

The tool that may be most appropriate for this watershed is Land Management Service Agreements that address Best Management Practices (BMPs) for forest and agricultural lands within targeted priority groundwater protection

[231]Ozment, S.; Gartner, T.; Huber-Stearns, H.; DiFrancesco, K.; Lichten, N.; Tognetti, S. 2016. Protecting Drinking Water at the Source: Lessons from Watershed Investment Programs in the United States. World Resources Institute. https://files.wri.org/d8/s3fs-public/Protecting_Drinking_Water_at_the_Source.pdf

[232]The Rio Grande program and the Denver water program are similar. However, the risk to human safety was much higher in the Rio Grande program. Not only was the risk of wildfire high like Denver Water, but flood and associated road and property damages were higher and impacted the political and financial development of the program.

areas. This approach is illustrated by the experience with the American Farmland Trust BMP Challenge. Targeted Land Acquisition or Conservation Easements may be necessary to provide greater stability in protections overtime as illustrated by existing aquifer protection programs in Austin and San Antonio, TX.[233] This watershed is also in a "Building Momentum" phase of development. Private landowners, including farmers are key stakeholders to engage in this phase and for this watershed. The focus on working forest land presence is strong throughout the forum discussion, which again indicates lessons can be learned from the Denver Water experience. Groundwater protection (assuming the extent is the wellhead protection zones) could possibly benefit from exploring how the BMP challenge and TNC Forest Bank could be adapted to this watershed. Studies like the Bawa, Dwivedi 2019 paper could inform the watershed about how to implement alternative cropping methods to protect unconfined aquifers from nitrogen leaching. If the wellhead protection area is small, offering a mix of long-term conservation easements, short-term conservation easements, and fee simple purchase can also be considered (see the case study for San Antonio, TX).

Savannah River - Need to develop further understanding of next steps and opportunities to build on existing work

This watershed provides a unique opportunity to work within the coastal wetlands and communities as there is some skepticism that traditional reforestation across the landscape will provide enough benefit where BMP compliance is already quite high. The Savannah Port Authority has a vested interest in keeping shipping channels navigable, so leveraging that interest and targeting restoration of ecosystem health in those coastal areas is a great opportunity to address sediment challenges in the basin. Furthermore, the potential to continue work with the Savannah Clean Water Fund should not be ignored. Based upon these existing efforts this watershed is moving through the "Designing the program" phase of development.

The tools that may be most appropriate for this watershed includes easements for targeted priority areas and Land Management Service Agreements that support desired land use practices. The Port Authority and existing activities related to the Savannah Clean Water Fund and wetland banking are key considerations for this watershed. Raleigh Water is a very good match for many of the Lower Savannah desired approaches. Investigating the Raleigh Water approach would provide a deeper insight for how they work with multiple water supply utilities, and their unique blend of funding source types and conservation goals. Their surface drinking water source protection goals are designed around 9 reservoirs and target both sediment and nutrients. The program has a notable high interest in implementing or protecting riparian forested corridors and land use conversion back into forested buffers. The program also applies a unique potential site weighted prioritization ranking system that considers many ecosystem services benefits, in part due to the wide variety of program collaborators.

Upper Oconee - Get going! All the pieces are in place to take action!

This watershed's greatest asset is an existing coalition of partners (the Upper Oconee Watershed Partnership) that are motivated and trusted to carry out a PES program. Consensus was reached on sediment posing the most significant challenge to the watershed from both landowners and water users; likewise, both groups saw great opportunity in tree planting and forestry as a solution to that problem. Combatting pressures from developers and seizing opportunities for getting more trees on the ground should be the PES program focus, and the recreational interests in the basin should be leveraged for funding and broader program awareness. This strong existing practice puts this watershed closest to the "Implementing the action plan" phase of development.

The tool to add to the ongoing efforts in this watershed that may be most appropriate is Land Management Service Agreements as illustrated by the existing programs in Denver, CO and the Rio Grande Water Fund in New Mexico. It is important to move beyond the limitations of land acquisitions and permanent conservation easements to engage additional target priority areas within the watershed. The existing partnerships and the interests of recreational users and tourism organization should be prioritized within the next steps. Raleigh Water is once again a very good match for many of the Upper Oconee desired approaches. Investigating the Raleigh Water approach would provide a deeper insight for how they work with multiple water supply utilities, and their unique blend of funding source types and conservation goals. Their surface drinking water source protection goals are designed around 9 reservoirs and target both sediment and nutrients. The program has a notable high interest in implementing or protecting riparian forested corridors and land use conversion back into forested buffers. The program also applies a unique

[233]San Antonio, Texas and Austin, Texas both draw water from the same aquifer, thou separated by many miles; and that aquifer is a karst aquifer. Karst features means that water transmission times are very fast.

potential site weighted prioritization ranking system that considers many ecosystem service benefits; in part to the wide variety of program collaborators. In addition, the discussion emphasis on working forest land indicates learning more about Denver Water approaches would benefit the Upper Oconee watershed.

Conclusion

The State of Georgia is rich in both forest and water resources. It is a growing state that attracts people from all over the world to its economic opportunities and quality of life. With continued thoughtful planning and strategic actions related to understanding and protecting the relationships between forests and water in the state and region, there is every opportunity for benefits to accrue to landowners and water utilities. The foundational elements are already in place for successful payment for ecosystem services (PES) markets to develop, and the time is right to scale up the investment and impact. Likewise, this work has the potential to be foundational for program development throughout the states of the Southeast U.S.

Appendix

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B. Population Growth Estimates for Georgia

TableC.1. Georgia Governor's Office of Planning and Budget[234] state 2030 growth estimates for top ten counties.

Highest Growth County	Growth by 2030	Current Population	% Growth	Physiographic Province / Groundwater Aquifers
	Georgia	10,707,203	12%	
1	**Jackson County**	75,351	38%	Piedmont & Blue Ridge
2	**Towns County**	12,427	37%	Piedmont & Blue Ridge
3	**Dawson County**	26,926	37%	Piedmont & Blue Ridge
4	**Forsyth County**	250,298	34%	Piedmont & Blue Ridge
5	**Oconee County**	41,334	33%	Piedmont & Blue Ridge
6	**Effingham County**	65,869	29%	Surficial and Floridan Aquifer System / A.K.A. Coastal Plain
7	**Barrow County**	85,056	27%	Piedmont & Blue Ridge
8	**Paulding County**	172,105	26%	Piedmont & Blue Ridge
9	**Bryan County**	40,443	26%	Surficial and Floridan Aquifer System / A.K.A. Coastal Plain
10	**Clayton County**	301,087	24%	Piedmont & Blue Ridge

TableC.2. Georgia Governor's Office of Planning and Budget state 2050 growth estimates for top ten counties.

Highest Growth County	Growth by 2050	Current Population	% Growth	Physiographic Province / Groundwater Aquifers
	Georgia	10,707,203	30%	
1	**Forsyth County**	250,298	118%	Piedmont & Blue Ridge
2	**Jackson County**	75,351	113%	Piedmont & Blue Ridge
3	**Dawson County**	26,926	96%	Piedmont & Blue Ridge
4	**Paulding County**	172,105	92%	Piedmont & Blue Ridge
5	**Effingham County**	65,869	87%	Surficial and Floridan Aquifer System / A.K.A. Coastal Plain
6	**Oconee County**	41,334	87%	Piedmont & Blue Ridge
7	**Barrow County**	85,056	86%	Piedmont & Blue Ridge
8	**Towns County**	12,427	85%	Piedmont & Blue Ridge
9	**Bryan County**	40,443	82%	Surficial and Floridan Aquifer System / A.K.A. Coastal Plain
10	**Clayton County**	301,087	65%	Piedmont & Blue Ridge

[234]Governor's Office of Planning and Budget. 2020. County Residential Population, 2020-2065. https://opb.georgia.gov/census-data/population-projections.

TableC.3. Georgia Governor's Office of Planning and Budget 2065 state growth estimates for top ten counties.

Highest Growth County	Growth by 2065	Current Population	% Growth	Physiographic Province / Groundwater Aquifers
	Georgia	10,707,203	44%	
1	**Forsyth County**	250,298	220%	Piedmont & Blue Ridge
2	**Jackson County**	75,351	192%	Piedmont & Blue Ridge
3	**Dawson County**	26,926	164%	Piedmont & Blue Ridge
4	**Towns County**	12,427	157%	Piedmont & Blue Ridge
5	**Paulding County**	172,105	154%	Piedmont & Blue Ridge
6	**Barrow County**	85,056	143%	Piedmont & Blue Ridge
7	**Oconee County**	41,334	139%	Piedmont & Blue Ridge
8	**Effingham County**	65,869	135%	Surficial and Floridan Aquifer System / A.K.A. Coastal Plain
9	**Bryan County**	40,443	126%	Surficial and Floridan Aquifer System / A.K.A. Coastal Plain
10	**Walton County**	96,335	105%	Piedmont & Blue Ridge

C. Legal Agreements

The authors of this literature review are not legal representatives. It is strongly recommended that program managers consult with their legal representatives whenever drafting or conducting legal agreements or transactions. The following discussions are not to be conveyed as legal advice or finalized language. Instead, the narratives presented are intended to be guidance discussions based on reviewed materials.

Conservation Easement Examples and Models

Sample Conservation Easement

The following model of a general Georgia Conservation Easement document is provided by Georgia Environmental Policy Institute and the Georgia Land Trust Service Center, as one of a series of resource papers on proactive strategies for a healthy environment. This resource pager is entitled A Landowner's Guide, Conservation Easements for Natural Resource Protection. (Accessed June 8, 2021, online at: https://p2infohouse.org/ref/14/13632.htm)

Note: Every conservation easement is unique. Each agreement reflects the needs and interests of the landowner, the objectives of the easement holder, and the nature of the land and its conservation values. The following example is provided to give a general idea of the kinds of issues that might be addressed and to show a sample format for an agreement. The identity of the landowner has been changed to protect his privacy. Otherwise, the easement agreement is real.

STATE OF GEORGIA

COUNTY OF MADISON

DEED OF CONSERVATION EASEMENT

THIS CONSERVATION EASEMENT (herein "Conservation Easement") is made this ____ day of March 1997, by and between John Q. Doe whose address is 123 Anywhere Rd, Athens, Georgia 30606 (hereinafter "Grantor") and BROAD RIVER WATERSHED ASSOCIATION, INC., a Georgia nonprofit corporation, with an address of Box 661, Danielsville, Georgia 30633 (hereinafter "Grantee").

RECITALS

A. Grantee is a nonprofit corporation established for the purpose of promoting the preservation of environmentally valuable and sensitive lands, recreational lands, agricultural lands, lands of historic or cultural importance, and open space in the Broad River Watershed and other watersheds within the State of Georgia for charitable, scientific, educational and aesthetic purposes.

B. Grantor owns in fee simple certain real property in Madison County, Georgia, being 111.579 acres, more or less, and more particularly shown and described in Exhibit A attached hereto, hereinafter "Property", consisting of Tract 1, 24.777 acres together with Tract 2, 0.555 acre, hereinafter "Secondary Conservation Area" and Tract 3, 86.252 acres together with Tract 4, a strip of land running to the center of the Broad River, hereinafter "Primary Conservation Area" as shown and described in Exhibit B attached hereto.

C. Grantor is willing to grant a perpetual Conservation Easement over the Property, thereby restricting and limiting the use of the land and contiguous water areas of the Property, on the terms and conditions and for the purposes hereinafter set forth, and Grantee is willing to accept such Conservation Easement.

D. Grantor and Grantee recognize the conservation value of the Property in its present state, being adjacent to the Broad River and two tributaries, as a significant natural area which provides a "relatively natural habitat for fish, wildlife, or plants or similar ecosystems" as that phrase is used in Section 170(h)(4)(A)(ii) of the Internal Revenue Code, including habitat for deer, muskrat, raccoon, opossum, squirrel, beaver, red and gray fox, otter, a variety of birds including turkey, and numerous fish species including the robust redhorse, which is being reintroduced into the Broad River under the direction of the U.S. Fish and Wildlife Service and the Georgia Department of Natural Resources.

E. Due in part to its location adjacent to the Broad River, one of the last free-flowing rivers, unimpounded and unchanneled, in the eastern Piedmont, Grantor and Grantee recognize the conservation and open space values of the property in its present state, the preservation of which (1) is pursuant to federal, state and local government policy as evidenced by:

(a) the designation of the Broad River and its tributaries, as Regionally Important Resources pursuant to the Georgia Planning Act of 1989 at O.C.G.A. 50-8-3 et. seq.

(b) the requirement that a Broad River corridor management plan be developed pursuant to O.C.G.A. 12-2-8(g) for the purpose of protecting the corridor, public water supply and wetlands;

(c) the recognition by the National Park Service in its 1982 Nationwide Rivers Inventory that 99 miles of the Broad River, including the segment adjacent to the Property, is pristine enough to qualify for consideration in the Federal Wild and Scenic Rivers System.

(d) the recommendation by the Georgia Department of Natural Resources in 1976 that a "Broad River Environmental Corridor" be created and the recognition of the Department of Natural Resources and the Georgia Natural Heritage program of the outstanding ecological and recreational importance of 175 miles of the Broad River system, including the segment adjacent to the Property;

(e) the recognition in the Madison County Comprehensive Plan and the Northeast Georgia Regional Plan currently under development, of the importance of preserving the ecological value of the Broad River and its tributaries and the Broad River Watershed Association's role in the protection of that ecological value;

(f) unanimous resolutions enacted in 1995 in support of the creation of a Broad River Heritage Trail by the Madison, Elbert, Franklin and Oglethorpe County Commissions; and (2) the preservation of which will provide for the scenic enjoyment by the general public, as evidenced by: (a) the large number of canoeists and rafters who float the Broad River to enjoy the scenery and wildlife; (b) the fact that development of the Property adjacent to the river would impair the natural scenic character enjoyed by the public; (c) the recent purchase of the Human tract, on the north side of the river from Grantor's property, by the Georgia Department of Natural Resources for recreational and scenic preservation purposes; and (3) the preservation of which will yield other significant public benefit including: (a) preservation of the water quality of the Broad River through control of point and non-point source discharges; (b) preservation of the scenic and natural landscape which attracts tourism and commerce to Madison County; (c) continuation of the traditional use of the non-residential portion of the Property for hiking, nature study, and other passive recreational uses.

F. Grantee is a tax exempt public charity under Section 501(c)(3) and 509(a)(2) of the Internal Revenue Code, is authorized by the laws of the state of Georgia to accept, hold and administer conservation easements, possesses the authority to accept and is willing to accept this Conservation Easement under the terms and conditions hereinafter described, and is a "qualified organization" and an "eligible donee" within the meaning of Section 170(h)(3) of the Internal Revenue Code and regulations promulgated thereunder;

NOW, THEREFORE, as an absolute gift of no monetary consideration but in consideration of the mutual covenants, terms, conditions and restrictions hereinafter set forth, Grantor hereby unconditionally and irrevocably grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity a Conservation Easement of the nature and character and to the extent hereinafter set forth, over the Property more particularly described in Exhibit A together with the right to preserve and protect the conservation values of the Property.

The purposes of this Conservation Easement are to preserve and protect the conservation values of the Property and to maintain permanently the dominant woodland, scenic, open, and natural character of the Property, including land and water resources; to protect plants and animals and plant and animal communities on or affected by the property's management; and to prevent any use of the Property that will significantly impair or interfere with the conservation values or interests of the property. To achieve these purposes, the following conditions and restrictions are set forth:

ARTICLE I. DURATION OF EASEMENT

This Conservation Easement shall be perpetual. It is an easement in gross, runs with the land and is enforceable by Grantee against Grantor, his personal representatives, heirs, successors and assigns, lessees, agents and licensees.

ARTICLE II. RIGHTS OF GRANTEE

To accomplish the purpose of this Easement the following rights are conveyed to Grantee by this easement:

A. To preserve and protect the conservation values of the Property;

B. To enter upon the Property at reasonable times in order to monitor compliance with and otherwise enforce the terms of this Easement in accordance with Article VI; provided that, except in cases where Grantee determines that immediate entry is required to prevent, terminate, or mitigate a violation of this Easement, such entry shall be upon prior reasonable notice to Grantor, and Grantee shall not in any case unreasonably interfere with Grantor's use and quiet enjoyment of the Property; and

C. To prevent any activity on or use of the Property that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features of the Property that may be damaged by any inconsistent activity or use, pursuant to remedies set forth in Article VI.

ARTICLE III. PROHIBITED AND RESTRICTED ACTIVITIES

Any activity on, or use of, the Property inconsistent with the purposes of this Conservation Easement is prohibited. Development that would significantly impair or interfere with the conservation values of the Property is prohibited.

A. Restrictions on the Property. The following activities and uses are expressly prohibited.

1. Industrial Use. Industrial activities are prohibited.

2. Signage. Display of billboards, signs or advertisements is prohibited on or over the Property, except the posting of no trespassing signs, signs identifying the conservation values of the Property and/or identifying the Grantor as owner of the Property.

3. Construction, Residential and Institutional Use. Construction, Residential and Institutional Use is prohibited except within the Secondary Conservation Area of the property. Development of single family homes and/or an institutional facility for the study of natural systems may occur consistent with zoning restrictions and building codes established by Madison County. No building may exceed 40 feet in height. Reasonable means of access to the residential dwelling/s or educational facility may be provided, however no road nor right of way may be wider than thirty (30) feet.

4. Dumping. Disposal of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or other materials on the property is prohibited.

5. Mineral Use, Excavation, Dredging. There shall be no filling, excavation, dredging, mining or drilling; no removal of topsoil, sand, gravel, rock peat, minerals or other materials; and no change in the topography of the land in any manner except incidental to the construction allowed herein.

6. Water Quality and Drainage Patterns. There shall be no pollution, alteration, depletion or extraction of surface water, natural water courses, subsurface water or any other water bodies except for the withdrawal of well water. Notwithstanding the foregoing, there shall be no activities conducted on the Property or on adjacent property if owned by Grantor which would be detrimental to water purity or which would alter natural water levels, drainage, sedimentation and/or flow in or over the Property or to the

Broad River, or cause soil degradation or erosion. Disruption of natural drainage patterns and creation of artificial drainage patterns including but not limited to construction of check dams and other impoundments is prohibited.

B. Additional Restrictions On the Primary Conservation Area. The Primary Conservation Area shall be maintained in its natural, scenic and open condition. The following activities and uses, in addition to those set forth in Section A above, are expressly prohibited within the Primary Conservation Area.

1. Industrial, Commercial and Agricultural Use. Industrial and commercial activities, including but not limited to commercial agricultural and horticultural use and livestock production, are prohibited.

2. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural, scenic, and aesthetic features is prohibited.

3. Building, Road, Fence and Path Construction. The construction of buildings, fences and roads are prohibited except for the construction of firebreaks and fire roads built by the Georgia Forestry Commission or the U.S. Forest Service in an emergency situation. Dirt foot paths may be constructed for hiking purposes.

4. Silvicultural Use. Silvicultural use is prohibited except Grantor may harvest timber which is dead or dying for use as firewood.

ARTICLE IV. RESERVED RIGHTS

Grantor reserves to himself, and to his personal representatives, heirs, successors, and assigns, all rights accruing from his ownership of the Property, including the right to engage in, or permit or invite others to engage in all uses of the Property that are not expressly prohibited herein and are not inconsistent with the purposes of this Easement.

ARTICLE V. MEDIATION

A. Mediation. If a dispute arises between the parties concerning the consistency of any proposed use or activity with the purpose of this Easement, and Grantor agrees not to proceed with the use or activity pending resolution of the dispute, either party may refer the dispute to mediation by request made in writing to the other. Within ten (10) days of the receipt of such a request, the parties shall select a single trained and impartial mediator. If the parties are unable to agree on the selection of a single mediator, then the parties shall, within fifteen (15) days of receipt of the initial request, jointly apply to a proper court for the appointment of a trained and impartial mediator. Mediation shall then proceed in accordance with the following guidelines:

1. Purpose. The purpose of the mediation is to (a) promote discussion between the parties; (b) assist the parties to develop and exchange pertinent information concerning the issues in dispute; and (c) assist the parties to develop proposals which will enable them to arrive at a mutually acceptable resolution of the controversy. The mediation is not intended to result in any express or de facto modification or amendment of the terms, conditions, or restrictions of this Easement.

2. Participation. The mediator may meet with the parties and their counsel jointly or ex parte. The parties agree that they will participate in the mediation process in good faith and expeditiously, attending all sessions scheduled by the mediator. Representatives of the parties with settlement authority will attend mediation sessions as requested by the mediator.

3. Confidentiality. All information presented to the mediator shall be deemed confidential and shall be disclosed by the mediator only with the consent of the parties or their respective counsel. The mediator shall not be subject to subpoena by any party. No statements made or documents prepared for mediation sessions shall be disclosed in any subsequent proceeding or construed as an admission of a party.

4. Time Period. Neither party shall be obligated to continue the mediation process beyond a period of ninety (90) days from the date of receipt of the initial request or if the mediator concludes that there is no reasonable likelihood that continuing mediation will result in a mutually agreeable resolution of the dispute.

5. Costs. The costs of the mediator shall be borne equally by Grantor and Grantee; the parties shall bear their own expenses, including attorneys' fees, individually.

ARTICLE VI. GRANTEE'S REMEDIES

A. Notice of Violation; Corrective Action. If Grantee determines that a violation of the terms of this Easement has occurred or is threatened, Grantee shall give written notice to Grantor of such violation and demand corrective action sufficient to cure the violation and, where the violation involves injury to the Property resulting from any use or activity inconsistent with the purpose of this Easement, to restore the portion of the Property so injured to its prior condition in accordance with a plan approved by Grantee.

B. Injunctive Relief. If Grantor fails to cure the violation within thirty (30) days after receipt of notice thereof from Grantee, or under circumstances where the violation cannot reasonably be cured within a thirty (30) day period, fails to begin curing such violation within the thirty (30) day period, or fails to continue diligently to cure such violation within the thirty (30) day period, or fails to continue diligently to cure such violation until finally cured, Grantee may bring an action at law or in equity in a court of competent jurisdiction to enforce the terms of this Easement, to enjoin the violation, ex parte as necessary, by temporary or permanent injunction, and to require the restoration of the Property to the condition that existed prior to any such injury.

C. Damages. Grantee shall be entitled to recover damages for violation of the terms of this Easement or injury to any conservation values protected by this Easement, including, without limitation, damages for the loss of scenic, aesthetic, or environmental values. Without limiting Grantor's liability therefor, Grantee, in its sole discretion, may apply any damages recovered to the cost of undertaking any corrective action on the Property.

D. Emergency Enforcement. If Grantee, in its sole discretion, determines that circumstances require immediate action to prevent or mitigate significant damage to the conservation values of the Property, Grantee may pursue its remedies under this Article without prior notice to Grantors or without waiting for the period provided for cure to expire.

E. Scope of Relief. Grantee's rights under this Article apply equally in the event of either actual or threatened violations of the terms of this Easement. Grantor agrees that Grantee's remedies at law for any violation of the terms of this Easement are inadequate and that Grantee shall be entitled to the injunctive relief described in paragraph 6.B, both prohibitive and mandatory, in addition to such other relief to which Grantee may be entitled, including specific performance of the terms of this Easement, without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies. Grantee's remedies described in this Article shall be cumulative and shall be in addition to all remedies now or hereafter existing at law or in equity.

F. Costs of Enforcement. All reasonable costs incurred by Grantee in enforcing the terms of this Easement against Grantor, including, without limitation, costs and expenses of suit and reasonable attorneys' fees, and any costs of restoration necessitated by Grantor's violation of the terms of this Easement shall be borne by Grantor; provided, however, that if Grantor ultimately prevails in a judicial enforcement action each party shall bear its own costs.

G. Forbearance. Forbearance by Grantee to exercise its rights under this Easement in the event of any breach of any term of this Easement by Grantor shall not be deemed or construed to be a waiver by Grantee of such term or of any subsequent breach of the same or any other term of this Easement or of any of Grantee's rights under this Easement. No delay or omission by Grantee in the exercise of any right or remedy upon any breach by Grantor shall impair such right or remedy or be construed as a waiver.

H. Waiver of Certain Defenses. Grantor hereby waives any defense of laches, estoppel, or prescription.

I. Acts Beyond Grantor's Control. Nothing contained in this Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury to or change in the Property resulting from causes beyond Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action, taken by Grantor under emergency conditions to prevent, abate, or mitigate significant injury to the property resulting from such causes.

ARTICLE VII. PUBLIC ACCESS

The granting of this Conservation Easement does not convey to the public the right to enter the Property for any purpose whatsoever. The public has the right of scenic enjoyment of the property from the Broad River, however.

ARTICLE VIII. EXHIBITS, DOCUMENTATION AND TITLE

A. Legal Description. Exhibit A, Legal Description of the Property, and Exhibit B, Survey of the Property, are attached hereto and made a part hereof by reference.

B. Easement Documentation Report. The parties acknowledge that the Doe Property Conservation Planning Data Sheet dated March 1997, a copy of which is on file at the office of the Grantee, accurately establishes the uses, structures, conservation values and condition of the Property as of the date hereof.

C. Title. The Grantors covenant and represent that the Grantor is the sole owner and is seized of the Property in fee simple and has good right to grant and convey the aforesaid Conservation Easement; that the Property is free and clear of any and all encumbrances; and Grantor covenants that the Grantee shall have the use of and enjoyment of all of the benefits derived from and arising out of the aforesaid Conservation Easement.

ARTICLE IX. COSTS, LIABILITIES, TAXES, AND ENVIRONMENTAL COMPLIANCE

A. Costs, Legal Requirements, and Liabilities. Grantor retains all responsibilities and shall bear all costs and liabilities of any kind related to the ownership, operation, upkeep, and maintenance of the Property. Grantor remains solely responsible for obtaining any applicable governmental permits and approvals for any construction or other activity or use permitted by this Easement, and all such construction or other activity or use shall be undertaken in accordance with all applicable federal, state, and local laws, regulations, and requirements. Grantor shall keep the Property free of any liens arising out of any work performed for, materials furnished to, or obligations incurred by Grantor.

B. Taxes. Grantor shall pay before delinquency all taxes, assessments, fees, and charges of whatever description levied on or

assessed against the Property by competent authority (collectively "taxes"), including any taxes imposed upon, or incurred as a result of, this Easement, and shall furnish Grantee with satisfactory evidence of payment upon request.

C. Representations and Warranties. Grantor represents and warrants that, after reasonable investigation and to the best of his knowledge:

1. No substance defined, listed, or otherwise classified pursuant to any federal, state, or local law, regulation, or requirement as hazardous, toxic, polluting, or otherwise contaminating to the air, water, or soil, or in any way harmful or threatening to human health or the environment exists or has been released, generated, treated, stored, used, disposed of, deposited, abandoned, or transported in, on, from, or across the property;

2. There are not now any underground storage tanks located on the Property, whether presently in service or closed, abandoned, or decommissioned, and no underground storage tanks have been removed from the Property in a manner not in compliance with applicable federal, state, and local laws, regulations, and requirements;

3. Grantor and the Property are in compliance with all federal, state and local laws, regulations, and requirements applicable to the Property and its use;

4. There is no pending or threatened litigation in any way affecting, involving, or relating to the Property; and

5. No civil or criminal proceedings or investigations have been instigated at any time or are now pending, and no notices, claims, demands, or orders have been received, arising out of any violation or alleged violation of, or failure to comply with, any federal, state, or local law, regulation, or requirement applicable to the Property or its use, nor do there exist any facts or circumstances that Grantor might reasonably expect to form the basis for any such proceedings, investigations, notices, claims, demands, or orders.

D. Remediation. If, at any time, there occurs, or has occurred, a release in, on, or about the Property of any substance now or hereafter defined, listed, or otherwise classified pursuant to any federal, state, or local law, regulation, or requirement as hazardous, toxic, polluting, or otherwise contaminating to the air, water, or soil, or in any way harmful or threatening to human health or the environment, Grantor agrees to take all steps necessary to assure its containment and remediation, including any cleanup that may be required, unless the release was caused by Grantee, in which case Grantee shall be responsible therefor.

E. Control. Nothing in this Easement shall be construed as giving rise, in the absence of a judicial decree, to any right or ability in Grantee to exercise physical or managerial control over the day-to-day operations of the Property, or any of Grantor's activities on the Property, or otherwise to become an operator with respect to the Property within the meaning of The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), and Georgia's hazardous waste statutes.

F. Hold Harmless. Grantor hereby releases and agrees to hold harmless, indemnify, and defend Grantee and its members, directors, officers, employees, agents, and contractors and the heirs, personal representatives, successors, and assigns of each of them (collectively "Indemnified Parties") from and against any and all liabilities, penalties, fines, charges, costs, losses, damages, expenses, causes of action, claims, demands, orders, judgments, or administrative actions, including, without limitation, reasonable attorneys' fees, arising from or in any way connected with: (1) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition, or other matter related to or occurring on or about the Property, regardless of cause, unless due solely to the negligence of any of the Indemnified Parties; (2) the violation or alleged violation of, or other failure to comply with, any state, federal or local law, regulation, or requirement, including, without limitation, CERCLA and state hazardous waste statutes, by any person other than any of the Indemnified Parties, in any way affecting, involving, or relating to the Property; (3) the presence or release in, on, from, or about the Property, at any time, of any substance now or hereafter defined, listed, or otherwise classified pursuant to any federal, state, or local law, regulation, or requirement as hazardous, toxic, polluting, or otherwise contaminating to the air, water, or soil, or in any way harmful or threatening to human health or the environment, unless caused solely by any of the Indemnified Parties; and (4) the obligations, covenants, representations, and warranties of paragraphs 8.A. through 8.E.

ARTICLE X. EXTINGUISHMENT AND CONDEMNATION

A. Extinguishment. If circumstances arise in the future that render the purpose of this Easement impossible to accomplish, this Easement can only be terminated or extinguished, whether in whole or in part, by judicial proceedings in a court of competent jurisdiction. The amount of the proceeds to which Grantee shall be entitled, after the satisfaction of prior claims, from any sale, exchange, or involuntary conversion of all or any portion of the Property subsequent to such termination or extinguishment, shall be the stipulated fair market value of the Easement, or proportionate part thereof, as determined in accordance with paragraph 9.B.

B. Valuation. This Easement constitutes a real property interest immediately vested in Grantee, which, for the purposes of paragraph 9.A., the parties stipulate to have a fair market value determined by multiplying (1) the fair market value of the Property unencumbered by the Easement (minus any increase in value after the date of this grant attributable to improvements) by (2) the ratio of the value of the Easement at the time of this grant to the value of the Property, without deduction for the value of the Easement at the time of this grant to the value of the Property.

C. Condemnation. If all or any part of the Property is taken by exercise of the power of eminent domain or acquired by purchase in lieu of condemnation, whether by public, corporate, or other authority, so as to terminate this Easement, in whole or in part, Grantor and Grantee shall act jointly to recover the full value of the interests in the Property subject to the taking or in lieu of purchase and all direct or incidental damages resulting therefrom. All expenses reasonably incurred by Grantor and Grantee in connection with the taking or in lieu of purchase shall be paid out of the amount recovered. Grantee's share of the balance of the amount recovered shall be determined by multiplying that balance by the equation set forth in paragraph 9.B.

D. Application of Proceeds. Grantee shall use any proceeds received under the circumstances described in this Article in a manner consistent with its conservation purposes, which are exemplified by this grant.

ARTICLE XI. ASSIGNMENT

This Easement is transferable, but Grantee may assign its rights and obligations under this Easement only to an organization that is a qualified organization at the time of transfer under Section 170(h) of the Internal Revenue Code (or any successor provision then applicable), and authorized to acquire and hold conservation easements under Georgia's Uniform Conservation Easement Act (or any successor provision then applicable) or the laws of the United States. As a condition of such transfer, Grantee shall require that the conservation purpose that this grant is intended to advance continue to be carried out. Grantee agrees to give written notice to Grantor of an assignment at least twenty (20) days prior to the date of such assignment. The failure of Grantee to give such notice shall not affect the validity of such assignment nor shall it impair the validity of this Easement or limit its enforceability in any way.

ARTICLE XII. SUBSEQUENT TRANSFERS AND ZONING APPLICATIONS

A. Subsequent Transfers. Grantor agrees to incorporate the terms of this Easement by reference in any deed or other legal instrument by which he divests himself of any interest in all or a portion of the Property, including, without limitation, a leasehold interest. Grantor further agrees to give written notice to Grantee of the transfer of any interest at least twenty (20) days prior to the date of such transfer.

B. Notice of Zoning Applications and Building Permits. Grantor, for himself, his heirs, successors and assigns, further agrees to notify Grantee in writing of any request to obtain a building permit or to amend the zoning of the property at least twenty (20) days prior to the filing of such a request with the appropriate Madison County agencies. The failure of Grantor to perform any act required by this paragraph shall not impair the validity of this Easement or limit its enforceability in any way.

ARTICLE XIII. RECORDATION

Grantee shall record this instrument in timely fashion in the official records of Madison County, Georgia, and may re-record it at any time as may be required to preserve its rights in this Easement.

ARTICLE XIV. GENERAL PROVISIONS

A. Controlling Law. The interpretation and performance of this Easement shall be governed by the laws of the state of Georgia.

B. Liberal Construction. Any general rule of construction to the contrary notwithstanding, this Easement shall be liberally construed in favor of the grant to effect the purpose of this Easement and the policy and purpose of the Uniform Conservation Easement Act. If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purpose of this Easement that would render the provision valid shall be favored over any interpretation that would render it invalid.

C. Severability. If any provision of this Easement, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this Easement, or the application of such provision to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

D. Entire Agreement. This instrument sets forth the entire agreement of the parties with respect to the Easement and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Easement, all of which are merged herein.

E. No Forfeiture. Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect.

F. Joint Obligation. The obligations imposed by this Easement upon Grantor and his heirs, successors and assigns, shall be joint and several.

G. Successors. The covenants, terms, conditions, and restrictions of this Easement shall be binding upon, and inure to the benefit of the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the Property. The terms "Grantor" and "Grantee," wherever used herein, and any pronouns used in place thereof, shall include, respectively, the above-named Grantor and his personal representatives, heirs, successors, and assigns, and

the above-named Grantee and its successors and assigns.

H. Termination of Rights and Obligations. A party's rights and obligations under this Easement terminate upon transfer of the party's interest in the Easement or Property, except that liability for acts or omissions occurring prior to transfer shall survive transfer.

I. Captions. The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

J. Counterparts. The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties, each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

TO HAVE AND TO HOLD unto the Broad River Watershed Association, Inc., its successors and assigns, forever. The covenants agreed to and the terms, conditions, restrictions and purposes imposed as aforesaid shall be binding upon Grantor, his personal representatives, heirs, successors and assigns, and shall continue as a servitude running in perpetuity with the Property.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals and caused these presents to be executed in their respective names by authority duly given, and their corporate seal affixed, the day and year above written.

TO BE EFFECTIVE upon the date of recordation in the official records of Madison County, Georgia.

GRANTOR:

John Q. Doe

Witnesses:_____

_____

NOTARY PUBLIC

GRANTEE:

BROAD RIVER WATERSHED ASSOCIATION, INC.

BY: _____(Name), Chair Board of Directors

Witnesses:_____

_____

NOTARY PUBLIC

ATTEST: _____

(Name), Secretary Board of Directors

Witnesses:_____

Additional Guidance Documents Online

We Conserve PA Guidance and Commentary Documents

The Pennsylvania nonprofit named We Conserve PA supports a website and development team lead by the Pennsylvania Land Trust Association, that offers a list of Conservation Easement models, guidance documents and expert commentary. Part of their mission is to help conservation organizations develop tailored conservation easement language, so their actions secure the conservation benefit desired, while facilitating flexible rights for landowner activities. The documents are developed and reviewed by a team of over thirty experts. While the references to State Administrative rules are specific to Pennsylvania, the general language and commentary provide useful direction to interested parties working in other states. Two key guidance documents are:

- *Model Grant of Conservation Easement and Declaration of Covenants, with Commentary* This 116-page document provides background and considerations on common Conservation Easement terms and conditions. In addition, the guidance provides options that tailor the easement's language in a manner that allows the landowner varied permissions by segmenting the forested land into Highest Priority Areas, Standard Protection Areas, and Minimal Protection Areas and their associated restrictions. While the guidance document is for perpetual easements, the commentary and model language for allowing silviculture to exist by using sustainable practices is provided. Available at: https://conservationtools-production.s3.amazonaws.com/library_item_files/323/2490/CE_model_and_commentary_201027.
- *Model Grant of Conservation Easement and Declaration of Covenants for Riparian Buffer Protection* This 18-page document providing a model and guidance was crafted for the specific purpose of permanently protecting riparian buffers along waterways. The model is based on the 7th edition of the Model Grant of Conservation Easement and Declaration of Covenants, also published by the Pennsylvania Land Trust Association. Available at: https://conservationtools-production.s3.amazonaws.com/library_item_files/702/1522/RBP_CE_model_170421.

Ensuring Sustainable Forestry, Through Working Forest Conservation Easements in the Northeast; A Forest Guild Perspective (2006)

Robert T. Perschel, Northeast Regional Director, Forest Guild (Chief Editor) lead a team focused on providing working forest conservation easement guidance. The resulting document provides options for easement terms and conditions from a forester perspective and covers topics such as offering permissions for sustainable forestry under an outline of eleven design approaches to easements that assure sustainable, ecological and economical forestry. Available at: https://foreststewardsguild.org/wp-content/uploads/2019/06/Forest_Conservation_Easements_Forest_Guild.pdf

Towards a Characterization of Working Forest Conservation Easements in Georgia, USA (June 2020)

A Georgia research team lead by Tyler Reeves, Daniel B. Warnell School of Forestry and Natural Resources, compiled the salient points from a review of 86 existing Conservation Easements in Georgia.

Abstract: We examine the attributes of working forest conservation easements in Georgia. Easement contracts and baseline reports are inspected to investigate easement themes, land use types, recreation opportunities, hydrological features, and forest management activity. Easement themes are heavily weighted towards themes of protecting natural habitat and preserving the conservation values of properties. Predominant land use types include wildlife food plots, bottomland hardwoods, and planted pine stands. Common hydrological features found were small creeks/streams and ponds. Lastly, forest management was characterized as having small amounts of restrictions present, with forest management being largely similar to other unencumbered property in the southeastern USA. This information can be used as a reference for landowners interested in establishing a working forest conservation easement (WFCE) on their property as well as a tool for comparison for researchers investigating easement characteristics in other regions. Available at: https://www.mdpi.com/1999-4907/11/6/635

Short-term (fixed term) Conservation Easement Language

Short-term, or fixed term Conservation Easements offer the private forest landowner an option to provide ecosystems services across a set number of years. Other restrictions and permissions are relatively independent of the duration of the easement.

To create a short-term or fixed-duration Conservation Easement when converting a perpetual easement into a fixed

duration easement, the representing Attorney would begin by altering the easement's Recitals language from being a grant time period defined as: "perpetual", "permanent", "forever" and/or "in perpetuity", to one being a fixed duration statement. For example, in the sample conservation easement above the grant Recitals discussion of time periods read (emphasis added):

> C. Grantor is willing to grant a perpetual Conservation Easement over the Property, thereby restricting and limiting the use of the land and contiguous water areas of the Property, on the terms and conditions and for the purposes hereinafter set forth, and Grantee is willing to accept such Conservation Easement.

And,

> NOW, THEREFORE, as an absolute gift of no monetary consideration but in consideration of the mutual covenants, terms, conditions and restrictions hereinafter set forth, Grantor hereby unconditionally and irrevocably grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity a Conservation Easement of the nature and character and to the extent hereinafter set forth, over the Property more particularly described in Exhibit A together with the right to preserve and protect the conservation values of the Property.
>
> The purposes of this Conservation Easement are to preserve and protect the conservation values of the Property and to maintain permanently the dominant woodland, scenic, open, and natural character of the Property, including land and water resources; to protect plants and animals and plant and animal communities on or affected by the property's management; and to prevent any use of the Property that will significantly impair or interfere with the conservation values or interests of the property. To achieve these purposes, the following conditions and restrictions are set forth:

The representing attorney would then select appropriate replacement language for the desired duration such as (emphasis added):

> C. Grantor is willing to grant a 15-year Conservation Easement over the Property, thereby restricting and limiting the use of the land and contiguous water areas of the Property, on the terms and conditions and for the purposes hereinafter set forth, and Grantee is willing to accept such Conservation Easement.

And,

> NOW, THEREFORE, as an absolute gift of no monetary consideration but in consideration of the mutual covenants, terms, conditions and restrictions hereinafter set forth, Grantor hereby unconditionally and irrevocably grants and conveys unto Grantee, its successors and assigns, a 15-year Conservation Easement of the nature and character and to the extent hereinafter set forth, over the Property more particularly described in Exhibit A together with the right to preserve and protect the conservation values of the Property. And thereby establishing this Conservation Easement as a legally binding agreement effective from *Month Day, Year* to *Month Day, Year*.
>
> The purposes of this Conservation Easement are to preserve and protect the conservation values of the Property and to maintain for the duration of this Conservation Easement the dominant woodland, scenic, open, and natural character of the Property, including land and water resources; to protect plants and animals and plant and animal communities on or affected by the property's management; and to prevent any use of the Property that will significantly impair or interfere with the conservation values or interests of the property. To achieve these purposes, the following conditions and restrictions are set

The representing attorney would then select appropriate replacement language for the desired duration such as (emphasis added):

> C. Grantor is willing to grant a 15-year Conservation Easement over the Property, thereby restricting and limiting the use of the land and contiguous water areas of the Property, on the terms and conditions and for the purposes hereinafter set forth, and Grantee is willing to accept such Conservation Easement.

And,

> NOW, THEREFORE, as an absolute gift of no monetary consideration but in consideration of the mutual covenants, terms, conditions and restrictions hereinafter set forth, Grantor hereby unconditionally and irrevocably grants and conveys unto Grantee, its successors and assigns, a 15-year Conservation Easement of the nature and character and to the extent hereinafter set forth, over the Property more particularly described in Exhibit A together with the right to preserve and protect the conservation values of the Property. And thereby establishing this Conservation Easement as a legally binding agreement effective from *Month Day, Year* to *Month Day, Year*.
>
> The purposes of this Conservation Easement are to preserve and protect the conservation values of the Property and to maintain for the duration of this Conservation Easement the dominant woodland, scenic, open, and natural character of the Property, including land and water resources; to protect plants and animals and plant and animal communities on or affected by the property's management; and to prevent any use of the Property that will significantly impair or interfere with the conservation values or interests of the property. To achieve these purposes, the following conditions and restrictions are set forth:

Furthermore, the reference to the defined grant period will appear in many of the Conservation Easement's Articles and a word search for key grant period terms should be conducted and replaced with appropriate fixed duration language. The duration terms used in the Recitals may not be the terms used in the Articles. For instance, in the general Conservation Easement example above the following Article exists:

ARTICLE I. DURATION OF EASEMENT

> This Conservation Easement shall be perpetual. It is an easement in gross, runs with the land and is enforceable by Grantee against Grantor, his personal representatives, heirs, successors and assigns, lessees, agents and licensees.

And,

> TO HAVE AND TO HOLD unto the Broad River Watershed Association, Inc., its successors and assigns, forever. The covenants agreed to and the terms, conditions, restrictions and purposes imposed as aforesaid shall be binding upon Grantor, his personal representatives, heirs, successors and assigns, and shall continue as a servitude running in perpetuity with the Property.

The PES program's representing attorney should select the appropriate terminology and also inform the PES managers on the legal requirements, outcomes and defensibility of the Conservation Easement, and related topics like taxation, tax credits and stated conditions and restrictions in the Conservation Easement's Articles.

Forestry Management Service Agreement

Colorado Tiers of Collaboration and Associated Legal Agreements

The Colorado Department of Public Health and Environment provides many legal agreement templates and educational opportunities for Public Water Systems (PWS) operating in Colorado. (Available at: https://cdphe.colorado.gov/swap). Using the Department's provided materials and Denver Water as a working example the following list of tiered legal agreements for funding, planning, implementing, and licensing access and activities on public and private forested lands is presented.

- Memorandum of Understanding (Federal and State): between The State of Colorado Department of Public Health and Environment and the USDA, Forest Service Rocky Mountain Region (Available at: https://cdphe.colorado.gov/swap)
- Memorandum of Understanding (County and Public Water System): template for PWS working with counties as part of the source water protection area efforts. (Available at: https://cdphe.colorado.gov/swap)
- Property Owner Cost Share Agreement (Nonprofit/contractor agreement with forestry landowner): This legal contract example provides a concise method to implement forestry health and protection services at a given location; this type of contract can be used as an attachment to a conservation easement as part of a referenced easement condition (with or without owner cash or in-kind match). (See example inserted below.)
- License to Enter Upon Land and Release of Liability: A singed agreement between the landowner and Coalition for the Upper South Platte (CUSP) working on services like wildfire prevention activities that provides rights for entry, storage of tools and equipment, and covers other important attributes like location, period of operation, purpose, Insurance Limits of Liability, no fee, release of liability and provided insurance, and additional terms and conditions. (See example on next page.)

Property Owner Cost Share Agreement Example

Coalition for the Upper Platte
40 Cherokee Ave
Lake George, Colorado 80827

Date:

Attention:

Project title:

Project description:

Name:

Physical Address:

Mailing Address:

Email:

Phone:

1. COST SHARE BUDGET

DESCRIPTION	QUANTITY	UNIT PRICE	COST
OWNER CASH MATCH			
OWNER INKIND MATCH			
CUSP SHARE			
TOTAL	2.5 acres	$ 2730.00/acre	$ 6800.00

THIS AGREEMENT is made on _____

BETWEEN

1. and

2.The Coalition for the Upper South Platte ("CUSP"), a Colorado 501(c) 3 not-for-profit organization of Colorado, USA, collectively referred to as the "Parties".

1.1 RECITALS

The Property Owner wishes to be provided with the Services (defined below) by CUSP and CUSP agrees to provide the Services to the Property Owner under the terms and conditions of this Agreement. The property owner agrees to provide the Services defined below.

1.2 SERVICES

CUSP shall provide the following services ("Services") to the Property Owner in accordance with the terms and conditions of this Agreement:

1.CUSP HAS AGREED TO PROVIDE COST SHARE FUNDING FOR WORK PROPOSED, NOT TO EXCEED AMOUNT REPRESENTED IN THE COST SHARE BUDGET.

2.CUSP SHALL INVOICE THE OWNER FOR THE CUSP SHARE PORTION AFTER THE PROJECT IS COMPLETED PER COLORADO STATE FOREST SERVICE CERTIFICATION.

The Property Owner agrees to:

1. PAY CUSP THE INVOICED AMOUNT PER THE COST SHARE AGREEMENT UPON COMPLETION OF THE PROJECT..

2. PROVIDE IN-KIND DOCUMENTATION PER THE IN-KIND FORM SUPPLIED BY CUSP.

3. PROVIDE BEFORE AND AFTER PHOTOS REPRESENTATIVE OF THE WORK.

4. PROVIDE MAPS AND SHAPEFILES (IF POSSIBLE) OF THE WORK.

1.3 DELIVERY OF THE SERVICES For the purposes of this agreement Services will be provided directly by CUSP staff with forest contract work being provided by "CONTRACTOR" listed below. The contractor's name is added only as a reference to this agreement and is NOT a party to this agreement unless otherwise noted.

1. CUSP Contract Manager –

2. CUSP Project Manager –

3. Contractor –

2. INSURANCE / COMPLIANCE WITH THE LAW

During the entire term of the Project, CUSP and Property Owner/Representative will adhere to all applicable legal requirements of Federal, State, and Local entities. During the entire term of Project, CUSP and the selected CONTRACTOR will maintain insurance in at least the following minimum amounts and classifications: (Please note – if the Contractor is not under contract with CUSP, CUSP cannot ensure that the contractor carries the following Insurance coverage).

Workers' Compensation/ Employer's Liability

Not less than that required by statute

Comprehensive General Liability (including blanket contractual liability insurance):

Bodily Injury $ 500,000 each person; $1,000,000 each occurrence

Property damage $ 600,000

General aggregate $ 2,000,000

Comprehensive Automobile Liability

Bodily Injury $ 500,000 each person; $1,000,000 each occurrence

Property damage $ 600,000

3. INDEMNIFICATION

Parties agree to protect, defend, indemnify and hold harmless each other against losses, penalties, injuries, claims, fines, legal actions, damages, settlements, costs, charges, professional fees, legal fees or other expenses or liabilities relating to the Services unless such claims are based on gross negligence or intentional acts that are outside the scope of this Agreement.

4. PAYMENT TERMS

4.1 Property Owner will remit payment to CONTRACTOR upon completion of all requirements and approval by CUSP Project Manager.

4.2 Property Owner will supply CUSP with a copy of the cancelled checks and invoice CUSP for CUSP Share of Cost Share Budget.

1. Invoice and copy of cancelled checks sent to:

Coalition for the Upper South Platte
P.O. Box 726
40 Cherokee Avenue
Lake George, CO 80827

4.3 CUSP will remit a check to the Property Owner upon receipt of invoice after project completion. This payment process can take up to 60 days.

Total Cost the Property Owner agrees to invoice to CUSP upon completion of work identified within the attached Scope of Work and CUSP agrees to pay to Property Owner $_____

5. GENERAL TERMS

5.1 – This agreement commences on the date of the last signature. Parties agree that this agreement will remain in force until (end date) _____. If project is not completed by the end date, parties will be required to draft an amended Cost Share Agreement or void this agreement.

5.2 - This Cost Share Agreement, a binding and singular contract, represents the amount of which the Property Owner and CUSP agree to remit for services provided upon successful completion of the Project described herein.

6. NOTICES

6.1 - Any notice which may be given by a Party under this Agreement shall be deemed to have been duly delivered if delivered in writing, by hand, first class post, facsimile transmission or electronic mail to the address of the other Party as specified in this Agreement or any other address notified in writing to the other Party.

6.2 - Any changes to the Scope of Work and/or prescription must be made in writing and mutually accepted by the Parties. If this occurs, revised cost share amounts may be necessary and will be discussed prior to agreement on this Cost Share Agreement.

7. MISCELLANEOUS

7.1 - The failure of either party to enforce its rights under this Agreement at any time for any period shall not be construed as a waiver of such rights.

7.2 - If any part, term or provision of this Agreement is held to be illegal or unenforceable neither the validity nor enforceability of the remainder of this Agreement shall be affected.

7.3 - Neither Party shall assign or transfer all or any part of its rights under this Agreement without the consent of the other Party.

7.4 - This Agreement constitutes the entire understanding between the Parties relating to this project.

7.5 - Neither Party shall be liable for failure to perform or delay in performing any obligation under this Agreement if the failure or delay is caused by any circumstances beyond its reasonable control, including but not limited to funding limitations, acts of good or nature, war, civil commotion or industrial dispute. If such delay or failure continues for at least 30 days, either party may terminate this Agreement by notice in writing to the other.

7.6 - If partial work under this agreement has been completed, parties are held to all general terms and payment terms of this agreement on pro-rated basis.

8. ATTACHMENTS

Scope of Work is included with this document.

9. SIGNATURES

By signing below I agree to and understand fully the Scope of Work, financial and time commitments and additional terms of this Agreement.

Property Owner(s) / Legal Representative

Name:
Signature:_____ Date: _____

For the Coalition for the Upper South Platte
Name:
Signature: _____ Date: _____

Example from the Coalition for the Upper South Platte (CUSP) a nonprofit working with Denver Water

LICENSE TO ENTER UPON LAND AND RELEASE OF LIABILITY

¬¬THIS LICENSE TO ENTER UPON LAND AND RELEASE OF LIABILITY is an agreement made and

entered into this _____ of _____, 2021, “Licensor” (landowner or landowner’s legal designee) by and between _____ and the Coalition for the Upper South Platte, hereinafter referred to as “CUSP”.

WHEREAS, CUSP has requested access to and the right to enter upon the land described below (the “Property”), for the purposes described below that are related to CUSP’s mission; and

WHEREAS, Licensor is the owner of the Property, or of the current right to occupancy thereof, and has the right to grant a license to enter upon the Property for the purposes described herein, and desires to grant such right to CUSP upon the terms and conditions set forth in this Agreement;

NOW, therefore, in consideration of the mutual promises and covenants contained herein, receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows.

A. License Grant. The Licensor grants to CUSP, its employees and authorized volunteers, contractors and subcontractors, acting within the scope of their employment or contract (collectively, the “Licensees”), a non-exclusive license to enter upon the Property during the term hereof for the purposes described below. Licensor may revoke such license at any time by written notice to CUSP in accordance with the Notice provisions herein. Said license is subject to the following terms and conditions:

1. Description of Property. This License concerns the following Property (physical address and legal description):

2. License Period. This License shall be in effect from _____ to _____, inclusive (the “License Period”). If any dates or times are excluded from the License Period, they are specified here:

a. not applicable
b. describe:

3. The parties may, by mutual written agreement, extend the term of this License as necessary to permit the purposes and activities for which it is granted to be completed. No work shall be commenced until this License has been fully signed

4. Purpose. This agreement applies to CUSP for the purpose of conducting the following activities (check all that apply; add additional pages as necessary for work descriptions)

a. X Access to property for planning of river restoration projects, or other work. Initial and date, if different from original signature date: Initial_____ Date_____

b. Locate and store tools, supplies, equipment requisite to field work. Initial and date, if different from original signature date: Initial_____ Date_____

c. Volunteer Projects <<Describe in space below or attach Scope of Work>> Initial and date, if different from original signature date: Initial_____ Date_____

d. Forest Health Projects <<Describe in space below or attach Scope of Work>> Initial and date, if different from original signature date: Initial_____ Date_____

e. Other Projects <<Describe in space below or attach Scope of Work>> Initial and date, if different from original signature date: Initial_____ Date_____

5. Commencement of Work. Work by CUSP and/or its contractors is expected to commence on or about the Effective Date, but is subject to change due to contractor scheduling, weather conditions, and other factors. CUSP will provide notice to Licensor when work is about to commence. Please provide best number for notifications below:

a.Phone and/or email for notification:

6. No License Fee. This license is granted at no cost to CUSP or the Licensor.

B. Release of Liability. CUSP hereby releases the Licensor from all liability or responsibility for injury that the Licensees (CUSP and contractors or consultants) may suffer as a result of or in connection with entering upon the Property (except as limited in paragraph C, below). CUSP and its contractors maintain minimum insurance as follows:

Insurance Limits of Liability

Workers' Compensation/Employer's Liability: Not less than that required by statute

Comprehensive General Liability (including blanket contractual liability insurance):

Bodily Injury	$ 500,000 each person/$1,000,000 each occurrence
Property damage	$ 600,000

Comprehensive Automobile Liability:

Bodily Injury	$ 500,000 each person/$1,000,000 each occurrence
Property damage	$ 600,000

Consultants and contractors working under CUSP's direction are required to provide proof of adequate general liability insurance, worker's comp, auto coverage, and other pertinent insurance to protect both CUSP and the Licensor prior to undertaking work for CUSP on the Property.

C. Limits of Liability. The Parties understand and agree that the liability of CUSP, its consultants, contractors, or volunteers is limited to its/their direct actions. CUSP shall be solely responsible for the actions of its agents, employees or invitees while on the Licensor's premises, and, to the extent allowed by law, shall hold the Licensor harmless from and indemnify the Licensor from any liability for:

1) theft of or damage to the Licensee's equipment or apparatus, OR

2) injury to persons caused by CUSP's agents, employees or invitees, unless such theft, damage, or injury is due to gross negligence or intentional acts by the Licensor.

In no case shall either party be liable to the other party for expenses above direct costs, unless the harm or claim is as a result of gross negligence or intentional acts by the other party.

D. Additional Terms and Conditions.

1.Notices. All legal notices required to be given under this License shall be deemed given when actually delivered to the designated representative(s) of the party to be given notice by (i) certified mail, return receipt; or (ii) by hand delivery or courier service, if a signed receipt is obtained upon delivery; or (iii) by facsimile transmission, if confirmation of receipt of the transmission is obtained. A party may change its designated representative(s) or address at any time by written notice in the same manner as for any other notice. The initial representatives of the parties shall be the persons whose names and addresses are:

Coalition for the Upper South Platte (CUSP)Address: PO Box 726
Address: Lake George, CO 80827
Phone: 719-748-0033
Email: cusp@cusp.ws
Owner:
Address:
Address:

2. Non-Assignment. Except as specifically permitted under section A herein above, CUSP shall not transfer, assign, or otherwise convey the rights granted in this agreement to any other person or party without the express prior written consent of the Licensor(s). Any such conveyance in violation of this paragraph shall be null and void.

3. Legal Authority. The Licensor warrants he/she/it possesses the legal authority to enter into this License and has taken all actions required by its procedures, bylaws, and/or applicable law to exercise that authority, and to lawfully authorize its undersigned signatory to execute this License and to bind the Licensor to its terms. The person(s) executing this License on behalf of the Licensor warrant(s) that such person(s) have full authorization to execute this License.

4. Non-Assignment. Licensor shall not assign or sublicense any of its obligations under this License without the advance written consent of CUSP. Any unauthorized assignment shall be void. CUSP shall have the right, but not the obligation to terminate this License, without waiver of any other right or remedy, upon notice of Licensor's assignment or sublicense in violation of this section.

5. Binding effect. This License is binding upon the heirs, personal representatives, successors, and permitted assigns of both parties.

6. Entire Agreement. This License including the exhibits incorporated herein by reference constitutes the entire agreement between the parties, and supersedes any previous contracts, understandings, or a greements of the parties, whether verbal or written, concerning the subject matter of this License.

7. Amendment. No modification or amendment to this License shall be valid unless it is made in a writing signed by the authorized representatives of the parties.

8. Waiver. The waiver by either party of a breach or violation of any provision of this License shall not operate as or be construed to be a waiver of any subsequent breach of the same or other provision hereof.

9. Maintenance of Improvements. The License understands and agrees that certain work provided by CUSP may not be changed, adjusted, or improved after the work is complete, without prior written approval of CUSP. If applicable, such work, and time periods as may be in effect, are described as follows:

IN WITNESS WHEREOF, THE PARTIES HERETO HAVE EXECUTED THIS CONTRACT

LICENSOR:

By:

_____

Print Name & Title:

_____

Signature

_____

Date

FOR CUSP:

By:

_____

Print Name & Title:

_____

Signature

Date

D. Forum Registrants

Affiliations of those that registered for the Forest & Water Connection Initiative series of online forums.

American Green Consulting Group

Athens Land Trust

Benera Farms LLC

Black Walnut Farms

C.H. Cannon Company

Callaway Blue Springs LLLP

Canaan Farms

Chattahoochee Riverkeeper

City of Savannah Water Resources

Cobb County Water System - Watershed Stewardship

Columbus State University

Columbus Water Works

Cox Enterprises Inc

Domain Timber Advisors

Family Owned Forest

Flint River Soil and Water Conservation District

Florida Fish and Wildlife Conservation Commission

Folds Farms LLC

Forest Heights Homeowners

Forest Lodge Farms, LLC

Georgia Association of Water Professionals

Georgia Environmental Protection Division

Georgia Chamber

Georgia Environmental Protection Division

Georgia Forestry Commission

Georgia Forestry Foundation

Georgia Heirs Property Law Center, Inc.

Georgia SFI Implementation Committee

Golden Triangle RCD

Goosenest Farms

Green Diamond Management Company

Greene Morgan FLA

Hardscrabble Farms

HAZEN & SAWYER

HL Strategy

Home Builders Assn of Georgia

Jones Center at Ichauway

Lamar E. Zipperer Consulting Forester LLC

Land Nerd LLC

Landowner

Louisiana Forestry Association

Murder Creek Plantation

New Growth Media, LLC

Newton County Water & Sewerage Authority

Natural Resource Conservation Service (USDA-NRCS)

Oconee River Land Trust

Oconee River Watershed Partnership

Ogeechee Riverkeeper

Rayonier Inc

Retired OR Retired Private Land Owner

River to Tap, Inc

Rivers Associates

Riverview Plantation

SARP (Southeast Aquatic Resources Partnership)

Shoal Creek, Inc

SilviaTerra

Southeastern Partnership for Forests and Water

Southern Georgia Regional Commission

SRWA

Stripling, Inc.

TBL Consulting

The Bishop Company

The Conservation Fund

The Eubank Land Company, Inc

The Longleaf Alliance

The Nature Conservancy

The Water Tower/Gwinnett County DWR

The Westervelt Company

Timberland Investment Resources, LLC

Tinkey Timberlands

Tolar Capitol Partners, Inc.

Toledo Mfg. Co.

UGA Marine Extension and Georgia Sea grant

University of Georgia

U.S. Fish and Wildlife Service

Weyerhaeuser

Wildland Management Services LLC

Willowbrooke Farm, LLC

Wrayswood LLLP

Connect With Us

DOVETAIL PARTNERS

www.dovetailinc.org

GEORGIA FORESTRY FOUNDATION

www.gffgrow.org