ELKIN & JONESVILLE

WATER SUPPLY PROTECTION PLAN



The Piedmont Triad Regional Council is is working with stakeholders to ensure lon-term ecological health and public use of the the water supply for the Towns of Elkin & Jonesville. While waters in Big Elkin Creek and around the Yadkin River intake are not rated as impaired, both fail to meet their full potential as public and ecological resources, and have opportunities to be restored to greater function as natural and recreational resources.

PIEDMONT TRIAD
REGIONAL COUNCIL

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MANAGEMENT TRUST FUND

Water Supply Protection Plan

Town of Elkin

&

Town of Jonesville

February 2015

PIEDMONT TRIAD REGIONAL COUNCIL

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Table of Contents

Figures & Tables

INTRODUCTION

The value of water as a public utility and resource is becoming more apparent in North Carolina as the state's population grows and affects its natural environment. Clean, safe, and reliable water supplies are vital for communities to grow their populations and economies, and are increasingly being demanded by the private sector and the public. The State of North Carolina has long recognized the value of restoring impaired waters so that they meet such standards, but, recently the NC Clean Water Management Trust Fund (CWMTF) and the NC Division of Water Resources (NC DWR) Drinking Water Protection Program have collaborated to protect public water supplies, regardless of their water quality status. Relying upon a watershed-based perspective over a long timeline, the State is investing resources and support for communities willing to assess the status to their water supplies and any risks that jeopardize a clean and safe status.

The Piedmont Triad Regional Council (PTRC) received a grant from the NC CWMTF in 2013 to proactively plan for long-term water supply protection for both the Towns of Elkin and Jonesville. This *Water Supply Protection Plan* and its recommendations are the result of this twelve-month planning process. This planning effort includes an assessment of historic and current land uses and policies; recommended policies and ordinances that can better protect water quality conditions; and a project atlas that identifies conservation and restoration projects that can best protect water quality conditions for the Towns of Elkin and Jonesville for the foreseeable future.

FIGURE 1: RIPARIAN BUFFER PROTECTION ALONG BIG ELKIN CREEK

SOURCE: JOE MICKEY

The NC Department of Environment and Natural Resources (DENR) DWR Drinking Water Protection Program has an existing Source Water Assessment program that determines potential risks for public water supplies. It was created in response to the Safe Drinking Water Act amendments of 1996 as well as to some protective measures required by the US Environmental Protection Agency (US EPA) (NC DENR 2012). It primarily assesses this risk based upon land use, land coverage, and identification of "potential contaminants", which are defined broadly. They desire more robust protection plans for public water supplies and collaborated with the NC CWMTF on this effort to serve these needs. NCDWR staff has completed source water assessment plans for all public water supplies in the state to satisfy these needs, and assessments for every public water supply were updated in 2015. The DWR has encouraged more detailed source water protection planning such as this effort, but there has been minimal support at the state and federal levels.

This *Water Supply Protection Plan* is designed to update the source water assessments of both Elkin and Jonesville (last done in 2001), characterize and describe potential water supply risks, and develop a plan to protect these water supplies for the foreseeable future with a combination of programs, policies, practices, and partnerships. The Town of Elkin relies on two water supplies: the Big Elkin Creek watershed is a 34-square

mile Class II water supply watershed, and currently rated "Good" for aquatic life by the NC Division of Water Quality; the Yadkin River (hereafter referred to as the "Jonesville Intake watershed" to distinguish it from the Yadkin River) is a 354.5-square mile Class IV water supply watershed (Figure 2) (NCDENR 2007a; NCDENR 2007b). These watersheds are located in a transition zone between the Piedmont and Blue Ridge Mountain ecoregions of North Carolina, and have many steep slopes and an elevation peak of 5,210 feet above sea level. These classes of watersheds refer to their level of protection, as specified by NCDENR to protect drinking water supplies in North Carolina.

Water Supply II (WS-II): Waters used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I classification is not feasible. These waters are also protected for Class C uses. WS-II waters are generally in predominantly undeveloped watersheds. All WS-II waters are HQW by supplemental classification. These watersheds limit developments to one dwelling unit (home) per two acres at <6% of the total area within a half-mile of the water intake and one home per acre at <12% of the total area for the remainder of the watershed. Multi-family units are also permitted, so long as the structures occupy <30% of the parcel, or <24% of the parcel within a half-mile of the intake. New industrial wastewater discharges are also prohibited in these watersheds, and 30 – 100-foot riparian buffers are required.

Water Supply IV (WS-IV): Waters used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I, II or III classification is not feasible. These waters are also protected for Class C uses. WS-IV waters are generally in moderately to highly developed watersheds or Protected Areas. These watersheds limit developments to one dwelling unit (home) per half-acres at <24% of the total area in the watershed. Multi-family units are also permitted, so long as the structures occupy <70% of the parcel. New industrial wastewater discharges are also permitted in these watersheds, and 30 – 100-foot riparian buffers are required (NC DENR 2011).

While the waters that drain to both the Elkin and Jonesville water supply intakes are not rated as impaired, both supplies are failing to meet their full potential as public and ecological resources. This plan identifies opportunities to restore these waters and watersheds to greater function as recreational resources, including paddling, tubing, hiking, and, in the case of Big Elkin Creek, as a trout fishery.

The PTRC approached the needs of the Towns of Elkin and Jonesville with a three-fold approach: relying upon stakeholder input and resources; analyzing local ordinances and policies for water quality protections strengths and weaknesses; and assessing historic and current land uses through written records and GIS tools. GIS can allow users to display multiple pieces of information on one map so their potential relationships can be observed. It can also be used to simplify and improve the management of a watershed, as it was used here to subdivide these two large watersheds into twenty-two smaller subwatersheds that permit higher resolutions of description and analysis (Figure 3). These relationships can be measured and analyzed for their impacts – potential and real – to water quality conditions using a diverse set of tools that are included with the mapping software.

The stakeholder group that guided this planning effort was composed of local environmental and recreation groups, local government staff from both municipalities and counties, and state staff from recreation and environmental agencies (Table 1). The initial stakeholder engagement was at two large meetings, but those proved less productive than hoped. The main topics of discussion (detailed here in individual chapters) require too much detailed discussion from many different stakeholders to attempt to cover them all in one, 3-hour meeting with all stakeholders present. These watersheds feature up to seven separate local governments, let alone the highly-vested environmental, recreation, and regulatory entities. Consequently, three discussion

groups began meeting for an hour or so to have focused conversations on these topics: Agriculture, Forestry, Natural Resources & Recreation, and Watershed Characterization (which includes infrastructure management). The PTRC also dedicated individual staff to each one of these topics to permit stakeholders better access to the project support staff and ensure great attention to detail. These groups met on the same days but at different times. Some stakeholders participated in all of these discussions – many did not. In total, the stakeholders met four times: twice as a large group and twice as smaller topic groups.

This *Plan* is organized to assess the water supply watersheds for both Elkin and Jonesville by examining the four topics that are of highest concern to the stakeholders: agriculture, forestry, natural resources and recreation, and the watersheds' features, which include policies and infrastructure assessments. The PTRC has planned for long-term water resource sustainability by employing tools that represent current, historic, and potential future land uses that are related to the quality of water in both Big Elkin Creek and the Yadkin River and its tributaries that drain to the Town of Jonesville's intake. Recommendations on how to ensure the sustainability of the four topic areas and to serve the water resources' needs are recommended within each chapter and summarized at the end of the *Plan*. This is complemented by a project atlas that details projects that can assist in stabilizing the present watersheds, which are plagued by seasonal but recurring sediment concerns. These projects will both address sites in need of restoration (e.g. streambank stabilization and riparian buffer restoration) and those in need of protection (e.g. pristine forests on steep slopes) that will ensure the long-term health and safety of these waters. The following timeline details the implementation of these policies and projects that have been deemed to best protect the water supplies of the Towns of Elkin and Jonesville.

	Immediate (2015 - 2017)	*Soon (2018 - 2023)*	*Future (2024 - 2029)*	*Long-Term (2030 - 2035)*
	INVEST IN A REGIONAL WATERSHED COORDINATOR TO IMPLEMENT THIS PLAN			
Agriculture	Support voluntary implementation of BMPs by working with counties, municipalities and other organizations to provide match funding for cost-share programs Improve monitoring efforts to identify point sources of agricultural pollution Develop a stewardship recognition program specifically targeting farmers within the Yadkin Valley area Investigate potential manure-to-fertilizer and manure-to-energy options Ensure waste utilization plans are reviewed and kept up to date Ensure farmers have the opportunity to properly dispose of hazardous waste Identify partners and develop programs to support young farmers Consider addressing the previous recommendations through the creation of an agricultural focus group	Improve chicken litter storage facilities Consider implementing a policy preventing industrialized feeding operations within three miles of a natural resource designated area		
Forestry	Adopt NC WRC policies for forestry protection on public lands	Implement VFLEP from Virginia for landowner outreach Regenerate recently harvested lands		
Natural Resources	Apply for a Partners in Green Growth grant for applying the GGT to local ordinances Create more fishing sites	Stock more streams with trout Invest in trails Create ordinances and bond referenda to preserve open space		
Restoration Projects	Conduct outreach to all landowners included in the project atlas to determine best opportunities Seek grant funds for design and construction of stream restoration and stormwater retrofit projects	Implement Restoration Projects 1 - 4	Implement Restoration Projects 5 - 8	Implement Restoration Projects 9 - 12 Implement Restoration Projects 12 - 16
Conservation Projects	Conduct outreach to all landowners included in the project atlas to determine best opportunities Seek grant funds for design and construction of stream restoration and stormwater retrofit projects	Implement Conservation Projects 1 - 4	Implement Conservation Projects 5 - 8	Implement Conservation Projects 9 - 12 Implement Conservation Projects 12 - 15

FIGURE 2: ELKIN & JONESVILLE WATER SUPPLY PROTECTION PLAN IMPLEMENTATION TIMELINE

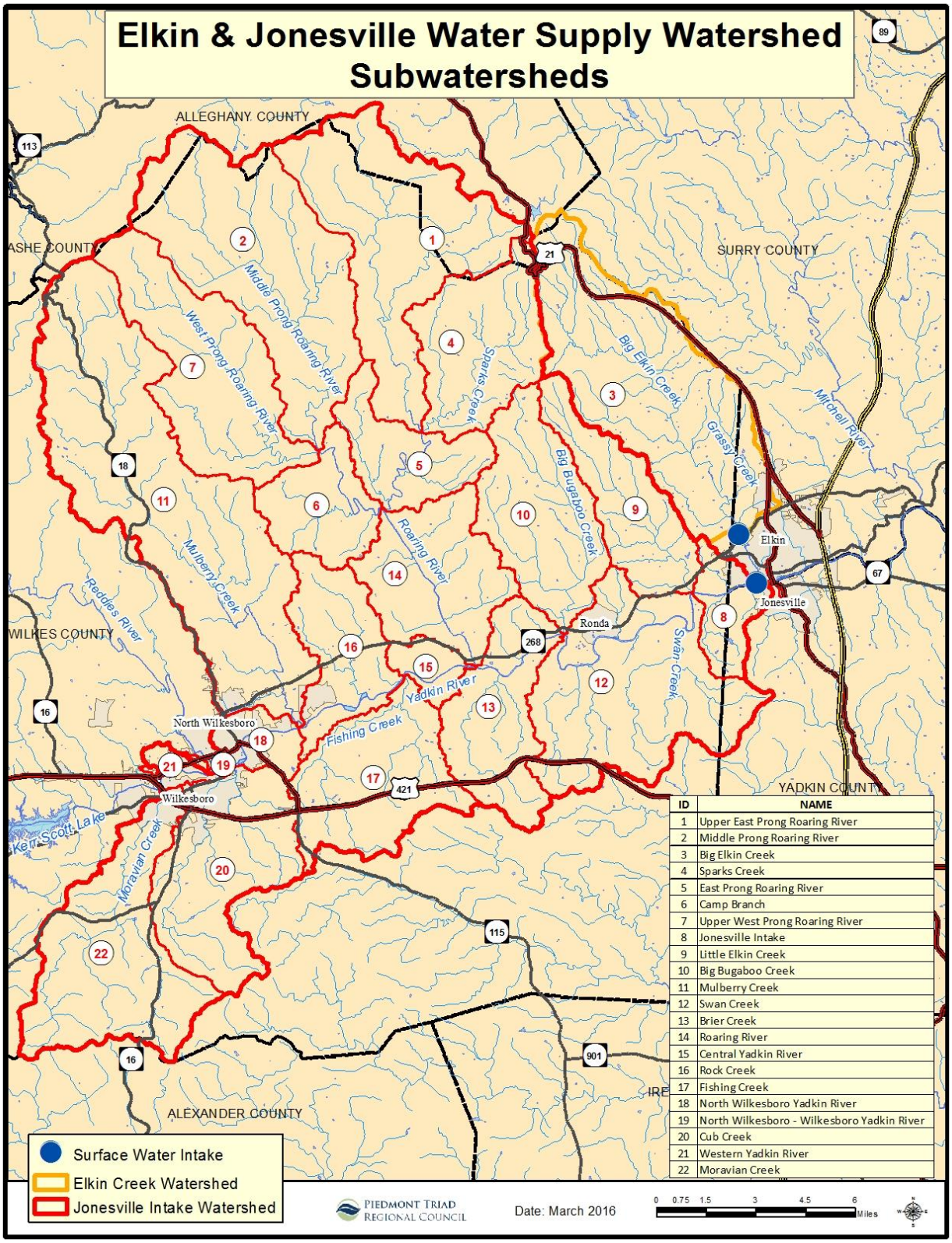


FIGURE 3: PTRC 2014

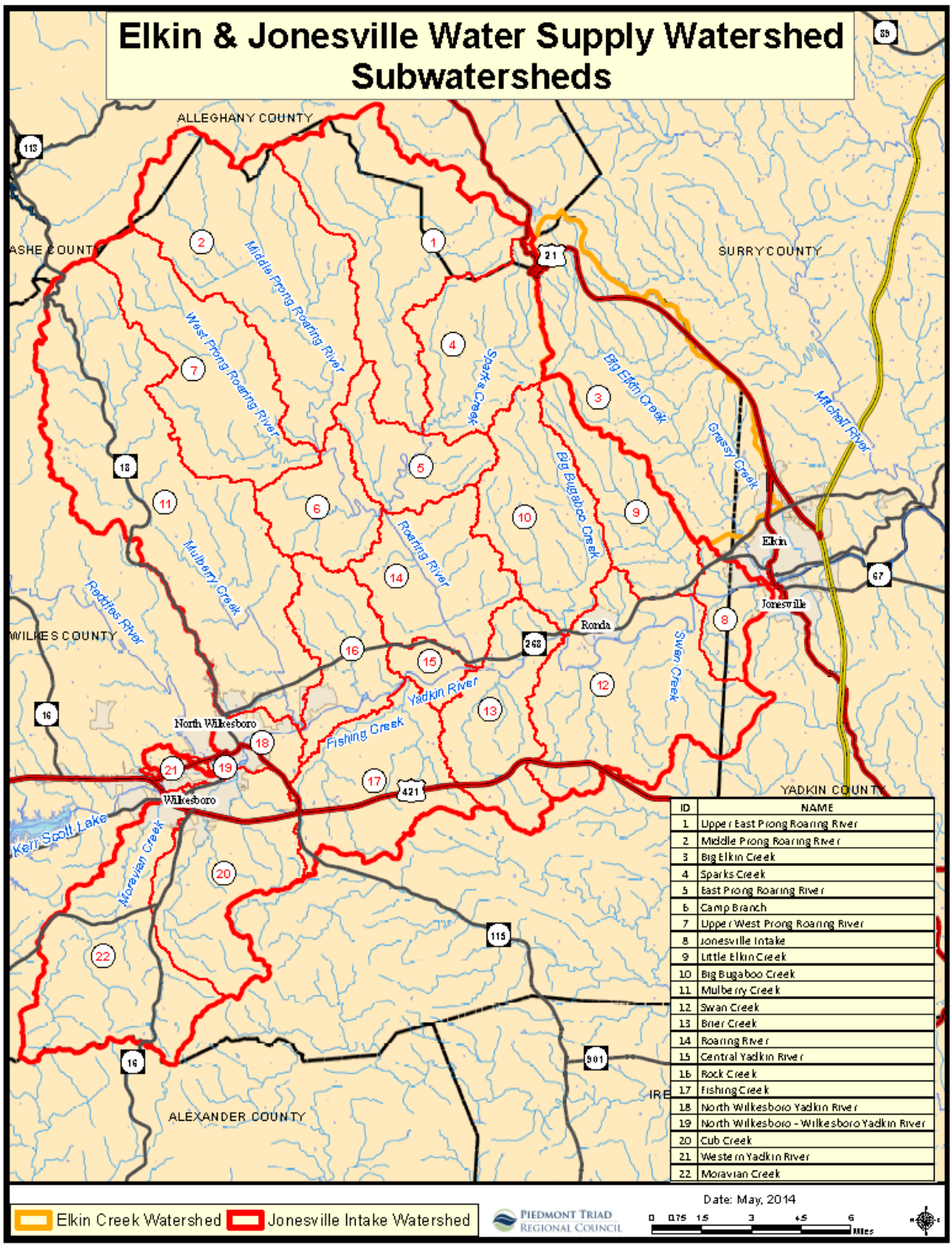


FIGURE 4: PTRC 2014

TABLE 1

Elkin & Jonesville Source Water Protection Stakeholders	
Name	Entity
Eddie Barnes	Wilkes County, Planning Department
Bill Blackley	Elkin Valley Trails Association
Scott Buffkin	Town of Jonesville, Manager
Leigh Calloway	Yadkin County, Soil & Water Conservation District
Duncan Cavanaugh	High Country Council of Governments
Colleen Church	Yadkin County, Cooperative Extension Service
Kacy Cook	NC Wildlife Resources Commission
Mark Fowlkes	NC Wildlife Resources Commission
Nathan Gatlin	NC Forest Service
Bill Hainlin	Wilkes County, Cooperative Extension Service
Andrea Leslie	NC Natural Heritage Program
Adam McComb	Town of Elkin, Parks & Recreation Department
Joe Mickey	Elkin Valley Trails Association
Dean Naujoks	Yadkin Riverkeeper
Mike Pardue	Wilkes County, Soil & Water Conservation District
Michael Poston	Yadkin County, Planning Department
Rebecca Sadosky	NC Division of Water Resources, Source Water Protection Unit
Bryan Tompkins	US Fish & Wildlife
Jason Walker	Yadkin County, Soil & Water Conservation District

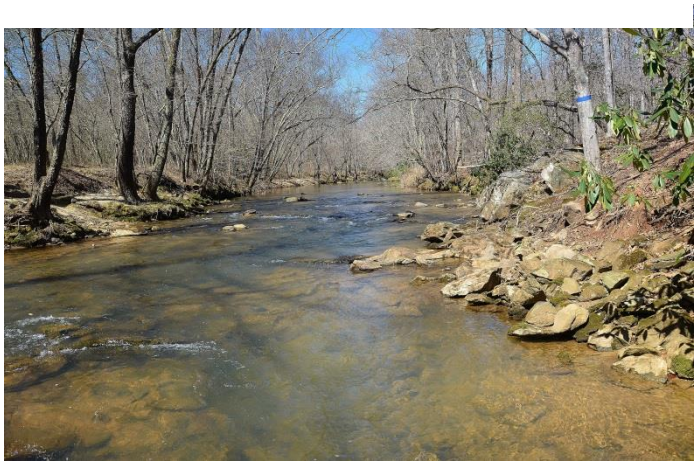
WATERSHED CONDITIONS

Background

Water Quality

Both the Yadkin River and Big Elkin Creek are rated "Good" or "Good-Fair" for fish community and benthic macroinvertebrates through 2012 (NCDENR 2012). These ratings reflect determinations made by NC DWR staff scientists who took field samples and judged them against reference streams that are rated "Excellent." The chemical data for both waters are similar, though there are seasonal peaks in sediment levels (NCDENR 2007). These reflect assertions by all stakeholders that high sediment levels plague both waters in the late winter through summer. However, both waters remain rated as "Good" for chemical parameters and are supportive of their current ecological and human uses, as determined by the NC DWR. However, the NC DWR does not consider either water body as being used for "primary recreation" (swimming, wading, etc.) or trout habitat. The Roaring River – one of the most significant tributaries in the Jonesville Intake watershed – is rated for primary recreation by NC DENR (NC DENR 2014).

FIGURE 5: ELKIN CREEK MARCH 2013



SOURCE: JOE MICKEY

The Upper Yadkin River Subbasin does not have many water quality monitoring sites for either chemical or biological parameters. The chemical water quality data collected has mostly been done by the Towns of Elkin, Jonesville, and Wilkesboro to satisfy their monitoring requirements under the National Pollutant Discharge Elimination System (NPDES) that regulates wastewater and stormwater discharges. The biological data is collected only at three (3) stations over nearly 400-square miles. The Jonesville Intake watershed in particular has very little data to characterize the health of its waters other than that collected for NDPES purposes by the local dischargers like Louisiana Pacific. Significant water systems like Roaring River and Swain Creek have never been monitored by regulatory staff. NC DWR currently does not utilize data collected and submitted by citizen groups for guidance or use support decision making.

The NC DWR Source Water Protection Unit has developed a comprehensive list of potential water contaminants for the entire state. These include highly regulated sources such as wastewater treatment plants, legacy sources of pollution like Superfund sites that were regulated after they were identified, and sites such as underground storage sites that are inspected less than once a year (Figure 3). These potential contaminant sites are a key input to DWR's Source Water Assessment Plans (SWAPs) that are currently used to assess the current risks to water supplies (NC DENR 1999).

The project stakeholders have noted the risk of these irregularly monitored and poorly characterized buried waste sites. When working with the NC Wildlife Resources Commission (NC WRC), Joe Mickey was called to a NC Department of Transportation construction project where forty-year old oil drums had been uncovered and were leaking into the trout waters of the East Prong of the Roaring River. This surprising find led to a $120,000 grant that then required Wilkes County to clean up the polluted soils (*personal communication with Joe Mickey; see 04/29/14 meeting minutes*). Based upon the available data collected by and reported to

DWR, these potential sites do not appear to be having an adverse effect on water quality conditions in either the Big Elkin Creek or Jonesville Intake watersheds. Without further water quality monitoring data in the watershed, though, it is impossible to know if this is accurate for much of the Jonesville Intake watershed.

It should be noted that these healthy water quality conditions can only be stated confidently for the water quality parameters regularly monitored and reported to and by the NC DWR. There are many other organic and inorganic agents like flame retardants or lead that are currently not monitored by the State of North Carolina. Metals have historically been monitored, but have not been since 2007 (NCDENR 2007c). Without these records, it is impossible and irresponsible to conclude whether these two drinking water sources are impacted by these potential contaminant sources.

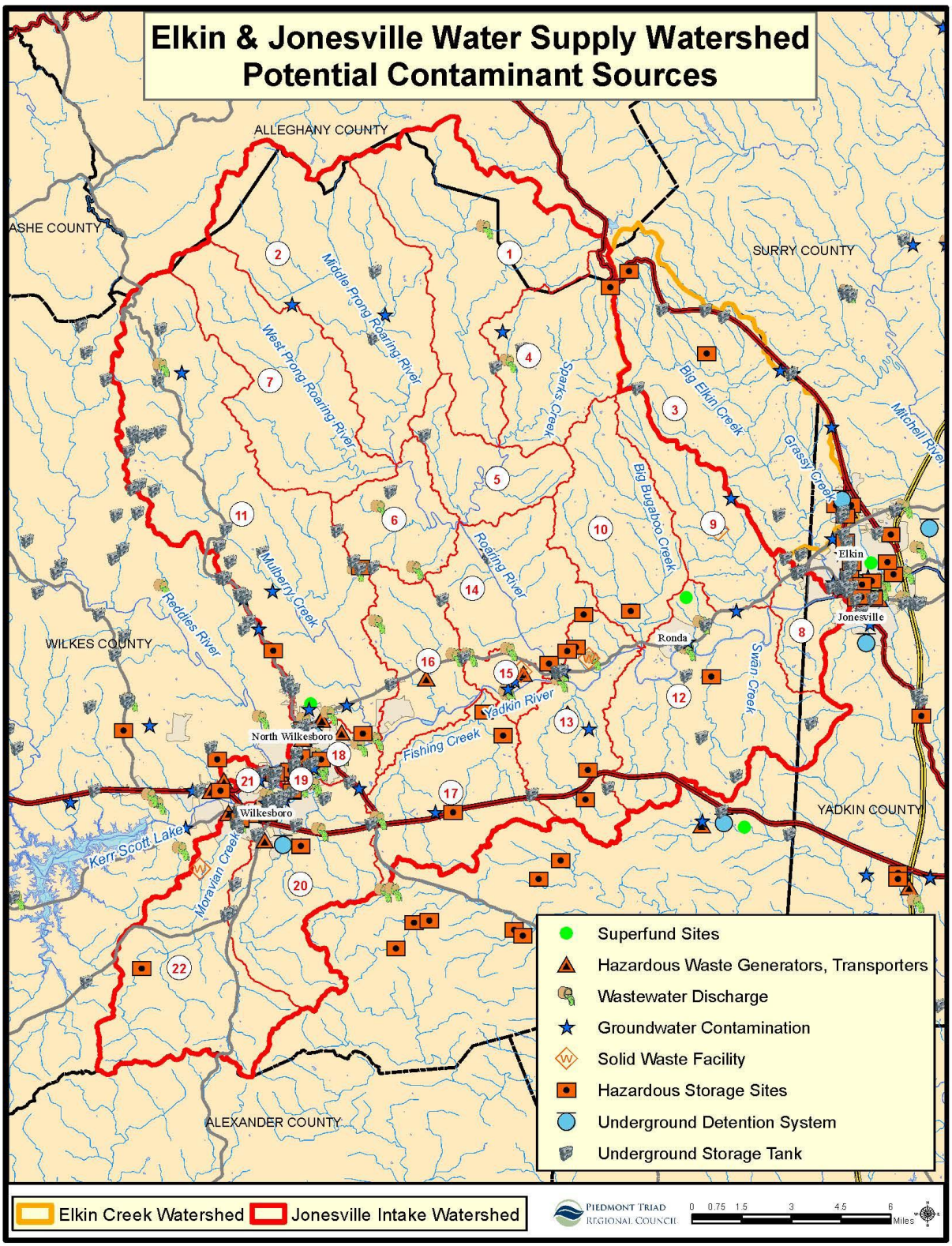


FIGURE 6: PTRC 2014

Yadkin River Study on the Impacts of Chicken Litter

The Yadkin Riverkeeper has invested significant time and resources to assessing the impacts of poultry operations upon local water quality conditions. As detailed in the Agriculture chapter, it is estimated that the dense presence of poultry operations in Wilkes County are not a significant risk to the water quality conditions of both watersheds though they likely are having impacts upon High Rock Lake due to high nutrient levels. Aerial assessments of the watersheds shows that several of these poultry operations also are not maintaining riparian buffers, directly exposing the local streams to the chicken litter as well as any other sediment sources that run from these facilities (*personal communication with Justin Quinlivan; see 04/29/14 meeting minutes*). Even considering the documentation of improper storage of litter piles, Dr. Shea Tuberty's laboratory at Appalachian State University has shown that the Yadkin River's assimilative capacity renders metals and other pollutants in the litter a non-risk for ecological and human health purposes (Pack 2009). Restoration of buffers would assist in addressing the local sediment reduction needs of these watersheds as well as the much larger nutrient reduction needs of High Rock Lake, which both of these watersheds drain to and is undergoing a nutrient management strategy development process to address its eutrophication issues.

Dr. Tuberty's work also shows a separate disturbing trend in how chicken litter is used as a fertilizer in Wilkes County. Poultry litter is a potent agricultural fertilizer that is rich in both nitrogen, potassium, and, especially, phosphorous. In order to be cost-effective, the litter must be applied within a 100 square mile local area. With 669,236 tons of litter possibly being produced in these watersheds, it leads to over-application of the litter on farmlands. While a rich source of nitrogen, the extremely high phosphorous levels of the litter will effectively strip the soils of other necessary minerals and nutrients in a short amount of time, rendering them unproductive for most crops. Dr. Tuberty has determined that, at current application rates, this watershed's farmlands could be stripped of their productive potential within the next forty years (Brower 2013). As unproductive farmland, these areas will either be biologically-poor ecosystems or developed into residential areas, adding to the watersheds' stormwater burdens. They could also be developed into tobacco farms, which generally do not use low- or no-till farming practices and often produce large amounts of sediment. Tobacco farms appear to be having significant impacts upon the Big Elkin Creek reservoir as an affordable water supply.

High Country Water Quality Initiative

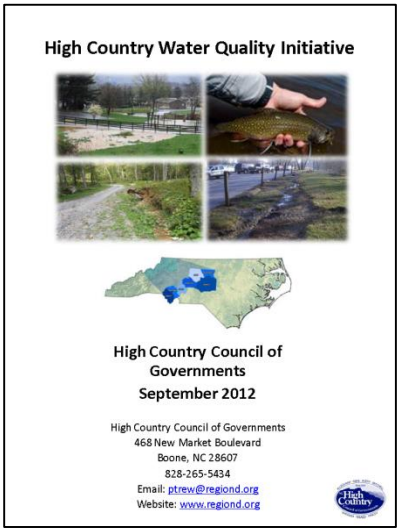


FIGURE 7: HIGH COUNTRY COG, 2012

The High Country Council of Governments (HCCOG) published the *High Country Water Quality Initiative* in 2012, in an effort to identify sites in all of their seven-county regions' communities that could be retrofitted to improve local and regional water quality conditions (Figure 4). HCCOG recognized the need to address non-point sources of water pollution through local stormwater controls, despite few municipalities having NPDES Phase II stormwater regulations. A key motivation for this planning effort was economic development, both in regard to protecting natural and recreational resources and safe and plentiful water supplies. Through this robust community outreach and planning effort, they worked with Wilkes County, Ronda, and Wilkesboro to identify one site in each community – though Wilkesboro has two – and catalogue them in a report. All of these sites have modeled load reductions for the proposed projects to determine their added value for water quality conditions. They all drain to the

Jonesville Intake on the Yadkin River and will be featured in this *Plan*'s Project Atlas. Their individual pollutant load reductions, including sediment, are provided.

Elkin

The Town of Elkin, NC, has two water supplies: a primary water supply in an impoundment on Big Elkin Creek and emergency water supply intake on the Yadkin River across the river from the Town of Jonesville. The Big Elkin Creek watershed is 34.5 square miles in area, with predominantly rural residential and agricultural land uses (Figure 5). Big Elkin Creek is generally a third- or fourth-order stream that runs in a moderately southwestern direction that has no significant named tributaries. It extends from the Town of Elkin's reservoir nearly to Stone Mountain State Park to the north. Big Elkin Creek reaches the Yadkin River at the Route 268 bridge in downtown Elkin. However, the creek is impounded at the town's reservoir, and for the purposes of this source water protection plan, the more urbanized landscape downstream of the reservoir will not be considered. Elkin's emergency water supply intake effectively has the same watershed as the Town of Jonesville's intake on the Yadkin River, which is described in detail below. The town also shares an interconnection with the Town of Jonesville, NC, for emergency conditions such as drought. This interconnection was a joint effort between the two municipalities costing over $1 million (*personal communication with Robert Fuller, Director of Public Works, Town of Elkin*).

The watershed provides over $3 million in annual ecosystem services, according to the Trust for Public Land (Table 2). These values are largely derived from the watershed's forests, which cover about half of this watershed and stabilize soils, add to local property values, provide habitat for many plants and animals (including game), and provide water filtration. The few wetlands and open waters – especially the town's reservoir – provide disproportionate values for the small areas they occupy in this watershed (Figure 6).

Elkin Creek

VALUE	CLASS	ACRES	PERCENTAGE	Annual Value Per Acre (1)	Annual Value
11	Open Water	29.36	0.13%	$224	$6,575.74
21	Developed, Open Space	1,736.23	7.88%	$0	$0.00
22	Developed, Low Intensity	171.47	0.78%	$0	$0.00
23	Developed, Medium Intensity	78.95	0.36%	$0	$0.00
24	Developed, High Intensity	32.25	0.15%	$0	$0.00
31	Barren Land	1.78	0.01%	$0	$0.00
41	Deciduous Forest	8,881.08	40.29%	$300	$2,664,324.04
42	Evergreen Forest	829.53	3.76%	$300	$248,858.83
43	Mixed Forest	1,360.61	6.17%	$300	$408,181.86
52	Shrub/Scrub	723.45	3.28%	$5	$3,617.24
71	Herbaceous	527.52	2.39%	$5	$2,637.59
81	Hay/Pasture	7,626.33	34.60%	$5	$38,131.67
82	Cultivated Crops	41.14	0.19%	$5	$205.71
90	Woody Wetlands	2.22	0.01%	$1,150	$2,557.53
95	Emergent Herbaceous Wetlands	0.00	0.00%	$1,150	$0.00
		22,041.91			**$3,375,090.23**

TABLE 2: THE TRUST FOR PUBLIC LAND: CONSERVATION ECONOMICS, NORTH CAROLINA'S RETURN ON THE INVESTMENT IN LAND CONSERVATION, EXHIBIT A-1, PAGE 29

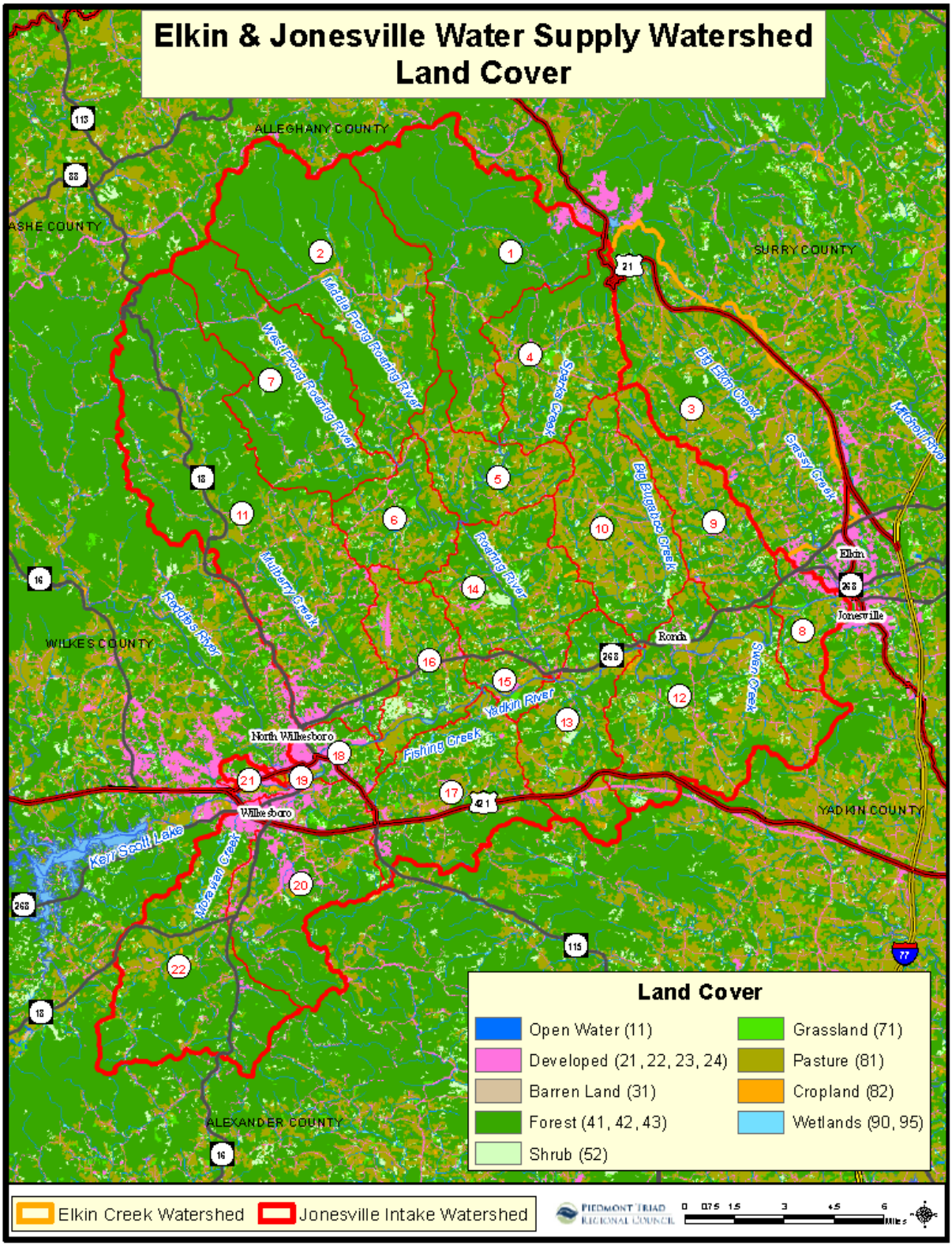


FIGURE 8: NLCD 2006

FIGURE 9: BIG ELKIN CREEK, FEBRUARY 2014,

SOURCE: JOE MICKEY

The Big Elkin Creek watershed is somewhat naturally unstable due to moderately erodible soils on stream banks, a high density of Group C soils, and steep slopes (Figures 7 – 10). There are periodic high elevations in the watershed that descend quickly to streams, especially in the headwaters near Stone Mountain State Park. This landscape largely serves agricultural purposes, some which can have high impacts on water quality conditions, especially if riparian buffers are not maintained along streams. In particular, tobacco farming appears to be contributing significant amounts of sediment to Big Elkin Creek and its tributaries every year.

Like many Piedmont Triad communities, the Town of Elkin has a history as a textile mill town. These communities focused their economies on the mill(s), which are almost always along major water features so that they can use them for power generation and/or wastewater discharge. Many of the residences are clustered around these mills for walkable access. A compact, efficient downtown or uptown commercial district is often the urban core of these former industrial communities. The effect of this pattern of development has been to focus impervious cover in the commercial and industrial sectors of town and creating residential districts that meet many of the desired needs of Americans: a single-family home on a ¼ - ½-acre grassed lawn with easy access to major roads. The legacy of this development pattern focuses stormwater and brownfield sites while also creating homes that have a relatively low stormwater impact. In Elkin, many of these areas are downstream of the reservoir. The other legacy of many of these mill towns is an infrastructure that has not been maintained in decades, especially once the industries left and the local tax base dried up.

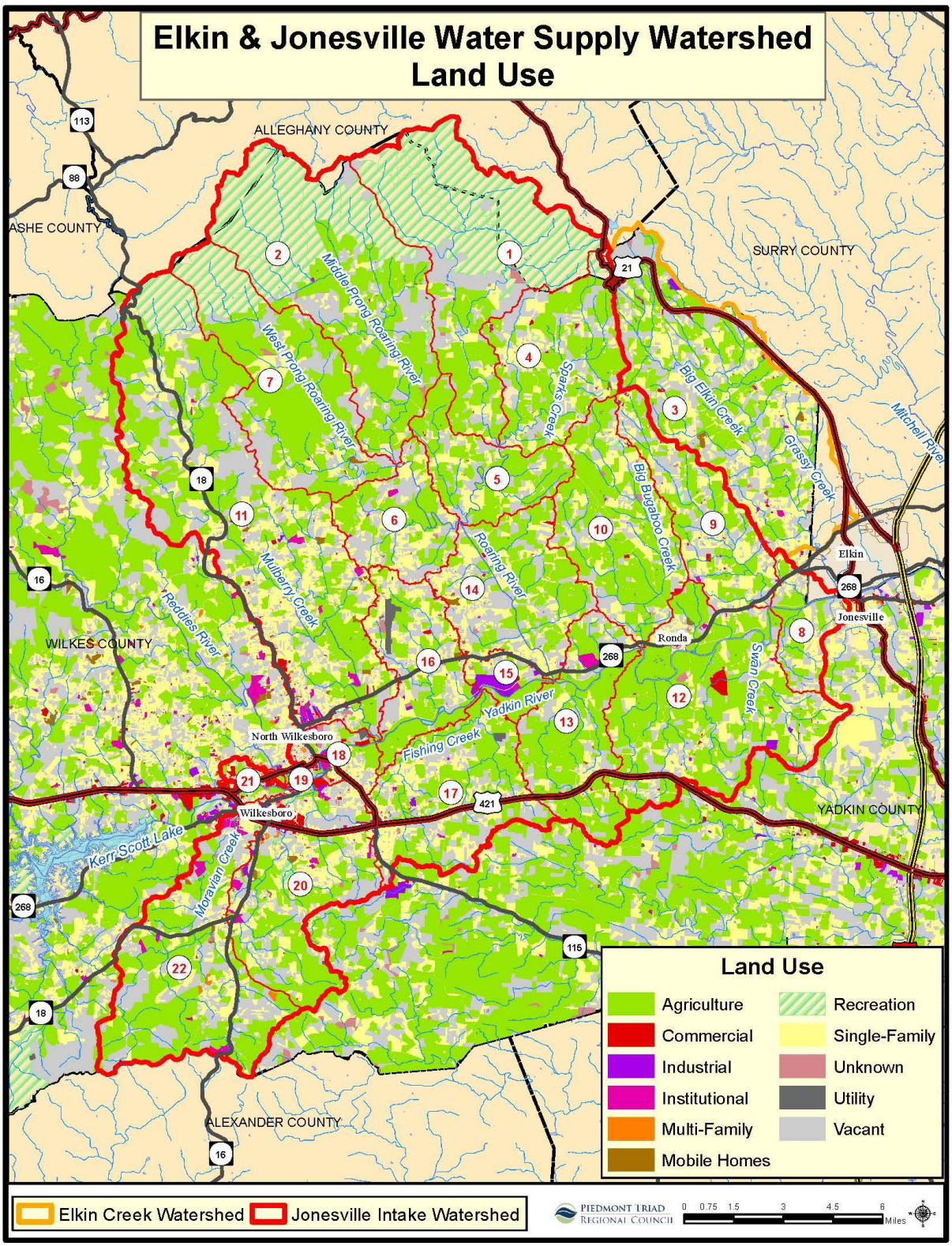


FIGURE 10: PTRC 2014

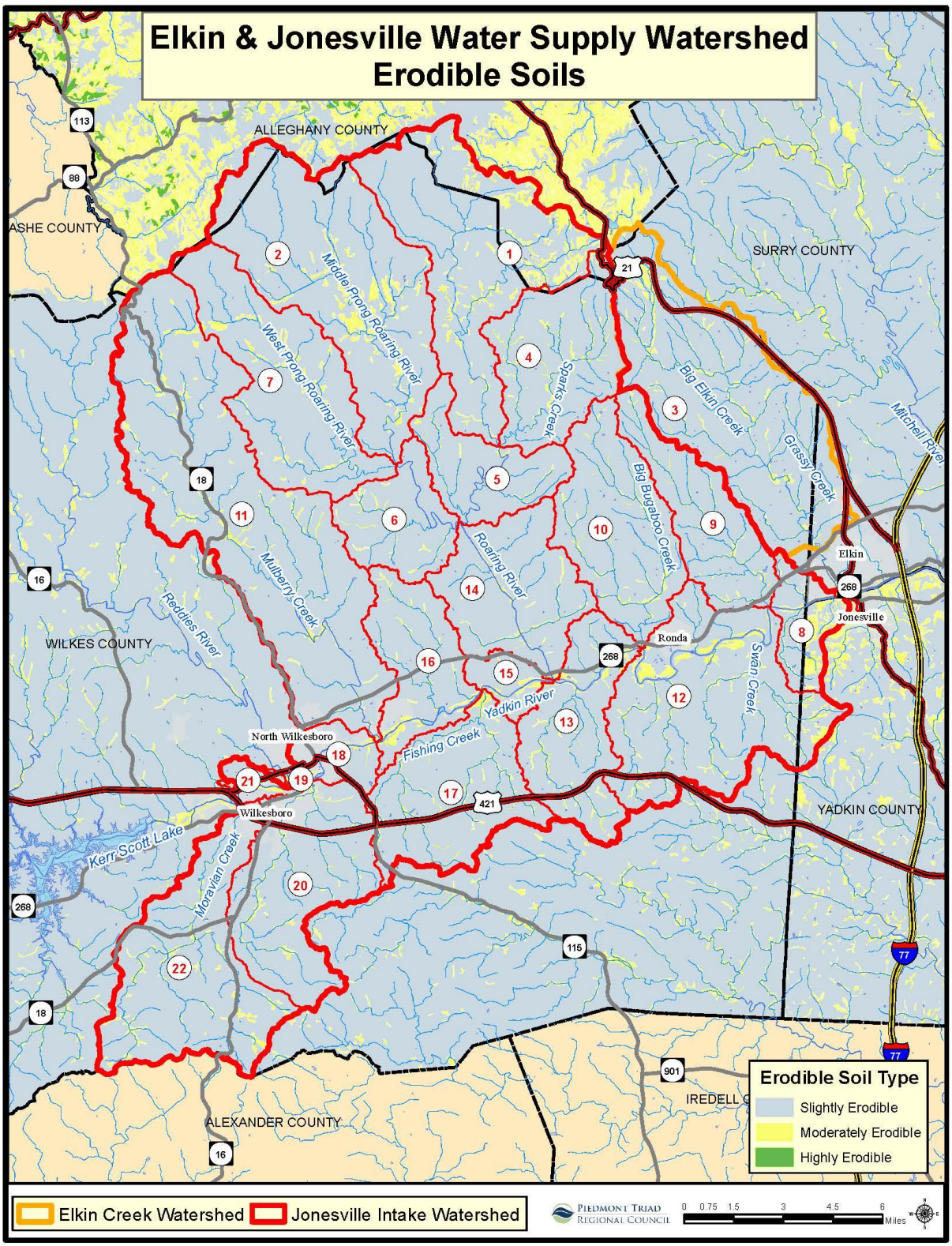


FIGURE 11: PTRC 2014

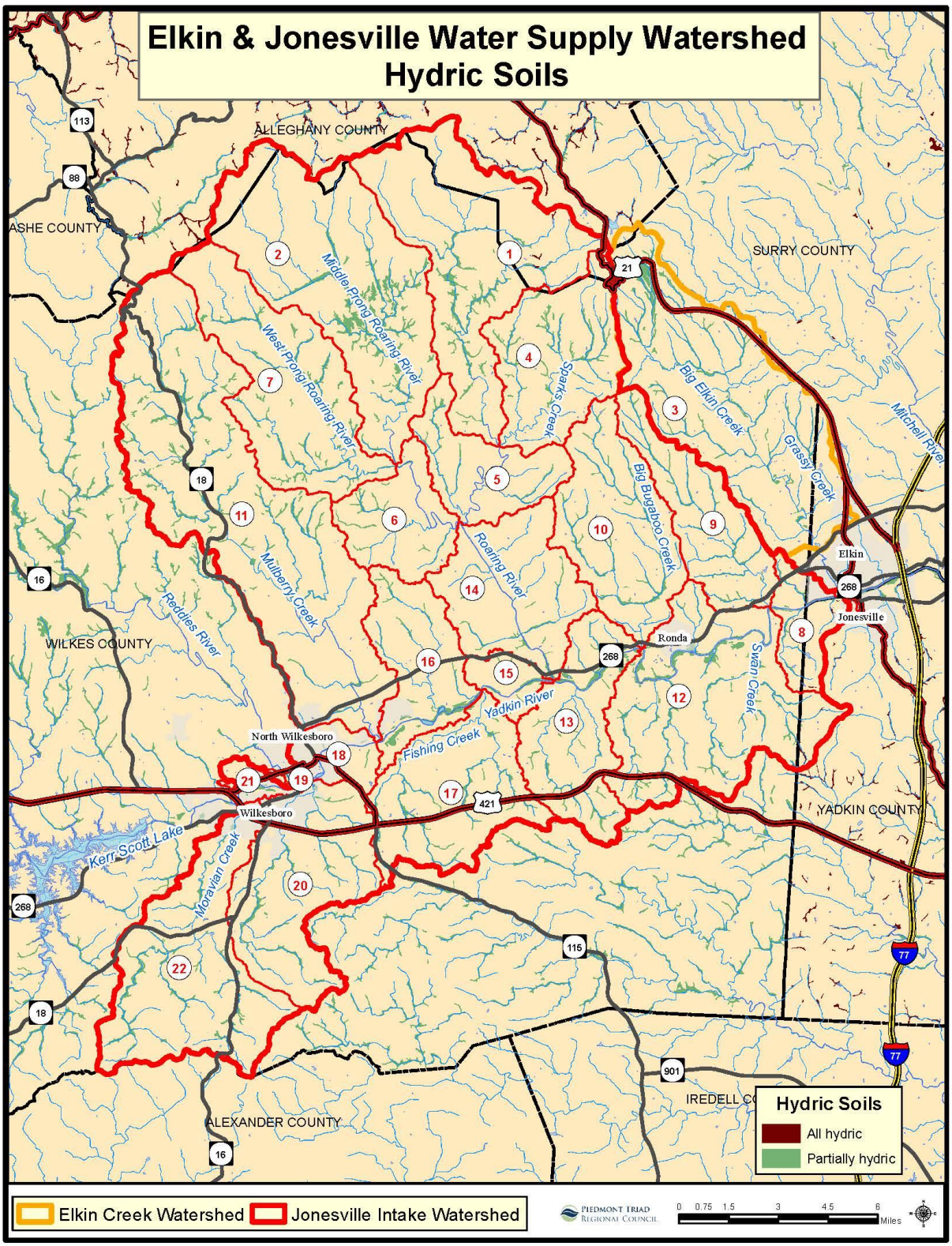


FIGURE 12: PTRC 2014

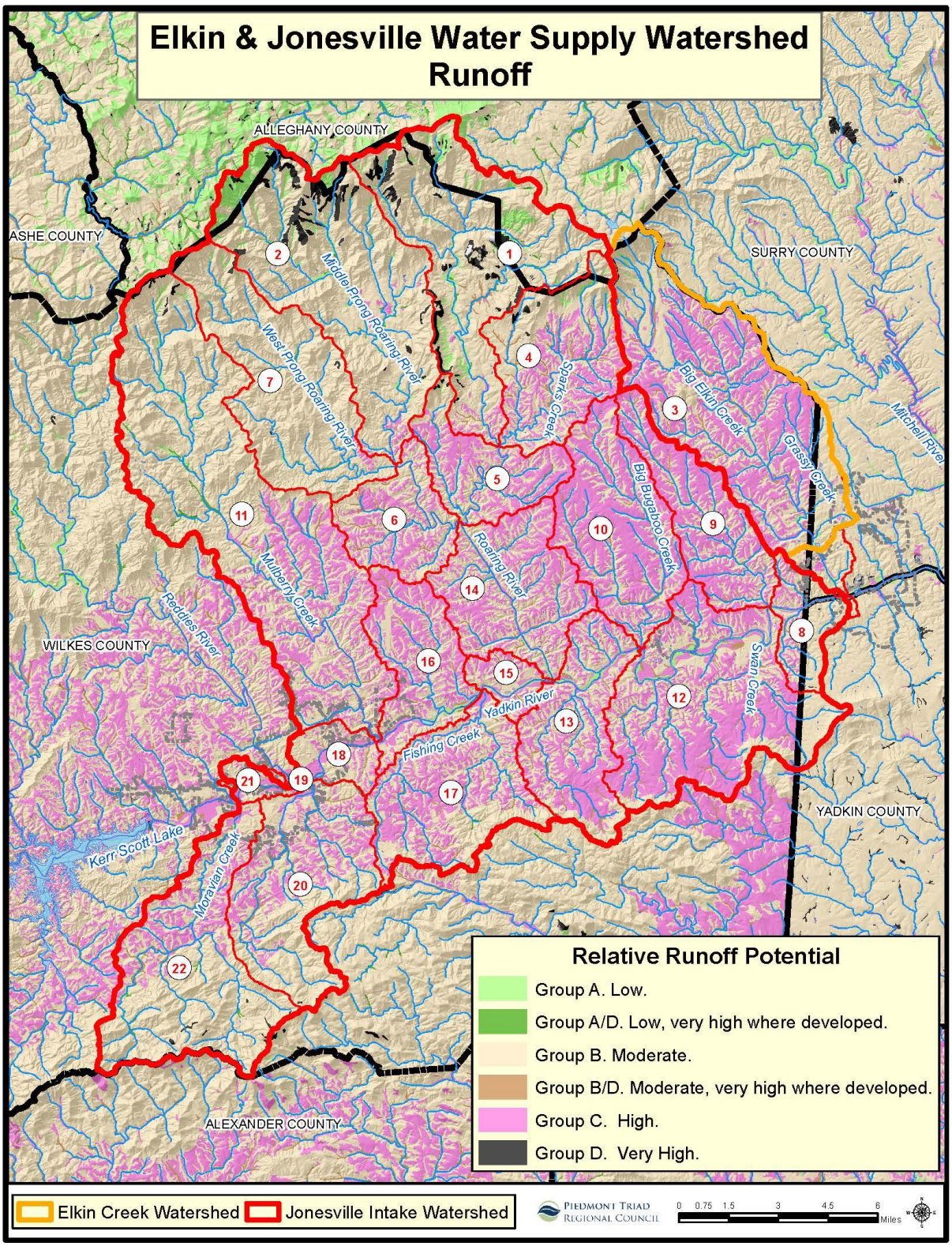


FIGURE 13: PTRC 2014

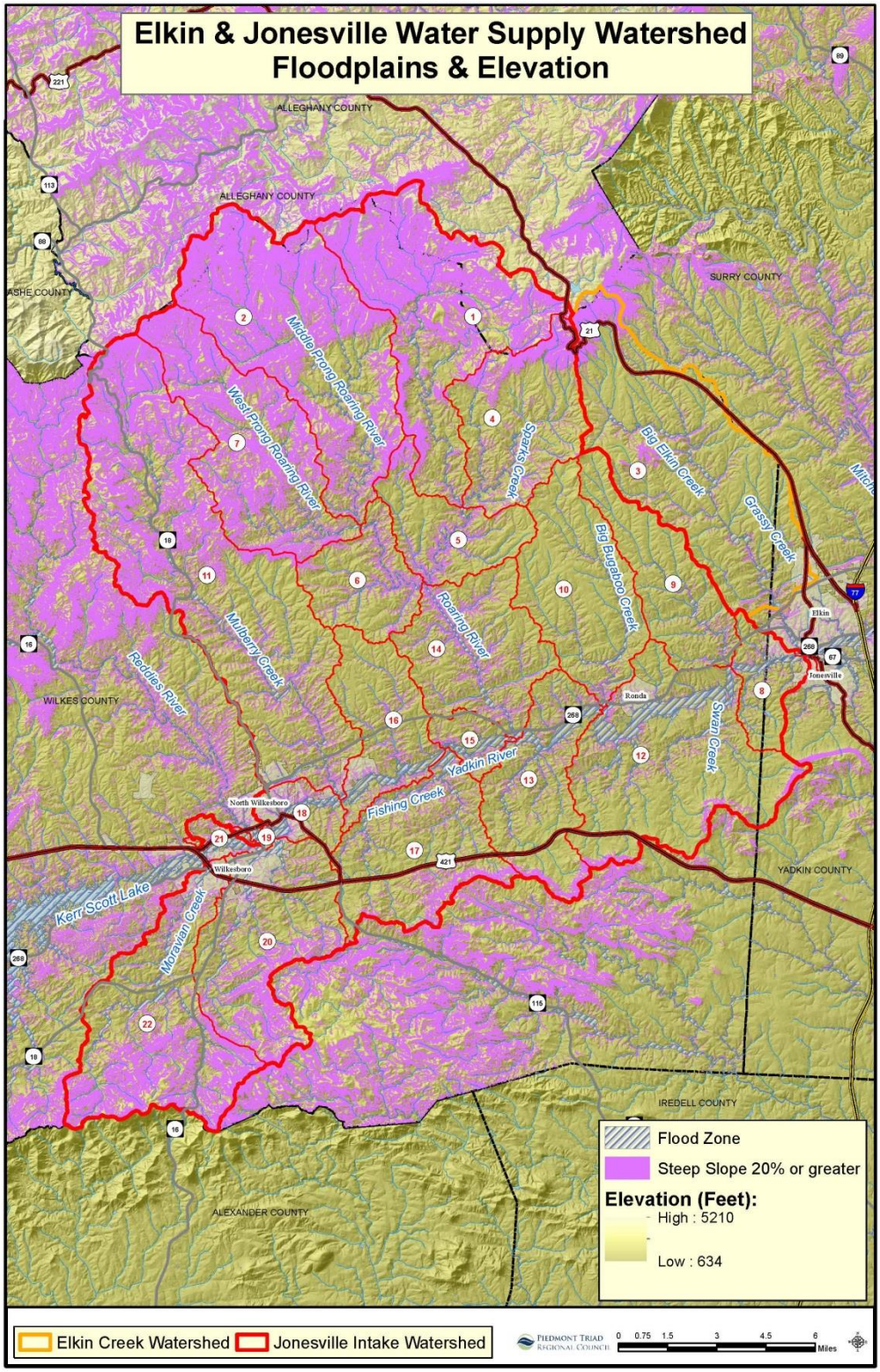


FIGURE 14: PTRC 2014

Jonesville

The Town of Jonesville's water supply watershed drains 354.5 square mile of the Upper Yadkin River Subbasin between the Town of Wilkesboro and Jonesville. This watershed is literally ten times the area of Elkin's primary watershed, presenting many more potential risks and management challenges to ensure the long-term sustainability and health of the Town's public water supply. Nearly all this watershed lies under the jurisdiction of Wilkes County, Wilkesboro, North Wilkesboro, and Ronda (Figure 5). In order to protect its water supply, the Town of Jonesville must coordinate with these other communities and develop interjurisdictional relationships that will protect its water supply. The Town of Elkin has a stake in these management strategies as well, as it has an interconnection with Jonesville to provide it with water in emergency situations such as drought. Jonesville's secondary water supplies come from two sources: if there is a problem with their primary treatment technologies, they have direct intake from the Yadkin River to their water treatment plant in addition to an interconnection with the Town of Elkin, which can provide them with treated water from the reservoir on Big Elkin Creek.

TABLE 3: THE TRUST FOR PUBLIC LAND: CONSERVATION ECONOMICS, NORTH CAROLINA'S RETURN ON THE INVESTMENT IN LAND CONSERVATION, EXHIBIT A-1, PAGE 29

Yadkin River (Jonesville)

VALUE	CLASS	ACRES	PERCENTAGE	Annual Value Per Acre (1)	Annual Value
11	Open Water	400.98	0.18%	$224	$89,818.69
21	Developed, Open Space	11,593.40	5.11%	$0	$0.00
22	Developed, Low Intensity	3,174.90	1.40%	$0	$0.00
23	Developed, Medium Intensity	1,175.35	0.52%	$0	$0.00
24	Developed, High Intensity	323.36	0.14%	$0	$0.00
31	Barren Land	58.71	0.03%	$0	$0.00
41	Deciduous Forest	121,087.73	53.38%	$300	$36,326,317.67
42	Evergreen Forest	11,603.18	5.12%	$300	$3,480,954.64
43	Mixed Forest	14,974.90	6.60%	$300	$4,492,469.06
52	Shrub/Scrub	7,929.01	3.50%	$5	$39,645.06
71	Herbaceous	5,258.06	2.32%	$5	$26,290.30
81	Hay/Pasture	48,298.63	21.29%	$5	$241,493.15
82	Cultivated Crops	596.02	0.26%	$5	$2,980.08
90	Woody Wetlands	340.04	0.15%	$1,150	$391,046.41
95	Emergent Herbaceous Wetlands	15.79	0.01%	$1,150	$18,158.47
		226,830.05			**$45,109,173.53**

The watershed provides over $45 million in annual ecosystem services, according to the Trust for Public Land (Table 3). These values are largely derived from the watershed's forests, which cover over 60% of this watershed and stabilize soils, add to local property values, provide habitat for many plants and animals (including game), and provide water filtration. Hay and pasture cover another fifth of the watershed, providing some soil stability and absorbing runoff from surrounding impervious surfaces and steep slopes. They also can be groundfowl habitat that gamesmen find highly valuable. The 350 acres of wetlands provide

disproportionate values for the small areas they occupy in this watershed and should be prioritized for permanent protections by the local governments and conservation groups (Figure 6).

The Jonesville Intake watershed is somewhat naturally unstable due to moderately erodible soils on stream banks, a high density of Group C soils, some highly-impervious Group D soils, and steep slopes (Figures 6 – 9). Given these conditions and the high potential for natural surface runoff, the stability and health of these subwatersheds and streams are remarkable. There are periodic high elevations in the watershed that descend quickly to streams, especially in the headwaters near Stone Mountain State Park and to the south of Wilkesboro. This landscape largely serves agricultural purposes, some which can have high impacts on water quality conditions, especially if riparian buffers are not maintained along streams. In particular, tobacco farming and improper forestry practices appear to be contributing significant amounts of sediment to Mulberry Creek and its tributaries every year (Figures 10 & 14). Furthermore, the Town of Wilkesboro directly discharges to the Yadkin River, granting it great responsibility as a water quality steward. As detailed below, this discharge has been carefully managed to protect water quality conditions on the Yadkin River.

FIGURE 15: RUNOFF UPSTREAM & DOWNSTREAM OF A TOBACCO FARM, SURRY COUNTY. PHOTO COURTESY OF JOE MICKEY, 2014.

The Town of Jonesville has a history as a Piedmont Triad mill town, with infrastructure focused on supplying its former industries and current residents with water. These communities focused their economies on the mill(s), which are almost always along major water features so that they can use them for power generation and/or wastewater discharge. Many of the residences are clustered around these mills for walkable access. A compact, efficient downtown or uptown commercial district is often the urban core of these former industrial communities. The effect of this pattern of development has been to focus impervious cover in the commercial and industrial sectors of town and creating residential districts that meet many of the desired needs of Americans: a single-family home on a ¼ - ½-acre grassed lawn with easy access to major roads. Much of this area is downstream of Jonesville's water intake.

As it has adjusted to a new economy following the globalization of the textile industry and the Great Recession of 2008, the Town of Jonesville is planning on supplying water for new growth. However, the development patterns of the past century have focused impervious cover in the Town's commercial center close to the Yadkin River and not attended to the local water infrastructure. The Town has invested millions of dollars to address these needs and ensure a healthy, safe water supply from the large Yadkin River in the future.

Current Conditions

Elkin

Supply & Demand

Big Elkin Creek provides the Town of Elkin with 3 million gallons a day (MGD) of drinking water. Its daily average demand, however, is 0.8 MGD. This includes providing some areas of Wilkes County – especially the Pleasant Hill community – and the Town of Ronda with water. The town's large excess capacity is mostly due to the loss of manufacturing facilities since the water treatment system was originally constructed. The Town currently has two (2) significant industrial users; its primary customer is residential. The Town provides all 4,118 people living there with water through fifty (50) miles of pipe (*personal communication with Robert Fuller, Public Works Director, Town of Elkin*).

The Town of Elkin is recovering from the effects of the recession following the globalization of industry and the Great Recession of 2008. According to the 2010 US Census, Elkin had an unemployment rate of 11.4% and a poverty rate of 11.3%, both higher than state and federal averages but lower than some of its neighbors (U.S. Census Bureau 2013). Surry County was recently rated as a Tier 1 county by the NC Department of Commerce (DOC), meaning that it is among the forty most economically-distressed counties in the state. Its 2010 unemployment rate was 9.5% and its poverty rate was 18.3%, when the county was rated a Tier 2 county by the NC DOC (NC DOC 2014, U.S. Census Bureau 2013).

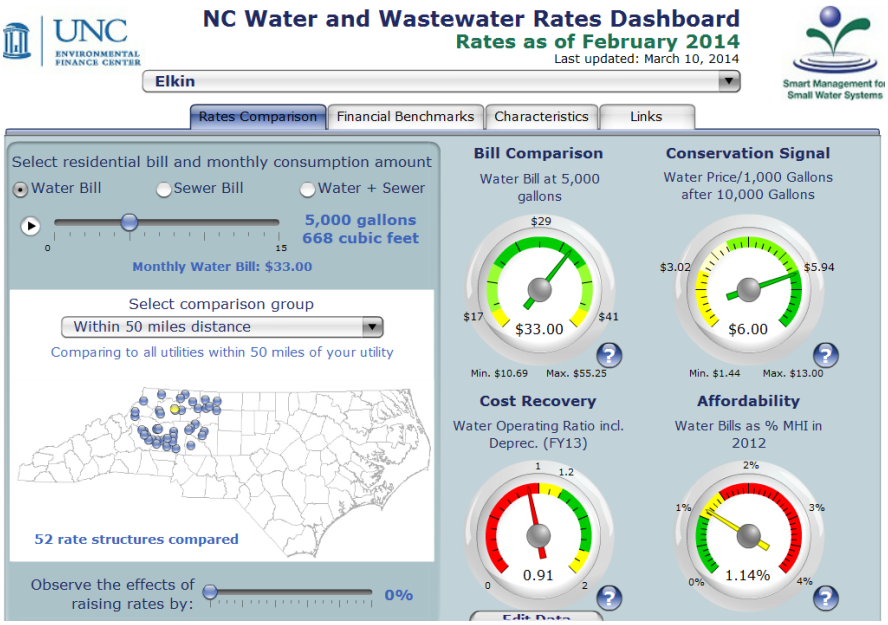


FIGURE 16: ELKIN'S WATER RATE PROFILE, UNC ENVIRONMENTAL FINANCE CENTER, MARCH 2014

The Town of Elkin water utility is currently debt free, having raised monthly residential and commercial rates significantly over the past few years, from $3.50 to $6 per thousand gallons for residents and from $10 to $15 per thousand gallons for businesses (*personal communication with Robert Fuller, Public Works Director, Town of Elkin*). However, the Town of Elkin is currently operating its utility in an uncomfortable position: it has an operating ratio of 0.91 (it is slightly losing money) and its rates are approaching unaffordability for those on fixed incomes (Figure 15) (UNC EFC 2014). Its residential and commercial rates are comparable to other

public water utilities in the Foothills/High Country region, but they need to be raised by 15% to meet an operating ratio of 1.

Historic rate increases were necessary for the Town to address enormous water loss rates – documented in 1998 at 88%. Through annual audits from the NC Rural Water Association (NCRWA) and strategic investments such as the installation of electronic water meters, the Town has been able to spend $300,000 to reduce this loss rate to about 30%. For a utility with a total 2013 operating budget of $873,000, these are enormous costs, which were offset in part by a 2002 $500,000 urgent needs grant that required a $50,000 match. They remain dedicated to reducing this loss rate further, continuing their annual audits with the NCRWA and attempting to identify specifically where the leaks persist and originate (*personal communication with Robert Fuller, Public Works Director, Town of Elkin*).

The Town is also investing in a raw water line that will pipe water from the Town's emergency water supply on the Yadkin River to the Big Elkin Creek reservoir rather than directly to its water treatment plant. This $1.2 million project will effectively mix the two water supplies and use the reservoir as a sort of settling pond for the significant sediment found in the Yadkin River. Filtration of this sediment at the water treatment plant is a significant cost and can exhaust machinery quickly. However, it may add to the Town's seasonal utility management stresses to address excess sediment flowing to the reservoir from upstream sources (Figure 8). They are also investing in an elevated storage tank for the Town's West End so that its pump station will not have continuously operate to provide those residents with water as well as the county and Pleasant Hill community residents with water.

Policies

The watershed that drains to Elkin's reservoir lies on the border of Surry and Wilkes Counties, which have similar histories but significantly different policies for land use. Most notably is that Wilkes County has very little land use zoning, considering most proposed uses within the County "by-right" and permissible. Restrictions exist for some land uses, and are relevant for all lands in this plan, as they are overlain with a water supply watershed designation, which places density restrictions on developments and requires mandatory fifty (50) foot riparian buffers along all bodies of water (Wilkes County 2014).

The Creek has historically served as the Town's drinking water supply and is upstream of many of the industries and commercial districts the Town relied upon for its economy. The Town has a *Land Use Plan* that was written in 2000 and addresses a number of long-term sustainability and security concerns for the Town's primary and secondary water supplies. The potential for stormwater impacts to degrade water quality conditions is addressed in its "Growth and Development/Community Identity" policy, which recognizes that "*Careful planning discourages growth at any cost while encouraging quality growth that enhances community character*". It also addresses the environmental and economic impacts of sprawl, encouraging all new residential development to occur where existing infrastructure is already present so that utilities are used and the Town optimizes its return on investment. This same policy encourages the use of "*innovative subdivision and site design that protects sensitive environmental areas…*" This same policy recommended the establishment of housing standards that minimize environmental impacts to local soils, water, and the environment. The *Plan* also advises the creation of a utility extension policy that will allow water and sewer extensions on conditional terms (Town of Elkin 2000).

The Town also has an Environmental Protection policy that "…[p]romote[s] growth that respects and accommodates environmental limitations for development." Water quality conditions are clearly a priority in this section of the *Land Use Plan*, with two of the three reasons for protecting the environment in Elkin being the

prevention of floods and the threats to "…*important public resources such as water supplies and the water quality of lakes and rivers.*" This is further addressed in its Natural Features section, where it identifies soil species, steep slopes, and water supply watersheds as being the least appropriate areas of the Town for development. The focus on soils is less on their erodibility and more on their suitability to stably host a foundation and a structure (Town of Elkin 2000).

Perhaps most encouraging for the future of Elkin's water supply is its Intergovernmental Cooperation section, which recognizes that growth is regional and relies upon steady and clear communication with its neighboring communities of Surry County, Wilkes County, and Jonesville (Town of Elkin 2000). With its other recommendations and concerns, this is an encouraging sign for the water quality of Big Elkin Creek and the Yadkin River. However, it requires tangible follow up to benefit the watershed and its residents.

The majority of both the Jonesville Intake and the Big Elkin Creek watersheds lie in Wilkes County. Wilkes County has very little zoning, deeming most development as "by-right" and permissible. This watershed includes the West Elkin zoning district, which permits a mixture of residential, commercial, and industrial development. The areas of the County that are addressed in this plan are presided by the water supply watershed overlay districts mandated by the NCDWR. This has especially had an impact in the Big Elkin Creek watershed, which is a highly protected WS-II watershed that allows minimal density. However, most agricultural lands are exempt from these regulations except the riparian buffers, as the structures they use are not for residential purposes. There is not a history of land use impairing the drinking water supplies of either of these watersheds since hog operations became less common in the area, with the exception of high-impact forestry operations. However, without specific language prioritizing these waters as drinking water supplies and protecting them from pollution, it remains a risk that must be considered. As noted by the stakeholders, some of the legacies of these land uses can pose risks to water quality conditions, with old and undocumented underground storage tanks and oil barrels rusting and leaking to soils, groundwater, and surface waters.

Wilkes County does rely upon a *Growth Management Plan* that reflects much of the county's history and how this heritage can be best carried forward to the twenty-first century. Significant to this *Plan* is the observation that over half of the County's population live in Wilkesboro and North Wilkesboro, both which largely lie in the Yadkin River Intake watershed. These towns are also the largest employers in Wilkes County. The *Growth Management Plan* does prohibit the installation of septic tanks on slopes >65%, which provides protection from a primary source of potential residential pollution in both watersheds. The *Plan* also encourages the use of cluster development for residential communities; the use of municipal utilities to minimize the installation and maintenance costs and problems associated with residential septic tanks; that the County wants to minimize sprawl; that the County wants to optimize recreation; and that it wishes to protect water quality, farmland, and environmentally-sensitive areas. It also recommends the creation of High Impact Land Use, Voluntary Farmland Conservation, Sedimentation and Erosion Control, and Riparian Buffer Ordinances. None of these ordinances have been passed in the past thirteen years. A new *Growth Management Plan* is being prepared by the High Country Council of Governments for Wilkes County.

Emergency Contingency Plan

The Town of Elkin's Emergency Operations Plan relies upon a close working relationship with Surry County Emergency Medical Services. The Town Manager is the designated Emergency Management Coordinator, and is responsible for implementing the emergency operations plan. They are also the designated Incident Commander. The manager is permitted to delegate these responsibilities to other individuals as they see fit.

Should a water quality emergency such as the spill of oil or hazardous chemicals occur within the water supply watershed of the Town of Elkin, the appropriate municipal staff and emergency agencies would be notified. Wilkes County, which occupies most of the Town's watershed, has a similar agreement with its neighbors that obligates it to notify them of a hazardous waste spill.

Should a major oil or chemical spill occur within the Source Water Protection Area, appropriate emergency staff and agencies would be notified. The first of these includes the Surry County Emergency Services and the Elkin Police Department, which serves as the town's Emergency Command Post. Neither Elkin nor Wilkes County recognize a need to explicitly contact each other, which makes them both vulnerable in an event that contaminates the Town's water supply.

Elkin Rescue Squad

National Guard Armory

Hugh Chatham Hospital

John Shelton, Director
Surry County Human Services Director
1218 State Street
Mount Airy, NC 27030
336-783-9000 (O)
336-783-9010 (F)
sheltonjo@co.surry.nc.us

The Town of Elkin relies directly upon the Public Works Director's involvement in this project, but does not have a specific plan for the contamination of its drinking water. It does identify the steps necessary to take should its sanitary sewer be affected by an incident in a way that could negatively affect the treatment facility operated by the Yadkin Valley Sewer Authority. It also has an *Emergency Water Shortage Response Handbook* that is applicable for when the water supply is "…declining due to conditions which may adversely affect the continued availability of water…" which may be construed to include contamination of the water supply. However, much of the *Handbook* is a regulatory framework for the restrictions placed upon water consumption during drought events.

The town does not have an iterative strategy for addressing contamination of its drinking water supply other than its interconnection with the Town of Jonesville. This approach is one in which the risk of these two local water supplies being simultaneously contaminated or a drought restricting the volume of water that maybe transferred from Jonesville is not assessed. No relationship between the Town and the staff at the regional NC DENR office in Winston-Salem is codified within the emergency operation plan. It is presumed that the Town would issue public notifications if its water supply was contaminated, but has no stated strategy that addresses this contingency, nor a plan to directly address this situation.

Short and Long Term Contingency Plan

The Town of Elkin's reservoir provides it with 3 MGD. It has little storage for the town's residents, relying instead upon its interconnection with the Town of Jonesville, which treats up to 1 MGD, but has a potential capacity of twice that. If both treatment facilities were compromised, the Yadkin River provides the towns with what is effectively a limitless supply of water for their combined populations of about 6,000 people. The town is also host to a National Guard Armory and a Walmart super store that can both supply water supplies to residents should the municipal utilities be unavailable. Unlike the Town of Jonesville, though, Elkin has not formalized an agreement or relationship with either entity guaranteeing this service during emergency conditions.

TABLE 4: TOWN OF ELKIN EMERGENCY OPERATIONS CONTACTS

Name	Resource
Primary Person responsible for implementing emergency response plan Town Manager Lloyd Payne 336-794-6464	Emergency Response & Incident Command
Secondary Person Chief of Police Monroe Wagoner 336-794-6471	Emergency Response
Utility Management Public Works Director Robert Fuller 336-794-6479	Emergency Response; Water System Management
Local Emergency Planning Committee Surry County Environmental Health Johnny Easter 336-401-8410	Emergency Response; Technical Support
NC Department of Environment and Natural Resources Winston-Salem Regional Office 450 West Hanes Mill Road Suite 300 Winston-Salem, NC 27105 336-776-9800	Regional Water Resources section; Public Water Supply Section; UST Section; Groundwater Section; Hazardous Waste Section; Regulatory Guidance; Technical Assistance
Walmart Elkin, NC 336-536-2636	Bottled Water Supplier
National Guard 1775 Bridge Elkin, NC 28621 336-835-3018	Bulk Water Supplier; Emergency Assistance; Security
High Chatham Memorial Hospital 180 Parkwood Drive Elkin, NC 336-527-7217	Emergency Response
Duke Energy Charlotte Office 800-777-9898 800-769-3766	Energy Utility
G&B Energy Company P.O. Box 811 Elkin, NC 28621 33-835-3607	Gas Utility

Jonesville

Supply & Demand

Jonesville's permitted water intake on the Yadkin River is 1 MGD, and it uses only 0.36 MGD of that on an average day. Similar to Elkin, this demand was much higher prior to the effects of globalization upon the local textile mills. Through sixty (60) miles of pipes, Jonesville provides water to 1,200 residents and an additional 100 residents in Yadkin County. Much of this infrastructure is fifty (50) years old or older, and often undersized to reliably supply water for both residents and industry. The Town has 1.2 MGD available for water storage in three (3) tanks and a clear well at its water treatment plant.

The Town of Jonesville is recovering from the effects of the recession following the globalization of industry and the Great Recession of 2008. According to the 2010 US Census, Jonesville had an unemployment rate of 14.9% and a poverty rate of 29.2%, both much higher than state and federal averages. Yadkin County's 2010 unemployment rate was 5.6% and its poverty rate was 17.6% (U.S. Census Bureau 2013).

The current monthly average residential water bill ($36.75) is unaffordable for many residents of Jonesville (Figure 16). While these rates are needed to balance the utility's financial needs, and its residential and commercial rates are comparable to other public water utilities in the Foothills/High Country region, they remain unaffordable for many of the town residents. The Town of Jonesville water utility is currently operating at a nearly perfect cost recovery rate and is debt free, with its revenues balancing with its expenses. Such an approach does not create a rainy day fund, nor does it plan for new capital expenses. A strategy on creative financing that does not further burden the town's ratepayers is necessary for it to grow, let alone continue to address the needs of aging infrastructure.

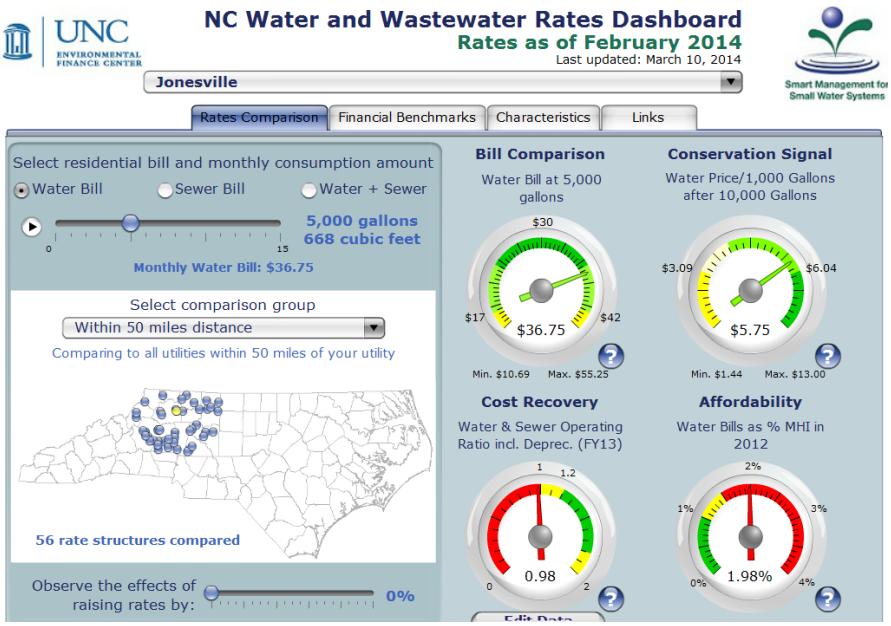


FIGURE 17: JONESVILLE'S WATER RATE PROFILE, (UNC EFC 2014)

Jonesville is anticipating greater demand for their water supply at Yadkin County's primary growth area at the intersection of I-77 and US-421, which is largely zoned for industry (Figure 17). The Town is investing $4.2 million in water treatment upgrades, largely at its water treatment plant, although $750,000 was also spent to secure the interconnection with Elkin. These are the first plant upgrades since 1950, and rely upon a newer

technology called Kruger ACTIFLO units that utilize microsand in a centrifuge to provide secondary and greater water treatment. While a less tested technology in the United States, this system could also be easily and cheaply upgraded to accommodate up to 2 MGD of demand (*personal communication with Scott Buffkin Manager, Town of Jonesville*).

Jonesville has some persistent but minimal leak concerns in its system. The Town conducts an annual audit with the NCRWA. Their greater concern is water loss due to the need to intentionally flush the system for the extrajurisdictional residents to eliminate stagnant water, which can create trihalomethanes. An elevated storage tank for this population would eliminate economic and water safety concerns over the long-term.

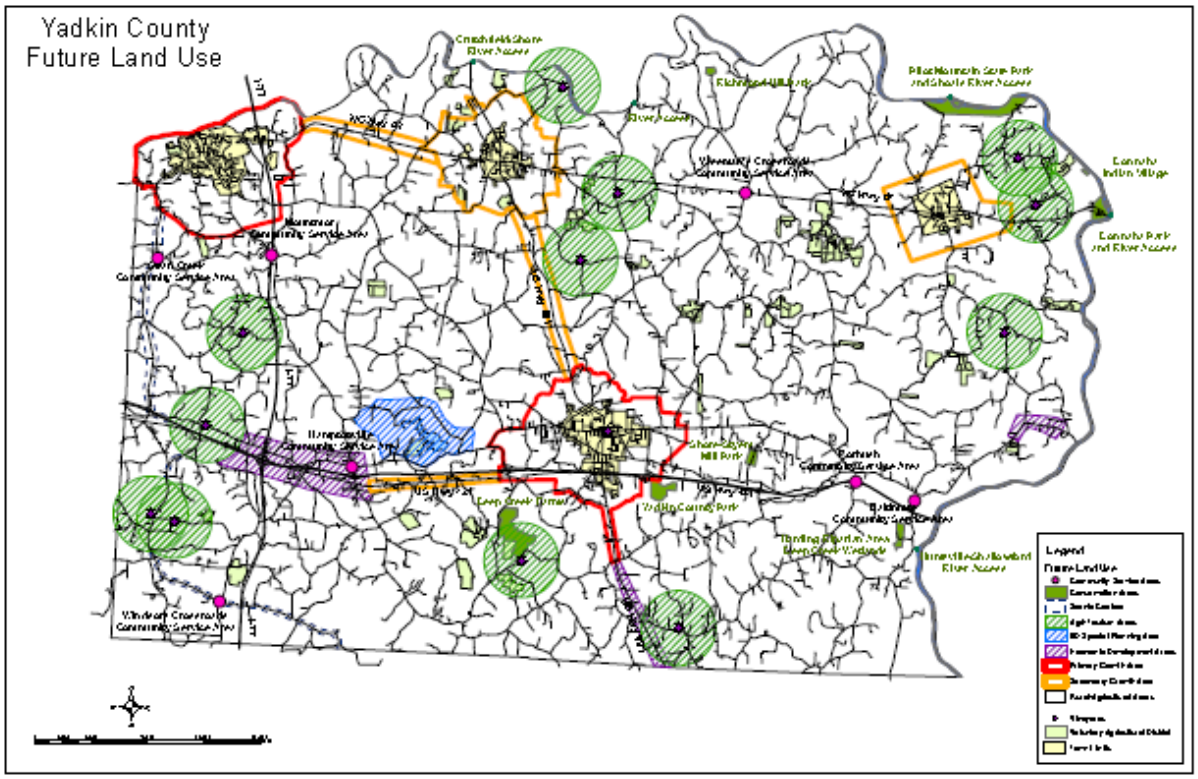


FIGURE 18: (YADKIN COUNTY LAND USE PLAN COMMITTEE 2011)

Of priority concern to the Town of Jonesville is the persistent presence of an organic mat that they find in their settling lagoons nearly every summer. It began appearing about five years ago and can only be eliminated through chemical flocculation. The mats resemble algae but remain largely uncharacterized, despite investigation by the NCRWA and researchers at NCSU. It appears to be a single-celled organism, but whether it is a plant or fungus and where it comes from are frustratingly unclear. The growth is unresponsive to chemical treatment like copper sulfate and actually denitrifies water in the ponds, requiring chemical treatment at the water treatment plant to eliminate algal species. Under these circumstances, it is often simpler for the Town to directly pump water from the Yadkin River to its WTP and conduct primary treatment there (*personal communication with Scott Buffkin, Manager, Town of Jonesville*).

Policies

The Jonesville Zoning Ordinance is over twenty years old, predating the National Pollutant Discharge Elimination System (NPDES) that regulates wastewater and stormwater discharges to surface waters, but it does feature some water quality protections. It has the NCDWR's required water supply watershed regulations for affected areas, which includes only a fraction of the Town and its extraterritorial jurisdiction. While the Town does permit cluster development in the watershed, it does not have a 10/70 density provision for this watershed, applying a consistent density standard throughout the affected areas of the Town. It also recognizes water quality threats within its Health and Sanitation ordinance, declaring them nuisances that have a stepwise violation compliance protocol for individuals to follow. The Town prohibits the construction of any new septic tanks within its jurisdiction, guaranteeing that all new businesses and residents in Jonesville will be on its municipal sewer system (Town of Jonesville 1985).

The majority of both the Yadkin River Intake and the Big Elkin Creek watersheds lie within Wilkes County. Wilkes County has very little zoning, deeming most development as "by-right" and permissible. The Jonesville Intake watershed includes the Rock Creek zoning district, which only permits residential development. The areas of the County that are addressed in this *Plan* are also presided by the water supply watershed overlay districts mandated by the NCDWR. This has had the effect of limiting density, building footprints, and impacts to riparian buffers (Wilkes County 2014). The lack of regulation on the specific land uses does not have a history of impairing the drinking water supplies of either of these watersheds. However, without specific language prioritizing these waters as drinking water supplies and protecting them from pollution, it remains a risk that must be considered.

Wilkes County relies upon a *Growth Management Plan* that does provide some land use zoning regulations in the Wilkes Industrial Park, which is outside of this watershed. The *Growth Management Plan* prohibits the installation of septic tanks on slopes >65%, which provides protection from a primary source of potential residential pollution. The *Plan* also encourages the use of cluster development for residential communities; the use of municipal utilities to minimize the installation and maintenance costs and problems associated with residential septic tanks; minimizing urban sprawl; optimizing recreation; and protecting water quality, farmland, and environmentally-sensitive areas. It also recommended the creation of High Impact Land Use, Voluntary Farmland Conservation, Sedimentation and Erosion Control, and Riparian Buffer Ordinances (Wilkes County 2014). None of these ordinances have been passed in the past thirteen years. A new *Growth Management Plan* is being prepared by the High Country Council of Governments for Wilkes County.

The *Growth Management Plan* states that over half of the County's population live in Wilkesboro and North Wilkesboro, both which largely lie in the Yadkin River Intake watershed. These towns are also the largest employers in Wilkes County (Wilkes County 2014). According to the US Census, Wilkes County had an unemployment rate of 9.3% and a poverty rate of 22.4% (U.S. Census Bureau 2014). The Town of Wilkesboro had an unemployment rate of 10.1% and a poverty rate of 35.1% (City-Data 2013). These unemployment figures are slightly higher than those of North Carolina's; the poverty figures are much higher than state or federal rates.

The Town of Wilkesboro has a great responsibility in ensuring the health and safety of Jonesville water supply. While there are other, smaller wastewater dischargers such as Louisiana Pacific, Wilkesboro operates the largest wastewater discharge facility in this watershed, with a permit for discharging 4.9 MGD. With a significant industrial base, it uses 3.9 MGD of this on an average day. Residential consumption only makes up 0.171 MGD of this demand (*personal communication with Sam Call, Utilities Director, Town of Wilkesboro*). Due

to this large industrial use, the Town is able to keep residential utility rates very low, at an average bill of $23.17 per house for both water and sewer (UNC EFC 2014).

The Town has invested $9 million in recent years to upgrade its wastewater facilities to ensure peak performance of its wastewater discharge. It also anticipates $3 million in upgrades to accommodate growth, anticipating a 5.0 MGD demand and 7.5 MGD in available capacity. These capital investments have largely been borne by ratepayers, with 7.5% annual increases in wastewater rates since 2003. It has a close relationship with the NC DWR regional office, reporting violations of their wastewater discharge permit when they occur, which is now rare (*personal communication with Sam Call, Utilities Director, Town of Wilkesboro*).

FIGURE 19: GREEN INFRASTRUCTURE AT A LOWE'S STORE IN WILKESBORO; HTTP://WWW.LANDSCAPEONLINE.COM/RESEARCH/LASN/2014/02/IMG/25194/25194-1.JPG

The Town of Wilkesboro has also invested significant time and resources in developing local ordinances and programs to manage non-point pollution to the Yadkin River and other local waters. Its zoning ordinance includes flexibility for developers to increase density while protecting streams and open space. Similarly, its subdivision ordinance prioritizes "natural buffers," "mature trees," and stormwater management throughout its text, encouraging growth that does not impact the local environment. Its robust tree ordinance provides the Town with a resource that is designed to enhance its urban canopy and protect its older trees. All of these documents can be instructive to both Elkin and Jonesville on how to have economic growth while not creating more regulatory and capital expenses in the future.

Yadkin County is the Town of Jonesville's county of residence and their policies interact in some small but significant ways. However, Yadkin County only occupies a small area of the Jonesville Intake watershed. Yadkin County utilizes a Land Use Plan last updated in 2011 to guide growth within their jurisdiction, including the non-incorporated areas around Jonesville. These suburban areas are rated as one of the county's two primary growth areas, largely due to the available infrastructure and the water services provided by the Town. Few details are available for how the land should be developed. The county identifies its agricultural heritage and the Yadkin River as critical economic and cultural resources, but no regulations or guidance have been drafted to protect these assets. Partnerships have been identified but not yet capitalized upon within the Plan, leaving Jonesville much of the decision making power in how its suburban areas are developed, if at all (Yadkin County Land Use Plan Committee 2011).

Emergency Contingency Plan

The Town of Jonesville's Emergency Response Plan relies upon a close working relationship with Yadkin County Environmental Health. The Town Manager is the designated Emergency Management Coordinator, and responsible for implementing the emergency response plan. The secondary staff to the manager are the mayor, who serves as system spokesperson, and the utilities director. The manager is permitted to delegate responsibilities to other individuals as they see fit.

Should a water quality emergency such as the spill of oil or hazardous chemicals occur within the water supply watershed of the Town of Jonesville, the appropriate municipal staff and emergency agencies would be notified. Wilkes County, which occupies most of the Town's watershed, has a similar agreement with its neighbors that obligates it to notify them of a hazardous waste spill but no explicit obligation to notify Jonesville should a spill occur within its water supply watershed.

Should a major oil or chemical spill occur within the Source Water Protection Area, appropriate emergency staff and agencies would be notified. The first of these includes the regional office of the NC Department of Environment and Natural Resources in Winston-Salem and the regional office of the US Environmental Protection Agency in Atlanta. More locally, the town will contact the Greensboro Hazmat Response Team and the Yadkin County Department of Environmental Health.

NC DENR Regional Office

US EPA Region IV Office

NC Division of Emergency Management

Gary Hayes, Director
Director of Inspections and Environmental Services
1218 State Street
Mount Airy, NC 27030
336-783-9000 (O)
336-783-9010 (F)
sheltonjo@co.surry.nc.us

The Town of Jonesville has clearly policies and procedures should its water supply be contaminated or its infrastructure compromised in its ability to deliver drinking water to residents. Following consultation with the NC Rural Water Association, local governments, and/or state agencies, the town will determine if it should issue a public notice advising residents of the condition of their water and if it may be used and if that use is conditional. Residents will be notified using all media outlets while "high priority facilities" such as school will be notified directly. The Jonesville Town Hall will serve as the Incident Command Center. The water treatment plant it will have access control provided by the town's police patrol and may be shut down at the discretion of the utility director. The Town has a protocol for sample collection and retains the services of Tritest Labs to collect and analyze samples for biological contaminants, chemical contaminants, radionuclides. There is no protocol for system rehabilitation once a contaminant has been identified, though it is likely that the town will proceed with best practices in consultation with the NC DENR and US EPA staffs.

Short and Long Term Contingency Plan

The Town of Jonesville has limited water supply storage. It does have an interconnection with the Town of Elkin, which treats up to 3 MGD in its reservoir. If both treatment facilities were compromised, the Yadkin River provides the towns with what is effectively a limitless supply of water for their combined populations of about 6,000 people. The Town also has a formal agreement with Walmart to supply the town with bottled water and the National Guard to supply the town with bulk water, if necessary. The town also has a back up power generator that can supply the plant with electricity if needed.

TABLE 5: TOWN OF JONESVILLE EMERGENCY RESPONSE CONTACTS

Name	Resource
Primary Person responsible for implementing emergency response plan Public Utilities Director Tim Collins 336-835-4068	Emergency Response
Secondary Person Water System Operator Billy Wood 336-835-2250	Emergency Response
System Spokesperson Mayor Lindbergh Swaim 336-835-3426	Emergency Response; Public Notification
Local Emergency Planning Committee Yadkin County Environmental Health Dale Trivette 336-469-0210	Emergency Response; Technical Support
Public Water Supply Section 1634 Mail Service Center Raleigh, NV 27699-1634 www.ncwater.org/pws	Technical Assistance; Regulatory Guidance
NC Department of Environment and Natural Resources Winston-Salem Regional Office 450 West Hanes Mill Road Suite 300 Winston-Salem, NC 27105 336-776-9800	Regional Water Resources section; Public Water Supply Section; UST Section; Groundwater Section; Hazardous Waste Section; Regulatory Guidance; Technical Assistance
Walmart Elkin, NC 336-536-2636	Bottled Water Supplier
National Guard 1775 Bridge Elkin, NC 28621 336-835-3018	Bulk Water Supplier; Emergency Assistance; Security
NC Division of Emergency Management H. Douglas Hoell 4713 Mail Service Center Raleigh, NC 27699 919-733-3867	Technical Assistance
Duke Energy Charlotte Office 800-777-9898	Energy Utility

800-769-3766	
G&B Energy Company P.O. Box 811 Elkin, NC 28621 33-835-3607	Gas Utility
Dixie Electro Mechanical Services 2115 Freedom Drive Charlotte, NC 28208 704-332-1116	Ump Supplier

Present & Future Watershed Needs

Despite being home to five municipalities, these watersheds are rural and sparsely populated, with most of the watersheds having populations of <200 people per square mile (Figures 20 & 23). The largest municipality is Elkin, which has a population of 4,118. Some of these areas have also declined in population, especially in the non-municipal suburban areas, relocating to jobs centers in the Piedmont Triad and elsewhere (Figure 21).

FIGURE 20: CORN FIELD VIEW IN JONESVILLE

SOURCE: PTRC

Elkin, Jonesville, and Wilkesboro all anticipate industrial and residential growth, but only Wilkesboro foresees the need for infrastructure expansion. Both Elkin and Jonesville currently utilize a small fraction of their available capacity. They can readily supply new businesses of nearly any size with water without new capital improvements. This includes robust growth (32%) in Ronda, to which Elkin is interconnected. Furthermore, their utilities must mostly be supported with residential rates, which are nearing unaffordability when compared to the local median household incomes for both towns. The towns have used available grants and loans from state and federal resources, but their infrastructure demands may require further consultation with the NCRWA and/or the UNC Environmental Finance Center as to how best leverage available assets with other financial resources.

Thus far, the towns have invested funds into the development of the Yadkin Valley Sewer Authority. With the nutrient management strategy stakeholder process beginning for High Rock Lake that will likely require upgrades at this regional wastewater facility, these investments appear wise and will continue to be the towns' priority. Expansions of the existing water treatment infrastructure are unnecessary; maintenance and efficient upgrades should be prioritized while also attempting to guarantee residents affordability.

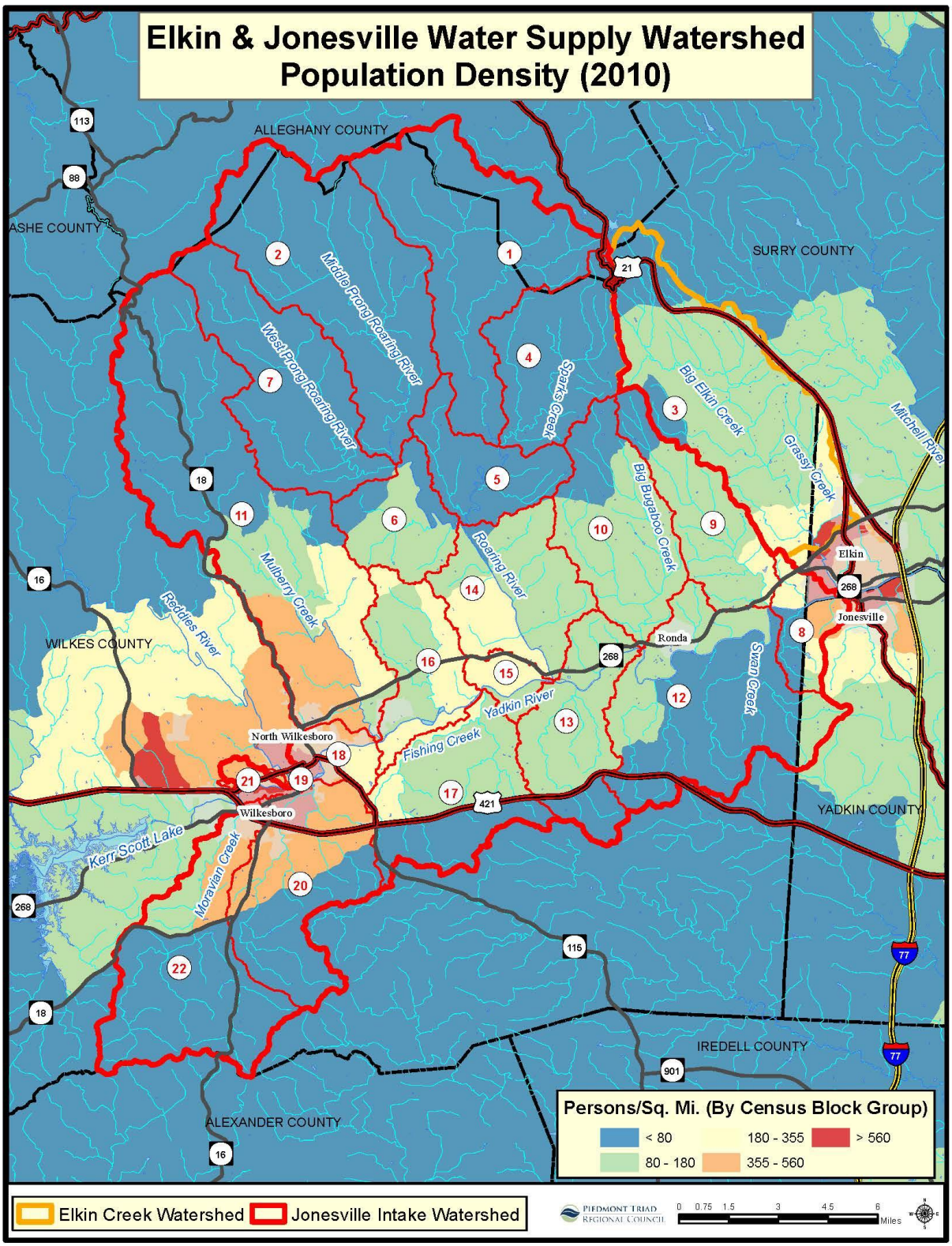


FIGURE 21: PTRC 2014

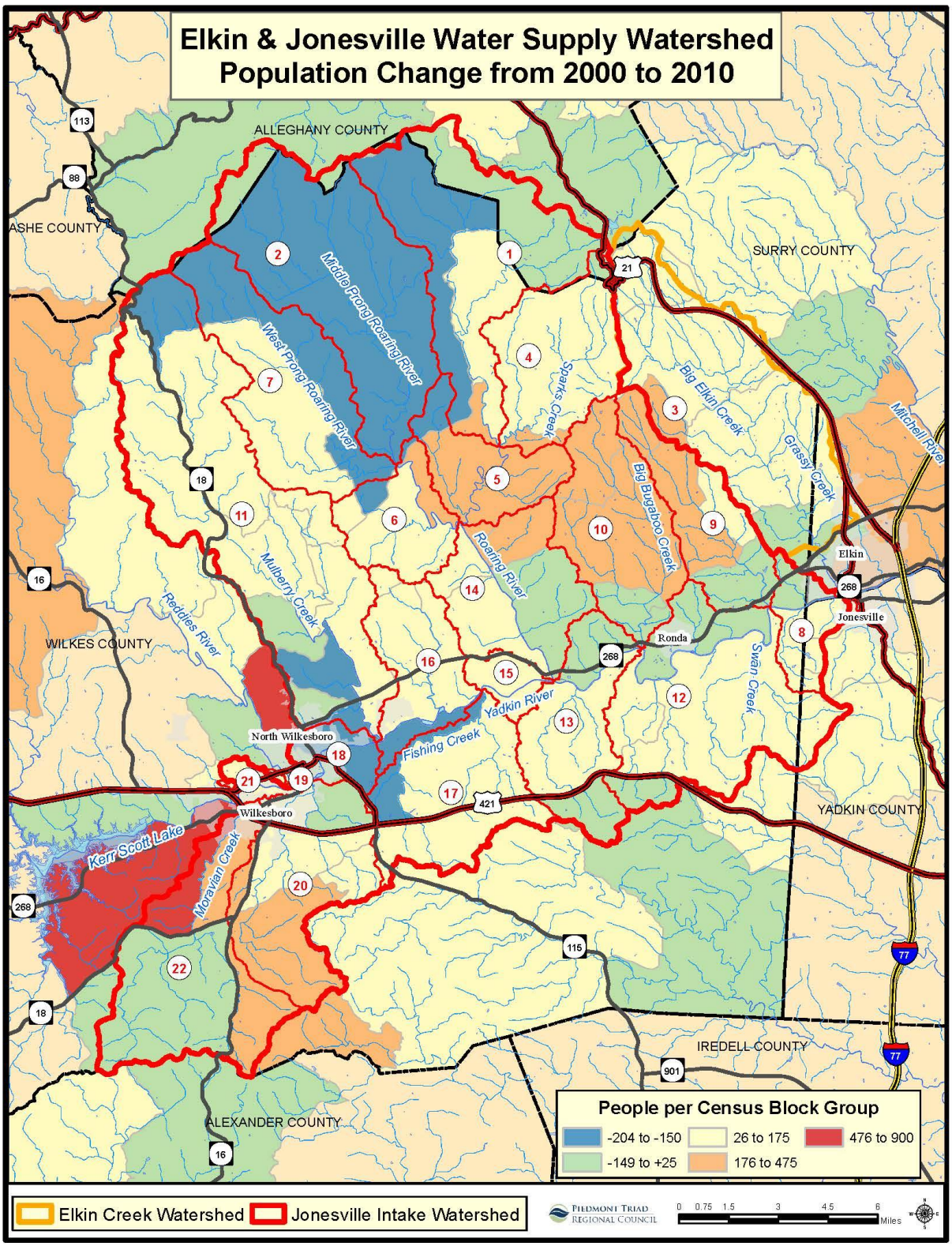


FIGURE 22: PTRC 2014

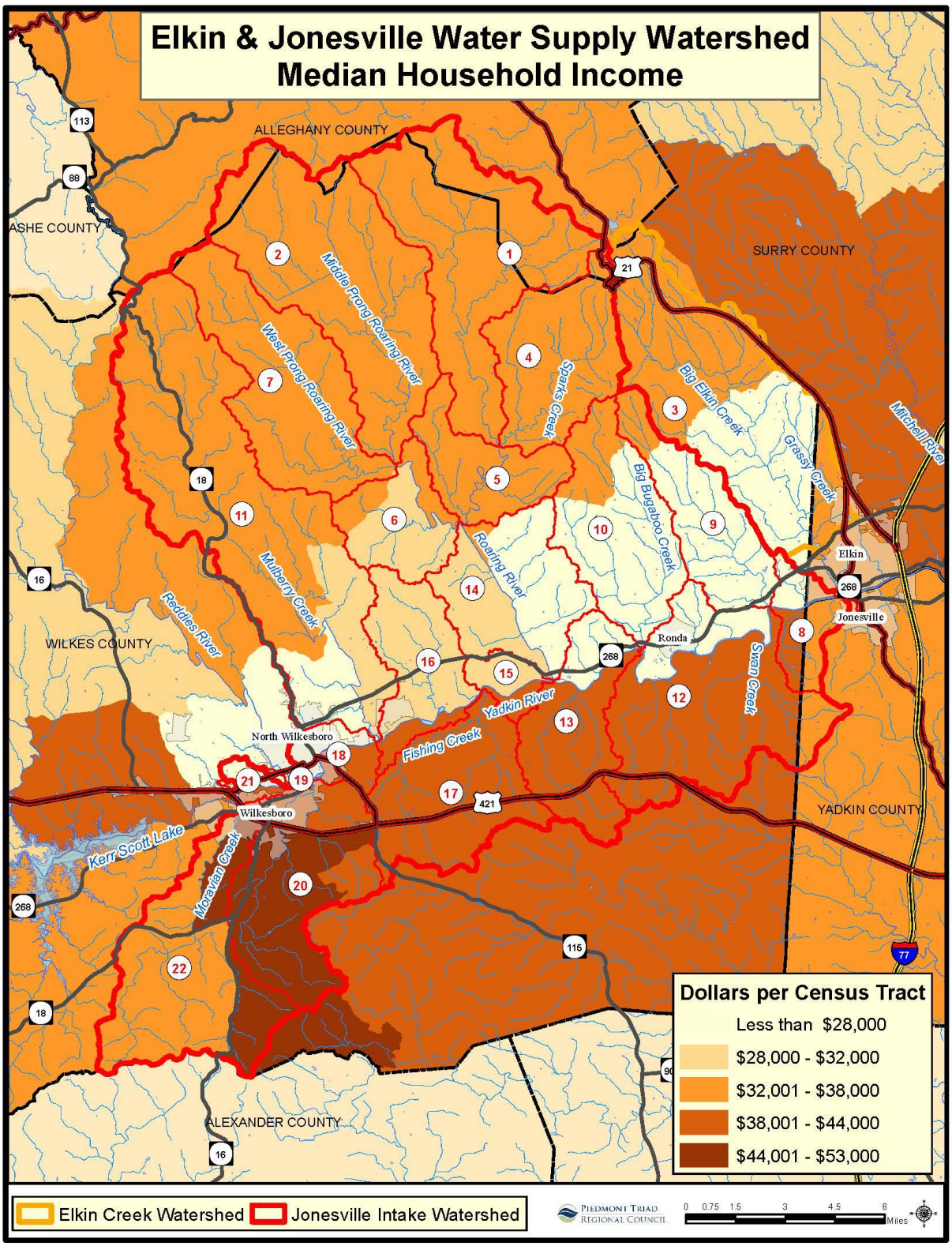


FIGURE 23: PTRC 2014

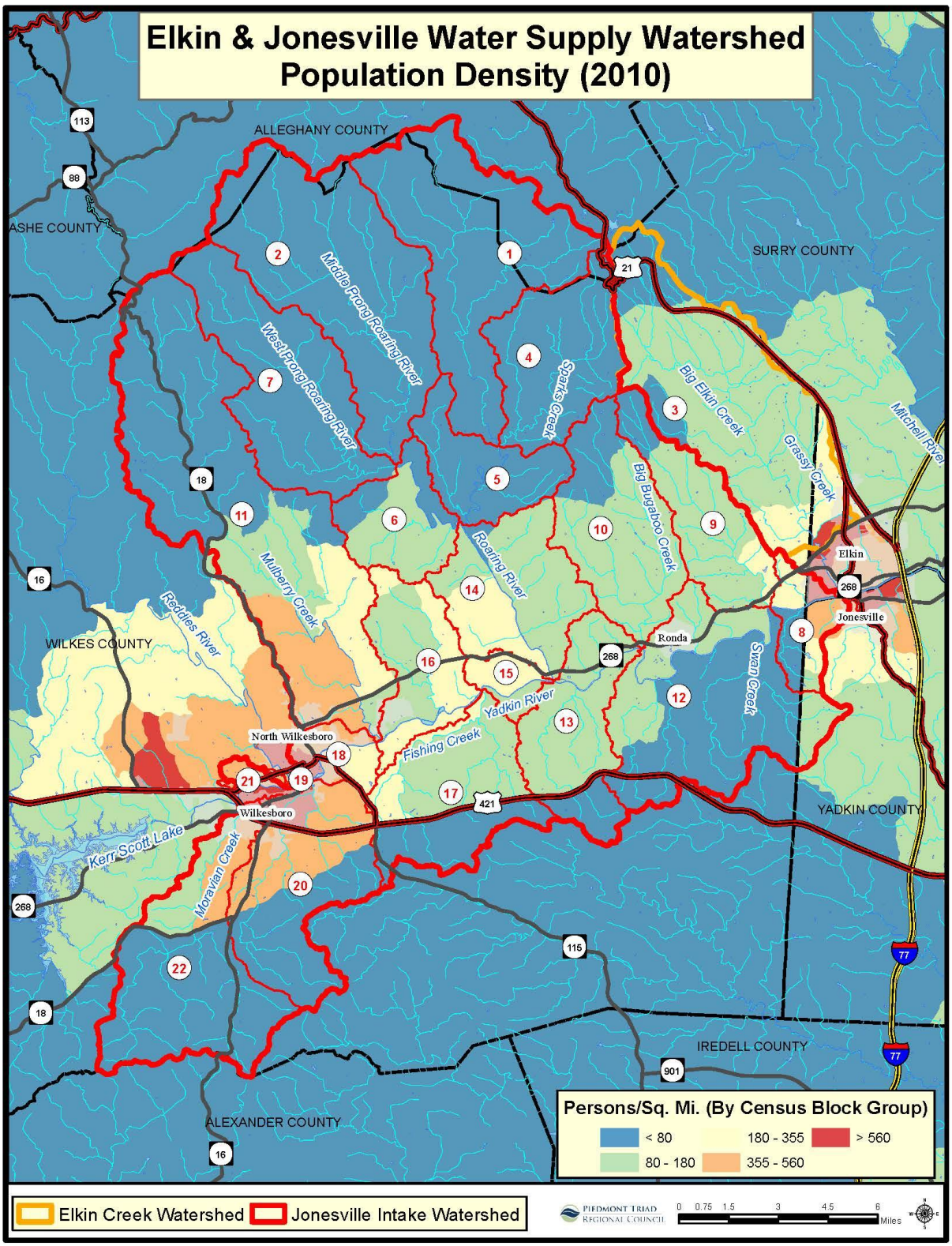


FIGURE 24: PTRC 2014

Programs

Update Emergency Response Plans

Both the Towns of Jonesville and Elkin have emergency planning documents that empower them to respond to extraordinary circumstances to protect their residents. Notable in both the Town of Jonesville's *Emergency Response Plan* and the Town of Elkin's *Emergency Operations Plan* is the absence of any mention of Wilkes County. As the most significant political entity in the water supply watersheds for both communities' primary water sources, this appears to be a gross oversight that should be addressed immediately. Should a spill occur on one of the many roads in Wilkes County or at one of their industrial properties, there needs to be an established mode and method of communication between the staffs of these two towns with the staff of the county. The best departments in Wilkes County to establish this communication are the Sheriff's Office and/or the Department of Environmental Health. It is appropriate and necessary for this communication to be formalized and codified by all three of these jurisdictions to protect the water supplies and safety of both towns' residents.

The Town of Elkin should also update its *Emergency Operations Plan* to specify water supply emergencies. Its *Emergency Water Shortage Response Handbook* can be made to support actions following the contamination of its supply on Big Elkin Creek, but it was not written for this purpose and only addresses such a situation indirectly. The Town could incorporate much of its introductory language from the *Handbook* into its *Plan*, but it needs to explicitly address a threat to water supply and identify its secondary water resources. This would be a project that could be done simply and would use resources within the Town. It may require a more specific definition of the Public Works Director's responsibilities in the *Plan*, especially in monitoring water quality conditions and how the public can be notified of this situation, but it will permit the Town to address a contamination event as the specific incident it is, as opposed to a more universal disaster emergency. The Town of Jonesville's *Emergency Response Plan* offers good guidance on better addressing this need.

Improved Water Quality Monitoring Network

The public water supply watersheds covered by this plan collectively have three ambient monitoring stations for water chemistry and four water quality monitoring stations for biology over a 400-square mile area. Both Big Elkin Creek and the Jonesville Intake watersheds have multiple tributaries with varying land uses; the Jonesville Intake watershed has large tributaries that drain to the Yadkin River. Only two of these tributaries (including Big Elkin Creek) have water quality monitoring stations. While the available data provides confidence that small sections of these water bodies are meeting water quality standards, there is a need for more robust data to responsibly manage and protect the watersheds. This is especially true if these streams and creeks are going to host primary recreation and/or trout habitats in the near future.

Unlike other states, the NC DWR does not utilize water quality data that has been collected by citizen groups for guidance or use support decision making. Consequently, there is little incentive for groups outside of the state institutions to develop a training and monitoring program for volunteers to collect water quality samples. Until this internal policy changes, the NC DWR needs to provide additional water quality monitoring stations on the Yadkin River, Big Elkin Creek, and their respective significant tributaries in order to manage and protect their identified uses and the water supplies of Jonesville and Elkin. The US Geologic Survey may be willing to assist in establishing these monitoring stations for their purposes and mission. There are local stakeholders groups that would also be interested in providing such assistance, but not until NC DWR's internal policy on data collected by citizen monitoring groups matures.

Annual Water Audit

Both the Towns of Elkin and Jonesville currently contract with the NC Rural Water Association (NC RWA) to conduct annual water loss audits on their systems. This has assisted both municipalities in addressing losses of revenue for their systems as well as any infiltration to the water supply system from undesired or potentially hazardous sources. Mostly significantly, it has permitted the Town of Elkin to reduce its water loss rate from 88% to under 30% in less than a decade. The less water lost to leaks, the more water that is available for growth in both the residential and business sectors.

This practice must continue to ensure the sustainability of the towns' respective infrastructures and related fiscal health. It should also be commended and recognized by the State of North Carolina in applications for infrastructure grants and loans offered by the NC Division of Water Infrastructure.

Academic Investigation of Jonesville's Vegetative Mats

The Town of Jonesville's primary concern with the health and safety of its water supply is the presence of the vegetative mats on the surface of their settling lagoons every summer. The Town must chemically flocculate these mats to eliminate the growth or directly route water from the Yadkin River and perform primary filtration within their water treatment plant. Should the organism causing these growths be described, it could be directly addressed and ideally eliminated.

There are researchers at many of North Carolina's academic institutions who not only could be of assistance in this matter, but would gladly look into the matter for their own research needs. The PTRC will work with the town to make scientists with careers in water safety and health as well as aquatic botanists aware of Jonesville's ongoing concern. This growth needs to be fully characterized, identified, and eliminated. The academic community is likely the most capable stakeholder to support the town in this matter, they just need to be made aware of the issue.

Target Primary Non-Point Sources of Sediment Pollution

The primary concern of all watershed stakeholders for the health and safety of both water supplies is the persistently high levels of sediment in both Big Elkin Creek and the Yadkin River. This influx of sediment has been determined to largely originate on farms without maintained vegetated stream buffers and forestry operations that fail to use forestry practice guidelines, as required by state law. The turbid waters challenge the successful establishment of trout fisheries in the area, impair the use of both the creek and river as recreational waters, and increase treatment costs to filter out these large masses of sediment. In particular, the Town of Elkin contends with the annual infill to its reservoir, losing days of potential supply capacity due to sedimentation displacing water volumes. It requires the town to settle the water before pumping it to its water treatment plant and gives its public water supply reservoir a muddy appearance that alarms the town's residents. The town is investing in a direct line to draw water from its emergency intake on the Yadkin River to dilute these high sediment levels, but this is also a capital cost that is avoidable if best management practices are used upstream.

FIGURE 25: IMPACTS OF TOBACCO FARMING ON LOCAL STREAMS IN MITCHELL RIVER WATERSHED, SURRY COUNTY. PHOTO COURTESY OF JOE MICKEY, 2014

The PTRC will work with both towns to develop partnerships with Surry, Wilkes, and Yadkin Counties' Soil & Water Conservation District staffs, Cooperative Extension staffs, foresters, and the regional DENR office to reduce these sediment sources. All cost-share programs are being used to their full capacity, but grants offer opportunities to enhance these programs and achieve greater gains. The PTRC water resources planning staff have earned about $1 million in water resource grants over the past six years, and will pursue further funds to address these issues in partnership will all vested partners. Other funding options and alternatives – including greater attention to the lack of compliance with the use of FPGs in this area – will be sought with all stakeholders.

Policies

Utility Financing

Currently, both the Towns of Elkin and Jonesville water utilities have operating ratios just under 1, meaning that they are operating at small deficits. The cause of these situations has been the loss of industry and commerce from the Triad and Yadkin Valley regions over the past few decades. Both municipalities have over 50% of their potential supply capacity available for new customers or residents; this capacity used to be in much higher demand, with use revenues from industry supporting the water utilities of both towns.

While both municipalities are operating with small deficits, they are only in this position after years of regular rate hikes necessary to support the needs of their aging water systems. Currently, these same fees are barely affordable for some residents, as based upon the median household incomes. Therefore, though rate hikes are necessary for the utilities' financial security, future hikes could unreasonably burden low-income households.

The UNC-Chapel Hill School of Government has an Environmental Finance Center (EFC) that assesses and addresses such utility finance concerns. It is recommended that both municipalities work with the EFC to determine a 25-year financial strategy to ensure the stability and sustainability of their respective water utilities. The EFC will work with the towns' utility, financial, and administrative staffs on developing a finance strategy that utilizes rates, bonds, grants, loans, and other tools to ensure that residents and businesses will have reliable and affordable water for the near-term future.

Watershed Stewardship

Throughout this planning effort, the indispensable role of water in Elkin, Jonesville, and their watershed neighbors has been apparent. It is clear in Surry County's Economic Development Strategy and the Town of Elkin's Economic Development Plan as well as the Yadkin Valley Heritage Corridor Strategic Plan. The Yadkin River and its tributaries are central to the identities of all communities in this area – urban and rural. It defines the area's setting, agriculture, economic future based upon ecotourism and industrial growth, and as home to many valuable animals and plants that are central to the identities, ecosystems, and economies of the area.

However, while these waters are central to life in Elkin, Jonesville, and their surrounding counties, there are limited efforts by local groups to actively protect and restore the watershed and water quality conditions. This despite that the ecosystems of both watersheds provide nearly $50 million in public services such as flood prevention and air pollution treatment every year for the area residents; an average value of nearly $200/acre (Table 6).

TABLE 6: THE TRUST FOR PUBLIC LAND: CONSERVATION ECONOMICS, NORTH CAROLINA'S RETURN ON THE INVESTMENT IN LAND CONSERVATION, EXHIBIT A-1, PAGE 29

Combined

VALUE	CLASS	ACRES	PERCENTAGE	Annual Value Per Acre (1)	Annual Value
11	Open Water	430.33	0.17%	$224	$96,394.44
21	Developed, Open Space	13,329.63	5.36%	$0	$0.00
22	Developed, Low Intensity	3,346.36	1.34%	$0	$0.00
23	Developed, Medium Intensity	1,254.30	0.50%	$0	$0.00
24	Developed, High Intensity	355.61	0.14%	$0	$0.00
31	Barren Land	60.49	0.02%	$0	$0.00
41	Deciduous Forest	129,968.81	52.22%	$300	$38,990,641.72
42	Evergreen Forest	12,432.71	5.00%	$300	$3,729,813.48
43	Mixed Forest	16,335.50	6.56%	$300	$4,900,650.93
52	Shrub/Scrub	8,652.46	3.48%	$5	$43,262.30
71	Herbaceous	5,785.58	2.32%	$5	$28,927.89
81	Hay/Pasture	55,924.96	22.47%	$5	$279,624.81
82	Cultivated Crops	637.16	0.26%	$5	$3,185.79
90	Woody Wetlands	342.26	0.14%	$1,150	$393,603.94
95	Emergent Herbaceous Wetlands	15.79	0.01%	$1,150	$18,158.47
		248,871.96			**$48,484,263.76**

With no stormwater regulations in the area, neither municipality is required to have a water quality education program. Many of the soil and water conservation districts do promote low- or no-till agricultural practices, but their limited staff and resources constrains their abilities to reach everyone. Similarly, forestry operations appear to be eluding their required FPGs through a lack of reporting by an underinformed public and a lack of enforcement capacity at the regional DENR office in Winston-Salem. The main environmental group active in this area is the Yadkin Riverkeeper, which has a responsibility to all 7,000+ square miles of the Yadkin

River basin, and cannot dedicate inordinate amounts of time to individual cases on private properties. Without state investments to improve programs to protect and improve water quality conditions, grass root actions are needed to protect the watershed and address concerns about potential impacts to it.

There are significant stewardship actions taking place within Elkin's water supply watershed. The Elkin Valley Trails Association (EVTA) has led the way with their astounding progress at creating the Elkin Valley Trail that connects Stone Mountain State Park to the Yadkin River along Elkin Creek. Within a short three years, this group has laid down miles of trails, built a bridge, and had the trail declared a birding hotspot. They are exploring paddling opportunities on Big Elkin Creek and the Roaring River and promoting these to the public, cementing the Wilkes County and the Yadkin River Valley as an ecotourism destination.

There are needs for greater stewardship efforts throughout both watersheds, though. Certainly, leading with positive (and tangible) results such as the Elkin Valley Trail are the best and most engaging approach for the broader public. The NC WRC is currently assessing and intending to stock tributaries within both Jonesville and Elkin's watersheds with trout on a seasonal basis. These trout will need clear, cool water that requires consistent stream buffers and low sediment loads. These needs (and their associated economic benefits) may be enough to increase support for the use of BMPs on farms and FPGs on forestry operations. However, there needs to be greater institutional support to shepherd these practices into reality. The soil and water conservation districts and the county cooperative extension offices are utilizing their cost-share and community assistance resources to their capacity; they need greater funding and support to get more farmers enrolled in these effective programs. With the tobacco buy-out program, these program needs become greater, as the more lucrative, yet more environmentally-intensive, tobacco will be more competitive with other crops.

In regard to forestry operations, there is anecdotal evidence and aerial data of an historic lack of use of FPGs in these watersheds. There are two issues that must be addressed here: the lack of reporting and the lack of enforcement. The public needs a venue in which they can be aware of what timber operations are required to do by law and that they can contact someone to enforce these laws. The Yadkin Riverkeeper and the EVTA have offered to lead this outreach effort. The enforcement of these laws requires both greater capacity by the DENR staff to investigate potential violators of state law as well as an environmental advocate to alert the DENR office that they must investigate every registered concern promptly; many of these operations are conducted in very short amounts of a time such as a week or a weekend, successfully evading regulators with hefty work loads. The Yadkin Riverkeeper is the appropriate environmental advocate for this role, but has limited staff with which to do it; greater participation by the public is needed. However, the Waterkeeper Alliance's Muddy Water Watch gives a good example of how to accomplish these ends, simply by shifting the focus from development sites to timber operations.

A permanent watershed stewardship coordinator that can serve these diverse needs and work with the appropriate partners on each of these issues (and more) is needed to shepherd this plan into reality. While all of the project stakeholders could invest in their own coordinators, a more neutral coordinator who can work with all of the political entities, the non-profit community, and the private sector would be more effective at implementing this plan. The Yadkin Valley Heritage Partnership is a tourism and economic development organization that has the support of all three counties and the municipalities featured in this watershed plan, and is the best home for this coordinator position. By seeding this position with public and private funds, the project could reap large rewards over a short time. The model used to create the Haw River Trail coordinator position in Alamance County provides a good model for how to achieve similar progress in this large watershed, as well as any other related water quality concerns of the involved parties.

Stormwater Ordinance

Both Elkin and Jonesville are too small to fall under the jurisdiction of the National Pollutant Discharge Elimination System's Phase II program, which regulates stormwater discharges from large urban areas. However, both towns are already fulfilling many of the program's requirements: a construction stormwater control program, a post-construction stormwater control program, a mapped stormwater system, and good housekeeping practices by municipal staff to prevent illicit discharges from entering the respective stormwater systems. While both towns largely drain downstream of their water intakes, Elkin's runoff does partially drain to the Yadkin River upstream of Jonesville's intake. Lastly, both towns' stormwater runoff drain to waters considered critical for the development of the Yadkin River Valley's ecotourism economy. Furthermore, any nutrient management strategy arising from the High Rock Lake special study currently being done by NC DWR will almost certainly require municipalities of all sizes in the lake's watershed to effectively institute the Phase II program.

It would be in the interests of both towns to invest in the final elements of a comprehensive stormwater program: illicit discharge detection and elimination (IDDE), community outreach and education, and public involvement. The largest expense with an IDDE program is mapping the stormwater system, which both towns have done. Otherwise, the program requires the town to inspect its stormwater infrastructure and creeks to find and stop non-permitted discharges like washing machines straight-piped to local streams or auto repair shops dumping oils down the storm drains. A benefit of surveying the stormwater system is that it also allows public works staffs to identify possible or likely inflow and infiltration instances, where stormwater is invading the wastewater infrastructure and burdening it with additional volume.

The public involvement and community outreach requirements are straight-forward and are likely already being done to some degree through other municipal programs like beautification or parks and recreation. Certainly the EVTA's activities in Elkin would largely satisfy these requirements, if officially supported by the Town of Elkin. However, the PTRC also offers these services through Stormwater SMART, which can customize services for both Elkin and Jonesville so that they can address the towns' concerns regarding water quality and engender a greater stewardship ethic among school children, master gardeners, civic associations, planning board, and/or the general public. These services can also be provided to counties to reach out to rural communities and serve all upstream and downstream stakeholders of watershed concerns.

Partnerships and Funding

Yadkin Valley Heritage Corridor Partnership

This partnership is a collaboration among Surry, Wilkes, Yadkin, and Caldwell Counties focusing on improving recreational and tourism infrastructure in the Yadkin River Valley. It is committed to capitalizing upon the wealth of cultural and ecological resources in the area central to the region's future economy. They have been central to the growth of the Yadkin Valley wineries and their economic boost to the region. The Partnership has a strategic plan that relies upon the two watersheds discussed in this plan being

healthy and stable, capable of supporting fisheries, paddling, hiking, and other activities that focus on the river corridor and its significant tributaries. The stakeholders have identified the Partnership as the most appropriate entity to house a watershed conservation coordinator who would implement this plan and protect the quality of the two towns' water supplies.

NC Environmental Finance Center

The UNC-Chapel Hill School of Government houses the Environmental Finance Center, which has a mission of "…*work*[ing] *to enhance the ability of governments and other organizations to provide environmental programs and services in fair, effective and financially sustainable ways*." They may be most notable for local governments in North Carolina due to their annual analysis of public water and sewer utility rates, their affordability, and their long-term fiscal health, all of which may be compared to other local governments in the state using a menu of different filters. They serve the needs of many states with this easily-accessible "dashboard" interface (featured in this plan), and build upon this knowledge by providing a sort of extension service for local governments that specializes in financial management. They are an excellent resource and a necessary partner to ensure the long-term stability and sustainability of both towns' water utilities.

NC Rural Water Association

NCRWA is a "…*non-profit organization dedicated to helping… members attain the highest standard in drinking water and wastewater service*." NCRWA has already been a vital stakeholder in the management of both Elkin and Jonesville's water systems, performing annual leak assessments and addressing those leaks. They perform a suite of other technical assistance services for utilities as well as private wells for rural communities. Their role as a partner to these municipalities is necessary for the long-term health and function of their water utilities, but they could provide greater assistance in the counties of these two large watersheds. The stakeholders' concerns about under-documented underground storage tanks and landfills and their potential risk to private drinking water wells could be better characterized by the NCRWA through their Wellhead Protection program.

NC Division of Water Resources

The NC DWR Drinking Water Protection Program played a fundamental role in realizing this planning project, and will play a similar role in implementing this plan. The program has supported and facilitated the creation of the statewide Source Water Collaborative, a diverse body of drinking water supply stakeholders including federal, state, and local governments, non-profit organizations, and academic institutions that are dedicated to working at a local scale with general public, utility operators, and local government staff and elected officials to ensure the long-term health and safety of their water supplies. The Drinking Water Protection Program has historically managed and staffed the Source Water Assessment Program, which authored the Source Water Assessment Plans required by the US EPA. This same staff will be assisting in implementing these more detailed source water protection plans, supporting local governments pursuing grant assistance to implement these plans.

North Carolina Universities

The Town of Jonesville is plagued by a vegetative growth that covers its settling ponds in the summers and has a spore stage in its life cycle that has proven resistant to chemical treatment, desiccation, and physical removal from the water's surface. This growth has largely been uncharacterized by the scientific research community. North Carolina is wealthy in universities with researchers who can assist the town in characterizing and identifying this growth, as well as possibly permanently eliminating it from the water supply. NC State University, UNC-Chapel Hill, UNC-Charlotte, Appalachian State University, Wake Forest University, and Duke University all have research faculty who could assist in addressing this issue.

NC Clean Water Management Trust Fund

The NC CWMTF is dedicated to protecting and rehabilitating the water resources of the state. It has provided hundreds of millions of dollars to local governments, non-profit entities, and private firms to develop watershed plans, restore streams and stream buffers, build greenways, develop innovative stormwater technologies, and acquire sensitive and valuable ecological habitats. The CWMTF funded this planning grant in an effort to address water quality concerns before they become water quality problems. They are key partner in implementing this plan, especially in protecting sensitive areas of the watershed, restoring streams and buffers, and assisting with the construction of the Elkin Valley Trail.

Duke Energy Water Resources Fund

In 2014, Duke Energy's Dan River power plant in Eden, NC, spilled over 38 million tons of coal ash into the Dan River, immediately degrading the ecological, recreational, and agricultural uses of that water system for its residents and ecosystems. In an effort to show a commitment to protecting and improving water quality conditions throughout its service region, it is dedicating $10 million annually for water resource projects. While there is not a Duke Energy power plant near this watershed, many of the projects recommended in this plan fit the requirements of projects requested by the fund.

NC Parks and Recreation Trust Fund

The NC Parks and Recreation Trust Fund (PARTF) is dedicating to fully matching the efforts of local governments for recreation projects. If cash and/or human capital can be accrued by the stakeholders in these watersheds, PARTF could be a valuable funding source for realizing greenway, blueways, and parks throughout these watersheds.

NC Division of Water Infrastructure

The NC DWI was created by the NC General Assembly in 2014 to consolidate the state's infrastructure support programs. It includes the Drinking Water State Revolving Fund and Clean Water State Revolving Fund loan programs as well as the Community Development Block Grant and Appalachian Regional Commission programs. The four programs are independently administered, but are all dedicated to the improvement and rehabilitation of water and sewer infrastructure in North Carolina.

Community Development Block Grant (CDBG)

In 2014, the State of North Carolina dedicated all of its federal CDBG support for water and sewer infrastructure projects. These projects must be located in areas with below-average income levels and outside of "entitlement" communities such as Greensboro that receive direct allocations of CDBG monies. These grants are awarded twice a year for a total of $25 - $30 million of projects per year. The water infrastructure of both Jonesville and Elkin would generally qualify for these funds and should consider supplementing their capital needs with this revenue source.

Appalachian Regional Commission

The ARC is dedicated to improving the economies and communities of the United States' Appalachian Mountains region. It has four program focuses that it supports with annual grants. All four programs emphasize economic development and better connecting Appalachia with the global economy and the nation. The Piedmont Triad has five counties (and their municipalities) that are eligible for ARC grants: Davie, Forsyth, Stokes, Surry, and Yadkin. Wilkes County is also under ARC jurisdiction. Supporting improvements to local water and sewer infrastructures are an historic legacy of this program, and one that both municipalities have used. This should and will continue to be a financial resource for these communities, provided their projects can deliver economic benefits locally and regionally.

AGRICULTURE

Agriculture is North Carolina's number one industry. Unfortunately, the loss of farmland to development poses a threat to sustaining the long-term viability of agriculture (CTNC 2014). If well managed, farmland in the watershed study area can protect and improve water quality. Because our water quality and soils are intrinsically linked, many best management practices (BMPs) protect both resources. A BMP is structured for delivering a conservation measure or series of measures that is useful, proven, cost-effective, and generally accepted among conservation experts (Texas Water Development Board 2005). When done correctly, BMPs can improve water quality while also improving the farmer's bottom line. This chapter addresses current concerns in the watershed study area and viable best manage practices including tillage, conservation, and regulatory practices, as well as current and potential partner organizations and resources.

According to the U.S. Environmental Protection Agency (2000), agriculture is the primary source of pollution for half of the impaired river and stream miles and 40% of impaired lake and reservoir areas. Agricultural sources of pollution include cropland and livestock production. Almost 42% of land in the watershed study area is designated farmland making farmers and livestock producers major participants in plans to reduce impacts to surface waters.

Depending on the practices used, agriculture can have significant positive or negative impacts on water quality. Because of the potential for runoff to become contaminated with sediment, pesticides, and fertilizers, agricultural operations can pose a number of risks to water quality and public health. Similarly, these practices directly affect the ecology of these areas, which often benefit from minimal management of lands, such as grazing. However, working lands are important parts of local histories and economies, and when properly managed, agricultural activities can be compatible with healthy water quality and aquatic habitat (UNRBA 2007).

In general, local governments cannot apply restrictions other than lot size to agriculturally zoned districts. Within agricultural zones, USDA-Natural Resources Conservation Service (NRCS) standards and guidance may affect where facilities are located. Voluntary Agricultural District (VAD) designations can help ensure that rezoning decisions factor in existing agricultural operations and local Soil and Water Conservation Districts (SWCD) and NRCS personnel can assist farmers with siting agricultural activities on their lands (UNRBA 2007).

TABLE 7: COMMON AGRICULTURAL BMPS

Common Agricultural Best Management Practices	
Permanent Vegetative Cover	Conservation Tillage Systems
Animal Waste Management System	Stream Protection System
Stripcropping Systems	Permanent Vegetative Cover On Critical Areas
Terrace System	Sediment Retention, Erosion, or Water Control Structures
Diversion System	Improving An Irrigation And Or Water Management System
Grazing Land Protection System	Tree Planting
Waterway System	Fertilizer Management
Cropland Protection System	Pesticide Management

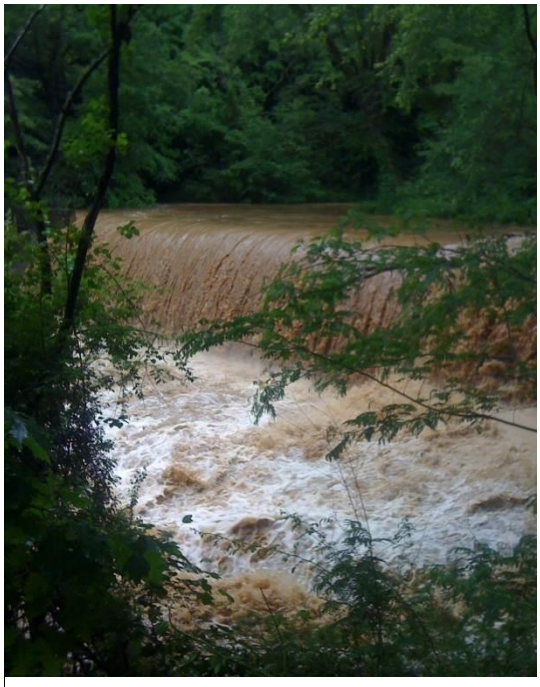
SOURCE: NORTH CAROLINA WATER QUALITY PROGRAM

Issues of Concern

Sedimentation

Well managed soil can improve water quality by infiltrating water into the ground and preventing runoff. If improperly managed, however, water may run off the surface carrying soil particles with it. Sediment is the leading source of water pollution in both the United States and North Carolina and is a major contributor to the degradation of waters in the Yadkin River and Big Elkin Creek. Sediment comes from many sources: agricultural fields, construction sites and eroded stream banks are a few of the contributors the watershed study area.

FIGURE 26: BIG ELKIN CREEK 2012 SOURCE PTRC



SOURCE: PTRC

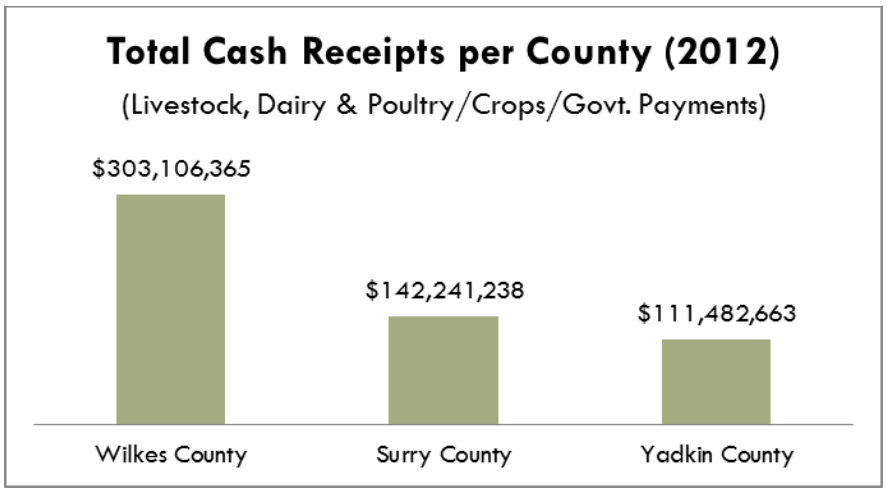
When streams and rivers and riverbeds change from clean gravel to muddy, many native fish and animals will disappear. These gravel beds provide important spawning areas for many aquatic species. Soil particles also cover spawning areas, smother fish eggs, aquatic insects and oxygen producing plants. High turbidity levels (suspended soils) in a stream also increase water temperatures, reduce light penetration and plant growth, prevent fish from capturing pray by reducing visibility, and clog fish gills. In addition to impacting the aquatic habitat, excess sediment reduces the storage capacity of reservoirs, can cause excessive flooding, and degrades the quality of water for municipal, industrial, and recreational uses (U.S. EPA 2014). Nutrient pollution is the result of fertilizer over application, improper storage of chicken litter, degraded stream buffers, and livestock access to waters.

Nutrient Pollution

Nutrient pollution is rapidly becoming one of the most costly and challenging environmental programs in the region. Too much cause algae to grow faster than ecosystems can handle. Large growths of algae, or algal blooms, reduce or eliminate oxygen in the water leading to fish kills and other ecological disasters. Some algal blooms produce elevated levels of toxins and bacterial growth that can make people or animals sick if they come into contact with contaminated waters (U.S. EPA 2014). High Rock Lake, downstream of both of these watersheds, is currently undergoing a regulatory review for high nutrient levels that have persisted there since the 1970s. Similar to the Falls Lake and Jordan Lake Nutrient Management Strategies, this process could lead to more direct regulation of land use roughly 4,000 square miles of the Upper Yadkin River Subbasin (NC DENR 2014).

Nutrient pollution is the result of agriculture, stormwater and wastewater as well as practices in and around the home including fertilizer use, pet waste, and use of detergents and other cleaners containing phosphorous. In addition to causing major environmental damage and health problem, nutrient pollution can take a toll on the economy, hurting industries and sectors that depend on clean water.

FIGURE 28: TOTAL CASH RECEIPTS PER COUNTY (2012)



(NC DA&CS 2012)

Pathogens

Pathogens are disease-causing organisms generally transmitted via rainwater flowing over the ground, picking up waste and depositing it into a nearby stream. Failing septic systems are another common source, especially in rural communities. Fecal coliform is a common indicator organism and is often used to indicate the possibility of fecal matter in surface waters. Testing for indicator organisms is more efficient and less expensive than testing for pathogens derived from specific sources (U.S. EPA 2013).

Hazardous Waste

Many products used around the home and farm contain hazardous materials. Improper disposal of hazardous waste can pose significant environmental and human health concerns. In rural locations, wastes are often disposed of by throwing in the trash, pouring in a ditch, dumping on a vacant lot or burning. When working with the NC WRC, Joe Mickey was called to a NC Department of Transportation construction project where forty-year old oil drums had been uncovered and were leaking into the trout waters of the East Prong of the Roaring River. This surprising find led to a $120,000 grant that required Wilkes County to clean up the polluted soils (*personal communication with Joe Mickey; see 04/29/14 meeting minutes*).

Hazardous waste can move down through the soil and contaminate groundwater or be washed into surface water bodies killing aquatic plants and wildlife. Carefully assessing which products need to be used, how to use them safely, and how to properly dispose of hazardous waste can safely keep hazardous waste out of surface and groundwater. If groundwater becomes contaminated, it is nearly impossible to clean up and well water is permanently compromised (Farm*A*Syst 2000).

FIGURE 27: CATTLE ACCESSING CREEK

SOURCE: JOE MICKEY

Livestock

Over the past 60 years, farm operations in the United States have become fewer in number but larger in size particularly in livestock and poultry production. While production has more than doubled since the 1950s, the number of operations has decreased by 80%. More concentrated facilities with animals raised in confined conditions has the potential to significantly degrade environmental quality, particularly surface and ground water conditions (U.S. EPA 2013).

Sediment is currently the largest source of concern in the watershed. Sediment is the result of both

construction practices (including construction runoff from farmland) and livestock grazing operations. In addition to increasing turbidity, sediment can carry nutrients and pathogens into surface waters, all of which creates poor conditions from aquatic life. Manure discharges to surface waters caused by rain events, equipment failure or improper application may deplete oxygen or ammonia toxicity causing fish kills. Nutrients from livestock and poultry manure also cause harmful algal blooms that may produce cyanotoxins which are harmful to animals and aquatic life as well as to humans when exposed in recreational or drinking water supplies. Pathogens from livestock and poultry operations can reach surface water or groundwater through runoff, spills, or infiltration and may pose a risk to human health. There are additional human health concerns with the overuse of antimicrobials and artificial hormones in livestock and poultry operations (U.S. EPA 2013).

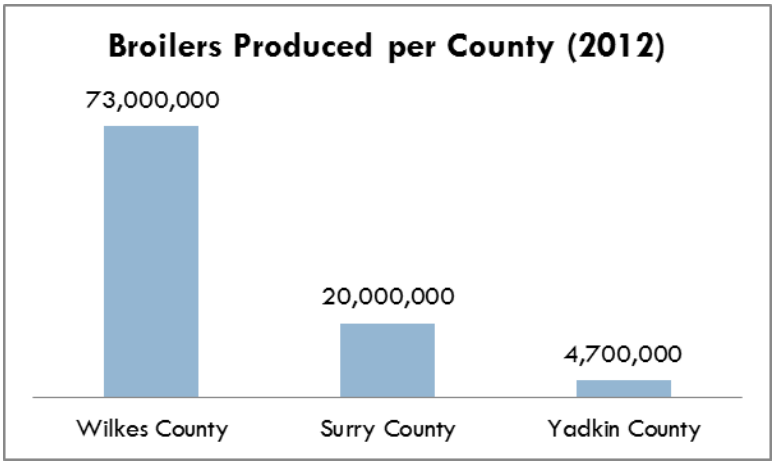
While the drinking water supply watersheds addressed in this study area are not currently listed as impaired through the NC DWR, proactively addressing potential impacts from livestock operations is paramount to ensuring water supplies remain protected. While a combination of source water protection, manure management, and water treatment processes can help reduce surface water pollution and remove contaminants from drinking water, two major challenges facing the watershed: size and scope of operations and enforcement. The majority of the watershed is made up of small to mid-sized farms and relies on voluntary compliance from farmers to minimize water pollution. While more heavily regulated, many of the large-scale farms lack the enforcement necessary to ensure waste is being properly managed.

Poultry

Managing poultry litter (a combination of wood shavings/ other bedding materials, chicken urine and feces, feathers, and dead birds) can be challenging for poultry producers. If properly handled, these by-products can be a valuable resource as fertilizer and a source of organic matter. However, if handled improperly, excess nutrients, pathogens and bacteria can pollute surface or groundwater or may cause public nuisances.

North Carolina legislation governs how poultry producers and contractors can apply poultry litter on farms and other land without discharging pollutants into surface waters. Animal waste management plans are applicable to all farms that raise at least 30,000 birds and use dry litter waste management systems. In addition to these requirements, manure haulers that apply 100 tons or less of animal waste per year are deemed permitted if they do not have a discharge of waste to the surface waters; land apply the waste at no greater than agronomic nitrogen rates; and do not apply the waste closer than 25 feet from perennial streams or perennial waterbodies. Manure haulers that apply more than 100 tons of waste per year must also not stockpile animal waste uncovered for more than 15 days; not stockpile animal waste within 100 feet of a perennial stream or waterbody; and only apply waste on fields that have a soil fertility analysis completed within the past 3 years. Manure haulers also have reporting requirements depending on how much waste they haul. (Crouse, David A., and Karl Shaffer 2010).

FIGURE 29: BROILERS PRODUCED PER COUNTY (2012)



(NC DA&CS 2012)

The watershed is host to a number of poultry operations, particularly in Wilkes County. As of 2012, Wilkes County was ranked second in

North Carolina in broiler production, with a total of 73 million chickens (NC DA&CS 2012) Dealing with poultry operations in the watershed, particularly in Wilkes County is vital to the local economy. While there is a need for more data and information regarding poultry farms, too much regulation could result in the industry moving to a less regulated area, causing significant economic impacts.

Wilkes County is ranked ninth in its production of egg-laying chickens (430,000) (NCDACS 2012). While the larger, permitted operations are easy to track and have a strong compliance record with watershed regulations, there are many smaller, undocumented farms that are likely contributing high levels of fecal coliform bacteria to the waters. Without a long-term water quality monitoring program, it is difficult to know where and when these waters are most impacted. The Yadkin Riverkeeper Association used aerial photography to document the number of chicken houses, each of which can hold approximately 25,000 birds. There are 182 separate poultry farms with 701 houses in the watershed. Conservatively, this adds up to about 87,625,000 birds that produce between 473,000 and 670,000 tons of waste per year (Quinlivan 2014). Unfortunately, there is no mechanism to determine how many of these are in use and whether they are following dry litter operations as required by the state. The organization has also been able to document illegally stored litter piles within 100 feet of perennial streams.

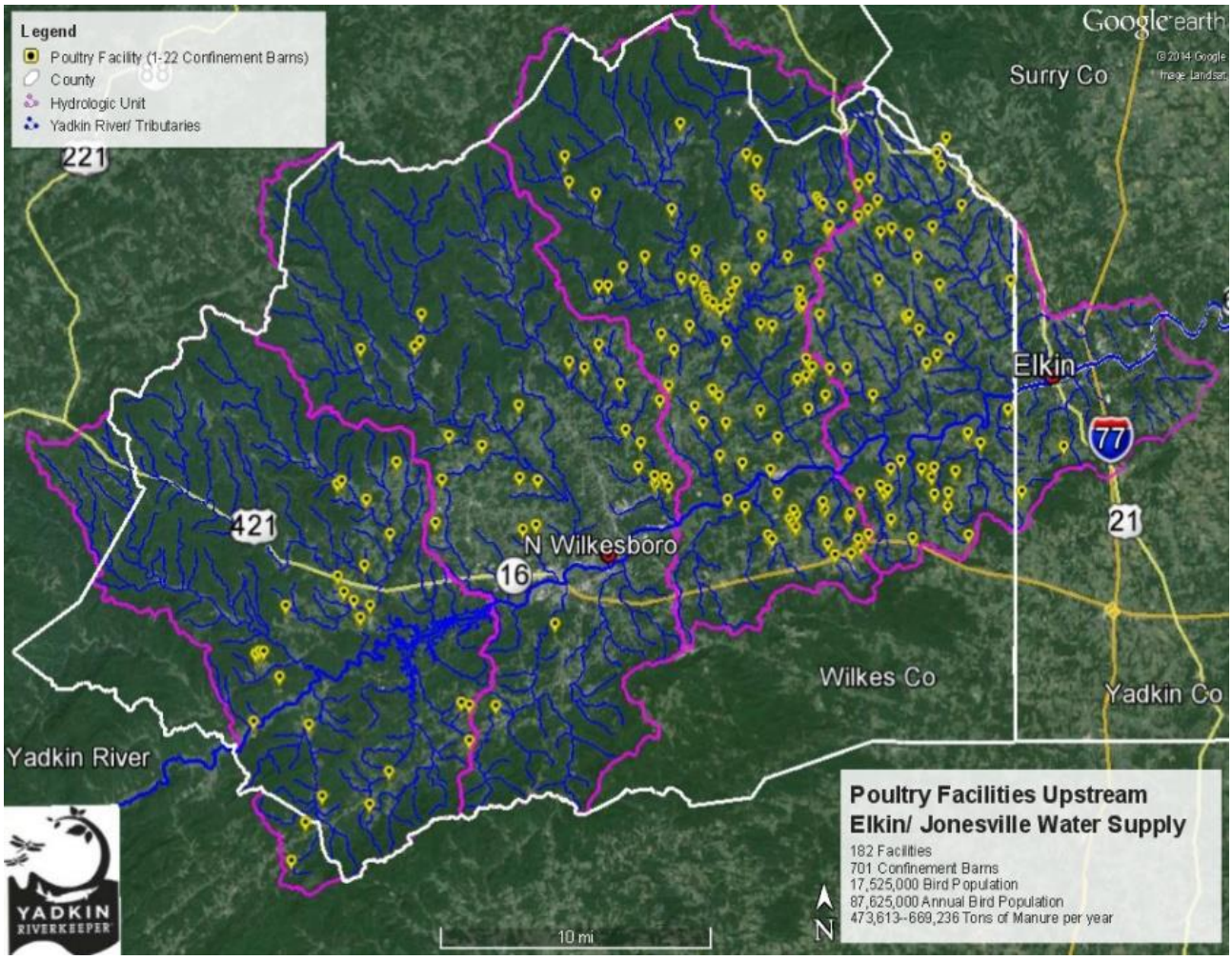


FIGURE 30: POULTRY OPERATIONS DOCUMENTED BY THE YADKIN RIVERKEEPER, 2014

Chicken litter may also contain trace metals from both naturally occurring and anti-coccidial treatments and growth supplements. If these trace metals leach into rivers and streams, aquatic organisms like fish and aquatic invertebrate species are at risk. Metals taken up through the digestive tract or through the gills can accumulate in fish and impact human and other predators. A recent study in the Bugaboo Creek watershed in Wilkes County provides very little evidence these metals are currently contributing to aquatic toxicity. If spreading continues, however, soil and streams may reach the toxic threshold for copper and zinc and severely impact agriculture as a viable economic driver in the region (Pack 2009).

FIGURE 31: POULTRY HOUSE

STOCK IMAGE

A separate study indicates many pastures in Wilkes County have reached the threshold for phytotoxicity from chicken litter applications. The heavy metals and arsenic added to poultry feed do not break down and remain in soils indefinitely, and may impact agricultural production. While trace amounts of metals are essential to plant metabolism, excessive levels have the potential to become toxic to plants. Continued application of chicken litter and increasing copper and zinc levels pose a threat to both crop production and consumption. While there is no immediate threat to human health, trace element accumulation in edible crops is also a concern. Chicken litter applications have also been shown to impact groundwater quality (Brower 2013).

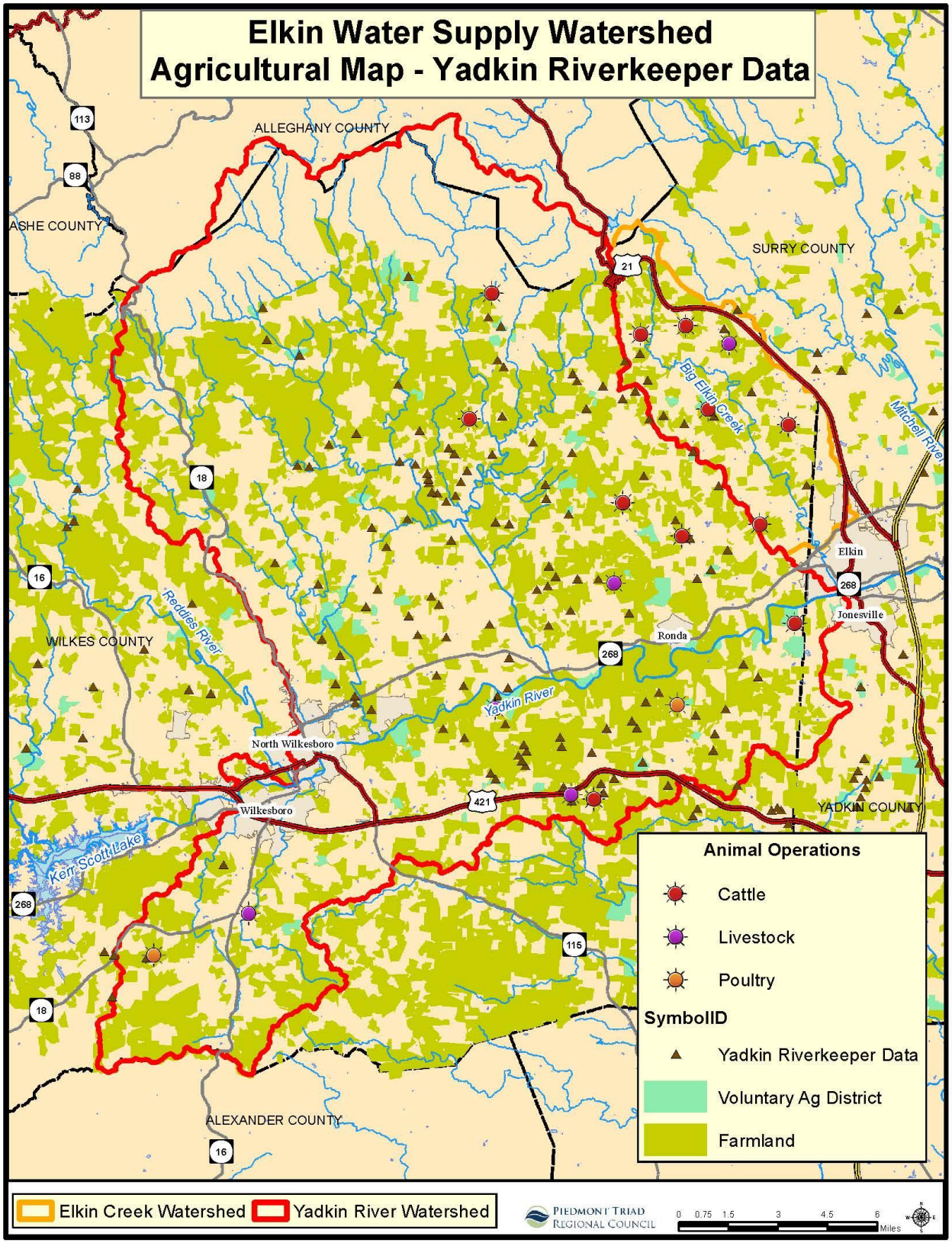


FIGURE 32: AGRICULTURAL MAP - YADKIN RIVERKEEPER DATA

Grazing Livestock

Wilkes County is home to 31,500 cattle, the third-largest county population in North Carolina (NCDACS 2012). Over the last several years, there has been a significant increase in turbidity in the watershed study area, due in part to cattle grazing operations. BMPs such as stream buffer and cattle exclusion fencing have the potential to reduce erosion and sedimentation by 20 to 90 percent from cattle grazing operations (U.S. EPA 2014). While Wilkes County is aggressively pursuing cost share funds to implement these practices, the need far outweighs available funding. The Wilkes County Soil and Water Conservation District requested $1,007,124 in fiscal year 2015 but only received 7% of the requested amount, $69,294 (NC DA&CS 2014).

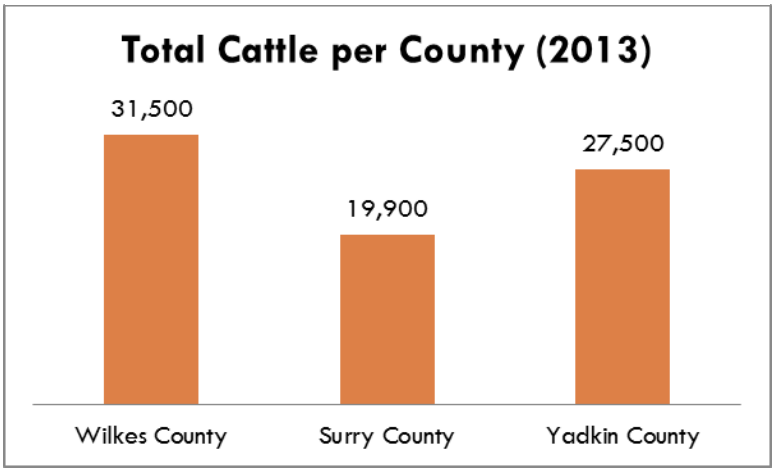
FIGURE 33: LIVESTOCK BMPS

SOURCE: NC.WATER.USGS.GOV

Uncontrolled, or overgrazing presents a number of disadvantages. Overgrazing exposes soils, increases erosion, encourages invasion by undesirable plants, destroys fish habitat, and reduces the filtration of sediment necessary for building stream banks, wet meadows, and floodplains (U.S. EPA 2014). The loss of vegetative cover weakens root systems and exposes and compacts soil, increasing erosion and increasing pollution from stormwater runoff (Farm*A*Syst 2001).

Planned grazing, rotational grazing or management-intensive grazing systems reduce the time that livestock spend in each pasture. This practice increases the nutritional value and uniformity of vegetation and nutrient cycling is more rapid. Controlled grazing can be implemented by using separate pastures or portable electric fences to make pastures smaller. Good grazing management optimizes animal production while maintaining vegetative cover by ensuring high nutritional value for peak lactation or optimal weight gain. Intensively managed grazing, on the other hand, causes some plants to mature and lose their high nutritional characteristics while others die from over grazing, resulting in declining animal performance (Farm*A*Syst 2001).

FIGURE 34: TOTAL CATTLE PER COUNTY (2013)



(NC DA&CS 2012)

Taking time to routinely assess pastures and evaluate how well a grazing program is working is important for both short-term management decisions and long-term profitability as it relates not only to animal health but the need for hay production and other cost considerations. Instead of having a dedicated area for feeding livestock, different feeding locations within the pasture can allow more efficient

feeding and better distribution of manure across pastures. If it is beneficial to have a dedicated feeding area for feeding, ensuring it is carefully managed for rainwater and runoff will reduce the potential for pollution (Farm*A*Syst 2001).

Limiting livestock access to riparian areas is one of the most critical methods of reducing water pollution from livestock operations. A riparian area is the ecosystem along a stream, ditch, creek, river, pond, or lake. Preventing livestock from standing in the water, walking down the banks, or depositing manure in the stream decreases the amount of sediment and manure entering surface waters. This also prevents soil compaction and degradation of vegetation and undergrowth allowing water to absorb more easily into the soil reducing runoff and erosion. Providing alternative water supplies for livestock away from stream banks and riparian areas is a key management technique for maintaining these critical areas (Farm*A*Syst 2001).

Agricultural lands, especially field borders and grazing lands are historically an important habitat for many native plants and animals. As these lands are converted to development or more intensive use such as crop lands, these important open early successional habitats are lost. This loss of habitat is of special concern for the federally endangered bog turtle which benefits from appropriate grazing regimes that keep open wet meadows and shrub dominated bogs from going through natural succession and becoming forested (NC WRC 2005). Cattlemen and farmers can conserve these habitats by planting native grasses, keeping bogs free of trees and following a grazing plan that avoids impacts to bog turtles, with the assistance of a wildlife biologist (NC WRC 2012).

Utilizing source water contamination preventing measures related to livestock and poultry manure can improve water quality and reduce the burden on drinking water treatment utilities. Management strategies include preventing animal manure from coming into contact with runoff and water sources, properly applying manure as fertilizer on crop or pastures, and appropriately managing pastures (U.S. EPA 2013).

Crops

Soils in the Piedmont region of North Carolina have been intensively farmed since the founding of our country. Wilkes County is currently the second-largest producer of hay in North Carolina, yielding 63,200 tons in 2012 (NC DACS 2012). The watershed is host to soybean, tobacco and corn operations, many of which utilize best management practices suited to the region and protect and improve water quality. Specific farms have, however, been identified as using poor management systems and ultimately contributing to degrading water quality conditions in the watershed. Conventional tillage impacts the health of our soil, our water and contributes to poor air quality. The following practices have a significant impact on stream health in the study area.

In 2004 the federal government instituted the Tobacco Transition Payment Program to help fund the transition for tobacco farmers as the tobacco quota and price support programs ended (USDA 2005). At the end of 2014 this funding source ends and the tobacco farmers enter into a free market system that lacks quotas and federal support. This may increase or decrease the price of tobacco which will determine how much farmland is put into tobacco production. Since tobacco is a crop that requires heavy tillage it often is a source of sediment if the field is not well buffered. This sediment impacts many of the native wildlife use surface waters for habitat.

FIGURE 36: STRIP TILLED CORN

SOURCE: STOCK IMAGE

Tillage Practices

Conservation Tillage

Conservation tillage is any tillage or cropping sequence that leaves 30 percent of the soil surface covered with plant residue to protect the soil from erosion year round (NCSU 2010). Conservation tillage increases infiltration, while reducing evaporation, runoff and erosion. Increased infiltration allows plants to have greater access to rainfall and reduces runoff and erosion. Residue also reduces the impact of raindrops on the soil surface minimizing the creation of a hard surface layer. Within conservation tillage are many practices including no-till, strip-till, minimum till and cover crops (NCSU 2010 and Furr 2014).

Research in North Carolina suggests that no-tillage or tillage with minimal soil disturbance on well-draining soils is most productive for large-seeded crops like corn and soybean. Two studies over a 25 year period provide insight on crop yield, crop residue ground cover, and infiltration compared to average non-irrigated, upland yields of the Piedmont (NCSU 2012). However, conservation tillage practices are not as cost-effective for tobacco, the predominant crop in the watershed. Poor weed control and inconsistent yields have made tobacco producers hesitant in adopting the practice. The best results from no-till practices have been shown with low residue cover crops which may not leave adequate cover for erosion control (Denton, Paul, Justin Bryant & John Morrison 2010).

Strip Tillage

Strip Tillage is considered a hybrid of conventional and no-till practices and yields appear to be comparable. Strip-tillage systems provide less soil erosion control than conservation tillage, but more than conventional practices. However, strip-tillage systems may also open up ground previously unsuitable for tobacco production. Weed control remains the biggest concern with strip-tillage practices (Bailey 2011).

The Wilkes Soil and Water Conservation District has a popular no-till drill rental program which was made possible through a grant secured through the NC Foundation for Soil and Water Conservation. The drill makes it easier for farmers to plant cool season grasses and small grains, fluffier seeds such as warm season grasses, and smaller seeds such as legumes (Wilkes County Soil and Water Conservation District 2014). The no-till drill program is popular with the community and usually has a waiting list.

FIGURE 35: NO-TILL SOY BEANS

SOURCE: FURR (2014)

The Agricultural Cost Share program identifies a long term no-till practice as "planting all crops for five consecutive years with at least eighty percent (80%) of the at-plant soil surface covered by plant residue from proceeding crops to improve water quality" (NC SWCD 2012). The program provides incentive payments up to $25,000 for long-term no till practices.

FIGURE 37: VITICULTURE

STOCK IMAGE

Cover Crops

Cover crops are grasses, legumes or forbs planted to provide seasonal soil cover on cropland when the soil would otherwise be bare (i.e., before the crop emerges in spring or after fall harvest). There are several important benefits of using cover crops including erosion control, the addition of nitrogen (N) to the soil while simultaneously preventing nutrient loading, buildup of soil organic matter and buildup of residue which acts as a mulch, increasing infiltration and runoff. They also restore the soil's natural "glues" that give it aggregate stability and improves the soils resilience to heavy rainfall and compaction. Native grasses and forbs also increase cattle production by providing the cattle with nutritious vegetation that is drought tolerant and has limited management requirements. Increasing native grasslands in agricultural landscapes also improves habitat for native wildlife such as bobwhite quail. Cover crops ensure that the soil structure is retained and increases infiltration reducing runoff and the associated loss of valuable top soil and nutrients (NC Cooperative Extension Service 2011, NC WRC 2014).

Conversion crops

While conventional farming systems vary, most conventional crops profoundly affect the ecological system. Erosion contributes to the decline of soil productivity and runoff carries sediment, salts, fertilizers, pesticides and manure into our waters impacting drinking water supplies, fishery production, loss of wetlands and wildlife habitat and contributing to water scarcity (Gold 2007). Converting to crops that are less intensive and more suited to the natural environment increases soil health, reduces erosion, improves biodiversity and enhances productivity.

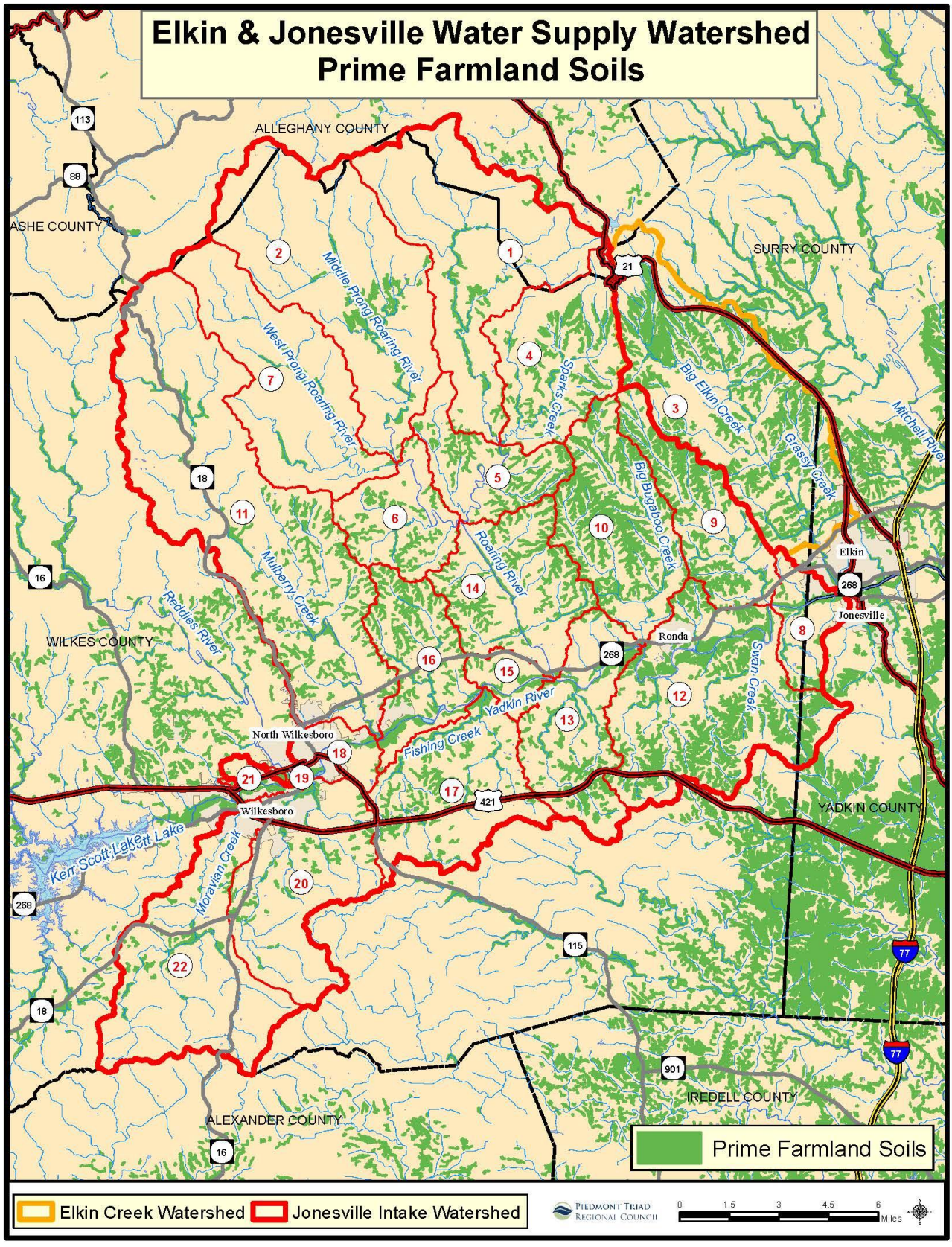


FIGURE 38: PTRC 2014

Potential Concerns

Nontraditional Operations

Nontraditional agricultural operations such as horse boarding, nurseries, dirt stockpiling, and community-supported agriculture are on the rise and these industries are likely to continue growing as development encroaches on rural lands, rural lands become more fragmented, and/or some agricultural lands are converted to low-density residential developments with agricultural components (UNRBA 2007). These nontraditional agricultural operations present management challenges because even though they are considered agriculture (and therefore cannot be regulated by the local government other than to protect public health), they may have significant amounts of impervious cover, fertilizer or pesticide use, or land disturbance and because local SWCDs may not have been made aware of them (UNRBA 2007).

Viticulture

Viticulture as an agricultural operation may have runoff containing sediment and nutrients. Similar to other types of agriculture, viticulture can use cover crops in the pathways and under trellises to meet multiple goals. Viticulture may be a source of erosion if a groundcover is not maintained between the rows. In addition to minimizing soil loss, maintaining a ground cover will reduce soil compaction, reduce weed growth and allow machinery movement sooner after rains. When utilized under-trellises cover crop species can be selected to reduce nematodes and reduce vine competition with weeds. To reduce the loss of nitrogen fertilizer application should be guided by soil tests and applied during periods where the vines will uptake more nitrogen such as during root development (Virginia Tech 2012).

Partnerships& Programs

Voluntary Agricultural District Program

Landowners of agricultural land (including forest management, livestock, and crops) can participate in the voluntary agriculture district (VAD) program authorized under the Agricultural Development and Farmland Preservation Enabling Act (N.C.G.S. §§ 106-735 through 106-749). Land with this designation is dedicated to the management of the land for rural uses with a conservation agreement between the landowner, county or local municipality that limits non-farm use or development. These voluntary districts give farmers who enroll the benefit of letting new neighbors know that agricultural operations will be occurring within a short distance of their property and protect the farmers from nuisance suits due to normal agricultural operations. VAD lands must be certified by the County Tax Department in order to receive a property tax deferment or credit and are inspected regularly to ensure that they are meeting VAD requirements. To be considered an Enhanced Voluntary Agricultural District the landowner waives their right to withdraw from the VAD program for a period of ten years and in return is eligible for higher cost share benefits. Within the watershed, there are approximately 35 registered VADs. As Elkin and Jonesville grow, conserving open spaces and agricultural land will be necessary to preserving the area's agrarian heritage and maintaining high quality waters.

Partners Organizations

- USDA Natural Resources Conservation Service (NRCS)
  NRCS provides technical and financial assistance to Districts and their cooperating land users. NRCS assistance includes helping land users plan and install conservation systems, collecting natural resources information, and helping communities reduce flood damage and enhance economic opportunities.

NRCS also works to improve water quality and the natural environment through voluntary programs and technical assistance.

- North Carolina Association of Soil and Water Conservation Districts
  The Association is an independent, nonpartisan conservation organization created in 1944 to represent the interests of the 96 local soil and water conservation districts and the 492 district supervisors who direct the District conservation programs in the state. Specifically, it; (a) promotes soil and water conservation through its member Districts, cooperating agencies, and organizations as well as the media, (b) represents the interests of member Districts in the creation, cultivation, and full realization of locally led conservation programs with state and federal agencies, interested organizations, and the public, and (c) coordinates the conservation partnership work for the common interests of all Districts.
- North Carolina Soil and Water Conservation Commission
  The commission is a body created by state statute, charged by law with carrying out a comprehensive statewide campaign to promote the conservation of soil, water, and related resources. The Commission is responsible for keeping local Districts organized according to the State's general statutes. The Commission also has responsibility for implementing specific state programs such as the North Carolina Agricultural Cost-share Program. A seven-person board governs the Commission. The North Carolina Division of Soil and Water Conservation, in the State's Department of Agriculture and Consumer Services, administers a comprehensive statewide program for conserving soil and water resources. It serves as staff for the Commission and assists the 96 Districts and the Association in providing technical, financial, and educational assistance to the public.
- North Carolina Association of Soil and Water Conservation Districts (NCASWCD)
  NCASWCD is one of the oldest conservation organizations in the state and represents 96 local soil and water conservation districts and district supervisors.
- North Carolina Soil and Water Conservation Partnership (NCSWCP)
  NCSWCP is one of the nation's top soil and water conservation programs for private lands. The Partnership is comprised of the state division, local conservation districts and the United States Department of Agriculture—Natural Resource Conservation Service as well as private and nonprofit entities.
- NC Cooperative Extension
  NC Cooperative Extension is another instrumental resource for NC farmers. With offices in every county of the state, the Cooperative Extension offers the expertise and resources developed by NCSU's agricultural and conservation programs – especially the Department of Biological and Agricultural Engineering – providing unbiased, research-based information to local governments and interested property owners. It provides comprehensive non-point source programs and training opportunities with these resources, often working closely with Soil and Water Conservation staff to best meet the needs of farmers.
- Conservation Trust for North Carolina (CTNC)
  CTNC is a land trust working to protect natural resources through direct protection efforts along the Blue Ridge Parkway and promoting assisting other land trusts in the state through loans, advocacy and distributing grants.
- Piedmont Land Conservancy (PLC)
  PLC permanently protects important lands to conserve our region's rivers and streams, natural and scenic areas, wildlife habitat, and farmland that make the Piedmont a healthy and vibrant place to live, work and visit for present and future generations.
- Blue Ridge Conservancy (BRC)
  BRC permanently protects land and water resources with agricultural, ecological, cultural, recreational and scenic value in northwest North Carolina.

- Land for Tomorrow
  A coalition of state and national conservation and environmental groups, local government associations and wildlife organizations that advocates for funding the state's conservation trust funds, including the ADFPTF.
- NC Department of Agriculture and Consumer Services (NCDA&CS)
  Works with CTNC and other land trusts to administer the ADFPTF and implement other statewide agricultural policies.
- NC Sustainable Local Foods Advisory Council (NCSLFAC)
  Created by a 2010 law, its goal is to promote the development of the local foods infrastructure.
- Carolina Farm Stewardship Association (CFSA) and Sustainable Foods NC (SFNC) – CFSA promotes the transition of farms to organic production and more sustainable agricultural practices. The SFNC coalition advocates for policies and programs that support local food systems. CTNC is an advisory member to SFNC.

Case Studies

Haw Rivers Land Stewards

This project fosters a conservation ethic among Haw River landowners through recruitment for and participation in the Haw River Land Stewards (HRLS) program. HRLS provides educational opportunities and resources through direct contact with the landowners. It also reduces pollution loading to the Haw River from riparian areas through land purchases for conservation and promotes public awareness of the need to protect regional water quality related to the Haw River by prominently visible signage designating "Haw River Land Steward." The conservation outcomes of this project are a community and social network of riverfront landowners interested in the welfare of the river, recruitment and identification of a group of landowners who are interested in becoming HRLS, and the ability to make additional presentations on conservation opportunities and benefits to landowners. A final intent is to foster the willingness of some of the landowners to enter their land into permanent conservation programs either through sale or donation of land to an appropriate agency (EPA 2008).

Neuse Education Team

The Neuse Education Team (NET) is a successful nutrient and pesticide management program in the Neuse River Watershed. The watershed is 6,200 square miles and entails over 3,000 stream miles. Housed at NC State University, NET was initiated to inform citizens, farmers, agencies, officials, and industry officials on how they could achieve a nutrient reduction goal of 30% over a five-year period. NET used four main management strategies: demonstration and implementation, partnerships and communication, nutrient management training, and evaluation. A series of demonstration farms encouraged widespread adoption of best management practices (BMPs) by farmers. Basin-wide partnerships were developed to promote BMPs. Various materials were developed to improve citizens' understanding of nutrient management and BMP impacts. NET successfully won more than $2 million in outside grants, developed a train-the-trainer agriculture nutrient education program for county staff to deliver farmers, wrote nutrient management plans for more than 150,000 acres and reduced N fertilizer application rates by 23%, saved farmers $20-$40 per acre by using nutrient management, fostered collaboration among diverse stakeholders and changed farmer behavior (National Water Program 2013).

Big Bear Creek Farms, Inc.

In Stanly County, NC, farmer Curtis Furr has utilized a system of farming that combines no-till farming and cover crops. By planting covercrops under his cotton and corn he has reduced erosion and increased corn yield with no increase in pests. By increasing the water holding capacity of the soil thorugh no-till and cover crops, Furr estimates a significantly higher yield than neighboring farmers who did not use cover crops. Furr has also seen an increase in organic matter in the soil, further contributing to higher yields. Covercrops include a mixture of legumes, vetch and winter rye. In addition to the nitrogen fixing legumes that helps fertilize corn, Like many Piedmont farmers, Curtis uses chicken litter as fertilizer, storing it in sheds until it is needed. Big Bear Creek Farm is a local example of using conventional corn and cotton with no-till and cover crops to reduce water pollution from sediment and nutrients while increasing yield (Furr 2014).

FIGURE 39: NO-TILL CORN

SOURCE: FURR (2014)

Soil Carbon Cowboys

Soil Carbon Cowboys demonstrates how farmers around North America have taken a new approach to cattle grazing and increased rainfall infiltration from ½ inch rainfall in an hour under conventional grazing techniques to 8 inches of rainfall infiltrating in one hour. They succeeded in reducing runoff and capturing precipitation by growing a variety of legumes, corn, and forbs for cattle to graze instead of fescue grass. Using a rotational grazing method of moving the cattle every couple of days, the plants are able to regenerate and the cattle get fresh food. This system reduces the cattle sickness, runoff from the farm, the cost of planting and harvesting feed for the cattle, increases the presence of pollinators and puts carbon back into the soil. A short video "Solar Carbon Cowboys: Arizona State Professor and Filmmaker Showcases Drought-Resilient Soil Practices" can be viewed here: http://ecowatch.us7.list-manage.com/track/click?u=214ab5fbb3f6015d74ffab4ec&id=a88eb0447e&e=6928771cf5 (Baker 2014).

Randolph County Zoning

Randolph County's zoning code protects agricultural lands and promotes development and may have useful applications in the watershed study area. Parcels zoned as rural/agricultural can be developed, but only if at least 30% is protected as open space. These areas include the mandatory riparian buffer, and are encouraged to be continuous. Randolph County also requires all new developments that adjoin agricultural or open space areas to preserve a viewshed buffer, maintaining the rural aesthetic of the landscape. These ordinances reflect the investment the County has in preserving and promoting its agrarian heritage.

Funding

North Carolina Department of Agriculture & Consumer Services

- NC Agricultural Development and Farmland Preservation Trust Fund (NCADFPTF)
  NCADFPTF supports the farming, forestry, and horticulture communities within the agriculture industry through providing funding to support the purchase of agricultural conservation easements (on farm, forest, and horticulture lands), including transaction costs, build public and private enterprise programs that will promote profitable and sustainable family farms through assistance to farmers in developing and implementing plans for the production of food, fiber, and value-added products, agritourism activities, marketing and sales of agricultural products produced on the farm, and other agriculturally related business activities, and fund conservation agreements (on farm, forest, and horticulture lands) targeted at the active production of food, fiber and other agricultural products.
- North Carolina Agriculture Cost Share Program (ACSP)
  The Agricultural Cost Share Program addresses nonpoint source pollution by providing technical and financial resources to landowners or renters of an existing agricultural operation that has been operating for more than three years. Up to 75% cost share assistance is provided to aid in the installation of best management practices.
- Agricultural Resource Assistance Program (AgWRAP)
  AgWRAP primarily addresses water use issues including efficiency, availability and storage. Funding is used to conserve and protect water resources, increase efficiency and increase water storage and availability for agricultural resources. In FY2015, AgWRAP received a state appropriation in the amount of $1,477,500.
- Community Conservation Assistance Program (CCAP)
  CCAP is a voluntary, incentive-based program designed to improve water quality through the installation of various BMP's on urban, suburban and rural lands. This program provides cost share and technical assistance for the installation of stormwater best management practices on non-agricultural land. Approved community conservation BMPs that are eligible include: Backyard rain gardens, cisterns, impervious surface conversion, riparian buffers, stream bank protection, pet waste receptacles, backyard wetlands, vegetation establishment and abandoned well closure.
- Conservation Reserve Enhancement Program (CREP)
  CREP is a voluntary program utilizing federal and state resources to achieve long-term protection of environmentally sensitive cropland and marginal pasture land. These voluntary protection measures are accomplished through 10-, 15-, 30-year and permanent conservation easements. CREP encourages farmers to place environmentally sensitive land near streams or other approved water bodies into a vegetative cover for a period of time. In return, landowners receive annual payments and are reimbursed for establishing conservation practices.

United States Department of Agriculture – Natural Resources Conservation Services

- Conservation Stewardship Program (CSP)
  CSP helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resources concerns. Participants earn CSP payments for conservation performance—the higher the performance, the higher the payment.
- Environmental Quality Incentives Program (EQIP)
  EQIP provides financial and technical assistance to agricultural producers in order to address natural

resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.

- Agricultural Conservation Easement Program (ACEP)
  ACEP provides financial and technical assistance to help conserve agriculture was created in the 2014 Farm Bill which consolidated the Farm and Ranch Lands Protection Program with the Grassland Reserve Program. This program provides matching funds to help purchase development rights to keep productive land in agricultural uses. Working through existing programs, USDA partners with State, tribal, or local governments and non-governmental organizations to acquire conservation easements or other interests in land from landowners. USDA provides up to 50 percent of the fair market easement value of the conservation easement.

Farmland Preservation Planning

The Piedmont Land Conservancy is currently assisting Yadkin County in completing a Farmland Protection Plan. PLC assisted Surry County in completing a Farmland Protection Plan in 2012. Wilkes County would also benefit by completing a Farmland Preservation Plan. Having an adopted farmland preservation plan allows the County to be eligible for preferential funding from the NC Agricultural Development and Farmland Preservation Trust Fund.

Recommendations

Support voluntary implementation of BMPs by working with counties, municipalities and other organizations to provide match funding for cost-share programs.

While cost-share programs provide a good incentive to invest in BMPs, many farmers are still struggling to make ends meet and often cannot afford to cover the additional 25 percent. A committee should be formed to work with counties, municipalities and other partner agencies to assess the feasibility of such a program. If the program is deemed feasible and supported through the participating agencies, a system should be put into place to ensure funds are spend in the most vulnerable portions of the watershed.

Improve monitoring efforts to identify point sources of agricultural pollution.

In-stream monitoring plays a critical role in targeting sources of agricultural pollution. Not only can monitoring help pinpoint where pollution is coming from, it can assess whether water quality and/or biological condition related to nutrients, sediment, or livestock-related pathogens are changing due to conservation practices. Agencies and organizations should consider seeking grant funds or collectively establishing a fund dedicated to improving monitoring efforts in the watershed. While an in-stream monitoring program may take a while to be implemented, a citizen monitoring group can be started quickly with little overhead. Providing citizens with a toolbox of what to look for and how to report issues can be equally effective. A citizen monitoring program has the added investment of building awareness in the watershed and establishing conservation farming as a social norm.

Develop a stewardship recognition program specifically targeting farmers within the Yadkin Valley area.

A farmers' perception towards conservation strongly impacts their decision on whether to pursue implementation of a practice. Establishing conservation practices as the social norm without the use of

regulatory action is critical to the long-term health of our waters. Such a program should be housed in an organization respected by the farming community (aka, Soil and Water Conservation Districts) and key leaders in the community should be central to establishing such an organization. This outreach would be ideal for a watershed conservation coordinator housed at the Yadkin Valley Heritage Corridor Partnership.

Investigate potential manure-to-fertilizer and manure-to-energy options.

Perdue AgriRecycle currently has a plant in Sussex County, DE, that pelletizes poultry litter and sells it as an additive to fertilizer. Poultry litter can also be turned into fuel, enhancing water quality and contributing to energy independence in the region. Wilkes County would be an ideal location for such a facility. Wilkes County, its municipalities and state economic development programs should pursue conversations with large-scale operators to assess the feasibility of establishing such a plant in Wilkes County.

Improve chicken litter storage facilities.

The amount of chicken litter produced far outweighs the amount that can safely be land applied at agronomic rates. However, transportation costs are a limiting factor in exporting poultry waste outside the watershed. Poultry farmers should work with local Soil and Water and Cooperative Extension offices to address storage needs and find applications for the surplus litter.

Consider implementing a policy preventing industrialized feeding operations within three miles of a natural resource designated area.

These areas are critical to protecting the biological integrity of our waters as well as providing wildlife habitat and opportunities for recreation. The area is building a reputation based on the potential for recreation and must take this growth into account when approving such facilities.

Ensure waste utilization plans are reviewed and kept up to date.

Implementation of a waste utilization plan ensures nutrients are applied at agronomic rates. Investigate pursuing a program designed to ensure poultry farmers are complying with the plan. Also ensure owners, truck drivers, and third party applicators are aware of regulations pertaining to the application of poultry waste.

Ensure farmers have the opportunity to properly dispose of hazardous waste.

Provide farmers with the means to properly collect and dispose of pesticides and other hazardous waste through well publicized collection sites and/or special events.

Identify partners and develop programs to support young farmers.

Ensure farming remains a central component of the local economy by providing young farmers with the training and resources needed to successfully maintain the agricultural heritage of the region. Work with nearby colleges and universities and leverage grant funding to build a successful program.

Consider addressing the previous recommendations through the creation of an agricultural focus group.

These and other key issues are most effectively addressed by those who have the potential to be impacted the most. Identifying and bringing together key players from the agricultural community to address water quality related issues and establishing non-regulatory measure by which to improve water quality

Conclusion

Agriculture defines life for many of the citizens in Surry, Wilkes and Yadkin counties. The Yadkin Valley is fortunate to have rich farmland soils, plentiful water supplies and generations of farming heritage. While agriculture is a vital part of the local economy, many farmers are struggling to make a profit and younger generations are not as prone to continuing the farming traditions of previous generations. The region is located on the fringe of one of the largest, fastest growing urban areas in North Carolina and farmland preservation and protection is vital not only to protecting water quality, but to preserving quality of life (McIntyre, Palmer et al. 2012).

While many farmers have traditionally produced commodity crops, improvements in transportation, the dismantling of trade barriers and increase in global conditions have made it increasingly challenging for North Carolina farmers to compete. Some of the crops and associated farming techniques have also had negative impacts on water quality. Through education and funding incentives, the region, particularly in the watershed study area, can diversify operations using best management practices and potentially increase their revenue streams, protect water quality, and ensure the agricultural heritage of the area remains intact (McIntyre, Palmer et al. 2012).

The agricultural community has more potential to improve water quality conditions than any other group. Through creative funding, stewardship, and enforcement of existing regulations, the waters of Big Elkin Creek and the Yadkin River can support the agricultural, recreational and community needs of the region.

FORESTS & FORESTRY

Forests serve as open spaces that can be an important source of profit for landowners who choose to timber or they can provide important water treatment benefits if left intact. Increasing forest cover by 10% in a drinking water source area provides a 20% -50% reduction in treatment and chemical costs, at least up to 60% tree cover, at which point the relationship weakens (Postel and Thompson Jr. 2005) (Ernst and Gullick 2002). Even with the benefit of reducing treatment costs in southeastern drinking water watersheds at least 1% of the land with natural vegetation is being lost annually to urbanization and agriculture (Wickham, Wade and Riitters 2011). Keeping the forested landscape in the watershed can therefore benefit water quality and be a potential economic resource. Landowners can protect the water quality by following the forestry best management practices (BMPs) that are designed to limit changes in sediment load, nutrient levels, water temperatures, stream flow, chemicals and dissolved oxygen levels caused by timbering.

TABLE 8: FOREST INDUSTRY ECONOMIC IMPACT

Forest Industry Economic Impact				
Total Impact	NC	Surry	Yadkin	Wilkes
Output ($mill.)	$23,400.0	$106.4 (0.64%)	$10.9 (0.05%)	$225.2 (0.96%)
Labor income ($mill.)	$6,100.0	$30.7 (0.50%)	$2.4 (0.04%)	$60.1 (0.99%)
Employment	123,000	680 (0.55%)	78 (0.06%)	1,242 (1.01%)

SOURCE: NC COOPERATIVE EXTENSION 2012

Logging operations in Wilkes, Yadkin and Surry counties are minimal and not having a significant impact on water quality. Just under1.5% ($342.5 million) of North Carolina's total economic output (Table 3) from the forestry industry comes from the three counties, collectively studied in this watershed (NC Cooperative Extension Service 2012).

However, the Southeastern United States is forecasted to be one of the top lumber producers in the states and one of the top in the world. North Carolina in particular, is estimated to have approximately 2.8 million dry tons of lumber, versus 1.8 million in South Carolina and 1.3 million in Virginia (Galick, Christopher, Robert Abt, & Yun Wu 2009). With increased demands for electricity, the biomass resource stream has implications for the economic vitality of the region but could also be detrimental to water quality if required guidelines are not properly enforced. While water quality in the study area is not considered impaired by the state, recent increases in turbidity have raised concerns among stakeholders. If not managed properly, sediment impacts from future logging operations in the watershed may have significant impacts on the economy as the public water supply and treatment costs. Geographic Information Systems (GIS) tools such as the Soil & Water Assessment Tool (SWAT) or SPAtially Referenced Regressions on Watershed attributes (SPARROW) could aid in developing a scenario most effective for protecting water quality.

Following the forestry BMP guidelines has the potential to reduce sedimentation by half (Stober, Fields, et al. 2013). These forestry BMPs, otherwise known as forestry practice guidelines (FPGs), are required in North Carolina, but are enforced by the overtasked NCDENR rather than NCFS staff (NC Forestry BMP Manual 2006). Due to a lack of resources and staff, these voluntary regulations are not always enforced and their compliance is irregular. Therefore, if a landowner chooses to ignore the recommendations of the NC forester there is limited recourse available to the forester to ensure that the forestry practices are modified to protect water quality.

The one forestry practice guideline that NCFS staff can enforce are the mandatory 50-foot stream buffers. Riparian buffers are areas along waterways that are forested. There is broad scientifically-based consensus

that contiguous, intact riparian areas are essential for the healthy functioning of streams (McNaught and Spalt 2013). Forested buffer zones provide the service of filtering debris, nutrients, and sediment from surface flow before it reaches catchment waters. Perhaps most importantly, riparian buffers have the ability to slow the velocity and disperse the volume of stormwater runoff before it reaches streams and erodes their banks and beds.

The trees provide shade to cool streams and people, critical for supporting trout, which begin to die in water temperatures above 78° F. A forested buffer along waterways are important for water quality and provide habitat for songbirds, deer, frogs and other wildlife people enjoy viewing or hunting (NC WRC 2007). "Younger riparian forests can also lack dead wood on the ground, which is important for some songbirds (e.g., Kentucky warbler), many reptiles, amphibians, and some small mammals. Habitat disturbance can be important for creating canopy gaps which create small pockets of dense, low growth (valuable for nesting for Swainson's warbler, hooded warbler, Kentucky warbler and wood thrush), provide cover for American woodcock, and are valuable foraging areas for many juvenile birds (WRC draft 2016 WAP). These forested buffers that are contiguous with floodplain forests are especially important to protect when the surrounding topography includes steep slopes and the soils are highly erodible.

Turbidity appears to be a top concern of these two watersheds and, indeed, the entire Yadkin River. Restoration of the stream buffers will be critical to mitigating these impacts and restoring healthy water conditions for habitat, recreation, and drinking water safety. In an effect to reflect the value of stream buffers for managing runoff and protecting streams' water quality, the PTRC conducted a stream buffer assessment for this plan. The PTRC staff used satellite imagery of the watershed's land cover to assess the quality of the buffers along all of the streams, ranking them on a five-point scale, with 1 being pristine conditions and 5 being conditions where the buffer is absent. The methodology of this assessment is detailed in the Watershed Protection and Rehabilitation chapter, and its findings directly inform the plan's project atlas.

Programs

Forestry programs

In the Piedmont region of NC the NC WRC recommends protecting 75 acres or more of upland forest blocks to provide habitat for priority species that include the Worm-eating Warbler, Black-throated Green Warbler, Yellow-billed Cuckoo, and Eastern Fox Squirrel. Using clustered development, a bond referendum, or fee-in-lieu systems may enable the City and the County to conserve forest land for recreation potential as well as wildlife habitat, which ultimately ensures water quality by protecting forested land use.

Protecting the rural landscape through the use of conservation easements is another strategy that can support local landowners by reducing the taxes on their land while ensuring undeveloped, forested areas are managed to benefit the landowner and the natural resources. There is a fair amount of public land in the headwaters of Roaring River, Big Elkin Creek and other important waters in this watershed but these lands are primarily dedicated to public uses. Increasing the prevalence of private protected land within the watershed will keep the rural heritage of the community alive while ensuring that residents are visible stewards of their land and open space.

Landowner Education Programs

NC Cooperative Extension offers educational programs covering forestry issues including family forestry, community forestry, wildlife and woody biomass. The family forestry program is designed to provide educational opportunities and professional services to landowners interested in enhancing natural resource

stewardship and increasing the economic benefits generated by the forests through active management. Increasing the awareness of these resources can benefit the landowners while also improving the health and management of the forest resources in the Elkin area watershed.

Virginia has the Virginia Forest Landowner Education Program (VFLEP), which "…offers a wide variety of science-based educational opportunities for new and experienced forest landowners. VFLEP also offers continuing education opportunities for natural resource and real estate professionals." It is designed to educate landowners on best practices so that they can both minimize environmental impacts of their forestry operations and optimize the yield(s) of their harvest(s). The program focuses on both structural and non-structural practices to accomplish these goals. More information can be found at http://forestupdate.frec.vt.edu/.

Regeneration of Forest Lands

Regeneration following logging is a great way to reduce sedimentation. Currently there is a 50% cost share program for replanting after timbering. Increasing the funding for that program to increase the number of landowners able to participate and increasing the available nursery stock used to regenerate land will improve the regeneration efforts already occurring. Incentivizing replanting through expedited re-zoning, or grant programs to increase the amount of financial incentives available to landowners, is important to keep sediment from entering the waterways.

FOREST DEVELOPMENT PROGRAM (FDP) – Property owners with five acres or more who have a forest management plan written by a consulting forester or NC Forest Service forester, are eligible for partial reimbursement for the cost of site preparation, seedling purchases, tree planting and the release of desirable seedlings by removing competing vegetation. These practices are aimed at increasing reforestation and providing a long term supply of timber (NC Forest Service 2013).

Natural Resources Assessment

The Elkin and Jonesville watersheds are ripe with natural resources including rivers, forests and open lands. Many of these resources have been identified and protected by federal and state agencies in the form of state parks and the Blue Ridge Parkway. Many other assets are on private land. Across the United States between 1970 and 2010, counties with over 30% protected public land saw a 345% job growth, compared to 83% growth over the same time for counties with no public land (Sturges 2014). The natural resources in the watershed that directly and indirectly impact or benefit from clean water include forests, trout, birds, and other plants and wildlife.

FIGURE 40: RUNOFF FROM A TOBACCO FARM, SURRY COUNTY. PHOTO COURTESY JOE MICKEY, 2014

Trout

North Carolina is at the southern range of coldwater fishery habitat and has vast amounts of granitic geology that limits productivity of the trout streams (NC WRC 2013). NC has approximately 4,000 miles of streams that can support brook, brown and rainbow trout which require cold, clean water and are therefore usually restricted to higher elevation streams and lakes (NC WRC 2013). The watersheds discussed in this plan have 13 miles of trout-supporting waters, half of which are wild trout waters, as determined by the NC WRC.

Large rivers that historically supported brook trout no longer have self-reproducing populations. Most brook trout are now relegated to the headwaters of streams and have vanished, or are much less prevalent in nearly half of the subwatersheds within their historical range (NatureServe 2014). The Roaring River headwaters and the public lands within the Jonesville watershed are home to native brook trout populations (Map 5). Brook trout have cooler water temperature requirements than the non-native brown and rainbow trout and require clean, clear waters for their habitat (National Park Service 2014). Ecosystems with limited human influence require less management and usually have self-sustaining fisheries (Kwak, Thomas 2012). Increasing the amount of suitable habitat for brook trout through land preservation and riparian buffer protection would benefit the water ecosystem and trout fishery.

FIGURE 41: BROOK TROUT,

SOURCE: PETE YEOMANS

Wild trout populations in NC are often dominated by trout that are less than 3 years old and shorter than 10 inches in length. Even with these limitations in 2008 trout anglers in NC contributed $174 million in economic output (NC WRC 2013). Nationwide anglers spent $25.7 billion on freshwater fishing trips and equipment (U.S. Fish and Wildlife Service 2013). Keeping surface water

clean enough for trout will support this important economic resource and ensure the quality of Jonesville and Elkin's drinking sources.

Many freshwater fisheries require intensive management to meet the human resource demands. Rivers and streams that have the characteristics to support trout but lack a robust population may be stocked with hatchery raised trout to increase populations. In streams and lakes that get too warm in the summer to support trout, the NC WRC may open the waters up to hatchery supported or delayed-harvest (NC WRC 2013). "Delayed-harvest" trout waters are stocked with hatchery raised trout by the NC WRC in the fall to increase the chances of catching trout. These fisheries are only open to youth fishing until June when it is opened to all anglers to prevent a massive die off in the summer. When the delayed-harvest waters open for adult fishing in June, regulations revert to hatchery supported restrictions including no size limit or bait specifications (NC WRC 2013). Currently there is only one "Delayed Harvest" reach within the study watershed which is located in Stone Mountain Park (see Figure 41). Addressing the sediment issue to improve water quality on Big Elkin Creek would increase the economic benefits from trout fishing by allowing more sites for WRC to stock trout.

While the Elkin water supply watershed plan aims to keep the water safe for drinking, there are other benefits gained by improving water quality. Point and non-point source discharges often result in a decline of water quality for human consumption, and also negatively impact stream ecology due to increased temperatures, high nutrient loads, acid deposition, and the addition of other substances toxic to fish (NC WRC 2013). Negative impacts in stream ecology, are seen as reduced abundance and diversity of aquatic invertebrates, which are an important part of the trout diet, pools are lost from channelization and modification of stream flow, adequate substrate is lost to increased sedimentation, and cover necessary to support trout populations is lost as riparian buffers are removed.

Wilkes and Surry Counties contain waters that are high enough in elevation (1,500 ft) to support trout based on the NC WRC trout water classification. The "Trout waters" criteria for the NC WRC differs from the DWR designation which only considers those "waters which have conditions which shall sustain and allow for trout propagation and survival of stocked trout on a year-round basis" (NC DWQ 2009).

TABLE 9: IMPACT OF WATER QUALITY ON TROUT

General Trout Requirements	*Contributing Resource*	*Common Challenges*
Cold Water	Trees that shade stream	Logging and overgrazing that alter riparian vegetation
Clean Water	Wetlands and riparian zones that help filter out pollutants	Polluted runoff containing herbicides, pesticides, and oils
Oxygen	Riffles to mix oxygen into stream	Decaying plants that rob oxygen from the stream
Food	Good populations of aquatic insects	Too much silt or algae that smothers insects
Holding Habitat	Instream structure, such as logs, deep pools, and boulders	Channelization and removal of wood from streams
Spawning Habitat	Clean gravels	Silt that clogs spaces between gravel

SOURCE: Modified from "My Healthy Stream", by Jack E. Williams, Michael P. Dombeck and Christopher W. Wood; Trout Unlimited and the Aldo Leopold Foundation

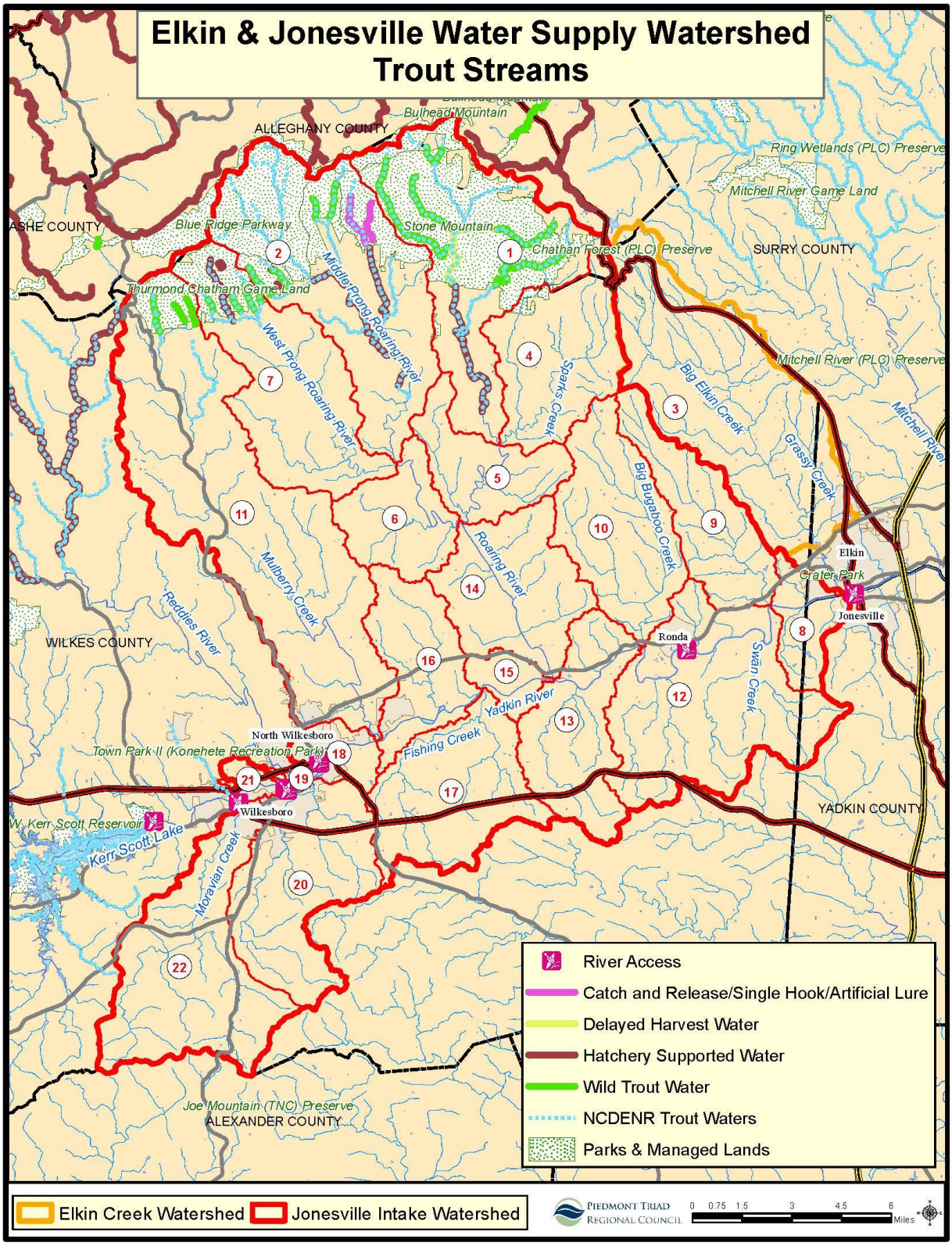


FIGURE 42: PTRC 2014

Wild trout fisheries maintain wild trout as renewable natural resources while also providing opportunities for harvest (NC WRC 2013). Streams designated as "Wild trout waters" support trout year round but restrict anglers to using only artificial lures (that lack a scent or taste to attract the fish) with one hook and keeping trout of seven inches in length to ensure populations will be maintained (NC WRC 2013). The NC WRC completed the North Carolina Trout Resources Management Plan in which "Five critical program areas (Trout Management, Resource Protection and Habitat Enhancement, Research, Angler Access, and Education and Communications) and specific goals for each area have been identified" (NC WRC 2013). Creating partnerships between WRC and other partner organizations to implement the five critical program areas for managing trout will have significant benefits to the local economy and help sustain the local water supplies into the future.

Bog Turtles

FIGURE 43: BOG TURTLE,

SOURCE: JONATHON MAYS AND JEFF HALL

Wetlands are one of a hydroscape's most valuable assets. Providing natural flood control, pollutant filtration, and ecological habitat (Washington State University 2014). Wetlands are delineated using three attributes: hydric soils, hydrophytic vegetation, and hydrology. The criteria basically fulfill the concept that soils must be saturated with water for at least two weeks out of an average year, and that these areas are supportive of wildlife that rely upon wetlands as habitat. The Elkin Watershed contains 5.7% of partially hydric soil and 0.03% all hydric soil for a total of 248,914 acres of potentially hydric soil (Figures 11 & 12) which contributes to the occurrence of suitable wetland habitat for the bog turtles. Bog turtles typically live in habitats that are sunny wetlands soggy from groundwater and natural springs. The Jonesville and Elkin Watersheds contain 15 bog turtle populations which are considered federally- and state-threatened (Figure 43). One of the threats to the bog turtle is the loss of habitat due to natural succession. Open pastures that are wet or ditches that have standing water serve as important habitat for the bog turtle but many of these areas are experiencing the growth of trees and shrubs due to succession (NC WRC 2007). Farmers can work with a wildlife biologist to implement appropriate grazing regimes that keep these wet pastures, and bogs open to encourage suitable bog turtle habitat. Historically, such habitats were preserved by natural fire regimes created by lightning strokes and other extreme weather events. Species that will benefit from protecting wetlands and bogs include the Bog Turtle, Alder Flycatcher, Meadow Jumping Mouse, Southern Bog Lemming, and Four-toed Salamander (NC WRC 2012)." Bog habitats and other wetlands should not be used for active recreational areas but passive recreation over boardwalks may be an opportunity to bring people closer to the birds and wildlife that inhabit these wet areas.

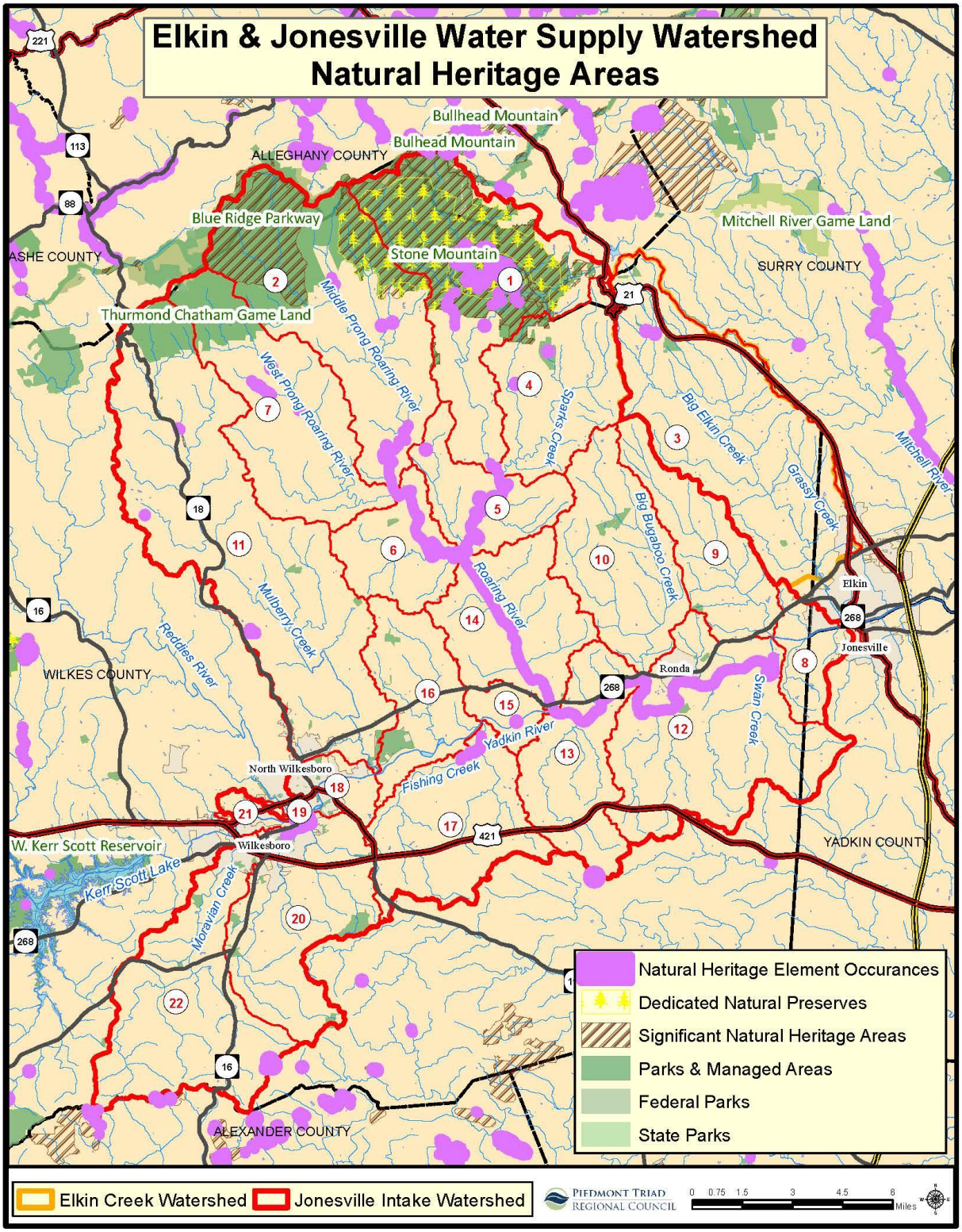


FIGURE 44: PTRC 2014

Rare Aquatic Species and Other Species of Concern

Rare aquatic species inhabiting the Elkin water supply watershed that could benefit from improving water quality include the brook floater (*Alasmidonta varicose*) which is state-endangered and a federal species of concern commonly found in the upper portions of forested watersheds. The brook floater is a mussel that lives in creeks and small rivers with moderate water flow and rocky substrates or sandy shoals (NatureServe 2014). This mussel is negatively impacted by eutrophic conditions caused by excess nutrients and siltation which removes the small riffles it requires for habitat. As adults the brook floater lacks the ability to move to cleaner waters which highlights the importance of improving water conditions by reducing sedimentation. The Carolina foothills crayfish (*Cambarus johni*) also prefers high gradient streams but is found in small to medium sized creeks in sandy substrate that have leaf packs and root wads (NatureServe 2014). This crayfish is only known to reside in North Carolina and relies heavily on vegetated riparian areas is for habitat.

The Elkin and Jonesville watersheds contain many species of concern that utilize floodplain forest habitats and adjacent forests. The vegetated riparian areas are important for the mayfly (*Macdunnoa brunnea)* which uses the leaves from trees and shrubs bordering swift, deep streams as a food source while living in the stream as larvae and then the adults likely utilize the forest as habitat while breeding (NatureServe 2014). Keeping forested buffers along the creeks in the Elkin and Jonesville watersheds will ensure that the water quality benefits from the forest cover, and also ensures the survival of the rare aquatic species that live in this area (Figure 43). Floodplain forests are also very important habitat for breeding amphibians and serve as critical movement corridors for mammals and reptiles (NC WRC 2005). Because upland species use floodplain forests during a portion of their life, or move through these habitats, floodplain forests benefit many species not exclusively considered aquatic or floodplain. In high water events adjacent upland sites can also serve as important refuges for many amphibian and reptile species (Bailey et al. 2004).

Native Plants

FIGURE 45: NATIVE CARDINAL FLOWER

SOURCE: JOE MICKEY

Plants that were growing in North America prior to European settlement are considered to be "native" plants. Native plants have been on this continent so long that they are adapted to the climate and the herbivore pests and require relatively little maintenance after they are established on an appropriate site (Moorman et. al 2002). Native plants in landscaping require no or minimal pesticides and fertilizers for optimal growth thus, reducing the potential runoff of those chemicals into our waterways. Native plants used in riparian buffers also increase the diversity of insects in the watershed and thus improve the insect-derived ecosystem services such as pollination in agriculture and food abundance for birds (Gill et. al 2014). Encouraging native plants in the watershed has the potential to protect the water quality, and increase the benefits to agriculture and recreation.

TABLE 10: PLANT AND ANIMAL SPECIES OF CONCERN

Species	Common name	State status	Federal status
Aquatic habitat			
Alasmidonta varicosa	Brook Floater	E	FSC
Cambarus johni	Carolina Foothills Crayfish	SR	
Macdunnoa brunnea	a mayfly	SR	
Wetland habitat			
Glyptemys muhlenbergii	Bog Turtle	T	T(S/A)
Forested and Riparian habitat			
Autochton cellus (forests)	Golden Banded-Skipper	SR	
Crocanthemum propinquum (varied w/woodlands)	Creeping Sunrose	T	
Crotalus horridus (hardwood forests and river bottoms)	Timber Rattlesnake	SC	
Macrocoma sullivantii	Sullivant's Maned-moss	SR-D	
Mononeuria groenlandica (rock outcrops)	Greenland Sandwort	T	
Myotis leibii	Eastern Small-footed Myotis	SC	FSC
Myotis septentrionalis	Northern Myotis	SR	FSC, PE
Orthotrichum keeverae	Keever's Bristle-moss	SR-L	
Plestiodon anthracinus(humid wooded area with leaf litter)	Coal Skink	SR	
Robinia hispida var. fertilis (woodlands and forests)	Fruitful Locust	SR-O	
Satyrium favonius Ontario(open woodlands)	Northern Oak Hairstreak	SR	
Setophaga cerulean(mature hardwood forests) Much info	Cerulean Warbler	SC	FSC
Spilogale putorius(forests)	Eastern Spotted Skunk	SR-G	
Sylvilagus obscurus(coniferous forests)	Appalachian Cottontail	SR-G	
Upland and Outcrop Habitat			
Asplenium pinnatifidum (dry rock outcrops)	Lobed Spleenwort	SR-P	
Chamerion platyphyllum (roadside and disturbed areas)	Fireweed	E	
Euchloe Olympia (open woods on shale barrens)	Olympia Marble	SR	
Heuchera hispida (rocky forests and outcrops)	Hispid Alumroot	SR-P	
Hexalectris spicata (dry forests and woodlands esp calcareous)	Crested Coralroot	SR-P	
Woodsia appalachiana (cliffs)	Appalachian Cliff Fern	SR-P	
Woodsia ilvensis (cliffs)	Rusty Cliff Fern	E	

SOURCE: NORTH CAROLINA NATURAL HERITAGE PROGRAM

Recreational Capacity

The natural environment in the Elkin watershed can draw many tourists to see the natural beauty of North Carolina, having outdoor recreation opportunities and supporting healthy water quality. A 2012 report found that, despite the recession of 2008, 140 million Americans make outdoor recreation a priority in their lives and spend $646 billion in outdoor recreation, in turn supporting 6.1 million direct jobs and $39.7 billion in state and local tax revenue (Outdoor Industry Association 2012).

Blueways

FIGURE 46: TOUR-DE-YADKIN 2014

SOURCE: JOE MICKEY

Blueways, or paddle trails, are managed systems of access points and facilities that allow trail users to plan trips along the water. Blueways are a way to support sustainable tourism by encouraging nature-based, low-carbon activities that can be developed close to population centers (Kline, et al. 2012). Within NC, approximately 664,000 residents participate in kayaking and/or canoeing, of which kayaking has increased by 260% and canoeing by 31% from 2002 to 2007 (North Carolina Division of Parks and Recreation [NCDPR], 2008). The Roaring River and the Yadkin River are paddle-able for beginner paddlers with the opportunity for longer trips on the Yadkin River or a trip down Big Elkin Creek for more experienced paddlers. Paddlers can put in upstream of the dams on Big Elkin Creek and traverse over the old dams using the flumes that can paddled through with a small drop (Personal Communication with Mr. Blackley).

The Yadkin River offers a great opportunity for paddlers to experience the river above, through and below the watershed. With access points in North Wilkesboro, Rhonda, Elkin and Yadkin County there are opportunities for paddlers with all comfort levels to park use the facilities and enjoy the water. Information on this blueway is maintained by the Yadkin Riverkeeper and highlighted by the Yadkin River Heritage Corridor.

Greenways/Trails

The floodplains in the Elkin water supply watershed provide ample opportunities for greenways to be developed as a passive source of recreation that promotes walking, cycling and bird watching. Greenways developed in the floodplain of rivers and streams ensure that forested buffers are retained and development in the riparian zone is minimized to protect water quality (Conine, et al. 2004). In North Carolina 72% of adults agree that more state transportation dollars should be spent to support bicycling and walking (Stutts and Hunter 2002). People taking part in these active living opportunities can also be the first defense of the water. When following streams, greenways provide environmental buffers, help reduce pollution caused by surface runoff, and often result in rapid reporting of leaks and illegal dumping to staff (WK Dickson, 2007).

Although greenways can provide benefits, they may also impact aquatic and terrestrial wildlife habitat. Paved greenways can contribute to surface runoff, culverts for greenway crossings can impede aquatic life movement if not properly installed and/or maintained, construction of greenways immediately adjacent to streams can disrupt wildlife movements and fragment wildlife habitat (NC WRC, 2012). When designing greenways, transportation planners should make every effort to minimize these impacts.

Greenways along the rivers and blueways in the rivers are examples of recreation opportunities that benefit from improving water quality. People are more willing to travel to paddle or walk along rivers that are clean. As people actively walk along the rivers they can see and report pollution/polluting activities quickly to ensure a fast clean-up response. Active living requires places such as greenways which provide locations for people to be active, in safe and convenient area which may also provide connectivity between destinations (e.g., home and work) (North Carolina Division of Public Health 2014).

FIGURE 47: ELKIN TRAIL 2014

SOURCE: JOE MICKEY

A regional plan for active living infrastructure for northwest North Carolina identified the need for key projects including the following: a master plan for connecting Stone Mountain to Elkin, a greenway feasibility analysis, a master plan for connecting Elkin's parks and a foot bridge design for the Mountains-to-Sea trail (Destination by Design 2014) (Figure 48). The Mountains-to-Sea Trail (MST), a trail connecting the Mountains of NC to the Ocean, is an example of connecting destinations. The MST includes a portion that will connect Pilot Mountain to Stone Mountain with a route that traverses through the Elkin and Jonesville watersheds. The Town of Elkin also has two well cared for trails including the Big Elkin Creek Greenway and Nature Trail which has 3+ miles of trail for walking and the Overmountain Victory Trail that traverses along Big Elkin Creek and the Yadkin River which has 4+ miles of multiuse trail (Day, et al. 2013). Showcasing these trails as connections, visitor destinations and recreation opportunities will benefit the community economically while also encouraging more streamside riparian areas to be developed in this low impact manner.

Greenways also provide outdoor learning opportunities for classes and the general public. Informational signs located along greenways can provide important historical and ecological information to recreational users. Signs about water quality can be effective instructional guides and can also serve as a teaching tool for the community. Signs about native plants can highlight the importance of native plants for the birds, bees, and butterflies as well as water quality. While signs are important for the general visitor, organized groups such as classes, historical reenactments and naturalist groups may use the safe, managed outdoor space as a site for their activities. In this way greenways offer a special learning environment for the community.

Bird Watching

Elkin is a birding hot spot on e-bird and has many acres of important bird habitat. Within the watershed 214 bird species have been documented in Wilkes County, 158 Bird species were documented for Surry County and 153 Species for Yadkin County. The Elkin and Alleghany Rail-Trail was designated as a birding hot spot (an area with high diversity) in Surry County with 73 bird species documented on their site. Within North Carolina, W Kerr Scott Reservoir—Dam was in the top 100 hot spots in with 154 species documented (eBird 2014). Stone Mountain State Park (with 86 bird species) was designated as a "hot spot" by eBird for Wilkes County and the Overmountain Victory Trail – Marley Ford Area had 77 bird species (eBird 2014).

FIGURE 48: BLUE BIRD

SOURCE: JOE MICKEY

In 2011 nearly $930 million was spent on equipment for watching wildlife (U.S. Fish and Wildlife Service 2013). The US Fish and Wildlife Service 2011 report also documented 1.9 million people enjoyed bird watching in NC with 35% traveling away from their residence to observe wild birds (US Fish and Wildlife Service 2011). Elkin has a high diversity of bird species and is labeled as a bird watching "Hot Spot" by e-bird (Bill Blackley). Many bird species migrate or move from one location to another during their life cycle. Some migrations are between summer and winter habitats (neotropical migrants) and some are as a result of changing conditions in their resident habitat (Heglund 2005). Migratory bird populations have experienced significant declines in recent years. Improving habitat quality and abundance can increase the economic benefit Elkin and Jonesville receive from bird watching. Riparian buffers and greenways frequently offer connectivity to other habitats and increase the presence of migratory bird species (Kohut and Hess 2009). Floodplain forests are also the most important habitat for nesting birds in North Carolina (NC WRC 2005). Therefore, improving, protecting and establishing riparian buffers and greenways can improve the water quality and also promote bird watching as an economic and recreational opportunity.

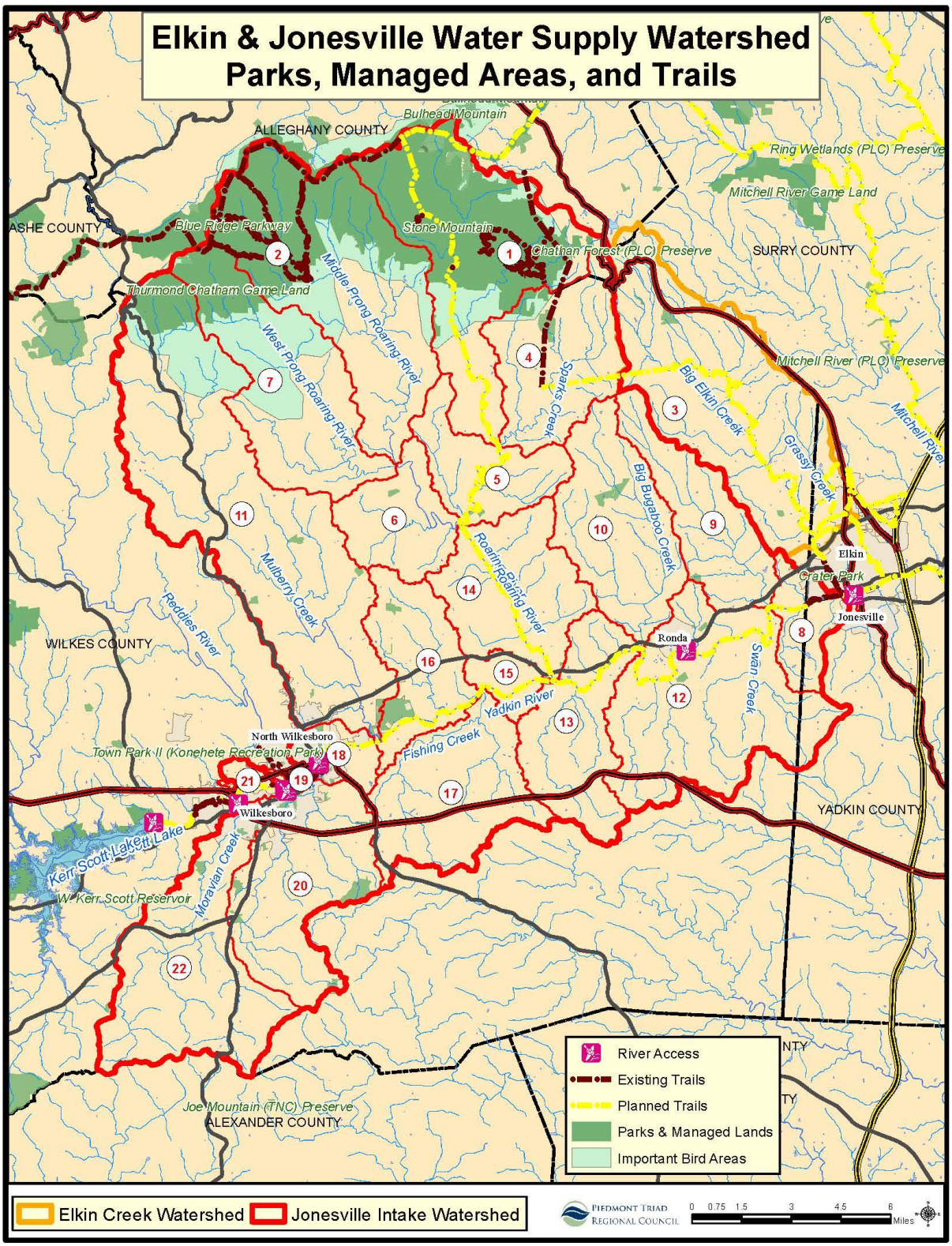


FIGURE 49: PTRC 2014

Programs

Green Growth Toolbox

The NC WRC is the state agency in charge of conserving and sustaining the state's fish and wildlife resources. The Green Growth Toolbox is a comprehensive set of resources that provides communities with tools to identify its natural assets and develop protections for them. The toolbox includes a technical assistance tool, a handbook on developing ordinances for protecting the environment, a GIS dataset and a website developed by the NC WRC to assist communities in growing in ways that conserve the most valuable natural resources including streams, and habitat. These resources were developed by the NC WRC to assist communities in directing growth in ways that conserve the most valuable natural resources, including streams and habitat. Organized, carefully planned, thoughtful development can coexist with a healthy environment and functional wildlife habitat (NC WRC 2007). The NC WRC provides municipal staff training on the tool that can be used to encourage the enhancement of recreation and tourism opportunities while attracting businesses and residents who are looking for healthy communities and understand how healthy environments increase quality of life (NC WRC 2012).

Increasing Recreational Opportunities

Fishing:
The NC WRC can provide technical assistance for river access points that increase recreational opportunities while protecting fragile wildlife habitat. Some aquatic programs where the NCWRC has partnered with local governments include the Community Fishing Program and the Tackle Loaner Program, but these two programs are not directly related to special ecological resources. The NCWRC focuses on natural resource management more with their Green Growth Toolbox.

FIGURE 50: FISHING ACCESS

SOURCE: PTRC

To support fishing as an economic resource and a way to improve watershed stewardship, the local government or non-profit agency may consider leasing current agricultural lands to improve vegetated buffers and provide designated access points for anglers. Reddies River just upstream of the Elkin Water Supply Watershed is a delayed-harvest location that received funds to construct "angler-access" steps to minimize erosion into the water by allowing anglers to traverse from the paved greenway down the steep bank to the river (NC WRC 2013).

Trails: Creating partnerships with private and public landowners to develop access points to the creeks and rivers for paddle trails in the Elkin and Jonesville watersheds will encourage increased tourism and passive recreation and increase watershed stewardship and awareness. The Elk Creek Vineyard could offer an ideal landing spot for the beginning of a paddle trail that could allow novice paddlers a 90-120 minute trail down

to the 2nd bridge (Bill Blackley). To develop this potential tourism resource the landowners, elected official and various stakeholders will have to partner to find funding to develop the paddle trail.

Birder Friendly Community Programs: The NC Birder Friendly Community training program was designed to provide businesses and communities with cooperative marketing tools reach birders who are following NC birding trail. While the educational trainings for businesses and communities have been discontinued, interested parties are still able to use the training document and program synopsis to increase their knowledge of the birding community

The Audubon Society of NC has also created a bird friendly community initiative to help conserve birds during all stages of their lives. The initiative encourages native plant landscaping, bird watching, lights out at night during spring and fall migration and brings the focus of concerned citizens to the nuthatch. Through the bird friendly community initiative, a continuing education program for landscapers will be created to encourage the use of native and bird friendly plants. Encouraging the use of native plants also benefits water quality since native plants are adapted to the local climate and rarely require fertilization or watering.

Important Bird Areas Program

The Audubon Society recognizes habitat loss and fragmentation in a changing climate as the greatest threats to the continued survival of many bird species. Through the Important Bird Areas (IBA) program Audubon identifies, monitors and creates a conservation plan for each priority site. In the Elkin/Jonesville watershed area Stone Mountain-IBA includes Stone Mountain State Park, the Blue Ridge Parkway and the Thurman-Chatham Game Lands along with some privately held properties. The habitat in this IBA includes deep cove forests, streams, rocky outcrops and cleared fields. The greatest threat identified in the conservation plan includes exotic invasive species, development and timbering. Recognizing and protecting important bird areas will provide habitat for birds while conserving many small streams that are important water resources.

Marketing Campaign to Highlight Ecotourism Potential

Ecotourism is a form of tourism that involves visiting destinations with rich ecological and cultural resources, including outdoor experiences as simple as hiking. The watershed can capitalize on ecotourism by preserving its valuable ecosystems and cultural history to ensure that rivers, trails and parks draw tourists and increases economic growth. The close proximity of the watershed to Winston-Salem and other urban centers makes it a great destination for audiences looking for easily accessible outdoor recreation. Ecotourism has been successfully embraced by areas such as nearby Hanging Rock State Park and Asheville, North Carolina, both of which have spent significant amounts of money to brand themselves as a destination for those seeking an authentic experience outdoors in areas with rich natural resources and cultural histories.

Homegrown Handmade, is one example of a resource that can be used to market the rich cultural and natural resources of the area. Another example of effective marketing is the Carolina Thread Trail which is an example of communities working together to promote regional recreational opportunities in the 15 counties including and surrounding Charlotte. goyadkinvalley.com is similar to the Carolina Thread Trail and Homegrown Handmade in that it brings communities in the Yadkin Valley together to market the agritourism, wineries, trails, historical and recreational opportunities in the area. However, sustained effort needs to be made to ensure that the information on the Go Yadkin Valley website and other marketing tools are updated and current.

Watershed Coordinator

A watershed coordinator for the Elkin and Jonesville watershed would connect the independent partners and implement the vision of improving water quality through sustainable economic development. This could include updating the goyadkinvalley.com website, having routine communication with the public, coordinating grant applications with local trails associations and land preservation efforts to support active living and economic development in the watershed. The watershed coordinator could also develop an economic development plan or open space preservation plan that focuses on the benefits of clean water and the economics behind implementing best management practices.

The Haw River Trail Partnership is an example of how cities and counties came together to support a position to implement the Haw River Trail for the conservation of the land and waters. This position was initially funded through a public, private partnership involving Burlington, Graham, Alamance County, Elon University, Preservation North Carolina and the Z. Smith Reynolds Foundation. Once the position proved to be effective at coordinating conservation and trail efforts, the position became a permanent position within Alamance County government with continued support from Burlington and Graham. A watershed coordinator position similar to the Haw River Coordinator would be very beneficial for the Elkin and Jonesville watersheds.

Policies

Open Space Preservation

Many options are available for the Towns of Elkin and Jonesville, and the surroundings counties to use to ensure that open space is maintained in their jurisdictions. Acquiring important open space is an effective way of preserving land and water quality in the watershed. The following options are appropriate to include in the subdivision ordinance and are examples that other communities in NC are following.

FIGURE 51: ELKIN CREEK

SOURCE: JOE MICKEY

Open Space Dedication Ordinances

Open space preservation or dedication ordinances are being used by communities throughout the State of North Carolina to ensure that there are recreational sites for current and future residents. Randolph County, for example, requires that developments within its rural/agricultural zone set aside a portion of a development site as open space in order to preserve the rural, agrarian heritage of the County. To incorporate open space preservation, or dedication as part of the zoning/subdivision ordinance, all residential developments with more than a certain number of dwelling units could be required to dedicate open space. The amount of useable open space required for dedication shall be determined by the jurisdiction adopting these policies. To encourage development of residential units in a downtown or designated development districts, all such residential development could be exempt from these provisions. This strategy needs to be clearly adopted and any barriers to implementation of this policy need to be removed.

Bond Referendums

Bond referendums that are approved by voters are one way to pay for open space for nature preserves, open space next to schools to improve access to low-impact recreation for youth and to preserve land along stream corridors to protect drinking water supplies. Voters in Wilkes, Yadkin and Surry Counties may appreciate the opportunity to voice their support of increasing open space with public access through bond referendums.

Fee in Lieu Ordinances used to protect open space land

As part of the power to regulate the subdivision of land, the towns or counties may determine an appropriate amount to be paid as a fee in lieu of parkland or open space dedication. The fee would not be greater than the fair market value of the land at the time of subdivision and can give the developer greater freedom in designing a subdivision. The fee in lieu allows the jurisdiction to use those fees to create a larger park or open space opportunity for the community in an area that may not be suitable for development but may be perfect for blueway access, trails, birding or other recreational activities. In this way fee in lieu ordinances can be used to ensure that water quality is improved by allowing infiltration of stormwater into open areas in areas not optimal for development. While such regulations are currently illegal in North Carolina if done for solely environmental benefits, their value for economic development, property values, and community health allow for other uses by communities.

LID Development

Local ordinances and codes can promote building and design techniques for new and redeveloped sites that can minimize a project's environmental footprint. This general approach to sustainable site design and construction is termed Low Impact Development (LID). LID is an approach to site development in which minimal disturbances are placed upon the surrounding environment by constructing structures using sustainable practices, such as using recycled building materials, solar-oriented structures, water recycling, or natural landscaping. Their central goal in regards to stormwater is to effectively reduce a site's impervious cover, and/or direct its runoff onto permeable surfaces (US EPA, 2013). There are no requirements for LID or sustainable development in the watershed outside of floodplain regulations.

LID techniques include regulations or ordinances that encourage or mandate land use practices such as cluster development, open space requirements, or pervious surface ordinances. NC requires that all publicly-funded or –owned buildings in the state achieve Leadership in Energy and Environmental Design (LEED) certification. LEED is a federal classification determined by the US Green Building Council (USGBC) that guides sustainability in building construction practices, and awards those sites that achieve their standards. The principles of LID are incorporated into all LEED-certified buildings, and, indeed, often take a larger scope of view to an entire site or landscape when considering construction and environmental impact.

The NCWRC has the Wildlife Friendly Development Certification Program. This is a program that allows developments to be recognized as wildlife friendly after meeting sufficient criteria. Developers must meet a portion of these criteria throughout all phases of the development's planning and construction, and must maintain the criteria once the development is complete. More information on the program can be found at http://www.ncwildcertify.org/Home.aspx.

Partnerships

NC Wildlife Resources Commission

To ensure that the special ecological resources that draw tourists are conserved to ensure outdoor recreation as economic revenue, the NC WRC partnered with Surry County to provide a Green Growth Toolbox training on September 19, 2014. Additional trainings in the future could ensure staff from Elkin, Jonesville, and surrounding areas are able to apply the Green Growth Toolbox during permit reviews and prior to planning additional city and county services, to protect wildlife resources. A Green Growth Toolbox training for realtors and developers would also increase awareness and consideration of the special natural resources that draw people to move to Elkin and Jonesville. Partnerships between the cities, the counties, the Forest Service, NC WRC and trail associations can also increase funding opportunities to realize the potential for recreation in the Elkin Area watershed.

Trails Associations

The Elkin Valley Trails Association is an affiliate of NC Rail Trails with the mission to increase the quality of life in the Elkin Valley by building and promoting a network of trails and greenways in Wilkes, Surry and Yadkin Counties. EVTA has been designated at a partner in realizing the goal of connecting the NC Mountains with the ocean by way of the Mountains to Sea Trail. EVTA is currently developing a master plan to determine the most feasible and stakeholder supported route for the NC State trail between Pilot Mountain State Park and Stone Mountain State Park (EVTA 2014).

FIGURE 52: EVTA BRIDGE PROJECT **SOURCE JOE MICKEY**

SOURCE: JOE MICKEY

NC Paddle Trails Association: The mission of the N.C. Paddle Trails Association is to empower communities in the local development, maintenance and restoration of paddle trails in North Carolina thereby nurturing economically and environmentally sustainable communities (Association 2014).

Yadkin Pee Dee River Trail Association is a private non-profit organization created in 1984 to promote watershed stewardship through policies, programs and projects (Yadkin Pee Dee River Trail Association 2014). Examples of projects that the Yadkin Pee Dee River Trail Association uses to instill stewardship include promoting and participating in the National River Cleanup on the Yadkin River. Expanding the historical Overmountain Victory Trail to connect Elkin with Wilkesboro is another project that they are involved with in partnership with the EVTA.

Local Land Conservancies

Piedmont Land Conservancy and the Blue Ridge Conservancy are local land conservancies that work within the Elkin and Jonesville watersheds and have the potential to protect natural resources and water quality through land conservation and stewardship.

Piedmont Land Conservancy (PLC) is a local resource for landowners interested in protecting the rural nature of their land and conserving the natural resources in perpetuity. Through conservation easements and donations, PLC strives to conserve the region's rivers, streams, wildlife, farmland and scenic areas that provide the rural heritage that draws residents and visitors alike. The PLC Stewardship program ensures lands in Surry and Yadkin Counties that are protected through conservation easements are cared for in a manner consistent with the site's ecological riches and the terms agreed to by all involved parties (PLC 2013a). Through their stewardship program, PLC ensures easement terms are upheld forever, landowner relationships are strengthened, and acquired lands are placed with the most appropriate stewardship for the long-term benefit of the land and its ecological riches. This is especially important in areas with sensitive flora and fauna such as the Elkin Valley. Land placed under the PLC stewardship program serve as an example of high quality land stewardship that other landowners can follow, and maintains adequate financial means to preserve the stewardship of the land for generations (PLC 2013a).

Blue Ridge Conservancy strives to permanently protect the land and water resources through voluntary conservation easements and stewardship. Properties placed under protection with the Blue Ridge Conservancy are managed according to a management plan designed to protect the important natural and cultural features of each individual property. In the Elkin Watershed area BRC protects properties in Wilkes County.

Yadkin Riverkeeper

The Yadkin Riverkeeper is a non-profit organization with a mission to "respect, protect and improve the water quality" in the Yadkin River through education, advocacy and action. In particular they strive to improve water quality, preserve forest canopy, support native biodiversity, teach a "river ethic" of ecological respect and ensure state and federal environmental laws are being followed. In the Elkin Watershed they bring awareness to the Yadkin River and the Roaring River through the annual Tour de Yadkin which is a three week paddle trip along the Yadkin River.

Funding

NC Wildlife Resources Commission

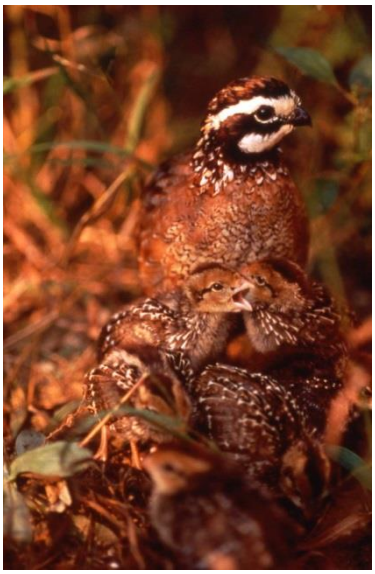
The NC WRC also has the following programs to help incentivize land management for wildlife:

Cooperative Upland habitat Restoration and Enhancement program (CURE) - Is a program developed by the NC WRC because wildlife that require early-successional habitats are among the most imperiled species in the United States, across the South, and within North Carolina. Bobwhite quail have become the "flagship species" among this group, but it also includes numerous declining songbirds, many species of mammals such as rabbits, pollinators such as butterflies, and many species of amphibians and reptiles.

Wildlife Conservation Lands Program

Similar to the Present Use Value program, but with an emphasis on ecological rather than agricultural value, this program is administered by the NC WRC. Lands must satisfy two criteria: the land must have more one or more

FIGURE 53: QUAIL AND CHICKS



SOURCE: NC WRC

protected species and the land is managed to support that species; and that the landowner must conserve at least one of the following NC WRC priority wildlife habitats:

- longleaf pine forest;
- early-successional habitat;
- small wetlands and bogs;
- stream and riparian zone;
- rock outcrop; or
- bat cave.

Grants

- NC Adopt-A-Trail Grant Program
  This program, operated by the Trails Section of the NC Division of State Parks, offers annual grants to local governments to build, renovate, maintain, sign and map and create brochures for pedestrian trails. Grants are generally capped at about $10,000 per project and do not require a match. A total of $108,000 in Adopt-A-Trail money is awarded annually to government agencies. Applications are due during the month of January.
- Recreational Trails Program
  The Recreational Trails Program (RTP) is a grant program funded by Congress with money from the federal gas taxes paid on fuel used by off-highway vehicles. This program's intent is to meet the trail and trail-related recreational needs identified by the Statewide Comprehensive Outdoor Recreation Plan. Grant applicants must be able contribute 20% of the project cost with cash or in-kind contributions. The program is managed by the State Trails Program, which is a section of the N.C. Division of Parks and Recreation.
- North Carolina Parks and Recreation Trust Fund (PARTF)
  The fund was established in 1994 by the North Carolina General Assembly and is administered by the Parks and Recreation Authority. Through this program, several million dollars each year are available to local governments to fund the acquisition, development and renovation of recreational areas. Applicable projects require a 50/50 match from the local government. Grants for a maximum of $500,000 are awarded yearly to county governments or incorporated municipalities. The fund is fueled by money from the state's portion of the real estate deed transfer tax for property sold in North Carolina.

FIGURE 54: ELKIN MUNICIPAL PARK

SOURCE: PTRC

- The North Carolina Division of Forest Resources
  Urban and Community Forestry Grant can provide funding for a variety of projects that will help toward planning and establishing street trees as well as trees for urban open space.

- North Carolina Community Transformation Grant
  In 2011, NC Community Development Corporation awarded $103 million to 61 state and local government agencies, tribes and territories, and nonprofit organizations in 36 states, along with nearly $4 million to 6 national networks of community-based organizations. $7.4 Million was awarded to North Carolina Awardees are engaging partners from multiple sectors, such as education, transportation, and business, as well as faith-based organizations to improve the health of their communities' approximately 120 million residents. Awardees also provide funding to community-based organizations to ensure broad participation in creating community change.

Conclusion

Efforts in this watershed to protect water quality will also benefit many natural resources, species of concern, and recreation. Increasing the awareness of the special ecosystems and recreational opportunities will increase watershed stewardship and will also increase economic benefits from eco-tourism. There are many natural resources that provide opportunities to connect different stakeholder groups which can help to pool resources and efforts that will benefit the whole community through watershed protection and increased passive recreation.

WATERSHED PROTECTION & REHABILITATION

This plan relies upon many resources and data developed by other entities. This includes stakeholder input, data maintained by regulatory and advisory agencies like NCDENR, professional and academic studies, and accumulated knowledge of an experienced staff. The PTRC was not able to enhance upon available water quality data or conduct a field assessment of current watershed conditions, but it did employ mapping tools to better characterize watershed conditions and identify areas that could be focused upon to ensure the long-term health and safety of water supplies.

Mapping technology is an invaluable watershed management tool. ArcGIS can be used to reflect current and historic conditions such as the local geology or land uses, and that application has been used to illustrate watershed conditions throughout this Plan. It can also be used, though, to analyze how these natural and manmade features interact to affect water quality conditions.

As seen throughout this document, maps have been made for both watersheds that show natural and manmade features in their watersheds. This includes fairly straightforward information like elevation and data that requires regular maintenance and updating, like the NCDENR potential contaminants. The PTRC has attempted to present this data in a way that is most useful to the watersheds' stakeholders and those reading this plan for the first time.

In an effort to better manage the watersheds and this plan to protect and restore them, the PTRC used the free software ArcHydro to use the local topography and hydrology to naturally segment the watersheds into smaller subwatersheds that can better characterized, allowing for more effective, local efforts that can address points of degradation or potential risk. This software delineated twenty-two subwatershed of all sizes, from 0.22 square miles (Subwatershed 19) to 49.25 square miles (Subwatershed 11) (Figure 55). These subwatersheds are defined by their natural confluence points where all tributaries come together and drain to the two larger water supply watersheds. This is reflected in the high variability of the number of stream miles they each contain (Figure 54). In the Big Elkin Creek, it was determined that there are no valuable further delineations, and therefore it has no subwatersheds. The delineated subwatersheds can be seen throughout this plan, as they helped in focusing attention to local areas that may have unique environmental or social conditions relevant to the health and sustainability of the respective watersheds.

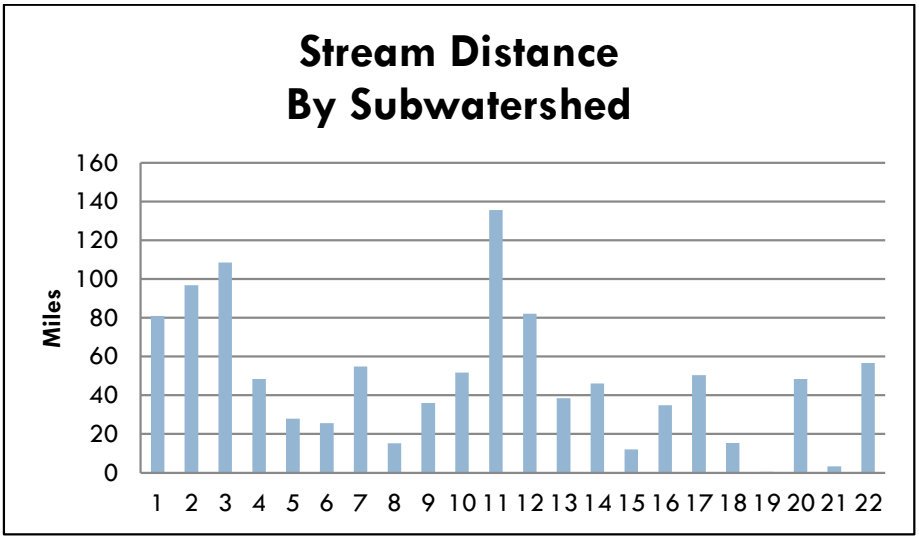


FIGURE 55: PTRC 2014

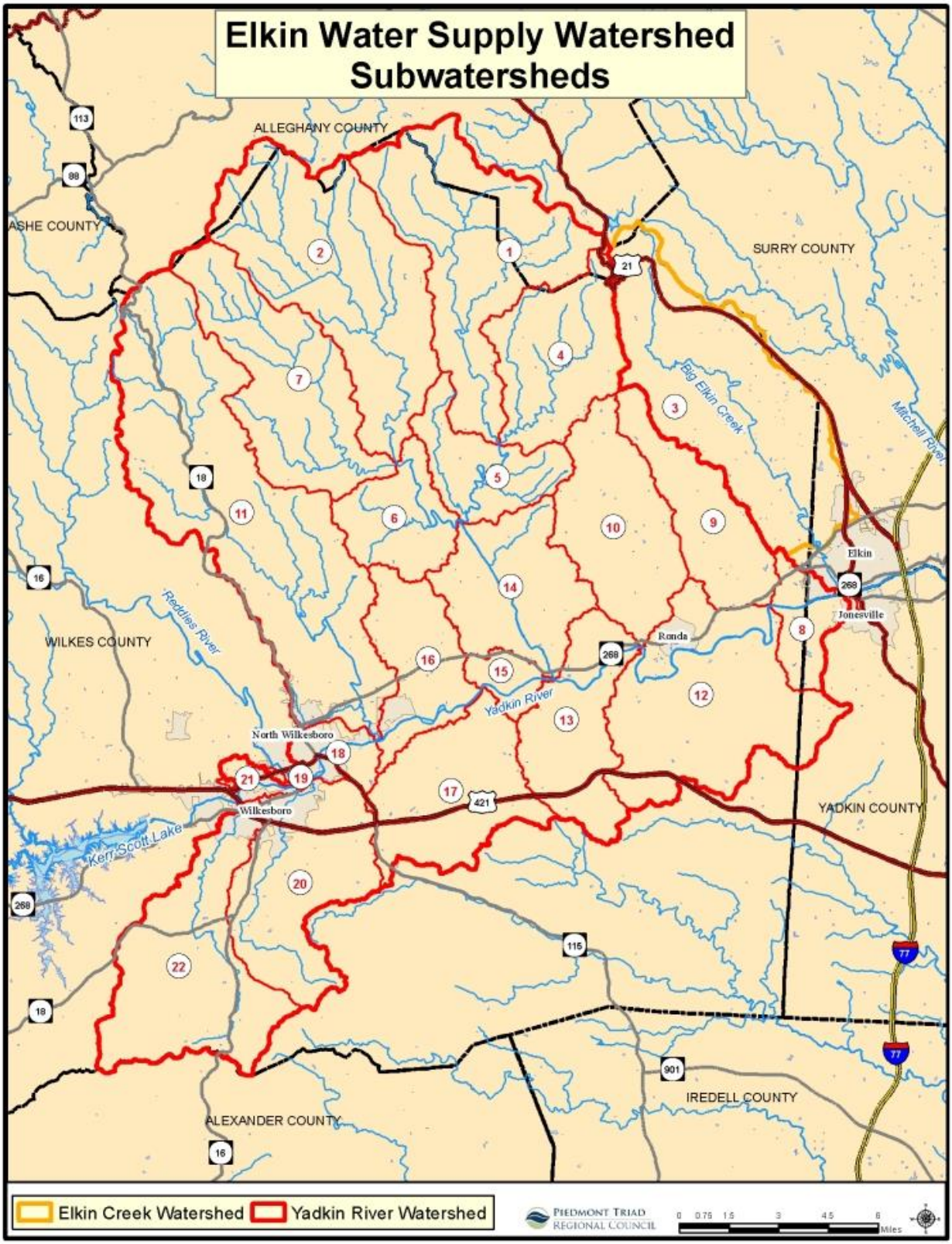


FIGURE 56: PTRC 2014

Water quality data records and anecdotal evidence reflect periodic high levels of sediment in both the Yadkin River and Big Elkin Creek. There are few water quality monitoring sites in these large watersheds, so it is difficult to assert the origin of the sources of sediment pollution. There is also no focused work by regulatory entities or preliminary academic research on local water quality and watershed conditions that could inform the health and safety of these water supplies. In an effort to remedy this situation, the PTRC relied upon an older assessment of watershed conditions throughout the Yadkin-Pee Dee River Basin and a new assessment of the aerial photographs of the watershed.

Yadkin-Pee Dee River Basin Watershed Priorities Atlas

In 2009, as part of the American Reinvestment and Recovery Act, the PTRC (then two Councils Of Governments (COGs): the Northwest Piedmont COG and the Piedmont Triad COG) collaborated with the HCCOG and the Centralina COG to attempt to use GIS data to anticipate water quality conditions in streams, rivers, and lakes. Two separate models were developed: one to assess land cover and land use in anticipated degraded or stressed water quality conditions and another to anticipate healthy water quality conditions. These models include data that both reflect current land uses as well as potential growth patterns by using data such as population growth and transportation improvement projects to identify likely patterns of development. These models were successful in reflecting water quality conditions when validated with available water quality data and water body ratings. The models were refined further for the entire Piedmont Triad region over the next three years, with the latest and best model applied to the Yadkin-Pee Dee River basin in 2013. Due to the high resolution of the data, it is still useful at the local watershed scale. These models reflect a need to protect the headwater watersheds south of Wilkesboro and surrounding Stone Mountain State Park, and a separate need to restore the urban watersheds in and around Wilkesboro and Elkin as well as the rural watersheds of Big Elkin Creek and especially Mulberry Creek (Figures 56 – 59).

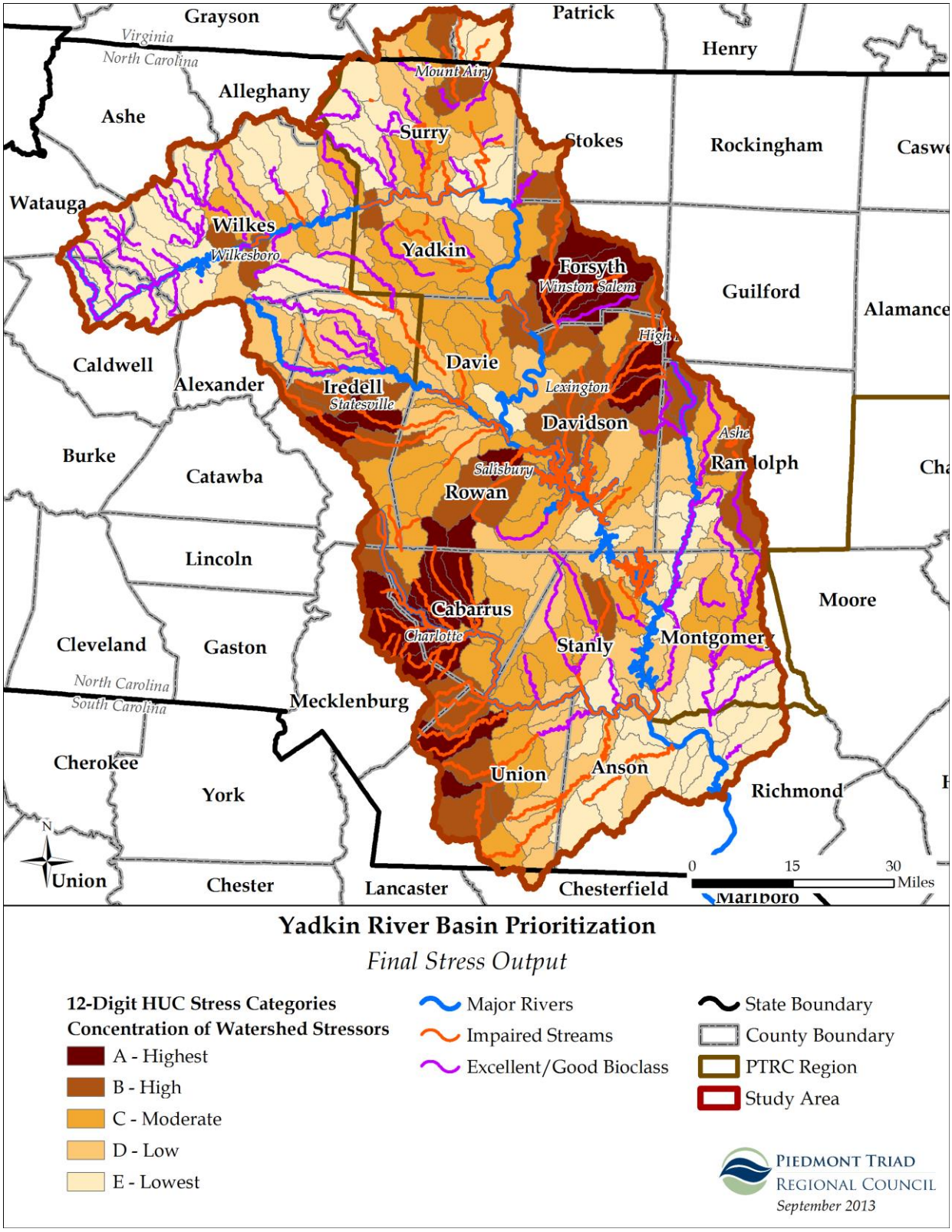


FIGURE 57: PTRC, 2013

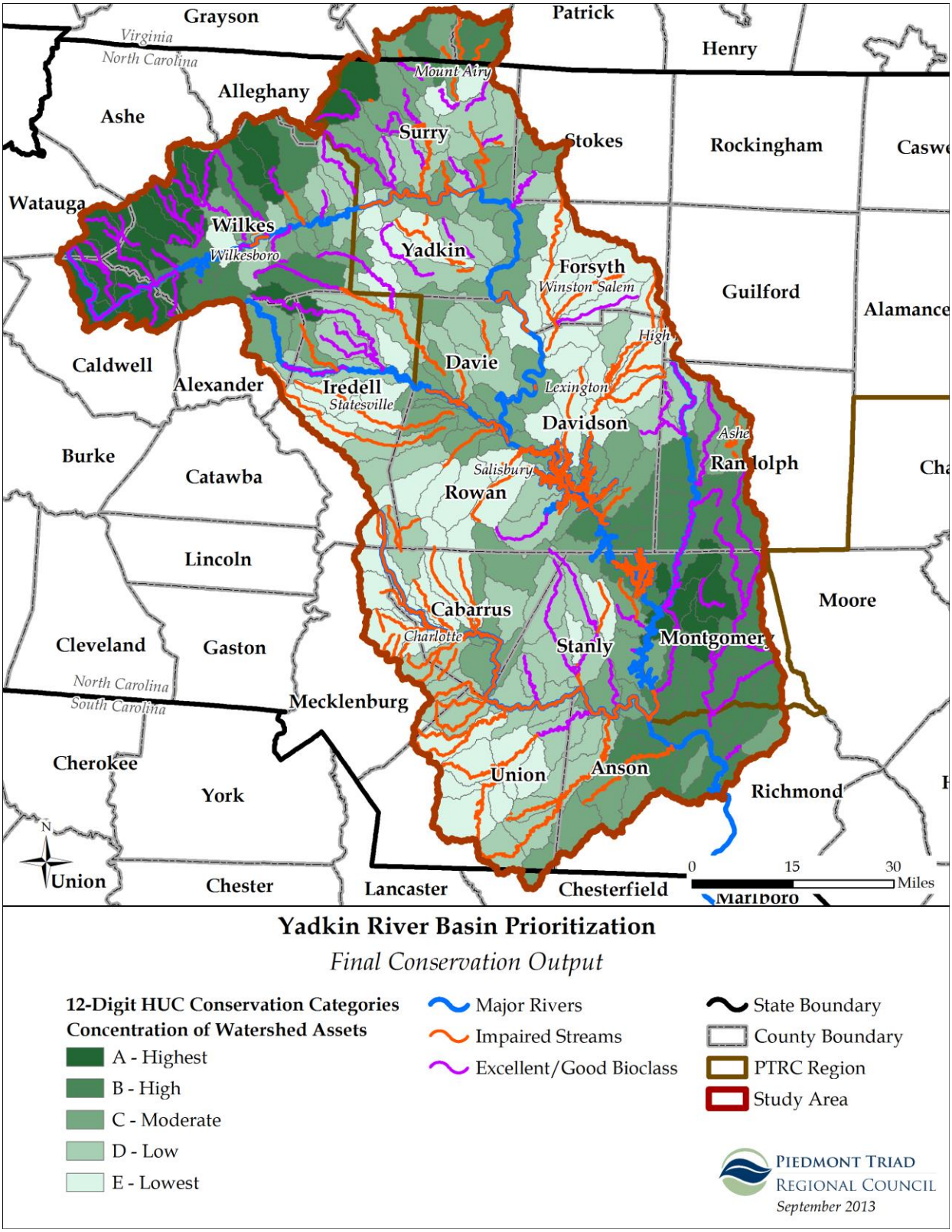


FIGURE 58: PTRC 2013

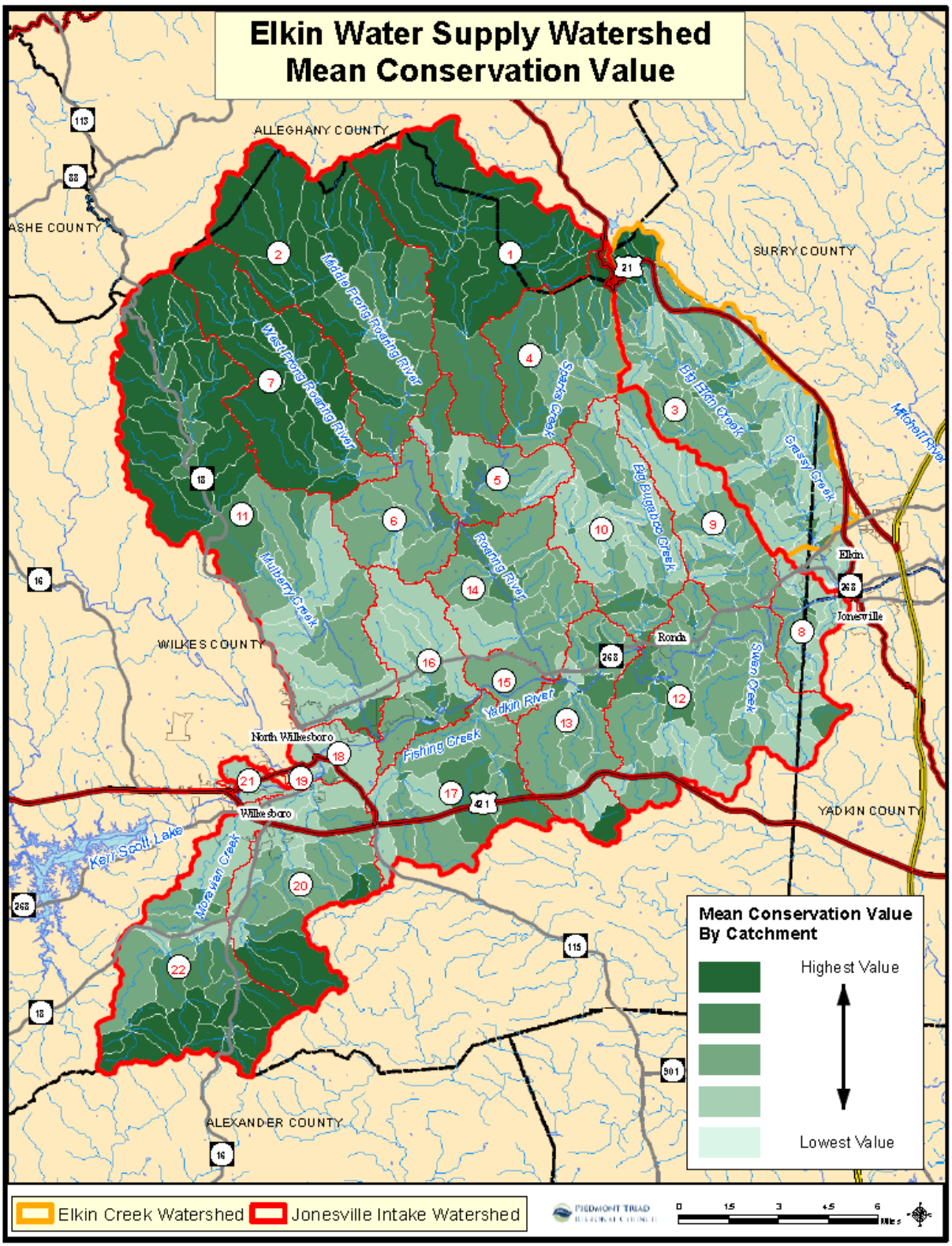


FIGURE 59: PTRC, 2014

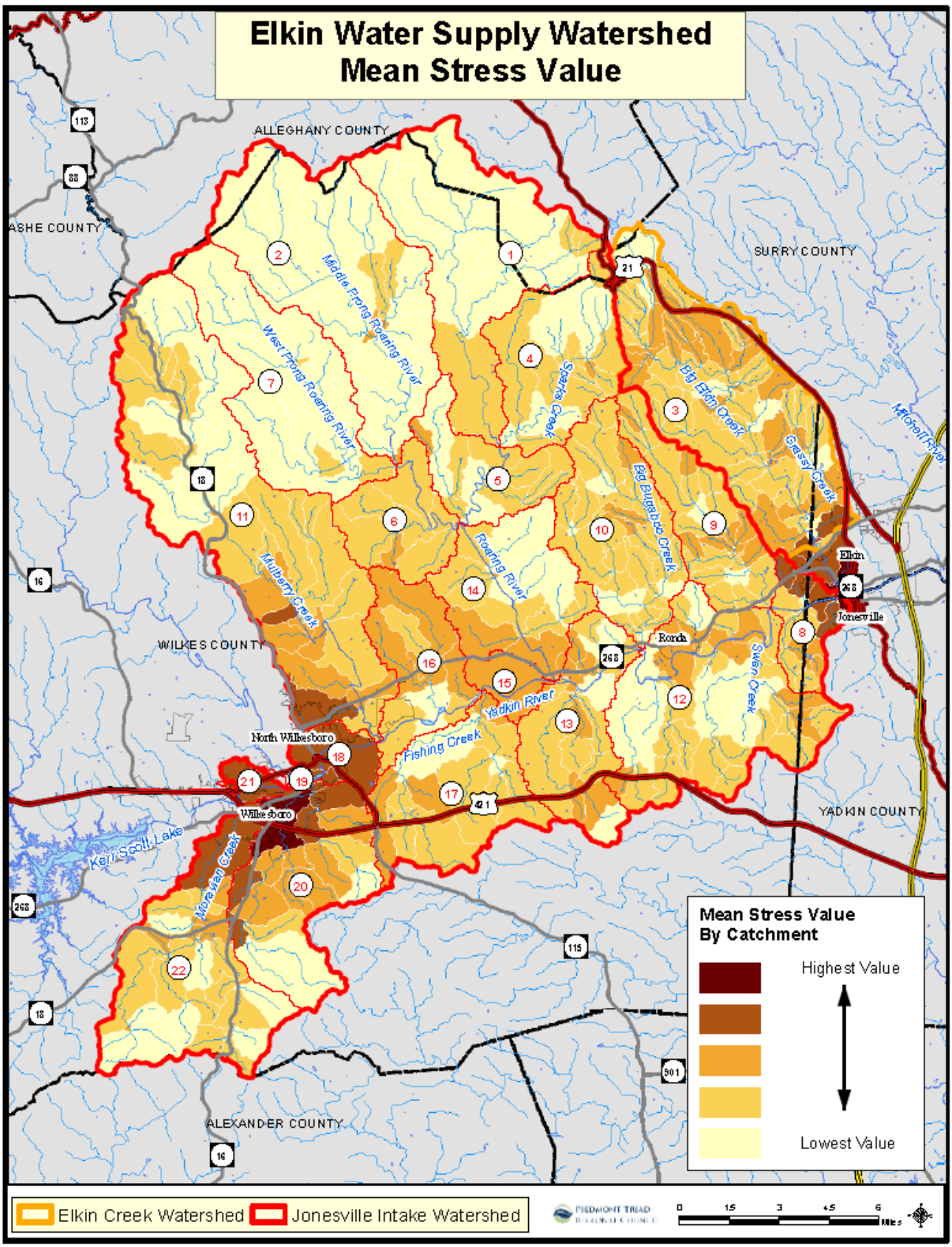


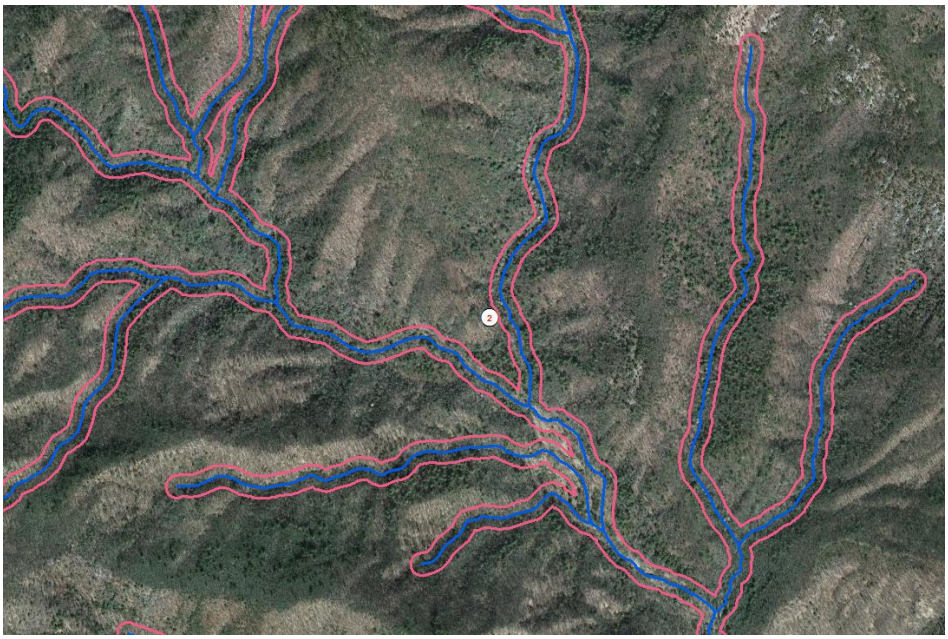
FIGURE 60: PTRC, 2014

The modeled watershed needs are a helpful tool designed to guide water quality stakeholders to more locally-focused efforts and analysis. At the request of the project stakeholders and to build upon the modeled data, the PTRC conducted a riparian buffer analysis, specifically reviewing the vegetated cover within the 100-foot stream buffer zone throughout both water supply watersheds. These riparian buffers are critical to protecting water quality conditions and ensuring safe habitat conditions for ecology as well as clean conditions for drinking water.

The PTRC established five-tiered ranking system for the heath of riparian buffer health, detailed here:

1) Pristine Riparian Buffers:
   The only streams that could qualify for this ranking are those that are completely untouched by present or recent human activity.

FIGURE 61: CATEGORY 1 STREAM (BLUE), STONE MOUNTAIN HEADWATERS,



SOURCE: PTRC

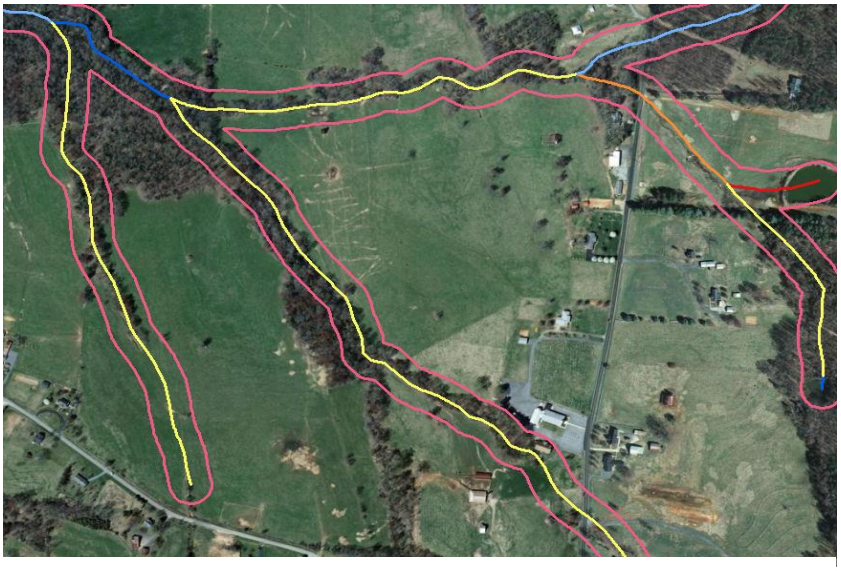
2) Impacted Riparian Buffers:
These streams have mild to moderate human activity, including small roads, utility rights of ways, single-family homes, and some farms.

FIGURE 62: CATEGORY 2 STREAMS, MORAVIAN CREEK WATERSHED,

SOURCE: PTRC

3) Managed Riparian Buffers:
These streams have human activity that is actively degrading the stream buffer on at least one side of the stream. The stream buffer must by consistently absent on one side of the stream – but not both – to qualify for this category.

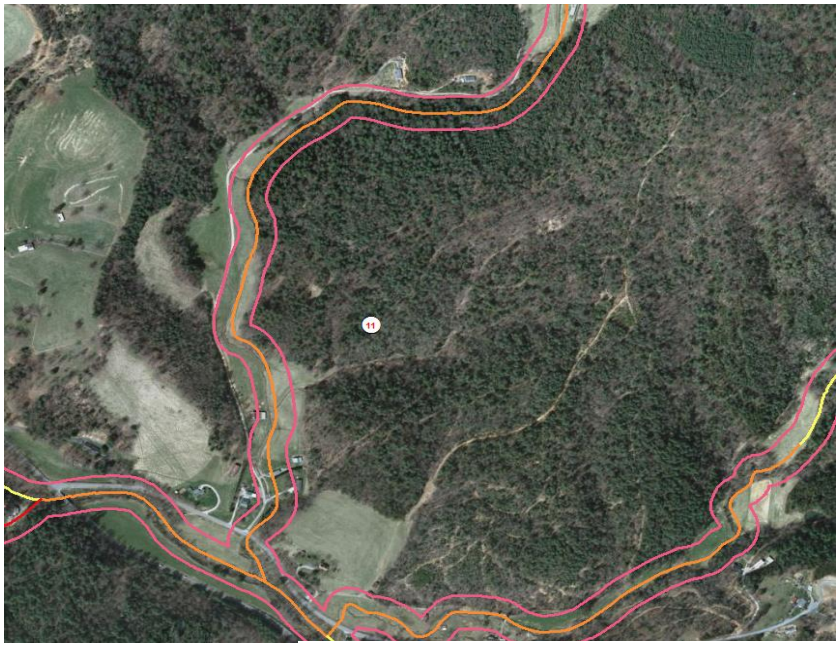
FIGURE 63: CATEGORY 3 STREAMS (YELLOW), SWAIN CREEK WATERSHED,



SOURCE: PTRC

4) Degraded Stream Buffers: These streams have degraded buffers on both sides of the stream. There is very little healthy vegetation present for these streams.

FIGURE 64: CATEGORY 4 STREAMS (ORANGE), MULBERRY CREEK WATERSHED, PTRC 2014



SOURCE: PTRC

5) Absent Stream Buffers: These streams have no vegetated buffer at all. Human activity has removed vegetation upon these streams either through agricultural practices, paving, or piping.

FIGURE 65: CATEGORY 5 STREAM (RED), BIG ELKIN CREEK WATERSHED, PTRC 2014

SOURCE: PTRC

These rankings were mapped for the entire watershed (Figure 65 & 66; Tables 9 & 10). The rankings of all of the streams within a catchment (the drainage areas making up a subwatershed) were then averaged within ArcGIS and these results were also mapped (Figure 67). These results generally confirm what was found through the models, especially the conservation model. These results show the need for immediate restoration of Swain Creek, Mulberry Creek, Big Elkin Creek, and Big Bugaboo Creek subwatersheds. When these streams are looked at, many of them appear to be impacted by either poor agricultural practices or improper forestry activities.

TABLE 11: SUBWATERSHEDS WITH THE GREATEST LENGTHS OF DEGRADED STREAM BUFFERS

Subwatershed Name	Subwatershed Number	Degraded Stream Buffer Miles (Category 4 & 5 Streams)
Big Elkin Creek	3	19.0
Upper West Prong Roaring River	7	11.5
Mulberry Creek	11	29.3
Swain Creek	12	17.2
Central Yadkin River	15	3.6

TABLE 12: SUBWATERSHEDS WITH THE GREATEST LENGTHS OF HEALTHY STREAM BUFFERS

Subwatershed Name	Subwatershed Number	Healthy Stream Buffer Miles (Category 1 Streams)
Upper East Prong Roaring River	1	39.6
Camp Branch	6	5.9
Big Bugaboo Creek	10	6.2
Brier Creek	13	6.3
Moravian Creek	22	14.7

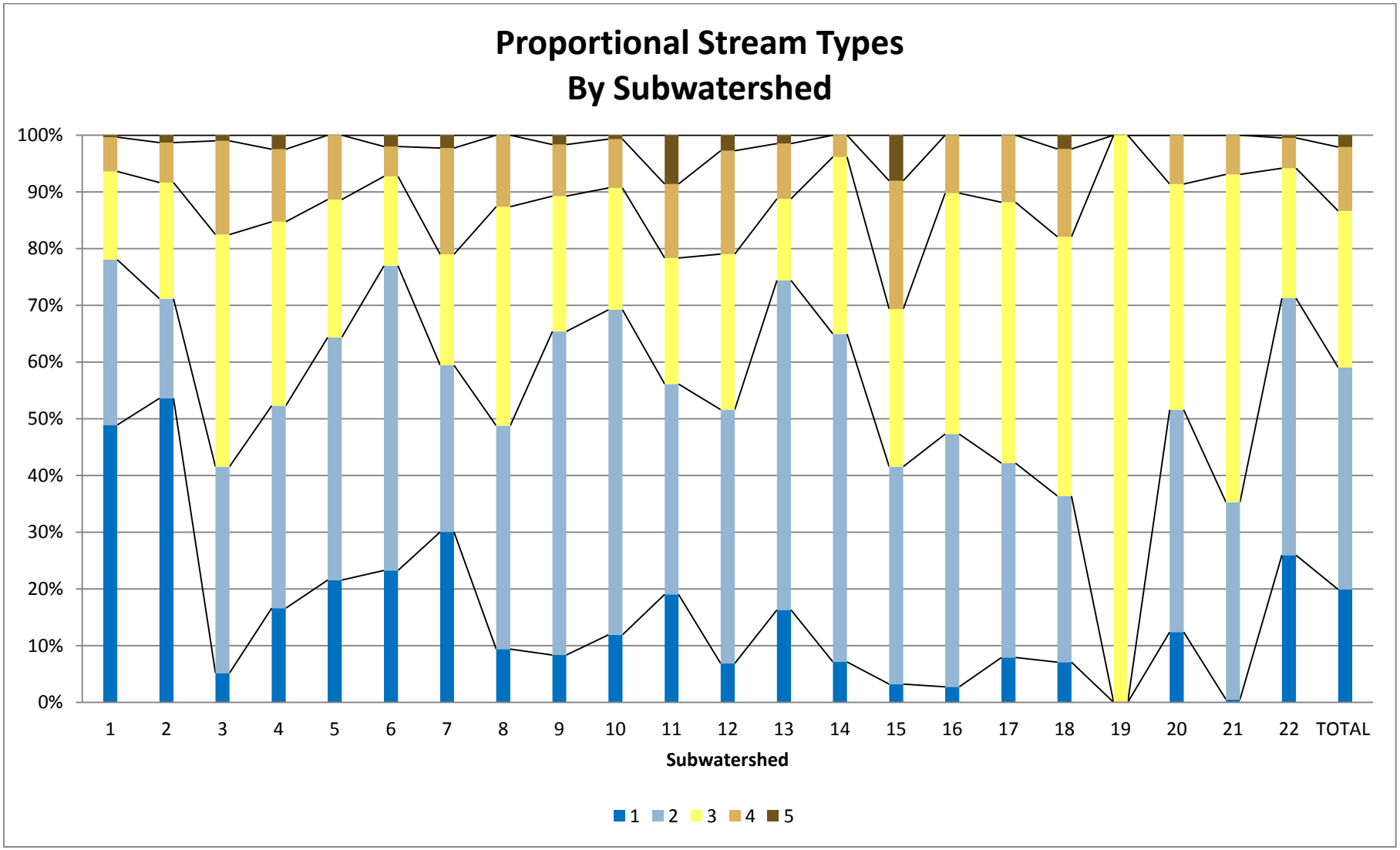


FIGURE 66: PTRC 2014

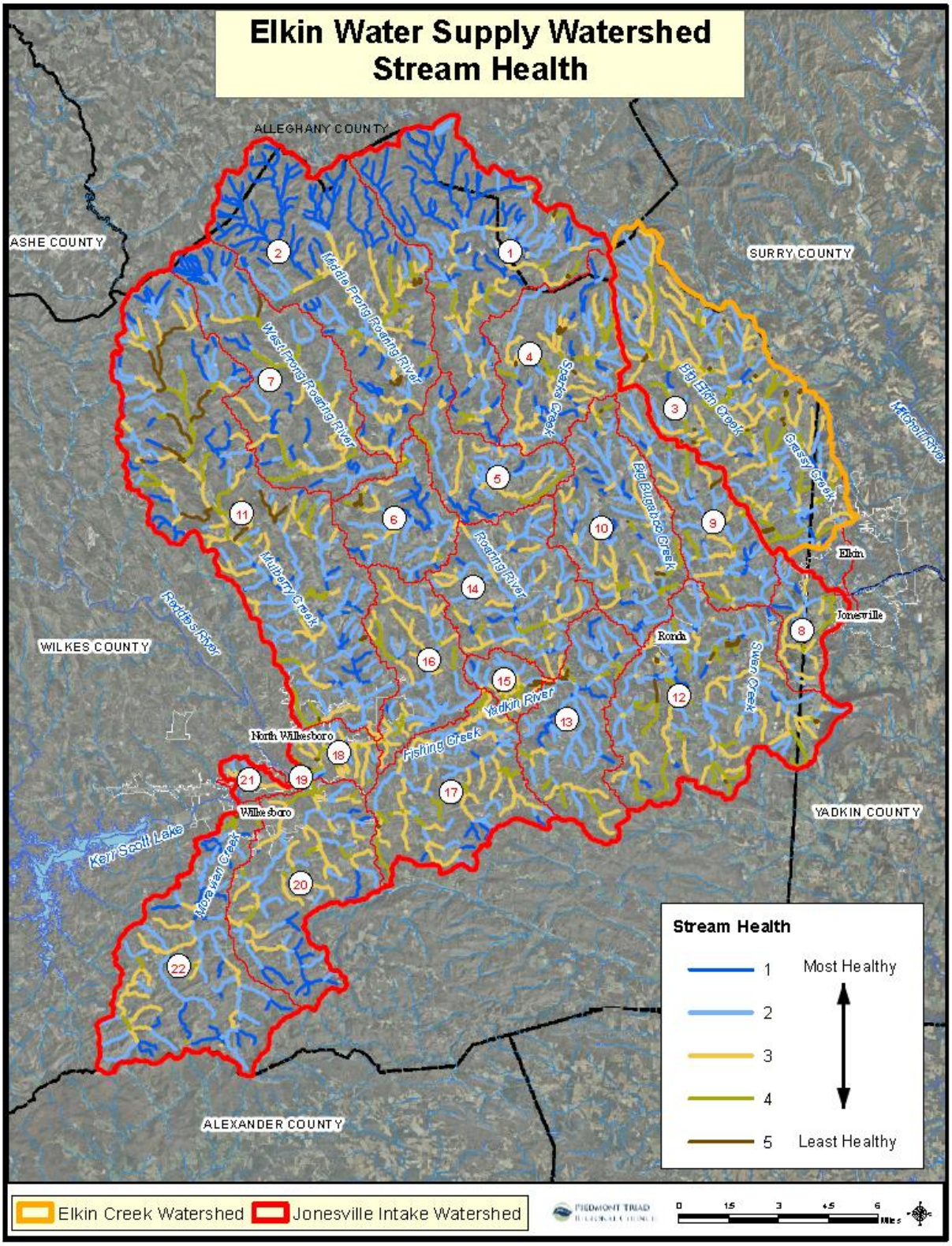


FIGURE 67: PTRC 2014

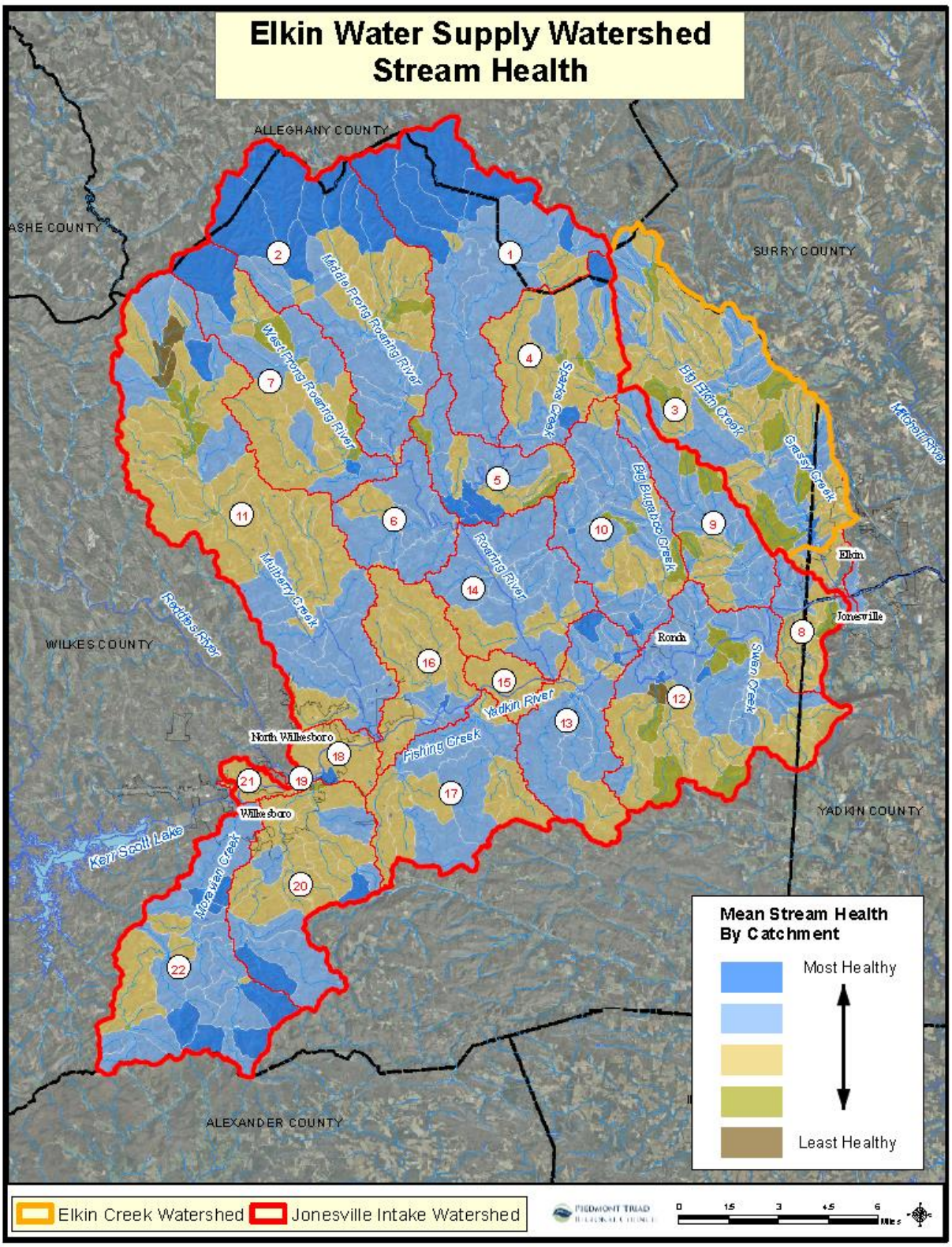


FIGURE 68: PTRC 2014

When assessed statistically, it can be seen that most of the streams have buffers, with the majority being managed or impacted. Category 5 stream buffers appear to the exception rather than the rule in these watersheds, but their impacts to the water supplies are disproportionate to their number: a few poorly managed streams are having huge impacts in loading sediment to these water supplies. Those poorly managed streams are almost entirely in rural areas and seem to be focused primarily in four subwatersheds: Swain Creek, Mulberry Creek, Big Elkin Creek, and Big Bugaboo Creek (Figures 65 – 68).

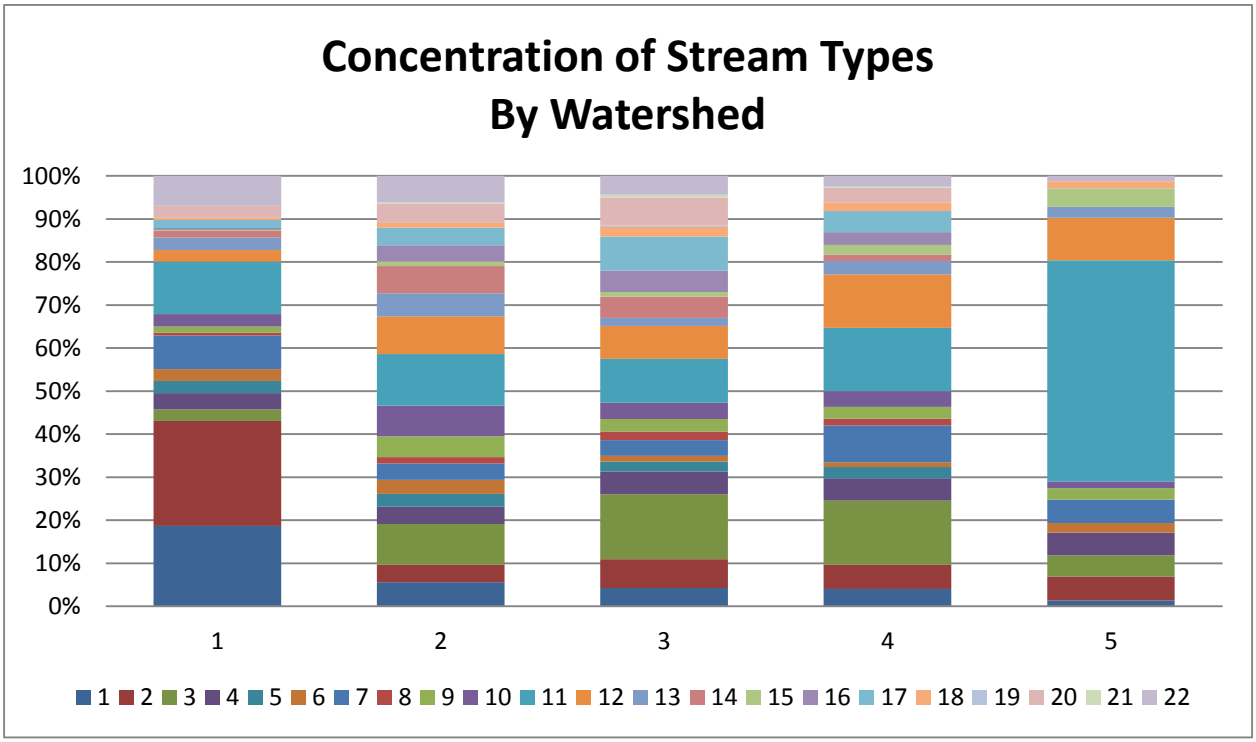


FIGURE 69: RELATIVE PROPORTION OF STREAM TYPES BY SUBWATERSHED

Policies

The attached project atlas provides over thirty local catchments that would have disproportionate benefits if restored or protected. The key policy for addressing the needs of the natural hydrologies that feed into Elkin and Jonesville's respective water supplies is to use this project atlas to protect and improve the local water quality conditions. It is recommended that the following partners and funding programs be utilized to achieve these goals.

Partnerships

NC Wildlife Resources Commission

To ensure that the special ecological resources that draw tourists are conserved to ensure outdoor recreation as economic revenue, the NC WRC partnered with Surry County to provide a Green Growth Toolbox training on September 19, 2014. Additional trainings in the future could ensure staff from Elkin, Jonesville, and surrounding areas are able to apply the Green Growth Toolbox during permit reviews and prior to planning additional city and county services, to protect wildlife resources. A Green Growth Toolbox training for realtors and developers would also increase awareness and consideration of the special natural resources that draw people to move to Elkin and Jonesville. Partnerships between the cities, the counties, the Forest Service, NC WRC and trail associations can also increase funding opportunities to realize the potential for recreation in the Elkin Area watershed.

Trails Associations

The Elkin Valley Trails Association is an affiliate of NC Rail Trails with the mission to increase the quality of life in the Elkin Valley by building and promoting a network of trails and greenways in Wilkes, Surry and Yadkin Counties. EVTA has been designated at a partner in realizing the goal of connecting the NC Mountains with the ocean by way of the Mountains to Sea Trail. EVTA is currently developing a master plan to determine the most feasible and stakeholder supported route for the NC State trail between Pilot Mountain State Park and Stone Mountain State Park (EVTA 2014).

NC Paddle Trails Association: The mission of the N.C. Paddle Trails Association is to empower communities in the local development, maintenance and restoration of paddle trails in North Carolina thereby nurturing economically and environmentally sustainable communities (Association 2014).

Yadkin Pee Dee River Trail Association is a private non-profit organization created in 1984 to promote watershed stewardship through policies, programs and projects (Yadkin Pee Dee River Trail Association 2014). Examples of projects that the Yadkin Pee Dee River Trail Association uses to instill stewardship include promoting and participating in the National River Cleanup on the Yadkin River. Expanding the historical Overmountain Victory Trail to connect Elkin with Wilkesboro is another project that they are involved with in partnership with the EVTA.

Local Land Conservancies

Piedmont Land Conservancy and the Blue Ridge Conservancy are local land conservancies that work within the Elkin and Jonesville watersheds and have the potential to protect natural resources and water quality through land conservation and stewardship.

Piedmont Land Conservancy (PLC) is a local resource for landowners interested in protecting the rural nature of their land and conserving the natural resources in perpetuity. Through conservation easements and donations, PLC strives to conserve the region's rivers, streams, wildlife, farmland and scenic areas that provide the rural heritage that draws residents and visitors alike. The PLC Stewardship program ensures lands in Surry and Yadkin Counties that are protected through conservation easements are cared for in a manner consistent with the site's ecological riches and the terms agreed to by all involved parties (PLC 2013a). Through their stewardship program, PLC ensures easement terms are upheld forever, landowner relationships are strengthened, and acquired lands are placed with the most appropriate stewardship for the long-term benefit of the land and its ecological riches. This is especially important in areas with sensitive flora and fauna such as the Elkin Valley. Land placed under the PLC stewardship program serve as an example of high quality land stewardship that other landowners can follow, and maintains adequate financial means to preserve the stewardship of the land for generations (PLC 2013a).

Blue Ridge Conservancy strives to permanently protect the land and water resources through voluntary conservation easements and stewardship. Properties placed under protection with the Blue Ridge Conservancy are managed according to a management plan designed to protect the important natural and cultural features of each individual property. In the Elkin Watershed area BRC protects properties in Wilkes County.

Yadkin Riverkeeper

The Yadkin Riverkeeper is a non-profit organization with a mission to "respect, protect and improve the water quality" in the Yadkin River through education, advocacy and action. In particular they strive to improve water quality, preserve forest canopy, support native biodiversity, teach a "river ethic" of ecological respect and ensure state and federal environmental laws are being followed. In the Elkin Watershed they bring

awareness to the Yadkin River and the Roaring River through the annual Tour de Yadkin which is a three week paddle trip along the Yadkin River.

Funding

North Carolina Department of Agriculture & Consumer Services

- NC Agricultural Development and Farmland Preservation Trust Fund (NCADFPTF)
  NCADFPTF supports the farming, forestry, and horticulture communities within the agriculture industry through providing funding to support the purchase of agricultural conservation easements (on farm, forest, and horticulture lands), including transaction costs, build public and private enterprise programs that will promote profitable and sustainable family farms through assistance to farmers in developing and implementing plans for the production of food, fiber, and value-added products, agritourism activities, marketing and sales of agricultural products produced on the farm, and other agriculturally related business activities, and fund conservation agreements (on farm, forest, and horticulture lands) targeted at the active production of food, fiber and other agricultural products.
- North Carolina Agriculture Cost Share Program (ACSP)
  The Agricultural Cost Share Program addresses nonpoint source pollution by providing technical and financial resources to landowners or renters of an existing agricultural operation that has been operating for more than three years. Up to 75% cost share assistance is provided to aid in the installation of best management practices.
- Agricultural Resource Assistance Program (AgWRAP)
  AgWRAP primarily addresses water use issues including efficiency, availability and storage. Funding is used to conserve and protect water resources, increase efficiency and increase water storage and availability for agricultural resources. In FY2015, AgWRAP received a state appropriation in the amount of $1,477,500.
- Community Conservation Assistance Program (CCAP)
  CCAP is a voluntary, incentive-based program designed to improve water quality through the installation of various BMP's on urban, suburban and rural lands. This program provides cost share and technical assistance for the installation of stormwater best management practices on non-agricultural land. Approved community conservation BMPs that are eligible include: Backyard rain gardens, cisterns, impervious surface conversion, riparian buffers, stream bank protection, pet waste receptacles, backyard wetlands, vegetation establishment and abandoned well closure.
- Conservation Reserve Enhancement Program (CREP)
  CREP is a voluntary program utilizing federal and state resources to achieve long-term protection of environmentally sensitive cropland and marginal pasture land. These voluntary protection measures are accomplished through 10-, 15-, 30-year and permanent conservation easements. CREP encourages farmers to place environmentally sensitive land near streams or other approved water bodies into a vegetative cover for a period of time. In return, landowners receive annual payments and are reimbursed for establishing conservation practices.

United States Department of Agriculture – Natural Resources Conservation Services

- Conservation Stewardship Program (CSP)
  CSP helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resources concerns. Participants earn CSP payments for conservation performance—the higher the performance, the higher the payment.
- Environmental Quality Incentives Program (EQIP)
  EQIP provides financial and technical assistance to agricultural producers in order to address natural

resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.

- Agricultural Conservation Easement Program (ACEP)
  ACEP provides financial and technical assistance to help conserve agriculture was created in the 2014 Farm Bill which consolidated the Farm and Ranch Lands Protection Program with the Grassland Reserve Program. This program provides matching funds to help purchase development rights to keep productive land in agricultural uses. Working through existing programs, USDA partners with State, tribal, or local governments and non-governmental organizations to acquire conservation easements or other interests in land from landowners. USDA provides up to 50 percent of the fair market easement value of the conservation easement.

NC Clean Water Management Trust Fund

The NC CWMTF is dedicated to protecting and rehabilitating the water resources of the state. It has provided hundreds of millions of dollars to local governments, non-profit entities, and private firms to develop watershed plans, restore streams and stream buffers, build greenways, develop innovative stormwater technologies, and acquire sensitive and valuable ecological habitats. The CWMTF funded this planning grant in an effort to address water quality concerns before they become water quality problems. They are key partner in implementing this plan, especially in protecting sensitive areas of the watershed, restoring streams and buffers, and assisting with the construction of the Elkin Valley Trail.

Duke Energy Water Resources Fund

In 2014, Duke Energy's Dan River power plant in Eden, NC, spilled over 38 million tons of coal ash into the Dan River, immediately degrading the ecological, recreational, and agricultural uses of that water system for its residents and ecosystems. In an effort to show a commitment to protecting and improving water quality conditions throughout its service region, it is dedicating $10 million annually for water resource projects. While there is not a Duke Energy power plant near this watershed, many of the projects recommended in this plan fit the requirements of projects requested by the fund.

NC Parks and Recreation Trust Fund

The NC Parks and Recreation Trust Fund (PARTF) is dedicating to matching the efforts of local governments for recreation projects. If cash and/or human capital can be accrued by the stakeholders in these watersheds, PARTF could be a valuable funding source for realizing greenway, blueways, and parks throughout these watersheds.

Wildlife Resources Commission

The NC WRC also has the following programs to help incentivize land management for wildlife:

Cooperative Upland habitat Restoration and Enhancement program (CURE) - Is a program developed by the NC WRC because wildlife that require early-successional habitats are among the most imperiled species in the United States, across the South, and within North Carolina. Bobwhite quail have become the "flagship species" among this group, but it also includes numerous declining songbirds, many species of mammals such as rabbits, pollinators such as butterflies, and many species of amphibians and reptiles.

Wildlife Conservation Lands Program

Similar to the Present Use Value program, but with an emphasis on ecological rather than agricultural value, this program is administered by the NC WRC. Lands must satisfy two criteria: the land must have more one or more protected species and the land is managed to support that species; and that the landowner must conserve at least one of the following NC WRC priority wildlife habitats:

- longleaf pine forest;
- early-successional habitat;
- small wetland communities and bogs;
- stream and riparian zone;
- rock outcrop; or
- bat cave.

CONCLUSION

Both Jonesville and Elkin have generally healthy water supply watersheds that have some persistent concerns such as water leaks and unknown buried contaminants and seasonal concerns, namely sedimentation from upstream practices that fill up reservoirs and muddy the Yadkin River in the rainy seasons. Many of these seasonal sources can be addresses, which is the main focus of the project atlas. The towns and counties are making great efforts to address the other needs of the watersheds.

The streams that are being degraded by poor forestry practices can be dealt with directly, as they are in violation of state law for failure to use forestry practice guidelines. Efforts should be made to contact the landowners and determine who conducted the harvest. NCDENR could begin monitoring their projects elsewhere in the region and the state more closely to determine if they are consistently violating these laws. Alternatively, a grassroots-based effort to address these needs could fulfill these needs. Similar to the Muddy Water Watch that effectively addressed a lack of enforcement of stormwater and sediment management at construction sites in the Neuse River basin, a citizen monitoring effort supported by the Yadkin Riverkeeper and other area non-profits could keep a trained eye on agricultural and forestry practices in these watersheds and ensure that they are complying with state requirements, as well as ensuring that the state regulatory staff are following up on these potential violators.

The poor agricultural practices are more challenging to address, as detailed in the Agriculture chapter. Unless the site has a CAFO permit, there are few regulatory mechanisms to require these landowners to protect the water quality of their downstream neighbors. There are a variety of agricultural cost-share and assistance programs that can support these landowners in improving their agricultural practices to protect the environment while not cutting into their profits. However, these programs and staff are underfunded at both the federal and, especially, state levels. According to staff, many of these programs have waiting lists years long for enrollment. Without the assistance, many of these farmers simply cannot afford to make the investments required to restore healthy water quality and stream buffer conditions. The project meetings for this project highlighted these frustrations among the soil and water conservation district and cooperative extension staffs.

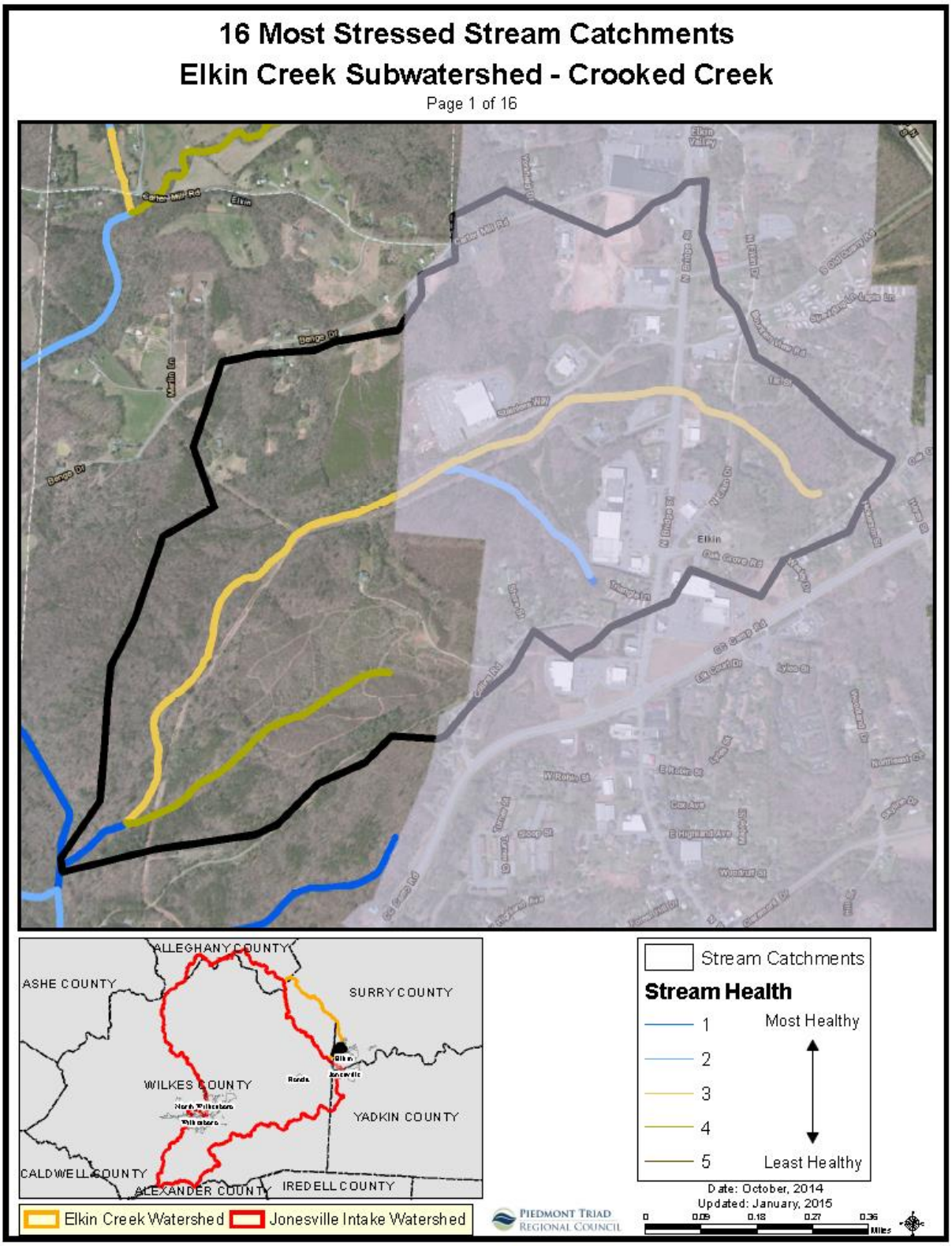
These mapping efforts and the extremely hard work of others have yielded many opportunities for the Towns of Elkin and Jonesville, the NCDWR, the NC Department of Agriculture & Consumer Services, the Farm Bureau, and federal partners to invest in to ensure healthy and safe water supplies for the foreseeable future. The projects that can yield the highest benefits for the watershed will be highlighted in the plan's Project Atlas chapter. The data collected by this effort will be available for any interested partners to utilize to improve the watersheds' conditions.

PROJECT ATLAS

The project atlas for the watersheds of Elkin and Jonesville is intended to both protect and improve water quality conditions in the two water supplies for the foreseeable future. The projects were selected from two sources: the prior water quality protection work of the High Country COG and the stream buffer aerial analysis conducted by the PTRC staff. Most of the projects were selected using the latter method, which was already described. Catchments were prioritized for projects using the catchment scores determined through the averaging of the riparian buffer scores in each catchment (Figure 67). The value of these catchments was determined based essentially upon the average quality of stream per acre of a catchment. Consequently, some smaller catchments with less intense stream conditions were placed in this atlas over those larger catchments with more variability in their stream conditions.

The ten catchments in the Jonesville Intake watershed with the highest buffer scores (indicating the worst stream buffer conditions) were selected for immediate actions, as were those ten catchments with the lowest buffer scores (indicating pristine stream buffer conditions). Similarly, the catchments with the five highest and five lowest scores in the Big Elkin Creek watershed were also selected for description here and immediate project implementation by the project stakeholders and their partners. These watersheds' priority catchments are separated for convenience, which should not be interpreted as a reflection of that catchment's importance for ensuring healthy and safe water supplies for Elkin and Jonesville. The atlas is structured to allow users to see the potential project in an aerial photograph, which is accompanied by a table of relevant statistics of the project and a brief description of the potential project and its value for the drinking water supply.

Big Elkin Creek Watershed Priorities: Restoration



BIG ELKIN CREEK WATERSHED RESTORATION PRIORITY: ELKIN CREEK

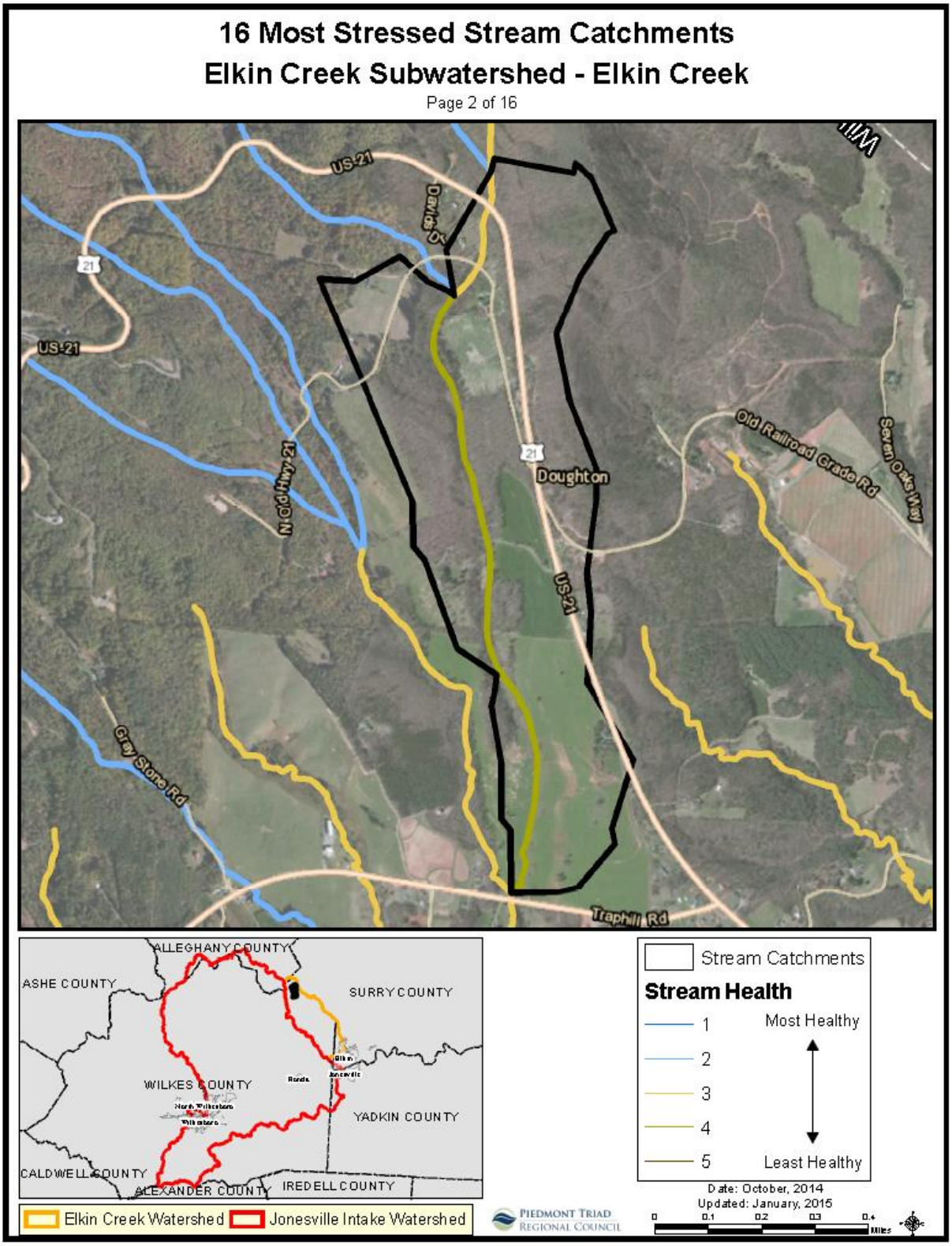
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	61	VACANT/UNKNOWN	283	60%	CLASS 1	716
PARTIALLY	64	RESIDENTIAL	94	20%	CLASS 2	1,650
		INSTITUTIONAL	26.5	6%	CLASS 3	8,208
		COMMERCIAL	42	9%	CLASS 4	2,640
		INDUSTRIAL	23	5%	CLASS 5	0
TOTAL	**125**	**TOTAL**	**468.5**	**100%**	**TOTAL**	**13,214**

This is a large catchment that lies partially within the limits of the Town of Elkin. As such, this catchments suburban, with diverse land uses and impacts to local water quality and stream conditions. Consequently, it is also an optimal site to connect unincorporated areas with the Town and Big Elkin Creek. Indeed, this catchment is a priority for the Elkin Valley Trails Association (EVTA) and their needs to connect their trail to Stone Mountain State Park.

The headwaters of this catchment have all been developed and are stressed from stormwater and direct impacts to the stream's structure and function. These issues may be remedied with stormwater retrofits such as rain gardens and stream restoration projects that can also serve the area's greenway needs. Downstream, the rural areas should be protected as much as possible – should they be used to extend the existing greenway network, that will be extremely helpful for water quality conditions. It appears that this catchment is a site of large timber operations. Stakeholders state that these parcels have been harvested using all forestry practices guidelines (FPGs), indicating a site where these best practices could be shared and promoted to other landowners in the area. Otherwise, much of the attention and investment in this catchment should be given to restoring the streams directly and mitigating the impacts of stormwater runoff in the headwaters,

Nest Steps:

- Invest in stormwater management projects in the catchment's headwaters;
- Invest in stream restoration projects in this catchment;
- Extend the EVTA's trails network through this watershed;
- Promote the use of FPGs on the parcels in this catchment in cooperation with the Wilkes County Soil & Water Conservation District.



BIG ELKIN CREEK WATERSHED RESTORATION PRIORITY: ELKIN CREEK

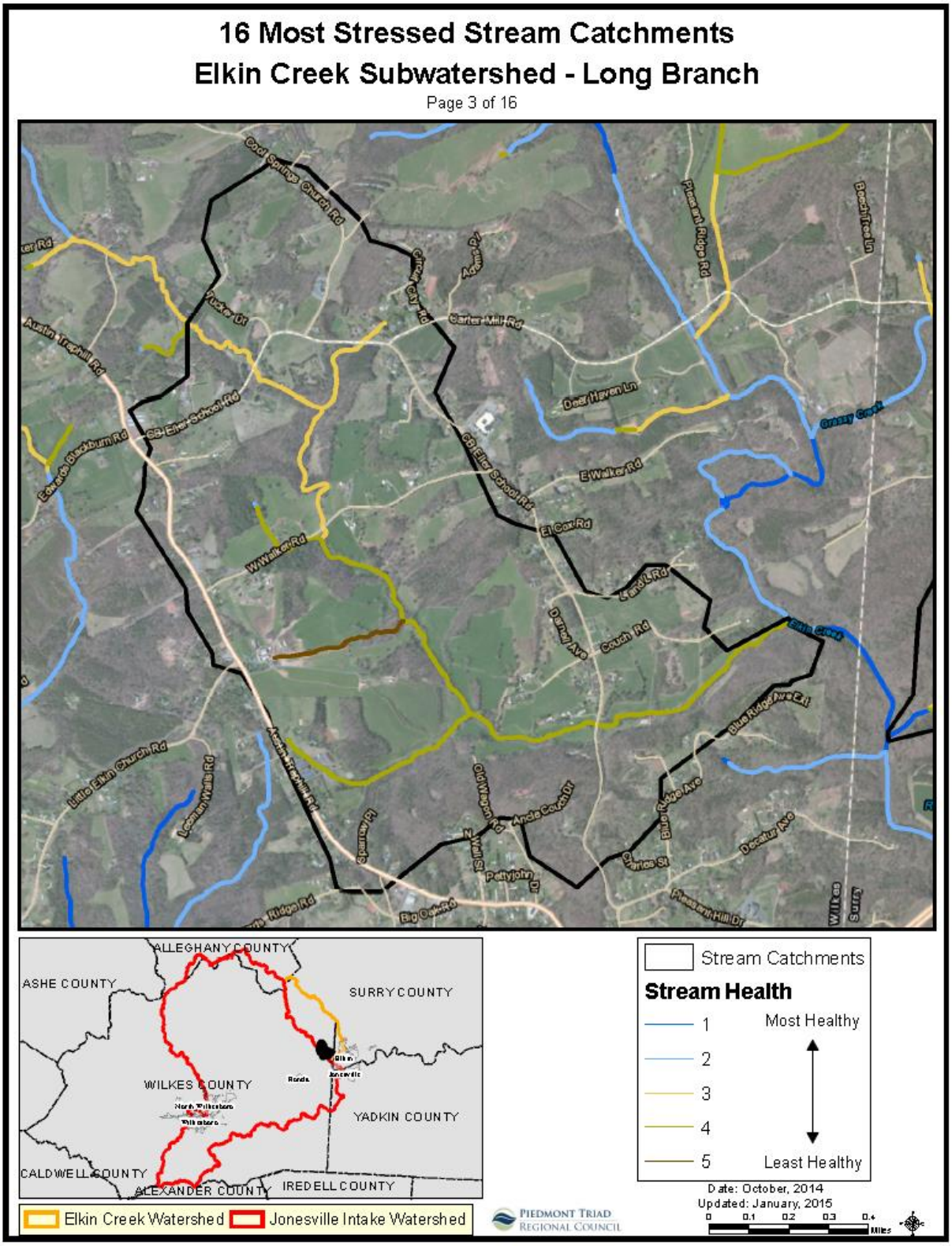
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	10	AGRICULTURE	161	64.3%	CLASS 1	0
PARTIALLY	22	RESIDENTIAL	21.5	8.6%	CLASS 2	0
		VACANT/UNKNOWN	68	27%	CLASS 3	1,352
		COMMERCIAL	0	0%	CLASS 4	6,259
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**32**	**TOTAL**	**250**	**100%**	**TOTAL**	**7,611**

This catchment is a 250-acre area covering mostly agricultural lands that appear to be directly degrading water quality conditions in Big Elkin Creek. The restoration of this stretch of Big Elkin Creek could have great benefits, as it is immediately downstream of good and pristine condition tributaries. The middle section of this creek is well-forested, but the upper and lower stretches of it are directly within farmland. The agricultural lands within this catchment appear to be primarily pasture, raising concerns about livestock access to the creek. This catchment is home to the endangered bog turtle, including the Elkin Creek Bog Meadows Natural Area, so restoration and management of the bogs for habitat needs is priority. Furthermore, this area is also home to the Cerulean warbler and the Carolina foothills crayfish, both priority species for conservation.

These parcels would be excellent candidates for agricultural cost-share programs that can provide livestock exclusion fencing, rewatering stations, and assist in the restoration of Big Elkin Creek's vegetated buffer area. The 1.5-mile stretch of the creek itself may need to be restored, and the opportunity to improve these conditions would be highly appealing to stream restoration professionals, stream mitigation banks, and soil and water conservation agents. A full restoration of this long stretch on the main stem of Elkin's water supply creek could reduce tons of sediment loading to its water supply every year, reducing treatment costs, public concerns, and improve the creek's recreational value.

Next Steps:

- Prioritize livestock exclusion fencing and stream buffer restoration, especially where priority species are found;
- Target landowners with information about agriculture cost-share programs, especially those that provide exclusion fencing or bog restoration/management;
- Work with EVTA on working with landowners on the value of clean waters for their lands and the local economy, especially if they feature priority conservation species;
- Contact stream restoration professionals on their interest in this large potential project.



BIG ELKIN CREEK WATERSHED RESTORATION PRIORITY: LONG BRANCH

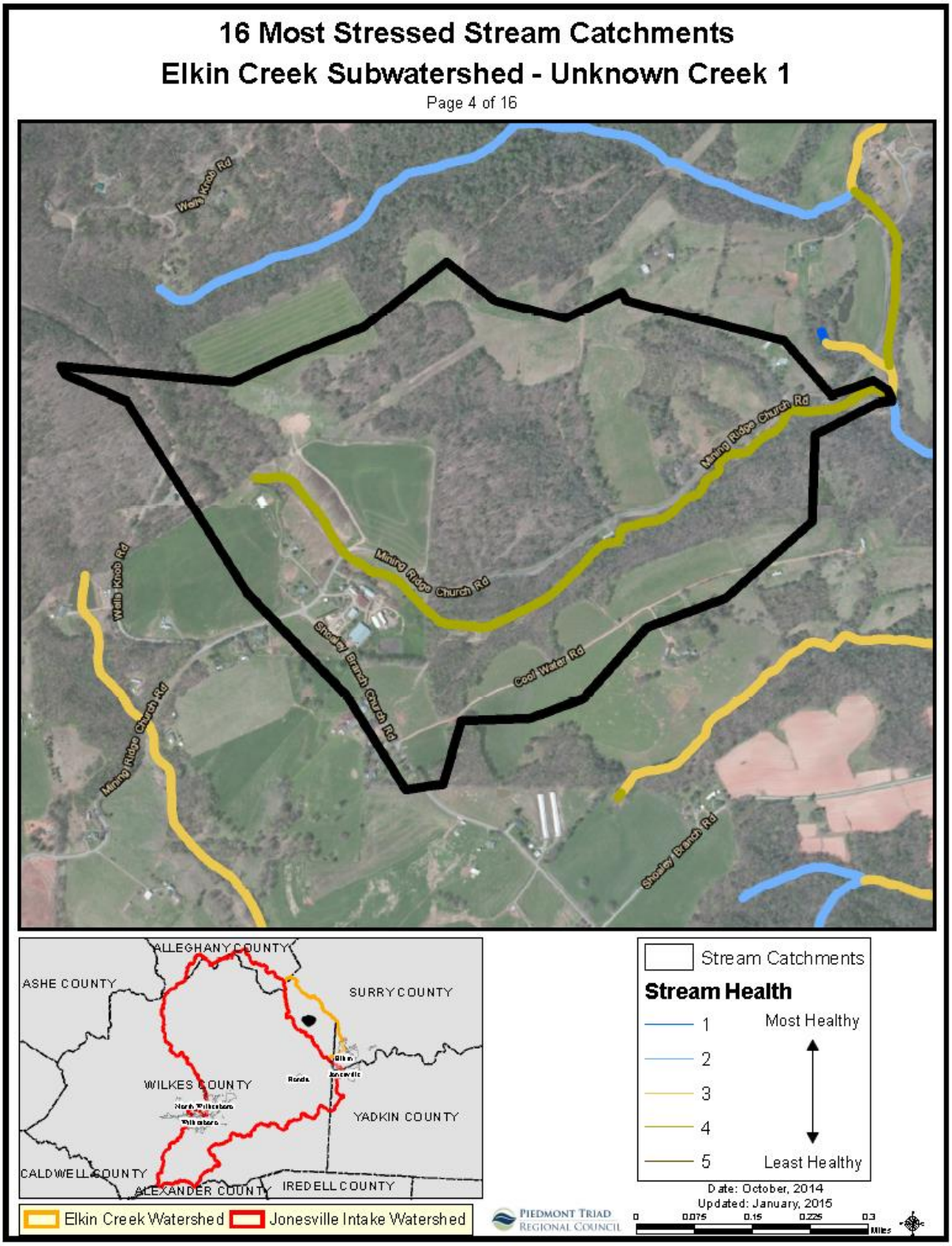
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	168	AGRICULTURE	267	28.1%	CLASS 1	0
PARTIALLY	137	RESIDENTIAL	359.5	37.7%	CLASS 2	66
		VACANT/UNKNOWN	289.5	30.4%	CLASS 3	6,389
		COMMERCIAL	33.5	3.5%	CLASS 4	12,557
		INDUSTRIAL	0.5	0.1%	CLASS 5	1,870
TOTAL	**305**	**TOTAL**	**952.4**	**100%**	**TOTAL**	**20,882**

This very large catchment is just upstream of Elkin's water supply reservoir, located at the border or Wilkes and Surry Counties. Long Branch and its tributaries currently have about 2.5 miles of immediate stream restoration and vegetated buffer restoration buffer opportunities. It has one tributary that is occupied by industrial and commercial properties, unfortunately all within its headwaters. With a few exceptions, the streams and creeks throughout this catchment are largely unbuffered, permitting the drainages of these properties to drain directly to Long Branch. Long Branch drain directly to Elkin Creek, which has good buffers and is largely forested in this stretch. Restoration of stream conditions in this catchment could have enormous benefits for the creek and the town's water supply.

This catchment offers many opportunities to improve local and regional water quality conditions, but it has many landowners that will need to be engaged if such an effort is to succeed. With over 300 property owners, any improvements will need to have a significant outreach component. This could come first, to educate the landowners about agricultural cost-share programs, stormwater practices, and the value of clean waters for the local and regional economies. It could also accompany a marquee project with a willing landowner, attracting neighbors through a project that is appealing and can yield near-immediate benefits. All efforts will need to be led by the Wilkes County Soil & Water Conservation District, but the close proximity of Long Branch to Elkin's water supply reservoir would make municipal engagement appropriate.

Next Steps:

- Engage in an outreach effort on agricultural best management practices and cost-share programs to all landowners in this catchment;
- Reach out to possible willing landowners to host a pilot project on their property;
- Reach out to the commercial and industrial properties on stormwater best management practices.



BIG ELKIN CREEK WATERSHED RESTORATION PRIORITY:

UNKNOWN CREEK 1

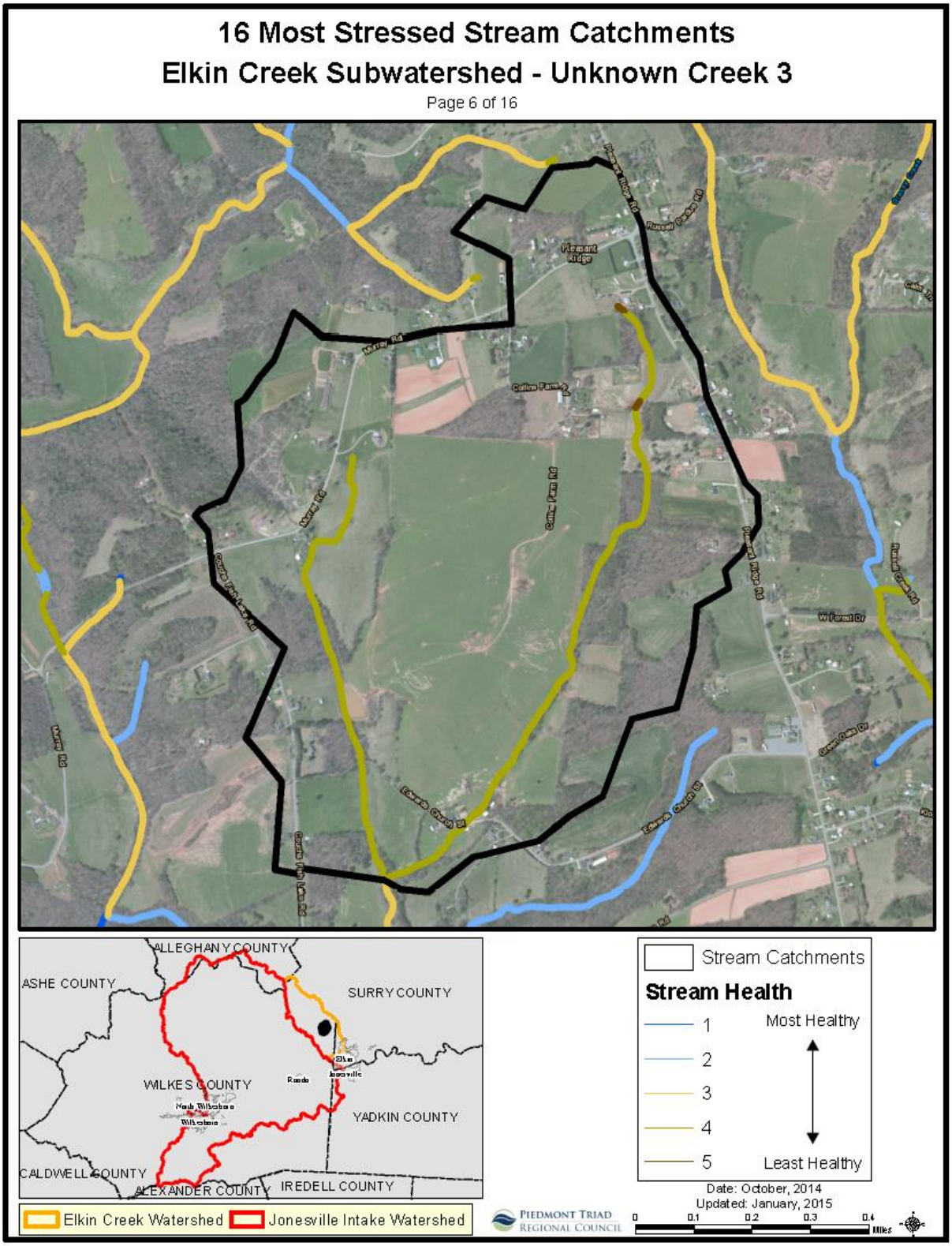
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	5	AGRICULTURE	194.2	85%	CLASS 1	0
PARTIALLY	21	RESIDENTIAL	17.8	8%	CLASS 2	0
		VACANT/UNKNOWN	17.2	7.5%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	5.461
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**26**	**TOTAL**	**229**	**100%**	**TOTAL**	**5,461**

This catchment is relatively small compared to many of the other catchments in this project atlas and only features one stream. It is primarily impacted by agricultural properties at its headwaters, though there are some smaller impacts downstream near its confluence. This farm is using no agricultural best management practices, and is plowing down to the streamside. No vegetative buffers are apparent, and the runoff from this farm can be considered to be significant to the quality of all downstream waters. It is unclear if this farm has livestock, but if they do, they are making large contributions of fecal material to the stream, as well as eroding the local streambanks.

The Wilkes County Soil & Water Conservation agents should prioritize this single farm for engagement on agricultural BMPs and enrollment into a cost-share program. The use of BMPs here will not only benefit water quality conditions, but will halt the loss of land that is surely occurring due to stream erosion. If this is a tobacco farm, efforts should be made to encourage the farmer to rotate crops or transition to a new crop that can be grown with low- or no-till crop management. Stream restoration on this highly-degraded stretch of this unnamed tributary of Big Elkin Creek will also be needed to halt erosion and restore it to a healthy structure and habitat conditions. Should this landowner not be interested, perhaps a project on nearby property could serve as an effective pilot project.

Next Steps:

- Reach out to the farmer in the headwaters of this stream to determine interest in using agricultural BMPs and/or enrollment in a cost-share program that will restore vegetated buffers, use low-impact crop management practices, and halt the loss of land to stream erosion and flooding;
- Gauge landowner interest in restoring this highly-degraded stream reach.



BIG ELKIN CREEK WATERSHED RESTORATION PRIORITY:

UNKNOWN CREEK 3						
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	50	AGRICULTURE	207.9	44%	CLASS 1	0
PARTIALLY	49	RESIDENTIAL	99.3	21%	CLASS 2	0
		VACANT/UNKNOWN	159.1	33.5%	CLASS 3	0
		COMMERCIAL	8.4	2%	CLASS 4	10,425
		INDUSTRIAL	0	0%	CLASS 5	153
TOTAL	**99**	**TOTAL**	**475**	**100%**	**TOTAL**	**10,578**

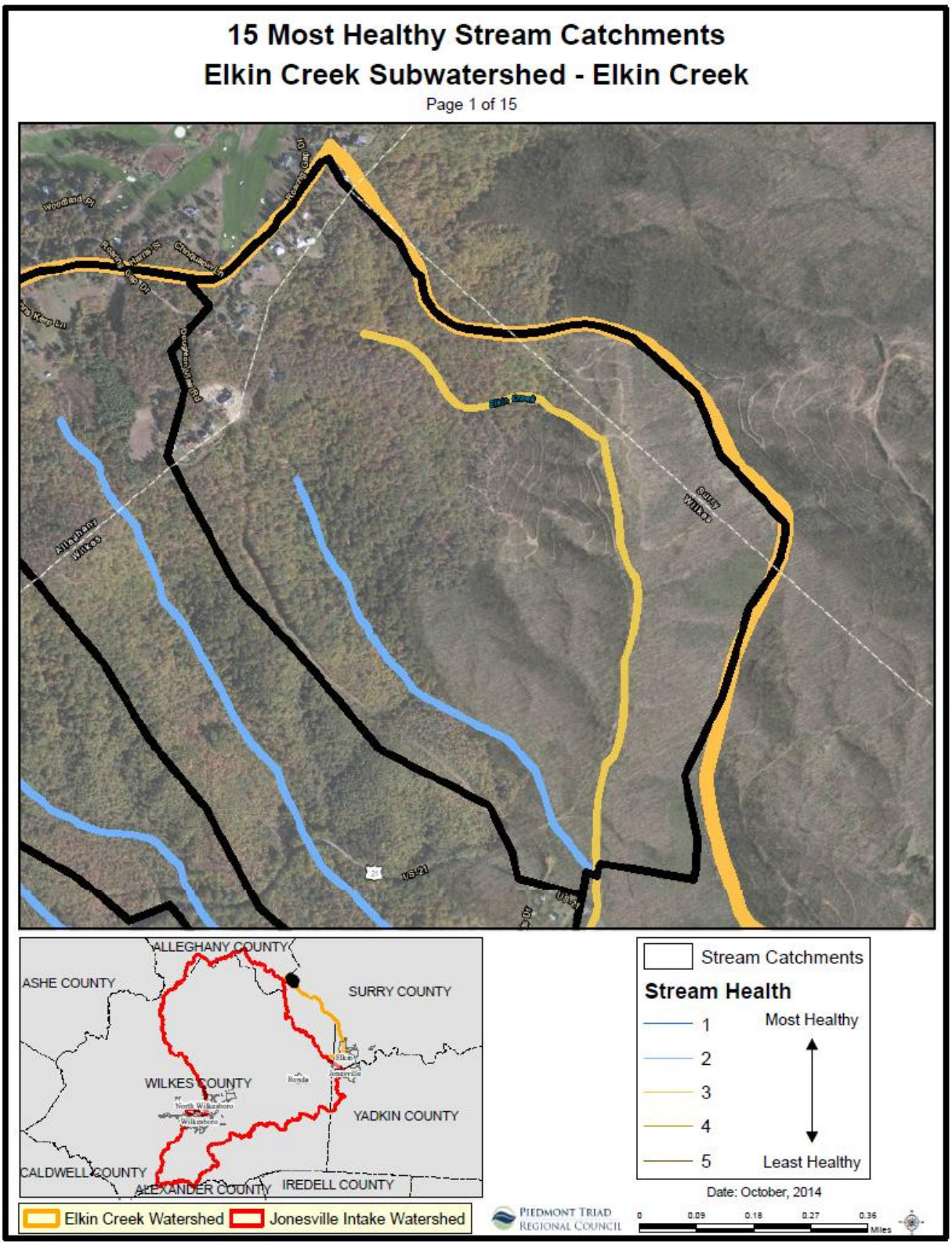
This catchment of unnamed tributaries to the Big Elkin Creek is almost uniformly degraded due to land clearing. This catchment requires intensive stream and stream buffer restoration efforts. Based upon the high-impact agricultural activities within this catchment, the streams can be estimated to contribute hundreds of tons of sediment, many pounds of nutrients from fertilizers, and possibly fecal material from livestock. If this land is being used to cultivate tobacco, then estimates of the sediment contributions of these farms make them a disproportionate source of impact to the larger watershed. Erosion from these high-impact practices are evident, with exposed soil due to erosion clearly visible in the aerial images. The headwaters of these tributaries are in worse condition, with paved areas abutting the points of origin for these streams.

Though there are 50 properties within this watershed, only several large lands are being used for farming. The owners of these large properties need to be contacted about the use of agricultural BMPs and cost-share programs. The need for improvements on these tributaries is pressing – they are 2 miles of poor streams contributing enormous loads of sediment to Elkin's water supply. Simply buffering the streams with vegetation would yield great benefits for the watershed, let alone improved agricultural practices and/or stream restoration. These projects would striking and highly-valuable pilot projects for this watershed and could even be showcased throughout Wilkes and Surry Counties.

Next Steps:

- Reach out to the farmer(s) of these farmed parcels to determine interest in using agricultural BMPs and/or enrollment in a cost-share program that will restore vegetated buffers, use low-impact crop management practices, and halt the loss of land to stream erosion and flooding;
- Gauge interest in restoring this highly-degraded stream reach.

Big Elkin Creek Watershed Priorities: Conservation



BIG ELKIN CREEK WATERSHED CONSERVATION PRIORITY:

ELKIN CREEK

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	13	AGRICULTURE	0	0%	CLASS 1	0
PARTIALLY	31	RESIDENTIAL	23	6%	CLASS 2	4,285
		VACANT/UNKNOWN	386	94%	CLASS 3	6,097
		COMMERCIAL	0	0%	CLASS 4	0
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**44**	**TOTAL**	**409**	**100%**	**TOTAL**	**10,382**

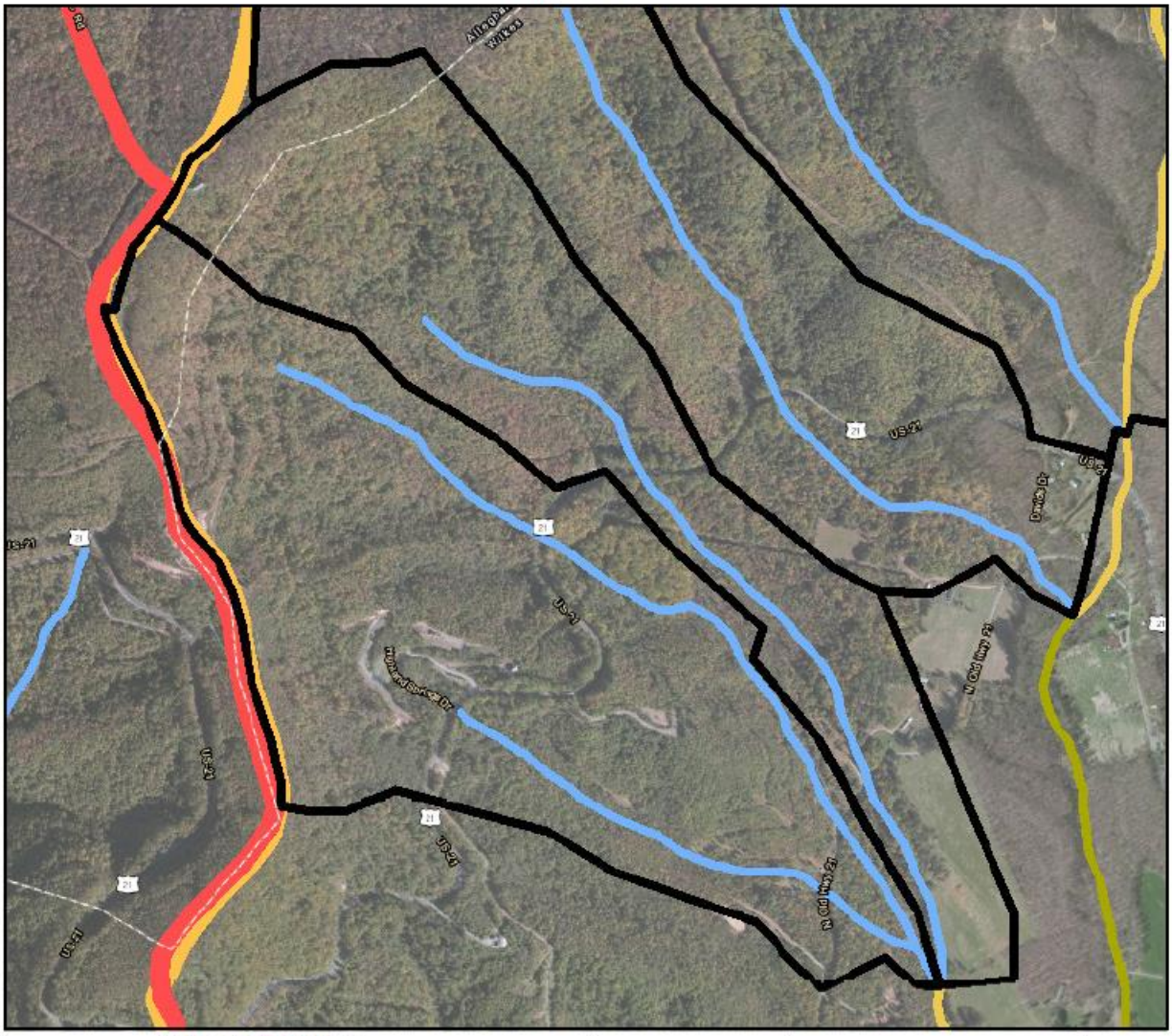
This catchment at the intersection of the Allegheny, Surry, and Wilkes County boundaries offers an opportunity to protect two miles of headwater streams in the mountainous areas of the Big Elkin Creek watershed. It shows that Elkin Creek's headwaters are being actively logged but are otherwise untouched by humans. The timber operations are not consistently maintained the fifty-foot stream buffers required within the Forestry Practice Guidelines set in law by the State of North Carolina, but they are mostly present.

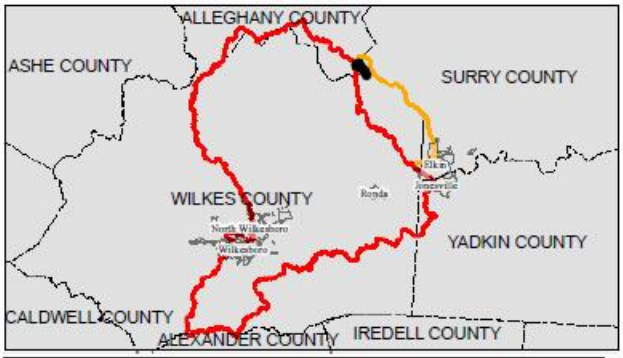
The multiple landowners within this catchment appear to largely be located in the utmost headwaters of the entire Big Elkin Creek watershed in Allegheny County. The lands in Wilkes and Surry Counties have no homes on them. As these are potential trout waters and drain to the waters the EVTA is focusing on for their recreation efforts, they should be prioritized for permanent protection efforts by the Blue Ridge Land Trust and the Piedmont Land Conservancy. Permanent conservation easements prioritize the protection of the assets of these lands and waters, but may permit the construction of a few homes, hunting and fishing, and even some forestry operations that don't negatively impact the surrounding ecosystems.

Next Steps:

- Ensure that the Wilkes and Surry County Foresters and the NC Division of Land Quality are aware of any new logging operations in this catchment and they inspect them to ensure FPGs are being used;
- Prioritize these lands for protection by the relevant land trusts;
- Make the origin of Big Elkin Creek conservation priority and trail destination by the EVTA, and incorporate this into other regional trails plans.

15 Most Healthy Stream Catchments
Elkin Creek Subwatershed - Unknown Creek 2





Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.095 0.19 0.285 0.38 Miles

BIG ELKIN WATERSHED CONSERVATION PRIORITY:

UNKNOWN CREEK 2

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	13	AGRICULTURE	19.5	10%	CLASS 1	0
PARTIALLY	28	RESIDENTIAL	15.9	8%	CLASS 2	6,200
		VACANT/UNKNOWN	153.6	81%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**41**	**TOTAL**	**189**	**100%**	**TOTAL**	**6,200**

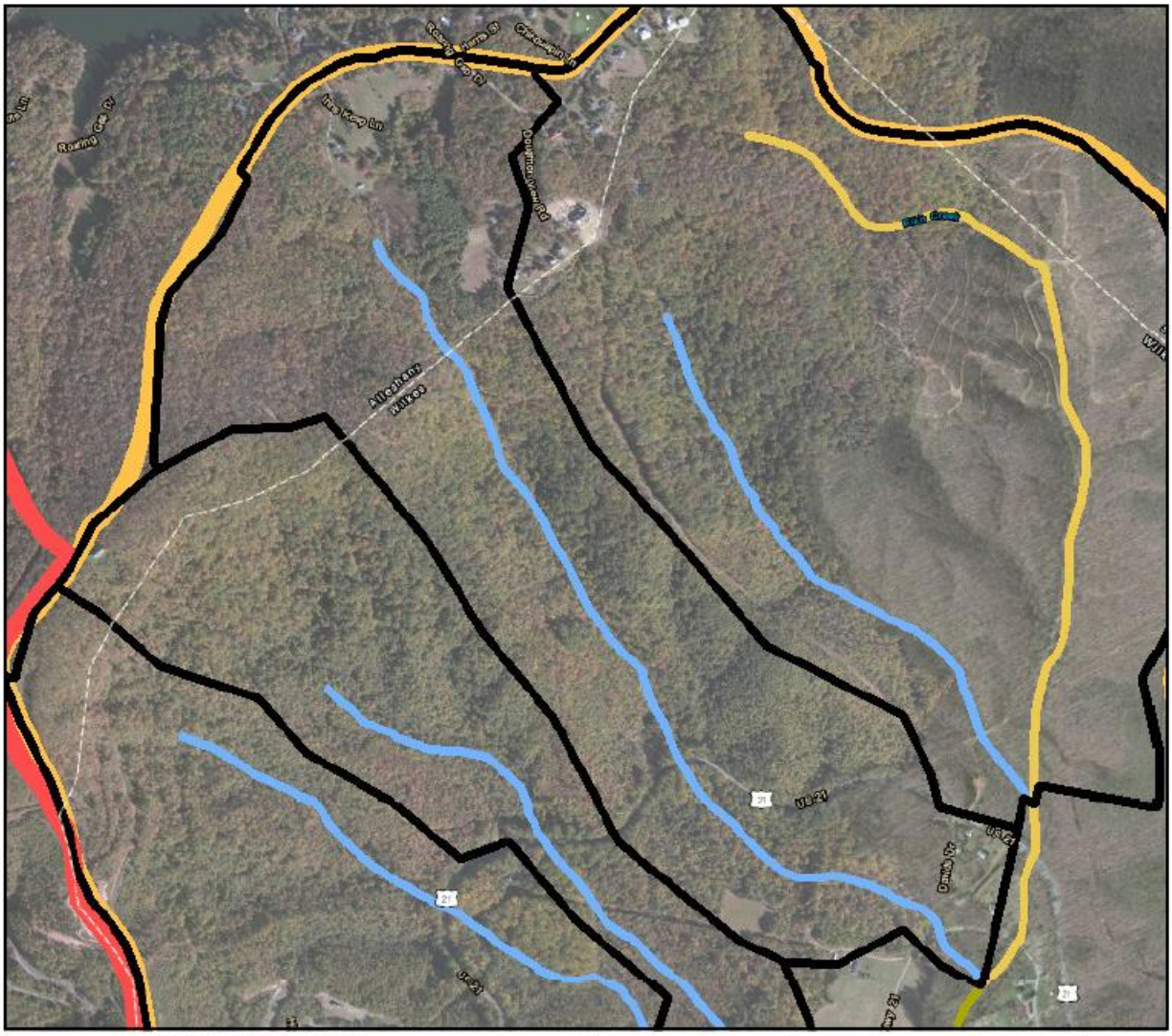
Route US 21 transects this catchment on the Wilkes and Allegheny County line disrupting the nearly pristine forests of this unnamed tributary to Big Elkin Creek. There are a few residences in this catchment, but they all appear to be uphill from the headwaters of these tributaries, with minimal impact upon these waters. These lands are all have the restrictions on development densities required of a WS-II water supply watershed, ensuring that any new residences or businesses in this catchment will have a minimal impact upon water quality conditions. Efforts will need to be made to ensure that any new forestry or farming operations in this catchment have a similar minimal impact to the local and downstream waters.

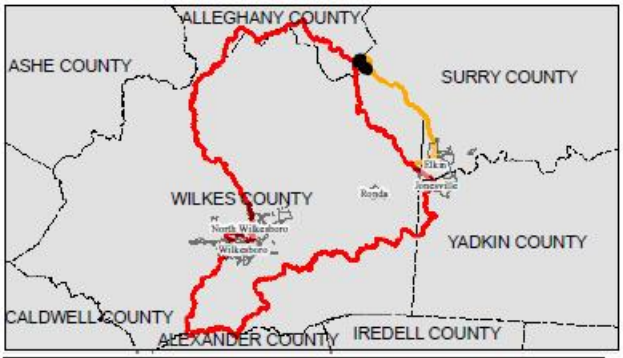
These catchments are also very close to the existing Stone Mountain State Park, and could be more permanently protected to provide a large habitat for indigenous ecology and perhaps expand upon the available recreation opportunities. Species such as the golden eagle and the cerulean warbler reside in the park and are major draws for tourists. This could potentially include the establishment of stocked or permanent trout populations in these cooler headwater areas.

Next Steps:

- Ensure that NC DOT is using stormwater best management practices at their road crossings, and that their culverts provide for fish passage;
- Blue Ridge Land Conservancy should assess landowner interest in permanently protecting these lands, as some are adjacent to Stone Mountain State Park;
- NC WRC should determine if these tributaries could host a stocked or permanent trout population.

15 Most Healthy Stream Catchments
Elkin Creek Subwatershed - Unknown Creek 3





Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.095 0.19 0.285 0.38 Miles

BIG ELKIN WATERSHED CONSERVATION PRIORITY:

UNKNOWN CREEK 3

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	40	AGRICULTURE	46.8	16%	CLASS 1	0
PARTIALLY	64	RESIDENTIAL	11.5	4%	CLASS 2	6,832
		VACANT/UNKNOWN	233.3	80%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**104**	**TOTAL**	**291**	**100%**	**TOTAL**	**6,832**

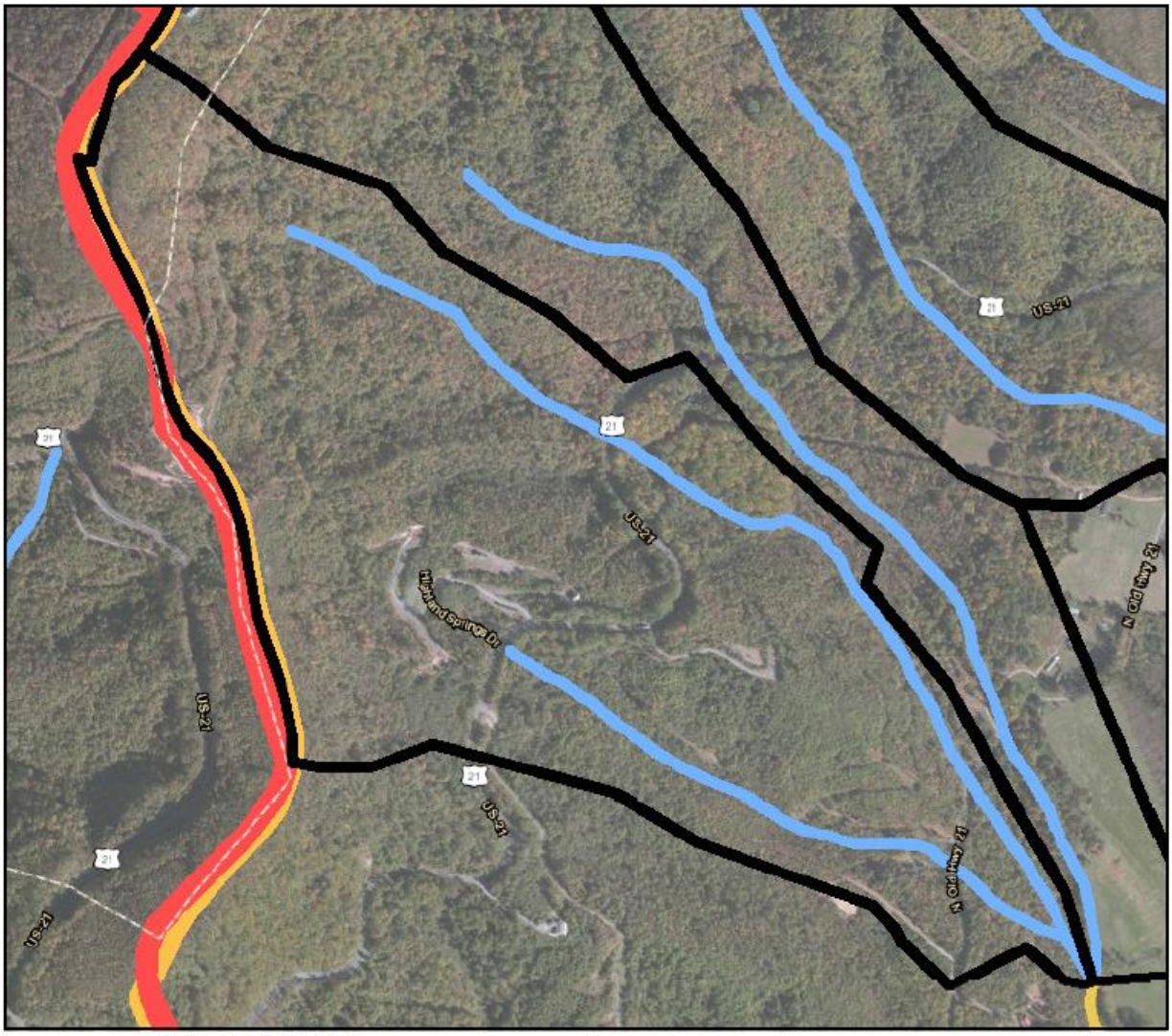
Though there are over 100 properties in this catchment, there appear to only be a handful of residences, all of them far from the stream corridor. These lands are all have the restrictions on development densities required of a WS-II water supply watershed, ensuring that any new residences or businesses in this catchment will have a minimal impact upon water quality conditions. Efforts will need to be made to ensure that any new forestry or farming operations in this catchment have a similar minimal impact to the local and downstream waters. Route US 21 transects this catchment on the Wilkes and Allegheny County line disrupting the nearly pristine forests of this unnamed tributary to Big Elkin Creek.

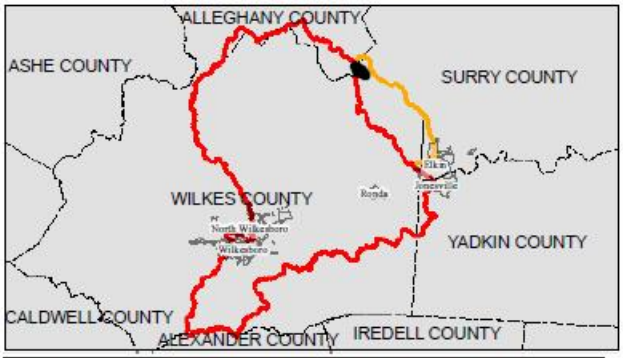
These catchments are very close to Stone Mountain State Park, and could be more permanently protected to provide a large habitat for indigenous ecology and perhaps expand upon the available recreation opportunities. Species such as the golden eagle and the cerulean warbler reside in the park and are major draws for tourists. This could potentially include the establishment of stocked or permanent trout populations in these cooler headwater areas. However, with potentially dozens of small parcels subdividing this catchment, the administrative burdens of creating such permanent protections would be daunting, if not a total deterrent. If the NC WRC or Department of Parks and Recreation could work with the EVTA or the counties to facilitate these processes, it could become much more feasible.

Next Steps:

- Ensure that NC DOT is using stormwater best management practices at their road crossings, and that their culverts provide for fish passage;
- Blue Ridge Land Conservancy should assess landowner interest in permanently protecting these lands, as some are adjacent to Stone Mountain State Park;
- NC WRC should determine if these tributaries have stocked or permanent trout potential.

15 Most Healthy Stream Catchments
Elkin Creek Subwatershed - Unknown Creek 4





Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.075 0.15 0.225 0.3 Miles

BIG ELKIN WATERSHED CONSERVATION PRIORITY:

UNKNOWN CREEK 4

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	20	AGRICULTURE	47.2	17%	CLASS 1	0
PARTIALLY	25	RESIDENTIAL	3.5	1%	CLASS 2	10,053
		VACANT/UNKNOWN	230	82%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**45**	**TOTAL**	**280**	**100%**	**TOTAL**	**10,053**

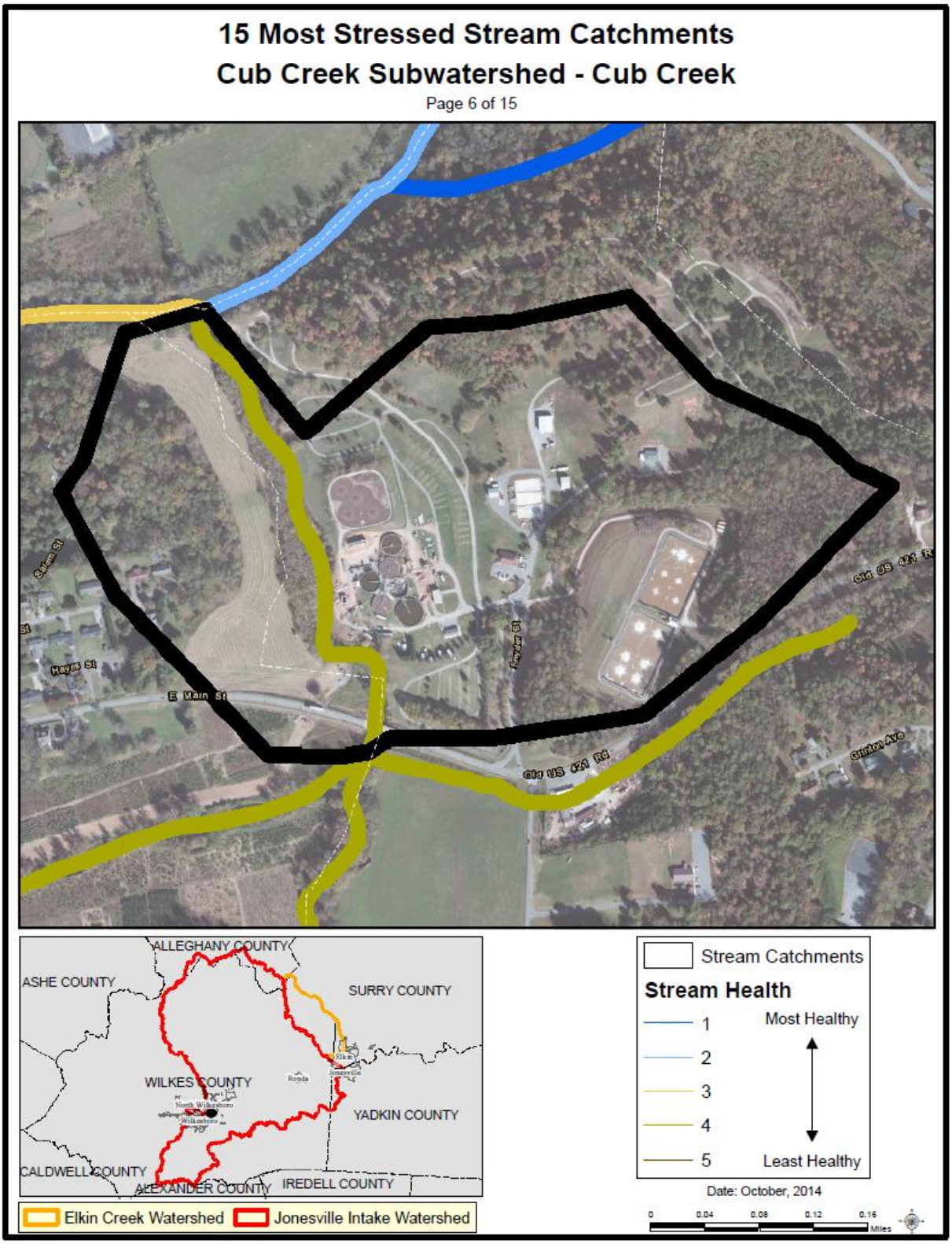
Route US 21 transects this catchment on the Wilkes and Allegheny County line disrupting the nearly pristine forests of these two miles of unnamed tributaries to Big Elkin Creek. There are a few residences in this catchment, but they all appear to be uphill from the headwaters of these tributaries, with minimal impact upon these waters. These lands are all have the restrictions on development densities required of a WS-II water supply watershed, ensuring that any new residences or businesses in this catchment will have a minimal impact upon water quality conditions. Efforts will need to be made to ensure that any new forestry or farming operations in this catchment have a similar minimal impact to the local and downstream waters.

These catchments are also very close to the existing Stone Mountain State Park, and could be more permanently protected to provide a large habitat for indigenous ecology and perhaps expand upon the available recreation opportunities. Species such as the golden eagle and the cerulean warbler reside in the park and are major draws for tourists. This could potentially include the establishment of stocked or permanent trout populations in these cooler headwater areas. However, with potentially dozens of small parcels subdividing this catchment, the administrative burdens of creating such permanent protections would be daunting, if not a total deterrent. If the NC WRC or Department of Parks and Recreation could work with the EVTA or the counties to facilitate these processes, it could become much more feasible.

Next Steps:

- Ensure that NC DOT is using stormwater best management practices at their road crossings, and that their culverts provide for fish passage;
- Blue Ridge Land Conservancy should assess landowner interest in permanently protecting these lands, as some are adjacent to Stone Mountain State Park;
- NC WRC should determine if these tributaries have stocked or permanent trout potential.

Jonesville Intake Watershed Priorities: Restoration



JONESVILLE INTAKE WATERSHED RESTORATION RIORITY: CUB CREEK						
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	3	AGRICULTURE	1.6	1.9%	CLASS 1	0
PARTIALLY	12	RESIDENTIAL	6.7	8%	CLASS 2	0
		VACANT/UNKNOWN	14.7	17.5%	CLASS 3	0
		COMMERCIAL	29.2	35%	CLASS 4	2,049
		INDUSTRIAL	19	22.6%	CLASS 5	0
TOTAL	**15**	**TOTAL**	**84**	**100%**	**TOTAL**	**2,049**

This relatively small catchment in Wilkesboro is an excellent opportunity to implement demonstration projects for stream restoration and stormwater BMPs: the largest properties are the Town of Wilkesboro's wastewater treatment plant (WWTP). Cub Creek has a poor stream buffer on its side closest to theWWTP, perhaps due to historic impacts and current stormwater runoff to the creek. A project that both restores healthy stream and buffer conditions to Cub Creek while also reducing the runoff from the facilities would be an excellent and high-value project for public engagement and protecting the water quality of the Yadkin River. Wilkesboro has invested millions of dollars and enormous resources to ensuring that the discharge from its WWTP is a positive contribution to the Yadkin River; it could now do so by making similar investments in runoff from these same facilities.

The Town of Wilkesboro would be very competitive for grant funds if it wishes to invest in the project recommended: a half-mile of stream restoration and stormwater improvements is an exciting project anywhere, but moreso in a water supply watershed. The NC Clean Water Management Trust Fund, the Duke Energy Water Resources Fund, and a number of other federal and state sources would count the dedication of lands to these conservation and restoration efforts as the Town's match for a grant project. It would also be an excellent opportunity to highlight all the Town is doing on behalf of its residents and its downstream neighbors to protect and improve water quality in the Yadkin River. Lastly, these improvements could be accounted for by the Town as reducing its nutrient contributions to the larger High Rock Lake watershed.

Next Steps:

- Town of Wilkesboro works with stream restoration and/or stormwater engineers to draft preliminary designs for the proposed project and apply for grant funds to execute this project in one or several phases;
- Should funding be received, engage in a public outreach campaign so that town residents and others know what the town is doing to protect and improve the quality of its streams.

FIGURE 70: FROM (HIGH COUNTRY COUNCIL OF GOVERNMENTS 2012)

High Country Council of Governments
Regional Stormwater Project

Wilkes County

Wilkes County Senior Center

Problem

Runoff from the building and parking lots is directed into a ditch, causing erosion and thereby introducing sediment into Long Creek in addition to pollutants from the stormwater.

Drainage area = 2.33 acres
Impervious surface = 1.76 acres; 76%

Affected stream = Long Creek
Stream classification = C

BMP solution

The ditch will be converted to a bioretention swale, replacing at least some of the soil with materials and a soil mix that will retain greater quantities of runoff. The addition of appropriate plants will increase its filtering and retention capacity while also enhancing the appearance of this public site. A series of checkdams will slow the velocity to allow more infiltration.

Water quality benefits[1]

By capturing and treating the runoff, heavy metals and other pollutants associated with parking lots and roadways will be prevented from entering the stream. The bioretention swale will also reduce erosion and sedimentation within the ditch. Reduction of stormwater velocity will help lessen erosion downstream that often results from higher stream volumes.

[1] The methodology used to obtain values was developed by the Illinois Environmental Protection Agency. U = unavailable

	Load before BMP (lbs/yr)	Load after BMP (lbs/yr)	Load Reduction (lbs/yr)
BOD	70	35	35
COD	1,207	724	483
TSS	3,099	837	2,262
LEAD	4	2	2
COPPER	1	U	U
ZINC	4	2	3
TDS	8,306	U	U
TN	18	11	7
TKN	26	U	U
DP	0	U	U
TP	3	1	1
CADMIUM	0	U	U

Cost estimate[2]

Construction	$19,184
Design & engineering	$ 1,083
	$20,267

Funding

North Carolina Clean Water Management Trust Fund

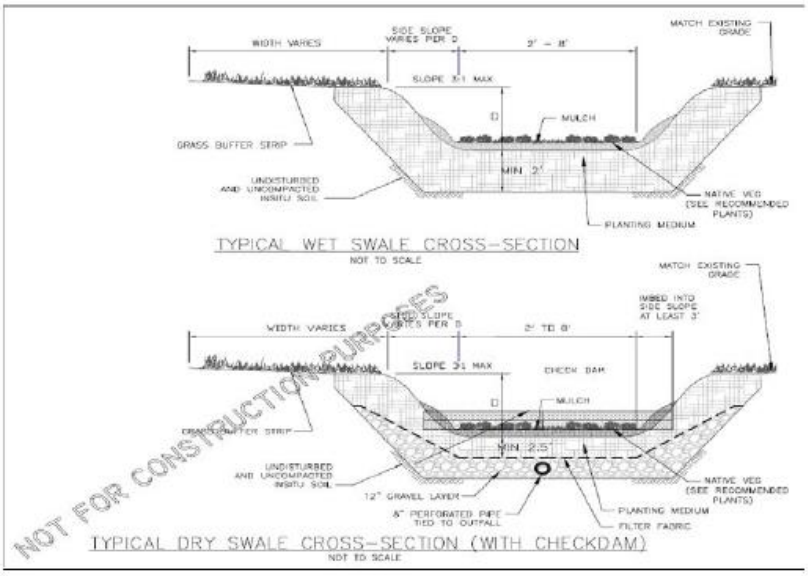
Soil & Water District Community Conservation Assistance Project Program

North Carolina Division of Water Resources Development Project Grant Program

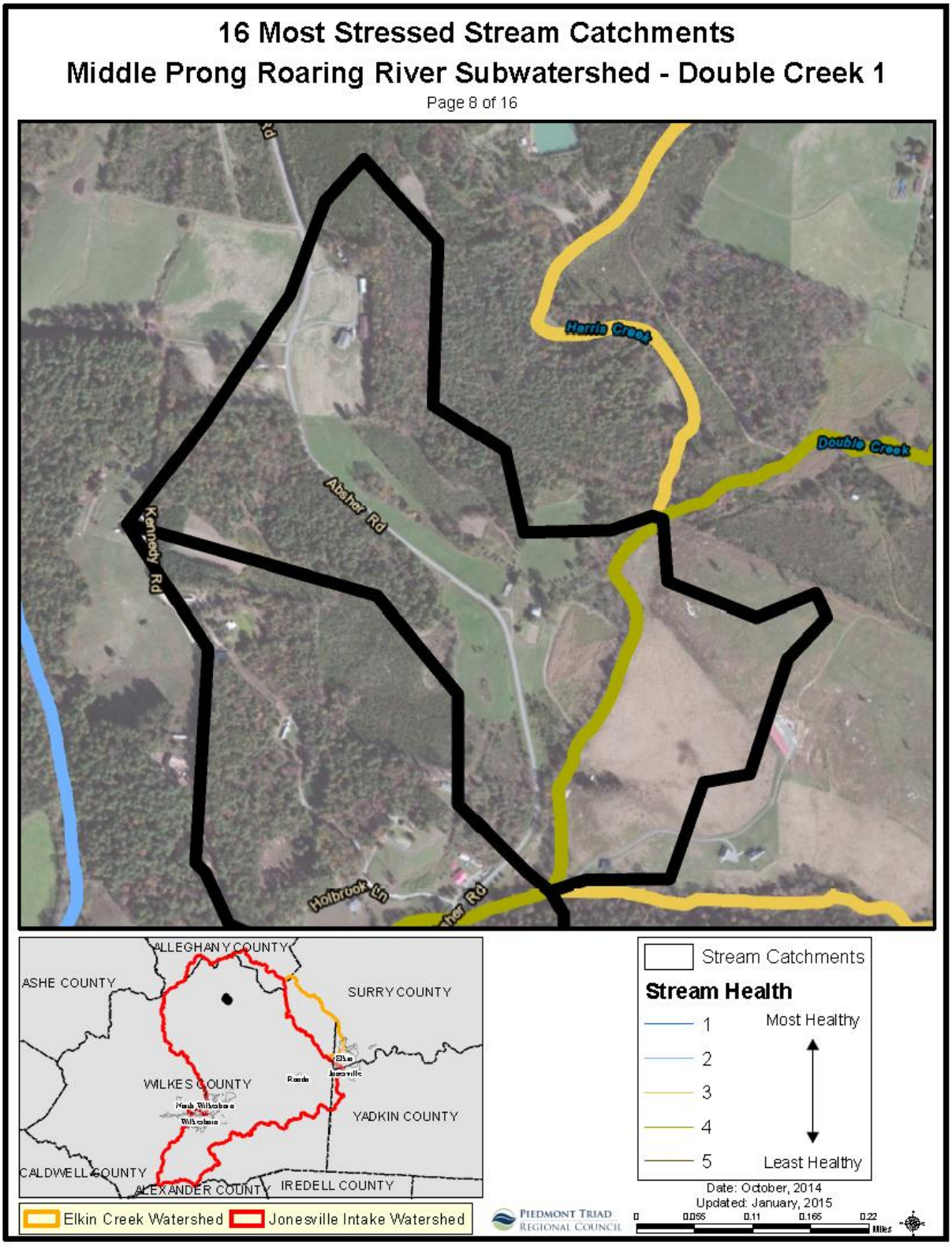
[2] Methodology used to calculate cost estimates is obtained from *Urban Subwatershed Restoration Manual No. 3* URBAN STORMWATER RETROFIT PRACTICES *Version 1.0* Tom Schueler, David Hirschman, Michael Novotney, and Jennifer Zielinski, Center for Watershed Protection, 2007


Wilkes County Site:
Wilkes County Senior Center
Site 1: Bioretention Swale
Site 2: Bioretention Swale
Site 3: Bioretention Swale
FAIRPLAINS SCH RD
WILKES COUNTY
SENIOR CENTER
Parcels
Drainage Area
Roads
Hydrology
Source: NC Floodplain Mapping Program
Culvert
Stream / River
2010 Orthophotography
1 inch = 75 feet
0
37.5
75
Feet

Diagram and photograph of a typical swale:



96



JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY:

MIDDLE PRONG ROARING RIVER, DOUBLE CREEK 1

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	80.9	77%	CLASS 1	0
PARTIALLY	10	RESIDENTIAL	10.7	10%	CLASS 2	0
		VACANT/UNKNOWN	13.5	13%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	2,113
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**10**	**TOTAL**	**105**	**100%**	**TOTAL**	**2,113**

This stretch of the headwaters tributary Double Creek cross through unbuffered agricultural land, including what appears to be a tobacco field. The use of agricultural BMPs – namely vegetated stream buffers – would be enormously beneficial on this half-mile stretch of the creek. Both banks of the creek are tilled for agriculture, but only the eastern bank appears to be completely unbuffered. Unfortunately, this is also the bank that appears to be intensively tilled, perhaps for tobacco. This is of even greater concern given that its is habitat for the brook floater freshwater mussel and a conservation priority for North Carolina. The land is being degraded, as seen in the active erosion ruts present in the aerial image – this is a farm that would greatly benefit from the use of agricultural BMPs and low-till cropping. The farm(s) on the western bank of Double Creek could also benefit from this information and implementation, though their current practices are having less impact on water quality conditions.

Next Steps:

- Seek federal and state assistance to restore brook floater habitat to these streams;
- Contact the owner(s) of the farms along Double Creek about agricultural BMPs and cost-share programs;
- Prioritize the restoration of stream buffer along Double Creek and/or the use of low- or no-till crop practices in the field that drains to the creek;
- Use stream restoration as needed and promote the project to the area as a demonstration project.

FIGURE 71: : FROM (HIGH COUNTRY COUNCIL OF GOVERNMENTS 2012)

High Country Council of Governments
Regional Stormwater Project

Ronda

Memorial Park

Problem

The Ronda Memorial Park contains a paved parking lot and a concrete canoe launch. Runoff from the majority of the parking lot flows down a steep bank approximately 20 feet to the Yadkin River. Runoff from the parking lot, driveway, and roadway above flows down the canoe ramp directly into the Yadkin River. The runoff from the site introduces oils and grease, hydrocarbons, metals, and road salt to the stream.

Drainage area = 1.33 acre
Impervious surface = 0.50 acre; 38%

Affected stream = Yadkin River
Stream classification = WS-IV

BMP solution

A grade-level drain will be installed to capture the runoff and drain it to a channel that will connect to a bioretention cell in the grassy area. Bioretention is the preferred BMP, considering the park environment.

Water quality benefits[1]

By capturing and treating the runoff, heavy metals and other pollutants associated with parking lots and roadways will be prevented from entering the stream. The bioretention cell will also reduce erosion and sedimentation resulting from stormwater draining unchecked down the bank to the river.

	Load before BMP (lbs/yr)	Load after BMP (lbs/yr)	Load Reduction (lbs/yr)
BOD	15	3	12
COD	259	U	U
TSS	665	40	625
LEAD	1	U	U
COPPER	0	U	U
ZINC	1	U	U
TDS	1,783	U	U
TN	4	U	U
TKN	6	U	U
DP	0	U	U
TP	1	0	0
CADMIUM	0	U	U

Cost estimate[2]

Construction	$9,950
Design & engineering	$ 500
	$10,450

Funding

North Carolina Clean Water Management Trust Fund

Soil & Water District Community Conservation Assistance Project Program

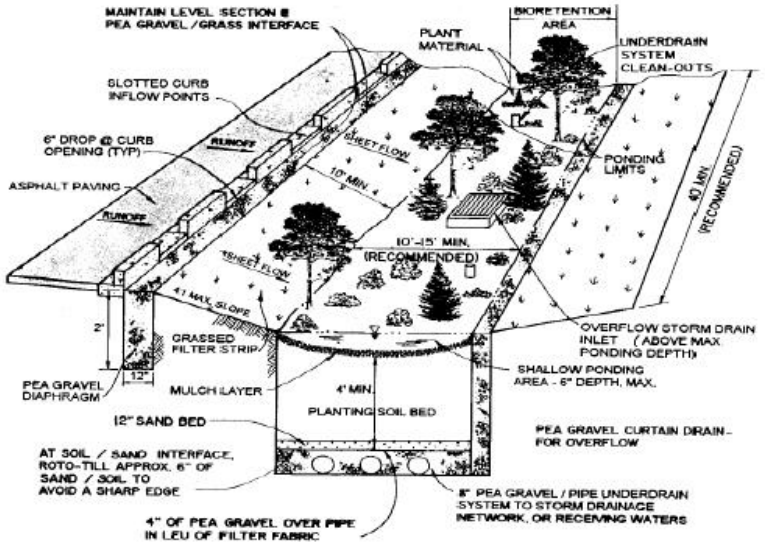
North Carolina Division of Water Resources Development Project Grant Program

[1] The methodology used to obtain values was developed by the Illinois Environmental Protection Agency. U = unavailable

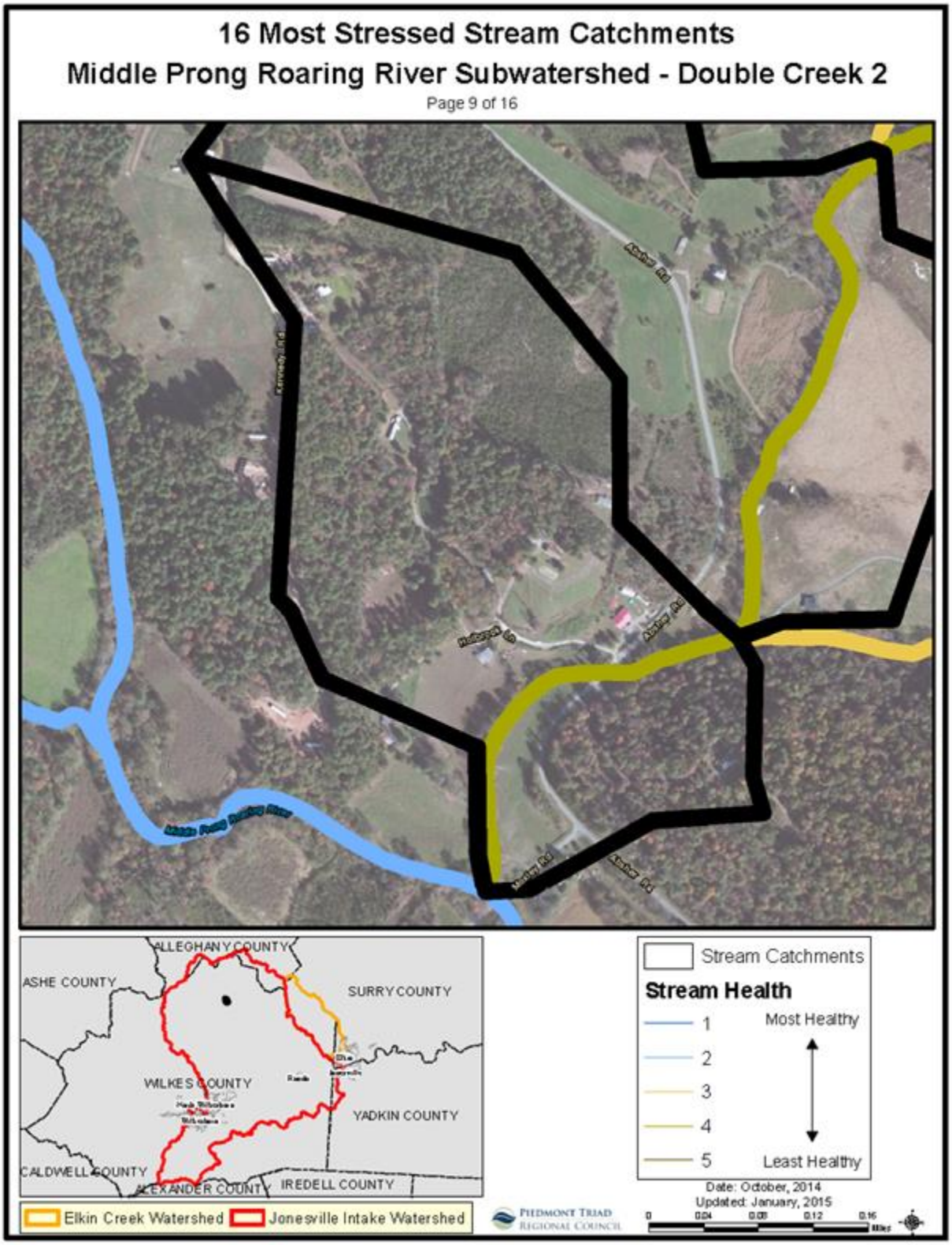
[2] Methodology used to calculate cost estimates is obtained from *Urban Subwatershed Restoration Manual No. 3* URBAN STORMWATER RETROFIT PRACTICES *Version 1.0* Tom Schueler, David Hirschman, Michael Novotney, and Jennifer Zielinski, Center for Watershed Protection, 2007


Town of Ronda Site:
Memorial Park
TOWN OF RONDA
CLINGMAN RD
Site 1: Bioretention Cell
Yadkin River
Parcels
Drainage Area
Roads
Hydrology
Source: NC Floodplain Mapping Program
Culvert
Stream / River
2010 Orthophotography
1 inch = 75 feet
0
37.5
75
Feet

Diagram and photograph of a typical bioretention cell:



100



JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY:

MIDDLE PRONG ROARING RIVER, DOUBLE CREEK 2

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	3	AGRICULTURE	31.2	43%	CLASS 1	0
PARTIALLY	16	RESIDENTIAL	24	33%	CLASS 2	0
		VACANT/UNKNOWN	16.7	23%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	1,680
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**19**	**TOTAL**	**72**	**100%**	**TOTAL**	**2,113**

This small catchment on the Double Creek tributary of the Middle Prong of Roaring River is surprisingly unprotected. Most of the catchment is forested on both banks of the creek, yet the creek itself is unbuffered and seems to be actively cleared for pasture and as a backyard feature. This stretch of Double Creek is immediately downstream of the much more intensively used catchment (Double Creek 1) and immediately upstream of the Middle Prong of the Roaring River. It drains directly to trout waters and receives highly-degraded waters. Its value to the whole Roaring River watershed is high, as its value as a demonstration project.

The Wilkes County Soil & Water Conservation District agents should reach out the few landowners who abut Double Creek about the value of stream buffers and low- or no-till agricultural practices. This half-mile of stream could be greatly improved with some small improvements that mitigate sedimentation of the creek. The benefits for downstream conditions could be enormous, especially in relation to the trout fisheries the NC WRC is cultivating in this watershed. Sediment and a lack of shade cover are two of the primary stressors to trout – if these two environmental conditions are prevented and the natural waters are cold enough, stocked and native trout can thrive. There may also be an opportunity to extend these fisheries up Double Creek if neighbors are willing to take similar steps to restore stream buffers and prevent sediment runoff.

Next Steps:

- Contact the landowner(s) along Double Creek about agricultural BMPs and cost-share programs, prioritizing the restoration of stream buffer along Double Creek and/or the use of low- or no-till crop practices;
- Restore streams as needed and promote the project to the area as a demonstration project.

FIGURE 72: : FROM (HIGH COUNTRY COUNCIL OF GOVERNMENTS 2012)

High Country Council of Governments
Regional Stormwater Project

Town of Wilkesboro

Tyson Plant (Main/Cherry Streets)

Problem

An unnamed tributary of Cub Creek and the stormwater from the Tyson plant and surrounding area flow down the channel shown in the right photo (flow and channel location shown by red arrow). In addition to the typical pollutants associated with parking lots, drives, and rooftops, water quality testing by the Town a few feet downstream revealed high levels of BOD, low dissolved oxygen, and high levels of fecal coliform bacteria.

Drainage area = 116.57 acres Impervious surface = 62.8 acres; 54%

Affected stream= unnamed tributary to Cub Creek
Stream classification = C

BMP solution

A weir will be installed on the existing concrete channel to divert stormflow to an adjacent parcel where a series of wetland cells will be constructed. The topography is conducive to this BMP and will provide substantial filtration of the targeted pollutants. The Town is currently engaged in a major streambank restoration effort on Cub Creek only a short distance downstream, which this BMP will complement and help protect from excessive stormwater flows.

Water quality benefits[1]

By capturing and treating the runoff, heavy metals and other pollutants associated with parking lots and roadways will be filtered. The BMP will remedy high levels of BOD, low dissolved oxygen, and high levels of fecal coliform bacteria currently in the stream. Elimination of the stormwater volume from the creek will lessen erosion downstream that often results from higher stream volumes.

	Load before BMP (lbs/yr)	Load after BMP (lbs/yr)	Load Reduction (lbs/yr)
BOD	4,663	1,725	2,938
COD	26,811	13,406	13,406
TSS	125,896	28,327	97,569
LEAD	162	57	105
COPPER	21	U	U
ZINC	140	91	49
TDS	131,724	U	U
TN	1,399	1,119	280
TKN	466	U	U
DP	87	U	U
TP	152	85	67
CADMIUM	3	U	U

Cost estimate[2]

Construction	$182,236
Design & engineering	$ 9,111
	$191,347

Funding

North Carolina Clean Water Management Trust Fund

Soil & Water District Community Conservation Assistance Project Program

North Carolina Division of Water Resources Development Project Grant Program

[1] The methodology used to obtain values was developed by the Illinois Environmental Protection Agency. U = unavailable

[2] Methodology used to calculate cost estimates is obtained from *Urban Subwatershed Restoration Manual No. 3* URBAN STORMWATER RETROFIT PRACTICES *Version 1.0* Tom Schueler, David Hirschman, Michael Novotney, and Jennifer Zielinski, Center for Watershed Protection, 2007

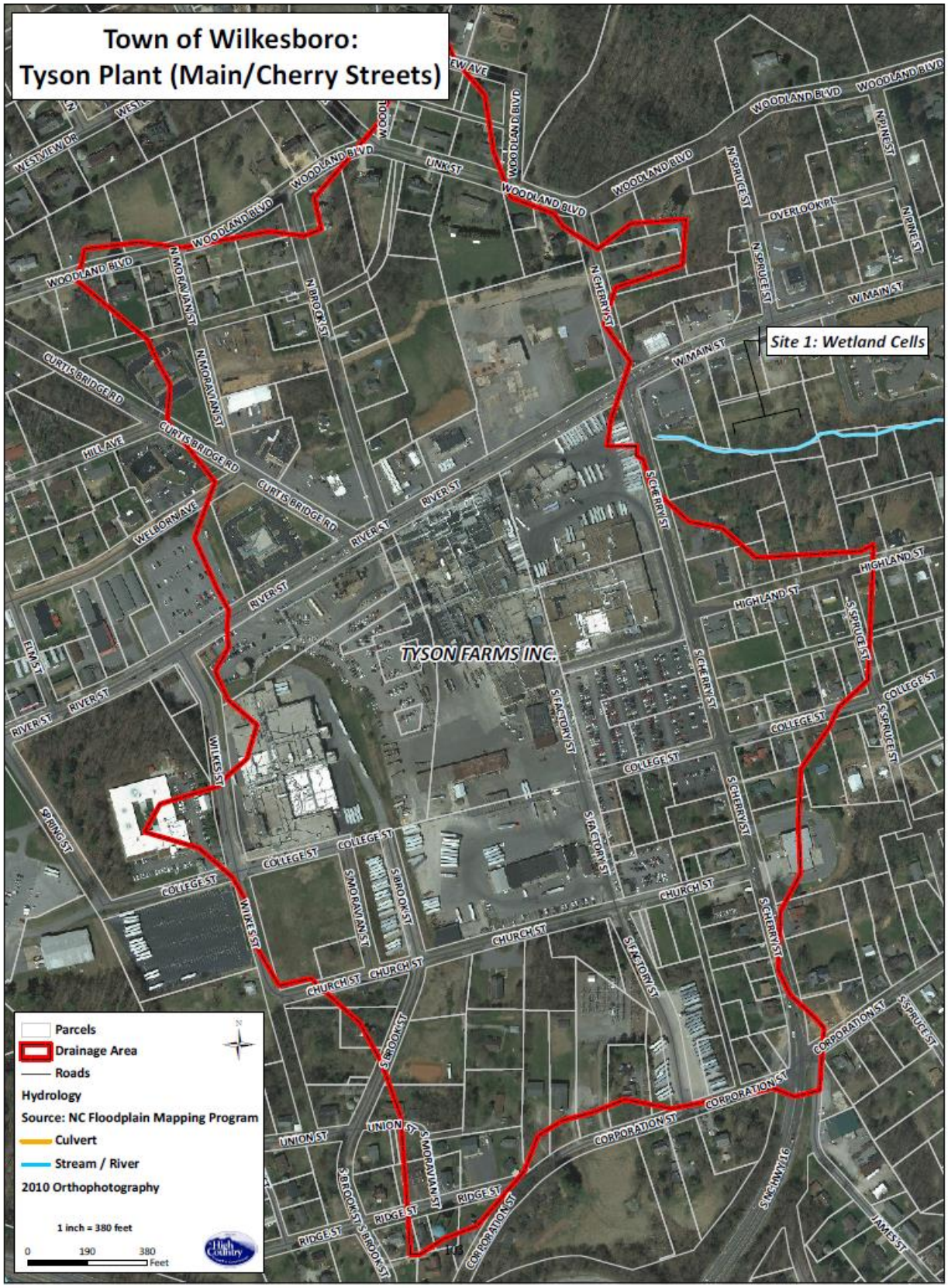
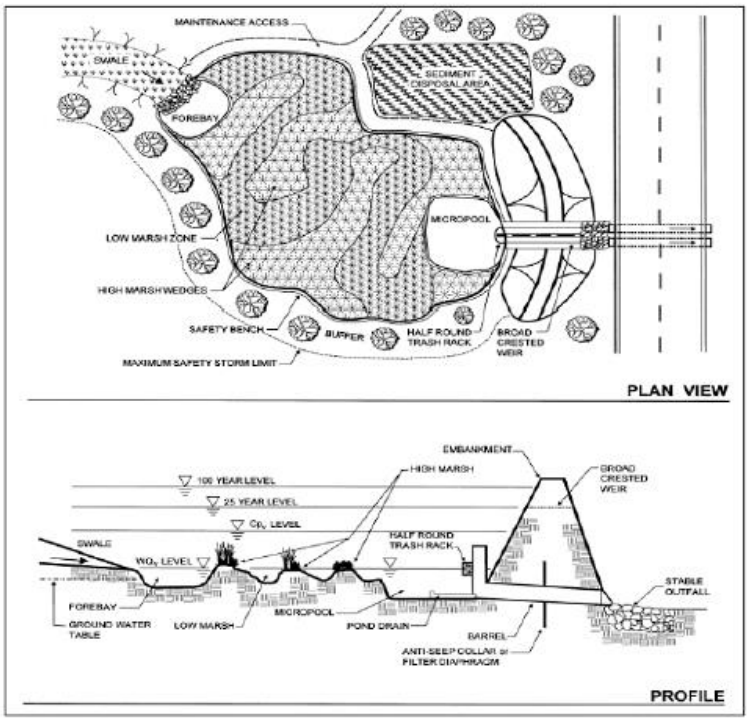

Town of Wilkesboro:
Tyson Plant (Main/Cherry Streets)
Site 1: Wetland Cells
TYSON FARMS INC.
WOODLAND BLVD
N MORAVIAN ST
N BROOK ST
N CHERRY ST
W MAIN ST
CURTIS BRIDGE RD
HILL AVE
WELBORN AVE
RIVER ST
ELM ST
WILKES ST
S SPRING ST
COLLEGE ST
S MORAVIAN ST
S BROOK ST
S FACTORY ST
S CHERRY ST
CHURCH ST
HIGHLAND ST
S SPRUCE ST
CORPORATION ST
UNION ST
RIDGE ST
JAMES ST
Parcels
Drainage Area
Roads
Hydrology
Source: NC Floodplain Mapping Program
Culvert
Stream / River
2010 Orthophotography
1 inch = 380 feet
0
190
380
Feet

Diagram and photograph of a typical stormwater wetland:



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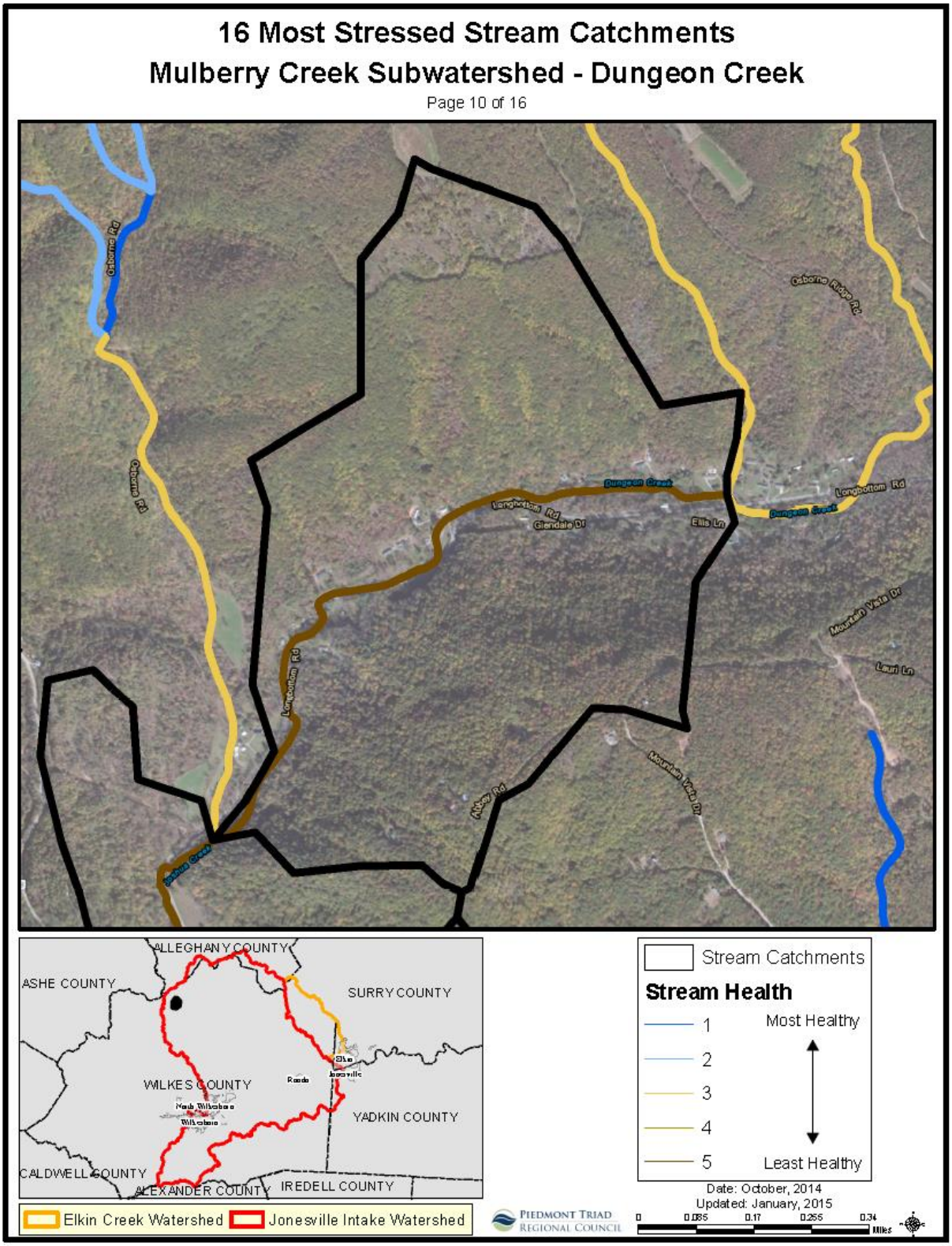


JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY:

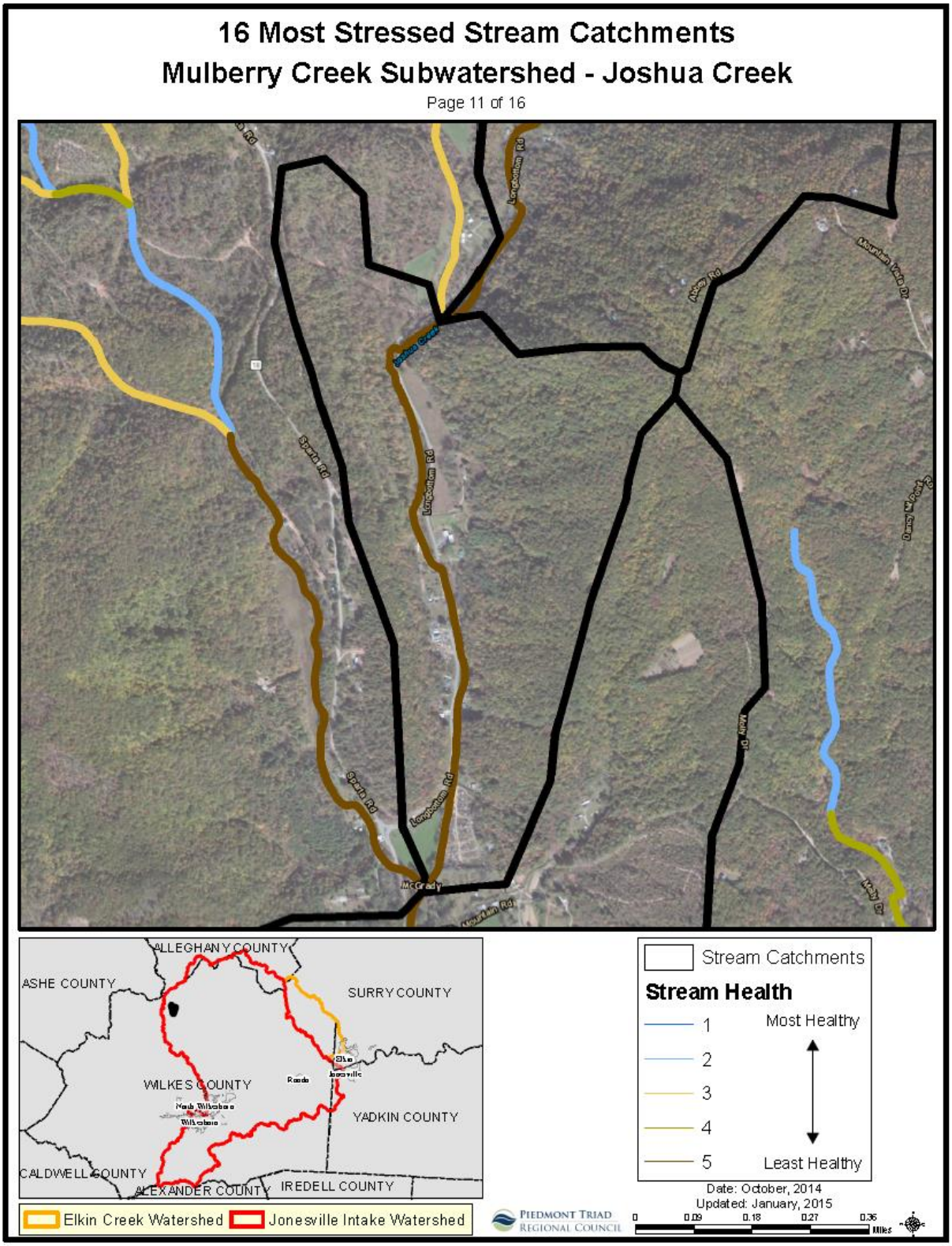
MULBERRY CREEK, DUNGEON CREEK

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	30	AGRICULTURE	20.4	6.4%	CLASS 1	0
PARTIALLY	23	RESIDENTIAL	120.7	38%	CLASS 2	0
		VACANT/UNKNOWN	66.6	21.5%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATIONAL	108.8	34%	CLASS 5	5,923
TOTAL	**53**	**TOTAL**	**319**	**100%**	**TOTAL**	**5,923**

Dungeon Creek is in an odd situation, where all of the land surrounding it is untouched – indeed 34% of it is permanently protected as part of the State Parks system – but the stream corridor has been completely stripped of its buffer. The residences along Dungeon Creek have eliminated all trees and shrubs from the buffer area while keeping all other areas completely vegetated with thick forests. This could be for the view from the hillside; for access to the creek; or simply because Longbottom Road was built along the stream corridor. Whatever the case, all runoff is flowing to this mile of a trout stream unfiltered. Concentrated outreach efforts by the Wilkes County Soil and Water Conservation District or the Wilkes County Planning Department about the value of stream buffers for trout, flooding, and other water quality concerns to these homeowners would be a simple first step that could yield great water quality results. If the need for buffer clearance for viewing the valley or creek access, simply using shrubs in the buffer area could be almost as beneficial as a forested buffer. It is unfortunate that the NC Department of Transportation constructed Longbottom Road directly within the stream corridor, and it would be appropriate if they funded any revegetation and/or stormwater management efforts here.

Next Steps:

- Reach out to homeowners on Longbottom Road about restoring a stream buffer along Dungeon Creek with supporting materials on why they should;
- Contact the regional office of NC DOT about managing the stormwater runoff from Longbottom Road to protect trout waters.



JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY:

MULBERRY CREEK - JOSHUA CREEK

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	13	AGRICULTURE	119.3	57%	CLASS 1	0
PARTIALLY	23	RESIDENTIAL	50.3	24%	CLASS 2	0
		VACANT/UNKNOWN	39.6	19%	CLASS 3	0
		COMMERCIAL	1.6	1.6%	CLASS 4	0
		RECREATIONAL	0	0%	CLASS 5	5,134
TOTAL	**36**	**TOTAL**	**211**	**100%**	**TOTAL**	**5,134**

NC DOT's construction of Longbottom Road within the stream corridor of a mile of Mulberry Creek's tributaries degrades its waters. There is no evidence of a vegetated buffer within the road's right-of-way or within the stream buffer: all stormwater runoff drains to Joshua Creek unfiltered and unimpeded, jeopardizing the sensitive waters of this headwaters stream. There are homes along the entire stretch of Longbottom Road and Joshua Creek that have runoff draining directly to this creek. It is appropriate that the NC DOT bears the costs for managing the stormwater runoff from this runoff and support the revegetation of this stream buffer.

There is one farm that also appears to be having a large impact to the conditions of Joshua Creek – a tilled field near this catchment's headwaters that may be tobacco. Buffering the runoff from this field is necessary; encouraging the landowner to consider crops other than tobacco or the use of low- or no-till practices could be very helpful for local water quality conditions. This farm could benefit from enrollment in a cost-share program that could offset these costs. Wilkes County Soil & Water Conservation District agents should contact this farmer about interest in these possible programs and/or practices.

Next Steps:

- Reach out to homeowners on Longbottom Road about restoring a stream buffer along Dungeon Creek with supporting materials on why they should;
- Contact the regional office of NC DOT about managing the stormwater runoff from Longbottom Road to protect trout waters;
- Wilkes County Soil & Water Conservation District reach out to the farmer who manages the tilled field in this catchment about the need for and benefits of a stream buffer as well as low- and no-till cropping, as well as related cost-share programs.

FIGURE 73: FROM (HIGH COUNTRY COUNCIL OF GOVERNMENTS 2012)

High Country Council of Governments
Regional Stormwater Project

Town of Wilkesboro

Wilkesboro United Methodist Church

Problem

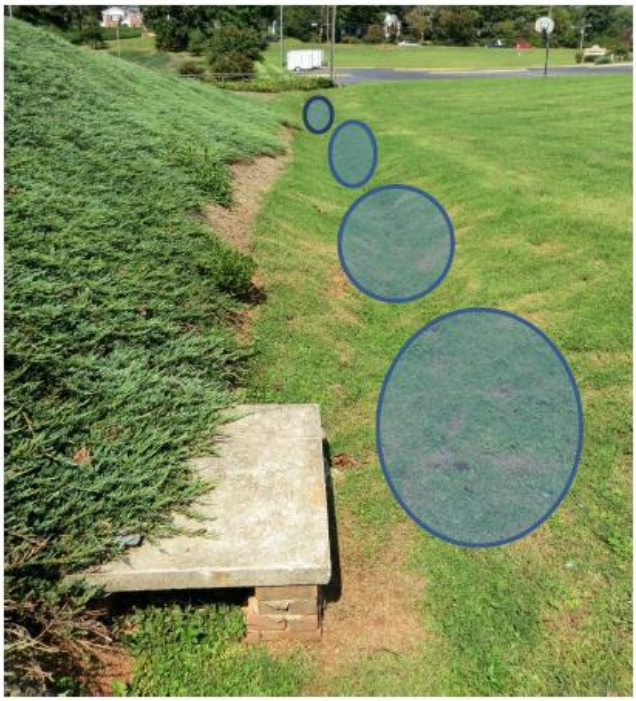
Runoff from the church parking lot flows down a drainage ditch to a pipe where it is discharged directly into a tributary of Cub Creek.

Drainage area = 0.51 acre
Impervious surface = 0.47 acre; 92%

Affected stream = unnamed tributary to Cub Creek
Stream classification = C

BMP solution

A bio-grade step or series of bioretention cells will be installed along the drainage ditch. This BMP will fit well into the existing topography and landscaping of the church grounds without excessive modification. The Town is currently engaged in a substantial streambank restoration effort on Cub Creek only a short distance downstream, which this BMP will complement and help protect from excessive flows.



Water quality benefits[1]

By capturing and treating the runoff, heavy metals and other pollutants associated with parking lots and roadways will be prevented from entering the stream. The BMP will also reduce velocity of stormwater discharging to the creek, reducing streambank erosion.

	Load before BMP (lbs/yr)	Load after BMP (lbs/yr)	Load Reduction (lbs/yr)
BOD	15	3	13
COD	264	U	U
TSS	678	41	638
LEAD	1	U	U
COPPER	0	U	U
ZINC	1	U	U
TDS	1,818	U	U
TN	4	U	U
TKN	6	U	U
DP	0	U	U
TP	1	0	0
CADMIUM	0	U	U

Cost estimate[2]

Construction	$11,938
Design & engineering	$ 1,000
	$12,938

Funding

North Carolina Clean Water Management Trust Fund

Soil & Water District Community Conservation Assistance Project Program

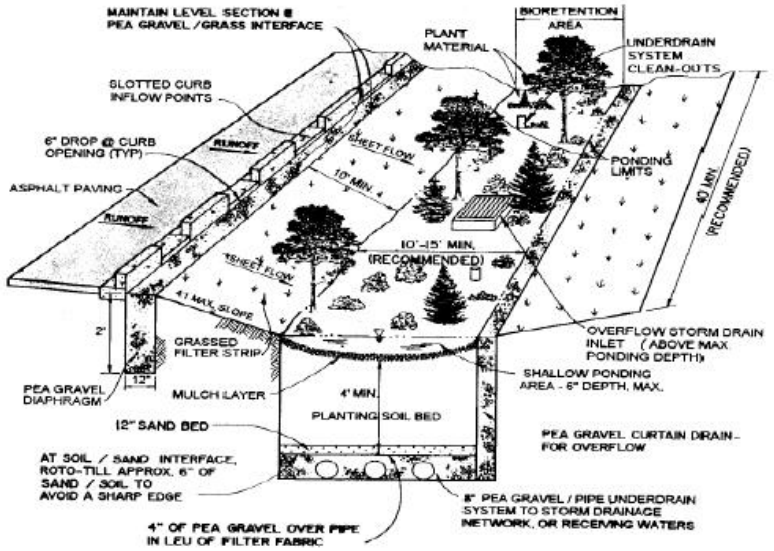
North Carolina Division of Water Resources Development Project Grant Program

[1] The methodology used to obtain values was developed by the Illinois Environmental Protection Agency. U = unavailable

[2] Methodology used to calculate cost estimates is obtained from *Urban Subwatershed Restoration Manual No. 3* URBAN STORMWATER RETROFIT PRACTICES *Version 1.0* Tom Schueler, David Hirschman, Michael Novotney, and Jennifer Zielinski, Center for Watershed Protection, 2007

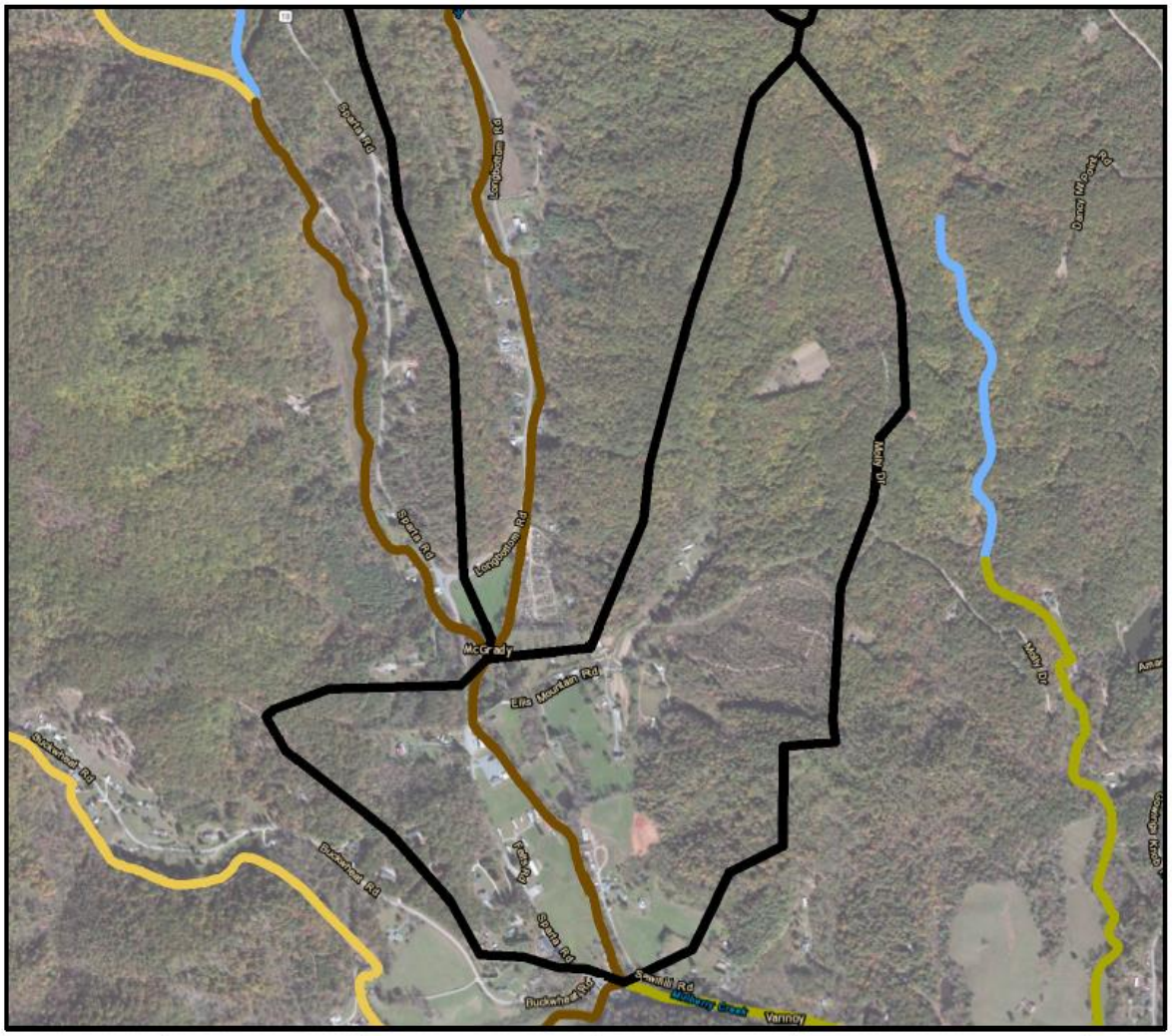

Town of Wilkesboro Site:
United Methodist Church
W MAIN ST
WILKESBORO METHODIST CHURCH INC.
Site 1: Bioretention Cells
Parcels
Drainage Area
Roads
Hydrology
Source: NC Floodplain Mapping Program
Culvert
Stream / River
2010 Orthophotography
1 inch = 50 feet
0
25
50
Feet

Diagram and photograph of a typical bioretention cell:



108

16 Most Stressed Stream Catchments
Mulberry Creek Subwatershed - Mulberry Creek 1



JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY: MULBERRY CREEK 1

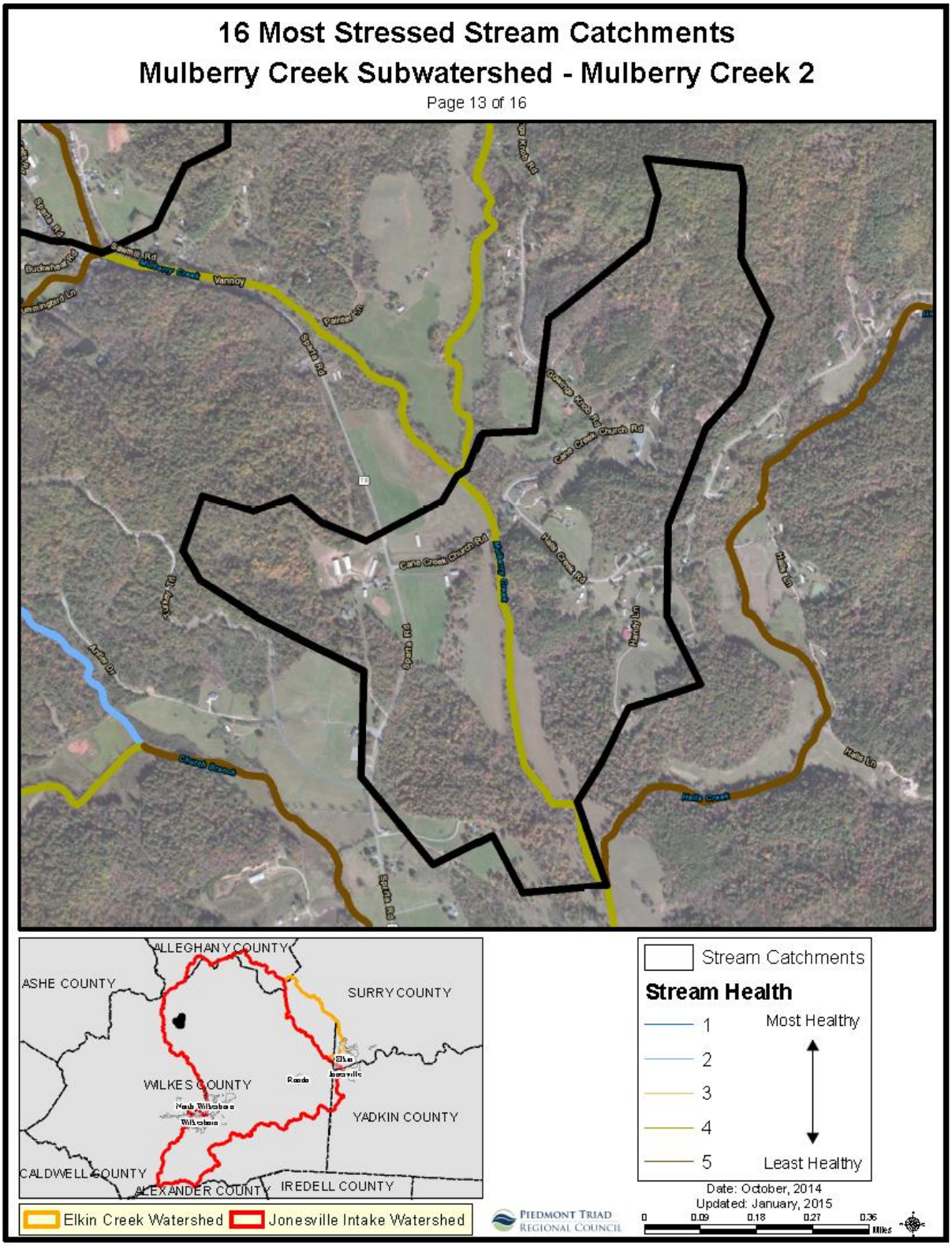
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	18	AGRICULTURE	114.1	48%	CLASS 1	0
PARTIALLY	35	RESIDENTIAL	91.5	38%	CLASS 2	0
		VACANT/UNKNOWN	24.1	10%	CLASS 3	0
		COMMERCIAL	3.7	1.6%	CLASS 4	0
		MOBILE HOMES	5.7	2%	CLASS 5	2,513
TOTAL	**53**	**TOTAL**	**239**	**100%**	**TOTAL**	**2,513**

This half-mile stretch of Mulberry Creek suffers from the unusual situation of its upstream tributaries Dungeon and Joshua Creeks: it is a largely forested and untouched catchment that has a cleared, farmed stream corridor. It is home to the endangered bog turtle, which have habitat needs. Furthermore, this area is also home to the golden eagle and the Carolina foothills crayfish, both priority species for conservation. In this more mountainous landscape with its steep slopes and challenging soils, it makes sense why the flatter floodplain areas desired for development and agriculture. However, the lack of stream buffers and degraded stream conditions demand greater local stewardship through best management practices and, especially, stream buffer restoration. Mulberry Creek appears to be lined mostly by farms that use the surrounding lands for pasture, though there are some trailers and parking lots lining the creek as well.

The Wilkes County Soil and Water Conservation District should reach out to these landowners regarding stream buffers and Carolina bogs. They should provide information on cost-share programs that assist with livestock exclusion fencing. Such actions could restore creek conditions to support a stocked trout population. Rain gardens would be helpful for intercepting stormwater from the catchment's parking lots and residences.

Next Steps:

- Reach out to homeowners about restoring a stream buffer and bogs along Mulberry Creek with supporting materials on why they should;
- Wilkes County Soil & Water Conservation District reach out to the farmers who manage the pastures in this catchment about the need for and benefits of a stream buffer as well as low- and no-till cropping, as well as related cost-share programs;
- Reach out to the residences with information on rain gardens and how they can benefit homeowners as well as Mulberry Creek and its ecology, including fish.



JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY:

MULBERRY CREEK 2

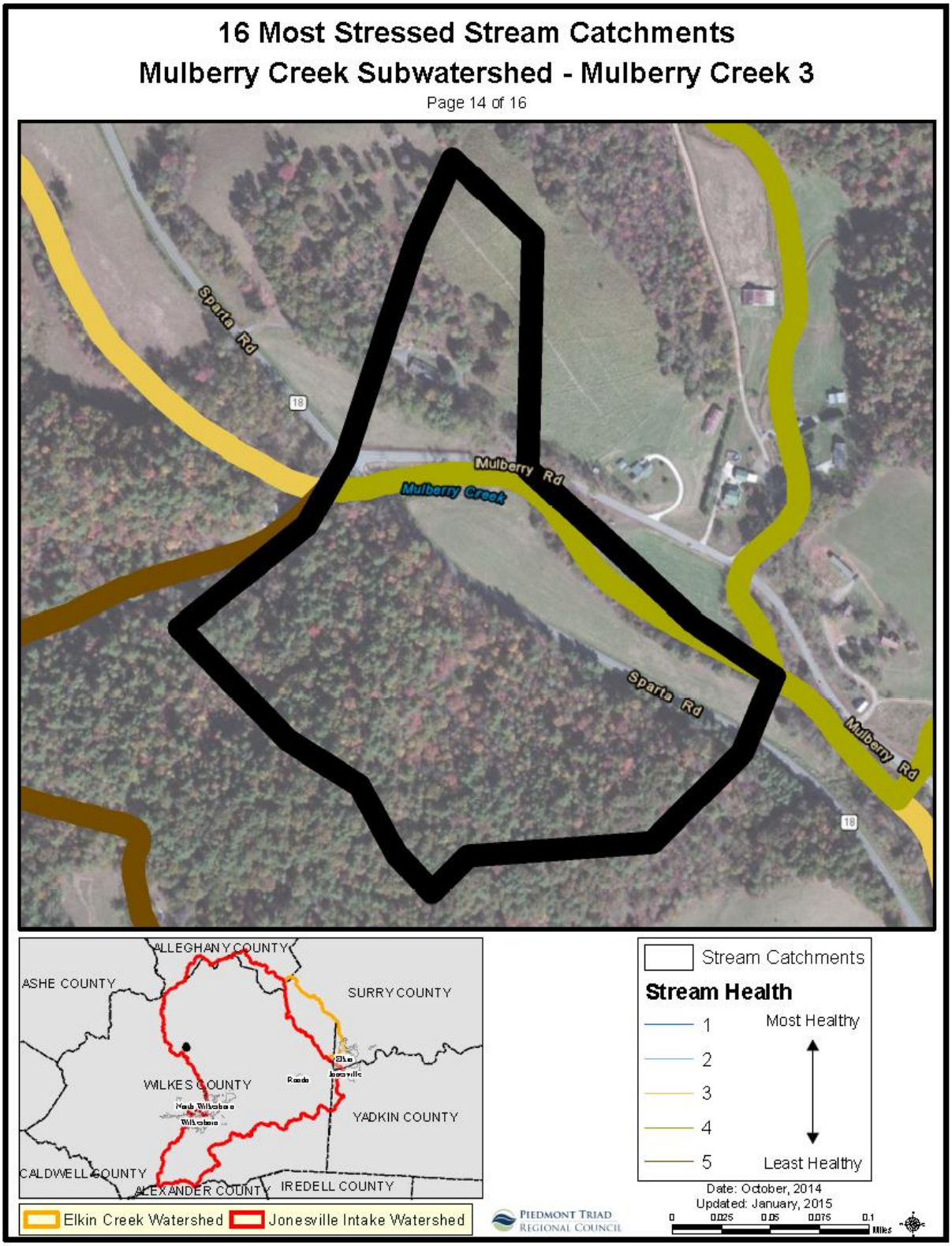
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	20	AGRICULTURE	155.4	54%	CLASS 1	0
PARTIALLY	36	RESIDENTIAL	64.1	22%	CLASS 2	0
		VACANT/UNKNOWN	53	18.5%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	3,934
		INSTITUTIONAL	13.7	5%	CLASS 5	0
TOTAL	**56**	**TOTAL**	**286**	**100%**	**TOTAL**	**3,934**

This stretch of Mulberry Creek is about 2/3-mile in length and requires improved agricultural practices, namely improved stream buffers, low- or no-till cropping, and habitat restoration for the priority conservation species found here: the endangered bog turtle, the golden eagle, and the Carolina foothills crayfish. It is likely that after years of degradation from this land use, the creek also needs to be restored. About 5% of the catchment is occupied by a public facility, which should be using stormwater BMPs and stream protection practices to ensure the health of local water quality conditions.

There are some minimal stream buffers along the creek, but they are under fifty-feet wide, the minimum to begin to have stream structure and ecological protection. These vegetated areas simply need to be expanded from what they currently are for improvements. Those areas without buffers need to begin using them. The agricultural fields may be growing tobacco, as active erosion in the fields is evident in the aerial images. Outreach from Wilkes County Soil and Water Conservation District on the value of low- and no-till agricultural practices for these fields appears to be needed. The reduction of sediment from these fields will have immediate benefits for Mulberry Creek and the Yadkin River, and may be helpful in establishing trout in these waters.

Next Steps:

- Reach out to farmers about restoring a stream buffer and bogs along Mulberry Creek with supporting materials on why they should;
- Seek federal and state support for restoring endangered species habitat to this catchment;
- Wilkes County Soil & Water Conservation District reach out to the farmers who manage the tilled fields in this catchment about the need for and benefits of a stream buffer as well as low- and no-till cropping, as well as related cost-share programs.



JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY:

MULBERRY CREEK 3

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	25.8	81%	CLASS 1	0
PARTIALLY	7	RESIDENTIAL	2.4	8%	CLASS 2	0
		VACANT/UNKNOWN	5.9	18%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	1,403
		INDUSTRIAL	0	0%	CLASS 5	0
TOTAL	**7**	**TOTAL**	**31.7**	**100%**	**TOTAL**	**1,403**

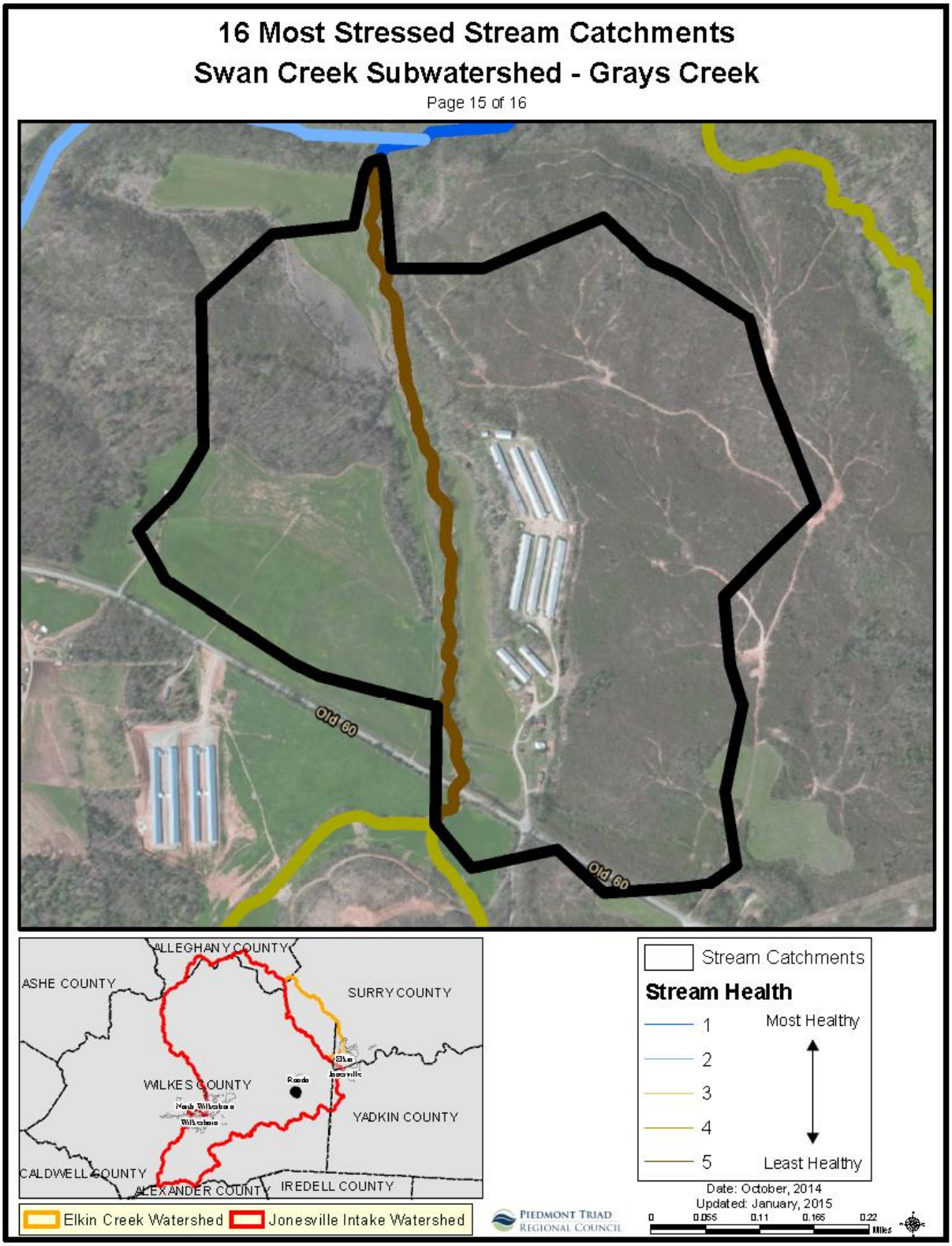
This very small catchment affords an opportunity to improve conditions in a degraded stretch of Mulberry Creek with the outcome of a demonstration project that can show the public the value(s) of protecting streams with buffers. The buffers here are inconsistent and offer little protection for Mulberry Creek. If expanded to at least 50 feet, they could adequately protect the local and downstream water quality conditions of Mulberry Creek, improving habitat and flooding conditions, and perhaps be able to support a trout fishery.

The NC DOT built Mulberry Road nearly on top of Mulberry Creek in this catchment and should bear some of the financial responsibility for improving the stream and buffer conditions. They should also use stormwater BMPs to ensure that the creek is protected from stormwater runoff from the road.

There are two pastures along Mulberry Creek in this catchment that may be impacting local water quality conditions, including bog turtle habitat. The Wilkes County Soil and Water Conservation District should speak with the property owner(s) about enhancing the vegetated buffer on these properties and ensure that they are excluding any livestock feeding here. The agents should also see if low- and no-till agricultural practices are being used: there appears to be active erosion. Enrollment in available agricultural cost-share programs would improve these conditions and support the farmers in these efforts.

Next Steps:

- Reach out to the farmers on Mulberry Creek about restoring a stream buffer and bogs with supporting materials on why they should;
- Contact the NC DOT regional office about managing stormwater runoff from Mulberry Road and restoring priority habitats to the catchment;
- Wilkes County Soil & Water Conservation District reach out to the farmer(s) who manages the tilled fields in this catchment about the need for and benefits of a stream buffer as well as low- and no-till cropping, as well as related cost-share programs.



JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY:

SWAN CREEK - GRAYS CREEK

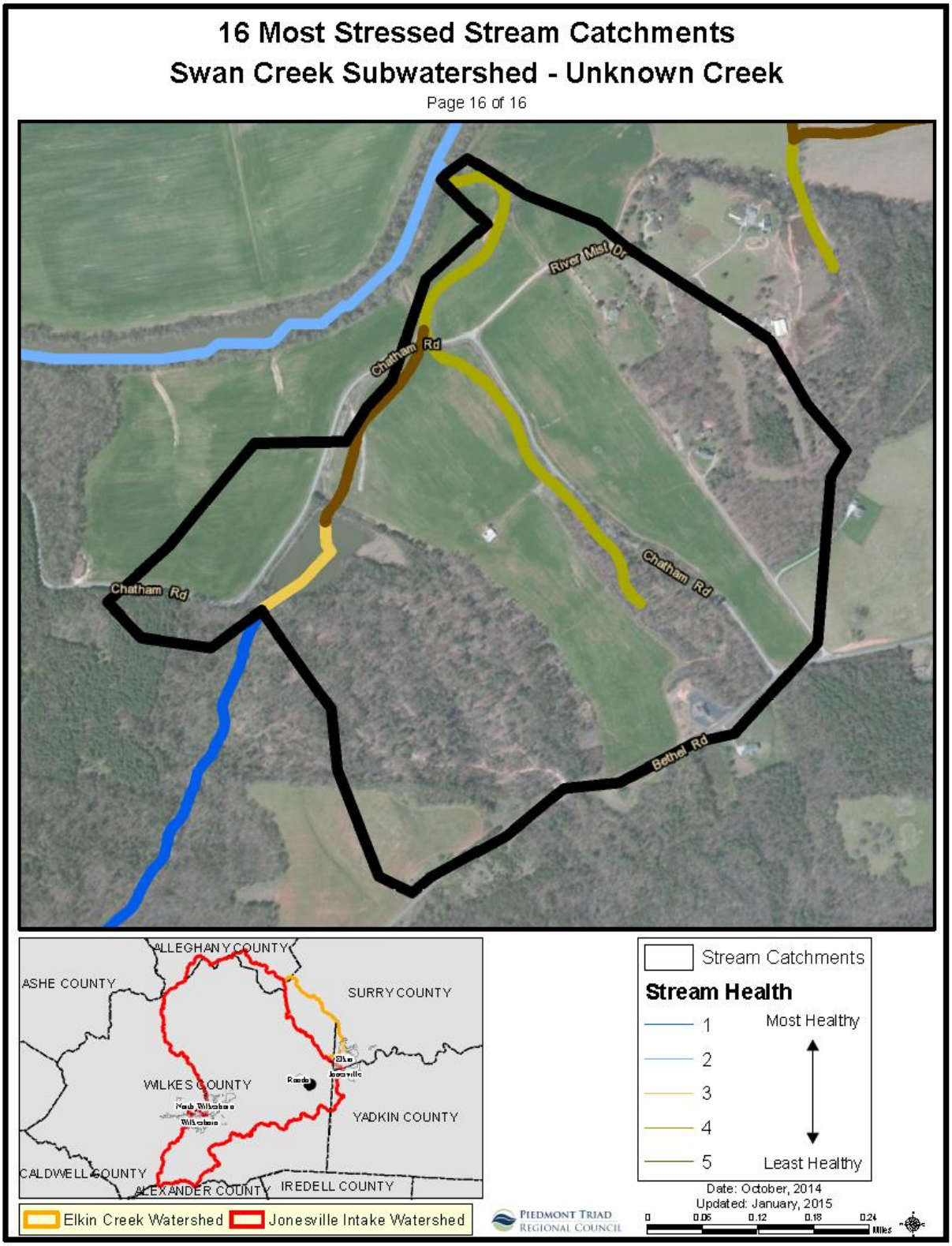
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	2	AGRICULTURE	192.2	99%	CLASS 1	0
PARTIALLY	7	RESIDENTIAL	0.8	0.4%	CLASS 2	0
		VACANT/UNKNOWN	1.1	0.6%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		INDUSTRIAL	0	0%	CLASS 5	3,856
TOTAL	**9**	**TOTAL**	**194**	**100%**	**TOTAL**	**3,856**

This catchment is being actively degraded by one farm that has no stream buffers and six full poultry houses as well as two smaller houses that may be used for storing and drying the chicken litter. Swan Creek is knowns to be potential brook floater freshwater mussel habitat. According to the Yadkin Riverkeeper's calculations, it is possible that these six houses produce 150,000 chickens per year. These chickens, in turn, produce about 675,000 lbs of nutrient-rich waste that will be dried on the property and then land-applied to nearby agricultural fields, often at higher than agronomic rates.

The production of chickens and their litter is not necessarily an immediate water quality concern, nor are the forests uphill of the chicken houses that are being actively logged. However, with the receiving stream of this catchment having no vegetated buffer to protect it from runoff, these lands need to use relevant best management practices, or they will definitely degrade local waters. Similarly, if the pastures surrounding the creek are not using conservation tillage, these farms are actively degrading water quality conditions.

Next Steps:

The 2/3-mile Grays Creek is in immediate need of full stream restoration. It also needs a vegetated buffer restored to it. The Wilkes County Soil and Water Conservation District needs to work with this landowner to ensure that all conservation practices possible are being used on this farm until the stream can be restored. The agents should work with the farmer and local engineers to draft preliminary designs for a stream restoration and pursues grants funds from the NC Clean Water Management Trust Fund and the Duke Energy Water Resources Fund, among others, to support construction and planning of this project. The landowner will need to be a willing and active participant in these efforts, at a minimum dedicating a conservation easement along Grays Creek for the restored stream and buffer. It may take time to convince them of the many benefits of such a project, but the impacts of this degraded stream to Swan Creek, the Yadkin River, and Jonesville's water supply are disproportionate to the size of the stream.



JONESVILLE INTAKE WATERSHED RESTORATION PRIORITY:

SWAN CREEK – UNKNOWN TRIBUTARY

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	4	AGRICULTURE	162.1	78%	CLASS 1	0
PARTIALLY	12	RESIDENTIAL	31.3	15%	CLASS 2	0
		VACANT/UNKNOWN	13.3	7%	CLASS 3	700
		COMMERCIAL	2.2	1%	CLASS 4	3,418
		INDUSTRIAL	0	0%	CLASS 5	1,261
TOTAL	**16**	**TOTAL**	**209**	**100%**	**TOTAL**	**5,379**

This mile-long, small tributary of Swan Creek, a north-flowing tributary of the Yadkin River, provides nearly no stream buffers and is in clear need of conservation tillage practices. . It appears to be managed by a single farmer. It is likely that after years of degradation from this land use, the creek also needs to be restored. It should be prioritized for attention by the Wilkes County Soil and Water Conservation District, as it is at its confluence with Swan Creek and could be remedied with mostly inexpensive solutions.

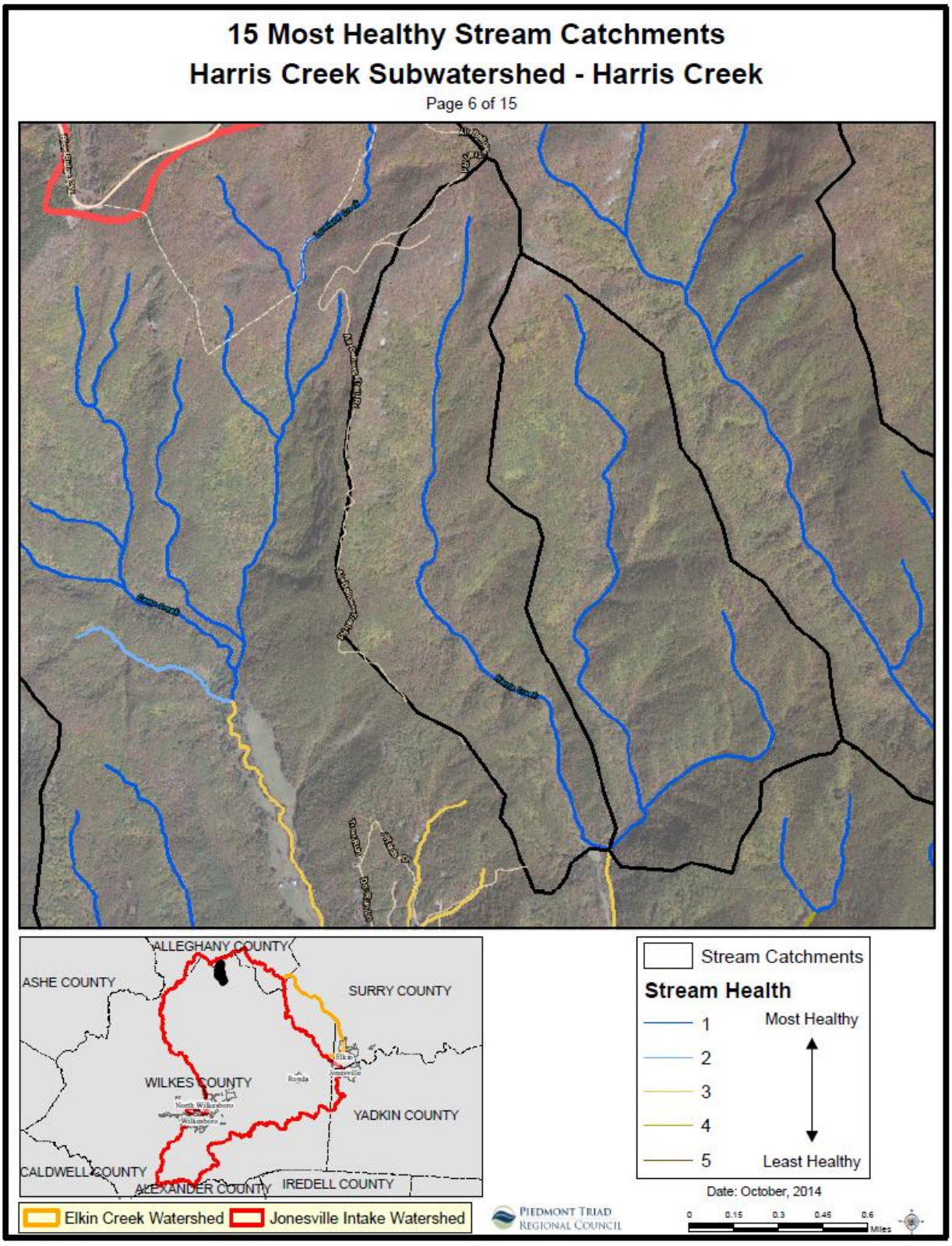
There are some minimal stream buffers in the creeks' headwaters. They are also excellent stream buffers upstream and downstream of this stretch of tributary to draw upon as examples. At this location, Swan Creek is lined with buffers on both sides, preventing it from being polluted from runoff from the agricultural fields along it. Most of these buffers are close to one-hundred feet in width, but a fifty-foot wide buffer is the minimum size necessary for them to begin to provide stream structure and ecological protection.

The agricultural fields may be growing tobacco, as active erosion in the fields is evident in the aerial images. Outreach from Wilkes County Soil and Water Conservation District on the value of conservation tillage practices for these fields appears to be needed. The reduction of sediment from these fields will have immediate benefits for Swan Creek, the Yadkin River, and Jonesville's water supply.

Next Steps:

- Reach out to farmers about restoring a stream buffer with supporting materials;
- Wilkes County Soil & Water Conservation District reach out to the farmers who manage the tilled fields in this catchment about the need for and benefits of a stream buffer as well as low- and no-till cropping, as well as related cost-share programs;
- Assess whether these stream are in need of restoration with engineers and pursue funding.

Jonesville Intake Watershed Priorities: Conservation



JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY:

HARRIS CREEK

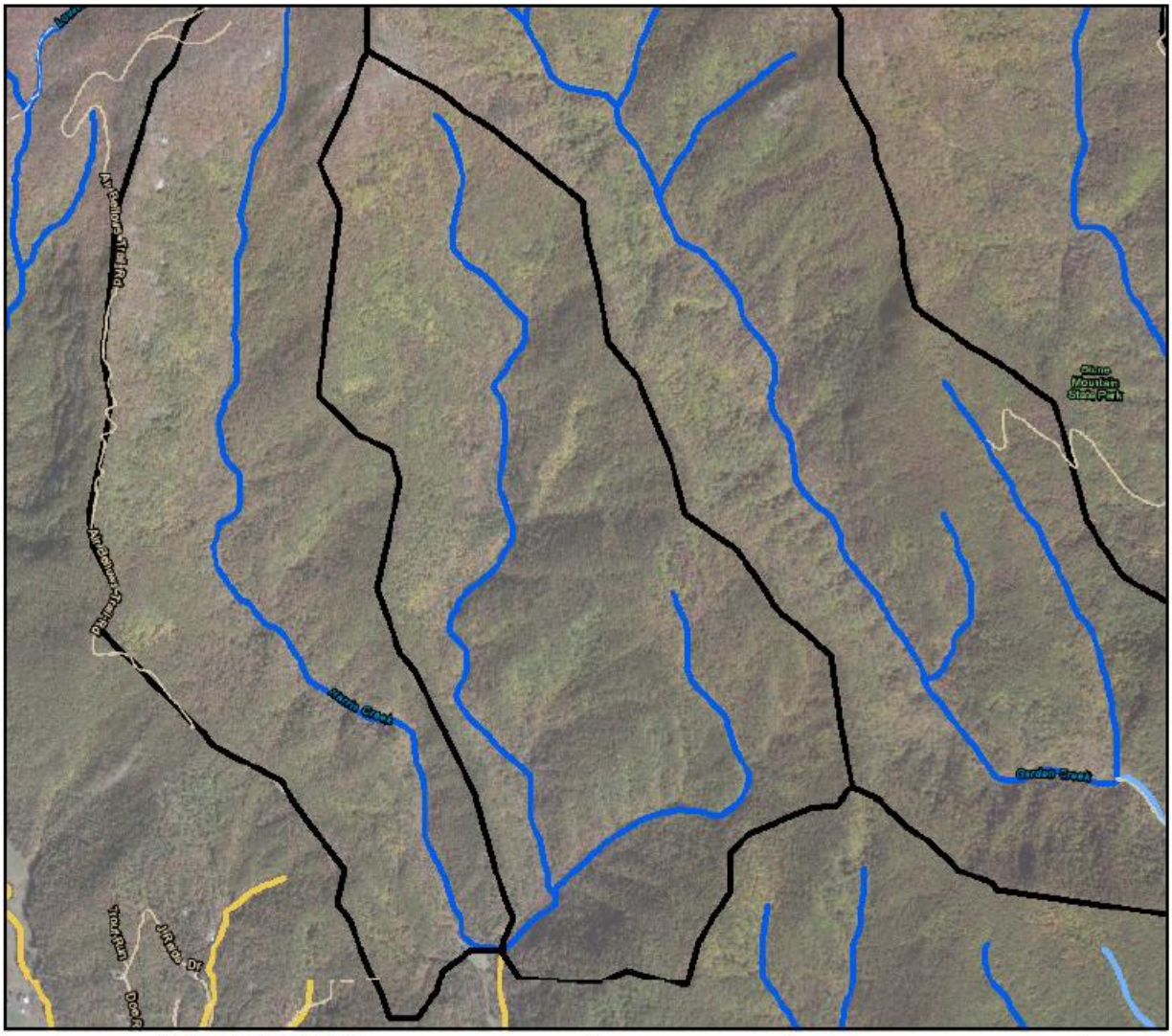
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	20.2	3%	CLASS 1	13,250
PARTIALLY	12	RESIDENTIAL	0	0%	CLASS 2	0
		VACANT/UNKNOWN	60	8%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATION	632	89%	CLASS 5	0
TOTAL	**12**	**TOTAL**	**712**	**100%**	**TOTAL**	**13,250**

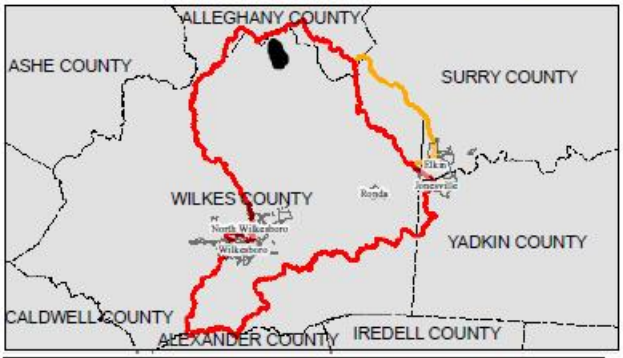
Nearly this entire catchment is within federally-protected lands of the Blue Ridge Parkway, and shows the value of such protection. As it is within the viewshed of the Blue Ridge Parkway, development is highly restricted within most of this catchment. The streams support trout, and may actually support a native brook trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet. Species such as the golden eagle and the cerulean warbler are major draws for tourists. The catchment also features trails that are part of the Mountains-to-Sea Trail, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina. Immediately downstream of this catchment, where agricultural and residential development is seen, Harris Creek's stream buffers degrade in quality, threatening these trout waters.

Next Steps:

- Promote the assets of the Roaring River and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

15 Most Healthy Stream Catchments
Harris Creek Tributary Subwatershed - Unk Creek





Elkin Creek Watershed | Jonesville Intake Watershed

Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.15 0.3 0.45 0.6 Miles

JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY:

HARRIS CREEK - UNK CREEK

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	4	AGRICULTURE	35.7	4%	CLASS 1	16,868
PARTIALLY	1	RESIDENTIAL	0	0%	CLASS 2	0
		VACANT/UNKNOWN	56.9	7%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATION	735.2	89%	CLASS 5	0
TOTAL	**5**	**TOTAL**	**828**	**100%**	**TOTAL**	**16,868**

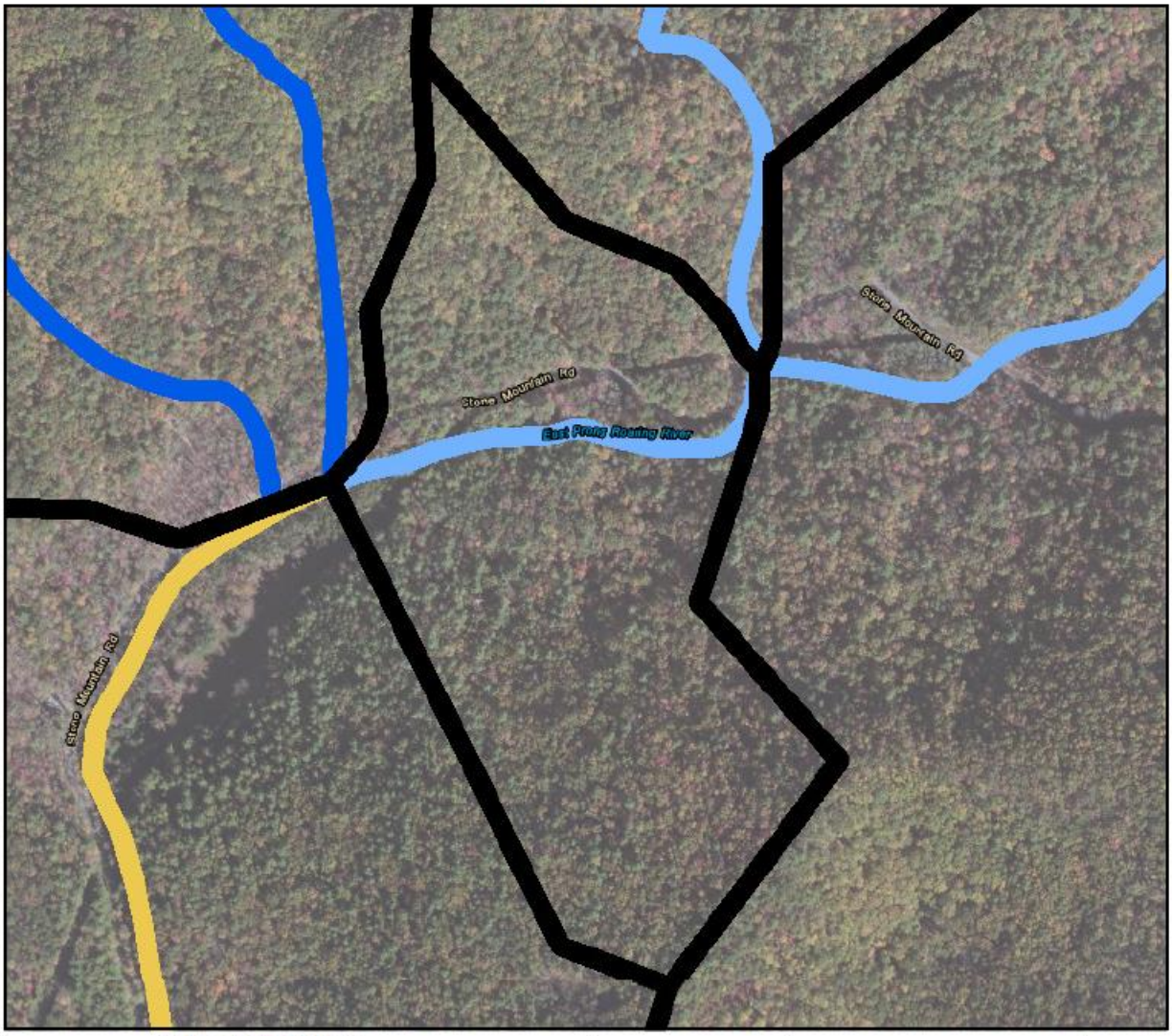
Nearly this entire catchment is within the federally-protected lands of the Blue Ridge Parkway or the state-protected lands of Stone Mountain State Park, and shows the value of such protection. As it is within the viewshed of both parks, development is highly restricted within most of this catchment. The nearly three miles of streams support trout, and may actually support a native brook trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina. Species such as the golden eagle and the cerulean warbler are major draws for tourists.

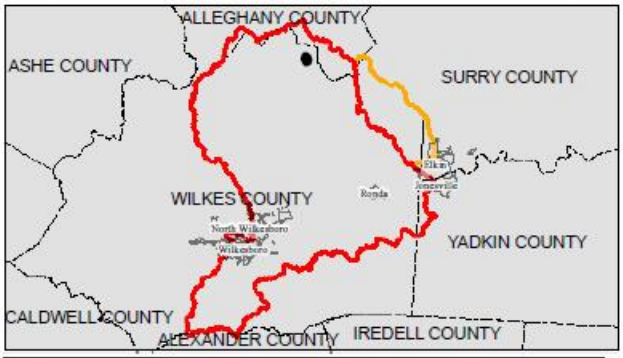
There are 57 acres not necessarily under permanent conservation. The Blue Ridge Land Trust should contact these property owners about selling their property or placing conservation easements on it. Immediately downstream of this catchment, where agricultural and residential development is seen, Harris Creek's stream buffers degrade in quality, threatening these trout waters.

Next Steps:

- Promote the assets of the Roaring River and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Contact the owner of the "Vacant" property in this catchment about permanently protecting it from dense development;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

15 Most Healthy Stream Catchments
East Prong Subwatershed - E. Prong Roaring River 1





Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.04 0.08 0.12 0.16 Miles

JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY:

EAST PRONG ROARING RIVER 1

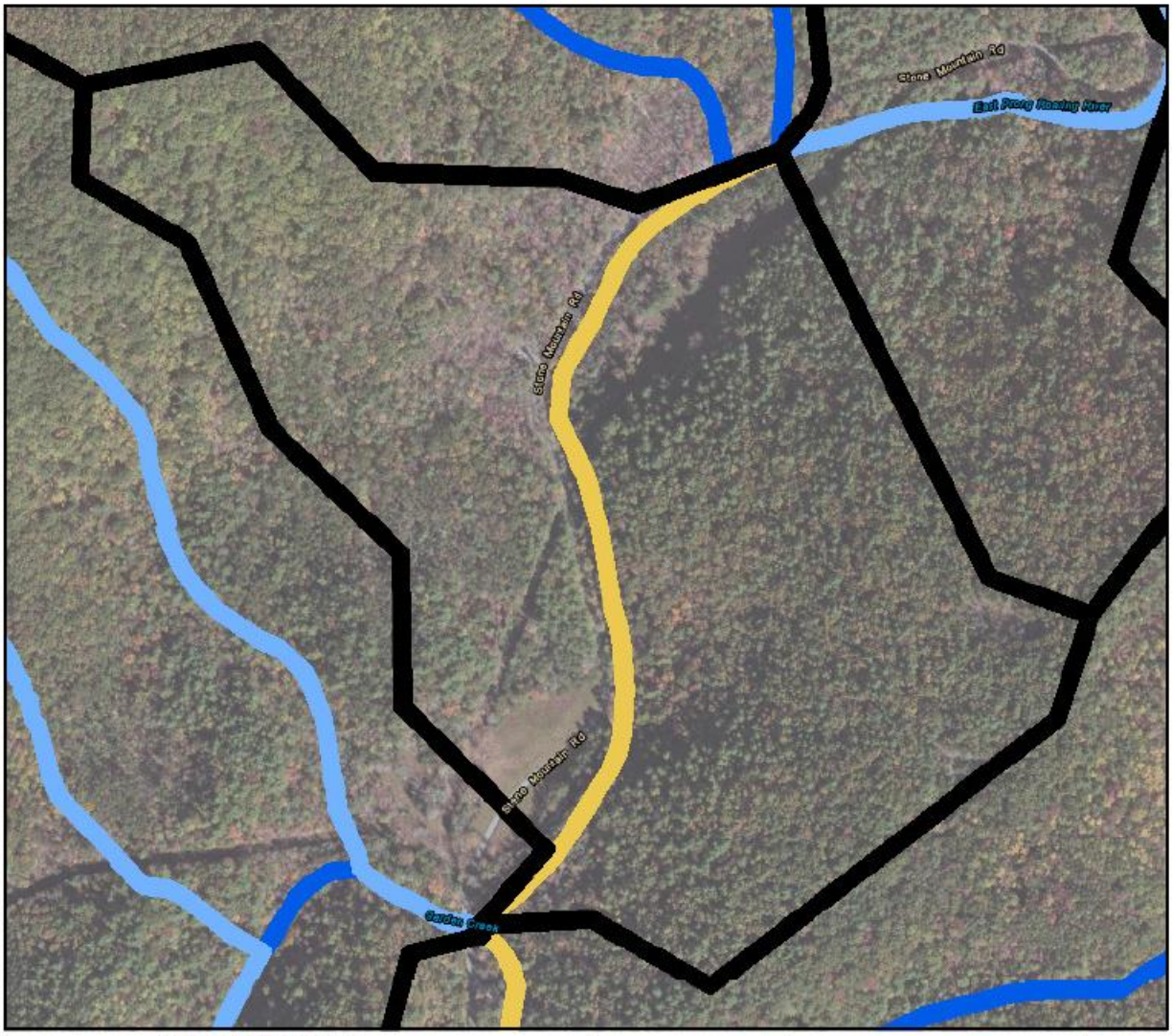
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	0	0%	CLASS 1	0
PARTIALLY	3	RESIDENTIAL	0	0%	CLASS 2	1,528
		VACANT/UNKNOWN	4	7%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATION	51.2	93%	CLASS 5	0
TOTAL	**3**	**TOTAL**	**55**	**100%**	**TOTAL**	**1,528**

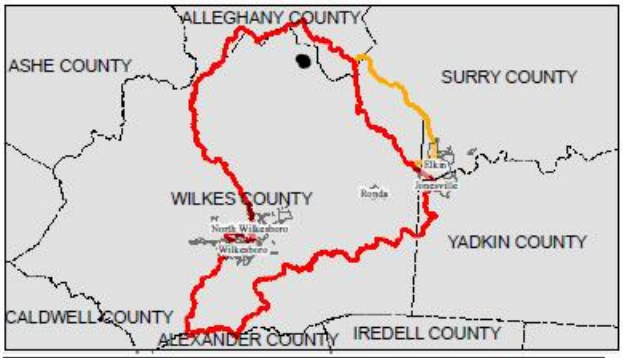
This entire catchment is within the federally-protected lands of the state-protected lands of Stone Mountain State Park, and shows the value of such protection. The catchment is only not rated as "pristine" (5) due to Stone Mountain Road crossing through it. As it is within the viewshed of both the park and the Blue Ridge Parkway, development is highly restricted within most of this catchment. The streams support trout, and may actually support a native brook trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina. Species such as the golden eagle and the cerulean warbler are major draws for tourists. There is a property not under the Park's ownership, and it should be determined if this "Vacant" property is protected from intense development with a conservation easement. Immediately downstream of this catchment, where agricultural and residential development is seen, the Roaring River's stream buffers degrade in quality, threatening these trout waters.

Next Steps:

- Promote the assets of the Roaring River and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

15 Most Healthy Stream Catchments
East Prong Subwatershed - E. Prong Roaring River 2





Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.045 0.09 0.135 0.18 Miles

JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY:

EAST PRONG ROARING RIVER 2

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	0	0%	CLASS 1	0
PARTIALLY	3	RESIDENTIAL	0	0%	CLASS 2	3,159
		VACANT/UNKNOWN	18.5	15%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATION	104.5	85%	CLASS 5	0
TOTAL	**3**	**TOTAL**	**123**	**100%**	**TOTAL**	**3,159**

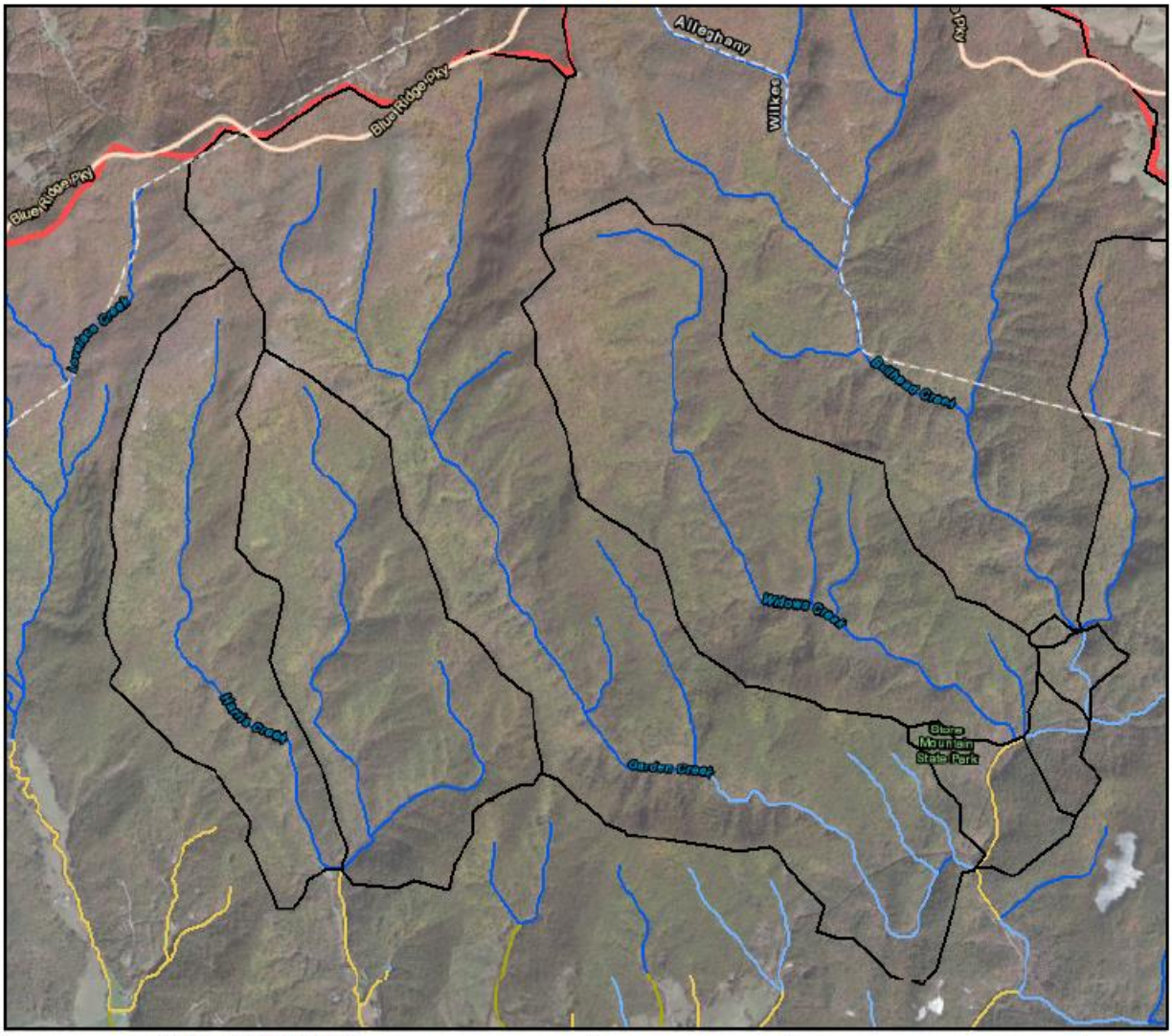
Nearly all of this catchment is within the federally-protected lands of the state-protected lands of Stone Mountain State Park. The catchment is rated as an impacted stream due to the cleared pasture land at its confluence with Garden Creek and the presence of Stone Mountain Road within the stream corridor through the entire catchment. The stream buffer appears present, but it is imperative that NC DOT use the most effective stormwater practices to protect these waters from the impacts of runoff from the road. Similarly, the presence of best management practices should be confirmed on the pasture near the end of this stretch of the Roaring River's East Prong. As it is within the viewshed of both the park and the Blue Ridge Parkway, development is highly restricted within most of this catchment.

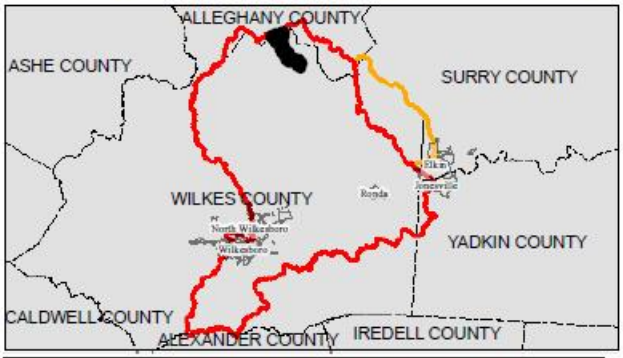
The streams support trout, and may actually support a native brook trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina. Species such as the golden eagle and the cerulean warbler are major draws for tourists. There are 18.5 acres not under the Park's ownership, and it should be determined if this "Vacant" property is protected from intense development with a conservation easement.

Next Steps:

- Promote the assets of the Roaring River and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Confirm the presence of best management practices by the NC DOT and the owner of the pasture land near the confluence with Garden Creek;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

15 Most Healthy Stream Catchments
Garden Creek Subwatershed - Garden Creek





Elkin Creek Watershed | Jonesville Intake Watershed

Stream Catchments

Stream Health

1 — Most Healthy
2
3
4
5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.25 0.5 0.75 1 Miles

JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY: GARDEN CREEK						
# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	0	0%	CLASS 1	36,678
PARTIALLY	13	RESIDENTIAL	0	0%	CLASS 2	13,966
		VACANT/UNKNOWN	241.7	11%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATION	1,930	89%	CLASS 5	0
TOTAL	**13**	**TOTAL**	**2,172**	**100%**	**TOTAL**	**50,644**

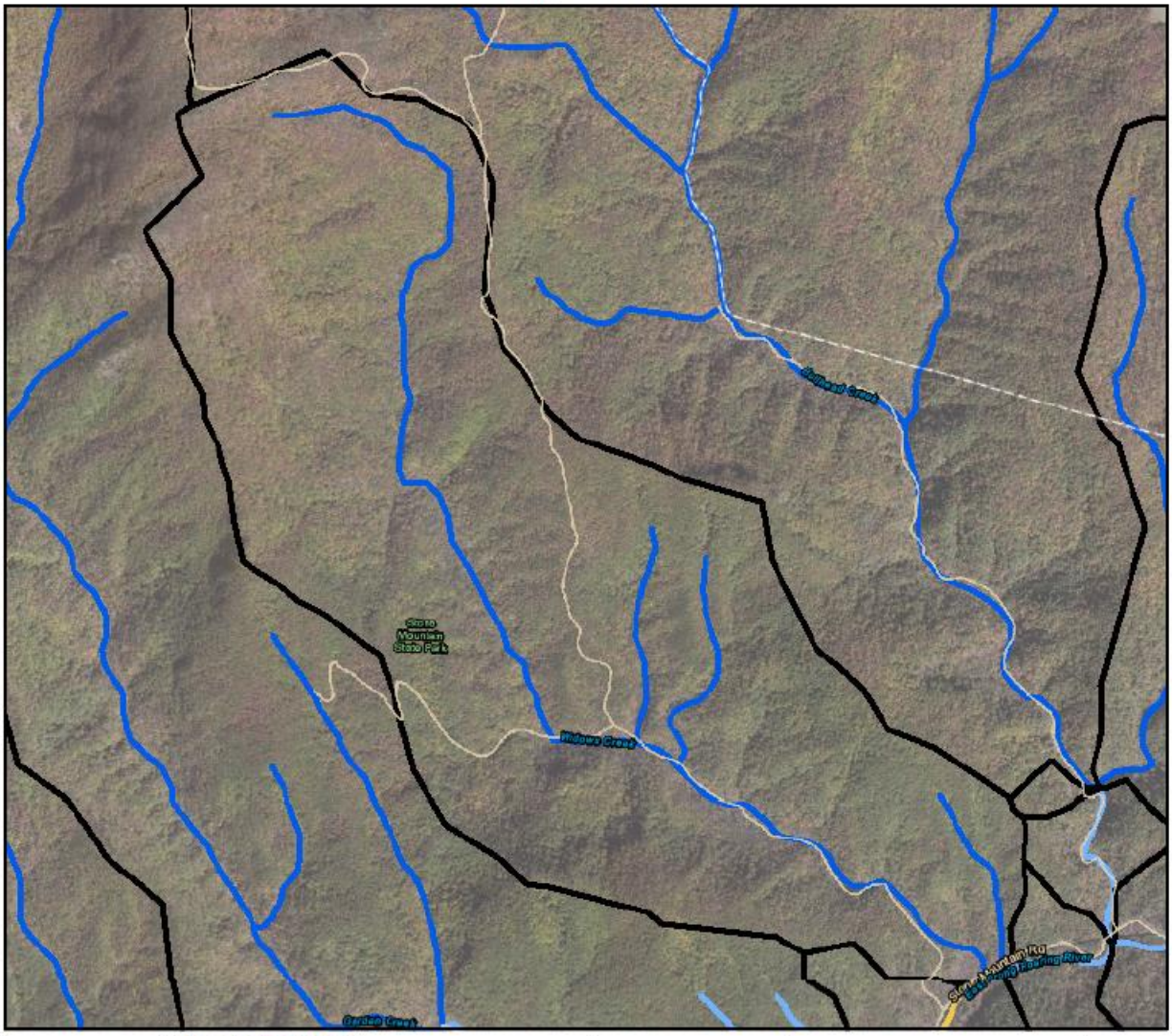
Nearly this entire catchment is within federally-protected lands of the Blue Ridge Parkway, and shows the value of such protection. As it is within the viewshed of the Blue Ridge Parkway, development is highly restricted within most of this catchment. The nearly ten miles of streams support trout, and may actually support a native trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet. Species such as the golden eagle and the cerulean warbler are major draws for tourists. There are 242 acres in the catchment that are not owned by the Park, and the NC Division of Parks and Recreation and the Blue Ridge Land Conservancy should determine if these "Vacant" lands are permanently conserved through an easement or other legal arrangement.

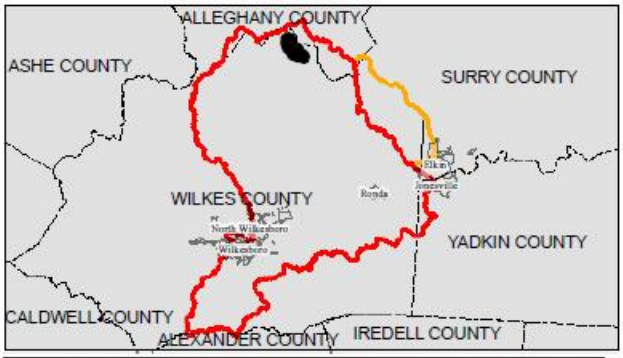
The catchment also features trails that are part of the Mountains-to-Sea Trail, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina. These watersheds serve as pilot projects for others throughout both the Jonesville Intake and Big Elkin Creek watersheds, less as a goal, which would unrealistic in more developed areas, but as what can be possible through conservation efforts. Some of the ecology supported within the Garden Creek catchment will not be seen in other, less protected areas, but supporting trout, hiking, and other features that can draw tourists and protect water supplies are goals that can be achieved throughout both watersheds.

Next Steps:

- Promote the assets of the Roaring River and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Determine the level of conservation protection on "Vacant" properties;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

15 Most Healthy Stream Catchments
Widows Creek Subwatershed - Widows Creek





Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.15 0.3 0.45 0.6 Miles

JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY: WIDOWS CREEK

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	0	0%	CLASS 1	24,473
PARTIALLY	4	RESIDENTIAL	0	0%	CLASS 2	0
		VACANT/UNKNOWN	9	1%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATION	1,182	89%	CLASS 5	0
TOTAL	**4**	**TOTAL**	**1,191**	**100%**	**TOTAL**	**24,473**

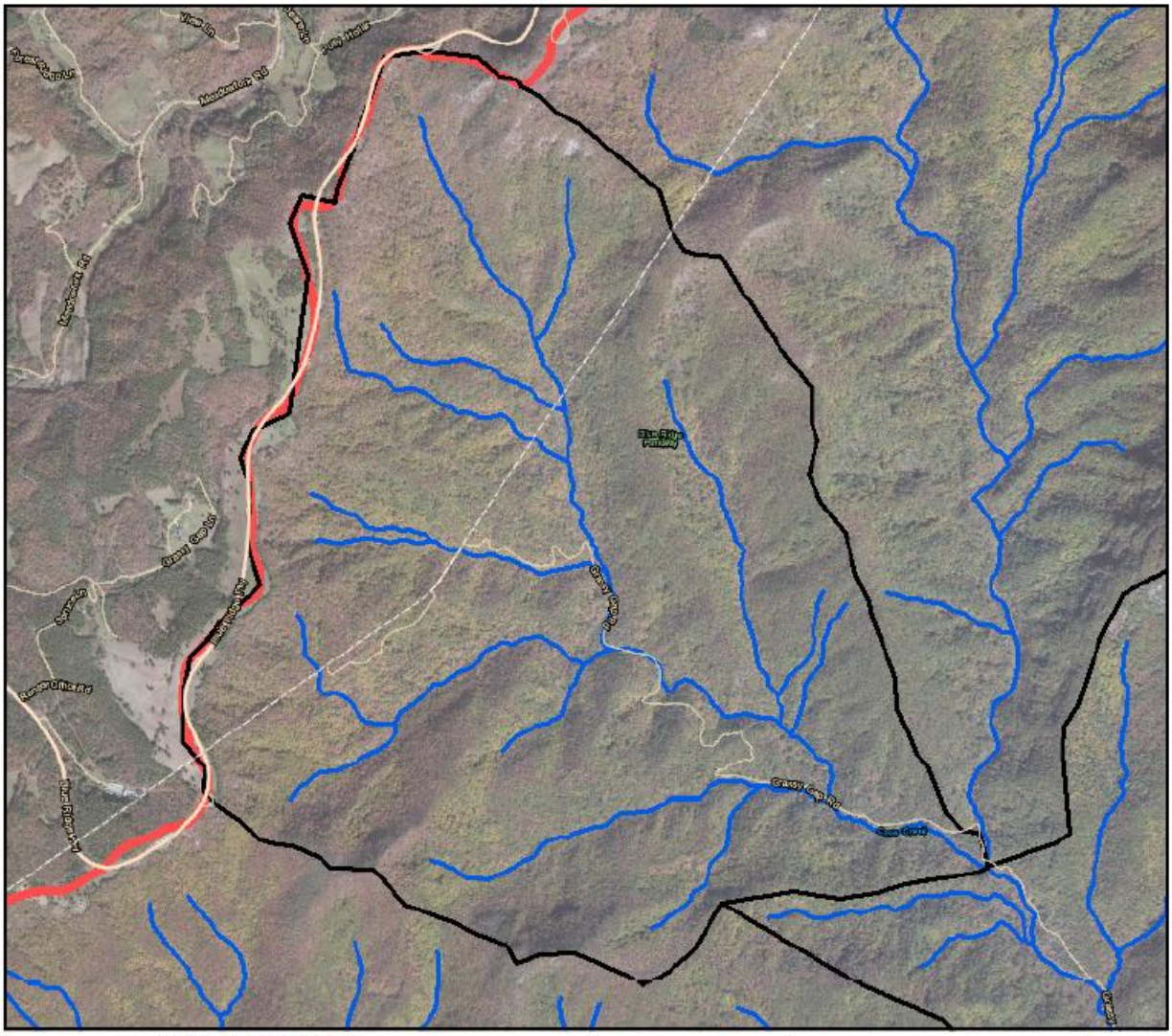
Nearly this entire catchment is within federally-protected lands of the Blue Ridge Parkway, and shows the value of such protection. As it is within the viewshed of the Blue Ridge Parkway, development is highly restricted within most of this catchment. The over four miles of streams support trout, and may actually support a native trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet. Species such as the golden eagle and the cerulean warbler are major draws for tourists.

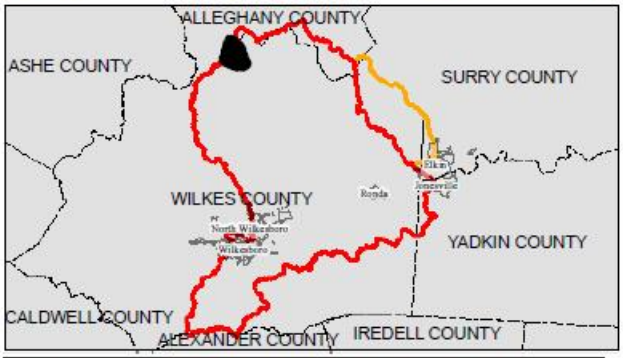
The catchment also features trails that are part of the Mountains-to-Sea Trail, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina. These watersheds serve as pilot projects for others throughout both the Jonesville Intake and Big Elkin Creek watersheds, less as a goal, which would unrealistic in more developed areas, but as what can be possible through conservation efforts. Some of the ecology supported within the Widows Creek catchment will not be seen in other, less protected areas, but supporting trout, hiking, and other features that can draw tourists and protect water supplies are goals that can be achieved throughout both watersheds.

Next Steps:

- Promote the assets of the Widows Creek, the Roaring River, and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

15 Most Healthy Stream Catchments
Cove Creek Subwatershed - Cove Creek





Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.2 0.4 0.6 0.8 Miles

JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY:

COVE CREEK

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	0	0%	CLASS 1	62,143
PARTIALLY	2	RESIDENTIAL	0	0%	CLASS 2	0
		VACANT/UNKNOWN	0	0%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATION	2,237	100%	CLASS 5	0
TOTAL	**2**	**TOTAL**	**2,237**	**100%**	**TOTAL**	**62,143**

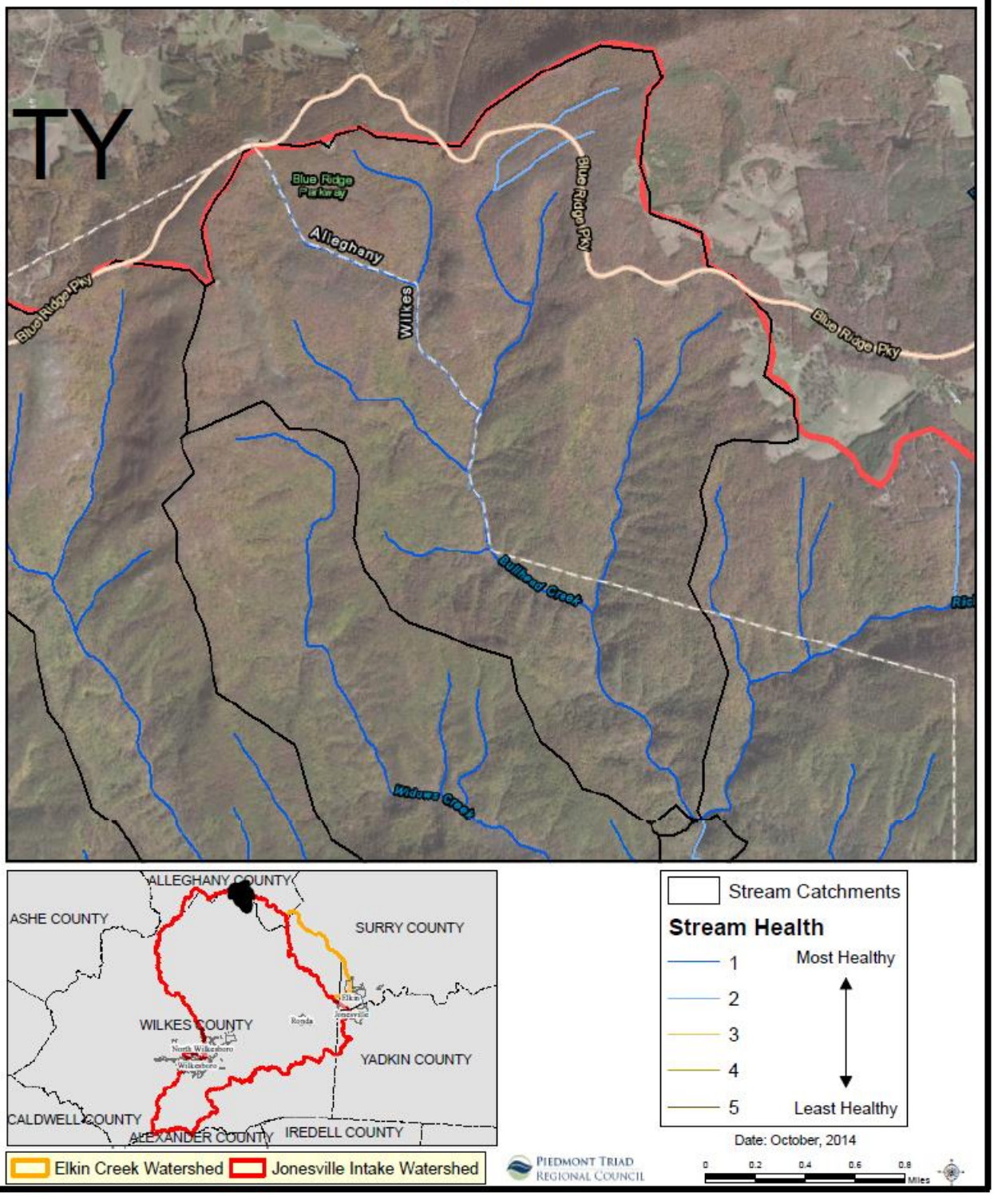
This entire catchment is within federally-protected lands of the Blue Ridge Parkway, and shows the value of such protection. As it is within the viewshed of the Blue Ridge Parkway, development is highly restricted within most of this catchment. The nearly twelve miles of streams support trout, and may actually support a native brook trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet. Species such as the golden eagle and the cerulean warbler are major draws for tourists. The costs of not having such protections can be seen dramatically in this aerial image at the cleared forests to the north in Allegheny County.

The catchment also features trails that are part of the Mountains-to-Sea Trail, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina. These cacthments serve as pilot projects for others throughout both the Jonesville Intake and Big Elkin Creek watersheds, less as a goal, which would unrealistic in more developed areas, but as what can be possible through conservation efforts. Some of the ecology supported within the Cove Creek catchment will not be seen in other, less protected areas, but supporting trout, hiking, and other features that can draw tourists and protect water supplies are goals that can be achieved throughout both watersheds.

Next Steps:

- Promote the assets of Cove Creek, the Roaring River and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

15 Most Healthy Stream Catchments
Bullhead Creek Subwatershed - Bullhead Creek 1



JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY: BULLHEAD CREEK 1

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	21	AGRICULTURE	0	0%	CLASS 1	47,795
PARTIALLY	27	RESIDENTIAL	0	0%	CLASS 2	6,169
		VACANT/UNKNOWN	0	0%	CLASS 3	0
		COMMERCIAL	0	0%	CLASS 4	0
		RECREATION	2,692	100%	CLASS 5	0
TOTAL	**48**	**TOTAL**	**2,692**	**100%**	**TOTAL**	**53,964**

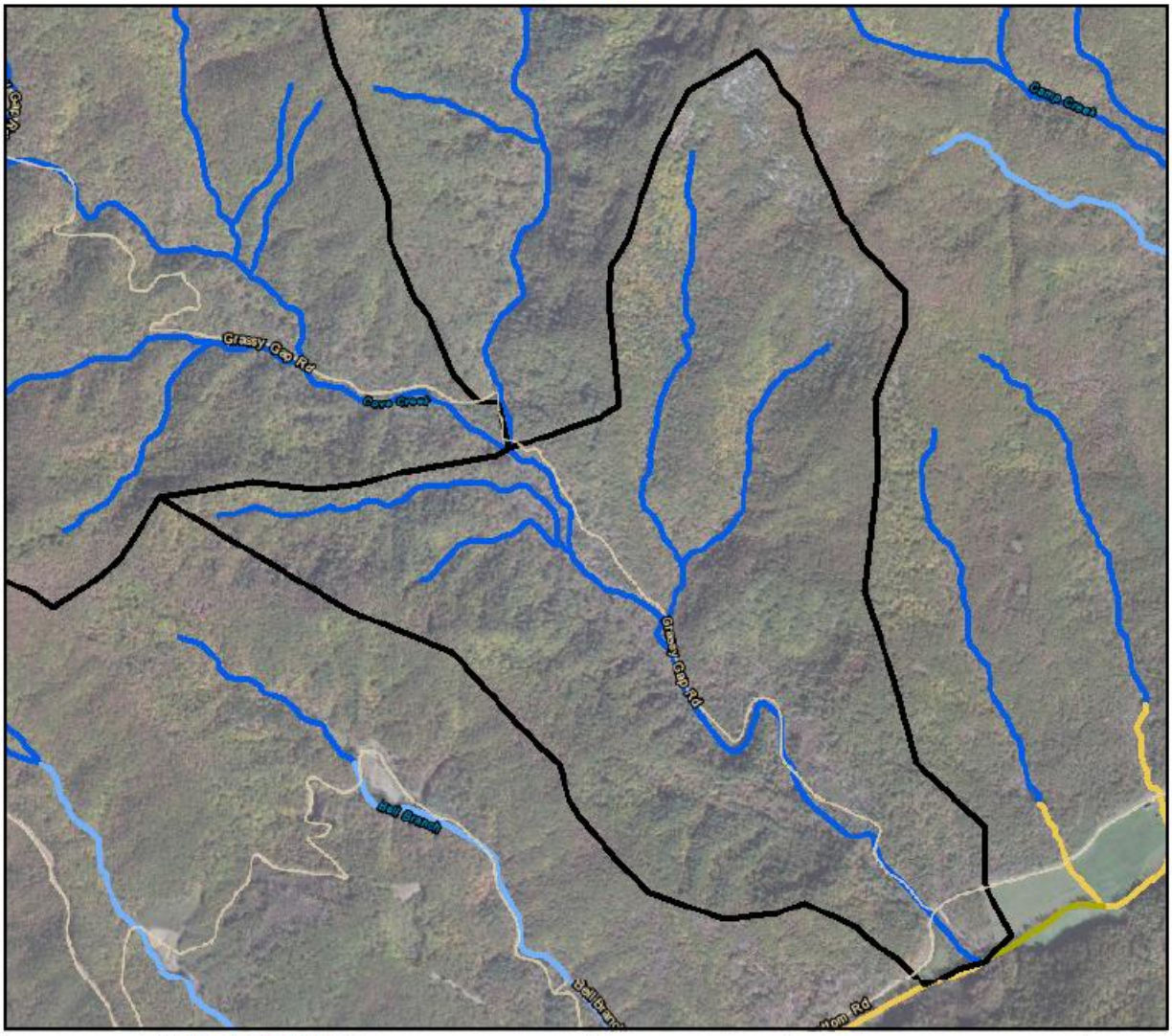
This entire catchment is within federally-protected lands of the Blue Ridge Parkway, and shows the value of such protection. As it is within the viewshed of the Blue Ridge Parkway, development is highly restricted within most of this catchment. The nearly ten miles of streams support trout, and may actually support a native brook trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet. Species such as the golden eagle and the cerulean warbler are major draws for tourists. The costs of not having such protections can be seen dramatically in this aerial image at the cleared forests to the north in Allegheny County.

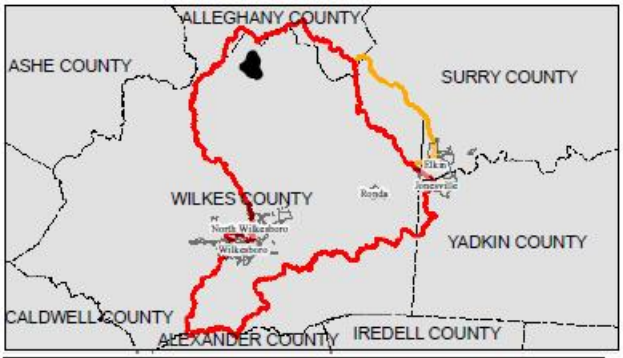
The catchment also features trails that are part of the Mountains-to-Sea Trail, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina. These catchments serve as pilot projects for others throughout both the Jonesville Intake and Big Elkin Creek watersheds, less as a goal, which would unrealistic in more developed areas, but as what can be possible through conservation efforts. Some of the ecology supported within the Bullhead Creek catchment will not be seen in other, less protected areas, but supporting trout, hiking, and other features that can draw tourists and protect water supplies are goals that can be achieved throughout both watersheds.

Next Steps:

- Promote the assets of Bullhead Creek, the Roaring River and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

15 Most Healthy Stream Catchments
Basin Creek Subwatershed - Basin Creek





Elkin Creek Watershed Jonesville Intake Watershed

Stream Catchments

Stream Health

1 — Most Healthy

2

3

4

5 — Least Healthy

Date: October, 2014

Piedmont Triad Regional Council

0 0.15 0.3 0.45 0.6 Miles

JONESVILLE INTAKE WATERSHED CONSERVATION PRIORITY:

BASIN CREEK

# PARCELS INVOLVED		LAND USE (ACRES; PERCENTAGE)			STREAM FEET (LINEAR FEET)	
FULLY	0	AGRICULTURE	22.6	2.5%	CLASS 1	24,547
PARTIALLY	6	RESIDENTIAL	5.4	1%	CLASS 2	0
		VACANT/UNKNOWN	2	0%	CLASS 3	0
		INSTITUTIONAL	7.6	1%	CLASS 4	0
		RECREATION	820,8	96%	CLASS 5	0
TOTAL	**6**	**TOTAL**	**858**	**100%**	**TOTAL**	**24,547**

Nearly this entire catchment is within federally-protected lands of the Blue Ridge Parkway, and shows the value of such protection. As it is within the viewshed of the Blue Ridge Parkway, development is highly restricted within most of this catchment. The over four miles of streams support trout, and may actually support a native brook trout population. The pristine forests provide habitat for many animals and plants, including some seen few other place on the planet. Species such as the golden eagle and the cerulean warbler are major draws for tourists. The catchment also features trails that are part of the Mountains-to-Sea Trail, bringing visitors and tourism revenue to this other economically hard-hit area of North Carolina.

There are farms in this catchment that appear to be at its confluence with the Roaring River. They take up very little area in this catchment, but other land use practices on nearby tributaries have impacted stream buffer conditions to a concerning level. Some of this is also due to the NC DOT building roads along the stream corridor, where they could have the greatest potential for impacting streams with stormwater runoff.

Next Steps:

- Promote the assets of Bullhead Creek, the Roaring River and its tributaries in a countywide or Yadkin Valley marketing campaign;
- Ensure that the NC DOT is using the best available stormwater practices to manage runoff from Grassy Gap Road;
- Ensure that any trout streams in this and adjacent catchments are permanently protected and sustained.

WORKS CITED

Association, NC Paddle Trails. 2014. http://ncpaddletrails.com/default.aspx (accessed September 2, 2014).

Bailey, Andy. "Utilizing Strip Tillage for Tobacco Production." *University of Kentucky College of Agriculture.* 2011. http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCAQFjAA&url=http%3A%2F%2Fwww2.ca.uky.edu%2Fanr%2FAgent%2520Resources%2F2011%2520Updates%2FPowerPoints%2FHopkinsville_West%2FBailey_Utilizing%2520Strip%2520Tillage%2520for%2520Tobacco%252 (accessed September 2014).

Baker, Brandon. *Solar Carbon Cowboys: Arizona State Professor and Filmmaker Showcases Drought-Resilient Soil Practices.* June 2014. http://ecowatch.com/2014/06/25/arizona-state-short-film-drought-soil/?utm_source=EcoWatch+List&utm_campaign=29c3c510f8-Top_News_6_26_2014&utm_medium=email&utm_term=0_49c7d43dc9-29c3c510f8-85924153 (accessed September 2014).

Brower, Michele B. *An Exploration of Chicken Litter-Induced Trace Metal Phytotoxicity in Agronomic Species of Plants.* Thesis, Boone: Appalachian State University, 2013.

City-Data. *Wilkesboro, North Carolina.* 2013. http://www.city-data.com/city/Wilkesboro-North-Carolina.html (accessed September 2014).

Conine, Ashely, Wei-Ning Xiang, Jeff Young, and and David Whitley. "Planning for multi-purpose greensways in Concord, North Carolina." *Landscape and Urban Planning* 68 (2004): 271-287.

Crouse, David A., and Karl Shaffer. "SoilFacts: Guidelines for the Commercial Application of Poultry Litter." *NC Cooperative Extension.* 2010. http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-76.pdf (accessed April 2014).

CTNC. *Protecting Farmland.* 2014. http://www.ctnc.org/land-trusts/statewide-land-protection-programs/farmland-protection/ (accessed September 2014).

Day, Jesse, Marc Alred, Elizabeth Jernigan, and Walsh Christina. *Recreation, Parks and Greenway Plan for the Town of Elkin.* Master Plan, Kernersville: Piedmont Triad Regional Council , 2013.

Denton, Paul, Justin Bryant & John Morrison. "Conservation Tillage for Burley Tobcco." *Auburn Univesity College of Agriculture.* 2010. http://www.ag.auburn.edu/auxiliary/nsdl/scasc/Proceedings/2010/Denton.pdf (accessed September 2014).

Destination by Design. "Health By Design A Regional Plan for Active Living Infrastructure for Northwest North Carolina." March 2014. http://issuu.com/dbdplanning/docs/health_by_design (accessed June 2014).

eBird. *eBird.* 2014. http://ebird.org/ebird/subnational2/US-NC-193/hotspots?yr=all&m (accessed June 16, 2014).

EPA. "Profiles of Environmental Education Grants Awarded in North Carolina." *United States Environmental Protection Agency.* 2008. http://www2.epa.gov/education/profiles-environmental-education-grants-awarded-north-carolina (accessed September 2014).

Ernst, Caryn, and Richard and Nixon, Kirk Gullick. *Protecting the Source: Land Conservation and the Future of America's Drinking Water.* Trust For Public Land, 2002.

EVTA. *Elkin Valley Trails.* 2014. http://elkinvalleytrails.org/ (accessed June 2014).

Farm*A*Syst. "Grazing Livestock and Water Quality." *North Carolina Cooperative Extension Service.* 2001. http://www.soil.ncsu.edu/publications/assist/farmassist/grazingFAS.pdf (accessed April 2014).

—. "Improving Storage and Handling of Hazardous Waste." *North Carolina Cooperative Extension Service.* July 2000. http://content.ces.ncsu.edu/20731.pdf.

Furr, Curtis. "Managing for Soil Health in the Piedmont Area of the Southeast - a Farmer's Perspective." *Conservation Webinars.* June 10, 2014. http://www.conservationwebinars.net/webinars/managing-for-soil-health-in-the-piedmont-area-of-the-southeast (accessed June 2014).

Galick, Christopher, Robert Abt, & Yun Wu. *Forest Biomass Supply in the Southeastern United States - Implications for Industrial Roundwood and Bioenergy Production.* Duke University, 2009.

Gold, Mary V. "Sustainable Agriculture: Definitions and Terms." *USDA - National Agricultural Library.* August 2007. http://www.nal.usda.gov/afsic/pubs/terms/srb9902.shtml.

Heglund, Patricia and Skagen, Susan. "Ecology and Physiology of En route Nearctic-Neotropical Migratory Birds: A Call for Collaboration." *The Condor*, May 2005: 193-196.

High Country Council of Governments. *High Country Water Quality Initiative.* Plan, Boone: High Country Council of Governments, 2012.

Kline, Carol, David Cardenas, Duffy Lauren, and and Jason Swanson. "Funding sustainable paddle trail development: paddler perspecties, willingness to pay and management implications." *Journal of Sustainable Tourism* 20, no. 2 (2012): 235-256.

Kohut, Salina M., and George R. and Christoper E. Moorman Hess. "Avian use of suburban greenways as stopover habitat." *Urban Ecosystems*, May 15, 2009: 487-502.

Kwak, Thomas. "Fisheries Indicators, Freshwater." In *The Berkshire Encyclopedia of Sustainability: Measurements, Indicators and Research Methods for Sustainability*, by Ray Anderson, 130. Berkshire, 2012.

McIntyre, Palmer et al. . *Surry County Farmland Preservation Plan: Preserving Our Agricultural Heritage and Future.* Piedmont Land Conservancy, 2012.

McNaught, D., and J. Rudek and E. Spalt. *Riparian Buffers: Common Sense Protection of North Carolina's Water.* 2013. http://www.edf.org/news/environmental-defense-calls-statewide-buffer-rule (accessed 2013).

Meijer, Alan D., et al. "Soil Facts: Long-Term Tillage Effects on Corn and Soybean Yield int he Piedmont." *NC Cooperative Extension.* 2012. http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-80W.pdf (accessed April 2014).

National Park Service. *Brook Trout.* 2014. http://www.nps.gov/shen/naturescience/brook-trout.htm (accessed September 10, 2014).

National Water Program. "NET." *National Water Program: A Partnership of USDA NIFA & Land Grant Colleges and Universities.* September 2013. http://www.usawaterquality.org/themes/npm/success/NET.html (accessed September 2014).

NatureServe. *NatureServeExplorer: An online encyclopedia of life.* 2014. www.natureserve.org (accessed June 10, 2014).

NC Cooperative Extension Service. "Crozier, Carl R., Greg D. Hoyt & Michael G. Wagger." *NC Cooperative Extension Service.* 2011. http://www.soil.ncsu.edu/publications/Soilfacts/AGW-439-58/AG-439-58W_WACC.pdf (accessed September 2014).

—. "Economic Impact Data." *NC Cooperative Extension Service.* September 2012. http://www.ces.ncsu.edu/economic-impact-data/ (accessed September 2014).

NC DA&CS. "Agricultural Statistics - 2012 Annual Statistics Book ." *North Carolina Department of Agriculture & Consumer Services.* 2012. http://www.ncagr.gov/stats/2012AgStat/ (accessed April 2014).

—. "Allocation of 2015 NCSP Financial Assistance Funds." *Cost Share Programs - Agriculture Cost Share Program (ACSP).* 2014.

http://www.ncagr.gov/SWC/costshareprograms/ACSP/documents/ACSPPY2015AugustBMPAllocation_SWCC.pdf (accessed November 2014).

NC DENR. "Special Studies." *Division of Water Resources.* 2014. http://portal.ncdenr.org/web/wq/ps/mtu/specialstudies (accessed November 2014).

NC DOC. "2015 North Carolina Development Tier Designations." *North Carolina Department of Commerce.* November 2014. http://www.nccommerce.com/Portals/0/Incentives/CountyTier/2015%20Development%20Tier%20Rankings.pdf (accessed November 2014).

NC DWQ. *Protecting Trout Waters of North Carolina.* Raleigh: North Carolina Department of Environment and Natural Resources, 2009.

NC DWR. "Dry Poultry Litter Requirements ." *NC Cooperative Extension.* 2013. http://bladen.ces.ncsu.edu/files/library/9/Dry%20Poultry%20Litter%20Requirementsnewspaperarticle.pdf (accessed April 2014).

NC Forest Service. *Managing Your Forest.* 2013. http://ncforestservice.gov/Managing_your_forest/fdp.htm (accessed January 31, 2013).

NC SWCD. "Long Term No-Till." *Agricultural Cost Share Program.* 2012. http://www.ncagr.gov/SWC/costshareprograms/ACSP/documents/long_term_notill.pdf (accessed September 2014).

NC WRC. *Conservation Recommendations for Priority Terrestrial Wildlife Species and Habitats.* Raleigh: North Carolina Wildlife Resources Commission, 2012.

NC WRC. *North Carolina Trout Resources Management Plan.* Management Plan, Raleigh: North Carolina Wildlife Resources Commission, 2013.

NC WRC. *North Carolina Wildlife Action Plan.* Raleigh: North Carolina Wildlife Resources Commisssion, 2005.

—. *North Carolina Wildlife Resources Commission News.* 2013. http://www.ncwildlife.org/News/NewsArticle/tabid/416/IndexId/9339/Default.aspx (accessed June 2014).

NC WRC. *Regulations Digest.* NC Inland Fishing, Hunting and Trapping Regulations Digest, North Carolina Wildlife Resources Commission, 2013.

NC WRC. *Wildlife Action Plan Five-part Series.* Collection of Articles, North Carolina Wildlife Resources Commission, 2007.

North Carolina Division of Public Health. *The North Carolina Guide to Incorporating Health Considerations into Comprehensive Plans.* Raleigh: North Carolina Department of Health and Human Services, 2014.

Osmond, D.L. et al. "Grazing Practices: A Review of the Literature." *NC State University.* 2007. http://www.soil.ncsu.edu/publications/Bulletins/GrazingPractices.pdf (accessed April 2014).

Outdoor Industry Association. "Outdoor Industry ." 2012. http://www.outdoorindustry.org/pdf/OIA_OutdoorRecEconomyReport2012.pdf. (accessed June 2013).

Overby, Cyd. *personal communication* (January 7, 2013).

Pack, Jessica. *Evaluation of Trace Metal Runoff From Chicken Litter Application in the Bugaboo Watershed.* Thesis, Boone: Appalachian State University - Department of Biology, 2009.

PLC. *Piedmont Land Conservancy.* December 2013. http://piedmontland.org/sites/stewardship.php (accessed December 2013).

—. *Stewardship.* 2013a. http://www.piedmontland.org/sites/stewardship.php (accessed January 7, 2013).

Postel, Sandra, and Barton H Thompson Jr. "Watershed protection: Captruing the benefits of nature's water supply services." *Natural Resources Forum* 26 (2005): 98-108.

RC SWCD. *Soil and Water Conservation.* 2013. Rockingham Couynty Soil and Water Conservation District (accessed January 16, 2013).

Shuford et al. *Planning for a New Energy and Climate Future.* Planning Advisory Service, Chicago: American Planning Association, 2010.

Stober, Cy. *The Feasibility of Forestry Operations within the Asheville, NC, Municipal Watershed: A Study of Appalachian Municipal Watershed Management. .* Durham, NC. : Duke Nicholas School of the Evironment Masters Project, 2007.

Stober, Cy, Joy Fields, Ford, Malinda, and Chris Bass. *Eden Area Watershed Restoration Plan.* Kernersville: Piedmont Triad Regional Council, 2013.

Sturges, Frank. *National Forests Support Recreation Economy.* July 2014. http://blog.nwf.org/2014/07/national-forests-support-recreation-economy/ (accessed July 23, 2014).

Stutts, Jane, and William Hunter. *Bicycling and Walking in North Carolina: Results of a Year 2000 Survey.* Chapel Hill: NC Department of Transportation Division of Bicycle and Pedestrian Transportation, 2002.

Texas Water Development Board. "Water Conservation Best Management Practices (BMP) Guide for Agriculture in Texas." *Texas State Soil and Water Conservation Board.* April 2005. http://www.tsswcb.texas.gov/files/docs/waterconservation/water_conservation_bmp.pdf (accessed September 2014).

Town of Elkin. *Elkin Land Use Plan.* Land Use Plan, Asheboro: Wooten Company, 2000.

Town of Jonesville. *Town of Jonesville City Zoning Ordinances.* City Ordinance, Jonesville: Town of Jonesville, 1985.

U.S. Census Bureau. "American FactFinder: Selected Economic Characteristics, 2008-2012 American Community Survey 5-Year Estimates: Jonersville, NC." *PTRC Regional Data Center.* 2013. http://www.ptrc.org/modules/showdocument.aspx?documentid=478 (accessed 2014).

—. *State & County QuickFacts: Wilkes County, North Carolina.* July 2014. http://quickfacts.census.gov/qfd/states/37/37193.html (accessed September 2014).

U.S. EPA. "2000 National Water Quality Inventory." 2000. http://www.epa.gov/305b/2000report (accessed April 2014).

—. "Literature Review of Contaminants in Livestock and Poultry Manure and Implications for Water Quality." *Water: Contaminants of Emerging Concern.* July 2013. http://water.epa.gov/scitech/cec/upload/Literature-Review-of-Contaminants-in-Livestock-and-Poultry-Manure-and-Implications-for-Water-Quality.pdf (accessed April 2014).

—. "Literature Review of Contaminants in Livestock and Poultry Manure and Implications for Water Quality." *Water: Contaminants of Emerging Concern.* July 2013. http://water.epa.gov/scitech/cec/upload/Literature-Review-of-Contaminants-in-Livestock-and-Poultry-Manure-and-Implications-for-Water-Quality.pdf (accessed April 2014).

—. "Nutrient Pollution." *United States Environmental Protection Agency.* November 2014. http://www2.epa.gov/nutrientpollution (accessed November 2014).

—. *Pasture, Rangeland, and Grazing Operations - Best Management Practices (BMPs).* 2014. http://www.epa.gov/agriculture/anprgbmp.html#NonPoint%20Source%20Pollution (accessed April 2014).

U.S. Fish and Wildlife Service. *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.* Survey, U.S. Department of the Interior, 2013.

UNC EFC. "North Carolina Water and Wastewater Rates Dashboard." *UNC Environmentak Fianance Center.* February 2014. http://www.efc.sog.unc.edu/reslib/item/north-carolina-water-and-wastewater-rates-dashboard# (accessed September 2014).

UNRBA. "Recommendation Sheet #15: Agricultural Best Management PRactices Education and Outreach." 2007. http://archive.unrba.org/docs/unwmp/RecSheet15.doc (accessed January 2014).

US Fish and Wildlife Service. *2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation in NC.* U.S. Department of the Interior, 2011.

USDA. *7 CFR Part 723.* Federal Register, Farm Service Agency, United State Department of Agriculture, Washington DC: USDA, 2005.

Washington State University. *Integrated Pest Management for Blueberries.* 2014. http://whatcom.wsu.edu/ag/comhort/nooksack/ipmweb/blue/pesticides_water.html (accessed June 2014).

Wickham, James D., Thimothy G. Wade, and Kurt H. Riitters. "An environmental assesment of United State drinking water watersheds." *Landscape Ecology*, 2011: 605-616.

Wilkes County Soil and Water Conservation District. "No Till Drill." *Wilkes Soil and Water Conservation District.* 2014. http://www.wilkesswcd.org/index.php/page,NoTillDrill.html?PHPSESSID=72b5db1d5cc0bc6528aa8ef464c0e956.

Wilkes County, Planning Department. *Wilkes County Growth Management Plan.* Plan, Wilkesboro: Wilkes County, 2014.

Yadkin County Land Use Plan Committee. *Yakin County Land Use Plan 2011.* Plan, Piedmont Regional Office: NC Department of Commerce, Division of Community Planning, 2011.

Yadkin Pee Dee River Trail Association. *About.* 2014. http://yadkinrivertrail.org/ (accessed September 2014).