Jordan Lake
Watershed Conservation Strategy

A component of the Jordan Lake One Water initiative

tlc
TRIANGLE LAND CONSERVANCY

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This project would not have been possible without the collaboration and support of the Jordan Lake One Water Partners. **See p.28 for a list of participating groups.**

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tlc Triangle Land Conservancy
The Conservation Fund
Triangle J Council of Governments

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1 Executive Summary

One of the most effective ways to protect drinking water sources is to conserve the upstream land, streams, and creeks. Forests, wetlands, and open fields slow down rain and runoff, giving water time to filter gradually and naturally through the soil. This traps sediment and pollutants before they flow into streams and lakes, and allows groundwater supplies to recharge.

This Jordan Lake Watershed Conservation Strategy provides a framework for protecting drinking water supply resources through land protection. This is a key element of the Jordan Lake One Water (JLOW) initiative, a comprehensive investment strategy that uses conservation and infrastructure enhancements to improve water quality. These approaches can help ensure clean drinking water now and into the future for the communities in central North Carolina that utilize this watershed.

Current Protected Area:

8%

Land conservation provides benefits for local communities far beyond water quality. Preserving land can also lead to the creation of new parks and greenways and provide healthy habitats for wildlife, natural flood protection, air purification, and other ecological services.

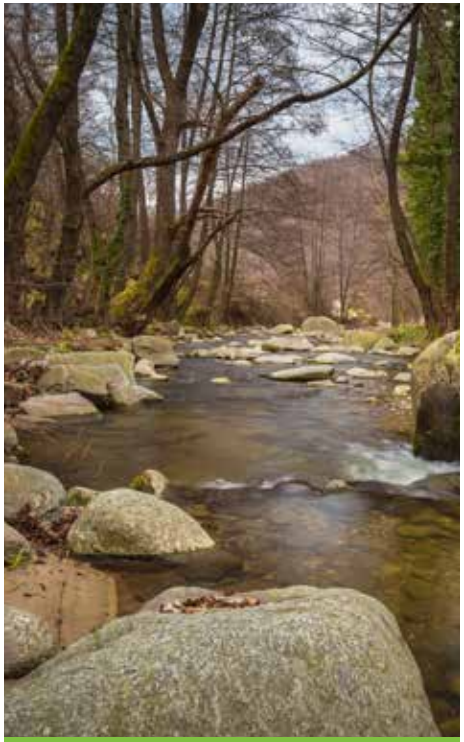
Only 8% of the Jordan Lake watershed (about 88,000 acres) is protected from development. Of the remaining unprotected area, almost 750,000

8% Protected

92% Unprotected

70%
of watershed lands comprised of farms, fields, wetlands & forests

Farms Fields Wetlands Forests



Water Sources & Conveyances

- Protect Headwater Streams
- Support Connected High Quality Water Features
- Protect Riparian Areas

Uplands

- Protect Uplands and Pervious Areas
- Protect Areas with Minimal Impervious Surface
- Protect Uplands with Forest Cover

Infiltration & Retention

- Promote Infiltration and Retention through Wetland Protection
- Promote Filtration through Floodplain Protection
- Protect Groundwater Recharge Areas

Vulnerable Areas

- Protect Wet / Hydric Areas
- Protect Steep Slopes
- Protect Highly Erodible Soils

acres, making up 70% of the watershed, are undeveloped lands including forests, fields, farms, and wetlands. The potential for a watershed protection program is great, but so is the risk that the drinking water supply will suffer additional impacts as this area continues to urbanize. From 2011 to 2016, the National Land Cover Database estimated that developed land increased by almost 13% in the watershed. Through strategic land preservation, the risks associated with development to the drinking supply reservoirs can be mitigated. The JLOW initiative is focused on identifying and protecting the best targets for preserving water quality before these lands and their benefits are lost.

In 2018, the JLOW partners and stakeholders undertook a planning process to design a land conservation strategy using the best available science and geographic data to identify land protection priorities. The result is an enhanced Geographic Information Systems (GIS)-based Watershed Protection Model that spatially identifies prioritized locations to invest in land conservation based on four main goals:

1. **Protect water sources and conveyances**
2. **Conserve upland areas**
3. **Promote water infiltration and retention**
4. **Protect vulnerable areas**

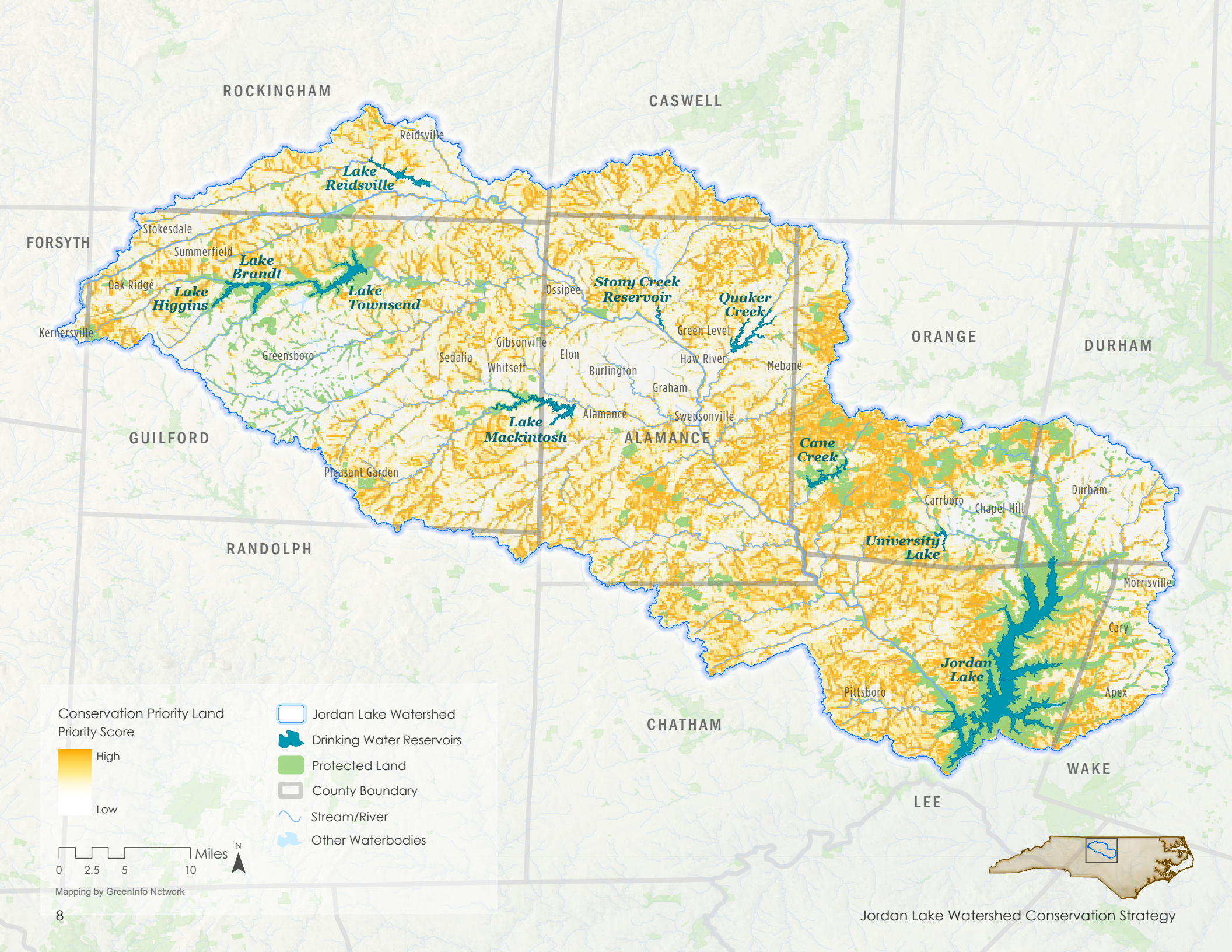
Through the convening of a Technical Advisory Team and stakeholder input meetings, the project team refined and weighted model objectives (Table 2) to create a map portraying these priority land protection areas that may provide the most "bang for the buck" in drinking water supply protection. The resulting model identifies over 10,000 parcels, for a total of over 385,000 acres, within the Jordan Lake watershed that would be priority conservation lands and therefore eligible for funding, should a water fund be established.

The JLOW Initiative partners have identified a goal of protecting 35,000 acres over the next 35 years, which corresponds to about 5% of eligible acreage within the watershed. This goal was determined based on projection of potential funds available, the historic success of the neighboring Upper Neuse Clean Water Initiative (read more about this in Section 2), and an assessment of future opportunities for land conservation.

Achieving this goal will provide tangible water quality benefits within the watershed and is a feasible target in a voluntary landowner, market-driven system. Complementary strategies such as restoration, land use regulations, stormwater programs, riparian buffers, and water and wastewater treatment upgrades will continue to play key roles in maintaining and enhancing clean water. Broad support from diverse stakeholders in the watershed can help turn this ambitious vision into a reality.

10,000 Parcels
385,000 Acres

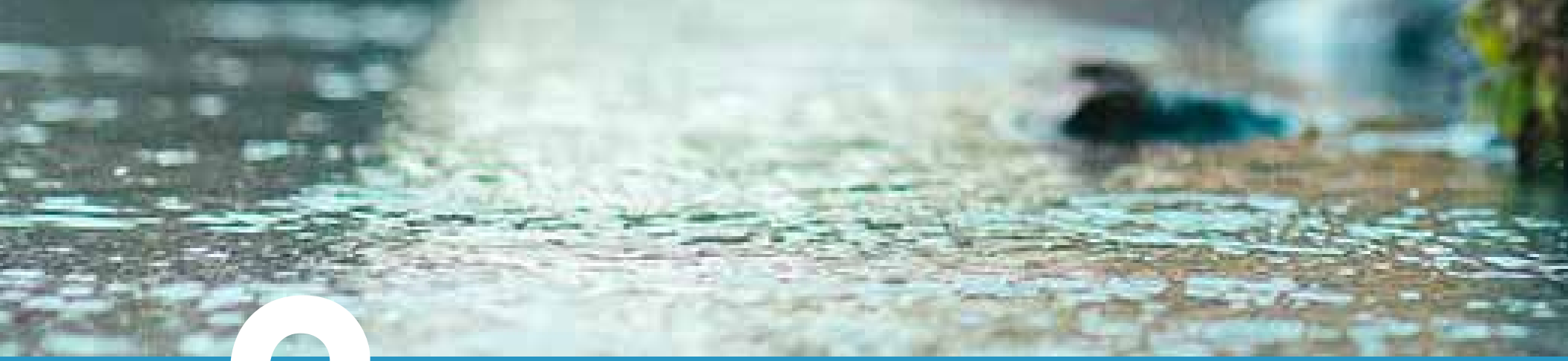
Priorities for Funding


ROCKINGHAM
CASWELL
FORSYTH
ORANGE
DURHAM
GUILFORD
ALAMANCE
RANDOLPH
CHATHAM
WAKE
LEE
Reidsville
Lake Reidsville
Stokesdale
Summerfield
Lake Brandt
Oak Ridge
Lake Higgins
Lake Townsend
Kernersville
Greensboro
Ossipee
Stony Creek Reservoir
Quaker Creek
Green Level
Gibsonville
Sedalia
Elon
Whitsett
Burlington
Haw River
Mebane
Graham
Lake Mackintosh
Alamance
Swepsonville
Pleasant Garden
Cane Creek
Carrboro
Chapel Hill
Durham
University Lake
Morrisville
Cary
Jordan Lake
Pittsboro
Apex
Conservation Priority Land
Priority Score
High
Low
Jordan Lake Watershed
Drinking Water Reservoirs
Protected Land
County Boundary
Stream/River
Other Waterbodies
Miles
0 2.5 5 10
N
Mapping by GreenInfo Network

Conservation Strategy Prioritization Map

The JLOW Initiative partners have identified a goal of protecting 35,000 acres over the next 35 years

Photo: Gretchen Smith



2 Planning Context

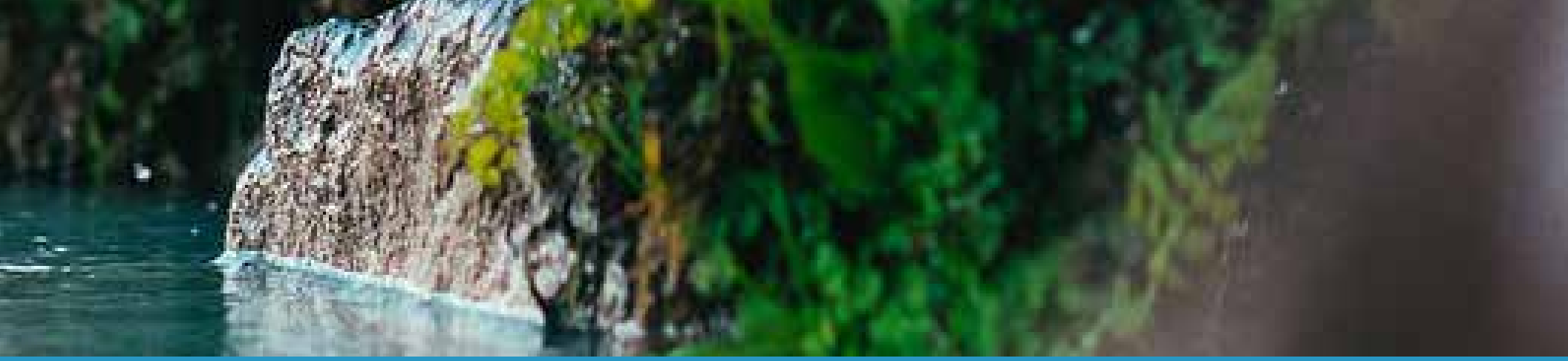
WATER QUALITY IN THE JORDAN LAKE WATERSHED

The Jordan Lake watershed, with the Haw River running through its core, is a 1,687 square mile watershed located in the center of North Carolina that stretches from Stokesdale in Guilford County to New Hill in Wake County. The watershed encompasses much of the Triangle (including parts of Raleigh, Durham, Cary, and Chapel Hill) and the Triad (Greensboro, High Point, and Winston-Salem), two of the state's largest urban areas. The region has seen significant development and growth over the last 40 years, but still retains strong rural character and vibrant farming communities.

This watershed in the Upper Cape Fear River Basin contains ten public drinking water reservoirs: Jordan Lake, Cane Creek, Lake Brandt, Lake Higgins, Lake Mackintosh, Lake Reidsville, Lake Townsend, Quaker Creek, Stony Creek, and University Lake.

It also includes 27 municipalities and portions of ten counties: Guilford, Alamance, Chatham, Orange, Rockingham, Durham, Wake, Caswell, Randolph, and Forsyth. The watershed drains into Jordan Lake, located in Chatham and Wake Counties.

The U.S. Army Corps of Engineers dammed the Haw River near its confluence with the Deep River in 1983 to create Jordan Lake. Later that year, the North Carolina Environmental Management Commission declared the reservoir as "Nutrient-Sensitive Waters." Jordan Lake consistently has nutrient pollution levels above EPA standards. Excess nutrients are known to cause harmful algal blooms, anoxic dead zones, and decreased water quality. The lake covers about 13,940 acres with a shoreline of 180 miles and currently



1,687 sq miles

supplies drinking water to Cary, Apex, Durham, Morrisville, Holly Springs, and Chatham County and many other communities through regional connections. In addition, Jordan Lake provides low-flow augmentation, flood control, recreation, and fish and wildlife habitat.

In 2009, the NC Department of Environmental Quality implemented the Jordan Lake Rules, which aim to reduce wastewater pollution, stormwater runoff, agricultural runoff, and fertilizer application. These rules were developed by residents, environmental groups, governments, and other stakeholders to protect and improve water quality in the lake.

These traditional regulations and engagement made some improvements to water quality and securing reliable clean water supplies, but the system is still impaired and unable to deliver the ecological or community benefits needed. Communities and businesses in the watershed realize the value of a restored and protected watershed and are collaborating to meet that goal.

DEVELOPING A ONE WATER APPROACH TO JORDAN LAKE

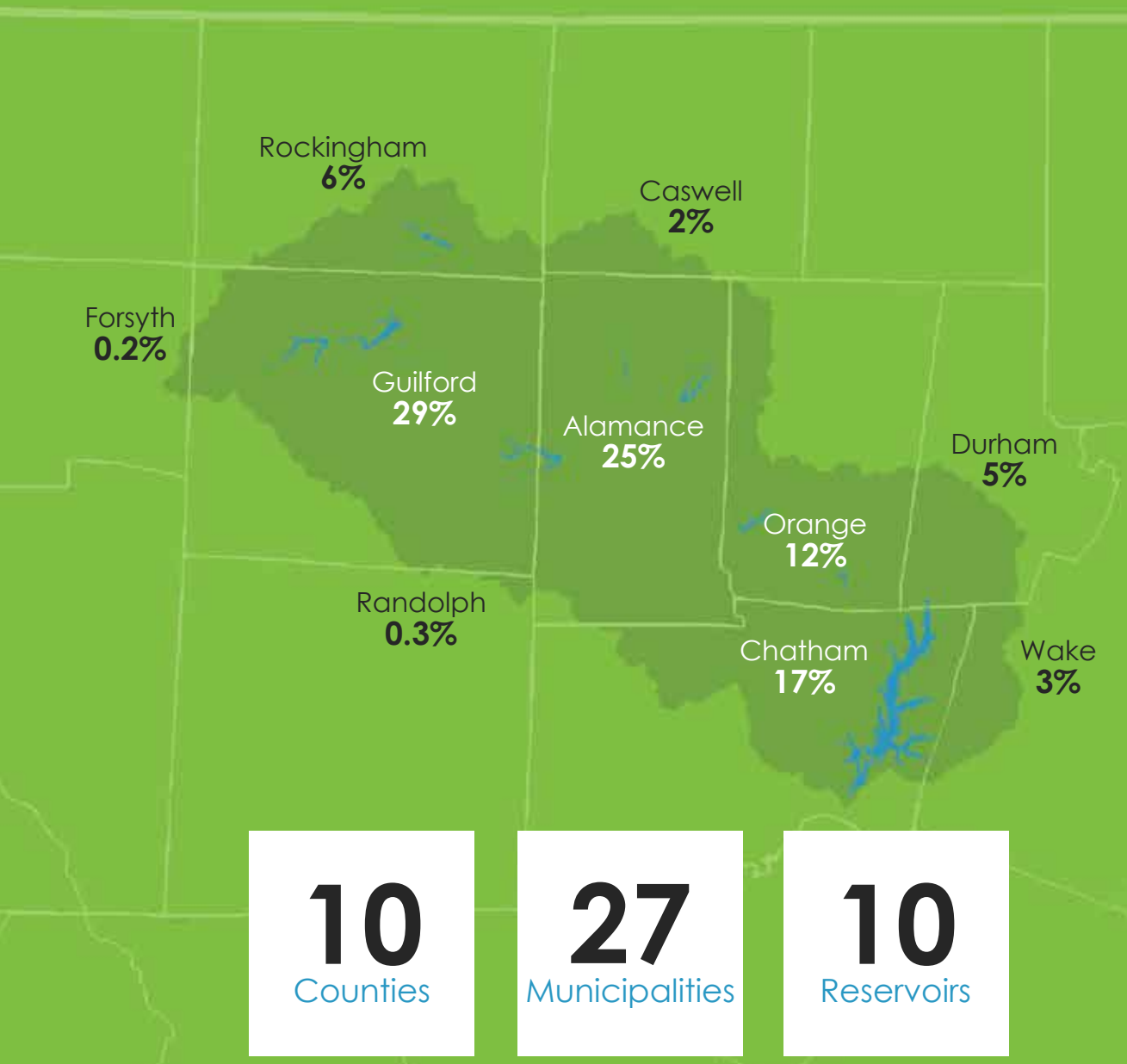
The JLOW initiative seeks to develop and implement an integrated watershed management strategy, i.e. a "One Water" framework, for the Jordan Lake watershed. The initiative facilitates collaboration among the many interested parties and provide an avenue to develop policy, operational, and financial recommendations to address regulatory concerns.

JLOW is working to:

1. **Solve regional watershed issues beyond the capacity of any one stakeholder**
2. **Draw on leadership of elected officials and other champions of the group to make change**
3. **Work closely with state regulators to develop an effective integrated watershed policy framework**
4. **Increase access to funding opportunities for watershed improvements**
5. **Establish and develop partnerships and trust**
6. **Share knowledge, resources, and experience among disparate stakeholder groups**

The JLOW initiative is administered by the Triangle J Council of Governments (TJCOG) with assistance from Piedmont Triad Regional Council (PTRC) and the Jordan Lake One Water Advisory Committee. Since the first Jordan Lake summit in 2017, JLOW stakeholders have met quarterly to learn about One Water; share perspectives, challenges, and possibilities; and discuss the application of an integrated watershed management framework in the watershed. These meetings bring together an average of 60 or more representatives of organizations and stakeholders, many of whom are collaborating across jurisdictions for the first time to achieve tangible watershed-wide benefits. Additional stakeholders are continuously identified and

From U.S. Water Alliance, Roadmap for One Water, 2016



10 Counties

27 Municipalities

10 Reservoirs

encouraged to participate. A list of the JLOW Advisory Committee members is included in the supporting materials of this report (see page 28-29).

The group places strong emphasis on examining both individual community objectives, as well as the collective vision across the watershed. This focus increases opportunities for upstream, downstream, urban, and rural entities to work together in complementary ways to implement multi-benefit projects. The conversations at these meetings are unprecedented and show the watershed wide support for a One Water approach.

The JLOW management framework is intended to be broad in scope to cover most, if not all, water-related management collaborative opportunities. One of the key areas addressed is the upcoming Jordan Lake Rules re-adoption process required of the NCDEQ. Legislation mandates this process begin in January 2020. The existing 2009 Jordan Lake Rules contributed to conflict among upstream and downstream communities, regulators, and permittees, which resulted in multiple rule delays by the North Carolina General Assembly. Although rule re-adoption is not the

sole focus of JLOW, it is a strong impetus for successful collaboration among the many diverse stakeholders in the watershed.

The need to restore and protect the Jordan Lake watershed creates an opportunity to reexamine the way that water resources are managed through various government-sponsored and required programs, as well as private activities. In particular, the nation is struggling to find a way to manage non-point source pollution as part of a traditional regulatory framework in a way that is ecologically responsible and cost effective. There are problems to be solved across the watershed and the JLOW initiative is committed to developing a system where individual, community, and regional activities work collaboratively. These efforts will improve the ecological function of the watershed through multi-benefit projects, meeting regulatory requirements, and delivering value to the communities where they are implemented. The anticipated success of this comprehensive approach to watershed management can serve as a model for other areas of the country resolving clean water supply issues and building resiliency into our nation's water systems.

WATER QUALITY BENEFITS FROM FORESTS AND WETLANDS

Protecting land in a drinking water supply watershed is one of the most effective and least expensive ways to limit its contamination. Natural terrains, such as forests, wetlands, and open fields, help to slow down rain and runoff by filtering water through the soil. This

A key component of the One Water Strategy will be ensuring healthy waterways. Watershed protection is a critical step in safeguarding clean water for the future and must be part of any integrated one water approach.

Wetlands Filter:

63% of Nitrogen, 45% of Phosphorous, & Retain up to 94% of Sediment

process prevents sediments, toxins, and excess nutrients from degrading nearby water bodies. Forests and wetlands can filter nitrogen, phosphorus, and sediment from surface runoff, effectively cleaning the water before it reaches our rivers and lakes. Chlorophyll-a levels and turbidity, commonly used indicators of water quality, may also be improved by maintaining and enhancing these filtering capabilities through land conservation.

Retaining and restoring land buffers along streams is one of the most cost-effective strategies for reducing nitrogen loads in a watershed. Studies have demonstrated reductions of 30 to 98% for nitrogen, phosphorus, sediments, pesticides, and other pollutants in surface and groundwater after passing through forested land along streams and other water bodies. A recent study in the Upper Neuse River watershed found that nitrogen and phosphorus levels in forested watersheds are significantly lower than the levels near new developments, even those in compliance with the Falls Lake Rules.*

Numerous studies also demonstrate that in addition to forests, wetlands also enhance water quality through retention and mitigation of sediments, toxins, and nutrients in the water. As water passes through wetlands, large populations of microbes break down organic substances and particles bind to sediments. Plants above and below the surface help purify the water by absorbing nutrients and other chemicals into their root system. They also supply substrates for bacterial growth, provide a medium for physical filtration and absorption, and restrict algal growth

and wave action.

By protecting natural watersheds, municipalities and utilities may lower costs associated with expensive treatment plants or upgrades in order to purify water in degraded watersheds. A 2007 study found that an 1,800 acre natural wetland could save $300,000 per year in annualized capital costs, operations, and maintenance to filter wastewater at one million gallons per day ($171 per acre per year). A survey of 27 water suppliers found that the higher the forest cover in a watershed, the lower the associated water treatment costs. The same study found that 55% of the variation in treatment costs could be explained by the percent of forest cover in the source area. Furthermore, for every 10% increase in forest cover in the watershed, treatment and chemical costs decreased about 20%, up to about 60% forest cover.

A similar 2011 study by Industrial Economics, Inc. in Delaware also found that wetlands filter 63% of nitrogen, 45% of phosphorous, and retain 69% to 94% of sediment. The study showed that a loss of 3,132 acres of wetlands over 15 years equated to costing $840,000 in annualized municipal water treatment, or $281 per acre per year.

Land conservation provides other community benefits including the

Upper Neuse Clean Water Initiative: Case Study

114
Properties

14
Years

111
Miles of Streams

10,000
Acres

7 to 1
Funding Leverage from City of Raleigh

$0.15
per 1000 gallons
Watershed Protection Fee

creation of new parks and greenways, and the protection of ecological services such as flood protection, air purification, and pollination.

*Please see the literature review, page 30, for the list of studies referenced in this section. Cost estimates were adjusted from the original studies to 2015 dollars using the Bureau of Labor Statistics Consumer Price Index Inflation Calculator: http://www.bls.gov/data/inflation_calculator.htm

THE UPPER NEUSE CLEAN WATER INITIATIVE: A MODEL FOR SUCCESS

The Upper Neuse Clean Water Initiative (UNCWI) has been an immensely successful conservation program to protect and provide clean water for the Triangle region for over 10 years. The Upper Neuse watershed includes 770 square miles, six counties, and nine water supply reservoirs, including Falls Lake, the primary water supply for Raleigh. Like Jordan Lake, Falls Lake has been identified as impaired due to high levels of turbidity and chlorophyll-α. UNCWI represents a partnership between the City of Raleigh, Conservation Trust for North Carolina, Triangle Land Conservancy, five other land trusts, local governments, and natural resource professionals. Their mission is similar to JLOW: to protect and enhance drinking water resources through land acquisitions, planning, and innovative water quality improvement activities.

In 2005, the UNCWI partners, subject-matter experts, and local stakeholders developed a conservation plan that identified important lands to conserve for water quality. This plan was a framework to leverage funding from multiple partners and sources to support the program's goals. In 2015, the partners and stakeholders used the best available science and geographic data to update, refine and refocus land protection priorities, a method duplicated in the Jordan Lake Watershed Conservation Strategy model.

Generous financial support from local and state government agencies is critical to the UNCWI's success. The City of Raleigh contributes to the UNCWI through a dedicated revenue source generated by a $0.15 fee per 1,000 gallons used by water utility customers. These small monthly allocations, based on water use and averaging only 60 cents a month per household, fund purchases of properties and conservation easements, landowner outreach, project negotiation, transaction and project costs, program administration, monitoring, and stewardship.

Since UNCWI launched in 2005, the initiative achieved impressive results. Partners have protected over 10,000 acres of land in the Falls Lake watershed across 114 properties, including 111 miles of buffered streams. Based on research by the North Carolina Forest Service, UNCWI estimates that conservation efforts have resulted in a pollution avoidance of almost 5,700 pounds of nitrogen and 1,000 pounds of phosphorus per year. Crucially, UNCWI has achieved a funding leverage ratio of $7:$1 from the City of Raleigh. Their commitment has inspired municipalities across the watershed to provide matching funds to protect high priority lands.

The Jordan Lake watershed has much in common ecologically and demographically with the Upper Neuse watershed. Both are experiencing similar development pressures from the recent growth of the Triangle and Triad regions. Adapting the strategies that led to success for Falls Lake provides a proven blueprint for voluntary conservation with measurable impacts on the water quality of Jordan Lake.

3 Land Conservation

PRIORITIZING CONSERVATION IN THE JORDAN LAKE WATERSHED

The Jordan Lake Watershed Protection Model, as part of the greater Conservation Strategy, is based on a model developed for the Upper Neuse River basin. This model was developed by a Technical Advisory Team that met multiple times in 2015 to evaluate and ultimately select 12 GIS data layers that best represented the UNCWI's water quality. Project staff collected and organized the best available GIS data

in a consistent format for the entire watershed (Table 1). The model for the Jordan Lake Watershed was based on the metrics of the UNCWI model. Project participants met with the larger JLOW partnership and individual utilities and stakeholders in 2018 and 2019 to present the model and incorporate feedback.

On March 27th, 2019, a group of 60 JLOW stakeholders gathered at the Impact Alamance Center in Burlington to provide input and feedback on the Watershed Protection Model criteria and weightings.

Using a "dot map" exercise, the stakeholders reviewed maps, evaluated model scores, and assigned relative weights of importance for the model criteria. Stakeholders were asked to weigh the three objectives for each watershed protection goal as well as the four overall goals.

Once the weights were obtained, the 12 GIS layers were combined into a raster-based GIS suitability model to generate model values on a 30-meter by 30-meter pixel scale.

Final weights selected are shown in Table 2.

MODEL RESULTS

The Watershed Protection Model spatially identifies critical locations where investments in land conservation would yield water quality benefits.

Priority parcels are those with a score above the median (47.2 out of 100) that are at least 10 acres in size. Using these criteria, over 10,000 parcels that encompass over 385,000 acres within the Jordan Lake watershed would be eligible for funding if a water fund is established. This corresponds to approximately 50% of all 10+ acre parcels in the watershed and

approximately 36% of the watershed's land area (See map, p.8).

LAND CONSERVATION STRATEGY

Due to existing water quality concerns and potential degradation from future land use changes, protecting drinking water supply resources through land protection is one key element of JLOW's comprehensive strategy. ***The time to boost land conservation investments is now, since projected increases in land values over the next 30 years will make land protection efforts increasingly unaffordable.***

Other elements of the comprehensive strategy for clean water and nutrient reduction include restoration, land use regulation, best management practices, point source nutrient reduction strategies, and education on land use strategies that minimize pollution and runoff. This coordinated set of strategies highlights that both gray and green infrastructure investments are needed to design the most efficient and cost effective program to ensure drinking water quality and supplies.

The Watershed Protection Model, along with an accompanying application process, will help guide the level of project investment partners are willing to contribute and identify appropriate matching funds to implement the highest priority projects. The Model identifies priority parcels, but specific JLOW investment priorities are driven by willing landowners and an application process for partner organizations that confirms the conservation and water quality value of the property.

Based on potential available funds, the historic success of UNCWI, and an assessment of future opportunities for land conservation, the JLOW partners have identified a goal of protecting 35,000 acres over the next 35 years, which corresponds to about 5% of eligible acreage within the watershed. This would provide tangible water quality benefits within the watershed and is a feasible target within a voluntary landowner, market driven system.

Broad support from stakeholders in the watershed will help turn this ambitious vision into a reality.

THE LAND CONSERVATION PROCESS

Land conservation is facilitated by nonprofit land trusts as well as local and state governments seeking to protect important natural lands for multiple public benefits including clean water, wildlife habitat, sustainable agriculture, and access to open space. This work is made possible by membership support, including individuals and corporations, as well as funding through foundations and grants, such as the North Carolina Clean Water Management Trust Fund.

Land trusts work with landowners to develop voluntary strategies that meet their long-term conservation and land management goals, while also realizing potential financial benefits, including potential tax incentives and available funding sources. When appropriate, land trusts partner with other conservation organizations, both public and private,

Goal	Objective	Criteria	Data Layer(s)
Protect water sources and conveyances	Protect Headwater Streams	Flow accumulation	USGS Hydrologic Units (HUCs), NC floodplain mapping LIDAR DEM
	Support connected high quality water features	Percent Conserved land by catchment	USGS NHD+, NC OneMap Managed Lands
	Protect riparian areas	Distance from streams	USGS NHD+ Flowline
Conserve upland areas	Protect uplands and pervious areas	Previous land cover types	USDA Cropland Layer (modified with USFWS wetlands + County GIS)
	Protect areas with minimal impervious surface	Imperviousness by catchment	USDA Cropland Layer (modified with County GIS)
	Protect uplands with forest cover	Percent Forest land cover by catchment	USDA Cropland Data Layer (modified with County GIS)
Promote water infiltration and retention	Promote wetland protection	Wetland coverage, proximity	USDA Cropland Data Layer (modified with National Wetlands Inventory)
	Promote floodplain protection	Floodplain areas	NC floodplain mapping LIDAR DEM
	Protect groundwater recharge areas	Soil infiltration capabilities	NRCS SSURGO soils with hydrologic group attribute
Protect vulnerable areas	Protect wet/hydric areas	Presence of saturated soils	NRCS SSURGO soils with hydric attribute
	Protect steep slopes	Land surface slope	NC floodplain mapping LIDAR DEM
	Protect highly erodible soils	Soil surface runoff potential	NRCS SSURGO soils with erodibility attribute

Table 1: Watershed Protection Model Criteria and Data

Goal	Goal Weight	Objective	Objective Weight	Model Weight (Goal x Objective)	Points
Protect water sources and conveyances	32%	Protect Headwater Streams	38%	12.2%	12
		Support connected high quality water features	19%	6.1%	6
		Protect riparian areas	43%	13.8%	14
Conserve upland areas	20%	Protect uplands and pervious areas	31%	6.2%	6
		Protect areas with minimal impervious surface	22%	4.4%	4
		Protect uplands with forest cover	47%	9.4%	9
Promote water infiltration and retention	28%	Promote wetland protection	38%	10.6%	11
		Promote floodplain protection	42%	11.8%	12
		Protect groundwater recharge areas	20%	5.6%	6
Protect vulnerable areas	20%	Protect wet/hydric areas	35%	7.0%	7
		Protect steep slopes	27%	5.4%	5
		Protect highly erodible soils	38%	7.6%	8
				Total Points =	**100**

Table 2: Watershed Protection Model Weights and Points

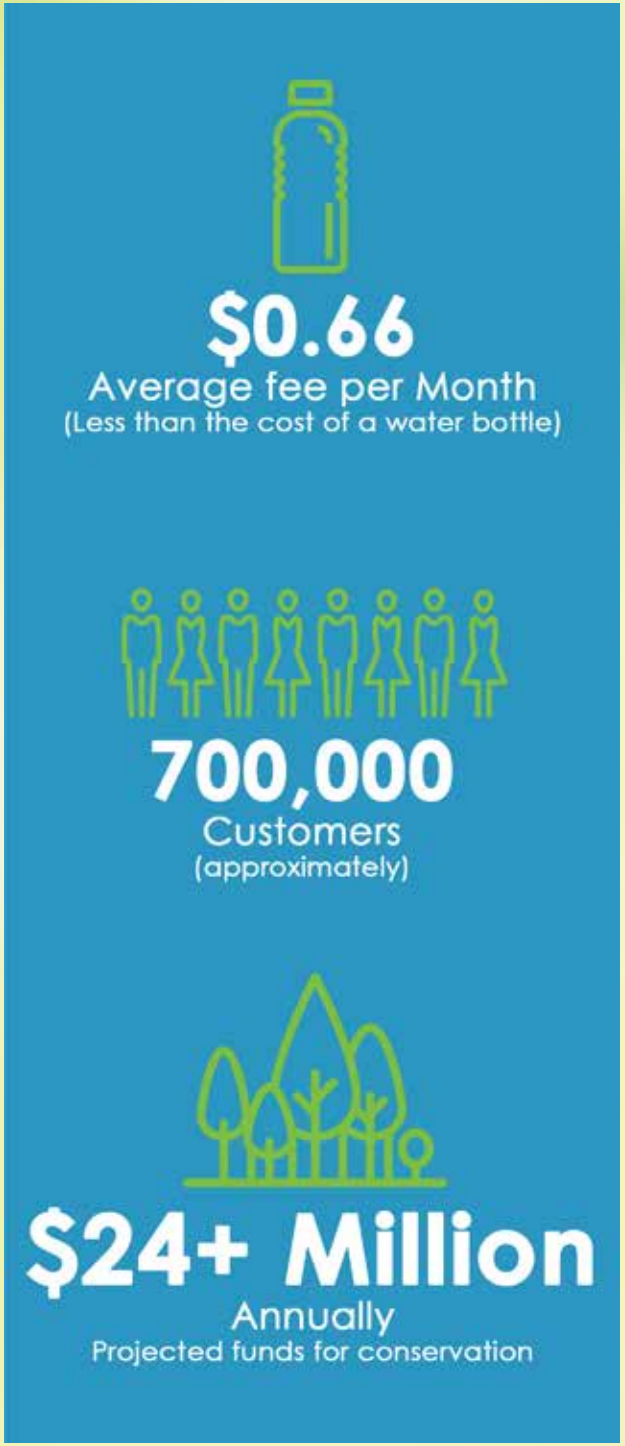
to conserve and steward land. The JLOW initiative is one such partnership.

Landowners are faced with a number of decisions when planning for the future of their land. Conservation organizations strive to balance their mission – in this case, the preservation of water quality in the Jordan Lake watershed – with the conservation and financial goals of each landowner. There are several conservation options:

- **Land Donation**
- **Purchase**
- **Bargain Sale**
- **Conservation Easement**

The main incentives for landowners are potential tax benefits, potential financial incentives, and the knowledge that their land is permanently protected.

Acquiring land or a conservation easement is just the first step in protecting conservation values. The conservation organization has a long-term responsibility to monitor and steward its properties. Through this commitment to stewardship of the land in perpetuity, conservation ensures that the natural benefits of that land will persist into the future.



FUNDING STRATEGY

Just as a successful One Water Initiative will require multiple tools and programs to protect and improve water quality, a successful conservation strategy will require multiple funding resources. In fact, the most successful programs and projects often use local funds to leverage state, federal and private funding resources. For every $1 invested by the City of Raleigh Public Utility Department in the Upper Neuse program mentioned in the case study, over $7 has been secured from a variety of resources including landowner donations and the State Clean Water Management Trust Fund.

Other resources, such as county-based open space bonds and recreation grants such as the Parks and Recreation Trust Funds have helped fund projects that provide public recreation and protect clean water. The Jordan Lake watershed already has a history of investment in land conservation, an early indication that stakeholders in the region are open to the JLOW Conservation Strategy approach. For example. Alamance County offers a 25% match for farmland conservation easements.

The Jordan Lake watershed is home to 24 public drinking water supply watersheds that supply almost 700,000 customers. If these customers committed just $0.15 per 1,000 gallons used towards watershed protection, as residents of Raleigh do, users could generate over $3 million a year for watershed protection. The Town of Cary alone could generate over $700,000 a year. For an individual residential customer this would equate to about $0.66 a month, or less than $8 a year. In return, the program could likely leverage $21 million a year from other resources.

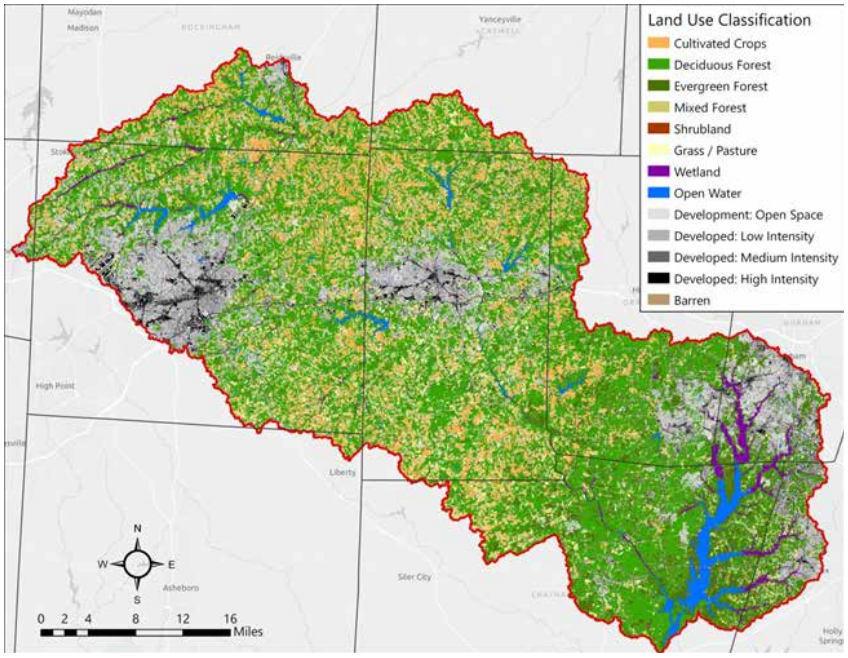
For the price of less than one bottle of water a month, users of Jordan Lake could contribute to a program that permanently protects thousands of acres of land, increases opportunities for recreation, supports biodiversity, protects and enhances local farms, and safeguards drinking water for this and future generations.

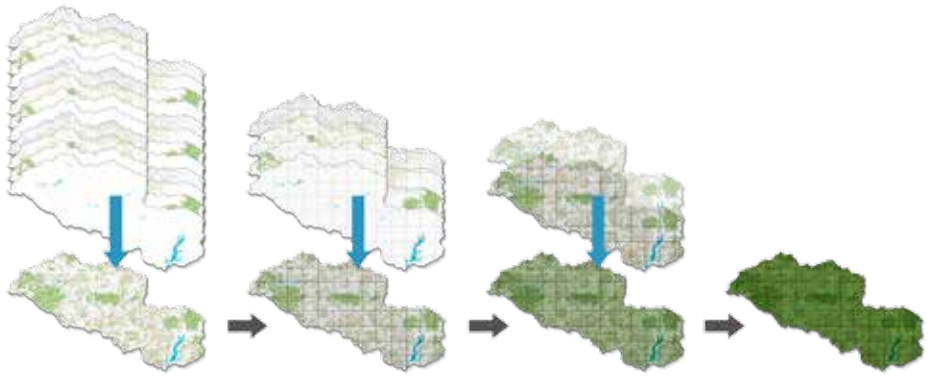
4 Supporting Materials

GIS MODEL DEVELOPMENT

The Jordan Lake Watershed Conservation Strategy is based on a geospatial analysis of the Jordan Lake watershed. The analysis used a 30x30 meter raster, or digital grid of pixels, covering the entire watershed. Each individual water quality objective was represented by a data layer. These data layers each had a classification system from 0-10 to provide a suitability ranking. The individual data layers and their corresponding classifications and values are shown in the tables on p.26 & 27.

Several of these layers and corresponding classifications were based on an updated land cover layer developed from the USDA's 2017 cropland data layer (CDL). The CDL was chosen instead of the NLCD (National Land Cover Dataset), on which it is based, for its superior representation of the extent of cropland. The CDL layer was updated with major primary and secondary state roads buffered to 15 meters. In addition, the layer was updated with more detailed wetland location information from the National Wetlands Inventory (NWI). NWI wetland types 'Freshwater Emergent Wetland', 'Freshwater Forested/Shrub Wetland', and 'Riverine' were used. The final, improved land classification raster data set used is shown on p.25. The partnership hopes that the model will be continually updated with new land cover data as it becomes available, starting with the 2016 Land Use Land Cover layer from the USGS released recently.


Land Use Classification
Cultivated Crops
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrubland
Grass / Pasture
Wetland
Open Water
Development: Open Space
Developed: Low Intensity
Developed: Medium Intensity
Developed: High Intensity
Barren
N
W
E
S
0 2 4 8 12 16
Miles


Original Data Layers
Objective Scores
Goal Scores
Model Score

Goal 1

Protect Water Sources & Conveyances

Objective 1.1: Protect Headwater Streams

Approach: Threshold for flow accumulation area. Catchments with lower flow accumulation denote source water areas.

Classes:	Score:
Drains ≤ 15.5 km2	10
Drains > 15.5 km2	0

Data Source: USGS Hydrologic Units (HUCs), NC floodplain mapping 20ft LIDAR DEM

Objective 1.2: Support Connected High Quality Water Features

Approach: Percentage of conserved land by catchment. Protect land within intact catchments.

Classes:	Score:
80 to 100%	10
50 to 80%	8
30 to 50%	6
10 to 30%	4
1 to 10%	2
0 to 1%	0

Data Source: USGS NHD+. NC OneMap Managed Lands

Objective 1.3: Protect Riparian Areas

Approach: Distance from streams based on buffer research. Proximity to stream = more water quality benefit.

Classes:	Score:
<100 feet from stream	10
100 to 300 feet from stream	8
>300 feet from stream	0

Data Source: USGS NHD+ Flowline

Goal 2

Conserve Upland Areas

Objective 2.1: Protect Uplands & Pervious Areas

Approach: Land cover value for stormwater retention. Pervious land cover reduces surface runoff denote source water areas.

Classes:	Score:
Deciduous, Evergreen Forest	10
Mixed Forest	10
Shrub / Scrub, Wetlands	10
Open Water	10
Grassland / Pasture	8
Crops	5
Developed / Open	5
Developed / Low, Med, High	0
Barren	0

Data Source: USDA Cropland Layer (modified with USFWS wetlands + County GIS)

Objective 2.2: Protect Areas with Minimal Pervious Surface

Approach: Catchment imperviousness based on research. Higher quality in less impervious catchments.

Classes:	Score:
0 to 10%	10
10 to 20%	5
20 to 100%	0

Data Source: USDA Cropland Layer (modified with County GIS)

Objective 2.3: Protect Uplands with Forest Cover

Approach: Percent forest land cover by catchment. Thresholds from High Rock Lake study.

Classes:	Score:
48 to 100%	10
37 to 48%	5
0 to 37%	0

Data Source: USDA Cropland Layer (modified with County GIS)

Goal 3

Promote Water Infiltration & Retention

Objective 3.1: Promote Wetland Protection

Approach: Wetland coverage, proximity. Closer to wetlands = higher value for water quality.

Classes:	Score:
<50 feet or contains wetland	10
>50 feet from wetland	0

Data Source: USDA Cropland Layer (modified with USFWS National Wetland Inventory)

Objective 3.2: Promote Floodplain Protection

Approach: Floodplain areas. Protect land that absorbs flood waters

Classes:	Score:
AE, AO, or A	10
0.2% annual chance	10
X	0

Data Source: NC floodplain mapping 20ft LIDAR DEM

Objective 3.3: Protect Groundwater Recharge Areas

Approach: Infiltration / runoff potential. Divert stormwater to increase groundwater supply

Classes:	Score:
A – high infiltration	10
B – moderate infiltration	7
C, B/D – low infiltration	3
C/D – very low infiltration	2
D – lowest infiltration	0

Data Source: NRCS SSURGO soils with hydrologic group attribute

Goal 4

Protect Vulnerable Areas

Objective 4.1: Protect Wet / Hydric Areas

Approach: Hydric soil presence / absence. Hydric soils capture and retain water.

Classes:	Score:
Containing hydric soils	10
Not containing hydric soils	0

Data Source: NRCS SSURGO soils with hydric attribute

Objective 4.2: Protect Steep Slopes

Approach: Land surface slope. Steeper slopes are more susceptible to runoff.

Classes:	Score:
25 to 100%	10
15 to 25%	8
10 to 15%	5
5 to 10%	3
0 to 5%	0

Data Source: NC floodplain mapping 20ft LIDAR DEM

Objective 4.3: Protect Highly Erodible Soils

Approach: Soil surface runoff potential. Protect areas more likely to export sediment.

Classes:	Score:
> 0.45	10
0.35 to 0.45	8
0.25 to 0.35	5
0.15 to 0.25	3
0 to 0.15	0

Data Source: NRCS SSURGO soils with erodibility attribute

JLOW Participants as of June 2019

Jordan Lake One Water Advisory Committee Members

Patrick Beggs, *NC Division of Water Resources*
Trevor Clements, *Tetra Tech*
Cameron Colvin, *Piedmont Triad Regional Council*
Erin Riggs, *UNC Environmental Finance Center*
Joey Hester, *NC Department of Agriculture*
Bill Holman, *The Conservation Fund*
Andy McDaniel, *NC Department of Transportation*
Sydney Miller, *City of Durham*
Peter Raabe, *American Rivers*
Jen Schmitz, *Triangle J Council of Governments*
Kristine Williams, *City of Greensboro*

Local Government - Counties

Alamance County, *Staff, elected officials, Soil and Water Conservation District*
Chatham County, *Staff, elected officials*
Durham County, *Staff, elected officials*
Orange County, *Staff, elected Commissioners*
Wake County, *Staff, elected officials*

Local Government - Municipalities

Apex, *Staff*
Burlington, *Staff, elected officials*
Carrboro, *Staff, elected officials*
Cary, *Staff, elected officials*
Chapel Hill, *Staff, elected officials*
Durham, *Staff, elected officials*
Greensboro, *Staff, elected officials*
Mebane, *Staff, elected officials*
Morrisville, *Staff, elected officials*
Pittsboro, *Staff, elected officials*
Raleigh, *Staff*
Roxboro, *Staff*

Utilities & Coucils of Government

Fayetteville Public Works Commission
Orange Water and Sewer Authority
Piedmont Triad Regional Council
Triangle J Council of Governments

State & Federal Government

NC Department of Agriculture
NC Department of Environmental Quality
NC Division of Water Infrastructure
NC Division of Water Resources
NC Department of Transportation
NC Wildlife Resources Commission
United States Geological Survey

Private Corporations

Ally, Williams, Carmen, and King

(consultants)
Biocenosis *(consultants)*
FountainWorks *(consultants)*
Hazen & Sawyer *(consultants)*
Research Triangle Cleantech Cluster
Tetra Tech *(consultants)*
Withers Ravenel *(consultants)*

Nonprofit Organizations

American Rivers
Cape Fear River Assembly
Carolina Wetlands Association
Clean Jordan Lake
Conservation Fund
Conservation Trust for North Carolina
Ellerbe Creek Watershed Association
Friends of Lower Haw River State Natural Area
Haw River Assembly
The Nature Conservancy
NC Conservation Network
NC Farm Bureau Federation
Piedmont Land Conservancy
River Network
Triangle Land Conservancy
Upper Neuse River Basin Association
WakeUP Wake County

Academic Partners

Duke University
NC Cooperative Extension Service
NC Environmental Finance Center at UNC
NC State University
University of North Carolina at Chapel Hill
UNC Policy Collaboratory

JLOW meetings are open to all stakeholders in the watershed and participation continues to grow at each gathering

Municipalities in the Jordan Lake Watershed

Apex, *Town (Wake County)*
Burlington, *City (Alamance County)*
Cary, *Town (Wake County)*
Chapel Hill, *Town (Orange County)*
Durham, *City (Durham County)*
Elon, *Town (Alamance County)*
Gibsonville, *Town (Guilford County)*
Graham, *City (Alamance County)*
Green Level, *Town (Alamance County)*
Greensboro, *City (Guilford County)*
Haw River, *Town (Alamance County)*
Hillsborough, *City (Orange County)*
Kernersville, *Town (Forsyth County)*
Mebane, *City (Alamance County)*
Morrisville, *Town (Wake County)*
Oak Ridge, *Town (Guilford County)*
Ossipee, *Town (Alamance County)*
Pittsboro, *Town (Chatham County)*
Pleasant Garden, *Town (Guilford County)*
Raleigh, *City (Wake County)*
Reidsville, *City (Rockingham County)*
Sedalia, *Town (Guilford County)*
Stokesdale, *Town (Guilford County)*
Summerfield, *Town (Guilford County)*
Swepsonville, *Town (Alamance County)*
Whitsett, *Town (Guilford County)*

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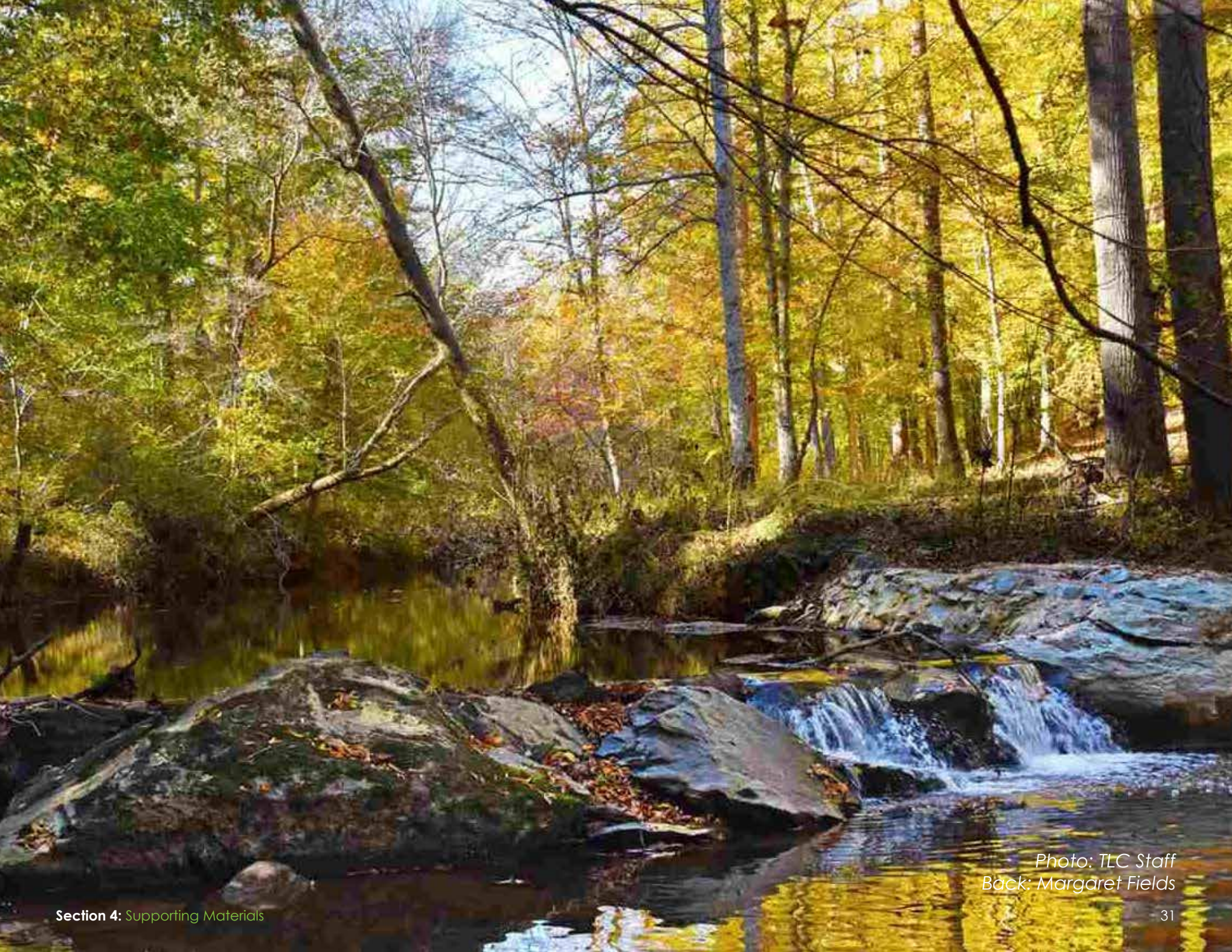

Photo: TLC Staff
Back: Margaret Fields


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