Elkin & Jonesville Stormwater Inventory

AUGUST 2020

Prepared by the

Piedmont Triad Regional Council

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Background & Purpose

The Towns of Elkin and Jonesville are located on the border of Surry and Yadkin County at the junction of Big Elkin Creek and the Yadkin River. Water has played an integral role in the development and heritage of both riverfront communities. However, over the past few years, stormwater has become an increasing problem for these two towns and the Yadkin Valley Sewer Authority (YVSA) who operates a collective sewer system for the Towns of Elkin, Jonesville, and Ronda, and their associated counties, Surry, Yadkin, and Wilkes. The YVSA's wastewater treatment facility treats approximately 650,000 gallons of wastewater on average, but after heavy rain storms, this number can increase to as high as 2 million gallons, well above the YVSA's 1.8 million gallons per day capacity. This has unfortunately resulted in periodic sanitary sewer overflows through and out of manhole covers, spilling into Big Elkin Creek and the Yadkin River. Heavy rainfall also regularly causes localized flooding and erosion, which contributes to muddy conditions in the river that are not suitable for recreation or wildlife.

In an effort to proactively address this problem, the Towns of Elkin and Jonesville partnered with the Piedmont Triad Regional Council (PTRC) to conduct a detailed inventory of both towns' stormwater drainage systems. The primary goals of this project were to establish an online database of all stormwater infrastructure throughout the two towns (including all drains, pipes, and outfalls), evaluate any potential maintenance needs, and identify additional opportunities to reduce stormwater flows. This inventory will help Elkin and Jonesville more easily manage and maintain existing stormwater infrastructure and better inform future stormwater management decisions, as well as help the YVSA identify potential sources of inflow and infiltration (I/I). The following report outlines the work completed and summarizes the project's findings.

Process

Field Work

In order to determine how stormwater is channeled throughout the Towns of Elkin and Jonesville, PTRC staff surveyed each inlet, junction box, culvert, manhole, outlet, and outfall over the course of several fieldwork days. A geodatabase was created in ESRI ArcGIS to house the stormwater infrastructure data. Each type of stormwater feature and its associated attributes (characteristics) was given a set of rules (attribute domains) for field data entry to enforce data integrity and ease data collection in the field (See Table 5). Attachments were enabled on the geodatabase to allow for photographs to be taken in the field and associated with each point.

The completed database structure was then uploaded to an online web map in ArcGIS Online so that it could be populated during field work. PTRC staff used the ArcGIS Collector application on Android tablets to collect stormwater infrastructure point data. For better locational accuracy, a Trimble R1 integrated GNSS Bluetooth device was used in combination with ArcGIS Collector. This device has a maximum precision of 1.64 feet.

Stormwater attribute data collected in the field consisted of stormwater inlet and outlet type, location (x-y coordinates), pipe material, diameter, direction, depth, condition rating, condition description, and a high-resolution hyperlinked photo of each stormwater feature. A laser distance tool and tape measurer aided in pipe diameter and depth measurements. At the end of each fieldwork day, data points from the Android tablets were synced back to the geodatabase. A total of 1,960 points were collected across 30 days of fieldwork. The Town of Elkin's Public Works Department provided an initial stormwater point and pipe layer containing 721 points, 482 pipes, and limited attribute data. This data was imported into the stormwater database and used throughout the study to verify infrastructure locations and attribute data.

Analysis

Upon completion of the stormwater point data collection, PTRC reviewed the data in ArcMap. Necessary data edits were made to clean up data inconsistencies, fill in missing attribute data, snap collected points to aerial imagery, and add any points that were not visible in the field. A stormwater pipe layer was created using pipe diameter and flow direction information collected in the field. The stormwater pipe layer was symbolized with arrows to indicate flow directions so that stormwater flow can be traced from the point of origin to the surface or stream outfall.

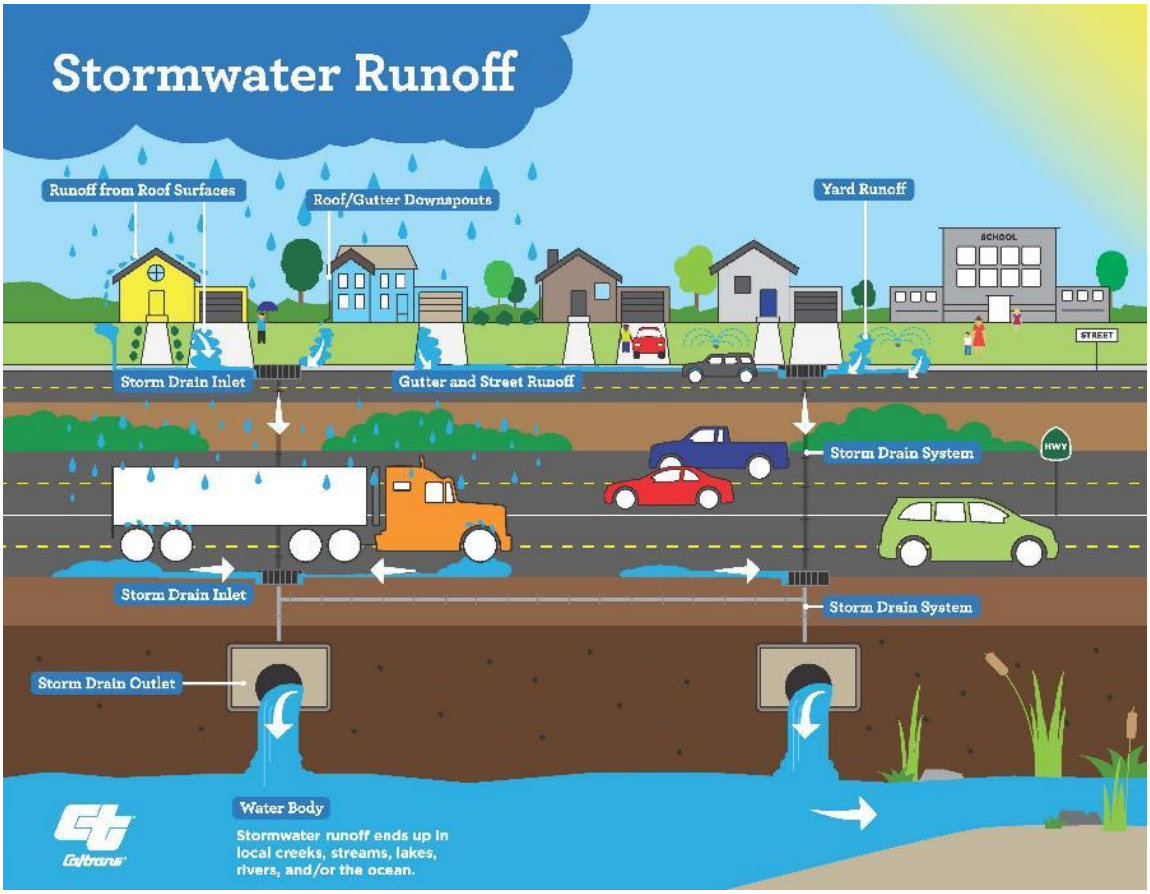
Stormwater Inventory

Summary

The completed stormwater inventory includes 1,960 stormwater points (1,567 in the Town of Elkin and 393 in the Town of Jonesville) and 1561 stormwater pipes (1,302 in the Town of Elkin and 259 in the Town of Jonesville) and is intended to help both towns better manage and maintain existing stormwater systems, identify potential sources of I/I, and make informed future stormwater management decisions. The following sections go into more detail about what influences stormwater runoff, the data collected, and how the database can be accessed and used.

Factors Influencing Runoff

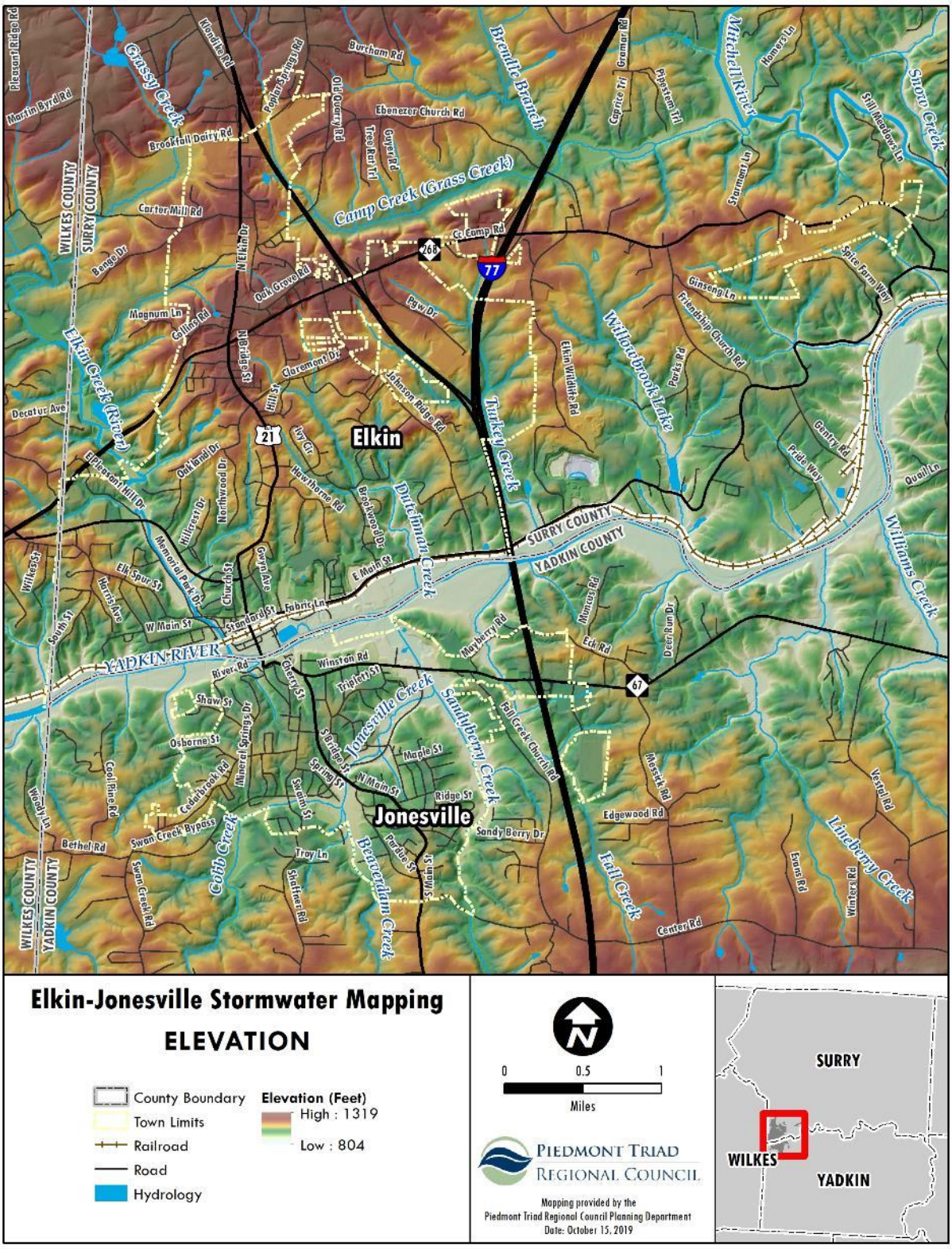
When it rains, some of the rainwater is absorbed into the ground, while part of it flows over the ground. All that water that rolls off of your roof, through your yard, and over the street is called stormwater runoff. The flow and volume of stormwater runoff is influenced by a number of environmental and human factors including the season, severity of storm, topography, soil conditions, and amount of vegetation or impervious surfaces (such as roads, driveways, parking lots, and roofs). To better understand the various factors influencing stormwater runoff in the Towns of Elkin and Jonesville, the PTRC reviewed available elevation, soil, and land cover data.



Elevation in Elkin and Jonesville ranges from a peak of 1,319 feet to a low of 804 feet above sea level. Generally, all rainwater in Elkin and Jonesville drains to the south and north, respectively, into the Yadkin River. The highest peaks are in northwest Elkin near the intersection of US 21 Business and NC 268 Bypass (CC Camp Road). I-77 and US-21 act as the primary ridge lines, directing stormwater runoff to the east or west before it reaches the Yadkin.

Topography not only influences flow directions, but also the speed at which water travels. In general, the steeper and longer a slope is, the faster water runs off of it, and the greater potential there is for erosion. Due to the natural topography of the foothills, there are several sections of Elkin and Jonesville that have long and steep slopes. These areas likely contribute to higher stormwater velocities and erosion rates. However, other factors like soil composition and vegetative cover also play an important role in determining runoff and erosion potential.

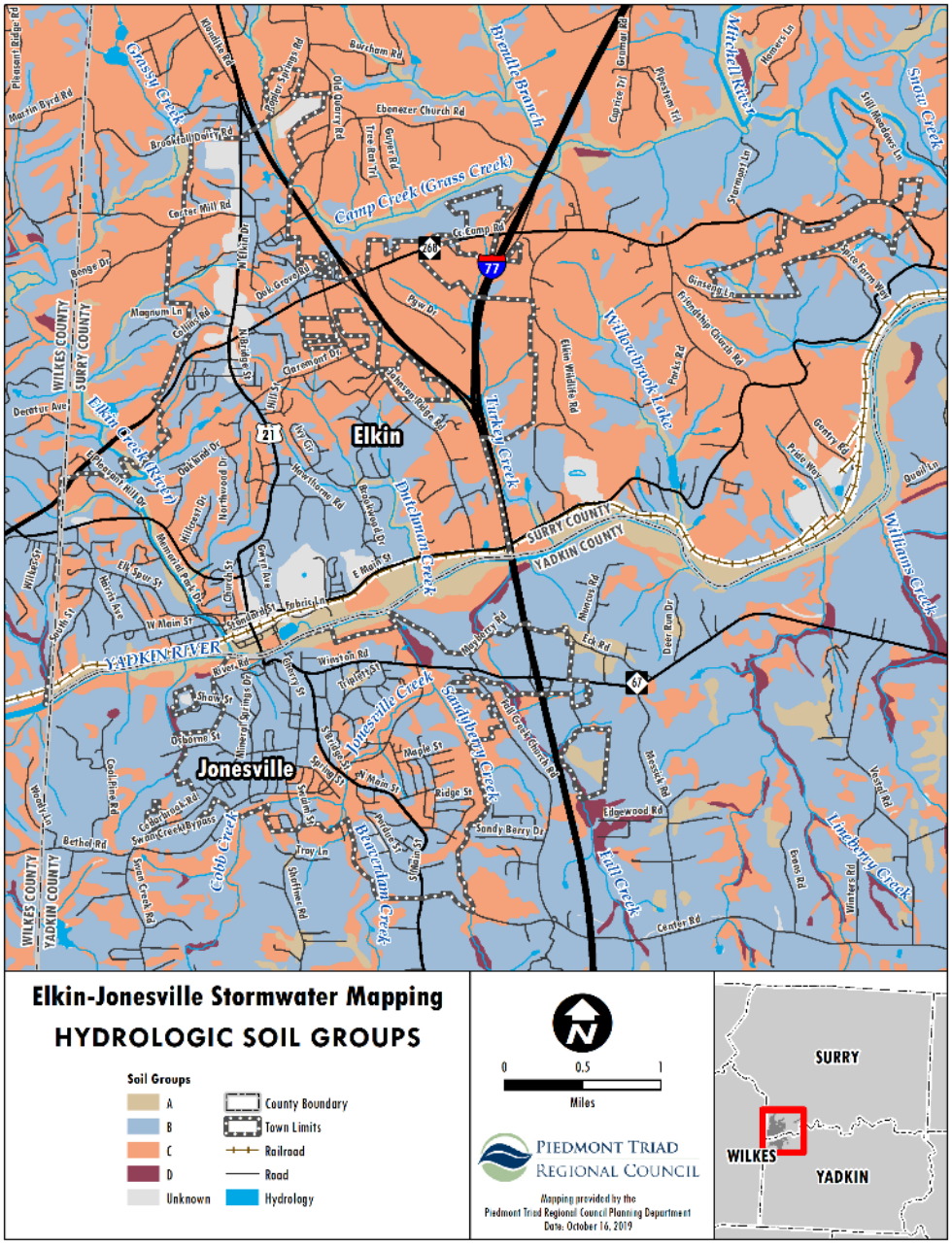
Map 1: Elevation



Source: 2014 LiDAR, 20 Foot Resolution

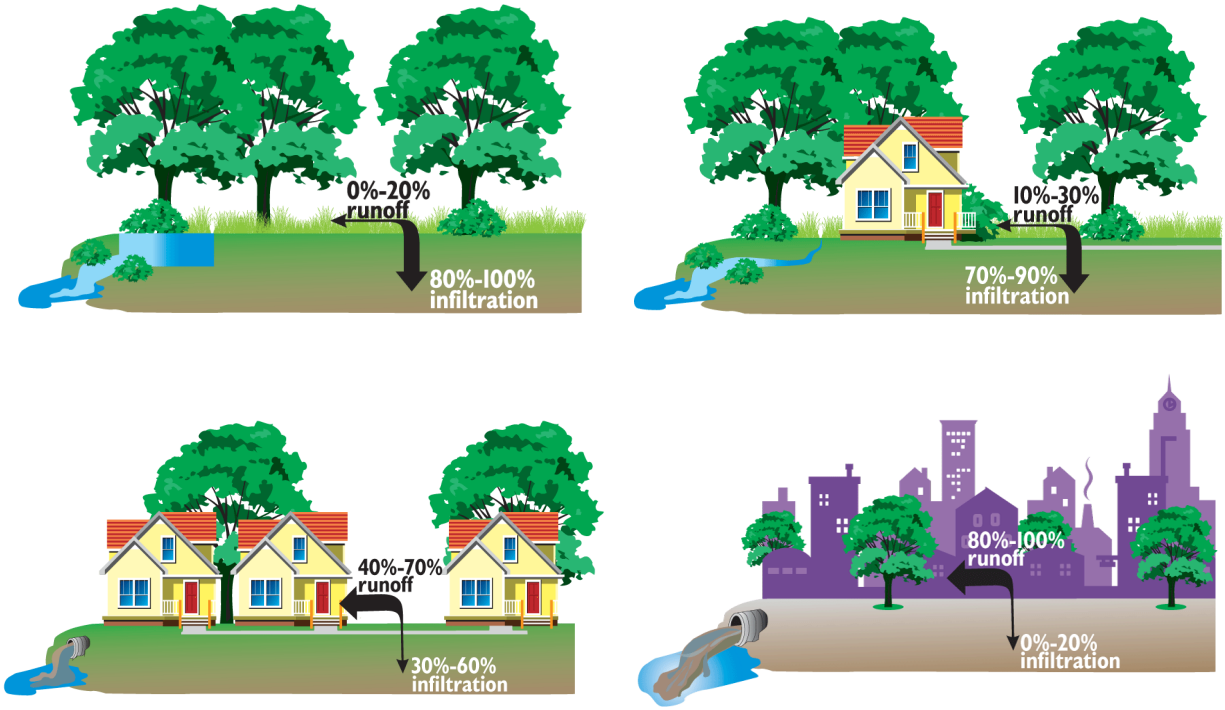
Soil composition affects how much water can be absorbed into the ground. Sandy soils have low runoff potential and high infiltration rates, while clay soils have high runoff potential and low infiltration rates. Soils are typically classified into four hydrologic soil groups (A, B, C, and D) based on their runoff potential, where A's generally have the smallest runoff potential and D's the greatest. A majority of the underlying soils in Elkin and Jonesville are categorized as Type B or C, which includes silt loams and sandy clay loams. These soil types have moderate to low infiltration rates. Type B soils are well-suited for a wide-range of SCMs, while Type C soils typically do not drain as well.

Map 2: Hydrologic Soil Groups



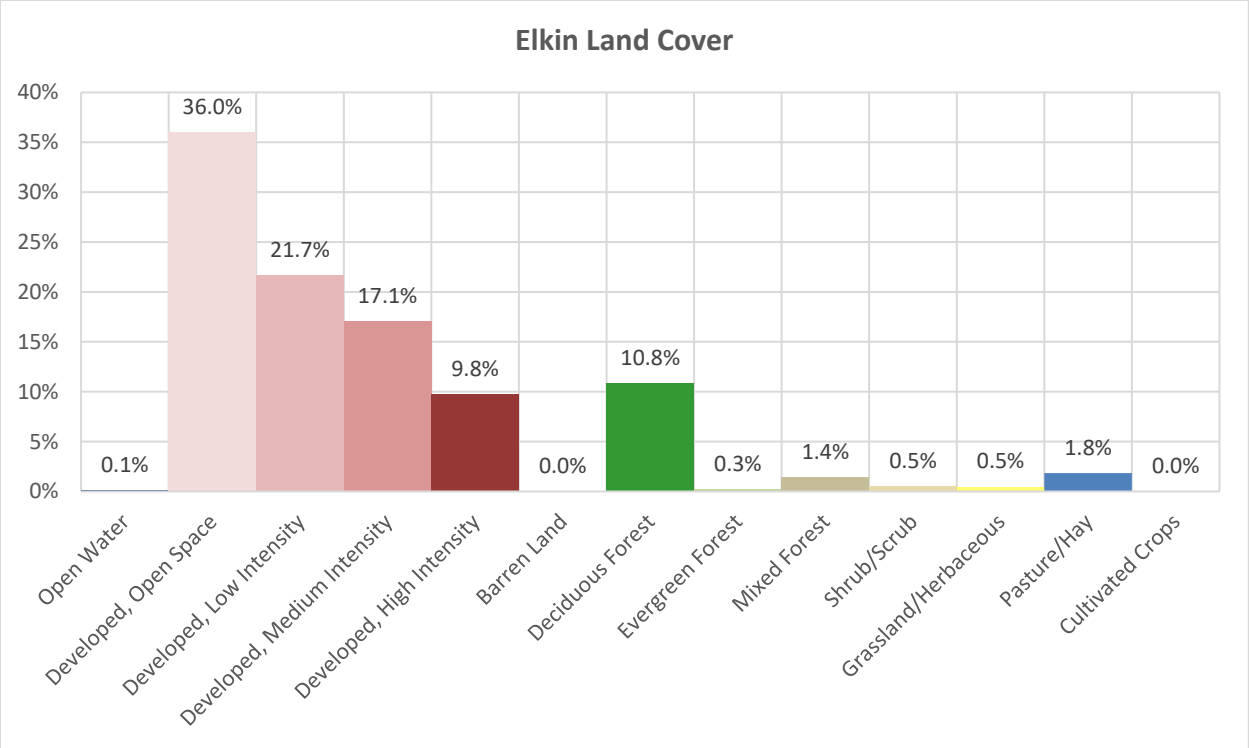
Source: USDA SSURGO Soil Database

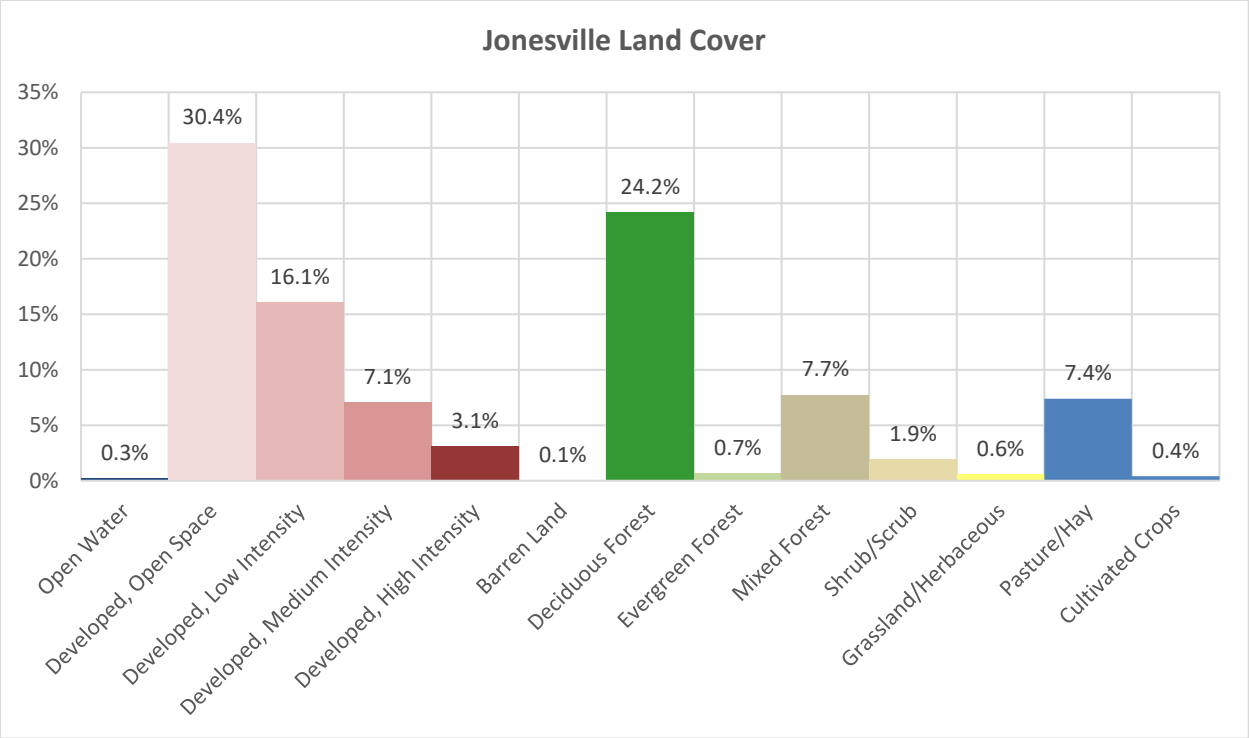
Another factor that influences stormwater runoff is the amount of impervious surfaces, such as roads, driveways, parking lots, and roofs, in an area. These hard surfaces prevent rainwater from percolating into the ground, which increases the amount of stormwater runoff and can lead to pooling or flooding.



There are 941 acres of impervious surfaces in Elkin and Jonesville, which make up approximately 15% of the total land area of each town (NLCD Percent Developed Imperviousness, 2016). Impervious surfaces are most concentrated along major thoroughfares, such as US 21 Business, NC 67, and NC 268 Bypass (CC Camp Road), and commercial and industrial centers. According to research by the Center for Watershed Protection, streams begin to be negatively impacted when impervious surfaces exceed just 10% of a watershed and streams in watersheds where impervious surfaces cover 25% of the watershed typically cannot support aquatic life. These ecological impacts can be offset by encouraging development in existing commercial and industrial centers and increasing the amount of greenspace and vegetation in open areas, which helps slow and filter stormwater runoff.

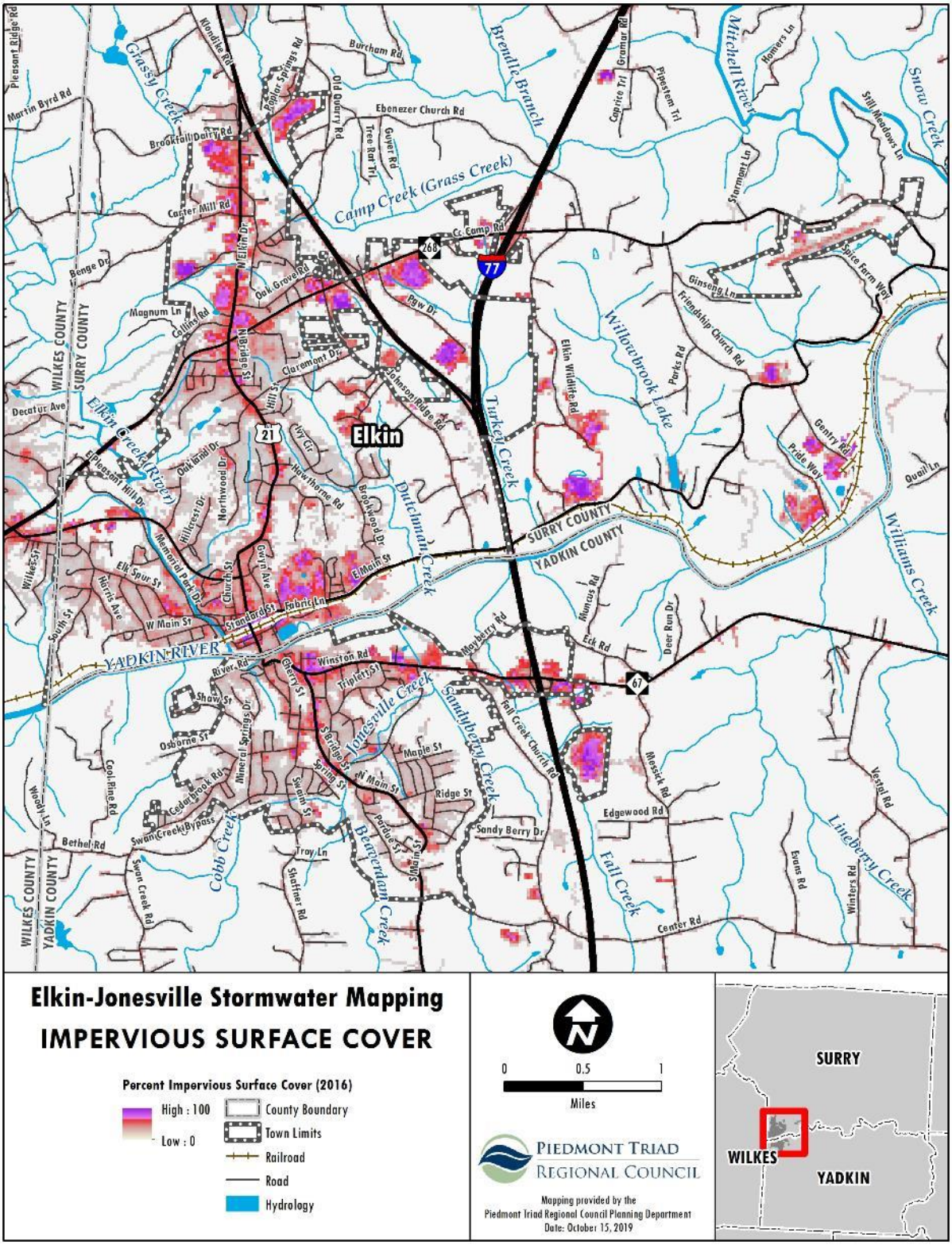
A more detailed breakdown of land cover shows that developed open space makes up the largest percentage of land cover in both towns (36% & 30% respectively), followed by low intensity development in Elkin (21.7%) and deciduous forests in Jonesville (24%). This reflects the high percentage of low-medium density residential throughout both towns and higher percentage of commercial and industrial uses in Elkin. Map 4 describes how land cover is distributed across the two towns (NLCD 2016 Land Cover).



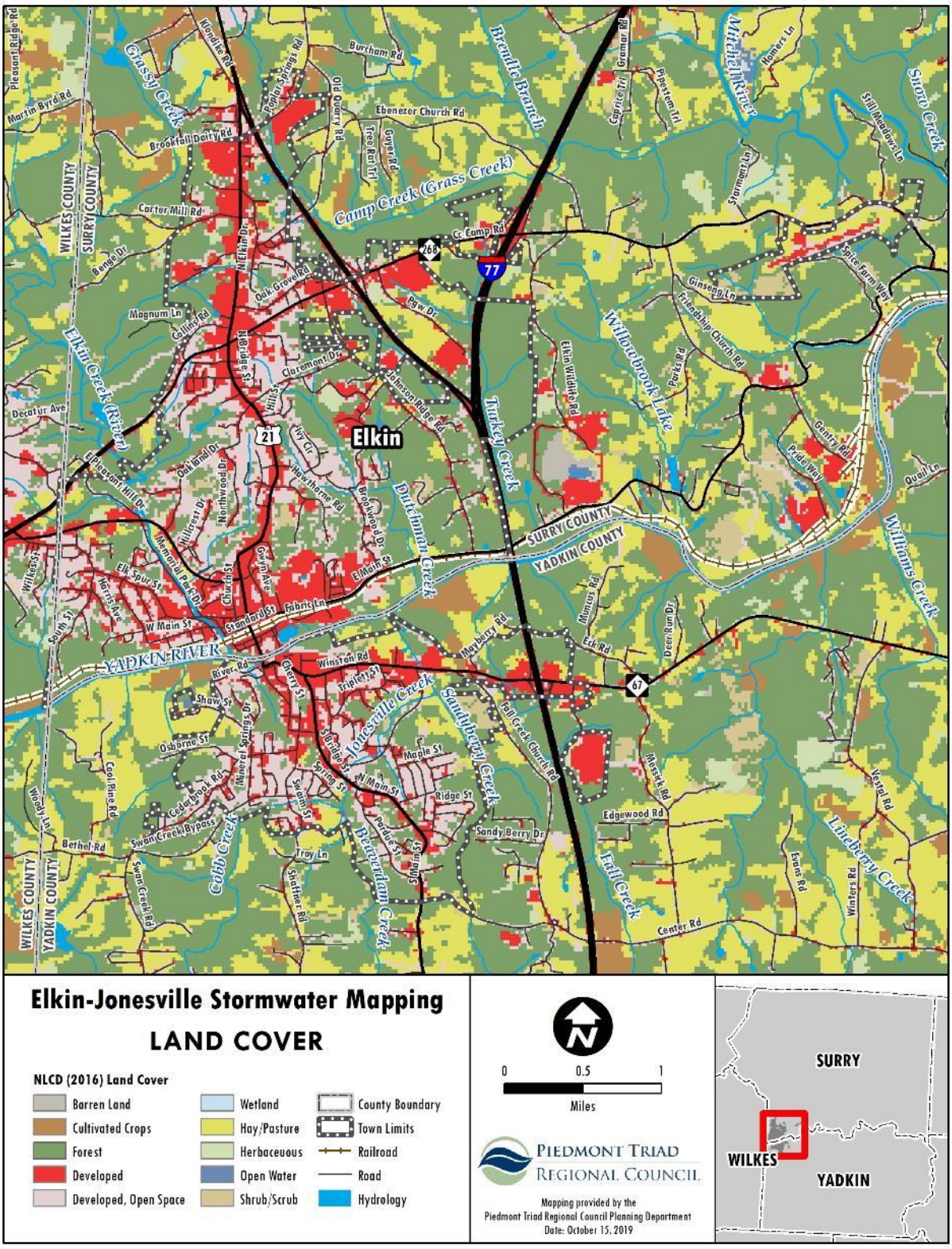


Source: NLCD 2016 Land Cover

Map 3: Impervious Cover

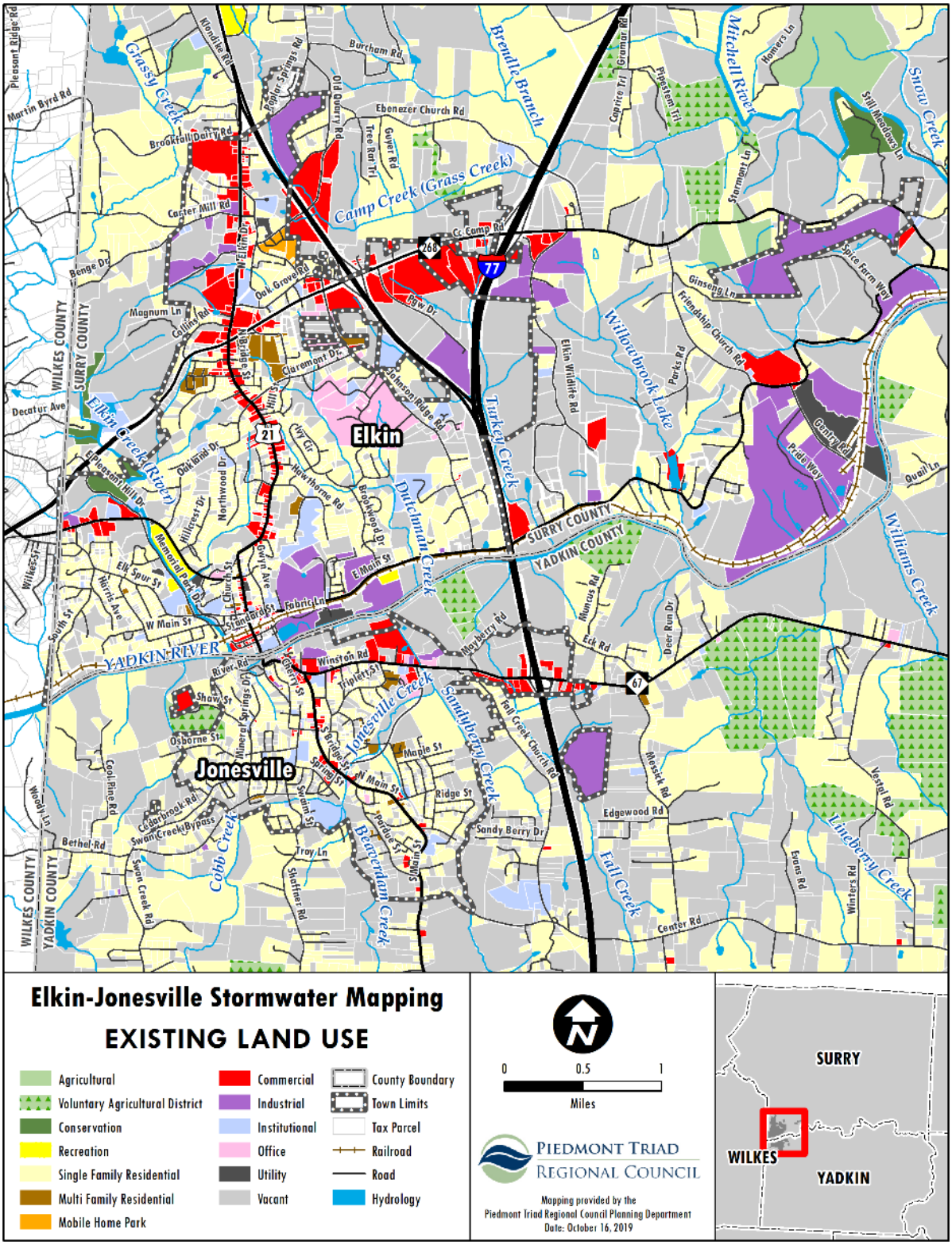


Map 4: Land Cover



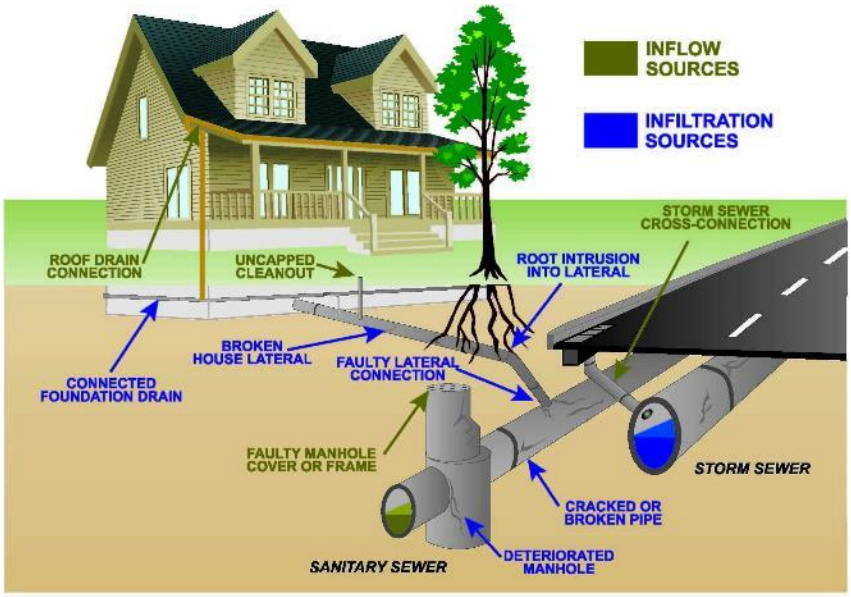
Source: NLCD 2016 Land Cover

Map 5: Land Use



Inflow and Infiltration

Inflow and infiltration, or I/I, are terms used to describe the ways that groundwater and stormwater enter sanitary sewer systems. Stormwater (inflow) typically enters sewer systems via downspouts, foundation drains, storm drain cross-connections, or through holes in manhole covers, while groundwater (infiltration) can seep into sewer pipes through holes, cracks, joint failures, faulty connections, or other parts of a collection system that have deteriorated, cracked, sagged, or collapsed. Additional water from inflow and infiltration places an extra burden on collection systems and wastewater treatment facilities. Collection systems can be damaged when they are forced to transport larger volumes of flow than they have been designed to handle. I/I also increases operation and treatment costs and can sometimes lead to sanitary sewer overflows (SSOs) when wastewater flow volumes exceed the design capacity of the treatment plant.

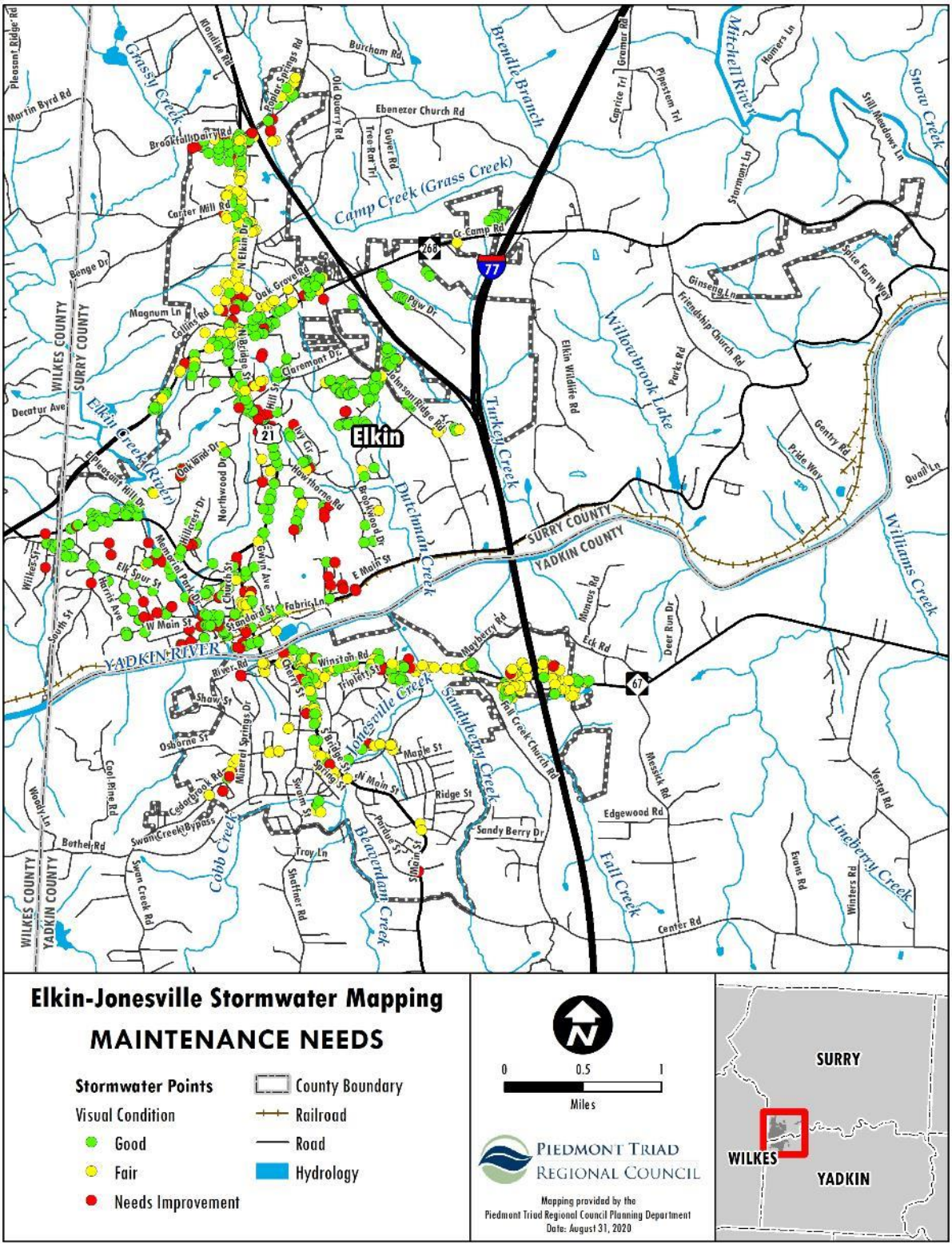


The Yadkin Valley Sewer Authority recently conducted a series of manhole, smoke test, and CCTV inspections to identify sources of I/I. These tests identified over 300 manholes that are in need of repair. Manhole repairs will include cementious lining of brick manholes, manhole inserts, and frame/cover replacements. 67 repairs resulting from the smoke test inspections will be completed including downspout and storm drain disconnects, service lateral repairs, main line repairs, and cleanout cap and riser repairs.

Maintenance Needs

Over the course of fieldwork, PTRC staff noted the visual condition of each stormwater feature to assist public works staff with infrastructure maintenance. Each feature was ranked as "Good", "Fair", or "Needs Improvement", based on their condition. Features were classified as "Fair" or "Needs Improvement" if they were not functioning as intended due to clogging or other structural impairments. Common issues included sediment, litter, and other debris buildup, as well as structural issues, such as cracks, sucken pipes, and erosion. Maintenance needs are fairly evenly distributed throughout both towns, suggesting that there are no areas of particular concern, but seem to be more concentrated in areas where infrastructure is more dated. Map 6 illustrates the visual condition of stormwater infrastructure throughout Elkin and Jonesville in more detail. Public Works staff should prioritize features ranked as "Needs Improvement" for maintenance and repair.

Map 6: Stormwater Maintenance Needs



Further Investigation

While a thorough effort was made to pinpoint all pipe connections and outfall locations, there were a number of areas where it was impossible to verify connections or outlets due to conflicting field data, inaccessibility, buried pipes, or overgrown vegetation. In some instances, pipe directions, materials, and sizes did not align with nearby stormwater points, suggesting that there may be additional underground connections that are not accessible from above ground. These data inconsistencies may require further investigation, beyond the scope of this project, to explain certain segments of the stormwater network and more accurately reflect stormwater connections and routes. A list of areas that require further investigation has been provided below for both Towns' convenience.

Table 1: List of Areas with Missing Stormwater Data

Elkin

Location	Description
Vaughan-Bassett Furniture on Poplar Springs Rd	Private property, unable to access catch-basins
Elkmont Plaza	Unable to determine pipe connections and outlet given field data
Sheetz & Elk Court Apartments	Unable to determine outlet direction of manholes in Sheetz driveway, pipe inlet to the north of Elk Court Apartments, or potential junction box
Advanced Auto Parts	Unable to determine outlet connection for catch-basin in southwest corner
Yadkin Valley Self Storage	Private property, unable to access catch-basins
Yadkin Valley Sewer Authority	Private property, unable to access catch-basins
Elkin High School	Unable to determine pipe connections near gym or access catch-bains near Elkin Parks & Rec maintenance building
Elkin Town Hall	Unable to access manholes during fieldwork to determine connections
Main line near 113 W Main St.	Unable to determine pipe connections or sizes due to depth
Chatham Textile Mill	Private property, unable to access. Acquired blueprints of underground pipes from Elkin Public Works, but have not digitized.
Lenoir Warehouse Group, Plant 2	Private property, unable to access catch-basins

Jonesville

Location	Description
Intersection of Bluff St and Winston Rd	Unable to locate several connections and outfall
Fields south of NC-67 and PVH Way	Unable to link outfalls and inlets with underground stream
Access road between Best Western and Cracker Barrel	Gravel lot at top of road has filled the lower catch basins impeding mapping
Intersection of US 21-Business and Winston Rd/N Bridge St	Unable to locate pipe connection or outfall for catch basins on southern side of Winston Rd/N Bridge St and manhole at end of Plaza St.

Database Access & Use

Collected stormwater data was organized into a final Stormwater Master Geodatabase for each Town enabling them to view and query infrastructure locations, attributes, and hyperlinked photos using ESRI ArcGIS or any similar GIS software. Each file geodatabase has a feature class containing three feature datasets: Points, Pipes, and Swales. The stormwater points layer includes all stormwater inlets, junction boxes, manholes, outlets, and outfalls. Users can view additional information about each feature by clicking on each point or pipe, including invert depths, sizes, material, flow directions, and visual conditions. In total, the database includes 1,303 pipes, 1,555 stormwater points, 20 swales, and 1,475 attached pictures in Elkin; and 262 pipes, 405 stormwater points, and 382 attached pictures in Jonesville. PTRC will work closely with both towns to ensure that the database is kept up-to-date to meet each town's specific needs.

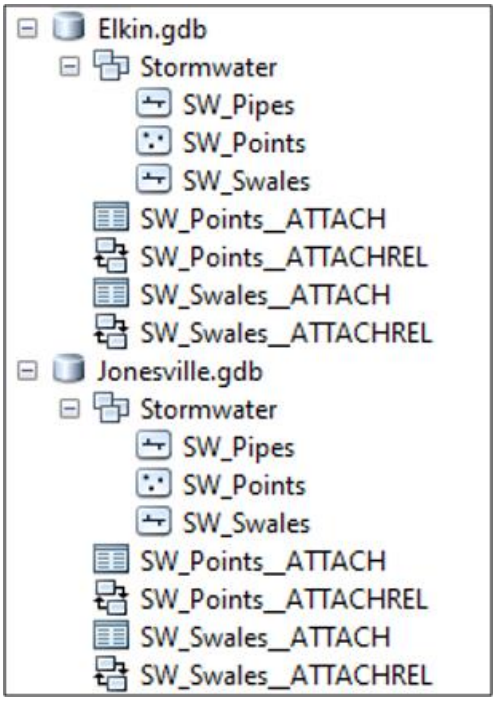


Table 2: Stormwater Point File Structure

Field Name:	Alias:	Data Type:	Length or Precision/Scale:	Domain:
Type		Text	20	SW_Type
Cover		Text	20	SW_Cover
Box_Material		Text	20	SW_Box
Pipe_Connections		Short Integer	5	Num_Pipes
Outlet_Depth		Double	38/8	
Outlet_Material		Text	20	SW_Material
Outlet_Diameter		Short Integer	5	Diameter
Outlet_Direction		Text	5	Direction
Inv1_Depth		Double	38/8	
Inv1_Material		Text	20	SW_Material
Inv1_Diameter		Short Integer	5	Diameter
Inv1_Direction		Text	5	Direction
Inv2_Depth		Double	38/8	
Inv2_Material		Text	20	SW_Material
Inv2_Diameter		Short Integer	5	Diameter
Inv2_Direction		Text	5	Direction
Inv3_Depth		Double	38/8	
Inv3_Material		Text	20	SW_Material
Inv3_Diameter		Short Integer	5	Diameter
Inv3_Direction		Text	5	Direction
Inv4_Depth		Double	38/8	
Inv4_Material		Text	20	SW_Material
Inv4_Diameter		Short Integer	5	Diameter
Inv4_Direction		Text	5	Direction
Flow_Presence		Text	5	YesNo
Visual_Pollution		Text	5	YesNo
Outfall_To		Text	20	SW_Outfall
Structure		Text	20	SW_Structure
Owner		Text	10	Owner
Visual_Condition		Text	20	Condition
Condition_Description		Text	250	
Year_Installed		Short Integer	5	
Comments		Text	250	
Elevation		Double	38/8	
Out_Elev		Double	38/8	
Inv1_Elev		Double	38/8	
Inv2_Elev		Double	38/8	
Inv3_Elev		Double	38/8	

Inv4_Elev		Double	38/8	
created_user		Text	255	
created_date		Date	-	
last_edited_user		Text	255	
last_edited_date		Date	-	
Flag		Short Integer	5	Flag
Source		Text	50	
ESRIGNSS_H_RMS	*Horizontal Accuracy (m)*	Double	38/8	
ESRIGNSS_V_RMS	*Vertical Accuracy (m)*	Double	38/8	
ESRI_NUMSATS	*Number of Satellites*	Short Integer	5	
ESRI_FIXDATETIME	*Fix Time*	Date	-	
ID_New	*Assigned ID*	Short Integer	5	
Outfall_New		Short Integer	5	
FieldworkPlan		Short Integer	5	

Table 3: Stormwater Pipes File Structure

Field Name:	Alias:	Data Type:	Length or Precision/Scale:	Domain:
Diameter		Short Integer	5	Diameter
Material		Text	20	SW_Material
Inlet_ID		Short Integer	5	
Outlet_ID		Short Integer	5	
Inlet_Elev		Double	38/8	
Outlet_Elev		Double	38/8	
Slope		Double	38/8	
Year_Installed		Short Integer	5	
Comments		Text	250	
created_user		Text	255	
created_date		Date	-	
last_edited_user		Text	255	
last_edited_date		Date	-	
ID		Short Integer	5	
Source		Text	50	
Type		Text	50	Pipe_Type
Roughness		Double	38/8	

Table 4: Stormwater Swales File Structure

Field Name:	Alias:	Data Type:	Length or Precision/Scale:	Domain:
Comments		Text	250	
created_user		Text	255	
created_date		Date	-	
last_edited_user		Text	255	
last_edited_date		Date	-	
Width		Short Integer	5	
Height		Short Integer	5	
Inlet_Elev		Double	38/8	
Outlet_Elev		Double	38/8	
Slope		Double	38/8	
Inlet_ID		Short Integer	5	
Outlet_ID		Short Integer	5	
Roughness		Double	38/8	

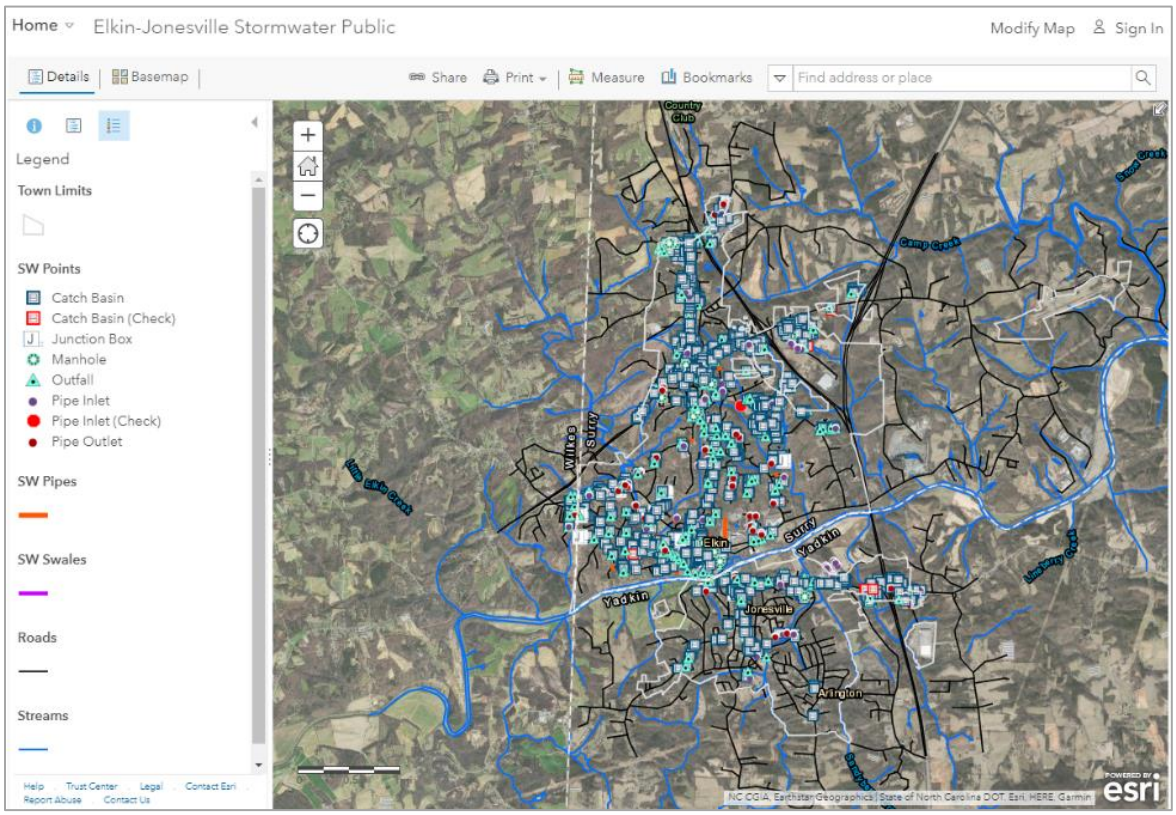
Table 5: Attribute Table Domains

Domain:	Condition		Diameter	Direction	Flag		NUM_Pipes	Owner			Pipe_Type	
Description:	*Visual Condition*		*Pipe Diameter*	*Flow Direction*	*Issues Noted*		*Number of pipe connections*	*Owner*			*Stormwater pipe type*	
Code & Description:	G	Good	2	N	0	0	1	T	Town	SL	Stormwater Line	
	F	Fair	4	S	1	Check old data	2	P	Private		CD	Culvert - Driveway
	NI	Needs Improvement	6	E	2	need PW staff	3	S	State		CR	Culvert - Road
			8	W	3	other	4					
			10	NE			5					
			12	NW								
			14	SE								
			15	SW								
			16									
			18									
			20									
			24									
			30									
			36									
			40									
			48									
			50									
			54									
			60									
			72									
			108									

SW_Box		**SW_Cover**		**SW_Material**		**SW_Outfall**		**SW_Structure**		**SW_Type**		**YesNO**	
Stormwater Box Material		*Stormwater Cover Type*		*Stormwater Pipe Material for Outlet/Inverts*		*Stormwater Outfall To*		*Stormwater Structure*		*Stormwater Point Type*		*Yes or No*	
B	Brick	G	Grate	C	Concrete	D	Ditch	E	Endwall	CB	Catch Basin	Y	Yes
C	Concrete	C	Concrete	CM	Corrugated Metal	DP	Detention Pond	EW	Endwall with Wings	JB	Junction Box	N	No
		MH	Manhole	CH	Corrugated HDPE	PL	Pond/Lake	H	Headwall	MH	Manhole		
				PVC	PVC	Str	Stream	HW	Headwall with Wings	PI	Pipe Inlet		
				T	Terracota	Sur	Surface	FES	Flared End Section	PO	Pipe Outlet		
				O	Other	O	Other	O	Other	OU	Outfall		
				S	Steel					CB_C	Catch Basin (Check)		
				SH	Smoothwall HDPE					PI_C	Pipe Inlet (Check)		

To increase use and ease of access to the dataset, the final stormwater infrastructure network was exported as a map service and brought into a web map in ArcGIS Online for public viewing. This web map can be accessed from any device with internet access at the following address:

https://ptrc.maps.arcgis.com/home/webmap/viewer.html?webmap=dcc1c3df37df45aa98872b1183009394



Other Stormwater Management Opportunities

While upgrading and properly maintaining stormwater infrastructure plays an important role in managing stormwater runoff, there are a number of additional ways to reduce stormwater flows. Several communities throughout North Carolina have begun installing or requiring stormwater control measures (SCMs), also known as best management practices (BMPs), to help absorb and treat stormwater onsite. SCMs are engineered devices that use natural processes, such as soil and vegetation, to capture, filter, slow, and reuse rain water, but can range greatly in design and function. Some examples include raingardens, street trees, bioretention cells, vegetated swales, or stormwater ponds. This approach to stormwater management is sometimes also referred to as low impact development (LID). The ability of these practices to deliver multiple ecological, economic, and social benefits or services has made them an increasingly popular strategy in recent years.

Bioretention Cell

Bioswale

Stormwater Pond

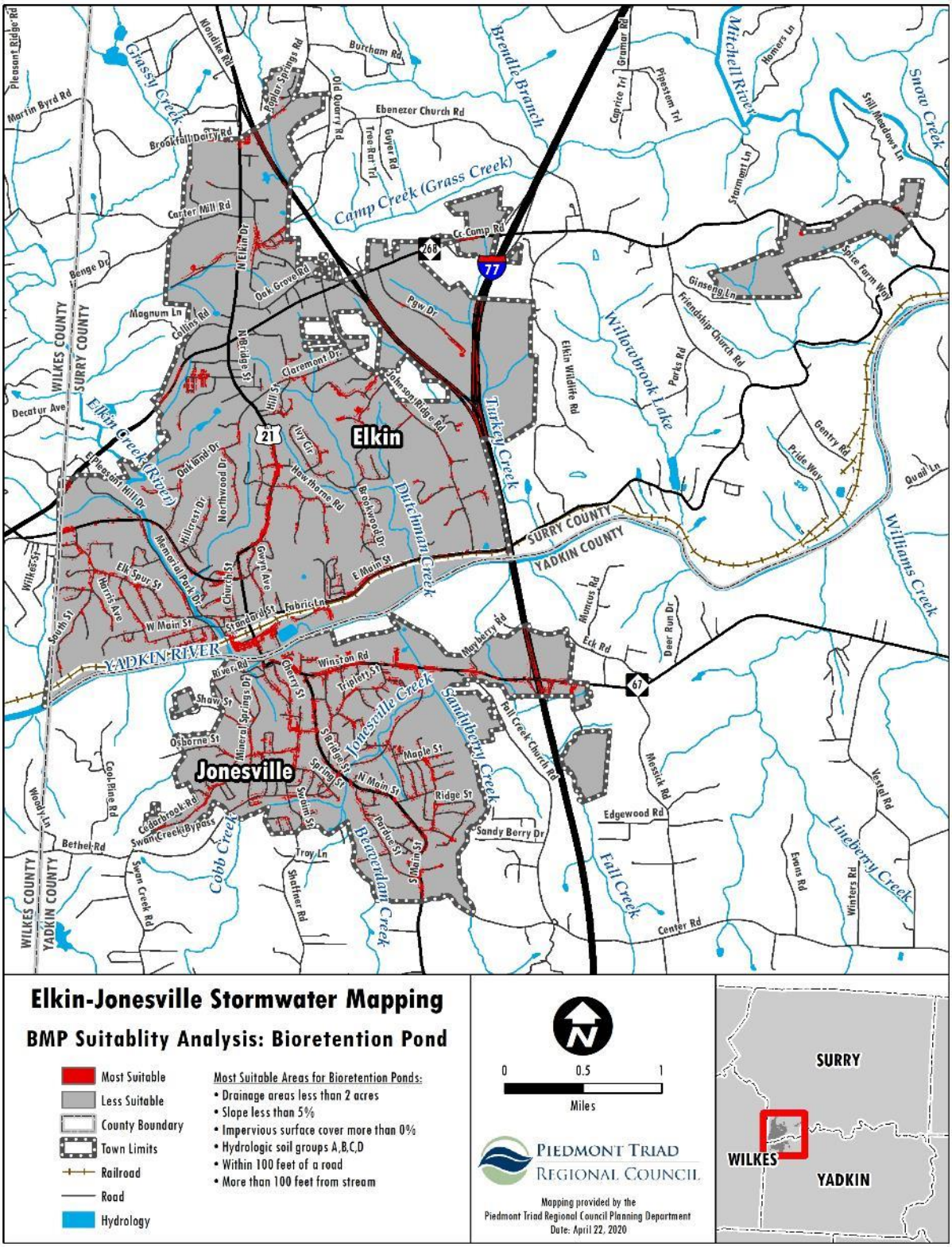
There are also a number of creative actions that individuals can take at their own homes or businesses to conserve natural resources. Simple acts, such as disconnecting downspouts that are directly connected to the storm drain system, installing rain barrels, or planting small raingardens can dramatically reduce stormwater loads. Many houses and businesses in Elkin and Jonesville have existing downspout connections that may be suitable for disconnection. Some communities have established creative programs to incentivize homeowners to reduce stormwater, including awards programs that recognize homeowners that implement green practices or financial assistance or rebate programs. Other communities have held events such as rain barrel workshops/giveaways and storm drain markings to remind residents that anything entering the storm drains flows directly into our streams. Homeowners can also help protect water quality and prevent localized flooding by picking up after their pets, bagging their leaves and grass clippings, and limiting fertilizers and pesticide use.

In order to supplement the stormwater infrastructure database, PTRC developed a GIS model to identify additional opportunities for stormwater management projects. Using criteria from the US EPA's *System for Urban Stormwater Treatment and Analysis IntegratioN (SUSTAIN) BMP Siting Tool*, this model overlays environmental and land use data to identify suitable locations for SCM projects. Only bioretention, grassed swale, porous pavement, and constructed wetland/wet pond projects were modeled for the purposes of this project. Maps 7-10 highlight areas where bioretention, grassed swale, dry pond, and constructed wetland projects may be suitable. These maps can be used by each town to help prioritize future stormwater management projects. Property ownership and costs should also be considered when weighing various projects, as certain stormwater BMPs are much cheaper than others and typically easier to implement on publically-owned land unless there is significant local buy-in.

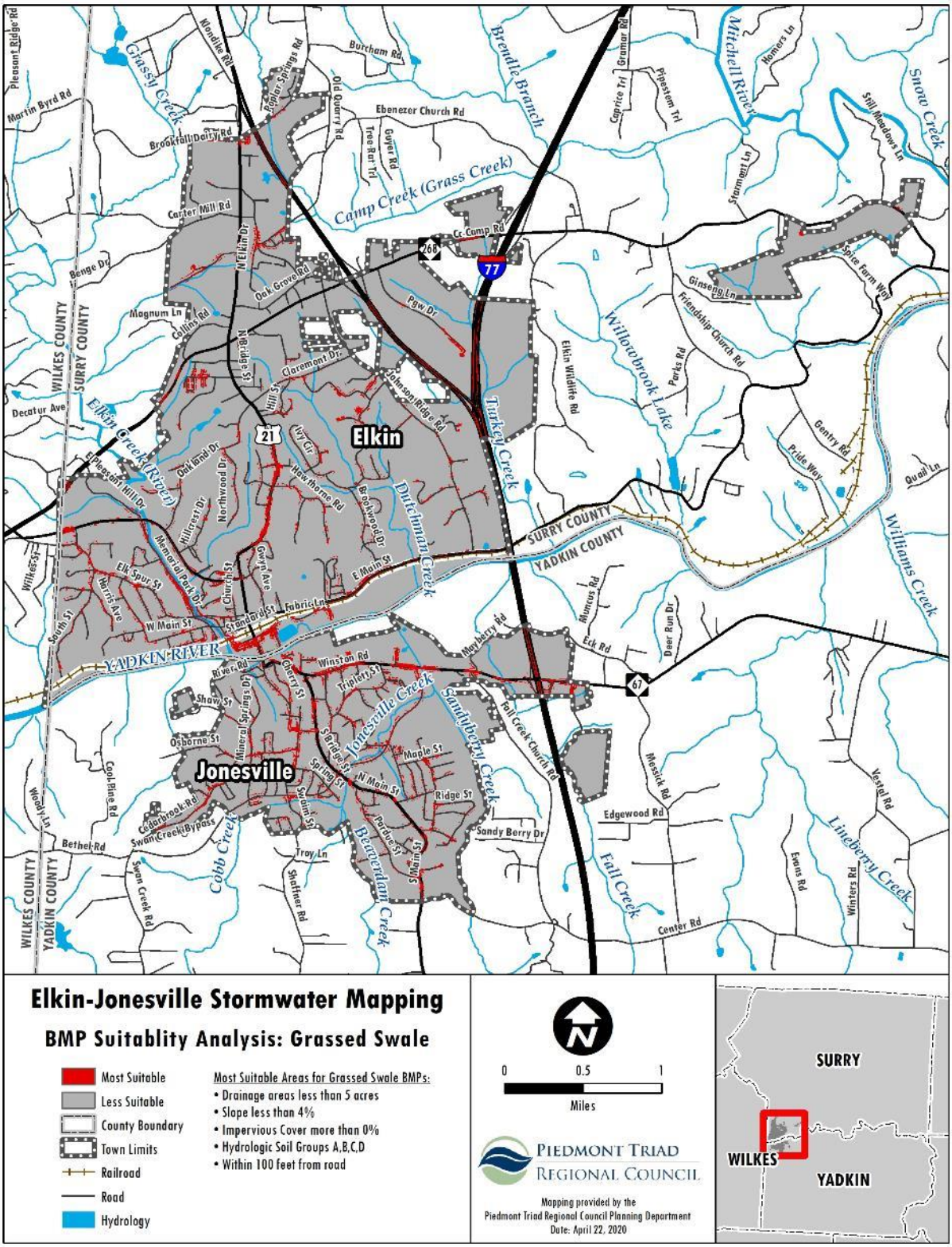
Table 6: Stormwater BMP Suitability Model Criteria

BMP type	Drainage area (acre)	Drainage slope (%)	Impervious (%)	Hydrologic soil group	Water table depth (ft)	Road buffer (ft)	Stream buffer (ft)	Building buffer (ft)
Bioretention	< 2	< 5%	> 0%	A–D	> 2	< 100	> 100	--
Cistern	--	--	--	--	--	--	--	< 30
Constructed Wetland	> 25	< 15%	> 0%	A–D	> 4	--	> 100	--
Dry Pond	> 10	< 15%	> 0%	A–D	> 4	--	> 100	--
Grassed Swale	< 5	< 4%	> 0%	A–D	> 2	< 100	--	--
Green Roof	--	--	--	--	--	--	--	--
Infiltration Basin	< 10	< 15%	> 0%	A–B	> 4	--	> 100	--
Infiltration Trench	< 5	< 15%	> 0%	A–B	> 4	--	> 100	--
Porous Pavement	< 3	< 1%	> 0%	A–B	> 2	--	--	--
Rain Barrel	--	--	--	--	--	--	--	< 30
Sand Filter (non-surface)	< 2	< 10%	> 0%	A–D	> 2	--	> 100	--
Sand Filter (surface)	< 10	< 10%	> 0%	A–D	> 2	--	> 100	--
Vegetated Filterstrip	--	< 10%	> 0%	A–D	> 2	< 100	--	--
Wet Pond	> 25	< 15%	> 0%	A–D	> 4	--	> 100	--

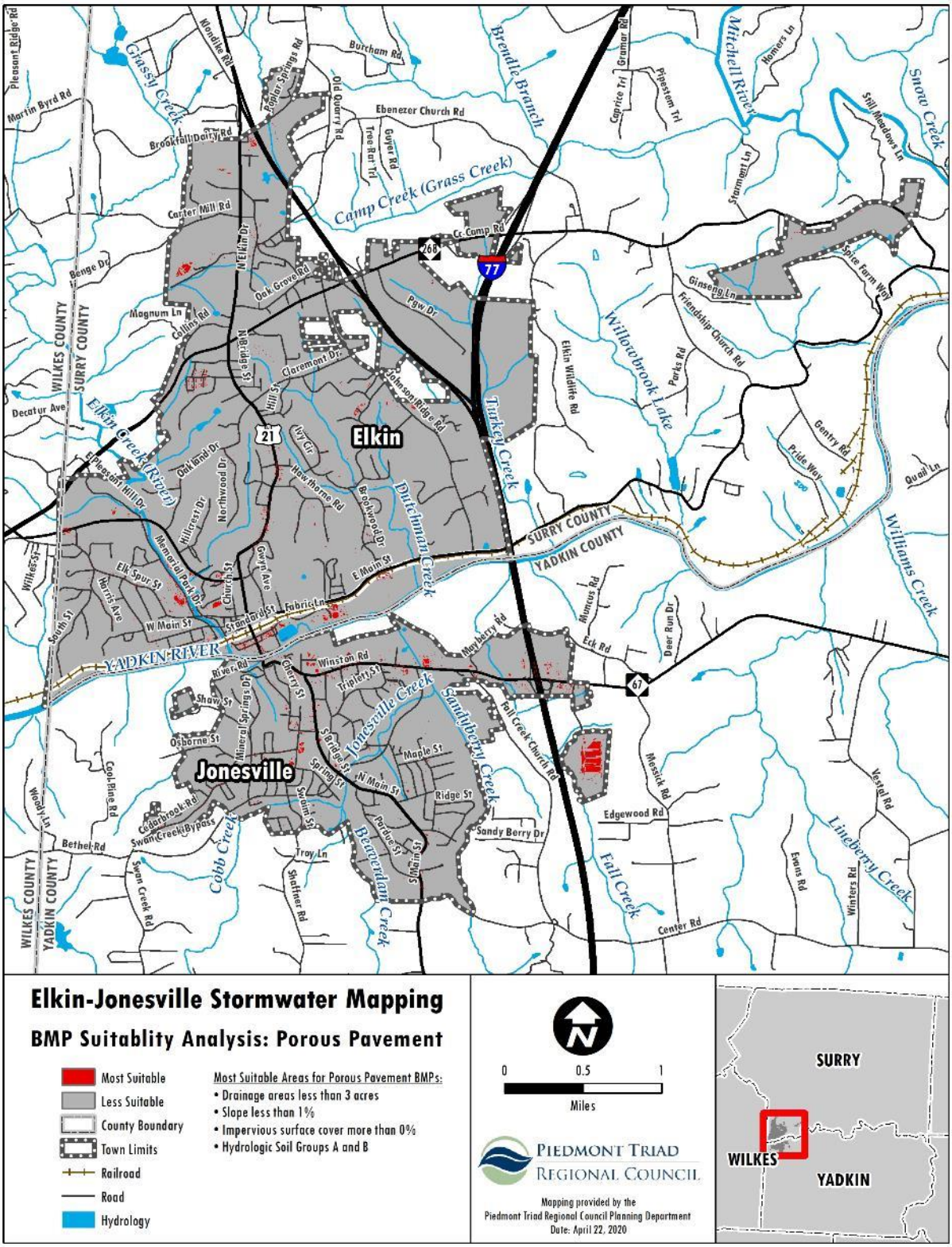
Map 7: Bioretention Project Opportunities



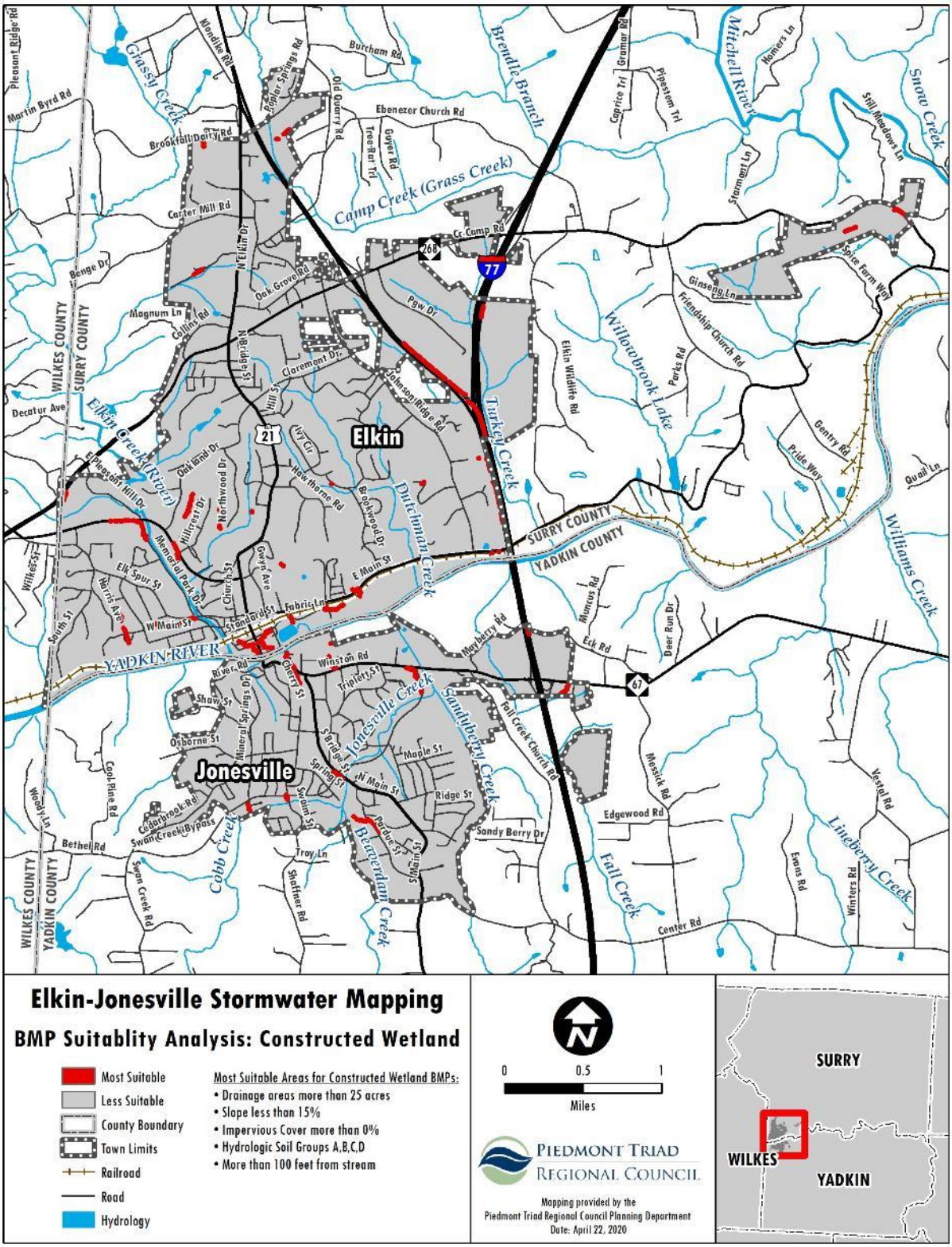
Map 8: Grassed Swale Project Opportunities



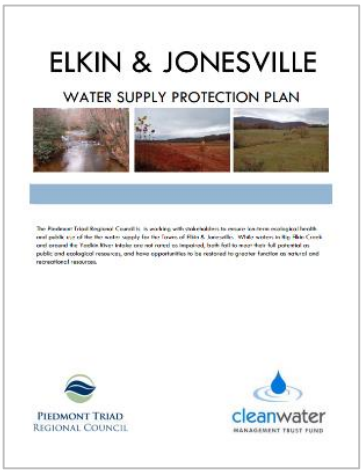
Map 9: Porous Pavement Project Opportunities



Map 10: Constructed Wetland Project Opportunities



In 2015, the PTRC also developed the *Elkin & Jonesville Water Supply Protection Plan* which provides a comprehensive assessment and set of recommendations to improve and protect local water supplies. As part of this report, PTRC identified several potential conservation and restoration projects that could best protect water quality conditions. These projects were reviewed to help further supplement the stormwater inventory and identify any projects that may align with stormwater management goals. Unfortunately, many of the proposed restoration projects from this report are located outside the town limits of Elkin and Jonesville. However, if implemented, these projects could help reduce flooding and erosion downstream.



While conducting fieldwork in Elkin, PTRC staff noted two sites that are particularly well suited for SCM improvements. At the corner of N. Bridge St. and Oak Grove Rd. are two concrete-lined swales that channel stormwater runoff from Oak Grove Rd. and the Elkin Village shopping center under N. Bridge St. These swales could be replaced with a raingarden to help better capture and treat stormwater runoff from the nearby parking lot.

Figure 1: Potential Raingarden at Corner of N. Bridge St. and Oak Grove Rd.

The parking lot across from the Elkin Public Library also tends to collect sediment at its southern end due to the slope of the parking lot, sidewalk on W. Main St., and lack of a stormwater inlet. If not regularly used, this section of the parking lot could be retrofit with a bioretention cell to help capture and treat stormwater runoff before it enters the stormwater collection system.

Figure 2: Potential Bioretention Cell near Elkin Public Library

Next Steps

Managing stormwater runoff can be a difficult task and often requires a multi-pronged approach that involves maintaining and upgrading existing pipes, updating development ordinances to address stormwater, and increasing public awareness about stormwater issues. By completing this project, the Towns of Elkin and Jonesville have taken a significant step forward in addressing this growing problem and can now begin resolving drainage issues and continue to build upon its stormwater management program. Using the information generated over the course of this project, Public Works staffs can begin addressing identified maintenance needs as they are able. This will help reduce clogs and improve stormwater flow during major storms. Known problem areas may require some additional investigation to determine upstream sources of erosion, debris, or stormwater.

It is recommended that both Towns then explore ways in which they can increase public awareness about stormwater issues, as there are many actions that local residents can take on their own properties to reduce stormwater runoff. Several organizations in Surry and Yadkin County are already doing this work and could partner with the Town to help meet stormwater education needs. These groups include Watershed NOW, the Yadkin Riverkeeper, Piedmont Land Conservancy, Surry & Yadkin Soil & Water, and Cooperative Extension. These partners may also be able to assist the Towns in identifying site-specific SCM projects that could be implemented to further reduce stormwater runoff and pursue state and federal funding to support such efforts. A comprehensive list of potential partners and funding sources has been provided below for the Towns' convenience.

Partners & Technical Assistance

Organization	Potential Role
Piedmont Triad Regional Council	• Locate and secure grant funding for follow-up studies and implementation • Planning assistance and expertise
Yadkin Valley Sewer Authority	• Help pinpoint and eliminate sources of I/I • Assist with water quality projects
Yadkin Riverkeeper	• Assist with water quality monitoring, outreach and education, and water quality projects
Surry & Yadkin County Soil & Water Conservation District	• Assist with stormwater outreach and education, particularly regarding agriculture
Surry & Yadkin County Cooperative Extension	• Assist with stormwater outreach and education, particularly regarding agriculture
Piedmont Land Conservancy	• Work with willing property owners to conserve land and protect water quality
NC Wildlife Resources Commission	• Provide free trainings for local officials on Green Growth strategies that reduce runoff and protect wildlife
NCDEQ-DWR	• Provide funding for water quality planning & stormwater management projects

Funding Sources

Funding can be one of the largest barriers to smaller municipalities when seeking to improve their stormwater management programs. Luckily, there are a number of state and federal grants that are specifically designated for projects that reduce stormwater runoff and improve water quality. Some of the most common grants for water quality projects include:

§205(j) Water Quality Management Planning Grants

Through the Section 205(j) Grant program, the U.S. Environmental Protection Agency provides states with funding for water quality planning. These projects can involve identifying the nature, extent and cause of water quality problems or doing planning work to address those problems. Projects can include, but are not limited to the development of EPA 9-Element Watershed Restoration Plans for a 12-digit or smaller USGS HUC, mapping stormwater infrastructure, conducting engineering designs for stormwater best management practices, and GIS-based watershed assessments of pollutant sources. 205(j) grants are eligible to regional Councils of Government, who can partner with any public sector organization to implement projects. Match is preferred, but not required.

Clean Water Management Trust Fund (CWMTF) Grants

The Clean Water Management Trust Fund provides grant assistance to conservation non-profits, local governments and state agencies for the protection of surface waters in North Carolina. The CWMTF funds projects that (1) enhance or restore degraded waters, (2) protect unpolluted waters, and/or (3) contribute toward a network of riparian buffers and greenways for environmental, educational, and recreational benefits, (4) provide buffers around military bases to protect the military mission, (5) acquire land that represents the ecological diversity of North Carolina, and (6) acquire land that contributes to the development of a balanced State program of historic properties. Match varies depending on the project, but is recommended as it increases applicant competitiveness.

NC Water Resources Development Grant Program

The NC Water Resources Development Grant program provides cost-share grants and technical assistance to local governments throughout the state. This grant program primarily funds general and recreational navigation, stream restoration, water management (SCMs, drainage, flood control, hydrologic restoration, etc), and water-based recreation projects (greenways, paddle access, fishing docks/piers, etc), as well as related preliminary feasibility or engineering studies. Applications are accepted throughout the year for two grant cycles during the spring and fall and there is a 50% match requirement.

Other Resources

A comprehensive list of financial resources, including grants, cost shares, and loans, has been compiled by NCDWR's Use Restoration Watershed Program in order to aid water quality project implementation. This list can be found at https://deq.nc.gov/about/divisions/water-resources/planning/basin-planning/use-restoration-watershed-programs/funding.

Depending on the level of need, the Towns of Elkin and Jonesville may also want to consider implementing a stormwater utility fee. Similar to water or sewer, stormwater utility fees help generate funds to support the construction, operation, and maintenance of stormwater systems. Rates are typically assessed based on the amount of impervious surface on a property. While not incredibly common in smaller towns, stormwater fees have been recognized as one of the best ways to generate local funds for stormwater maintenance and improvements. The University of Chapel Hill's Environmental Finance Center has a useful Stormwater Rates Dashboard that can be used to compare stormwater rates across the state. This dashboard can be accessed at: https://efc.sog.unc.edu/resource/2017-north-carolina-stormwater-rates-dashboard.