CATOCTIN CREEK WATERSHED

2005 PROFILE

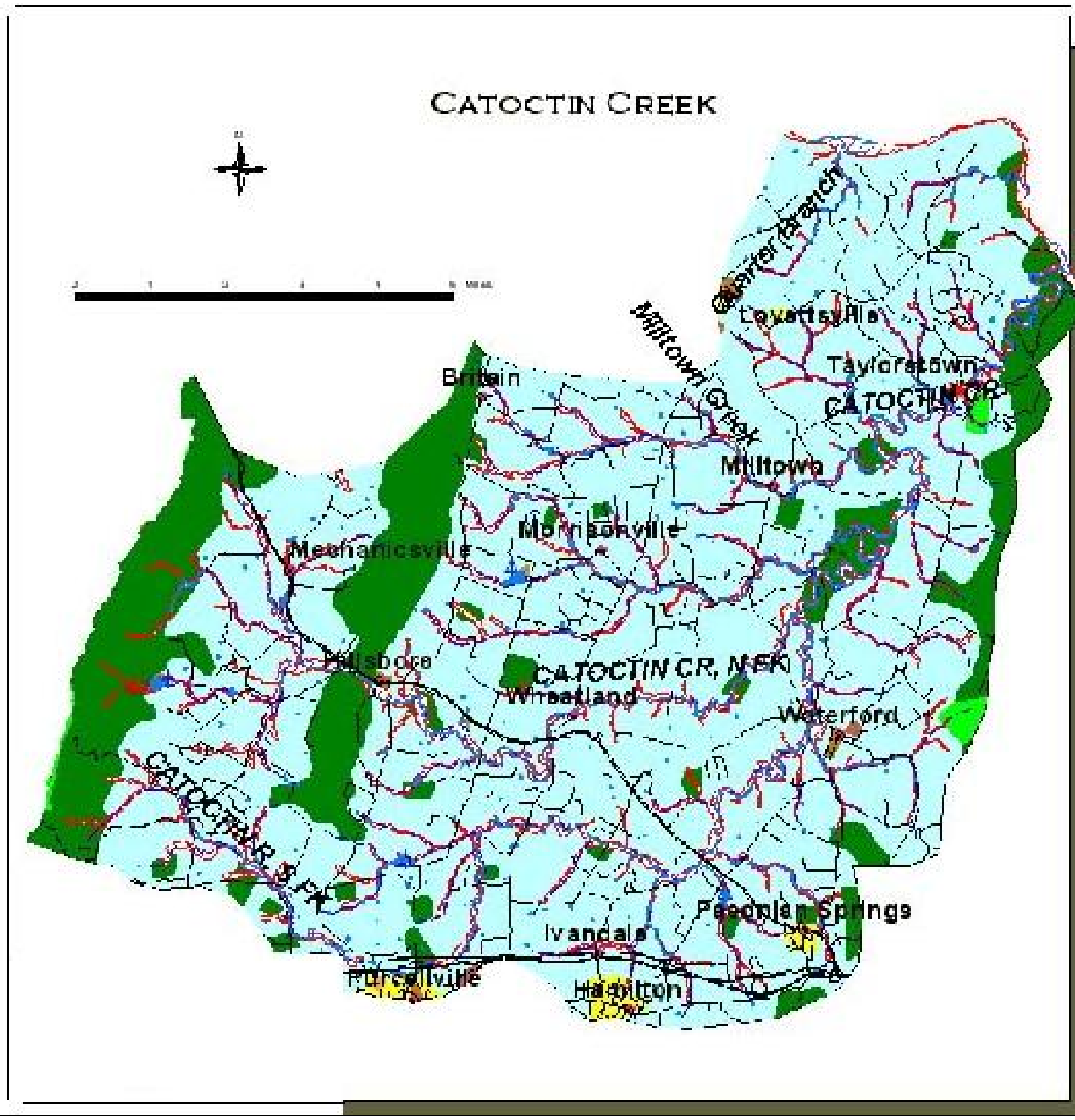


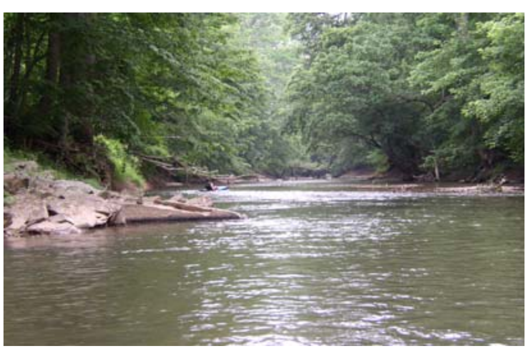
Table of Contents Page

Attachments

Watershed Description

The Catoctin Creek watershed is located in Loudoun County, Virginia, immediately north of Purcellville and approximately five miles to the northwest of Leesburg, Virginia. The watershed flows into the Potomac River and the Chesapeake Bay. The South Fork of Catoctin Creek rises on the slopes of the Blue Ridge west of Purcellville and flows eastward toward Waterford. The North Fork rises on the Blue Ridge west of Hillsboro and flows eastward toward the confluence with the South Fork north of Waterford.

The primary tributary to Catoctin Creek is Milltown Creek which originates on the eastern slope of Short Hill Mountain and flows easterward to join the main stem of Catoctin Creek east of Milltown. The main stem of the creek turns north toward the Potomac. The steep rocky bluffs along the stream in the final miles from Taylorstown to Point of Rocks produce a destination for kayakers and canoeists, and contributes to Catoctin Creek's value as a recreational resource.



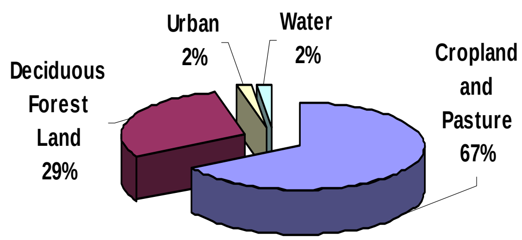
Mainstem Catoctin Creek has deeper waters ideal for canoeing, kayaking and fishing.

Milltown Creek tributary has fair to good quality riffles for aquatic insects.

Land Use -- Catoctin Creek drains approximately 59,100 acres or 100 square miles, with agriculture and forest as the primary land uses. There are small areas of suburban development surrounding some of the oldest towns in the country. The proportion of land in these uses is shown in **Figure 1**. The volcanic rocks from which the area's soils were derived have created productive farmland. In earlier times this area was known as the breadbasket of Loudoun. The southern edge of the watershed includes portions of the rapidly growing towns of Purcellville, Round Hill and Hamilton. Intensive suburban development is rapidly altering the nature of the land in the headwaters of Catoctin Creek.

Impervious Surfaces -- Impervious surfaces include the roadways, driveways, rooftops and parking lots that do not allow infiltration of water from rainstorms andrunoff. The Loudoun County Environmental Indicators Project (LEIP) includes mapping impervious surfaces in the county using Lansat Imagery. They report that the amount of impervious surface in Catoctin Creek as 0.36%. This is a modest amount and does not represent levels that would be expected to have a noticeable impact on the hydrological characterisitics of the watershed as a whole. However, imperviousness in towns such as Purcellville and Waterford, are much greater, and can be expected to impact stream health and water quality in the South Fork Catoctin Creek.

Figure 1. Land Use in Catoctin Creek Watershed 2000

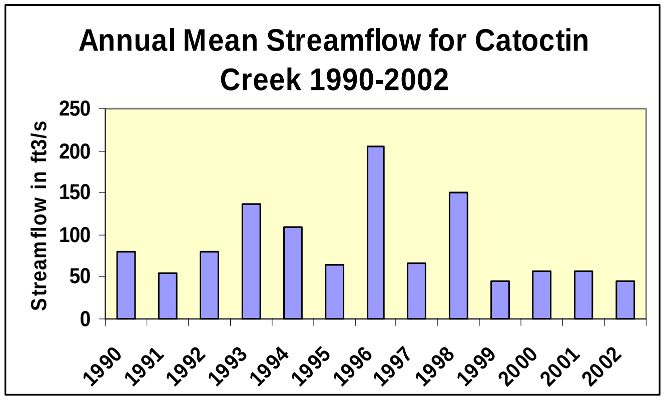


Impervious roadways and parking lots collect stormwater that flows directly into South Fork Catoctin Creek.

Precipitation and Stream Flow – Precipitation is measured at a station in Lincoln in Loudoun County. Analysis of data from 1968 to 2001 show there are differences in mean monthly precipitation. Precipitation in the spring-summer months of March through August tends to be higher than precipitation in the fall-winter months.

US Geological Survey (USGS) has been collecting stream flow data in the Catoctin watershed at Taylorstown since 1971. Average annual flows are shown in **Figure 2.** Average stream flow is approximately 100 cubic feet per second which is adequate to maintain a healthy stream ecosystem. However, these data show that stream flows are highly variable. Stream flows in the summer-fall months tend to be lower than flows in the winter-spring months.

Figure 2. Annual Mean Stream flow for Catoctin Creek at Taylorstown Based on US Geological Survey Stream Monitoring Data, 1990 – 2002.



Water Quality Studies

Citizens are concerned about good water quality for a variety of reasons. Dip a paddle, run a rapid, cast a fishing line, hike along a stream, or just sit under a tree on a stream bank. Our streams provide special places for recreation and aesthetic enjoyment, essential habitat to wildlife, and a source of drinking water. They are a valuable resource that must be protect and manage wisely.

Water Quality Studies – Virginia Department of Conservation and Recreation (DCR) published a report on water pollution in the Catoctin watershed in March 2002 called the Total Maximum Daily Load or TMDL study. The study focused on four stream segments that violate the state and Federal water quality standard. Fecal coliform bacteria in these streams are consistently elevated above the standard. These stream segments are "impaired" which means the water quality does not support the stream's intended use for primary contact recreation (e.g. swimming, wading, and fishing).

Virginia Department of Environmental Quality (DEQ) added another stream segment in the North Fork Catoctin Creek to the impaired list in 2004 based on fecal coliform bacteria contamination. A second segment was added in the South Fork Catoctin Creek for violating the standard for aquatic life as revealed by benthic macroinvertebrate monitoring. These impairments and the status of other stream segments are summarized in **Appendix 1** to this profile.

Analyses of the water quality data show that there are high concentrations of fecal coliform bacteria at all flows and all months. There is no significant difference in monthly fecal concentrations within a year. Monthly mean concentrations at DEQ's monitoring station at Taylorstown on the mainstem are shown on **Table 1.** The water quality standard is 400 fecal coliform bacteria/100 ml., and this level is exceeded more than 50% of the time every month. The public health risks associated with fecal contamination are discussed in statements issued by the DCR and Virginia Department of Health and provided in **ATTACHMENT C**.

Table 1. Summary of Mean Monthly Fecal Coliform Concentrations at Catoctin Creek, Taylorstown Based on DEQ Stream Monitoring Data from 1973-2001.

Month	Mean (cfu/100 ml)	Minimum (cfu/100 ml)	Maximum (cfu/100 ml
January	1,792	93	8,000
February	689	3	3,900
March	1,577	43	24,000
April	546	0	2,500
May	1,849	100	9,200
June	2,066	100	24,000
July	532	23	4,100
August	1,759	43	16,000
September	1,909	100	9,200
October	1,794	100	24,000
November	911	100	4,600
December	2,709	43	24,000

Sources of Pollution

Point Sources – Four facilities are permitted to discharge treated wastewater through a pipe (point sources) into the Catoctin Creek watershed. They are the Hamilton Sewage Treatment Plant, Purcellville Water Treatment Plant, Waterford Sewage Treatment Plant, and 1 private residence. Permitted discharges may contain pathogens associated with fecal matter, and are required to maintain a fecal coliform concentration below 200 cfu/100ml. Monitoring of the point discharges from sewage treatment plants at Hamilton, Purcellville, and Waterford by the Loudoun County Sanitation Authority show these facilities are well designed and operated, and fecal coliform concentrations are reduced to levels well below the 200 cfu/100ml limit.

Nonpoint Sources – The principal sources of pollution causing the fecal coliform impairments in the Catoctin Creek watershed are from nonpoint sources. They include livestock, humans (from malfunctioning and failed septic systems), and wildlife. Analyses of pollution levels and stream flows showed that there are high levels of pollution from these sources under all conditions, but periods of low flow and less dilution water resulted in the worst pollution conditions. The proportion of fecal pollution from human sources ranges from as low as 4% to over 90%. These results are based on bacterial source tracking samples taken by DEQ in the Catoctin watershed.

- **Private Septic Tank Systems –** Typical private residential sewage treatment systems consist of a septic tank, distribution box, and a drainage field. Wastes from the septic tank are distributed to the drainage field, where it flows downward to groundwater, laterally to surface water, and/or upward to the soil surface where water is evaporated. Removal of fecal coliform and pathogens is accomplished primarily by die-off in the soils. The Loudoun County Department of Health reports that fecal coliform can survive in soils for up to 50 days and move laterally up to 50 feet. These numbers might be higher or lower depending on soil moisture and temperature.

A properly designed and functioning septic system provides sufficient retention to kill 99.9% of the fecal coliform bacteria.

A septic system fails when a drain field has inadequate drainage or a "break" that allows wastewater (effluent) to flow directly to the soil surface. In this situation the effluent can be flushed into surface waters during rain runoff events or flow directly into a nearby stream. Failures are more likely to occur in the winter-spring months than in the summer-fall months.

The Loudoun County Health Department reports that there are approximately 3100 septic systems in the Catoctin watershed. They estimate a failure rate of 5% with the majority of failures occurring at homes that are 20 years or more old. The estimated number of failing systems that are directly depositing sewage to streams is shown in **Table 2**.

Table 2. Estimated Number of Failing Septic Systems in Catoctin Watershed Based on 5% Failure Rate.

Stream Portion	Total Septic Systems	Failing Septic Systems	Straight Pipes
Catoctin Mainstem	1300	6	3
South Fork	470	2	1
North Fork	1340	7	4
Total	**3110**	**15**	**8**

- **Livestock –** The predominant types of livestock in the Catoctin Creek watershed are beef cattle and horses. Fecal pollution can enter surface waters from livestock both from direct deposited wastes from cows standing in a stream and from wash-off of manure from the pasture during a run-off producing rain. Direct deposits by beef cattle are the most serious. DEQ reports that 70% of the wastes of cattle with access to a stream will be deposited in the stream. Wash-off of wastes deposited on the land is especially important if there are poor natural riparian buffers and run-off is not filter before it enters a stream. The estimated livestock populations are provided in **Table 3**.

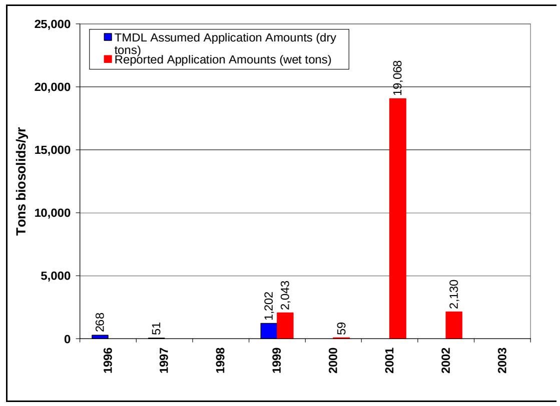
Table 3. Livestock Populations in the Catoctin Creek Watershed Estimated by the Loudoun Soil and Water Conservation District.

Animal Type	Number of Animals
Dairy Cows	170
Beef Heifer	5300
Horses	3100
Sheep	1180
Goats	75
Swine	315

- **Biosolids --** The DEQ water pollution study considered several nonpoint pollution sources. The assessment of one source, biosolids, was developed from data covering the period 1999-2001. The DEQ report concluded that biosolids did not contribute to the water pollution problems.

However, more recent data obtained by Loudoun Watershed Watch from the Loudoun County Department of Health reveal that the amount of biosolids applied since 2001 is several orders of magnitude greater than was considered by DEQ in the TMDL report. The annual application amount is shown in **Figure 3**. There are also anecdotal reports of fish kills from biosolids, and evidence from the Loudoun County Department of Health that biosolids have been applied in sinkholes and areas of "steep slopes". The potential significant loading contribution from biosolids is not included in the TMDL implementation plan designed to restore water quality. The DEQ report makes the assumption that the use of land applied fecal material (biosolids) will be maintained at current loadings or below current levels which is not supported by more recent data.

Figure 3. Amount of the Class "b" Biosolids Considered by DEQ (blue bars) in the Catoctin TMDL Report Compared With More Recent Data From Loudoun County Dept of Health (red bars).



- **Wildlife –**The most important species of wildlife impacting on water quality are muskrat and beaver because they deposit fecal wastes directly in the water. Other wildlife species, including deer, are less important because they deposit their wastes on land and it only enters the water in a diluted form in runoff. The Virginia Department of Game and Inland Fisheries (VDGIF) estimates there are 2800 muskrats and 200 beaver in Catoctin Creek. The high number of muskrat makes them the only wildlife species significantly impacting on water quality.

Stream Monitoring Activities

Water quality and stream health in the Catoctin watershed are monitored by DEQ, Loudoun Soil and Water Conservation District, and Loudoun Wildlife Conservancy. A summary of data for the Catoctin watershed is provided in **Table 4**.

DEQ Monitoring – Water quality was routinely monitored by DEQ at three permanent stations until 2001. In 2001 DEQ changed their monitoring program to a rotational plan in which every watershed is sampled 2 years out of every 6 years. In addition, the frequency of monitoring was reduced from monthly to once every two months so that within the six-year cycle, each monitoring station has only 12 sample results. At the same time, DEQ established four new stations for routine monitoring for a total of seven in the watershed. Three additional stations were sampled in 1999-2000 period during the TMDL study.

Table 4. Stream and Habitat Monitoring Data for Catoctin Creek.

Monitoring Sites	USGS Water Flow	Chemical	Bacterial	Habitat Assessment	Macro-invertebrate
Main Stem					
Rt 663	**USGS** 1972-2001	**DEQ** 1978-2004 **LSWCD** 1999-2004	**DEQ** 1978-2004 **LSWCD**1999-2004	**LSWCD** 1999-2001 **LWC** 1997-2001	**LSWCD** 1999-2004 **LWC** 1997-2004
South Fork					
Rt. 681				**LWC** 2004	**LWC** 2004
Rt 698	**USGS** 1972-2004	**DEQ** 1973-2004	**DEQ** 1973-2004		
Rt 738		**DEQ** 1977-2004	**DEQ** 1977-2004		
Rt. 611				**LWC** 1997-2004	**LWC** 1997-2004
Rt 690		***DEQ** 1973-2000*	***DEQ** 1973-2000*	**DEQ** 2001	**DEQ** 2001
Rt 711		**LSWCD** 1999-2003			
Rt. 719				**LWC** 2004	**LWC** 2004
Rt. 713				**LWC** 2004	**LWC** 2004
North Fork					
Rt 681		**DEQ** 1979-2001	**DEQ** 1979-2001	**LWC** 1997-2004	**LWC** 1997-2004
Rt 287		**LSWCD** 1999-2003 ***DEQ** 1974-2000*	**LSWCD** 1999-2003 ***DEQ** 1974-2000*	**LSWCD** 1999-2003	**LSWCD** 1999-2003
Rt 690		***DEQ** 1979-2000*	***DEQ** 1979-2000*		
Rt. 812		**DEQ** 2003 - 2004	**DEQ** 2003 - 2004		
Rt 719		**LSWCD** 1999-2003	**LSWCD** 1999-2003	**LSWCD** 1999-2003	**LSWCD** 1999-2003
Milltown Creek					
Rt. 673		**DEQ** 2003 - 2004	**DEQ** 2003 - 2004		
Rt. 682				**LWC** 2004	**LWC** 2004
Rt. 691				**LWC** 2002-2004	**LWC** 2002-2004
Unnamed Tributary (aka Richard Run)					
Cottage Grove Lane		**DEQ** 2003 - 2004	**DEQ** 2003 - 2004	**LWC** 2004	**LWC** 2004

DEQ's altered monitoring plan has two major impacts:

- **Limited Data Available for Decision Making –** Every two years DEQ reviews the stream monitoring data to assess water quality. **Table 5** shows that the number of samples making up the data set used for the assessment has decreased since the 2001 change in state monitoring. In addition, the same data set will be used to assess ambient stations for two to three consecutive assessments, decreasing the value of the assessment process.

Table 5. Analysis of the Number of Samples Used in the 305(b)/03(d) Integrated Report by DEQ for Loudoun County Waters – 2000 through 2006.

Watershed Monitoring Station	Type of Station	Number of Samples Used for Assessment			
		2000	2002	2004	2006 (Projected)
Catoctin Creek A02					
1ACAX004.57	Trend[1]	49	51	38	35
North Fork Catoctin Creek A02					
1ANOC000.42	Ambient[2]	19	22	16	10
1ANOC004.38	Ambient		11	11	12
1ANOC009.13	Ambient		11	13	13
South Fork Catoctin Creek A02					
1ASOC001.66	Ambient	20	22	17	11
1ASOC007.06	Ambient		11	11	11
1ASOC0012.38	Ambient		12	12	12

[1] Trend Stations – monitored once every two months, every year
[2] Ambient Stations – monitored once every two months, two out of every six years.

- **Limited Data Available to Assess Catoctin TMDL --** The original bacterial source tracking (BST) done by MapTech, Inc. under contract with DEQ during the TMDL study was very limited. The TMDL report concluded that it was sufficient only to "provide insight into the likely sources of fecal contamination," and to "aid in distributing fecal loads from different sources during model calibration." The MapTech, Inc. data, in themselves, are not sufficient to identify hot spots of contamination because of the short duration of the MapTech, Inc. study and the resulting small number of observations. Further, the impairments and watershed characteristics found in the Catoctin Creek watershed are characterized as "highly complex" under DCR guidelines. Field surveys, stream walks, and an expanded source assessment are needed in such situations, but have not been done.

County Agency Monitoring -- LSWCD has monitored stream water quality in the Catoctin watershed at five (5) stations since 1999. Samples are analyzed for nutrient parameters, bacteriological quality, and aquatic life.

Citizen Monitoring – LWC has sampled benthic macroinvertebrates at four (4) stations since 1997. In 2004 the number of stations was increased to nine (9) to better assess aquatic life conditions that are largely not monitored by DEQ. In 2005 LWC plans to expand their monitoring to include bacteriological quality assessment. An example of the importance of citizen monitoring to identify problems is provided in **Appendix 2** to this profile.

Stream monitoring tream collecting aquatic insects in headwater stream after flooding.

Aquatic insects picked out of sample and placed in ice cube tray for identification and counting.

Physical, Chemical, Nutrients, and Sediments Conditions

Physical and Chemical Parameters –DEQ has collected physical and chemical data on the main branch of the Catoctin Creek, and the North and South Forks the 1970's. The status of these key physical and chemical parameters are summarized in **Table 6**. the water quality standards are consistently met in Catoctin Creek.

Table 6. Summary of Key Chemical Parameters Based Upon DEQ Data in the Catoctin Watershed Between 1996 and 2001.

Parameter	DEQ's Criteria	Observation	Condition
pH	6-9 units	The average pH is good.	**Criteria consistently met**
DO (Dissolved Oxygen)	Minimum of 4 mg/l	DO levels vary between 6 – 9 mg/l which is well above the DEQ minimum standard.	**Criteria consistently met**
BOD (Biological Oxygen Demand)	Maximum of 7 mg/l set by EPA	Occasional high BOD spikes are possibly related to large storm events -- fewer spikes in recent years.	**Criteria consistently met**

Chesapeake Bay Nutrient Reduction Goals -- Government and citizen groups in the Chesapeake Bay watershed have worked together since 1987 to reduce the amount of nutrients flowing into the Bay from tributaries such as the Potomac River and its tributaries including Catoctin Creek. High nutrient levels threaten the delicate balance of the Bay ecosystem by causing the rapid growth of unhealthly algae and prohibiting light from reaching underwater grasses critical to the health of the Bay's fish and shellfish. Excess algae release oxygen as a byproduct of photosynthesis during the day, but during the night, they respire and consume oxygen. Their oxygen consumption can reduce dissolved oxygen concentrations below the levels necessary to support other life. Excess algae can also foul the substrate habitat of aquatic insects.

Nutrient Levels in Catoctin Creek -- Virigina agreed in 2003 to reduce sediment loads into the Chesapeake Bay to provide water clarity necessary for underwater grasses to thrive. Turbidity due to suspended solids and particles in the water is a major factor that blocks light from reaching the grasses. Virginia is to reduce sediments loads in the Potomac River watershed by 617,000 tons/year.

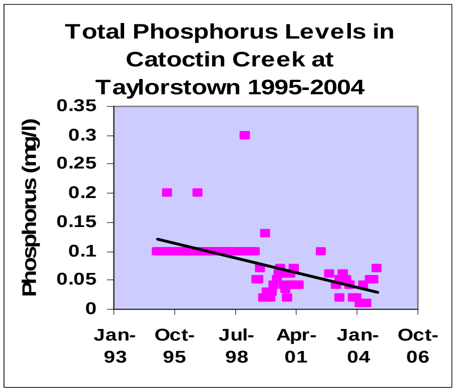
DEQ has collected nutrient data on the North, South, and main branch of the Catoctin Creek since the 1970's. LSWCD also has been collecting nutrient data at four stations since 1999. Estimated nutrient loads flowing from Catoctin Creek into the Potomac River are provided in **Table 7**.

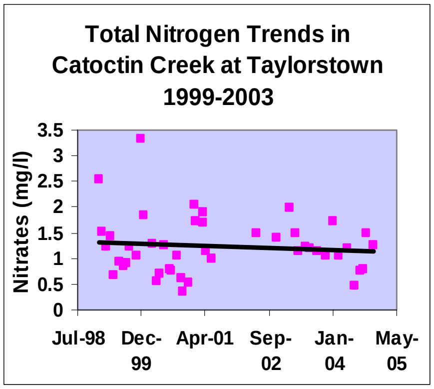
Table 7. Average Annual Nutrient and Sediment Loads (lbs/ac/yr) for Catoctin Creek Based on DEQ 305(b) Data.

	Total Nitrogen	Total Phosphorus	Total Dissolve Solids
lbs/ac/yr	7.64	0.86	0.22
Acres	59,000	59,000	59,000
Total	450760 lbs/yr	50,740 lbs/yr	12,980 lbs/yr

Analyses of the DEQ data, provided in **Graph 1 and 2**, show that phosphorus levels have decreased over the last 10 years. However, nitrogen levels have remained about the same over this time period. It is critical to reduce nitrogen in order to raise the dissolved oxygen levels in Chesapeake Bay and eliminate the "dead zones" in the Bay where the lack of oxygen is killing fish, crabs, and shellfish.

Graph 1 and 2. Total Phosphorus and Total Nitrogen Levels in Catoctin Creek at Taylorstown based on DEQ Data, 1999-2004.





Best Management Practices – There are four nonpoint pollution management practices recommended to reduce nutrient loads:

- Restore stream buffers on agriculture land to keep fertilizers and animal wastes out of the streams;
- Improve waste-water treatment to reduce nutrient loads;
- Improve retention of urban storm water to better manage erosion, sediments and nutrients; and

- Utilize low impact residential development designs and nitrogen removing septic systems in rural areas.

Sediments – Sediments also impact Catoctin Creek. Aquatic insects live in the substrate and provide food for many game fish including bass. Fine particle sediment suspended in the stream water will settle out and fill in living spaces around gravel and cobble, and smother the aquatic organisms. Sediment also creates sand and mud bars in streams that shift after high flows. These unstable substrates provide unhealthy conditions for aquatic life.

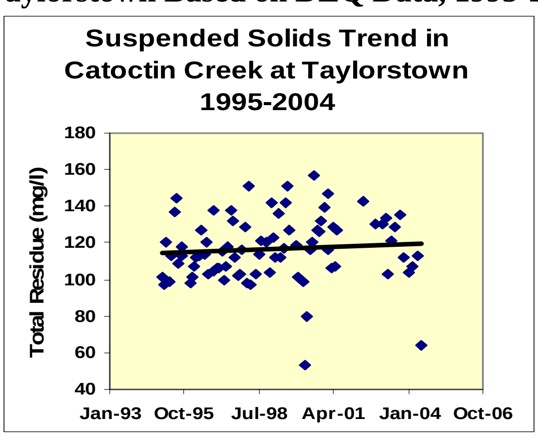
DEQ found that the primary sources of sediments in Catoctin Creek and the Potomac River are streambank erosion and runoff from agricultural lands used for pasture and crops with inadequate natural buffers along tributary streams. Sediment loads flowing into the Potomac River from Catoctin Creek are shown in **Table 8**. The estimated load for 2001 is 8,800 tons. Remedies to restore healthy stream conditions include fencing livestock out of streams to decrease stream bank erosion and providing wider natural riparian buffers to stablize streambanks.

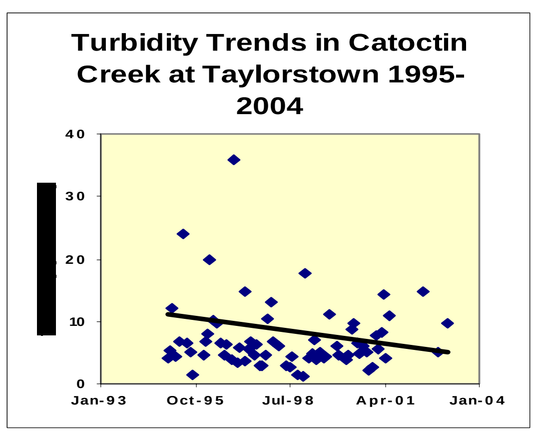
Table 8. Average Annual Sediment Loads from Catoctin Creek by Source (in tons/year) for 2001.

Source	Loads	Percent
Construction	268	3.02%
Crops	1,335	15.03%
Forest	290	3.27%
Pasture	3,213	36.17%
Streambank Erosion	3,728	41.97%
Other	47	0.53%
Total	**8,882**	**100.00%**

DEQ has also collected turbidity and suspended solids data in the Catoctin Creek watershed since the 1970's. Analyses of DEQ data, provided in **Graphs 3 and 4**, show that suspended solids levels have remained about the same over the last 10 years. Turbidity, which is a measure of the discoloration of water and the extent to which visibility is reduced, has decreased.

Graphs 3 and 4. Suspended Solids and Turbidity Levels in Catoctin Creek at Taylorstown Based on DEQ Data, 1995-2004.





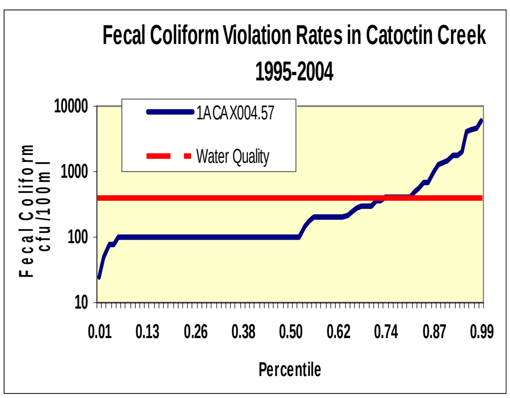
Bacteriological Water Quality Conditions

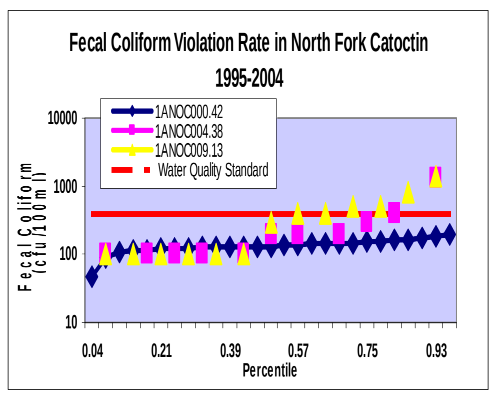
DEQ Data – Streams fit for recreational use must have low levels of fecal bacteria contamination. DEQ has collected fecal coliform data in the North Fork, South Fork, and the main stem of Catoctin Creek since the 1970's. The 1995-2004 fecal coliform bacteria levels for Catoctin Creek and the North and South Forks are shown in **Graphs 5, 6, and 7**. These data are plotted as cumulative percentages to show violation rates. The point at which the data line crosses the water quality standard line of 400 fecal coliform (mFC/100 ml) indicates the percentage of samples that meet the water quality standards. The difference between that percentage and 100% is the violation rate.

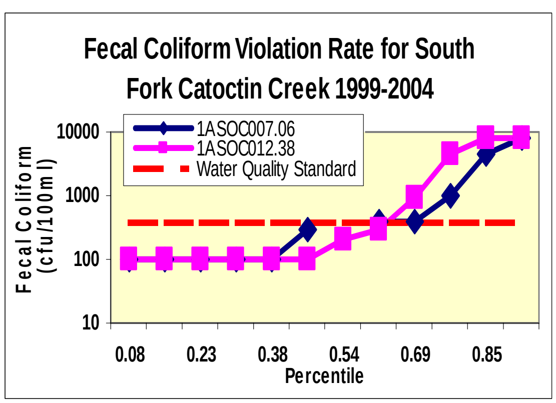
The DEQ data show the following:

- The data line for the mainstem of Catoctin Creek at Taylorstown Bridge crosses the DEQ standard line at approximately 80% indicating that 20% of the samples exceed 400 mFC/100 ml and there is a 20% violation rate.
- The data lines for the North Fork Catoctin Creek stations indicate that water quality standards are met near the mouth of North Fork, but that water quality deteriorates upstream. The violation rate at the 4.38 stream mile point is 17% and at the 9.13 stream mile point it is 35%.
- The data lines for the South Fork Catoctin Creek stations indicate that water quality standards are exceeded 30 to 35% of the time at the two stations.

Graphs 5, 6, and 7. Fecal Coliform Bacteria Concentrations Showing Water Quality Violation Rates for the Catoctin Watershed, 1995-2003.







Loudoun Soil and Water Conservation District Data -- LSWCD also collects fecal coliform data at four stations in the mainstem and North and South Forks Catoctin Creek. The monitoring data for the period 1999 – 2003 also show that a high percentage of samples violate the water quality standard at all stations.

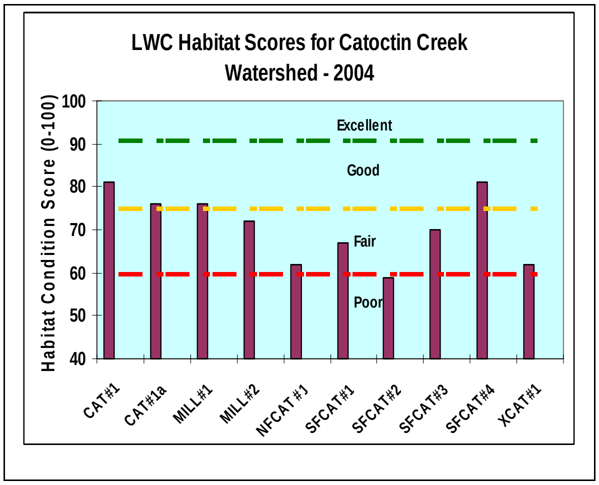
Stream Habitat Conditions

LWC Stream Habitat Data – LWC has collected stream habitat data since 1996 in the North and South Forks and at Taylorstown, and since 2002 in the Milltown Run tributary. LWC uses the EPA RBPII protocol and assesses the stream using ten parameters. Habitat scores for the 2004 assessments are shown in **Graph 8.** The chart shows that the stream habitat at 60% of the monitoring stations is rated in the "Fair to Poor" range.

The habitat parameters that are most stressed or altered from what are natural conditions are:

- Narrow riparian buffers that reflect human impact along the immediate bank zone;
- Unstable banks with eroded areas, bank scars, and bank sloughing;
- Stream banks poorly covered with natural vegetation leaving bare soils or low cut vegetation that are susceptible to erosion;
- Find sediments that surround and fill-in living spaces around and between gravel, cobble, and boulders creating poor conditions for aquatic life; and
- Sediment deposition in the stream that fills in pools, and creates point bars at bends and mud banks along edges.

Graph 8. Stream Habitat Conditions in the Catoctin Creek Watershed Based on LWC Assessment Data.



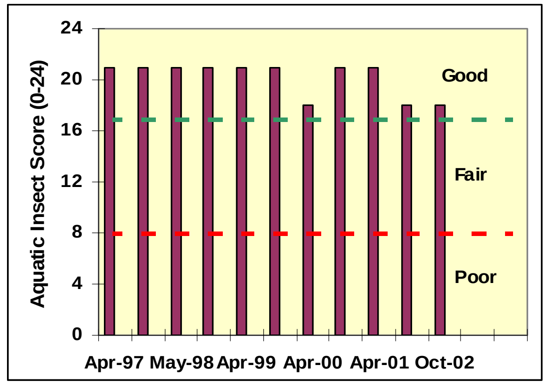
Absence of trees encourages stream bank erosion and sloffing of soils into stream creating mud banks that smoother aquatic life.

Aquatic Life Conditons

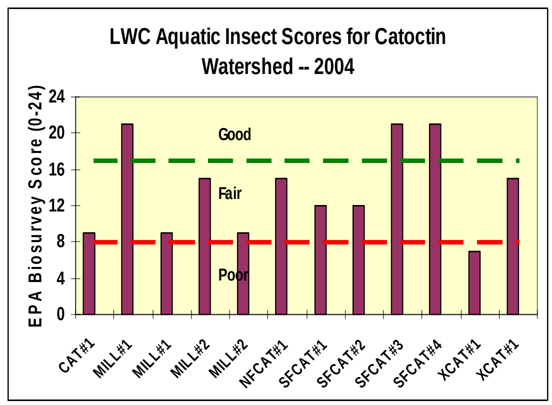
DEQ Aquatic Insect Data – DEQ has monitored aquatic insects in Catoctin Creek at Taylorstown for several years. DEQ considers the Taylorstown site to be comparable to the best condition to be expected in the ecological region. According to their data, there is an optimal and balanced aquatic insect population for a stream the size of Catoctin. The DEQ data are shown in **Graph 9**.

LWC Aquatic Insect Data – LWC has monitored aquatic insect at four sites in the Catoctin Creek watershed since 1998. In 2004 the number of sites was increased to nine in order to develop more comprehensive data on the watershed. The 2004 data were analyzed to calculate an aquatic insect score for each monitoring station based on EPA recommended criteria. The results for the nine stations are shown on **Graph 10**. These data show that the aquatic insect scores in the watershed generally are in the "fair" range. This means that there is only a moderate amount of species diversity, there are fewer sensitive species such as stoneflies and mayflies, and there are several species that are moderately tolerant of pollution such as caddisflies, true flies such as midge larvae, and aquatic beetle.

Graph 9. DEQ Aquatic Insect Scores for Catoctin Creek at Taylorstown, 1997-2002.



Graph 10. LWC Aquatic Insect Scores for Nine Catoctin Creek Watershed Monitoring site in 2004.



Overall Assessment of Stream Health

The quality of the water and health of the stream ecosystem in the Catoctin watershed is well documented compared to most other streams in Loudoun. A summary of the various stream assessments are summarized in **Table 9**. These assessments show that the health of the Catoctin Creek watershed is being significantly impacted by human activities. Large portions of the stream do not meet water quality standards and are designated as impaired because of fecal coliform bacteria contamination.

Assessments of the stream habitat show generally "fair to poor" conditions. Narrow riparian buffers, unstable stream banks, and sediments that smother bottom substrates are common problems. The assessments of aquatic life show that the aquatic insect populations at all monitoring sites are generally in the "fair" range. The aquatic life assessments in the South Fork Catoctin Creek at Purcellville show a stressed aquatic insect community, and a stream segment has been designated as impaired.

Corrective Action Needed -- Non-point sources of pollution are widespread in the watershed and are the cause of the poor water quality and aquatic life conditions. DCR has established limits on the pollution impacts that must be met to meet water quality standards. DCR also has worked with local stakeholders and developed a plan to limit these pollution loads and restore water quality by 2015. The pollution control plan targets cattle with access to streams and failing septic tank systems as the major problems to correct to reduce fecal contamination. Farmers in the watershed are being offered cost-share and tax credits as incentives to exclude livestock from the streams. The most common exclusion method is to provide fencing and an alternative water supply. Homeowners are being asked to repair malfunctioning septic systems.

Table 9. Summary of Catoctin Creek Water Quality and Stream Health Assessments.

Monitoring Site	Environmental Parameters					
	Chemical Quality	**Nutrients/ Sediments**	**Bacteria Quality**	**Habitat Assessment**	**Aquatic Insect Score**	**Impervious Surfaces**
Main Stem	**Good**	**Marginal**	**Impaired**	**Good**	**Fair**	**Good**
North Fork	**Good**		**Impaired**		**Fair**	**Good**
South Fork	**Good**		**Impaired**	**Fair**	**Fair**	**Good**
Milltown Creek	**Good**			**Fair-Good**	**Fair**	**Good**

References

DEQ & DCR. 2004. *Virginia 305(b)/303(d) Water Quality Integrated Report to Congress and the EPA Administrator for the Period January 1, 1998 to December 31. 2002.* March 2004. Richmond, VA.

Environmental Protection Agency. 1997. *Volunteer Stream Monitoring: A Methods Manual. November, 1997.*

Environmental Protection Agency. 1999. *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers. Second Edition.* July 1999.

Interstate Commission on the Potomac River Basin. 2004. *Benthic TMDLs for the Goose Creek Watershed*. Virginia Department of Environmental Quality and Virginia Department of Conservation and Recreation. April 2004.

Interstate Commission on the Potomac River Basin. 2003. *Bacteria TMDLs for the Goose Creek Watershed*. Virginia Department of Environmental Quality and Virginia Department of Conservation and Recreation. February 2003.

Loudoun County Sanitation Authority. 2003. *Goose Creek Source Water Protection Program.* December 2003.

MapTech. 2002. *Fecal Coliform TMDL (Total Maximum Daily Load) Development for Four Catoctin Creek Impairments, Virginia.* March 26, 2002. Blacksburg, VA.

Schwalm, Darrell. 2002. *State of Loudoun Streams: 2002.* Loudoun Watershed Watch. October 2002.

Trieu, Phong, J. Galli, J.Dittman, M. Smith, and C. Vatovec. 2003. Loudoun County Baseline Monitoring Survey (2000-2002) Phase I: Broad Run, Goose Creek, Limestone Branch, Catoctin Creek, Dutchman Creek, and Piney Run Mainstem Conditions. Metropolitan Washington Council of Governments. Washington, DC.