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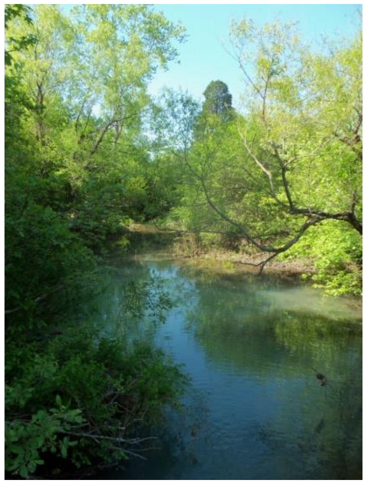


DYKES CREEK WATERSHED MANAGEMENT PLAN

Acknowledgements

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Georgia Environmental Protection Division

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Executive Summary

Dykes Creek flows into Etowah River in Floyd County and its watershed includes land in the northeastern Floyd County and a small portion of Bartow County. By the early 2000's, the stream water had been degraded by fecal coliform contamination and sediment and failed to meet the state criteria for pathogens and impacted biota. An overall plan to decrease fecal coliform and sediment loading in the watershed has been developed using data collected from Dykes Creek. This data includes water quality data, stream macroinvertebrate data, and field observations of the condition of the watershed, examination of aerial photography and land use databases from satellite sources. The plan includes the Nine Key Elements as recommended by the Environmental Protection Agency and outlines a process for implementing the load reductions necessary for returning the watershed to a cleaner, better-functioning landscape.

Sources of nonpoint pollution to the creek were identified to be unpaved roads and a poorly functioning culvert in the upper watershed, bauxite mine-tailing piles, agricultural in the form of pasture, and residential septic systems. These nonpoint pollution sources may be managed in several ways. Roads could be paved and the culvert replaced by working with the county government. The mine tailings piles could be stabilized reshaping the surface and returning the area to native forest vegetation. Existing programs, such as those developed by the Natural Resources Conservation Service, have Best Management Practices for sediment and fecal coliform management, which include development of off stream watering facilities for livestock, fencing to protect stream banks, restoration of riparian vegetative buffers, and streambank restoration. Reduction in fecal coliform into the stream from residential sources could be achieved by fixing septic systems, running a septic tank pump-out program, and holding homeowner workshops with the help of the North Georgia Health Department. An Adopt-A-Stream program in watershed is planned to help educate the public, and other forms of public outreach, such as stream cleanups, could be included. This plan includes monitoring as restoration projects are implemented to show whether the Best Management Practices have been effective in controlling sediment and fecal coliform.

To determine what level of funding that would be appropriate to restore the stream, an estimate of the total cost of fixing all the problems in the watershed was calculated. Then a percentage of this total was selected, 60%, to balance cost with progress toward improvement, and that amount was broken into 3 grant cycles over several years. The plan is designed in this way to provide a planned, comprehensive treatment of the watershed instead of piecemeal approach. As work is completed, reevaluation of the stream's condition by monitoring the water will be done, and grant request process can be adjusted.

The state of Georgia actually delisted the creek for fecal coliform in 2012. Dykes Creek is still listed for sediment/macroinvertebrate community impairments. The goal of this Watershed Management Plan is to delist Dykes Creek for the sediment impairments and keep the stream from being placed back on the impaired list for fecal coliform. This will be done by improving the management of the watershed by completing on-the-ground projects to control nonpoint source pollution, and through education and outreach programs.

Section 1: Plan Preparation and Implementation

The purpose of this Watershed Management Plan is to improve the water quality in Dykes Creek and thus the larger river that it flows into, the Etowah, which is used for fishing, boating and drinking water supply. The eventual goal is the removal, or delisting, of Dykes Creek from Georgia's list of impaired streams and rivers. To achieve this long-term goal, public managers and citizens must be made aware of the impairments in the creek, the sources of these impairments on the landscape, and what can be done to correct problems and improve the management of the land in the watershed. By identifying issues to be solved, managers can plan projects and secure funding to address these issues. Another goal is to help public managers and citizens to work together on these problems, and to educate the public about protecting our shared water resources, which benefit all of us in the present and which are a heritage to future generations.

The development of this WMP coincides with a state-wide effort by Georgia Environmental Protection Division (EPD) to update all Total Maximum Daily Load (TMDL) Implementation Plans to include the nine key elements (described below) as recommended by the US Environmental Protection Agency (EPA). The nine key elements are a recommended new addition to these documents to help ensure that stakeholder involvement and approval lead to an explicit prescription to eventually meet watershed restoration objectives. The nine key elements are shown below:

1. An identification of the sources or groups of similar sources contributing to nonpoint source (NPS) pollution to be controlled to implement load allocations or achieve water quality standards.

2. An estimate of the load reductions needed to delist impaired stream segments;

3. A description of the NPS management measures that will need to be implemented to achieve the load reductions established in the TMDL or to achieve water quality standards;

4. An estimate of the sources of funding needed, and/or authorities that will be relied upon, to implement the plan;

5. An information/education component that will be used to enhance public understanding of and participation in implementing the plan;

6. A schedule for implementing the management measures that is reasonably expeditious;

7. A description of interim, measurable milestones (e.g., amount of load reductions, improvement in biological or habitat parameters) for determining whether management measures or other control actions are being implemented;

8. A set of criteria that can be used to determine whether substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether the plan needs to be revised.

9. A monitoring component to evaluate the effectiveness of the implementation efforts, measured against the criteria established under item (8) above.

The individuals in Table 1.1 represent the various agencies and organizations that showed interest in working on the issues concerning Dykes Creek. Included in this list are representatives of local, state and federal government, higher education, and private groups advocating for the protection and enhancement of streams and rivers.

Table 1.1. Stakeholder committee members who participated in the WMP development.

WATERSHED ADVISORY COMMITTEE MEMBERS		
Name	**Title/Main Affiliation**	**Email Address**
John Boyd	Utilities Manager/Floyd County Water Department	boydj@floydcountyga.org
Eric Lindberg	Water & Environ Prog/Rome Water & Sewerage	elindberg@romega.us
Leigh Ross	Director/Rome Water & /Sewerage	lross@romega.us
Sherri Teems	District Conservationist/NRCS	sheri.teems@ga.usda.gov
Joe Cook	Upper Coosa Basin Riverkeeper/CRBI	jcook@coosa.org
Amos Tuck	Program Coordinator/CRBI	atuck@coosa.org
Clinton Agnew	Board member/CRBI	chagnew@comcast.net
Keith Mickler	Floyd Co. Ag. Ext. Agent/UGA Coop. Extension	mickler@uga.edu
Mike Pitts	Floyd County Environmental Health	william.pitts@dph.ga.gov
Ricky Ensley	Polk County Ag .Ext. Agent/UGA Coop. Extension	rensley@uga.edu
Susan Monteleone	Shorter University	smonteleone@shorter.edu
Michael Crosby	Shorter University	Mcrosby@shorter.edu
Katie Owen	Field Manager/The Nature Conservancy	kowens@tnc.org
Leighann Gaines	Polk County Environmental Health	leighann.gaines@ga.gov.dph

Section 2: Dykes Creek Watershed Description

2.1 Landscape Features

Watershed Description

Dykes Creek begins in Floyd County near the foot of the eastern side of Armstrong Mountain. The creek flows southward, collecting the drainage from the eastern sides of Armstrong and Ward Mountains, which are probably the most prominent topographical features in the watershed. Dykes Creek continues south by southeast, flowing through Halls Lake, a man-made reservoir in the Morrison Campground area, and continuing southward to the Etowah River. The watershed drains an area of 10,944 acres. The watershed is shown in Figure 2.1, with the main stem of the creek shown in dark blue, and many unnamed tributaries in light blue shown entering the creek as it flows southward.

Dykes Creek is within the Ridge and Valley physiographic region. The ridges in this area are typically composed of chert and capped sandstone, while the valleys are usually limestone or shale. The thicker, more fertile soils typically form in the valleys from erosion of soil at higher elevations and the weathering of parent material. The weathering of sandstone and chert on ridges helps form the acidic soils which support the forested areas of this region.

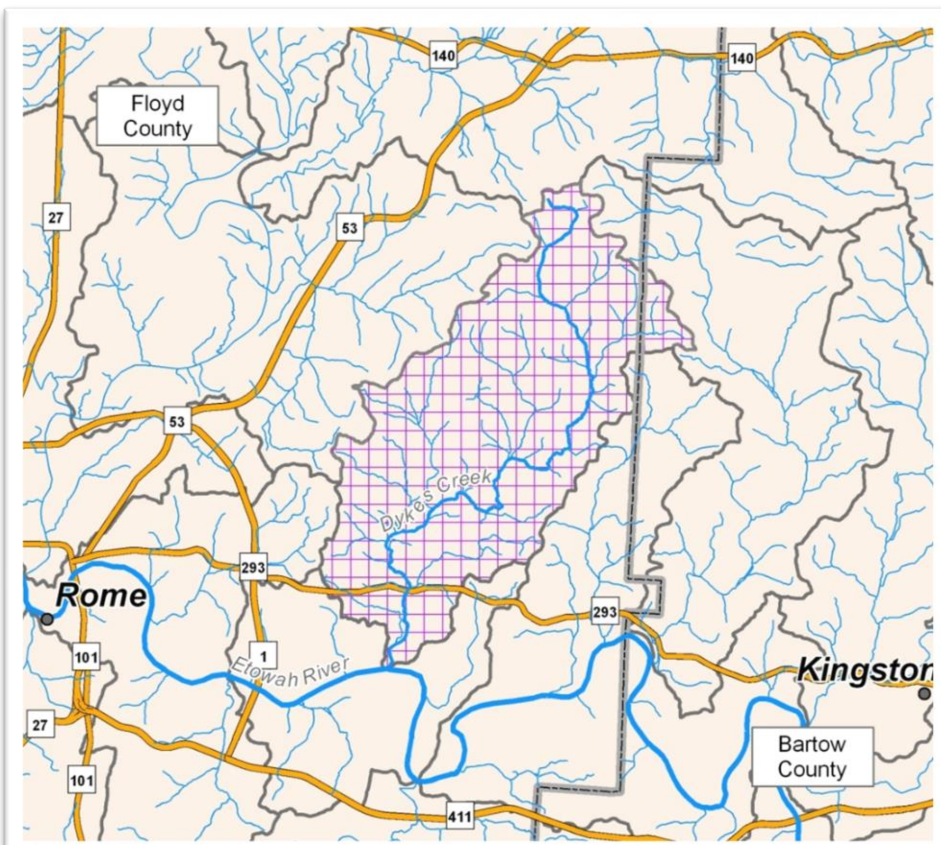


Figure 2.1. Map of Dykes Creek watershed, Floyd and Bartow Counties, Georgia

Watershed Geology and Soils along Dykes Creek

Almost all of Dykes Creek watershed is over the Knox Formation, which contains Longview Limestone, Chepultepec Dolomite, and Copper Ridge Dolomite. This geology causes streams on the ridges to dry up periodically, because the water is moving underground in the porous rock (Cressler, 1970). This happens seasonally, in the dryer part of the year. In addition, field observations comparing summer 2011 to summer 2013, show that in wet years, more of the channel is flowing aboveground. The limestone parent material probably contributes to the basic soils found in the lower parts of the watershed.

According to the 1978 Soil Survey for Chattooga, Floyd, and Polk counties, the main stream of Dykes Creek does not traverse a wide variety of soils, until it reaches the vicinity of Morrison Campground, below which it courses through a number of soil types. The headwaters arise in an area of Shack soils at the top of Armstrong Mountain. Shack soils form in material weathered from cherty limestone, interbedded with small amounts of sandstone, siltstone, and shale, and are moderately acid. There is no sampling site within the Shack soil area, due to the paucity of water in the tiny branches.

The northern reaches of the creek below the headwaters tend to be bordered by Subligna soils, which formed in colluvium from weathered sandstone, shale, and siltstone. Most Subligna soils are somewhat gravelly, and strongly acid. Soils along the creek as it descends from Firetower and Flowery Branch Roads are in the Subligna series. The East Hermitage Road, Wayside Road, McClain Road, and Gentry Road sampling sites lie within this long, narrow band of Subligna soils.

The Gentry Road Tributary runs through Wax, Fullerton, and Shack series, all in the vicinity of the sampling site.

Just southwest of the intersection of Gentry and McClain Roads, Subligna soils give way to an area of Chewakla silt loam, a poorly drained soil formed in alluvium from limestone, cherty limestone, sandstone, shale or siltstone. The Morrison Campground Road, Fred Kelley Road, and Kingston Road sampling sites lie within the Chewakla silt loam area. The Morrison Campground Road 2 site is located in an area of Chewakla or Subligna soils, which of the two is not clear from the map.

A short distance below the Morrison Campground Road sampling site is Halls Lake, a small impoundment bordered by Shack, Rome, Fullerton, Bodine, Roanoke, and Wax associations. Roanoke, Rome and Wax associations are alluvial soils, and may represent the soil bordering the original channel.

Below Halls Lake, Dykes Creek flows through an area of Roanoke silt loam, and continues southward through a short stretch of Toccoa fine sandy loam, another alluvial soil, weathered from limestone, cherty limestone, shale, and siltstone. Below the Toccoa soil, the creek flows through Decatur loam, formed in residuum weathered from non-cherty dolomitic limestone and old valley fill material.

Between the Decatur loam area and the Etowah River, the creek passes over mainly Chewacla soil. Kingston Road is the only sampling site in the interval.

Stream conductivity measurements show a reasonable relationship to soil pH levels. In the northern reaches where the soil type is acid, the conductivity is low. Further downstream the conductivity is higher where basic soils occur. This suggests that the changes in conductivity observed are naturally occurring and not caused by human activity.

Climate, Stream flow and Groundwater

The Soil Survey for Chattooga, Floyd, and Polk Counties (1978), describes the climate as moist and temperate with an average daily minimum temperature of about 30◦ F in February, and an average daily maximum temperature of 89◦ F in August. About 52 inches of precipitation fall annually and are somewhat evenly distributed throughout the year, although winter and spring are often the wettest seasons. Snowfall is rare, except on the mountains. The abundant precipitation contributes to the presence of many perennial streams on the landscape, and stream flow levels closely follow precipitation. Heavy winter and spring rainfall can lead to major runoff events and high stream flows. Much of the precipitation percolates through the soil and moves dissolved or suspended materials downward, leaving the soils generally low in bases. Plant remains decay rapidly, and produce organic acids that hasten the breakdown of minerals in the underlying rock.

Most of Dykes Creek has a rocky bottom, with riffles and pools. Although Dykes Creek is perennial in the lower reaches, the geology of the area affects the flow in the upper reaches. As discussed in the Geology and Soils section, streams may disappear underground in the limestone and dolomite rock that underlies Dykes Creek watershed. In dryer years the uppermost part of Dykes Creek may be completely without above-ground water; the visual survey of July 2011 found no water above the Morrison Campground Road #2 crossing. In July of 2013, which was a wetter year, Dykes Creek was flowing in the upper reaches around Hermitage Road and Wayside Road, but went underground around McCain Road and stayed underground until the area around Morrison Campground. The channel in this middle reach of the stream was dry, with isolated pools in places. Since no major agricultural withdrawals are known to exist on the creek, it is reasonable to conclude that the underlying geology contributes to this sporadic flow. A geology professor from Dalton State College, Jean Johnson, viewed the watershed in January of 2014 and concluded that several small pools may be sinkholes, which are characteristic of karst topography. In particular, she noted that a large hole in the streambed just below the McClain Road bridge is probably a sinkhole. This hole is in the stretch of the river that goes completely dry in the summer.

Stream flow data at Kingston Highway Bridge, in the lower perennial reaches was collected with water quality data in 2005 by the state and is shown in Figure 2.2. Dykes Creek is a small stream with non-storm flows below 5 cubic feet/second (cfs), but when storms do occur, the flow can swell to values in the 30's or higher. A USGS gage was located off of Fred Kelly Road just upstream of the Kingston Highway site in the 1930's and 1940's, and the mean monthly discharge in Figure 2.3 shows similar summertime flows. Although the stream flow data in Figure 2.3 is many decades old, it shows that heavy winter and spring storms combined with lack of water uptake by dormant deciduous trees can cause surges in stream flow that are many times higher than base flow.

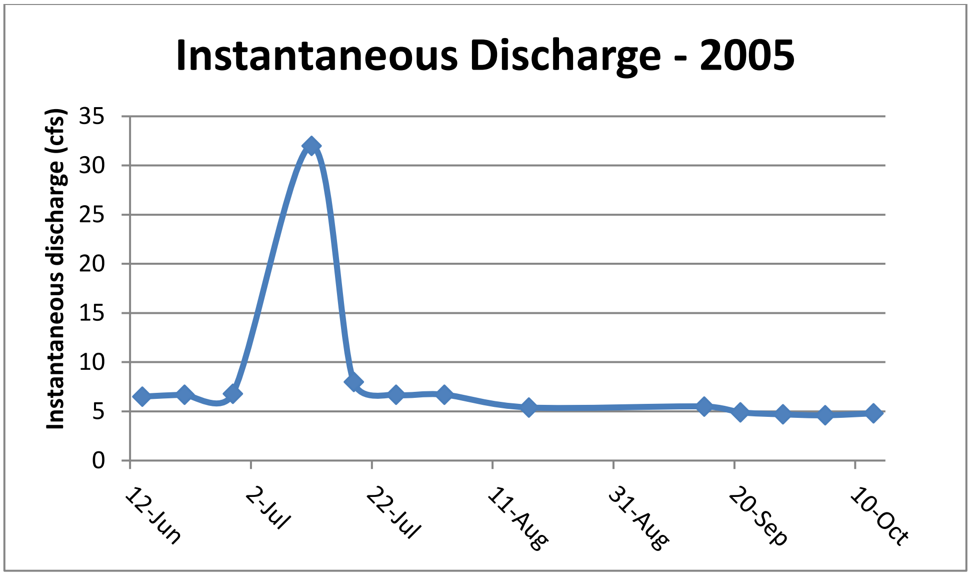


Figure 2.2 A display of the instantaneous discharge (flow) in Dykes Creek at Kingston Highway (SR 293) during summer and fall of 2005. Source: USGS

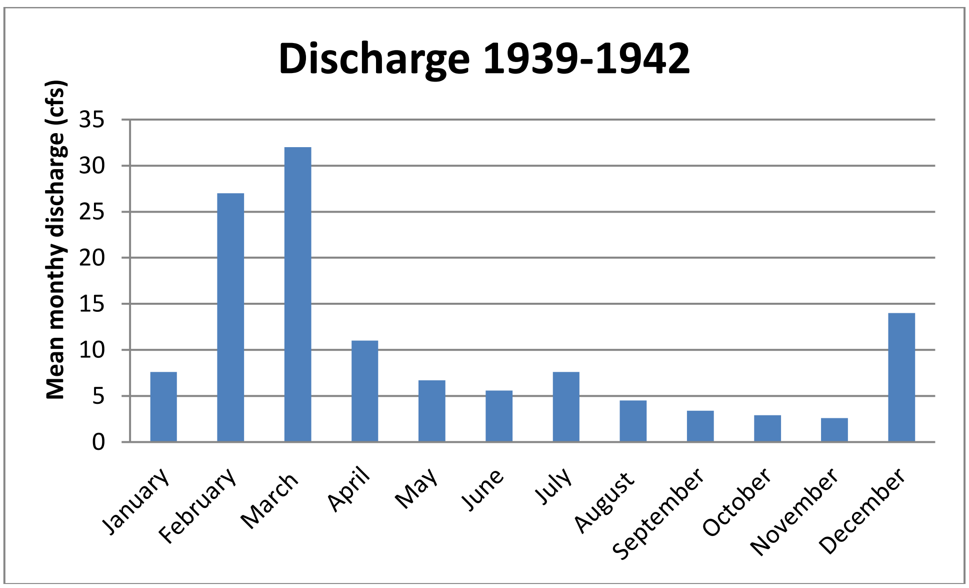


Figure 2.3. A display of the mean monthly discharge (flow) for Dykes Creek off of Fred Kelly Road for the years 1932-1942. Source: USGS

The Morrison Campground Spring, one of four major springs in Floyd County, contributes to the reappearance of good flow in Dykes Creek in the Morrison Campground area in the southern portion of the watershed. Conversations with local residents have identified it as a historically important water source. Its flow in 1970 was 0.85 million gallons/day. At that time it was used as a water source for the Morrison Campground summer camp (Cressler, 1970).

2.2 Important Flora and Fauna

Forest Ecosystems

Forest cover, at 65.9%, is the largest land use category in the Dykes Creek watershed. In general, in the Ridge and Valley Province, forests are mixed conifer and hardwoods. Ridges tend to have hardwoods and the valleys and lower slopes include loblolly and Virginia pines (Georgia Statewide Assessment of Forest Resources). On the slopes hardwood species include oaks and hickories, with a variety of other species such as maples, dogwood, and sourwood. In the stream valleys a large diversity of tree species can be found, including tulip poplar, beech, elms, ashes, box elder, red maple, black walnut and sycamore (Norman, 2000). In the Dykes Creek riparian zone, trees observed at sampling sites include oaks (such as water oak), loblolly pine, eastern red cedar, sweetgum, hackberry, sycamore, willow, alder (see Figure 2.4) and lots of invasive Chinese privet. In fact, Chinese privet is present at each of the nine sites and dominates the understory at several of the sites (Figure 2.5).

Figure 2.4. Alder in bloom at Wayside Road crossing of Dykes Creek (DC 8). Note milky appearance of water at this site.

Figure 2.5. Thick stand of Chinese privet at Gentry Road tributary (DC 5).

Wildlife and Habitat

Forest species of interest occurring in Northwest Georgia include white tail deer, wild hogs, and many smaller mammals such as raccoons, skunks, opossums, squirrels, mink, muskrats, otter and beaver. Wild hogs are particularly destructive in riparian areas as they dig for roots. Although the researchers of the NWGRC have not observed wild hogs in the watershed, they occur throughout north Georgia and can be assumed to be present a forested area such as this. Deer have been sighted during the sampling process. Beavers are evident in the watershed; there is a beaver dam on the creek that is visible from Fred Kelly Road. Raccoon tracks have been found under the Kingston Bridge. With regard to birds, the forest and open areas provide suitable habitat for several species of raptors. The red-shoulder hawk, which often preys on amphibians and uses riparian areas extensively, has been observed during sampling at Wayside Road. Crows, doves, and many songbird species would find suitable habitat in the forests and fields of the watershed. Birds observed include American crow, blue jays, eastern blue birds, cardinals, and eastern phoebes. The streams, small ponds or sinkholes and Hall's Lake provide habitat for shorebirds and waterfowl. Several neotropical migrant songbirds such as Louisiana waterthrush, yellow warbler, and common yellowthroat inhabit riparian areas and could be expected during migration or the summer breeding season.

Vernal pools in riparian areas and sinkholes provide breeding habitat for amphibians. During the February 2014 sampling of Dykes Creek, upland chorus frogs could be heard calling at several sites. Reptiles using the riparian areas and the streams include many turtle and snake species. Snakes have been observed near and in the water during sampling.

Listed and Sensitive Species

Dykes Creek watershed lies within the range of three state protected species that may be affected by activities in the watershed. Two reptiles, the Common Map Turtle (*Graptemys geographica*), and the Alabama Map Turtle (*Graptemys pulchra*) are listed by the state of Georgia as rare and have ranges that fall within Dykes Creek watershed. The Blue Shiner (*Cyprinella carerulea*) which is state endangered and federally threatened, had a range that included more tributaries of the Coosa River system, but it is no longer found in Floyd County. Although their range indicates that they could occur in the watershed, none of these three animals have been found in the Dykes Creek watershed.

Three protected fish species are known to occur in Floyd County. The Coldwater Darter (*Etheostoma ditrema*) and the Trispot Darter (*Etheostoma trisella*) are on the state endangered list, and the River Redhorse (*Moxostoma carinatum*) is listed as rare by the state. A Georgia DNR survey of fish on the creek in October 2012 did not detect any of these three species.

Fisheries

The Georgia DNR fish survey mentioned above identified 30 species of fish and 3138 individuals, including darters, stonerollers, bass, Redhorse, shiners, crappie, creek chub, and many types of sunfish. Trout are stocked in Dykes Creek four times a year at Fred Kelly Road Bridge. Dykes Creek is a secondary trout stream, which means it has no evidence of a naturally reproducing trout population, but is capable of supporting trout throughout the year (State of Georgia. Water use classifications and water quality standards). Trout streams in Georgia are supposed to have 50 foot wide vegetated buffers. Although it is not the focus of this document, there is also a Commercial Fishing Ban due to PCB's (polychlorinated biphenyls) in Dykes Creek, as shown in Table 2.1 (GA DNR EPD 2009a). Throughout the Etowah River Watershed, streams have been impacted by PCB's, whose source was the General Electric Company's plant in Rome, GA, which operated from 1954 to 1998, and the PCB's came from the manufacture of transformers. Details of fish consumption guidelines for the Etowah River, which Dykes Creek flows into, and the Coosa River, which the Etowah River joins in Rome, can be found in the Georgia Sport Fishing 2014 Regulations (Georgia DNR 2014).

Table 2.1. A description of the water quality standard violation related to PCB's in Dykes Creek.

Stream Name and 303(d) Location	Violation	Extent	Year TMDL Completed
Dykes Creek Headwaters to Etowah River	Commercial Fishing Ban (CFB)	7 miles	2009

2.3 Anthropogenic Features

Land and Resource Uses

Land use information is available from the state 2009 TMDL evaluation for fecal coliform for streams in the Coosa River Basin (Table 2.2) and from the 2008 Georgia Land Use Trends (GLUT) data (Figure 2.6 and Table 2.3). The GLUT project is a GIS (Geographical Information System) database for the whole state generated from Landsat data.

Visual Surveys of July 11 & 19, 2011 and August 2013, aerial maps, and GLUT data show that the Dykes Creek drainage area can be divided roughly into three parts: northern, central, and southern. The northern third is almost all forested. Superimposition of tax maps on aerial photos shows that though there has been extensive suburban-style subdivision of properties, little housing has been constructed to this point. This carving up of the land has occurred mostly to the east of Flowery Branch and Fire Tower Roads, and the area impacted is traversed by East Hermitage Road, NE. There appears to be little active agriculture in the upper area.

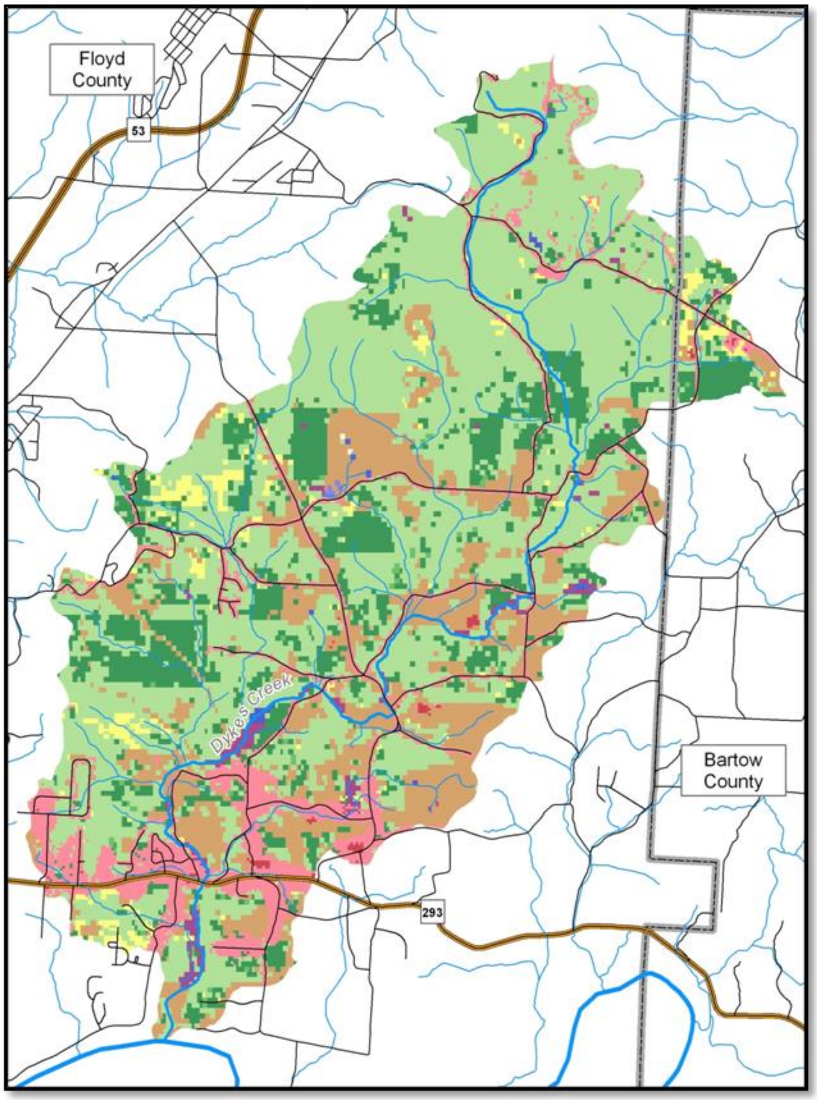
The central portion has forested areas, but agriculture is notably present. Some of the open areas are hayfields, and a moderate amount of pasture is in use for cattle. For example, there is a large pasture with cows present at the intersection of Flowery Branch and Wayside Road, and another active cow pasture along Gentry Road. There appears to be a discrepancy between the state EPD data and on-the-ground observations with regard to row crops. There are very few, if any, row crops even though the state EPD data lists the area of row crops at 2247 acres (Table 2.2). The central section of the drainage is also the location of a certain amount of low-density, rural residential development, particularly in an area defined by Wayside, Ward Mountain, and Potts Roads to the west of the creek, and by McClain, Kerse, Fulton, and Wiseman Roads to the east.

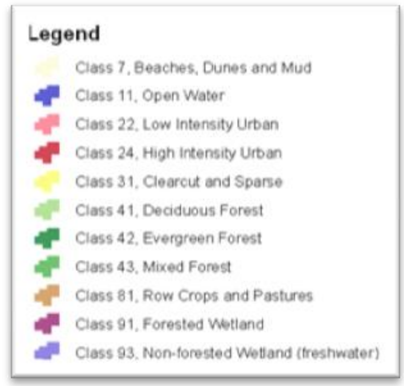
In the southern portion of the Dykes Creek drainage, woods remain prominent, and agriculture is present but, along with low-density rural residential development, there is also a good bit of suburban-style residential development. This type of development may explain the Land Use table's listing of 10% "Parks, lawns, etc.," but almost brings into question the same table's figures for residential use.

Table 2.2. Land use in the Dykes Creek Watershed. Source: Georgia DNR: EPD. 2009.

Land Use	**Acres**	**Percentage**
Forest	7,213.57	65.9
Row crops	2,247.89	20.5
Parks, lawns, etc.	1,090.59	10.0
Pasture/hay	211.71	1.9
Low density residential	86.06	0.8
Woody wetlands	53.37	0.5
Open water	21.57	0.2
High density residential	10.10	0.1
High intensity commercial, industrial, transportation	6.00	0.1
Bare rock, sand, clay	1.78	0.02
Emergent herbaceous wetlands	1.56	0.01
Total	10944.11	100.0

Comparisons of land use estimates from the EPD (Table 2.2) and GLUT data (Table 2.3) indicate that many of the numbers are similar. However, there are some important differences. The GLUT data lists 1280 acres of urban uses, both low intensity and high intensity, whereas the EPD data lists only 102 acres within the residential and commercial, industrial and transportation categories. The EPD's category of "Parks, lawns, etc." (1091 acres) should probably be part of the residential category, since there are no public parks in the watershed. That would somewhat reconcile the difference between the two data sets, because the EPD's value for residential, commercial, industrial, and transportation would then be 1193 acres. Field observations and aerial photos support this conclusion. Another case where the GLUT data seems to be more accurate is with regard to agricultural use. The EPD data from 2009 shows the amount of row crops at 2,247 acres, and only 211 acres of pasture/hay. The GLUT data lumps together the row crops and pasture, with a total area for this category at 1866 acres. On-the-ground observations indicate that most of this is pasture and hayfields, with very few, if any, row crops in the watershed, as noted above. Neither land use data sets were able to distinguish the small amount of disturbed area from old mines in the upper part of the watershed. These areas show up as urban on the GLUT map along East Hermitage Road.





Land type Category	Acres	%
Beaches, Dunes, and Mud (7)	1.77	0.0
Open water (11)	20.87	0.2
Low intensity Urban (22)	1252.00	11.2
High intensity Urban (24)	27.69	0.2
Clearcut and sparse (31)	297.80	2.7
Deciduous Forest (41)	5903.11	52.7
Evergreen Forest (42)	1625.35	14.5
Mixed Forest (43)	63.79	0.6
Row Crops and Pastures (81)	1865.59	16.7
Forested Wetland (91)	130.31	1.2
Non-Forested Wetland (93)	5.10	0.0
total:	11193.38	100

Figure 2.6. A map displaying Dykes Creek watershed land uses and their percentage in the watershed using Georgia Land Use Trends (GLUT) data from 2008.

Political Boundaries

Dykes Creek Watershed is located almost completely within Floyd County, with 357 acres in Bartow County on one of the northeastern tributaries in the area of Wayside Road. There are no cities or towns in the watershed, and Rome is the nearest city, lying west of the watershed. The watershed is mostly rural with some suburban development in the lower part of the watershed near GA 293 (Kingston Highway). The small town of Kingston lies to the east, outside the watershed. See Figure 2.1 for map showing the location of the watershed in relation to Rome and Kingston, and the county boundaries.

Active Groups within the Watershed

Groups that work with resource conservation in Floyd County include federal and state agencies such as the Natural Resources Conservation Service (NRCS), the Georgia Department of Natural Resources (DNR), and the Georgia Environmental Protection Division (EPD). University of Georgia Agricultural Extension has an Agricultural Extension Agent in Floyd and Bartow counties. The Floyd County Water Department withdraws water from the Etowah River and Oostanaula River and is concerned with good water quality for drinking water supply. The Keep Rome Floyd Beautiful organization works to educate the public about litter control and holds public cleanups. Private conservation groups include the Nature Conservancy (Upper Coosa Basin project) and the Coosa River Basin Initiative (CRBI-Upper Coosa Riverkeeper).

Section 3: Watershed Conditions and Monitoring Results

3.1 Water Quality Standards and Impairments within the Dykes Creek Watershed

Georgia Water Quality Criteria

The state regulates water quality by assigning standards. The water quality standards are split into two groups of criteria. The first, a general criterion of cleanness, must be met for all waters, but it is a qualitative or descriptive criteria:

- Waters shall be free of materials, oils, and scum associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits, produce turbidity, color, or odor, or that may otherwise interfere with legitimate water uses.

- Waters shall be free from toxic, corrosive, acidic, and caustic substances in amounts which are harmful to humans, animals, or aquatic life.

The second type of criteria, which are specific and numeric, apply to the designated use of a waterbody. There are six designated uses in Georgia, and the standards vary in how strict they are depending on the designated use.

The six designated uses in Georgia are:

- Drinking Water Supplies
- Recreation
- Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life
- Wild River
- Scenic River
- Coastal Fishing

Dykes Creek is designated for Fishing, and the presence of fecal coliform and excessive sediment resulted in the creek's being listed as non-supportive of those uses. Designated uses are not assigned casually, and final approval of the Georgia Department of Natural Resources' use designations comes from the federal Environmental Protection Agency. See Table 3.1 for the fecal coliform water quality criteria. The creek was delisted for fecal coliform in 2012, after the process of initiating the grant that funded the development of this Watershed Management Plan had occurred. Data collected by the state EPD (table 3.4) in 2013 show that the stream has gone above the state standard and could be relisted, so fecal coliform information shown here is still of interest.

Dykes Creek violated the Fecal Coliform criteria and Sediment/Biota Impacted – Macroinvertebrate Community (Bio M), and is listed on the Georgia 303(d) list for Not Supporting for fishing from the headwaters to its confluence with the Etowah River which is a length of 7 miles (Table 3.2). See Figure 2.1 for a map of the Dykes Creek watershed, showing the seven-mile stretch of impaired stream in dark blue. The TMDL Load reduction for Fecal Coliform is 48% (GAEPD TMDL 2009), and the TMDL Load reduction for Bio M is 90% (US EPA TMDL 2004). As noted in the paragraph above, the stream was delisted in 2012 for fecal coliform.

Table 3.1. A description of the quantitative water quality criteria for waters designated for the use of fishing.

GEORGIA'S WATER QUALITY CRITERIA FOR FISHING WATERS				
Designated Use	**Fecal Coliform Bacteria**	**Dissolved Oxygen**	**pH**	**Temperature**
Fishing	May – Oct* < 200 colonies/100 ml as geometric mean** Nov – April < 1000 colonies/100 ml as geometric mean < 4,000 as instantaneous max	< 5 mg/l daily average Not < 4 mg/l at all times	Between 6.0 and 8.5	< 90° F

****The summer recreation season is defined as running from May through October. Most water-contact activities are expected to occur during these months.***

*****Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200/100 mL (geometric mean) occasionally, then the allowable geometric mean of fecal coliform shall not exceed 300/100 mL in lakes and reservoirs and 500/100 mL in free-flowing freshwater streams.***

Table 3.2. A description of the water quality standard violations in Dykes Creek. Bio (M) = Impacted biota characterization resulting from macroinvertebrate sampling.

Stream Name and 303(d) Location	Violation	Extent	Year TMDL Completed
Dykes Creek Headwaters to Etowah River	Fecal Coliform, Sediment: Biota Impacted (Macroinvertebrate Community)	7 miles	Fecal Coliform (2009) Sediment: Bio Macroinvertebrate Community(2004)

Fecal Coliform Impairments

Fecal coliform bacteria come from the feces of humans and other warm-blooded animals, which can include domestic animals and a wide range of wild animals, including deer, wild pigs, and geese. Therefore, land used for pasture, feedlots, and forest can be a source for animal fecal coliform bacteria. Fecal coliform bacteria are also present in human waste, and sources for this type of contamination can be failed septic systems and leaking sewer pipes. The fecal coliform bacteria can survive outside the bodies of animals and when found in the environment at low levels are not a cause for concern. When it rains, fecal material can wash into streams and lakes with storm water runoff. High level of fecal coliform in the water can be used as an indicator for disease-causing organisms that might be present in human and animal waste. It is cost-prohibitive to monitor water for all of the different disease-causing organisms from fecal material on a routine basis. By monitoring fecal coliform bacteria, the potential incidence of disease-causing bacteria like *Salmonella*, and *Shigella* (both of which cause gastroenteritis), and *Pseudomonas aeruginosa* (which causes swimmer's ear and dermatitis), parasites like *Giardia* and *Cryptosporidium* (also causing gastroenteritis), and viruses like hepatitis A can be estimated.

When sources of fecal coliform contamination are from non-point sources like pastures, failed septic systems, and forest areas with wild animals, the fecal coliform has been shown to be higher in stream water during high flows (storm events) while low flows may show low levels of fecal coliform (Gregory and Frick 2000). Storm water runoff flushes accumulated fecal material off the landscape. The Dykes Creek watershed has pasture, forest land, rural housing, and suburban housing, and spikes in fecal coliform during storm flows could be expected when sampling in this watershed.

This study focuses on *Escherichia coli (E.coli)*, a species of fecal coliform associated with disease outbreaks, rather than the more general category of fecal coliform. Between 60% and 80% of fecal coliform bacteria in streams have been found to be *E. coli*. The US EPA has recommended that *E. coli* be used as an indicator species for recreational waters and the detection of health risks in those waters because *E. coli* is more closely associated with swimming-related gastrointestinal illnesses compared to fecal coliforms (Georgia Adopt-A-Stream Bacterial Monitoring manual. 2009).

To help identify septic system leakage in the watershed, this study also focused on detecting Optic Brightening Agents (OBA's) from laundry detergent using a fluorometer. By using the fluorometer to look for OBA's, it may be possible to distinguish human fecal contamination of stream water from animal contamination, since only leakage from septic systems would have laundry detergent included in the effluent. Fluorometers are used in monitoring the waste stream for OBA's at sewage treatment plants to check for complete processing of sewage. They have been successfully used in the field to check stream water for OBA's in tidal creeks in North Carolina and the amount of OBA's increased with the amount of fecal coliform bacteria (Taveres et al. 2008).

Impacted Biota Impairments

In 2004 the state of Georgia set Total Maximum Daily Loads (TMDLs) for sediment for Dykes Creek (GA DNR EPD 2004). The load is shown in table 5.2 as 197 tons/year, which means the sediment load cannot exceed 197 tons/year. The criterion that has been violated is Biota-macroinvertebrates (Bio M) (Table 3.2). To comply with this loading rate, the observed sediment load needs to be reduced by 90%. The macroinvertebrate communities were shown to be degraded in the sediment study. Macroinvertebrate communities need sediment-free streambeds to thrive. Algae, which is a food source for many macroinvertebrates, grows better when not choked with sediment, and light can penetrate more effectively through clear water for photosynthesis. Leaf packs, another major food source, are available for feeding if not buried in sediment. A sediment-free streambed has space between the rocks for hiding, building retreats, and egg-laying. Large quantities of sediment can smother eggs by preventing oxygen from reaching them. Fish in turn benefit from healthy macroinvertebrate populations because many fish feed on macroinvertebrates. Therefore, the state links sediment loading to fish and macroinvertebrate populations. After collecting sediment data, biotic community data, and stream flow data the state used sediment loading models to estimate the amount of sediment that will degrade the habitat enough to effect fish and insect populations. By regulating the sediment loading, the state protects the habitat and the organisms have space for laying eggs, feeding, and hiding from predators and water is clear enough for fish to find food.

Turbidity is being measured in this study to help identify the movement of sediment in the stream, which is assumed to be the source of impairment for the macroinvertebrate community.

3.2 Available Monitoring/Resource Data from Recent Years

Two groups have collected water information on Dykes Creek. Volunteers have collected data from 1999 at Fred Kelly Road Bridge and entered it into the Georgia Adopt-A-Stream database. Volunteer data was also collected and entered from 2001 to 2004 at Kingston Bridge. Georgia EPD has been monitoring Dykes Creek extensively. The EPD collected water quality data in 2005 at Kingston Bridge and these data contributed to the decision to list the stream as impaired for fecal coliform (Table 3.3). Sampling on the creek by EPD resumed again in 2010 and is ongoing. The state's current sampling site is located about a half mile upstream of the Fred Kelly Road sampling site and is labeled Dykes Creek Crossing on the sampling site map in Figure 3.1. This ongoing data collection effort is summarized in table 3.4.

Table 3.3 A display of fecal coliform data collected by Georgia EPD in 2005 for the purpose of establishing TMDL for Dykes Creek. Location is the DC 1 site at Kingston Bridge. The geometric mean here is calculated for 4 samples over a 30 day period, as required by the method of establishing TMDLs. MPN/100 ml=Most Probable Number/100 milliliters.

Site location code	Date	Observed fecal coliform counts (MPN/100 ml)	Geometric Mean (counts/100/ml)
Dykes Creek DC 1	6/14/2005	80	
Dykes Creek DC 1	6/21/2005	130	
Dykes Creek DC 1	6/29/2005	230	
Dykes Creek DC 1	7/12/2005	9000	383
Dykes Creek DC 1	9/15/2005	70	
Dykes Creek DC 1	9/21/2005	220	
Dykes Creek DC 1	9/28/2005	300	
Dykes Creek DC 1	10/5/2005	500	219.2

Table 3.4. A display of geometric means of fecal coliform counts calculated from samples collected by Georgia EPD. The location of Dykes Creek Crossing site is on Fred Kelly Road, 3/4 mile from intersection with Kingston Highway, on a private drive. This location is an ongoing sampling site for the Georgia EPD.

FECAL COLIFORM GEOMETRIC MEANS (MPN/100 ml)				
Site and year	**Winter**	**Spring**	**Summer**	**Fall**
Dykes Creek Crossing 2010	38	87	107	96
Dykes Creek Crossing 2011	38	114	24	24
Dykes Creek Crossing 2012	24	24	20	31
Dykes Creek Crossing 2013	2008	190	130	not avail.
Dykes Creek Crossing 2014	600*			

**one sample only on Feb 4, 2014*

The above data shows fecal coliform counts that are not extremely high (not in the 10,000 range) but high enough to violate the 200 colonies/100 ml (as a geometric mean) in 2005. In general, the more recent data show much lower geometric means, except for winter 2013, when the geometric mean of 2008 colonies resulted from two high counts during the month of January (5000 colonies on January 15 and 50,000 colonies on January 31). Therefore, although the stream was removed from the list in 2012, this data shows that values that do not meet the criteria can still be found in the creek, and it could be placed back on the list. The fecal coliform data from Georgia Adopt-A-Stream shows a geometric mean for fecal coliform from this data is 60 colonies/100 ml during the 2001 to 2004 period mentioned above.

The turbidity data at Dykes Creek Crossing collected by the state shows low values (Table 3.5).
Winter and spring have the highest means, probably a factor of heavier rains during these seasons. The Adopt-A-Stream data from 1999 included Total Suspended Solids on six different dates, and the value was always zero. The Total Suspended Solids (TSS) data from the state of Georgia are shown in Table 3.6. These are generally low values for suspended solids, except for the mean for winter 2013.

Table 3.5. A display of turbidity means calculated from samples collected by Georgia EPD.

TURBIDITY MEANS (NTU's)				
Site (code and year)	**Winter**	**Spring**	**Summer**	**Fall**
Dykes Creek Crossing 2010	3.7	7.3	1.85	2
Dykes Creek Crossing 2011	3	5.9	1.9	2.1
Dykes Creek Crossing 2012	5.9	2	2	1.2
Dykes Creek Crossing 2013	7.3	3.2	1.4*	0
Dykes Creek Crossing 2014	1.7*			

**one value only*

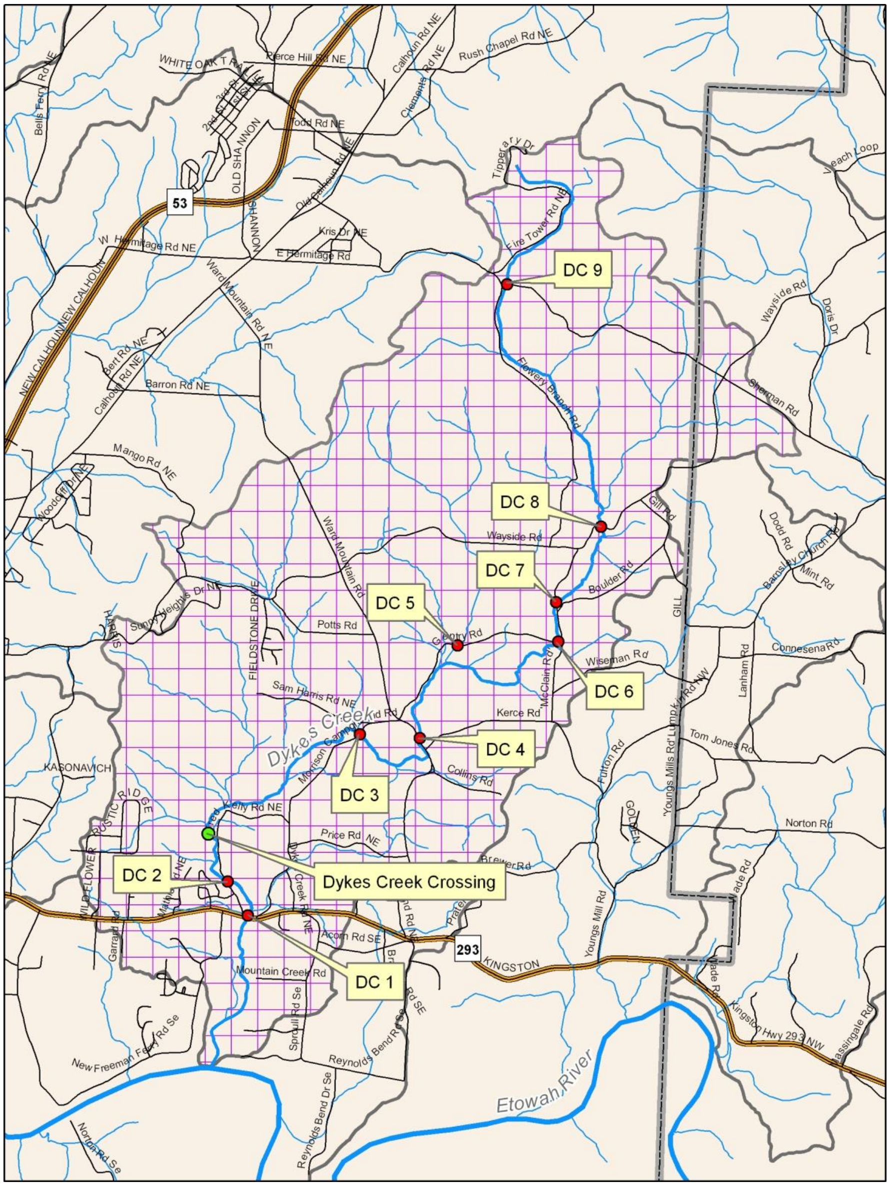
Table 3.6. A display of Total Suspended Solids (TTS) means calculated from samples collected by Georgia EPD.

TOTAL SUSPENDED SOLIDS MEANS (mg/l)				
Site (code and year)	**Winter**	**Spring**	**Summer**	**Fall**
Dykes Creek Crossing 2010	1.9*	4.08	2.55	1.325
Dykes Creek Crossing 2011	1.37	2.6	1	1.17
Dykes Creek Crossing 2012	3.93	2.93	2.77	3.97
Dykes Creek Crossing 2013	16.77	1.83	1.48	3.15

**one value only*

3.3 Monitoring/Resource Data and Field Observations Collected for this WMP

Water quality data was collected for this study of Dykes Creek by the staff of the Northwest Georgia Regional Commission between August 2013 and May 2014. Water quality parameters being tested on a monthly basis include *E. coli*, Optical brightening agents (OBA's), turbidity, temperature, and conductivity. Optical brightening agents are found in laundry detergent and their presence in stream water has been linked to human sewage leaks. In addition, the macroinvertebrate community was sampled in October, 2013 and May 2014 using the Georgia Adopt-A-Stream macroinvertebrate assessment method. Visual surveys in August 2011 and August 2013 have been used to show the condition of the stream and surrounding watershed, with photos taken to record conditions. Nine sites, eight of which are on the main stem of the creek, were sampled. The sites are shown in Figure 3.1.



Key to map:	
Kingston Road/SR 293 crossing	DC1
Fred Kelly Road crossing	DC 2
Morrison Campground Road #1 crossing	DC 3
Morrison Campground Road #2 crossing	DC 4
Gentry Road tributary crossing	DC 5
Gentry Road crossing	DC 6
McClain Road crossing	DC 7
Wayside Road crossing	DC 8
East Hermitage Road crossing	DC 9

Figure 3.1. A map showing the location of sites currently sampled by Northwest Georgia Regional Commission.

Bacterial Results

Approximately 65% of the watershed is forested, which suggests that wildlife contributes a significant proportion of the fecal coliform load in the creek. The importance of wildlife as a source of fecal coliform bacteria in streams varies considerably, depending on the animal species present in the watersheds. Based on information provided by the Wildlife Resources Division (WRD) of GA DNR, the animals that spend a large portion of their time in or around aquatic habitats are the most important wildlife sources of fecal coliform. Waterfowl, most notably ducks and geese, are considered to potentially be the greatest contributors of fecal coliform. Other potentially important animals regularly found around aquatic environments include raccoons, beavers, muskrats, and to a lesser extent, river otters and minks. Recently, rapidly expanding feral swine populations have become a significant presence in the floodplain areas of all the major rivers in Georgia, and numerous sightings have been reported in Floyd County, especially around Johns Mountain. Wild swine have been shown to increase fecal coliform counts in streams (Kaller, Hudson, Achberger, and Kelso. 2007) and to prefer riparian areas (Merringer and Silvy 2007).

Cows and other livestock in pastures can also contribute to fecal coliform in stream water, especially if they have unrestricted access to the creek and streamside buffers are lacking to slow the flow of runoff. According to the GLUT data (Figure 2.6), 16 percent of the watershed is in row crops and pasture. This could indicate a source of fecal coliform from livestock, especially from areas where we have observed animals in pastures surrounding the stream, or near the stream (Figure 3.2).

Septic system failure may contribute to fecal coliform in the stream particularly in the lower part if the watershed where there is suburban style development. None of the homes in this watershed are served by sewage lines from the city of Rome, so all the homes should have septic systems if they are conforming to current building code standards. Violations of building codes with regard to septic systems still occur, and it is possible to find sewage piped straight to the creek in rural North Georgia, as well as inadequate and failing septic systems.

The fecal coliform in the creek appears to vary with rainfall. The values in Table 3.7 show that many measurements of *E. coli* bacteria are low. The period between August and November 2013 was relatively dry. The December, 2013 sampling date was four days after a heavy rainfall, and the water level was high, with flows at every site. Fecal coliform was found at every site except E. Hermitage on this date. In February and January 2014 the water was flowing at every site, but it had not rained within 24 hours of sampling. Both the March, 2014, and the April, 2014 were storm sampling dates. On March 17, 1.4 inches of rain had fallen in the 24 hours before sampling and it rained during sampling. On April 7, 2014, 2.85 inches of rain had fallen in the last 24 hours. It is clear from the high fecal coliform values during these rainfall events that rain moved fecal material off the land with water runoff and into the stream. Morrison Campground Road Crossing #1 (DC 3) has also had several months with higher counts from summer into fall of 2013. A possible source here might be the septic facilities of the campground itself, which is used in the summer. These results are consistent with the fecal coliform study on the Chattahoochee River by Gregory and Frick (2000) where there were spikes in fecal coliform levels during storm events when the nonpoint source pollution was from pastures, residential septic systems, and wildlife. If wildlife were a large contributing factor, one would expect the uppermost site, East Hermitage Road, where the landscape is mostly forested, to have high fecal coliform. The *E. coli* measurements at this site are generally low, and on four of the sampling dates, the measurement was zero colony-forming units (cfu). During the two storm events in March and April 2014, the *E. coli* was elevated at E. Hermitage, but it was the lowest value compared to the elevated *E. coli* at the other downstream sites. This suggests that livestock and residential septic systems area probably the main source of fecal coliform, with wildlife making an unknown, or hard to detect, contribution. Downstream, in the area around Fred Kelly Road, where there was an active beaver dam before it was washed out in the storm in April 2014, *E. coli* values have been sometimes zero, and sometimes somewhat elevated (never above 200 cfu except during the two storms). Again, this shows that the contribution of beavers to the fecal coliform is not clear.

Table 3.7. Escherichia coli (E. coli) Bacteria Counts from Northwest Georgia Regional Commission Water Quality Monitoring. Sites are shown on the map in Figure 3.1. Sites are listed from downstream to upstream. cfu/100 ml=colony-forming units/100 milliliter

Dykes Creek *E. coli* Counts (cfu/100 ml)										
	Sampling Dates									
Site	**8/29/13**	**9/12/13**	**10/8/13**	**11/21/13**	**12/12/13**	**1/26/14**	**2/19/14**	**3/17/14**	**4/7/14**	**5/5/14**
Kingston Rd (DC 1)	0	133	66	33	167	0	33	1800	5733	0
Fred Kelly Rd (DC 2)	0	0	33	33	167	33	0	1567	TMTC	33
Morrison Cpgd Rd 1 (DC 3)	166	233	166	0	300	0	0	8200	8500	66
Morrison Cpgd Rd 2 (DC 4)	dry	dry	dry	dry	100	0	33	9133	8567	33
Gentry Rd tributary (DC 5)	0	0	dry	dry	500	67	100	TMTC	TMTC	33
Gentry Rd (DC 6)	dry	dry	dry	dry	100	0	33	233	2433	200
McClain Rd (DC 7)	dry	dry	dry	dry	67	0	0	400	2677	66
Wayside Rd (DC 8)	100	66	dry	dry	33	33	33	667	2100	0
E. Hermitage Rd (DC 9)	66	0	33	33	0	0	0	133	1533	1300

**Too many to Count*

Turbidity and Macroinvertebrate Results

The data in Table 3.8 show that the turbidity is generally low for this stream except during storm events, which were sampled in March 2014 and April 2014. The highest non-storm values, which are not particularly high, have been from the top of the watershed at the East Hermitage Road crossing of Dykes Creek. The last two sites, at Fred Kelly Road, and Kingston Highway, are generally quite low during periods when it is not raining. Hall's Lake is probably capturing sediment before it reaches these two sites.

Table 3.8. Turbidity Measurements (NTUs) from Northwest Georgia Regional Commission Water Quality Monitoring. Sites are shown on the map in Figure 3.1. Values shown are the mean of three measurements taken at each site. Sites are listed from downstream to upstream.

Dykes Creek Mean Turbidity Measurements (NTU)										
	Sampling Dates									
Site	**8/29/13**	**9/12/13**	**10/8/13**	**11/21/13**	**12/12/13**	**1/26/14**	**2/19/14**	**3/17/14**	**4/7/14**	**5/5/14**
Kingston Rd/SR 293 (DC 1)	0.00	0.53	1.30	1.05	6.42	3.29	4.97	15.62	38.55	2.14
Fred Kelly Rd (DC 2)	0.07	1.70	0.49	0.98	6.12	3.53	4.17	15.81	66.00	1.39
Morrison Cpgd Rd 1 (DC 3)	0.14	0.87	1.36	1.32	6.67	2.86	5.67	18.73	39.71	0.98
Morrison Cpgd Rd 2 (DC 4)	dry	dry	dry	dry	8.33	6.66	6.94	19.71	83.26	2.60
Gentry Rd tributary (DC 5)	1.71	0.83	dry	dry	5.75	3.27	4.37	13.33	46.84	1.81
Gentry Rd (DC 6)	dry	dry	dry	dry	9.94	7.81	9.77	20.20	81.34	6.71
McClain Rd (DC 7)	dry	dry	dry	dry	9.50	7.81	11.04	19.51	72.55	7.55
Wayside Rd (DC 8)	4.11	4.50	dry	dry	9.85	8.35	9.34	17.68	63.06	8.20
E. Hermitage Rd (DC 9)	4.84	7.84	7.67	4.14	13.28	13.10	15.26	19.59	70.37	13.06

The macroinvertebrate results are shown in Table 3.9. When the macroinvertebrates were sampled on October 10, 2013, there was water flowing at East Hermitage Road, the uppermost site in the watershed, but then the stream was dry for the next 5 sites, from Wayside Road to Morrison Campground 2. This was due to low rainfall in this typically dry month, and the fact that the stream seems to go underground around McClain Road when the water table drops.

The sporadic flow of the creek over time and along the length of the stream channel undoubtedly affected the stream macroinvertebrate composition and abundance. Many aquatic insects require several months to complete their lifecycles, and some spend more than a year in the water as larvae. Aquatic snails and clam require a continuous supply of water for survival. At the two lowest sites, Fred Kelly Road and Kingston Road, the number of species was high, and the water quality rating was "excellent". Aquatic gilled snails were extremely abundant at both of these sites and *Corbicula* clams were present. Several other pollution sensitive groups, including mayflies, stoneflies, water pennies, and non-hydropsychid (non-net-spinning) caddisflies were found at these two sites. Upstream at the next site, Morrison Campground Road 1, there was still water in the channel, but the water quality rating dropped to "good." Some groups were missing, but a large number of aquatic gilled snails were found. One crayfish was found here too. The next five sites did not have water and so could not be sampled. The site uppermost in the watershed, the East Hermitage Road site, showed lower diversity and fewer numbers of individuals, except for midges, which can have short life cycles. The water quality rating at this site was "fair". Aquatic snails were not found here. This would suggest that snails and other macroinvertebrates have difficulty colonizing the upper reaches because of the middle stretch of stream that goes underground in the summer.

The stream was flowing at all 9 sites along the course of the stream during the May 20-21, 2014 macroinvertebrate sampling because of spring rainfall, and according to our observations during monthly water quality sampling, all of the sites had experienced flowing water since December 2013. The sampling data showed that the stream macroinvertebrate community in the middle reaches of the stream was greatly affected by a completely dry streambed the previous summer and fall.

The water quality rating based on macroinvertebrate sampling at the three lowest sites, Morrison Campground Road 1, Fred Kelly Road, and Kingston Highway was “excellent” in May 2014. At these sites, caddisflies, mayflies and stoneflies and other sensitive species were present, and there were large numbers of organisms, particularly at Kingston Bridge. As we moved upstream to sample, the water quality rating dropped, probably a consequence of stream sites recovering from being dry the previous summer and fall. The diversity of species and the number of organisms was less than downstream. The site with the lowest water quality rating was Gentry Road, downstream of the sinkhole, having an index value of “2”, which is rated “poor”. We found only 2 aquatic sow bugs there. The riffle/pool habitat not present there probably because the stream has been channelized below the bridge, while above the bridge the streambed has a clay bottom and looks like it only carries water in wet weather. The next two sites upstream received a rating of “fair”, but still had very few numbers of organisms. The *Corbicula* clams were absent above Fred Kelly Road, and gilled snails were absent above Morrison Campground Road 1. At the uppermost site, East Hermitage Road, which had water throughout our sampling period from August to May, the rating was “good”, but the number of individuals was low.

The presence of sensitive groups like mayflies, caddisflies, stoneflies, and gilled snails, and the accompanying “excellent” water quality rating supports a conclusion that the stream macroinvertebrate community is in excellent condition in the lower reaches, from Morrison Campground Road 1 downstream. The stream flow data in section 2 (Figures 2.2 and 2.3) show that the stream never goes dry at the Fred Kelly and Kingston Road sites.

Table 3.9: Stream Macroinvertebrate assessment results for Dykes Creek, Floyd County Georgia, which was sampled in October 2013 and May 2014. Investigators: Kevin McAuliff and Gretchen Lugthart, Northwest Georgia Regional Commission. Method of sampling was Georgia Adopt-A-Stream macroinvertebrate assessment. Sites are listed from downstream to upstream.

	Date			
	October 10, 2013		May 20 and 21, 2014	
Location	**Index Value**	**Water Quality rating**	**Index Value**	**Water Quality rating**
Kingston Rd (DC 1)	25	Excellent	30	Excellent
Fred Kelly Rd (DC 2)	24	Excellent	28	Excellent
Morrison Campground Rd 1 (DC 3)	17	Good	28	Excellent
Morrison Campground Rd 2 (DC 4)	dry creek	-	14	Good
Gentry Rd tributary (DC 5)	dry creek	-	16	Good
Gentry Road (DC 6)	dry creek	-	2	Poor
McClain Rd (DC 7)	dry creek	-	12	Fair
Wayside Rd (DC 8)	dry creek	-	15	Fair

East Hermitage Rd (DC 9)	13	Fair	17	Good

Fluorometric results (Optical Brightener Agents monitoring)

The search for OBA's using the fluorometer did not yield detectable values. A detectable value is above 5 units. This may be an indication that there are few leaking septic systems near the stream and its tributaries. Since the area is not piped for sewage from Rome, there are no leaking sewage pipes. However, the problem of degradation of the OBA's by ultraviolet light, (a component of sunlight), and the dilution effect of the stream water are other possible reasons why no OBA's have been detected. The fluorometer readings were slightly elevated during the March 17th, 2014 storm and the April 7, 2014 storm (see Appendix A for OBA data).

Site specific sources of Sediment in Dykes Creek Watershed from Headwaters to Kingston Road

Sedimentation in creeks is also generally associated with human activities, and there are many potential sources, including animal access to waterways resulting in eroded stream banks and disturbed creek bottoms. Unpaved roads also can contribute to sedimentation. Construction (especially unpermitted) may also be a source of sedimentation. Timber harvesting could be implicated in sedimentation. The following is a discussion of field observations of sediment sources in the creek from the headwaters down to Kingston Road.

At the very top of the watershed on Armstrong Mountain, off of Firetower Road, is an area of unpaved roads. These roads are not county roads. The area was subidivided in the 1980's, given the name of Shannon Oaks subdivision, and lots were sold. Some of the lots have been built on, but many of them are undeveloped. The main unpaved road leads off of Firetower Road and forms a loop into this wooded area. Two other unpaved roads lead off of it. Mileage in the Dykes Creek watershed of this group of roads is 0.5 miles (the full mileage of these unpaved roads is much greater, but it is outside of the watershed). The roads are very wide in places, as much as 25 feet wide, and are in terrible condition, with steep sections, potholes and no gravel. During wet winter weather it is clear that sediment is moving off the road and into the forest. (See Figure 3.2). Although the headwaters of Dykes Creek do not flow all year round, in February 2014 Dykes Creek was flowing. Homes are located in this area with unpaved drives that also potentially contribute sediment to Dykes Creek and its headwater tributaries. Continuing southward on Firetower Road are more unpaved driveways, some of which are in poor contition.

Figure 3.2. Road in Shannon Oaks Subdivision off of Firetower Road. Note large accumulation of sediment on right from road.

Figure 3.3. Old bauxite mine tailings site off East Hermitage Road.

An old bauxite mine site is located along East Hermitage Road. This is a pit mine that filled with water while the mine was still active in the mid 20th century. The tailings for the pit are piled on the south side of the road in two areas. Field observations of one of the areas revealed that these tailings have trees growing on them, but much of the ground is bare dirt with gullies (see Figure 3.3). The area that these two piles of tailings cover is about 13.75 acres. Erosion from these sites would enter an unnamed tributary on the east side of the watershed. Materials from these mining sites would not affect the extreme upper reaches of Dykes Creek, including the East Hermitage Road site, because this eastern tributary enters the main branch of Dykes Creek further downstream. Materials moving off this site would enter the ditch and flow into a tributary of Dykes Creek.

Figure 3.4. Overshot, failed culvert on E. Hermitage Road. Note the milky appearance of the water.

The stream crossing on East Hermitage Road is a double culvert in poor condition (Figure 3.4). The area underneath the culvert has eroded out so that water flows underneath the culvert. The culvert is overshot so that a plunge pool has been created and the banks are eroded. The culvert needs to be replaced and properly aligned so that there is no plunge pool. The ditches leading to this culvert are eroded, although effort has been made to create check dams with riprap. Downstream of the culvert the creek is downcut, probably a result of past timber harvest leading to increased flow in the 20th century.

Continuing south on Flowery Branch Road, a section of the road is unpaved, but graveled. This section is 0.9 miles long. The creek is very close to the road for about 50 yards and the gravel is going straight into the creek (Figure 3.5).

Figure 3.5. Photo showing unpaved section of Flowery Branch Road with gravel washing down the bank into Dykes Creek.

In the Flowery Branch area and other areas in the watershed, hobby farming with animal enclosures near the creek or encompassing the creek is occuring (Figures 3.6). Several large cow pastures area located in the watershed as well.

Figure 3.6. Hobby farming with horses in pasture with creek flowing through pasture.

Since we began measuring turbidity in August 2013, on the main stem of Dykes Creek it has always had the highest turbidity at the East Hermitage Road crossing, and often very low turbidity downstream at Kingston Road and Fred Kelly Road (Table 3.8). One would expect that the turbidity would be less in the upper part of the watershed because there is so much forested land there (Figure 2.6-GLUT map). However, the disturbances just described lie above the area where the creek goes underground part of the year. At the Gentry Road crossing is a depression which a geologist from Dalton State College identified as probably a sinkhole (Figure 3.7). Other potential sinkholes can be found on the landscape in the watershed. These potential sinkholes are capturing water and moving it underground. The water emerging from underground at Morrison Campground Spring is very clear. When the water goes underground in the summer, the sediment appears to go with it, and not emerge when the water emerges from underground. Hall's Lake also serves as a sediment trap, decreasing the impact of the sediment on the Etowah River.

Clearcutting in the watershed could explain the sediment issues that were reported in Dykes Creek in 2004. Recent aerial photographs show one large clearcut in the central portion of the watershed east of Gentry Road. Another source of sediment is from recreational 4-wheel drive use in the pipeline corridor off of Morrison Campground Road. The pipeline crosses the creek at this point.

Figure 3.7: Probable sinkhole, filled with water in January 2014, on Dykes Creek at Gentry Road Bridge.

Potential sediment issues in the upper reaches may be controlled when the water goes underground. In addition, Halls Lake provides a settling basin for sediment. However, if Hall's Lake fills with sediment because it is serving as a settling basin, the water quality in this lake will decline. This would be a detriment to lake habitat for macroinvertebrates and fish and it would decrease the recreational and scenic value of the lake. As such, relying on the lake to capture sediment is not a long-term, conservation-based solution. Therefore, although the downstream impact of sediment on the Etowah River, into which Dykes Creek flows, is attenuated by the lake, in the long term the sediment should be dealt with at its source. This would be the best benefit to residents around the lake and to users of the Etowah River downstream.

3.4 Buffer Analysis

Vegetated strips of land along streams, or riparian buffers, are essential to controling sediment, nutrients, and fecal coliform movement into streams when areas near streams are disturbed by agriculture, logging, and development. The plant roots, leaves, stems and trunks slow down the movement of stormflow, hold soil in place, and filter out sediment, nutrients, and fecal coliform before it reaches the stream channel. Stream banks are more stable with trees in place because the roots hold the streambank soils in place. The trees provide shade to keep the water cool for macroinvertebrates and fish. Trees and herbaceous plants provide food for the stream ecosystem in the form of leaves and wood. The riparian forest buffer provides habitat for terrestrial wildlife and corridors for animals like deer, bobcats, and bears to move between larger areas of forest.

Buffer analysis allows the watershed manager to pinpoint where pollutants may be entering the stream because of large stretches of missing buffer, and areas where livestock are walking into the creek, which would result in fecal waste being deposited directly into the creek.

This buffer analysis was done with aerial photography and GIS technology. The buffer width chosen was fifty feet because this is the minimum required buffer on a secondary trout stream, which is the designation for Dykes Creek. Areas along Dykes Creek and the larger tributaries were examined on aerial photographs for stretches lacking fifty feet of forest vegetation on either side of the stream (both banks need to be vegetated). In addition, the location of homes and businesses were marked in the watershed. Barns and other farm outbuildings were not counted. Since the watershed has no municipal sewerage serving the area, all homes and businesses are assumed to have septic systems. This gives an reasonably accurate count of septic systems in the watershed. All the residential and business structures were included because it is a small area overall and many tributaries feed into the main stem of Dykes Creek.

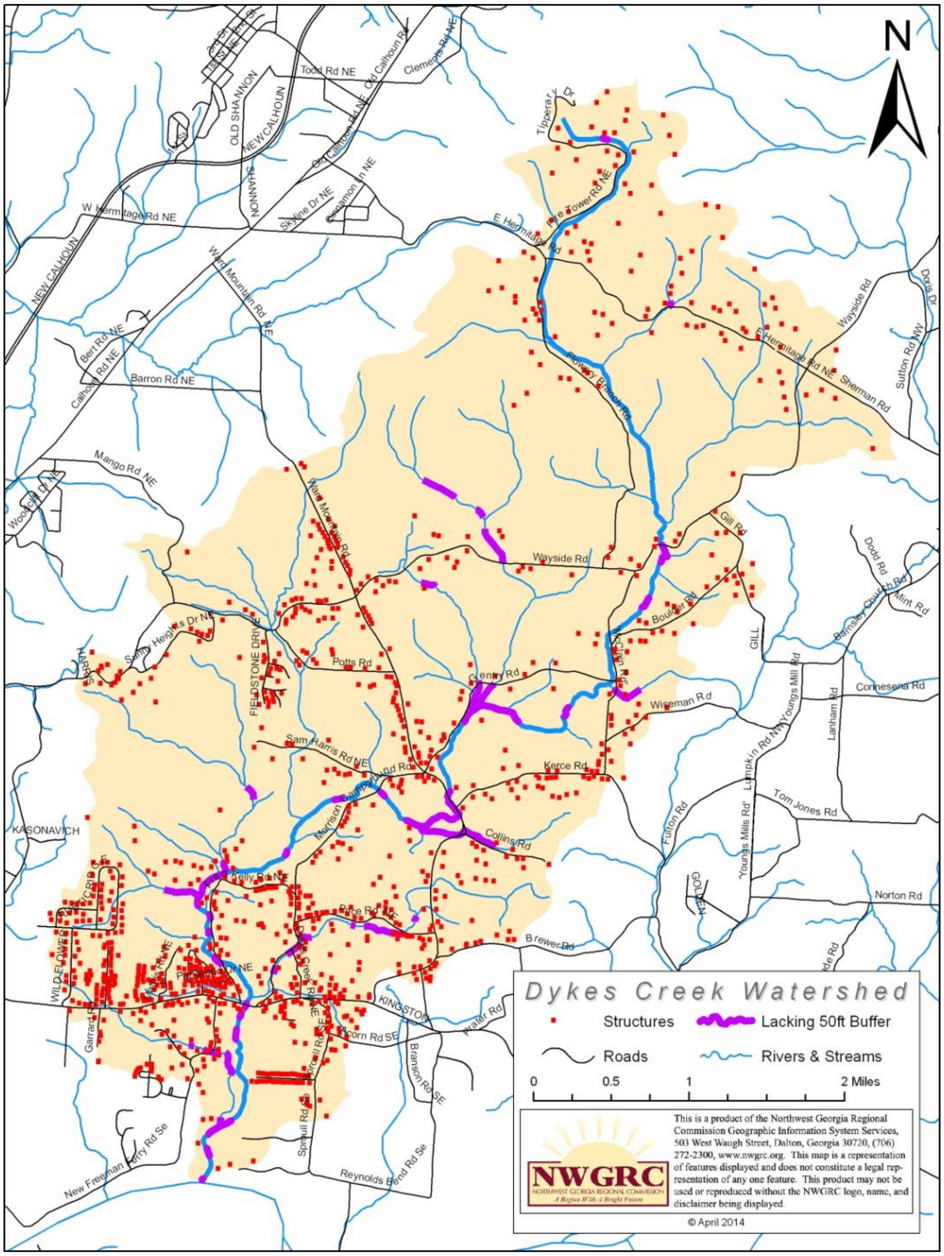


Figure 3.8. Map of insufficient 50 foot riparian buffers and total residential/business structures expected to have septic systems in the watershed.

The map in Figure 3.8 shows all the residential/business structures as red dots in the Dykes Creek watershed, which equals 1,085 buildings with septic systems. The streamside areas lacking 50 foot naturally vegetated forest buffers, marked in purple, include 2.1 miles along the main Dykes Creek and 3.2 miles on the tributaries, for a total of 5.3 miles of missing buffers.

Section 4: Pollution Source Assessment

Nonpoint Sources

These types of pollutants move into the stream during storms and are hard to link to a single source or pipe discharging directly into the water. The polluting materials that cause problems in the stream may be naturally-occurring substances like soil that move into the creek from many adjacent fields, and thus are hard to track in terms of their actual source. Most of the pollution in Dykes Creek is assumed to be from these diffuse sources because there are no factories or animal operations to which the state has given permits for point source discharge in Dykes Creek watershed under the NPDES program. Discussed below are nonpoint sources from agriculture, wildlife, urban/suburban runoff, and silviculture.

Agriculture

Table 4.1 shows the overall population of livestock in the two counties in which Dykes Creek watershed lies. According to land use data provided in the state document for listing Dykes Creek as impaired (GA DNR EPD 2009), and shown in Table 2.3 of this document, the agricultural land use is 22.4%. Percentage of agricultural land use is 16.7% from the GLUT data shown in Table 2.3. These percentages seem low, but presence of livestock on the creek and its tributaries is evident as discussed above in Section 3.3 (Figure 4.1). During storm sampling events in March 2014 and April 2014, *E. coli* was not as high in the uppermost part of the watershed where it is more wooded and where there is almost no pasture (see Table 3.7). This suggests that wildlife alone are not to blame for the high fecal coliform values. Agricultural sources of fecal coliform are probably significant. Fecal coliform is probably washing off the various pasture areas in the middle area of the watershed. Pastures near and on the creek could be a source of sediment as well.

Figure 4.1. Cows in pasture on Wayside Road.

Table 4.1. Estimated Livestock Populations in Bartow and Floyd Counties provided by NRCS, 2008 (GA DNR EPD 2009b).

Livestock Populations								
County	**Beef Cattle**	**Dairy Cattle**	**Swine**	**Sheep**	**Horses**	**Goats**	**Chicken Layers**	**Chickens-Broilers Sold**
Bartow	15,000	130	250	225	4925	1600	220,000	32,175,000
Floyd	8250	-	3500	170	560	470	20,000	23,400,000

Wildlife

Forested land makes up a large percentage of the Dykes Creek watershed. According to the GA EPD (2009b) data shown in Table 2.3, 66.4% is forested, while 69% is forested land according to the GLUT land data in Table 2.4. With almost 70% of the watershed providing suitable habitat for wildlife, these animals could be a significant source of nonpoint fecal coliform pollution, as discussed in Section 3.3 above. However, since the uppermost site at East Hermitage Road, where the land is almost completely forested, always has low fecal coliform, wildlife is not the only source of fecal coliform in the watershed (see Table 3.7).

Urban/Suburban Runoff

Information on septic system installation for Bartow and Floyd counties was provided by the state DNR EPD document that lead to the listing of Dykes Creek as impaired for fecal coliform (GA DNR EPD 2009b) and is shown in Table 4.2. Although these data are somewhat old, they show an increase in septic systems during the 2000's. This trend will probably increase as the population increases. The Dykes Creek watershed is outside the service area for the municipal sewer system of Rome, so all of the homes should have septic systems if they are in compliance with local codes. GIS analysis (Figure 3.7) shows 1,085 residences and business structures in the watershed. Fecal coliform could be entering the creek from a portion of these residential sources, especially in the middle and lower parts of the watershed where there are more homes. As discussed in Section 3, sediment from unpaved roads and driveways is a problem in this watershed, particularly in the upper reaches of the watershed, where the land has been subdivided.

Table 4.2. A display of septic system installation and repair information compiled from 2001 to 2006. (GA DNR EPD, 2009b).

Septic System Statistics				
County	**Existing Systems (2001)**	**Existing Systems (2006)**	**Number of Systems Installed (2001 to 2006)**	**Number of Systems Repaired (2001 – 2006)**
Bartow	22,361	24,656	2295	800
Floyd	16,981	17,881	900	988

Silviculture

As discussed above in the Wildlife section, forested land makes up about 70% of the watershed. The GLUT land use data in Table 2.4 has an additional category for clearcuts, which in the case of Dykes Creek watershed are listed as 2.7% of the total land area. Although the rate of timber removal in this watershed may be low now, the future impact of silviculture could be large, since so much of the area is in forest. This is a potential source of sediment into Dykes Creek and its tributaries. The timber in this watershed has probably been removed several times over since European settlement. Sediment in the creek may still be moving out from past logging operations.

Old Mine sites

Although the old mine site tailing piles off of East Hermitage Road evaded detection on both the land use data sets, they could be contributing to sediment loading in streams as soil erodes off these sites, as discussed in Section 3.

4.2 Point Sources

Point sources of pollution, harmful materials that get into a stream or lake by way of "discrete conveyances", like discharge pipes from a factory, are assumed to be very few in this watershed compared to nonpoint sources. If there are any, they have not received a permit through the NPDES permitting system, because there are no such permits for this watershed. There are no Confined animal feeding operation (CAFO) permits for swine, dairy or poultry in the watershed.

Section 5: Watershed Improvement Goals/Pollution Reduction

5.1 Overall Objectives

The goal of this Water Management Plan is to return the creek to compliance with state water quality standards and to prevent further degradation, or decline, of the water resource. To achieve these goals, management of the land surrounding the creek must be improved. Since all of the land in the watershed is private land, this can only be achieved by working with landowners on their property and educating them and members of the local community about watershed restoration, septic system management, and the value of clean, sediment-free stream water, and their role as citizens to safeguard water resources for downstream users and future generations.

5.2 Load Reduction Targets

The state of Georgia does not have a numeric standard for sediment in waterbodies. The federal government and the State of Georgia regulate sediment pollution in streams and rivers through a process that involves sampling many streams for water quality parameters, fish and macroinvertebrate populations, designating some streams as less disturbed reference streams, and then modeling levels of sediment to establish Total Maximum Daily Loads (TMDLs) for streams that have been shown to be impaired by sediment. A TMDL sets the total pollution load a waterbody can assimilate and still achieve water quality standards.

In Georgia, fecal coliform does have a numeric standard, which is shown in Table 3.1. Fecal coliform pollution is regulated in a similar way to sediment, with many streams sampled for fecal coliform, violations above the standard identified, and TMDLs for fecal coliform established for those streams in violation.

The following tables provide information contained in the state documents that establish TMDLs for the impaired Dykes Creek (GA EPD 2009b, GA EPD 2004). By definition, “wasteload allocations” (WLA) for municipal and industrial wastewater discharges and for storm water outfalls (WLAsw) are established in permitted areas, while “load allocations” (LA) are established for nonpoint sources of pollution. Wasteload allocations are assigned by Georgia EPD during the NPDES permitting process and are not part of the TMDL implementation planning process, which deals solely with nonpoint sources of pollutants. As shown in Tables 5.1 and 5.2, there are no wasteload permits for Dykes Creek. All sources of pollution are assumed to be nonpoint sources.

Table 5.1 shows that the current load of fecal coliform is 3.66 billion counts/30 days but it should be 1.91 billion counts/30 days, with a reduction of 48% needed to meet this TMDL goal. This would be the load reduction required if the stream had not been delisted in 2012 by the EPD.

Table 5.1: Fecal Coliform Loads and Required Fecal Coliform Load Reductions (GA EPD 2009b)

FECAL COLIFORM LOAD REDUCTIONS NEEDED						
Impaired Stream Segment	**Current Load (counts/30 days)**	**WLA (counts/30 days)**	**WLAsw (counts/30 days)**	**Load Allocation (counts/30 days)**	**TMDL (counts/30 days)**	**Percent Reduction**
Dykes Creek	3.66E+12	0	0	1.72E+12	1.91E+12	48%

According to Table 5.2, the TMDL for Dykes Creek for sediment should not go above 197 tons/year. Although the current load for sediment was not displayed in the original EPD document, it can be calculated to be 1970 tons/year based on the load reduction requirement of 90%. The current sediment load needs to be reduced from 1970 tons/year to 197 tons/year, a reduction of 90%.

Table 5.2: Total Annual Sediment Loads and Required Sediment Load Reductions from TMDLs that have been completed. (current load was not shown in original document) GA EPD 2004.

	SEDIMENT LOAD REDUCTIONS NEEDED					
Impaired Stream Segment	**Current Load (tons/year)**	**WLA (tons/yr)**	**Load Allocation (tons/mi^{2}yr)**	**TMDL (tons/mi^{2}yr)**	**TMDL (tons/yr)**	**Percent Reduction**
Dykes Creek	1970	0	13.22	13.22	197	90%

5.3 Existing Conservation Programs

Existing Structural Programs and Practices

Pollution reduction could be achieved through existing programs available throughout Georgia and administered at a state and federal level. Table 5.3 shows several of the existing programs.

Table 5.3 Existing Structural Programs and Practices in the Dykes Creek Watershed

Agency	Program Name	Funding Arrangement	Type of Practice
USDA NRCS	EQIP- Environmental Quality Incentive Program	cost share	BMP's Heavy use area stabilization Streambank stabilization Riparian enhancement
USDA Farm Service Agency	CRP- Conservation Reserve Program	Yearly rental payments to keep sensitive areas out of production	BMP's Buffers on streams Vegetative cover Off-stream watering areas
Northwest Georgia Health District	Septic tank permitting programs	Permit paid for by landowner	Proper installation of new septic systems Proper repair of failed septic systems Licensing of contractors
Existing non-structural Programs and Practices			
USDA NRCS	Conservation plans and Conservation Nutrient Management Plans-CNMPs		Manage natural resources Control runoff May lead to structural improvements
USDA NRCS	Farm and ranch land protection program		Preserves land as farmland in land trust
Georgia Forestry Commission	Forestry BMP Program		Educate forestry community to encourage BMP use, monitor BMP use and effectiveness, investigate and mediate forestry water quality complaints
Georgia Forestry Commission	Forest Legacy Program		Preserves land as forest in land trust
Georgia EPD	Erosion and Sedimentation Act		Buffers on waterbodies: 50 foot of natural vegetation in the riparian zone on trout streams

5.4 Proposed Conservation Program for Dykes Creek

Proposed Structural Practices of the Restoration Program

The above discussion has identified several specific fecal coliform and sediment problems in the watershed that could be addressed with structural land management practices. Unpaved roads in the upper watershed could be paved or receive much needed regular maintenance. The old mine tailing sites off East Hermitage Road could be stabilized with grading and vegetation. At least one culvert, the one on East Hermitage Road, could be replaced. The establishment of a cost-share program for the implementation of agricultural BMP's and restoring streamside buffers would be useful in controlling sediment and fecal coliform off of pasture areas. A septic system repair program would help control fecal coliform moving off of residential areas with failing septic systems. Based on US EPA estimates that 10% of septic systems in the US are not working properly, the number of septic systems to fix, 109, was calculated from the 1,085 residential/business structures in the watershed (Figure 3.8).

Proposed Non-Structural Practices of the Restoration Program

Education and public outreach compose the main part of the non-structural practices planned. These would involve informing the public about septic system maintenance and the proposed septic system repair program. Press releases and workshops could be used to disseminate this information. The Georgia Adopt-A-Stream program will be used to get volunteers on the ground to observe the creek and care for the watershed.

Section 6: Implementation

6.1 Management Strategies

The goal is the eventual delisting of the stream, which should be a result improving the water quality of the stream so that it accommodates a wide range of fish and other wildlife and is safe for recreational activities such as fishing. Included in this is an assumption that delisting Dykes Creek will mean that the creek no longer contributes to the degradation of the Etowah River, into which it flows. Since this is nonpoint pollution, the management strategies that would help mean this goal are those that reduce unpaved road sediment, mining sediment, agricultural sediment, agricultural fecal coliform, and residential fecal coliform inputs into Dykes Creek. These will be the focus of this effort, with the Environmental Health Departments and road departments of Floyd and Bartow Counties, the NRCS, and the county agricultural extension agents being potential partners in these efforts. Landowners, agencies, and organizations participate voluntarily in grant programs and private property rights will be respected.

The TMDL for sediment for Dykes Creek calls for a 90% decrease in sediment. Restoring 90% of the watershed would be cost prohibitive. Some change in the sediment loading could be expected with a smaller percentage of the watershed restored. Stakeholders familiar with the watershed have also indicated that the level of landowner participation for agricultural restoration may be low. Therefore, to reach a balance between cost and the state's mandate to reduce nonpoint source pollution in the watershed, 60% of the septic work and agricultural/streambank improvements would be funded by proposed grants over 8 years (see Table 6.1). Because the road paving, culvert replacement, and mine tailing stabilization are each single projects in themselves (60% of a culvert cannot be replaced) this proposal seeks full funding for these projects, minus landowner contribution.

6.2 Management Priorities

Stakeholders were surveyed and also invited to two public meetings. Their input was used to develop management priorities. Other factors in developing priorities involved the size of the watershed, the current condition of the watershed, and which reaches of the stream flow all year. Based on stakeholder input and these other factors, the first two grant requests will focus on septic system improvements and agricultural BMP's/streambank restoration. The last grant request will focus on the specific projects in the upper part of the watershed, including the road paving, culvert replacement, and mine tailing stabilization. If considerable progress can be made toward watershed improvement during the first two grant cycles, these other projects may not be pursued, since the funding may be more difficult to obtain for these. The county may deal the road related projects through their maintenance schedule.

6.3 Interim Milestones

The following objectives will help in determining whether the goal of water quality improvement and delisting of Dykes Creek have been achieved.

OBJECTIVE #1: Create an agricultural BMP cost-share program in the watershed.

MILESTONES:

- Hold meetings with the NRCS to determine appropriate BMPs and cost-share rates.

- Advertise the available grant money through local media.
- Issue press releases for successful BMP installations.
- Maintain the agricultural BMP program throughout the implementation process.

Landowners will participate on a voluntary basis, with projects that will be tailored to their specific needs as well as improve water quality and land management.

OBJECTIVE #2: Implement BMPs to achieve load reductions specified in the TMDL.

MILESTONES:

- Identify farmers willing to cost-share on agricultural BMP projects.
- Identify property owners willing to address inadequate riparian zones.
- Identify homeowners with failed or missing septic systems.
- Implement septic repairs and pump-outs in the watershed anticipated for each grant period as shown in Table 7.5.b. in Section 7.5.
- Implement agricultural BMPs in the watershed anticipated for each grant period as shown in Table 7.5.b. in Section 7.5.
- Estimate load reductions from projects when possible.

OBJECTIVE #3: Reduce pollution inputs from suburban and rural areas through education and outreach

MILESTONES:

- Hold a homeowner's septic system pump-out workshop designed to educate local citizens on proper septic system maintenance.
- Provide opportunities for the public to assist with stream cleanup efforts.
- Provide opportunities for the public to participate in Georgia's Adopt-A-Stream Program.
- Conduct presentations discussing watershed restoration efforts at local events.
- Submit press releases to inform the public of the restoration process and NPS pollution issues and solutions.

OBJECTIVE #4: Create a septic system repair cost-share program in the watershed.

MILESTONES:

- Identify local certified septic system contractors interested in participating in the program.
- Hold meetings with NGAHD representatives to design program.
- Hold a septic system installer's workshop to explain program details, and ensure standards for participation are understood.
- Maintain the septic repair program throughout the implementation process.

Homeowners will participate on a voluntary basis. Failing septic systems within 100 feet of the creek and its tributaries will receive priority for repair. Home owners will share the cost of the repair.

OBJECTIVE #5: Reduce sediment loading from specific areas identified in upper watershed identified in Section 3.3: road paving and driveway paving, culvert replacement, mine site stabilization.

MILESTONES:

- Identify funding partners to cost share on these specific projects
- Encourage private landowners to see the benefit of more productive, stable forest land at mine tailing sites.
- Meet with county road managers in the field to discuss solutions to unpaved roads and driveways that are producing sediment
- Use Georgia Better Backroads Guidelines to choose unpaved road BMPs that fit specific sediment issues in the upper Dykes Creek Watershed.
- Get road paving and culvert replacement on the county priority list.

Solving these specific problems with high price-tags will require planning, persistence, and innovative thinking. Private landowners would participate in the mine site restoration on a voluntary basis, so the benefit to them will have to be sufficient to gain their good will.

OBJECTIVE #6: Document changes in water quality throughout WMP implementation.

MILESTONES:
- Submit a water quality monitoring plan for each grant received.
- Conduct Pre- and Post-BMP monitoring for large agricultural BMP projects.
- Sample to potentially delist the stream from being impaired for fecal coliform violations.
- Initiate WMP revisions.

The Northwest Georgia Regional Commission will monitor on a regular basis for *E. coli* and turbidity as a measure of sediment. When a large agricultural BMP project is planned, sampling will take place before and after the project to check the effectiveness of the management practices. Improvements will trigger reassessment of the activities in the Watershed Management Plan.

The Georgia EPD will sample for fecal coliform on a regular basis to see whether it can maintain its current status of meeting water quality criteria. The state will also sample fish and macroinvertebrate populations to see if the biological community is recovering.

OBJECTIVE #7: Provide local community leaders with the knowledge to consider the effects management decisions may have on stream health in the watershed.

MILESTONES:
- Establish connections with local community leaders.
- Conduct presentations to community leaders discussing water quality issues and the solutions that BMPs can provide.
- Share water quality data and interpret the results with local community leaders for discussion purposes.

City and county personnel will be updated regularly through presentations at local meetings to keep up involvement and /or awareness during the restoration process. The stakeholders will receive monitoring data as it is collected.

6.4 Schedule of Activities

The following schedule provides the anticipated years in which various objectives and milestones in the WMP implementation process would occur. Activities are dependent on whether funding is obtained.

Table 6.1. A display of milestone activities and a timeline in which they will each be addressed during the implementation of the WMP.

IMPLEMENTATION SCHEDULE									
MILESTONE ACTIVITY	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Submit §319 Proposal to GA EPD	X			X			X		
Create an agricultural BMP cost-share program		X							
Create septic system cost-share program		X							
Install Agricultural BMPs			X	X	X	X	X	X	X
Install Septic System BMPs			X	X	X	X	X	X	X
Install other management practices in upper watershed: road paving, culvert replacement, mine site restoration					X				
Establish AAS Monitoring Group	X		X		X		X		X
Update County Commission/Press Releases			X		X		X		X
Conduct Education/Outreach Events		X	X	X	X	X	X	X	X
Conduct WQ Monitoring (Targeted)	X		X			X			X
Conduct WQ Monitoring by state (de-listing)	X			X			X		
Reevaluate Milestones					X			X	
Initiate Reassessment of WMP						X			X

6.5 Indicators to Measure Progress

The most basic measure of progress in improving conditions in the watershed would be tallying the number of septic systems fixed, the number of agricultural improvement projects completed, and miles of stream buffer replanted, as well as the paving, culvert replacement, and mine tailing stabilization projects completed.

In addition, the level of landowner participation in the restoration effort is a good indicator of awareness of and good will toward the state's investment in improving the water quality conditions in the watershed. It will be sign of progress if landowners are showing increased interest and understanding of the need for BMP's over the course of the project. As individual BMP projects are completed, it is hoped that these projects will serve as an advertisement to increase participation.

Monitoring of water quality by the NWGRC would allow for feedback in determining where to refocus effort in the watershed as projects are completed. The parameters at the current 9 sites should include *E. coli*, turbidity, and rapid macroinvertebrate assessment on a periodic basis, such as every quarter, taking care to include storm events, since this seems to be when the fecal coliform moves into the stream in this watershed.

The most significant measure of progress will be if Dykes Creek is not on the state list of impaired waterbodies. Georgia EPD monitors fecal coliform, sediment, macroinvertebrates, fish, and many other parameters on a periodic basis. If load reductions for sediment are met, then the stream can be delisted for sediment. If low values for fecal coliform are maintained, then Dykes Creek will stay off the list of impaired streams.

6.6 Technical Assistance and Roles of Contributing Organizations

Table 6.2 shows the various groups that would be possible partners in the effort to restore the watershed. The Georgia EPD and the US EPA would provide funding for these efforts. Georgia DNR provides ongoing monitoring to see which streams meet state criteria. The NWGRC would provide monitoring as well. The Northwest Georgia Public Health could be expected to contribute expertise in the septic system repair program. Nonprofit advocacy organizations including the Nature Conservancy and the Coosa Basin Initiative would provide education and outreach activities. Shorter University is interested in providing Adopt-a-Stream monitoring. The Natural Resource Conservation Service would be a logical partner in providing expertise in agricultural BMP installation and communication with landowners, as would the University of Georgia Cooperative Extension Agency.

Table 6.2. The following groups are anticipated to contribute to the Dykes Creek WMP by taking on the roles below.

Organization Roles and Responsibilities		
Organization Name	**Organization Type**	**Description of Role in WMP**
Northwest Georgia Regional Commission	Regional Agency	Monitor water quality to assess effectiveness of BMP's
Georgia Department of Natural Resources	State Agency	Conduct monitoring rotations to sample sites in the watershed for fecal coliform bacteria and biota that can reveal improvements or aid delisting efforts.
Georgia Environmental Protection Division	State Agency	Administer Clean Water Act Section 319 Grants to provide funding for this restoration program.
Environmental Protection Agency	Federal Agency	Provide EPA Clean Water Act Section 319 funds to Georgia EPD to administer through the state 319 grant program.
Northwest Georgia Public Health	State Agency	Provide technical expertise for septic system repairs. This process will include assessing, planning, permitting, and inspection of installed or repaired septic system components. Help may also be

		provided through identification of potential septic system repair projects. Assistance may also be provided during workshop preparation if applicable.
The Nature Conservancy	Nonprofit	Serve as a vehicle to promote the Dykes Creek Restoration Project and assist in marketing its outreach efforts.
Shorter University	Local university	Serve as a vehicle to promote the Dykes Creek Restoration Project and assist in marketing its outreach efforts.
Coosa Basin Initiative	Nonprofit	Serve as a vehicle to promote the Dykes Creek Restoration Project and assist in marketing its outreach efforts.
Natural Resource Conservation Service	Federal Agency	Provide expertise in BPM installation and communication with legible landowners
Cooperative Extension Agency	State Agency	Provide expertise in BPM installation and communication with legible landowners

6.7 Estimates of Funding

Although there are many state and federal programs aimed at reducing NPS pollution in Georgia, problems with sediment, fecal coliform and other pollutants still exist in the wider Coosa River Basin and threaten the aquatic diversity of the streams, provide management difficulties for drinking and industrial water supply intake, and degrade the recreational experiences of the citizens of Northwest Georgia. This Watershed Management Plan would rely on the 319 program as the main source of funding for this comprehensive restoration program, with help from the partners in Table 6.2 above.

The total cost of fixing all the identified problems simultaneously in the watershed is stated in Table 6.3. This serves a hypothetical starting point for estimating how to proceed. One million dollars may seem like a large amount of money, (and it is a strong reminder that taking steps to prevent degradation in the first place is undoubtedly cheaper) but only 60% of this would be provided by the 319 program, or $620,200, with the remainder as cost share. In addition, this amount would be further reduced by assuming that the whole watershed does not need to be treated to allow delisting to occur. According to Table 5.2, a 90% reduction in sediment is needed. We could say that 90% of the watershed should be treated to achieve a 90% reduction in sediment. That would still be a high price tag for one small watershed. If 60% of the septic system improvements and the agricultural/streambank improvements were done, and all of the mine site/road paving/culvert replacement work were done, (since you cannot replace 60% of a culvert), that would be a compromise between cost and progress toward delisting. This money would be divided into 3 grant cycles (see Table 6.1 and Table 6.4).

Based on stakeholder responses, we propose to focus first on the more conventional projects of septic system repairs and agricultural and streambank improvements for the first two grant cycles. The mine site/road paving/culvert replacement projects will be undertaken during the last grant cycle if improvements in water quality and the accompanying delisting do not occur sooner. After the first grant cycle, evaluation of progress would be made, and the amount of money requested in the next grant cycle would be more or less depending on the degree of progress made over the years. This allows for planned, comprehensive treatment spread out over a number of years, instead of piecemeal.

Table 6.3. An estimate of the cost associated with a hypothetical instantaneous watershed-wide treatment for fecal coliform and sediment reduction at all critical sites.

TOTAL WATERSHED TREATMENT TABLE			
Agricultural BMPs (Name - Code)	**Quantity**	**Cost/Unit**	**Cost Estimate**
Fence - 382	20,000 lin.ft.	$2.14/lin.ft.	$42,800
Heavy use area (pad - concrete; 3'x 4'w/ 614 below) - 561	17	4.02/sq ft	$ 820.08
Heavy use area (pad – geotextile 50' x 50') - 561	3	$1.50/sq ft	$11,250
Livestock Pipeline - 516	2000 lin. ft	$1.71	$3,420.00
Riparian forest buffer -391	33 acres	$156.82/ac	$5,175.06
Riparian herbaceous cover - 390	16 acres	$228/ac	$3,648
Streambank and Shoreline Stabilization 580 (protection)	850 lin. ft	$67.27/lin.ft.	$57,179.50
Water well - 642	10	$4569 each	$ 45,690
Watering facility (3'x4' pad) - 614	20	$712.50 each	$ 14,250
Brush management – privet control-mechanical roller, mechanical	15 acres	$49.43/acre	$741.45
Septic System BMPs (Name - Code)	**Quantity**	**Cost/Unit**	**Cost Estimate**
Conventional system repair	100	$4000 each	$400,000
Experimental system Installation	9	$7000 each	$63,000
Educational Events	**Quantity**	**Cost/Unit**	**Cost Estimate**
Septic installer workshop	1	$1,500	$1,500
Homeowner workshops (septic maintenance)	1	$1,500	$1,500
TOTAL AG. AND SEPTIC TREATMENT COST			**$ 650,974.09**
60% OF TOTAL TREATMENT COST AG AND SEPTIC (LANDOWNER CONTRIBUTIONS EXCLUDED)			**$390,584.45**
Other Management Practices	Quantity	Cost/Unit	Cost Estimate
Old mine site stabilization	11 acres	$6084/acre	$66,924
Culvert replacement – East Hermitage Road	1	$45,000/each	$45,000
Paving non-county road 0.5 miles in watershed	0.5 mile x 22 feet	$15/sq yard	$96,703

Paving county road 0.9 miles Flowery Branch Road	0.9 mile x 22 feet	$15/sq yard	$174,066
TOTAL OTHER TREATMENT COST			**$382,693.00**
60% OF OTHER TREATMENT COST			**$229,615.80**
TOTAL WATERSHED TREATMENT COST			**$1,033,667.09**
60% OF TOTAL WATERSHED TREATMENT COST			**$620,200.25**

Table 6.4. A display of recommended financial requests for each of three 319 grants sought by NWGRC attempting comprehensive watershed restoration. The sum of the septic system improvements and the agricultural/streambank improvements is 60% of total watershed treatment as displayed in Table 6.3, excluding the landowner contributions.

	septic system repair funds	**Agriculture projects/stream restoration funds**	**Mine/road paving /culvert funds**	**Total**
Proposal 1 2015	$83,880	$33,295	-	$117,175
Proposal 2 2018	$83,880	$33,295	-	$117,175
Proposal 3 2021	-	-	$229,615.8	$229,615.8

Section 7: Education and Outreach Strategy

For the overall improvement of the watershed, the people living in the watershed need to be aware of the stream's water quality and committed to improving the health of the stream and the riparian areas. Efforts will be made to allow residents to participate in keeping sediment and fecal coliform out of Dykes Creek. The efforts may include a septic repair program, tree planting programs, and volunteer creek cleanup days, and Adopt-A-Stream monitoring. With regard to Adopt-A-Stream monitoring, one of the stakeholders who is a biology professor from nearby Shorter University has gone through Adopt-A-Stream training with her students. Volunteer hours, supplies, and other donations will be recorded and volunteer events will be assigned a value based on this information. The value of these events can be used as matching funds to the federal funds coming from any 319 grant that may be received.

Summary of Nine Key Elements

The following is a summary of the Nine Key Elements addressed in the Dykes Creek Watershed as identified in the Watershed Management Plan (WMP).

1. An identification of the sources or groups of similar sources contributing to nonpoint source pollution to be controlled to implement load reductions or achieve water quality standards.
Section 2 describes the overall conditions in the watershed and discusses two different sets of land use data, with a GLUT map of the land uses. This map portrays a rural watershed with a large forest component, but with areas of pasture and residential structures. Section 3.2 shows water quality data collected by Adopt- A-Stream groups and Georgia EPD. Section 3.3 shows water quality data collected by the NWGRC. Field observations have identified sediment sources, including unpaved roads and driveways in upper part of the watershed, one culvert with unstable streambanks directly downstream, an old bauxite mine tailings site, and pastureland next to the stream or its tributaries. The NWGRC bacterial data showed that values for *E. coli* are sometimes high in the middle reaches around the Gentry Road tributary and around Morrison Campground Road during low flows. During storm flows *E. coli* was elevated at all the sites, with several values quite high compared to non-storm values. Agricultural and septic system sources may be responsible. In Section 3.4, stream buffer analysis with aerial photography and GPS technology identified how many miles of 50-foot riparian buffers were missing along Dykes Creek and its larger tributaries. In addition, Section 4 outlines general potential sources of nonpoint source pollution in the watershed. Improving roads and stream crossings, stabilizing the mine tailings, fixing septic systems, installing agricultural BMP’s such as off-stream watering facilities and restoring stream-side buffers could all address these issues.

2. An estimate of the load reductions expected for the management measures described under number 3 (below). If the entire watershed was treated, as shown in Table 6.3, which is the total watershed treatment table, the goal of reducing sediment loads by 90%, as required by the TMDL’s, would undoubtedly be accomplished. Section 5 shows the required reductions for fecal coliform and sediment (biota: macroinvertebrate). Since the stream is currently not listed for fecal coliform, but may be relisted in the near future because of recent fecal coliform data collected by the Georgia EPD, it is difficult to address exact load reductions for fecal coliform. Section 6.1 discusses the portion of the total watershed this WMP proposes to treat to see sediment and fecal coliform load reduced. Section 6.5 discusses indicators to measure progress, which would include how much work is accomplished in the watershed in categories like septic system repair, streambank stabilization, and agricultural BMP installation, road paving, culvert replacement and mine tailing stabilization. The level of landowner participation in these kinds of programs would also show that progress had been made toward better stewardship of the land in the watershed. The actual delisting of the stream for sediment/macroinvertebrates would show that load reductions had been met. Progress would also be shown if the stream remains off the list of impaired streams for fecal coliform.

3. A description of the NPS management measures that will need to be implemented to achieve the load reductions established in the TMDL or to achieve water quality standards. Section 6.3 lists milestones to accomplish in the process of reaching load reduction targets. These include the installation of agricultural BPM’s and streambank stabilization, septic system repairs, specific road improvements, mine tailings stabilization, as well as non-structural controls like education and Adopt-A Stream monitoring. Table 6.3, the total watershed treatment table, shows the types of BMP’s and other management strategies proposed to address the problems specific to this watershed. In this table are agricultural BMP's, septic system repairs and homeowner septic maintenance workshops, old bauxite mine tailings stabilization, road paving, and culvert replacement.

4. An estimate of the amounts of technical and financial assistance needed, and/or the authorities that will be relied upon to implement the plan. In Section 6, Table 6.3, the total watershed treatment table reveals the total watershed restoration cost if all the landowners decided to participate and the work was done all at once. Table 6.4 shows the breakdown of grant requested over an 8 year period. Section 6 includes Table 6.2, which is a list of the organizations that are interested in participating in carrying out the plan.

5. An informational/educational component that will be used to enhance public understanding of and participation in implementing the plan.

Section 7 indicates that an Adopt-A-Stream group of Shorter University students and one professor is trained to sample the creek. CRBI and the Nature Conservancy are active in the whole Coosa basin in providing education and outreach to the public.

6. A schedule for implementing the management measures that is reasonably expeditious. See Table 6.1 for proposed schedule. This proposed schedule spreads the work out over 3 grant cycles, from 2015 to 2023. This schedule proposes fixing 60% of the septic systems and 60% of the agricultural BMP installation/streambank restoration, and accomplishing 100% of the paving, culvert, and mine tailings stabilization over this time period, with adjustments if more progress than expected is made on restoring the watershed.

7. A description of interim, measurable milestones (e.g., amount of load reductions and improvement of biological or habitat parameters) for determining whether management measures or other control actions are being implemented. Section 6.3 has objectives and milestones to measure progress. These include setting up a BMP cost-share program and implementing agricultural BMP's, improving education and outreach, creating a septic system repair cost-share program in the watershed, and reducing sediment loading from specific areas identified in the upper watershed, by road paving, replacing one culvert, and bauxite mine tailing stabilization. Another objective is monitoring the water quality to see if there are improvements over time.

8. A set of criteria that can be used to determine whether substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether the plan needs to be revised. Section 6.5 discusses indicators to measure progress, which would include how much work in restoration and stabilization of sediment is accomplished in the watershed, how many landowners are participating, and whether the Georgia EPD's water quality data, which is collected periodically on a schedule, shows that the stream is not exceeding limits for fecal coliform or sediment loading. In other words, if the stream is clean enough to be off the state list of impaired waters, substantial progress will have been made. Since the work is to be done over 3 grant cycles, conditions in the watershed can be monitored, as described in Section 6.3, Interim Milestones, Objective #6. If improvements are made faster than anticipated, then the next grant request may be less than is shown in this proposal (Table 6.3), or efforts may be directed to another part of the watershed.

9. A monitoring component to evaluate the effectiveness of the implementation efforts, measured against the criteria established under item (8). Monitoring by the NWGRC for the development of this plan was done between August 2013 and May 2014 for *E. coli*, turbidity, OBA's and conductivity, and water temperature. Monitoring in low flows, normal flows, and high flows following storms has been accomplished. Periodic sampling could continue as the WMP is implemented. This could be done on a monthly or quarterly basis, with effort made to capture storm events, since our monitoring efforts so far have shown that fecal coliform seems to be washed into the creek during storms. Monitoring for fecal coliform and sediment to determine whether the stream should be on the list of impaired waterbodies has also been ongoing by the state following a strict procedure. This information would provide official evidence that the stream has been restored and whether it should be listed as impaired for fecal coliform or sediment.

Glossary of Acronyms

AAS - Adopt-A-Stream

BMP - Best Management Practice

CNMP - Comprehensive Nutrient Management Plan

cfu - colony-forming units

DNR - Department of Natural Resources

EPA - Environmental Protection Agency

EPD - Environmental Protection Division

GIS - Geographic Information Systems

IBI - Index of Biotic Integrity

NPS - Nonpoint Source

NRCS - Natural Resource Conservation Service

NWGRC – Northwest Georgia Regional Commission

TMDL - Total Maximum Daily Loads

WMP - Watershed Management Plan

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Appendix A: 2013-2014 Optical Brightener Agent Monitoring Data

This data was collected by Northwest Georgia Regional Commission. Fecal coliform, turbidity, and macroinvertebrate data are found in Section 3 of main document.

Dykes Creek Mean Turbidity Measurements (NTU)										
	Sampling Dates									
Site	8/29/13	9/12/13	10/8/13	11/21/13	12/12/13	1/26/14	2/19/14	3/17/14	4/7/14	5/5/14
Kingston Rd/SR 293 (DC 1)	0.256	0.335	0.340	0.349	0.806	0.287	0.352	1.009	2.759	0.203
Fred Kelly Rd (DC 2)	0.321	0.370	0.303	0.301	0.836	0.332	0.327	0.985	2.471	0.232
Morrison Cpgd Rd 1 (DC 3)	0.336	0.239	0.338	1.253	0.691	0.266	0.313	1.227	2.934	0.095
Morrison Cpgd Rd 2 (DC 4)	dry	dry	dry	dry	0.838	0.385	0.408	1.183	2.622	0.507
Gentry Rd tributary (DC 5)	0.270	0.185	dry	dry	0.540	0.267	0.312	1.074	2.185	0.124
Gentry Rd (DC 6)	dry	dry	dry	dry	0.798	0.426	0.481	1.040	2.653	0.402
McClain Rd (DC 7)	dry	dry	dry	dry	0.831	0.451	0.707	1.018	2.551	0.343
Wayside Rd (DC 8)	0.302	0.294	dry	dry	0.816	0.435	189.311	0.970	2.800	0.311
E. Hermitage Rd (DC 9)	0.395	0.403	0.402	0.299	0.893	0.463	0.545	0.919	2.396	0.345

Appendix B: Notes from Stakeholder Meetings

AGENDA

Dykes and Silver Creek Partnership Advisory Committee Meeting

Thursday, November 7, 2013, 11:00 a.m.
Northwest Georgia Regional Commission
Jackson Hill, Rome

1. Introductions
2. Informal presentation of staff findings on Dykes Creek
3. Members comments on and amplifications of staff findings
4. Discussion of contents of Dykes Creek Management Plan
5. Informal presentation of Silver Creek fecal coliform findings
6. Discussion of Silver Creek fecal coliform sources
7. Review of Silver Creek Implementation process
8. Other business
9. Adjourn

Minutes

of the

Dykes and Silver Creek Partnership Advisory Committee Meeting

Thursday, November 7, 2013, 11:00 a.m.
Northwest Georgia Regional Commission
Jackson Hill, Rome

Attendees:

Michael Crosby, Shorter University

Amos Tuck, Coosa River Basin Initiative

Susan Monteleone, Shorter University

Sheri Teems, National Resource Conservation Service

Eric Lindberg, City of Rome

Clinton Agnew, Coosa River Basin Initiative

Ricky, Ensley, Polk County Agricultural Extension

Katie Owens, The Nature Conservancy

Kevin McAuliff, Northwest Georgia Regional Commission

Gretchen Lugthart, Northwest Georgia Regional Commission

Introductions

The meeting opened at approximately 11:10 a.m. with introductions all around.

Kevin stated that the purpose of the Advisory Committee was to help direct the watershed planning activities of the Northwest Georgia Regional Commission, stating that funds are available for agricultural BMP installation, and septic tank repair/replacement in the Silver Creek watershed.

Informal Presentations of Staff Findings on Dykes Creek

After these introductory remarks, Gretchen briefly summarized the Dykes Creek water quality data (See attachment.), noting that sampling included fecal coliform bacteria, optical brighteners, turbidity, conductivity, and temperature. In October, staff conducted a macroinvertebrate survey, showing that the stream is generally healthy. The creek is underlain by the limestone and dolomite Knox Formation, and runs underground from somewhere around Wayside Road to just beyond the Morrison Campground Crossing 2.

Staff noted that Flowery Branch Road is graveled for several miles, and that the runoff contributes to sedimentation in the creek. Also, most of the driveways in the vicinity of the intersection of East Hermitage and Flowery Branch Roads are either gravel or dirt. Right at the intersection, ditches are badly eroded, and water runs under a culvert, undermining it and carrying sediment into the creek.

Members Comments On, and Amplifications of Staff Findings/ Discussion of Contents of Dykes Creek Management Plan

After staff remarks, Eric commented that he knew that there are grey-water straight pipes, so optical brighteners could be present in the water.

Eric, who lives on the creek, continued, saying that Halls Lake is filling with sediment, so there is erosion underway. He noted that there is scouring from the spillway, and that he has observed turbidity as a problem over the last fourteen years, and notices some embedding of the cobbles. Amos suggested testing to determine how embedded the cobbles might be. Eric also noted that four-wheelers are causing erosion in the gas line easement, and that rain carries the sediment into the creek, though the power company could control the problem by limiting access to the area. He noted further that Dykes Creek could be thought of as two different projects: One project downstream from Halls Lake, and another upstream from Halls Lake.

Amos noted that the Coosa River Basin Initiative tests at the Kingston Road Bridge, and that the pH and the temperature there are good. Eric added that DNR stocks trout at the pavilions next to the Fred Kelley Road Crossing, and speculated that there may be a spring near the pavilions. The owner, a Mr. McAbee, routinely allows people to fish there.

Susan and Eric both noted that due to springs along the creek, and the fact that that the lake empties from the top, there are both cold and warm water fish species in the creek. Amos stated that the State had sampled fish in the lower part of Dykes Creek, and that he had participated in the effort.

With reference to the origin of fecal coliform in the creek, Eric thought that cattle in the southeastern quadrant of the watershed could be a contributing factor. Sheri interjected that poultry farms in that area have nutrient plans, but cattle farms may not have the equivalent. Funding for addressing these problems in the Dykes Creek Watershed is not in hand, and will be applied for. However, Kevin will describe the failing culvert, drainage ditch problems, and unpaved alignments in the vicinity in hopes of securing funding to address the issues. Someone noted that outside funding could move such projects high on the County's maintenance list. The Committee also recognizes that not all the problems in the creek are related to agriculture.

Susan asked if cattle impacted the lake rather than the stream, and Eric answered that it would be good to clear up the sediment problems overall, and get Dykes Creek delisted.

The issue of pipeline easement erosion came up. Sheri and Eric both noted that four wheelers were causing erosion sending sediment to the creek, and wondered if a 319(h) grant could address the issue. Kevin brought up the fact (again) that there is a lot of erosion in the vicinity of the intersection of Hermitage Road and Fire Tower Road, as a result of a lack of paving on both public and private properties. Eric said he could raise the Heritage Road ditch issue with the County, and that ditch maintenance could become part of a maintenance goal.

Susan asked about the possibility of easements to protect properties, mentioning the Nature Conservancy. Katie replied that there is not much interest in such matters in the Etowah Basin. Some discussion of conservation easements and land trusts followed.
Sheri reminded Committee members that the Conservation Reserve Program provides rental payments to easement participants. She said that owners need to be approached from the standpoint of livestock health and increased profitability, as opposed to environmental benefits.

The subject shifted to the question of whether municipal wells could cause a creek to run dry, but consensus was that it was unlikely in the case of Dykes Creek.

Informal Presentation of Silver Creek Fecal Coliform Findings

Gretchen reported that there is now more than 18 months of data from sites on Silver Creek. Although there are some high counts at various sites in summer and early fall (September), there is no pattern suggesting continuous leaking sewage from any of the sites in the urbanized areas. The highest count, 900 cfu, actually occurred at Brice Station in the headwater region in June of 2012, in a rural area with agricultural land use. This sampling site is near the wild animal farm "Running Wild". Since August 2013, the staff has been also sampling optical brightener agents, turbidity, conductivity, and temperature. There has not been anything unusual about the results of these measurements so far.

Discussion of Silver Creek Fecal Coliform Sources and Review of Silver Creek Implementation Process

Sheri suggested using existing programs like the buffer program and selling it to the farmers as a management program that will benefit their cows. Otherwise the farmers may become defensive about making changes. The Conservation Reserve Program (CRP) may be available after the new federal farm bill finally passes. She said it would be hard to spend $300,000 on agricultural BMP's in the Silver Creek watershed.

There was some discussion of the mixed domestic and exotic animal farm called "Running Wild" which is near the uppermost sampling site, Brice Station Road, on Silver Creek. The owners of the farm have not had any interest in participating in NRCS programs in the past.

Amos Tuck asked if the pond at that farm takes up all the flow of the creek. Kevin showed that on the maps, the pond does not seem to be collecting water from what appear to be the major rivulets converging to form the headwaters, so the pond is an unlikely diversion of significant amounts of water to cause the Brice Station Crossing site to go dry.

Sheri recommended looking for sediment from old forestry operations in the watershed. Agriculture is not the only source of sediment. It was mentioned that landowners who attend the evening meeting should be asked what they know about sources of sediment.

Amos noted that a fish workshop will build positive interest in water quality management among landowners. If they see the neat fish living in the stream, they will be more willing to change their behavior.

What could be the major sources of fecal coliform? Leaky septic lines could be a problem. However, the leaking septic line at Darlington Drive has been fixed. Kevin said people in the area have told him that a septic tank company may be dumping into the creek at Lindale. The possibility that this might be true was discussed, and Eric and Amos thought that there should be more evidence if this were happening, such as tire tracks, toilet paper, algal slime, and foul odor.

Eric suggested offering to cost share in pumping out septic tanks as well as cost sharing in repairing failing septic systems could be included. He also suggested a flyover in winter to look for failing septic systems might be a good use of money.

Cost sharing on the agricultural BPM’s would be a good idea. Sheri said that just offering 40% would not be enough for farmers because they can get a better deal from another program.

Other business

There was general agreement that the next meeting could be in late January on a Thursday.

Adjourn

The meeting adjourned by consensus sometime after 1:00 p.m.

Respectfully Submitted,

Kevin McAuliff and Gretchen Lugthart

Staff

Notes from the Dykes Creek Residents Walk-In Meeting

Thursday, November, 7, 2013, 5:00 p.m. – 7:00 p.m.
Northwest Georgia Regional Commission

Attendees:

Wayne Shelly
Michael Moore
Bob Johnstone
Jerel McClay
Roger Barton

The above-listed signed in. Several wives were present, as well.

Visitors began to arrive shortly after 5:00 p.m. and lively conversations developed, with participants offering many interesting observations.

The locals consider Morrison Campground the location of the headwaters of Dykes Creek, although they are aware of a creek bed to the north. They agree that the creek bed above Halls Lake has been dry “forever.”

Residents noted that the greatest change in the creek over the years has been the disappearance of large mussels that were once found there. There are also fewer spring lizards (salamanders) and bottom feeding darters (exact name not agreed on). They were also in agreement that the abundant water willow weed (*Justicia americana,* which is a common native species) was not formerly found there. They hate it, and regard it as an invasive introduced when someone dumped an aquarium out into the creek. Some reported having been able to kill it with an aquatic version of Roundup.

Asked about the excavation in the creek bed on McClain Road just north of Gentry Road, residents said that it had been there for more than 50 years, but they did not know its origin or purpose.

There was complete agreement that the major source of fecal coliform in the creek is beavers. Residents said that there were few beavers on the creek fifteen years ago, but that they had proliferated and become a serious problem over the past ten years.

The meeting drew to a close around 6:30 p.m., but NWGRC staff remained available until 7:00 p.m.

Notes taken by Kevin McAuliff, NWGRC Staff

AGENDA

Dykes and Silver Creek Partnership Advisory Committee Meeting

Tuesday, April 29, 2014, 11:00 a.m.
Northwest Georgia Regional Commission
Jackson Hill, Rome

1. Introductions

2. Presentation of staff findings on Dykes Creek

    Data

    Proposed projects

    Projected costs

3. Members comments on and amplifications of staff findings and proposals

4. Current status of Silver Creek Implementation Project

5. Discussion of how to proceed on Silver Creek Implementation Project

6. Other business

7. Adjourn

Minutes

of the

Dykes and Silver Creek Partnership Advisory Committee Meeting

Tuesday, April 29, 2014, 11:00 a.m.
Northwest Georgia Regional Commission
Jackson Hill, Rome

Attendees:

Eric Lindberg, City of Rome

David Howerin, NWGRC

Gretchen Lugthart, NWGRC

Barbara Stitt-Allen, GAEPD

Leighann Gaines, Polk County Health Department

Clinton Agnew, Citizen

Susan Monteleone, Shorter University

Michael Crosby, Shorter University

Leigh Ross, City of Rome

Mike Pitts, Floyd County Health Department

Katie Owens, The Nature Conservancy

Mike Hackett, City of Rome

Kevin McAuliff, NWGRC

The meeting opened at approximately 11:10 a.m. with introductions all around.

Presentation of staff findings on Dykes Creek

Kevin McAuliff asked Gretchen Lugthart to present the staff findings including watershed data, project proposals and associated costs.

Gretchen presented the requested information, and, after citing certain relevant technical data, identified certain likely sources of sedimentation including piles of old mine tailings on East Hermitage Road, a culvert on the same road, unpaved roads and driveways in the Shannon Oaks Subdivision, and an unpaved stretch of Flowery Branch Road with unpaved driveways in the same vicinity. In addition, there is pastureland lacking 50 foot buffers required on trout streams.

Although Dykes Creek is not currently listed for fecal coliform, there is still a problem, and Gretchen mentioned failing septic systems as a likely source of contamination, along with pastureland, for example, a large cow pasture on Wade Mountain Road, that appears to drain into the Gentry Road tributary.

Members' comments and amplifications of staff findings and proposals

Susan Monteleone wondered whether recreational users of the creek, such as fishermen or boaters, could be brought into the discussion. Gretchen noted that boating is limited on the creek, due to its shallowness, and access is limited since the adjacent land is private.

Katie Owens noted that the fish diversity in Dykes Creek is excellent, and that Patty Langford of GA DNR would have the fish data. Gretchen said that she had contacted Patty, and was awaiting the data.

Eric Lindberg suggested that if we pursue septic system repair/replacement projects, we could avoid future problems, with Mike Pitts adding that the Health Department offers septic maintenance education sessions. Eric continued, saying that the same BMPs that address sediment often address fecal coliform, and wondered what funding source we might find to underwrite implementation costs.

Clinton Agnew shifted the focus to the abandoned mine, and asked about the water quality in the flooded pit, speculating that there could be a connection between the water in the pit and in the creek. Staff replied that they had done no testing, and that there was no outlet apparent on USGS maps. Clinton pointed out that the mine pit had functioned as a local dump for 30 years or more, and that no one knows what might be in there. Reverting to the sedimentation issue, Clinton suggested that it might be addressed by a series of sedimentation ponds along the creek.

Eric noted that the erosion situation in the Shannon Oaks Subdivision needed to be mitigated, noting that no entity claimed responsibility for the dirt/gravel roads or their maintenance. Barbara Stitt-Allen wondered if the area might be eligible for a Community Block Grant to address the problem via implementation of the Georgia Better Back Roads recommendations, noting that the EPA Nine Elements-based Dykes Creek Watershed Management Plan could be used to support an application. She noted that counties, municipalities, and regional commissions are eligible to apply, adding that additional points accrue with the provision of a greater match.

Barbara also noted that the piles of mine tailings are a stabilization issue, and that 319 funding could be used. She explained further that although only $400,000 could be awarded each year, the Watershed Management Plan could be used to support consecutive years of grant applications. She also noted that funding is available for streambank stabilization.

Eric stated that we need to be specific on areas to be addressed, including stabilizing dirt roads, buffering pastures and streambanks, and fixing culverts. Clinton added fixing ditches, driveways, and roads, since they contribute more to sedimentation than does agriculture. Eric noted that we have no control over Shannon Oaks Subdivision. Clinton also suggested sediment ponds along the creek, but Barbara was of the opinion that that would not be funded.

The meeting moved into a phase of scattered discussion, during which Eric and Mike pointed out on the watershed map areas that had recently been clearcut. Eric was of the opinion that the timber was low quality, and wondered if development was the object.

Current Status of Silver Creek Implementation Project

Kevin introduced the topic of progress on implementing the Silver Creek Project, saying that the septic system repair/replacement project was proceeding well, though a bit slowly. He also noted that an individual crucial to the BMP promotion and installation aspect of the project had backed off from his previous enthusiastic stance, and that Kevin did not anticipate that the person would participate in any way. He then asked the Committee for advice on how to proceed.

Discussion of how to proceed on Silver Creek Implementation Project

There was general agreement that septic installers should be made aware of the repair/replacement project, and that they would spread the word.

Regarding the BMP aspect, there was general agreement that highly placed Regional Commission people should discuss the importance of BMPs in bringing some $200,000 into the County.

Other Business

Gretchen requested that stakeholders fill out and submit the priority questionnaire for the Dykes Creek Watershed Management Plan that had been e-mailed to them, and the stakeholders agreed to do so.

No further business was introduced.

Adjourn

With no other business, the meeting adjourned by consensus.

Respectfully submitted,

Kevin McAuliff
Acting Secretary