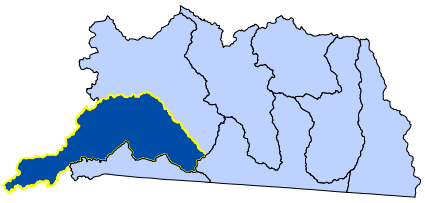
Green River Watershed



HUC's 0305010501 & 0305010502

Includes Joe Creek, Brights Creek, Walnut Creek & Whiteoak Creek

General Watershed Description

The Green River and its tributaries originate in Henderson and Polk Counties and flow into the Broad River near the Polk-Rutherford County line. Tributaries to the Green River include Joe Creek, Brights Creek, Hungry River, Britten Creek, Walnut Creek and Whiteoak Creek (Figure 7-2). From the headwaters to Rock Creek, the Green River is designated High Quality Waters (HQW). Further downstream, the river has been dammed in two locations to form Lakes Summit and Adger. Both reservoirs are used to produce hydroelectric power; neither is classified as a water supply watershed. The Green River Game Land and the Green River Preserve provide important protected areas to help maintain existing water quality throughout the watershed. Much of the watershed is forested; however, portions are rapidly being developed for second homes and recreational activities (Figure 7-1).

Watershed at a Glance

Counties

Henderson, Polk

Municipalities

Saluda, Columbus

Permitted Facilities

NPDES WWTP:	6
NPDES Nondischarge:	1
NPDES Stormwater:	6
Animal Operations:	2

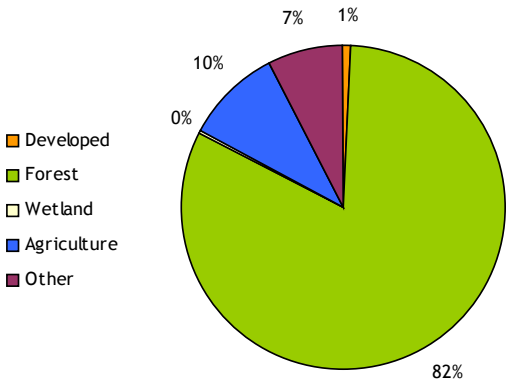
Monitored Stream Miles (AL)

Total Streams:	109.9 mi
Total Supporting:	109.9 mi
Total Impaired:	0 mi
Total Not Rated:	0 mi

Water Quality Overview

Of the 268 stream miles in the Green River watershed, 109 miles were monitored by DWQ. Of these waters, 100 percent are rated as Supporting for aquatic life. Main stressors in this watershed are habitat degradation and nutrient impacts due to construction activities and stormwater runoff (Table 7-1).

Figure 7-1: Green River Watershed Land Cover



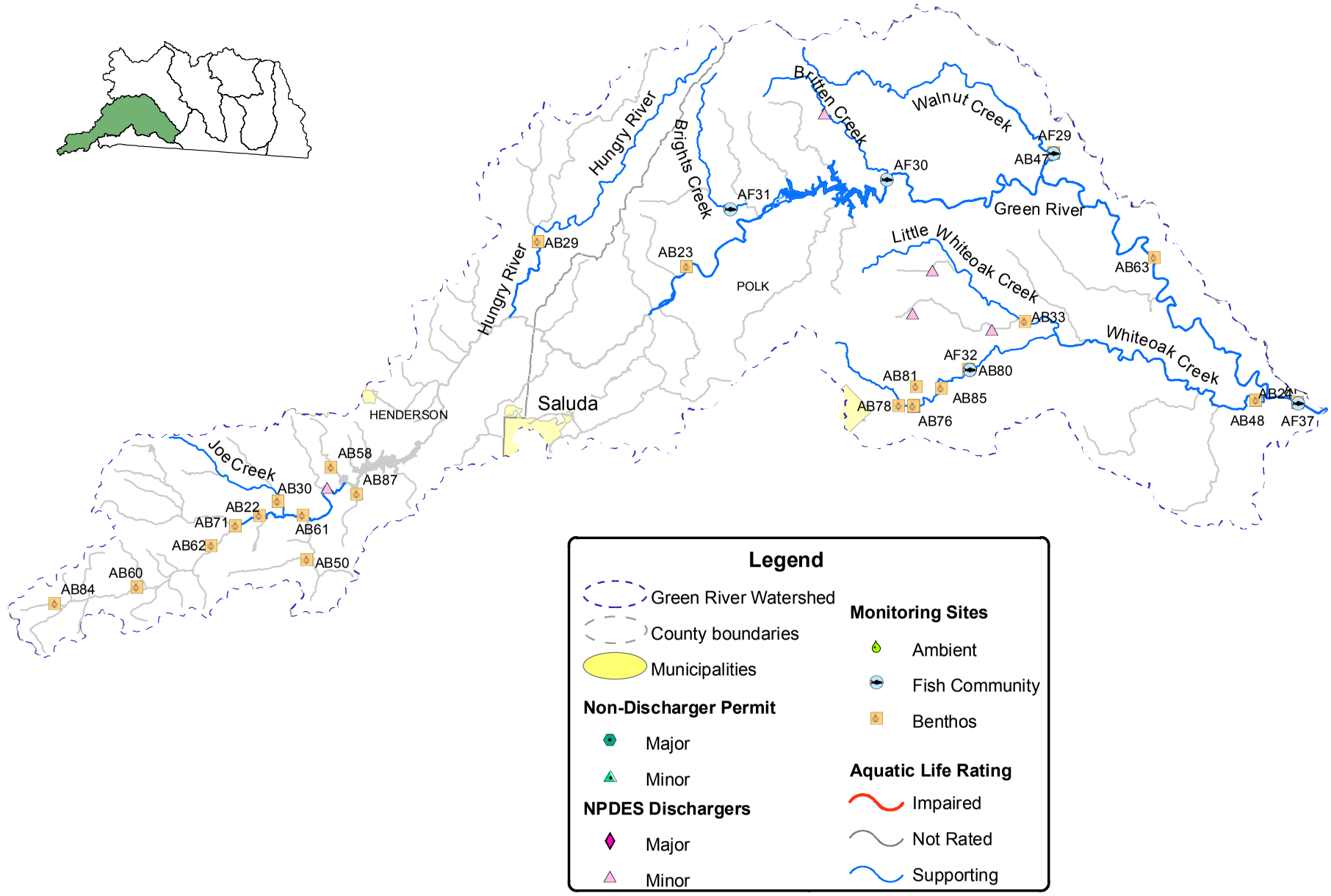
NRI: National Land Cover Data, 2001

Biological monitoring was conducted at nine basinwide sites, two of which were sampled for the first time in 2005. Benthic samples were also collected from three special study sites – Green River headwaters, Joe Creek and Little Whiteoak Creek.

No waters are Impaired in the Green River watersheds; however, sedimentation was observed in many of the streams and further investigation is needed to determine the status of the HQW designation of the Green River (Table 7-1). For more information on HQW designations, see ***Chapter 2*** of *DWQs Supplemental Guide to North Carolina's Basinwide Planning*.

There are six minor NPDES Discharge Permits within this watershed, not including a seventh facility (Six Oaks Complex) which has recently been built. Its first inspection was in February of 2007. Of the six Stormwater Permits, five of the facilities discharge to Whiteoak Creek and its headwaters.

Figure 7-2: Green River Watershed, HUC's 0305010501 & HUC 0305010502



Planning Section
Basinwide Planning Unit
April, 2008

How to Read this Document

This document was written to correspond with our new ***Online Geographic Document Distribution (OGDD)*** tool using Google Earth™. If you are unable to use Google Earth, this document provides maps and associated water quality information and a discussion of water quality trends occurring in the watershed. Google Earth™ is an independent software program which can be downloaded to a personal, business, and most local and state government computers; the program allows you to view satellite imagery of the earth's surface along with location identifiers. DWQ's Basinwide Planning Unit created a "transparency" add on layer to Google Earth™ with basinwide water quality data, which allows a user to locate their watershed, pinpoint a waterbody and use support ratings, find a location of a permit and provides links to PDF watershed reports. For more information on how to download Google Earth™ and DWQ's data visit ***DWQ's Basinwide Planning's OGDD*** website. Please contact Melanie Williams for more information at melanie.williams@ncmail.net or 919-807-6447.

Impaired streams are those streams not meeting their associated water quality standards in more than 10 percent of the samples taken within the assessment period (January 1, 2002 through December 31, 2006) and impacted streams are those not meeting water quality standards in 7 to 10 percent of the samples. The ***Use Support*** report provides information on how and why water quality ratings are determined and DWQ's "***Redbook***" describes in detail water quality standards for each waterbody ***classification***. For a general discussion of water quality parameters, potential issues, and rules please see "***Supplemental Guide to North Carolina's Basinwide Planning: Support Document for Basinwide Water Quality Plans***".

Appendix 7-A provides descriptions of Use Support ratings for all monitored waterbodies in the subbasin.
Appendix 7-B provides a summary of each ambient data monitoring station (THERE ARE NO AMBIENT STATIONS IN THIS WATERSHED).
Appendix 7-C provides summaries of biological and fish assessment monitoring sites.

Table 7-1: Monitored Stream Segments In The Green River Watersheds

AU Number	Stream Name	Length (miles)	Class.	2008 IR Category	Impaired	Impacted	Potential Stressors (Potential Sources)	DWQ Subbasin
9-29-(12.5)a	Green River	4.6	B; Tr	2	-	-		03-08-03
9-29-(33)	Green River	39.0	C	2	-	-	**Habitat Degradation,** (Construction) **Nutrient Impact** (Stormwater Runoff)	03-08-03
9-29-14	Joe Creek	4.6	B; Tr	2	-	-	**Habitat Degradation**	03-08-03
9-29-30	Hungry River	12.5	C; Tr	2	-	-		03-08-03
9-29-38-1	Brights Creek	5.3	C; Tr	2	-	-		03-08-03
9-29-43	Britten Creek	6.1	C	2	-	-		03-08-02
9-29-44	Walnut Creek	11.6	C	2	-	-		03-08-02
9-29-46	Whiteoak Creek	18.1	C	2	-	-		03-08-02
9-29-46-1	Little Whiteoak Creek	8.0	C	2	-	-	**Habitat Degradation,** (Animals, Construction)	03-08-02

*The 2008 IR Categories definitions can be found on the first page of Appendix 7-A

Current Status of Impaired & Impacted Waters

Green River AU#: 9-29-(12.5)a

Three benthic samples were collected in the Green River. Two (AB23 and AB24) are basinwide sites; one (AB22) was sampled at the request of DWQ regional office staff to evaluate the impacts of commercial and residential development on water quality above Lake Summit.

Located approximately three miles upstream of the lake, site AB22 received a Good-Fair bioclassification. Several samples were collected above Lake Summit in 1989 and 1993. All received a Good or Excellent bioclassification; however, the most recent Good-Fair shows a significant decline in water quality. Land cover in the area is predominantly agriculture

with some forest and residential areas nearby; however, development pressure is evident throughout the watershed. Substrate was a mix of boulder (15 percent), rubble (25 percent), gravel (15 percent), sand (35 percent) and silt (10 percent). Instream habitat was abundant; however, moderate streambank erosion and narrow riparian zones were identified as habitat problems. More sampling is warranted based on the close proximity of the HQW designation just upstream of the sampling reach (***BAU Memo, December 2005***).

Site AB23 is located between Lake Summit and Lake Adger and received a Good bioclassification, a slight improvement from the Good-Fair it received in both 1995 and 2000. Substrate is a mix of rubble (35 percent), boulder (20 percent), gravel (20 percent) and sand (25 percent). Instream habitat consisted of leafpacks, snags, undercut streambanks, and frequent pools and riffles. DWQ biologists also noted that the riparian zones were intact.

Site AB24 is located near the mouth of the Green River and has been sampled five times since 1987. In 1987 and 1989, the site received a Good bioclassification. Since 1995, however, the site has consistently rated Good-Fair. Even though the site has consistently rated Good-Fair, species number and type declined significantly in 2005, and DWQ biologists believe this decline is likely attributed to increased nutrient input and sediment from development activities in around Lake Adger. Substrate was a mix of rubble (45 percent), boulder (20 percent), sand (20 percent), gravel (10 percent) and some bedrock.

Joe Creek AU#: 9-29-14

Joe Creek is a small tributary to the Green River and was sampled as part of a follow-up to special studies conducted in 1989 and 2000. In 1989, site AB30 received a Good-Fair. In 2000, the site received an Excellent. In 2005, the site dropped back down to a Good-Fair. Substrate was a mix of rubble (35 percent), gravel (30 percent), sand (30 percent) and boulder (5 percent). Land cover is predominantly agriculture; however, like many watersheds in the Broad River basin, land cover is quickly changing to commercial and residential properties. DWQ biologists recommend additional monitoring on Joe Creek and throughout the Green River headwaters to evaluate the impacts to water quality from land cover changes.

Brights Creek AU#: 9-29-38-1

Site AF31 was sampled for the first time in 2005 and received a Good bioclassification. It was the smallest sub-watershed sampled in the Broad River basin and was originally identified as a potential regional fish reference site in 1998. However, during the time of sampling, DWQ biologists noted that the area nearby and immediately upstream of the site was being developed into a 4,500-acre (7 mi^2) residential golf club. When sampled on June 23, 2005, biologists observed that land clearing activities followed by a storm event had contributed to excessive turbidity and thick sediment deposits in the creek. A non-discharge permit has been issued to the Brights Creek Golf Club. The permit allows the facility to spray disinfected (ultraviolet disinfection) effluent onto the development's golf course. The DWQ regional office staff in the Aquifer Protection Section will be responsible for compliance evaluations on this facility.

Walnut Creek AU#: 9-29-44

Walnut Creek drains the extreme northeast corner of Polk County. Within the sampling reach, the DWQ biologists noted very diverse habitat. The lower one-third of the reach has a cobble and boulder substrate with riffles and a swift current. The upper two-thirds of the reach is shallower, slower moving, and the substrate is mostly sand. Site AF29 received an Excellent bioclassification in 2000 and 2005. DWQ biologists note that the watershed and the fish community are unique in that:

- Twenty-five species have been collected from the stream, including ten species of minnows, five species of suckers and four species of darters. It is only one of two streams in the basin where this many species have been collected;
- Six pollution intolerant species have been collected;
- Regional endemic species inhabiting the stream include three chub species and a darter;
- Two species (the brassy jumprock and the piedmont darter) are rare to uncommon in the basin; and
- Only one non-native (exotic) species was collected from the stream.

Site AB47 received a Good bioclassification. Species collected in 2000 (Excellent) and 2005 (Good) are indicative of a minimally impacted stream segment. The slight difference in rating may be due to seasonality and scouring that likely occurred during the 2004 hurricane season. Sediment was identified as a habitat concern for the Walnut Creek watershed.

Whiteoak and Little Whiteoak Creeks AU#: 9-29-46, 9-29-46-1

Whiteoak Creek drains central Polk County, which includes the Town of Columbus. Sites AF32 and AB48 received Good bioclassifications. Ten fish species were collected at site AF32. This included both pollution tolerant and intolerant species with the bluehead chub being the dominant species. The bluehead chub is often an indicator of nutrient enrichment; therefore, nutrients are identified as a concern for this watershed. Site AB48 has been sampled five times since 1986. The site was rated Good-Fair in 1986, but subsequent years have resulted in a Good bioclassification. The substrate is a mix of rubble, boulder and gravel (50 percent) and sand (50 percent). Fewer species were collected in 2005 when compared to previous years of sampling indicating a decline in water quality. DWQ biologists identified sediment as a concern for the Whiteoak Creek watershed.

Little Whiteoak Creek is a tributary to Whiteoak Creek and was sampled as a special study site to evaluate impacts from development activities in the watershed. Site AB33 received a Good-Fair bioclassification. Several pollution tolerant and intolerant species were collected; however, animal waste in the stream likely contributed to the Good-Fair rating. Within the sampling reach, cattle had unlimited access and riparian zones were limited due to agricultural activities along both sides of the stream. Livestock exclusion is recommended along Little Whiteoak Creek to prevent further degradation of the stream.

Recommendations for these waters can be found later in this chapter.

Significant Non-Compliance Issues

Upon request, DWQ provides technical assistance to facilities that are interested in upgrading or changing their treatment procedure. DWQ technical assistance is provided to ensure that the facility remains in compliance with the permitted limits while also exploring other treatment options. The Town of Columbus' WWTP (Permit NC0021369) requested DWQs assistance in August 2007. DWQ provided guidance on flow measurements and composite sampling and advised the installation of an automatic bar screen to improve the performance of the secondary clarifier. The Town is also in the process of obtaining funds to perform a feasibility study for a regional wastewater treatment plant for the Towns of Columbus, Tryon and Saluda. The study will evaluate the feasibility of treating all of the towns' wastewater at the Tryon WWTP and eliminating the other two (Columbus and Saluda WWTPs). DWQ staff believes that a countywide system would be an asset to Polk County residents and support the efforts of the Town of Columbus to efficiently and effectively treat wastewater in their area.

No significant non-compliance issues were identified within the Green River watersheds.

Local Initiatives

NC Agriculture Coast Share Program

The NC Agriculture Cost Share Program (NCACSP) was established in 1984 to help reduce agricultural nonpoint runoff into waters of the state. The program helps landowners and renters of established agricultural operations improve their on-farm management by using approved agricultural BMPs. BMPs include vegetative, structural or management systems that can improve the efficiency of farming operations while reducing the potential for surface and groundwater contamination. The NCACSP is implemented by the Division of Soil and Water (DSWC), which divides the approved BMPs into five main purposes or categories:

- Erosion Reduction/Nutrient Loss Reduction in Fields;
- Sediment/Nutrient Delivery

Table 7-2: BMPs Installed through NCACSP

Purpose of BMP	0305010502		0305010503	
	Total Implemented	Cost	Total Implemented	Cost
Erosion Reduction/ Nutrient Loss Reduction in Fields	0.95 acres	$13,045	8.9 acres	$1,200
Sediment/Nutrient Delivery Reduction from Fields	1 unit	$5,140	--	--
Stream Protection from Animals	2 unit 600 linear feet	$10,185	3 units 5,234 linear feet	$16,796
Proper Animal Waste Management	--	--	--	--
Agricultural Chemical Pollution Prevention	1 unit	$2,789	2 units	$18,627
Total Costs		$31,159		$36,623
Benefits (lb.)	**0305010502**		**0305010503**	
Total Soil Saved (tons)	98		7	
Total Nitrogen (N) Saved	255		9	
Total Phosphorus (P) Saved	185		--	
Total Waste-N Saved	853		--	
Total Waste-P Saved	377		--	

Reduction from Fields;
- Stream Protection from Animals;
- Proper Animal Waste Management; and
- Agricultural Chemical (agrichemical) Pollution Prevention.

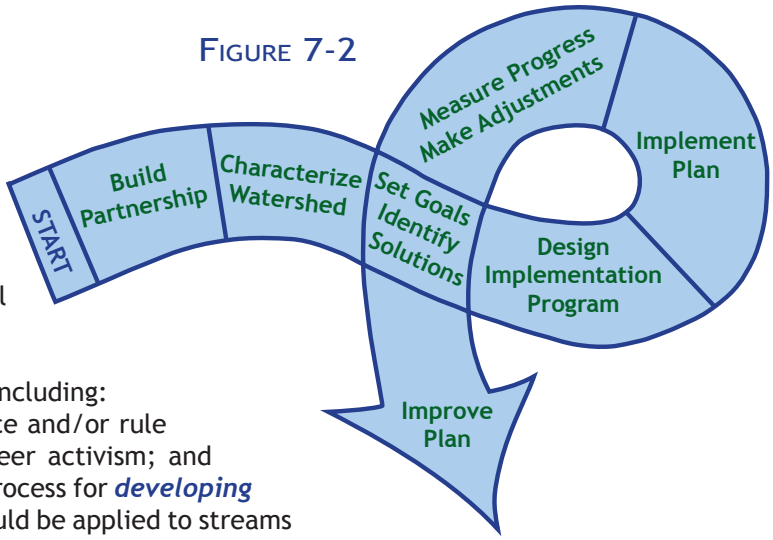
The NCACSP is a voluntary program that reimburses farmers up to 75 percent of the cost of installing an approved BMP. The cost share funds are paid to the farmer once the planned BMP is completed, inspected and certified to be in accordance with NCACSP standards. The annual statewide budget for BMP cost sharing is approximately $6.9 million. During this assessment period, $67,782 was allocated for BMPs in the Green River watershed. Table 7-2 summaries the cost and total BMPs implemented.

Recommendations

Habitat Degradation

In most cases habitat is degraded be the cumulative effect of several stressors acting in concert. These stressors often originate in the upland portions of the watershed and may include impervious surfaces, sedimentation and erosion from construction, general agriculter, and other land disturbing activities.

Figure 7-2



Many tools are available to address habitat degradation including: ***urban stormwater BMPs***; ***agricultural BMPs***; ordinance and/or rule changes at the local, state, and federal level; volunteer activism; and education programs. Figure 7-2 illustrates the general process for ***developing watershed restoration plans***. This process can and should be applied to streams impaired or impacted by habitat degradation. Interested parties should contact the ***Basinwide Planning Program*** to discuss opportunities to begin the planning and restoration process in their chosen watershed.

Nutrient Impact

Nutrients refer to phosphorus (P) and nitrogen (N), which are common components of fertilizers, animal and human waste, vegetation, aquaculture and some industrial processes. Nutrients in surface waters come from both point and nonpoint sources including agriculture and urban runoff, wastewater treatment plants, forestry activities and atmospheric deposition. While nutrients are beneficial to aquatic life in small amounts, excessive levels can stimulate algal blooms and plant growth, depleting dissolved oxygen in the water column.

Nutrient impacts in this watershed are mainly from agriculture, commercial and residential property stormwater runoff. Riparian buffers are needed along streams to filter excess nutrients and other contaminates before the runoff reaches the stream. Excessive fertilizing of residential lawns and golf courses also significantly impacts water quality. Education, along with encouraging the use of riparian buffers, can reduce the amount of phosphorus and nitrogen entering surface waters.

References & Supporting Documentation

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