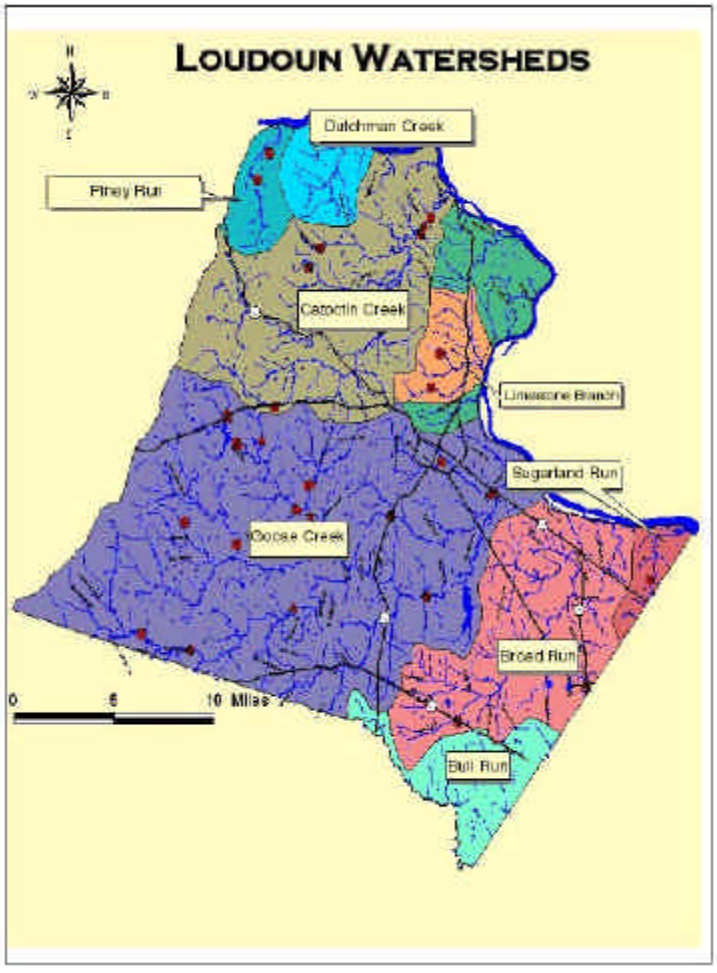
Report on
Impaired and Threatened Waters in Loudoun County:
2004



Loudoun Watershed Watch

January 2004

DRAFT

Acknowledgements

Several professionals at the Virginia Department of Environmental Quality (DEQ) have been most helpful in providing Loudoun Watershed Watch (LWW) with DEQ water quality standards, stream monitoring data, stream monitoring plans, and other various public documents regarding the assessment of the quality of waters in Virginia. Appreciation is extended to Bryant Thomas, Greg Brown, and Kate Bennett in the Northern Regional Office; and Joyce Brooks at Richmond. LWW recognizes the hard work and dedication of these individuals in documenting and working to protect water quality in Loudoun County, and in cooperating with local agencies and citizen environmental stewardship groups.

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EXECUTIVE SUMMARY

In April 2004 the Virginia Department of Environmental Quality (DEQ) will update the designations of waters in Loudoun County that are impaired or threatened as required under the Federal Clean Water Act, Section 303(d). Impaired waters are unsuited for their intended use for aquatic life and recreation, and threatened waters are those that require additional monitoring to document an impairment. DEQ publishes these lists to help local communities establish priorities for stream water quality protection and restoration programs and projects.

County agencies and citizen environmental stewardship groups have been monitoring Loudoun streams for several years. In some cases local organizations have not met DEQ requirements regarding the submission of stream monitoring data for use by DEQ. As a result there was much local data not used by DEQ when they published the 2002 list of impaired and threatened waters. Loudoun Watershed Watch (LWW) has compiled these monitoring data from agencies and groups in Loudoun County.

This report documents the waters in Loudoun County that DEQ and local stream monitoring data show should be included in DEQ's 2004 305(b) list as impaired or threatened. The impacted waters are in the following watersheds:

- Piney Run
- Catoctin Creek
- South Fork Catoctin Creek
- Middle Goose Creek
- North Fork Goose Creek
- Little River
- Tuscarora Creek
- Sugarland Run
- Limestone Branch
- North Fork Catoctin Creek
- Lower Goose Creek
- Beaverdam Creek
- Crooked Run
- Sycolin Creek
- Broad Run

Studies have been conducted by DEQ in Catoctin Creek, Goose Creek, Piney Run, and Limestone Branch to document the causes of water quality problems. DEQ has also determined the levels of reduction of pollutants that are needed to make Loudoun waters suitable for aquatic life and recreational uses. Most pollution comes from nonpoint sources that are not regulated by the state. These include runoff from agricultural activities and stormwater from residential communities and commercial areas. Improving land runoff and stormwater management practices to better protect stream water quality will rely on County stormwater management programs and voluntary measures by property owners along impacted streams.

Nonpoint pollution is a national problem, and there are many economic incentives being offer to property owners from Federal and state funding sources. Nevertheless, an individual's willingness to protect water from nonpoint sources depends upon recognition that there is an individual and public benefit to be gained. An important challenge that faces Loudoun citizens is to better understand the benefits to be gained from protecting water quality.

I. INTRODUCTION

Significant progress is being made in Loudoun County by the state, local agencies, and citizen groups to document pollution problems and develop plans to restore the quality of waters impacted by pollution. This progress targets waters that have been designated by the Virginia Department of Environmental Quality (DEQ) as impaired for their designated uses. In April 2004 DEQ will update the list of waters in Loudoun County that are impaired or threatened. Impaired waters are unsuited for their intended use for aquatic life and recreation, and threatened waters are those that require additional monitoring to document an impairment.

DEQ publishes these lists to help local communities establish priorities for stream water quality protection and restoration programs and projects. Updating these lists will help insure that stream quality restoration initiatives will include all waters that do not meet water quality standards. This report documents the waters in Loudoun County that DEQ and local stream monitoring data show should be included in the 2004 list as impaired or threatened.

Protecting Loudoun Streams

The federal Clean Water Act of 1972 guarantees citizens the right to be informed about the quality of their drinking and recreational waters, and to help keep these waters healthy. Water quality standards establish criteria for the safe use of waters for aquatic life, drinking, swimming, fishing, and boating. The standards are designed to limit pollution that enters a stream so degradation does not occur to prevent these uses.

There is a five-step process required under Virginia state laws to be followed to protect the safety of Virginia waters. In brief, the process involves the following.

1. **Monitoring** -- The water quality of state waters is monitored to measure their compliance with water quality standards.
2. **Assessment** -- The water quality data is analyzed and a public determination is made, at least every two years, as to whether the waters meet designated use standards.
    a. Waters that meet standards are designated as “supporting.”
    b. Waters that do not meet standards are designated as “partially” or “not supporting.”
    c. Waters with insufficient data to make a determination are designated as “supporting” if the available data suggests good water quality, or threatened (“observed effects”) if available data suggests poor water quality.
    d. Waters with no data are designated as “supporting.”
3. **Pollution Load Study** – Waters that are found not to comply with water quality standards are studied in order to determine the sources of pollution and the pollution loads that cause water quality standards not to be meet. The study determines the amount of reduction in pollution loads needed if the waters are to meet standards.

4. **Pollution Load Reduction Plan** – Pollution load reductions require that polluters make changes to reduce the amount of pollution reaching the impacted waters. The state, local officials, and landowners develop a plan that provides details as to specific pollution management actions that are needed to improve water quality. Most pollution affecting waters in Loudoun comes from nonpoint sources that are not controlled by law, such as runoff from farm operations or residential areas. Most clean-up actions rely upon voluntary actions by landowners.

II. BACKGROUND

Water Quality Standards

All streams in Loudoun County are designated for recreational uses including swimming and boating, and for the support of aquatic life under the federal Clean Water Act and the State Water Control Law. Some sections of streams are also designated for use as a source for drinking water. These designated uses determine the water quality criteria applicable to particular streams. Water quality standards consist of narrative and numeric criteria. These statements and numbers describe the water quality necessary for designated uses such as swimming and other water-based recreation, public water supply, and the support of aquatic life. More information about water quality standards in provided in **ATTACHMENT A**.

Monitoring Loudoun Streams

Water quality monitoring is done on a regular basis in Loudoun by DEQ at 16 to 18 stations as part of Virginia's trend and ambient water quality monitoring network. The data consist primarily of measuring physical, chemical, and bacteriological parameters. DEQ also collects stream habitat and macroinvertebrate data at three stations. The locations of many DEQ sampling stations are rotated on a two-year basis to better cover all major watersheds. In addition, the U.S. Geological Survey (USGS) collects chemical, sediment, and stream flow data at ten stations located in all the major watersheds in Loudoun.

There are several local authorities and citizen organizations that routinely monitor streams in Loudoun County.

- Loudoun County Soil and Water Conservation District (LCSWCD) monitors physical and chemical parameters, fecal coliform bacteria, and benthic macroinvertebrates at selected streams throughout the county using the Izaak Walton, Save Our Streams (SOS) protocol. They also assist volunteer citizen groups and work with landowners to install agricultural best management practices.
- Loudoun County Sanitation Authority (LCSA) monitors wastewater and drinking water treatment discharges throughout the county. It does not routinely monitor streams, but does special studies at sites of proposed discharges. One such special study is being conducted on Broad Run.
- Loudoun Wildlife Conservancy (LWC) monitors basic physical and chemical parameters, benthic macroinvertebrates, and stream habitats at stations throughout

Loudoun County using citizen volunteers. LWC follows a monitoring protocol recommended by EPA.

- North Fork Goose Creek Watershed Committee (NFGC) monitors basic physical and chemical parameters, and benthic macroinvertebrates at stations in the North Fork Goose Creek watershed using citizen volunteers. NFGC uses the Izaak Walton SOS protocol.

Assessing the Quality of Loudoun Streams

DEQ monitors streams to identify waters that do not meet Virginia Water Quality Standards and are impaired for their intended uses. Virginia is required under Section 303(d) of the Federal Clean Water Act to issue a biennial 303(d) list of impaired waters. This list is used by the state and local agencies for watershed planning and management purposes to:

- educate and inform citizens and public officials about local water quality;
- determine the extent to which Virginia waters are failing to support their designated uses;
- determine the causes for the failure to support the designated uses; and
- determine the nature of point and nonpoint pollution sources impacting on local waters.

Data Used to Assess Water Quality Compliance -- There are two types of data used by DEQ to assess the quality in waters in Loudoun County. The first type is DEQ's own data. These data comply with DEQ's quality assurance and quality control guidelines.

The second type of data is from county agencies and citizen groups that do not have a DEQ approved sampling and analysis protocol. These data are considered to be of lower quality, and are only used to help DEQ identify chronic and recurring water quality degradation problems. Prior to 2004, DEQ used these data to identify waters as "threatened" as provided in EPA guidelines. In 2004 DEQ will begin labeling these waters as having "insufficient data but having observed effects on water quality." DEQ will direct their monitoring efforts to these waters as resources allow.

III. DEQ LISTED IMPAIRED WATERS IN LOUDOUN COUNTY

DEQ's 2002 List of Impaired Waters – Waters designated as impaired are those waters that DEQ have assessed and found not to meet water quality standards for their designated uses. Impaired waters are found in every major watershed in Loudoun except Broad Run. Waters designated as impaired in 2002 are listed in **Table 1.**

Table 1. Impaired Waters in Loudoun Water Listed by DEQ in 2002.

Stream Name	Cause[1]	Boundaries of Impaired Segment
Piney Run	FC	3.5 mile segment from the mouth at the Potomac River upstream to the confluence with an unnamed lake
Catoctin Creek	FC	7.2 mile segment from its mouth at the Potomac River upstream to the confluence with Milltown Creek
NF Catoctin Creek	FC	4.1 mile segment from the confluence with Catoctin Creek upstream to a point 0.2 miles downstream of the Rt. 287 bridge
SF Catoctin	FC	17.3 miles from the mouth at Catoctin Creek upstream to the headwaters
Limestone Branch	FC	4.8 miles from the mouth at the Potomac River upstream to the headwaters, but not including two unnamed tributaries
Goose Creek	FC, Benthic	4.8 mile segment from the mouth at the Potomac River to the Goose Creek impoundment
NF Goose Creek	FC, Phosphorus	4.3 mile segment from the confluence with Crooked Run upstream to the confluence with an unnamed tributary approx. 0.25 m upstream from the Rt. 611 bridge
Beaverdam Creek	FC	6.3 mile segment from the confluence with the North Fork Goose Creek upstream to the confluence with North Fork Beaverdam Creek
Little River	FC, Benthic	6.1 mile segment from the confluence with Goose Creek upstream to the confluence with Hungry Run
Sycolin Creek	FC	7.1 mile segment from a point 0.3 miles upstream of Rt. 643 upstream to the headwaters
SF Sycolin Creek	FC	3.3 miles from the mouth at Sycolin Creek upstream to the headwaters
Sugarland Run	FC	5.8 mile segment from the mouth at the Potomac River upstream to the confluence with Folly Lick Branch

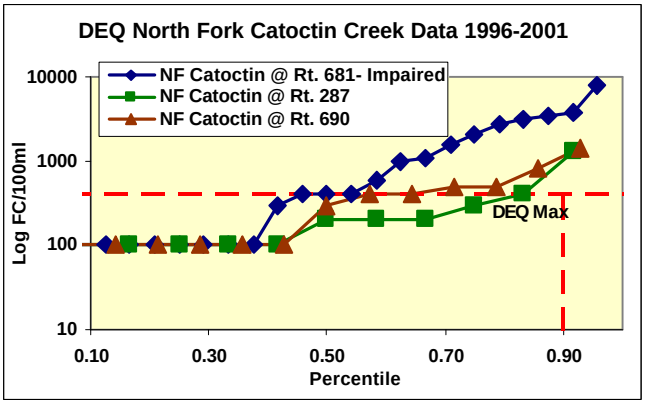
[1] Causes of Impairments: FC = Fecal Coliform Bacteria; Benthic – Aquatic Life

IV. OTHER IMPAIRED WATERS IN LOUDOUN COUNTY

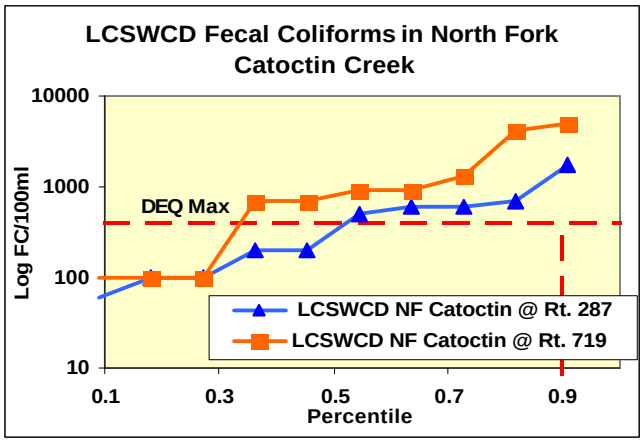
In 2003 DEQ adopted a new interim water quality standard for fecal coliform to use while the standard is changed from fecal coliform to *E. coli.* The new interim standard lowers the maximum level of fecal coliform that must be met 90% of the time from 1000 FC/100 ml to 400 FC/100 ml. As a result there are several waters in Loudoun County that were marginal under the old standard and now do not meet the new interim standard. A list of these other waters that are impaired is provided in the following. The list includes a summary of the state and local data that support this impaired designation.

1. North Fork Catoctin Creek

Bacteriological Water Quality – There are three DEQ stations in the North Fork Catoctin Creek – one in the impaired segment at Rt. 681, and two in unimpaired segments at Rt. 287 and Rt. 690/812. The plot of the data show that the fecal levels at all stations exceeds the standard.



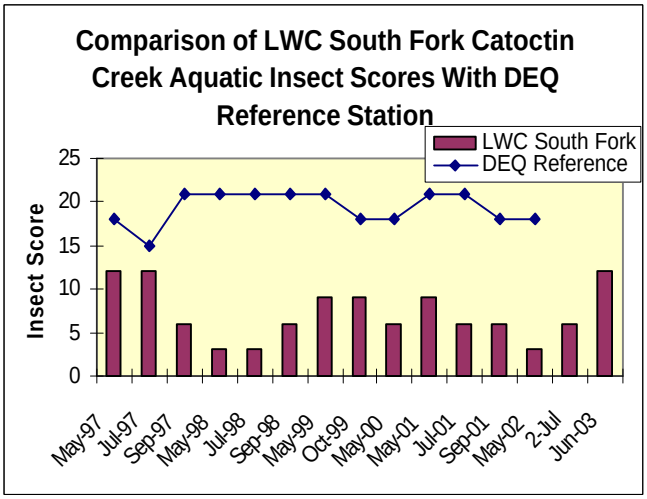
LCSWCD has two stations in the unimpaired portions of North Fork Catoctin Creek -- station #10 at Rt. 287 and station #11 at Rt. 719. The data graph shows that fecal coliform levels at both stations are similar and exceed the water quality standard.



Conclusion – DEQ and local agency monitoring data at three different stations in the unimpaired, upstream portion of North Fork Catoctin Creek show there is poor water quality similar to the downstream impaired segment. The upstream portion of the watershed extending from the impaired segment starting at stream mile 4.1 to its headwaters should be considered impaired for fecal coliform.

2. South Fork Catoctin Creek

Aquatic Life – LWC has one station on the South Fork Catoctin at the Purcellville Nature Park upstream of Rt. 611. A comparison of the aquatic insect scores with DEQ's reference station at Taylorstown in the mainstem of Catoctin Creek is provided in the data graph. This graph shows a substantial difference in scores, and that the aquatic insect assemblages in the South Fork Catoctin are generally poor compared to the reference site.



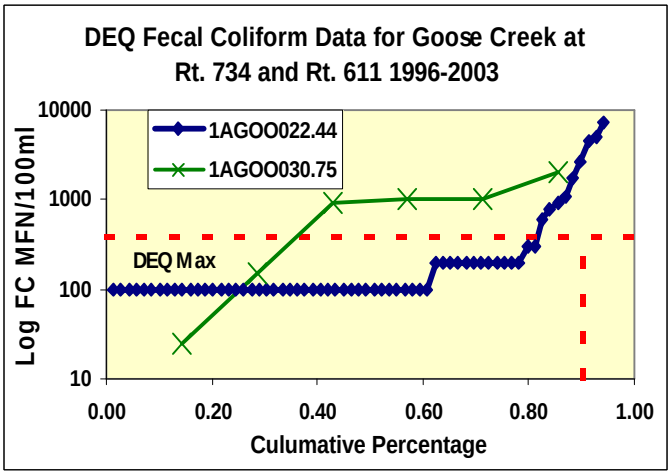
DEQ sampled aquatic insects at two locations upstream from Purcellville on three occasions in 2001 and 2002 In follow up to LWC's data. These stations are upstream from industrial areas and storm water discharges in Purcellville, and the aquatic insect scores are comparable with those at the reference station.

LCSWCD monitors benthic macroinvertebrates at station #9 on South Fork Catoctin downstream from Purcellville off Rt. 711 just upstream from Rt. 9. These data from 1999 to 2001 show good to excellent aquatic insect assemblages.

Conclusion – Citizen monitoring data and DEQ biomonitoring data show that aquatic insect communities in the South Fork Catoctin Creek downstream of Rt. 690 in Purcellville are being impacted by industrial and residential sources of runoff pollution. DEQ has indicated verbally that this section of the creek will be listed as impaired in 2004. It is for this reason this area is listed in the "Other Impaired Waters" section of this report. South Fork Catoctin Creek should be designated as impaired for aquatic life from Rt. 287 upstream to Rt. 690.

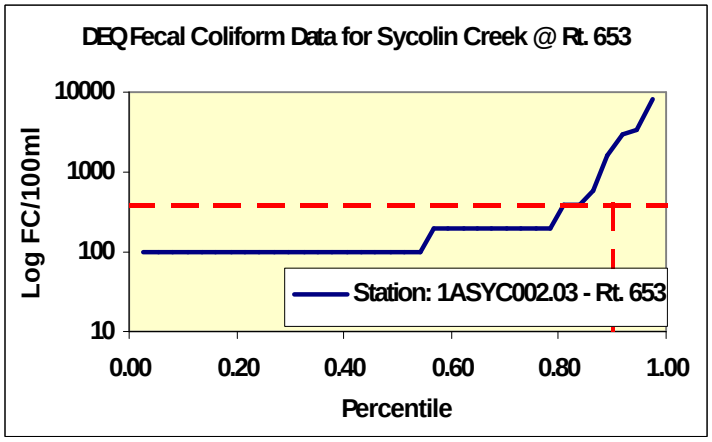
3. Middle Goose Creek

Bacteriological Water Quality – DEQ has two stations in the unimpaired portion of the middle section of Goose Creek at Rt. 734 and Rt. 611. The data graph shows that the bacteriological quality of this section of the stream does not meet the water quality standard.



Conclusion – DEQ bacteriological monitoring at two stations upstream from the impaired portion of the stream shows there is poor to marginal water quality. These data indicate the waters of Goose Creek from the confluence with the North Fork Goose Creek upstream to Rt. 50 should be considered impaired for fecal coliform. This is consistent with the finding of the Total Maximum Daily Load (TMDL) study that the water quality is poor throughout Goose Creek watershed in Loudoun County.

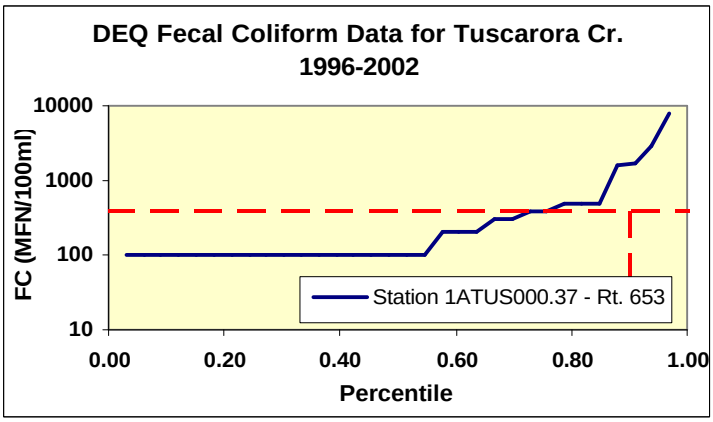
4. Sycolin Creek



Bacteriological Water Quality – DEQ has one station in the unimpaired portion of Sycolin Creek at Rt. 653. The data graph shows that the bacteriological quality at this station does not meet the water quality standard.

Conclusion – DEQ bacteriological monitoring in Sycolin Creek shows there is marginal water quality and that the waters from the mouth at Goose Creek to the current impairment at stream mile 2.85 should be considered impaired for fecal coliform. This is consistent with the finding of the TMDL study that the water quality is poor throughout Goose Creek watershed.

5. Tuscarora Creek

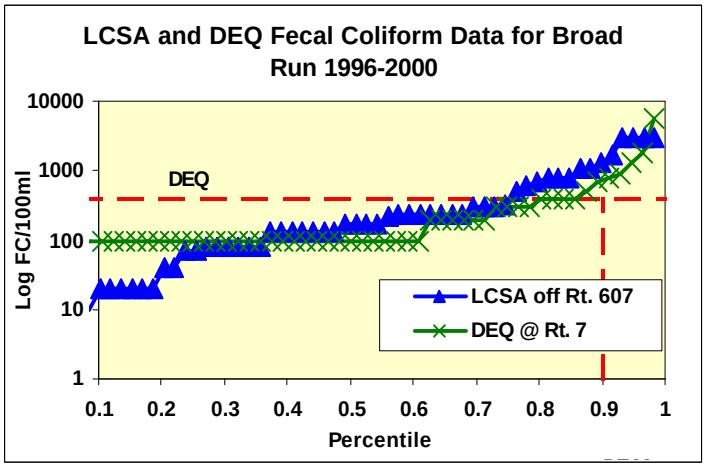


Bacteriological Water Quality – DEQ has one station on Tuscarora Creek at Rt. 653. The data graph shows that the bacteriological quality of the stream water does not meet the water quality standard.

Conclusion – DEQ bacteriological monitoring in Tuscarora Creek shows there is marginal water quality. The waters from the stream mouth at Goose Creek upstream to the confluence with Town Run should be considered impaired for fecal coliform. This is consistent with the finding of the TMDL study that the water quality is poor throughout Goose Creek watershed in Loudoun County.

6. Broad Run Watershed

Bacteriological Water Quality – DEQ has one station on Broad Run at Rt. 7. Loudoun County Sanitation Authority (LCSA) also has a station in Broad Run about ½ mile upstream of the DEQ station. The graph of the DEQ and LCSA data shows the bacteriological quality of the waters at these stations do not meet the water quality standard.



Conclusion – DEQ and LCSA bacteriological monitoring in Broad Run shows there is marginal water quality. The waters of Broad Run from its mouth at the Potomac River upstream to the confluence with Horsepen Run should be designated as impaired for fecal coliform.

V. DEQ LISTED THREATENED WATERS IN LOUDOUN COUNTY

DEQ List of Threatened Waters in Loudoun County -- DEQ published a list of waters in 2002 that were "threatened." When DEQ updates this list in 2004, these waters will be labeled as "having observed effects." These are waters that have data showing they may not meet water quality standards, but have not been fully assessed by DEQ to determine whether water quality standards have been violated. In many instances the data used for these preliminary assessments are from unapproved sources such as local agencies and citizen monitoring groups. The list of threatened waters published by DEQ in 2002 is provided in Table 2. Although the name for these waters will change when the next report is published in April 2004, for consistency sake, LWW will continue to call these waters "threatened" in this report.

Table 2. Waters Designated by DEQ as Threatened in 2002 305(b) Report.

Name of Waters	Data Base Used	Description
North Fork Goose Creek	LWC Site 7 -- macroinvertebrates (moderate rating)	**Aquatic Life Use - Threatened -** 2.5 stream miles segment begins at the outlet from Sleeter Lake and continues downstream to the confluence with Jacks Run.
North Fork Goose Creek	DEQ – 1ANOG005.69 sufficient exceedances of the phosphorous screening value of	**Aquatic Life Use - Threatened –** 4.3 miles segment begins at the confluence of an unnamed tributary to North Fork Goose Creek, approximately 0.25 river miles upstream from the Route 725 bridge, and continues downstream to its confluence with Crooked Run, approximately 0.35 river miles upstream from Route 729 bridge.

Name of Waters	Data Base Used	Description
	200 ug/L were recorded	
North Fork Beaverdam Creek	LWC Site 9 -- macroinvertebrates (moderate rating)	**Aquatic Life Use - Threatened** - 2.9 mile segment begins at the confluence of an unnamed tributary to the North Fork Beaverdam Creek, near the Rt. 730 bridge crossing the unnamed tributary, and continues downstream to the confluence with the main stem of Beaverdam Creek.
Tuscarora Creek	LWC Site 2 - macroinvertebrates (poor rating)	**Aquatic Life Use - Threatened** - 3.6 miles segment begins at the confluence of Town Branch to Tuscarora Creek, approximately 0.55 rivermile upstream of the Route 643 Bridge, downstream to its confluence with Goose Creek.
Sycolin Creek	DEQ – 1ASYC002.03	**Drinking Water Supply - Threatened**[1] - 2.9 miles segment begins at the confluence of an unnamed tributary to Sycolin Creek, approximately 0.23 rivermiles upstream from Route 643, and continues downstream to its confluence with Goose Creek.
Broad Run	DEQ – 1ABRB002.15	**Drinking Water Supply - Threatened**[1] - 2.9 miles segment begins at the confluence of Beaverdam Run to Broad Run, approximately 0.8 rivermiles upstream of Route 7, and continues downstream to its confluence with the Potomac River.
Sugarland Run	Friends of Sugarland Run	**Aquatic Life Use - Threatened** - 5.8 miles segment begins at the confluence of Folly Lick Branch to Sugarland Run and continues downstream to its confluence with the Potomac River.

DEQ's list of threatened waters shows two kinds of threats. The most common threat is to aquatic life due to chemical impacts (i.e., sufficient exceedances of the phosphorous screening value of 200 ug/L were recorded) or to poor quality aquatic insect communities (benthic macroinvertebrate). The latter impacts are most often caused by erosion and runoff problems that introduce sediments into the waters. The second threat is to drinking waters due to taste and order problems. However, the taste and order criteria were made less stringent in 2003, and these threats will not be listed in 2004.

DEQ used two sources of data to determine which areas should be listed as threatened. First, DEQ used their own data to determine that waters in three streams did not meet water chemistry standards or screening levels (informal standard). Secondly, DEQ used LWC and the Friends of Sugarland Run benthic macroinvertebrate data that were provided to DEQ. These two citizen monitoring groups have stream monitoring protocols approved by DEQ. (Note: Friends of Sugarland Run is no longer an active citizen monitoring group.)

VI. OTHER THREATENED WATERS IN LOUDOUN COUNTY

Not all stream monitoring data collected in Loudoun County were used by DEQ in 2002 in determining which waters were to be designated as threatened. LWW believes that

[1] Note: The Mn water quality criteria apply in public water supplies. This is a taste and odor criteria and plans for the 2003 triennial review are to have these criteria apply only at the intake. Therefore, this criterion [and the significance] will soon drop from the radar screen.

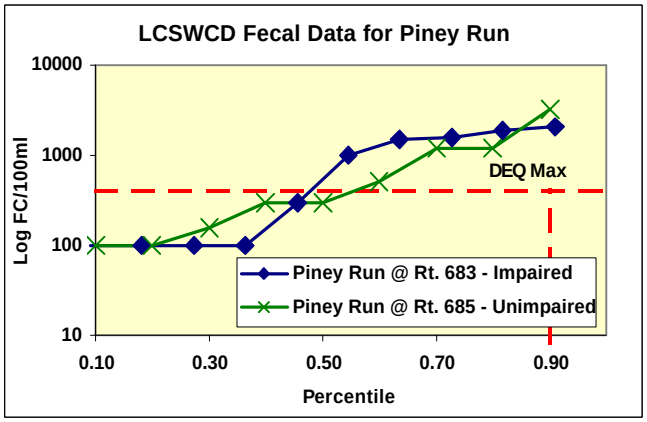
there are many more waters in Loudoun County that should be listed as threatened in 2004. LWW's belief is based, in part, on the monitoring data collected by County Agencies and citizen groups that were not used by DEQ. In most instances, these data provide results that are comparable to DEQ's results as is graphically shown in ATTACHMENT B and in the Broad Run data presented in the previous section.

LWW's belief is also based on the models used by DEQ in the TMDL's for Catoctin Creek and Goose Creek. These models show that large sections of waters throughout the watersheds do not meet water quality standards. The water quality data collected by County Agencies and citizen monitoring groups collaborate the findings of these models.

LWW further believes that stream monitoring data collected by County Agencies and citizen monitoring groups should be used to inform citizens about the quality of their drinking and recreational waters in cases where **there are no state data available to assess the quality and safety of the waters.** A list of waters that LWW considers to be threatened based on local data is provided in the following. These are stream segments that have not been assessed by DEQ. LWW has requested that DEQ list these waters as threatened (having "observed effects") in 2004, and that they collect additional monitoring data so an assessment of the waters can be completed. The following list also includes a summary of the local data that support this request.

1. Piney Run

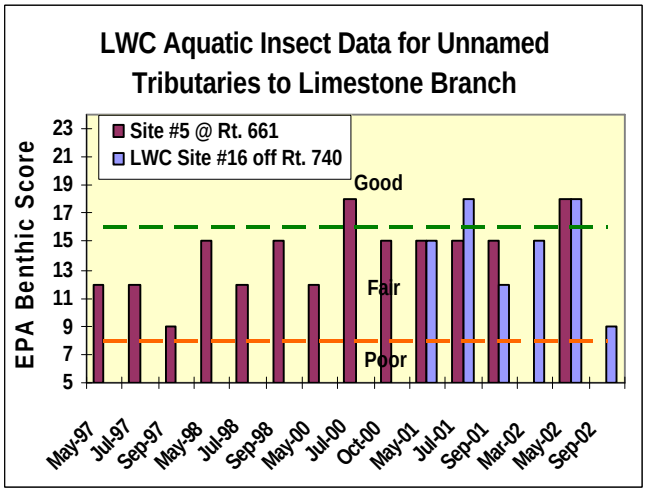
Bacteriological Water Quality – LCSWCD has station #12 on Piney Run at Rt. 683 in the impaired segment, and station #13 at Rt. 685 upstream in the unimpaired segment. The data graph shows both stations have similar fecal coliform levels, and that both stations greatly exceed the water quality standard. There has been no DEQ monitoring in the upstream, unimpaired segment.



Conclusion – Local agency monitoring in Piney Run shows the water quality in the unimpaired segment upstream of the impairment has poor water quality similar to the downstream-impaired segment. The portion of Piney Run extending from the unnamed lake at stream mile 3.5 upstream to its headwaters should be considered threatened for fecal coliform.

2. Limestone Branch – Unnamed Tributaries

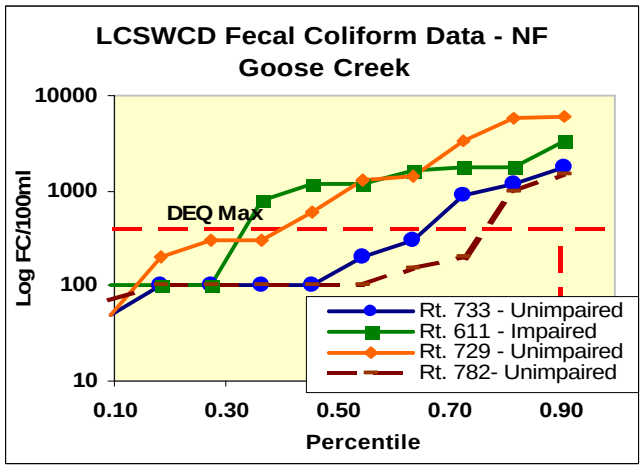
Aquatic Life – LWC has benthic monitoring stations on two unnamed tributaries to Limestone Branch; Station #5 at the Rt. 661 bridge and Station #16 off of Rt. 740 of the Lufter property. The data graph for these stations shows that the aquatic insect assemblages at both sites generally rank in the "fair" range using EPA's scoring. The southern tributary is impacted by runoff from the Beacon Hill development and golf course where riparian buffers are poor.



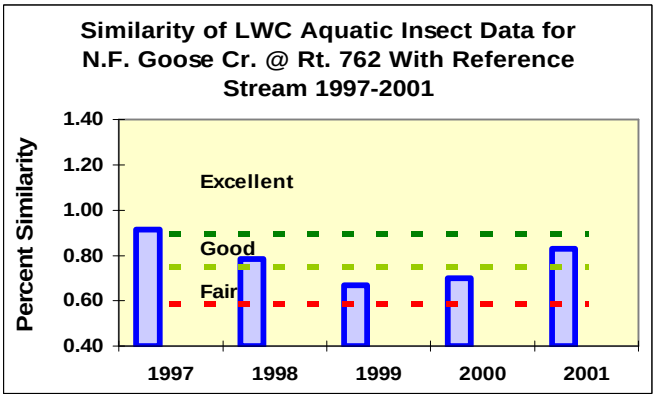
Conclusion – Citizen biomonitoring data shows that the quality of aquatic life is marginal in the two unnamed tributaries to Limestone branch. These tributaries should be considered threatened for aquatic life from their mouth at Limestone Branch to their headwaters.

3. North Fork Goose Creek

Bacteriological Water Quality – LCSWCD has four stations in the North Fork Goose Creek Watershed – one in the impaired portion at Rt. 611 and three in unimpaired segments at Rt. 733, Rt. 729, and Rt.782. The graph of the fecal coliform data shows that the water quality at all stations exceeds the water quality standard. There has been no DEQ sampling in the upstream, unimpaired portion of the stream prior to 2003.



Aquatic Life – Three local groups have biomonitoring stations located on North Fork Goose Creek below Sleeter Lake. LCSWCD and North Fork Goose Creek Watershed Association (NFGC) each have one monitoring station at Rt. 782/ Rt. 762 using the SOS protocol, and LWC has one monitoring station at Rt. 762 using the ANS/EPA RBPII protocol. Benthic macroinvertebrate community ratings at the LCSWCD station (#8), the NFGC station (#1), and LWC station (#7) below Sleeter Lake range from poor to excellent. DEQ has designated 2.5 miles downstream from Sleeter Lake as threatened based on the LWC data.



LSWCD N. Fork Goose Creek at Rt. 782 - Station #8	
Aug-99	Fair
Nov-99	Good
Jun-00	Good
Feb-01	Good

LCSWCD station #7 and NFGC station #5 at Rt. 729 downstream of the confluence with Crooked Run and LCSWCD station #3 at Rt. 733 at the mouth of North Fork Goose show poor to good aquatic insect community ratings. There is no DEQ biological data for the North Fork Goose Creek watershed.

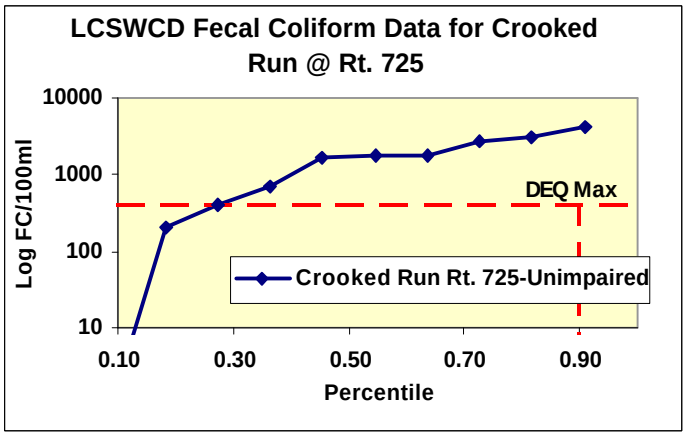
LCSWCD Benthic Data at Rt. 729-- Site #7		NFGC Benthic Data at Rt. 729 -- # 5		LCSWCD Benthic Data at Rt. 733 -- Site #3	
Date	**SOS Rating**	**Date**	**SOS Rating**	**Date**	**SOS Rating**
Aug-99	Fair	07/26/00	Fair	Aug-99	Good
Nov-99	Good	02/12/01	Fair	Nov-99	Fair
Jun-00	Good	05/18/01	Poor	Jun-00	Good
Feb-01	Good	08/13/01	Fair	Feb-01	Fair

Conclusions -- Local agency fecal coliform monitoring at three stations in unimpaired segments downstream and upstream of the impaired segment in the North Fork Goose Creek show there is poor water quality similar to the impaired segment. North Fork Goose Creek from its mouth at Goose Creek upstream to the confluence of Crooked Run and the current impairment should be considered threatened for fecal coliform. Further, North Fork Goose Creek from its current impairment approximately 0.25 m upstream from the Rt. 611 bridge to Sleeter Lake should be considered threatened for fecal coliform.

Local agency biological monitoring at two stations and citizen monitoring at one station suggest there are portions of the North Fork Goose Creek that have poor to fair quality insect communities. North Fork Goose Creek from its mouth at Goose Creek upstream to the confluence of Crooked Run should be considered threatened for aquatic life.

4. Crooked Run

Bacteriological Water Quality – LCSWCD has monitoring station #6 at Rt. 725 in the Crooked Run Watershed. The graph of the fecal coliform data shows that the water quality at this station greatly exceeds the water quality standard. There has been no DEQ sampling in this stream.



Conclusion -- Local agency bacteriological monitoring at one station in this unimpaired stream shows there is poor water quality. Crooked Run from its mouth to its headwaters should be considered threatened for fecal coliform. This is consistent with the finding of the TMDL study that water quality is poor throughout the Goose Creek watershed in Loudoun County.

5. Beaverdam Creek

Aquatic Life – LCSWCD has monitoring station #4 at Rt. 731 in the Beaverdam Creek watershed. The benthic macroinvertebrate community at this LCSWCD station is generally rated from fair to excellent as shown in the table. There has been no DEQ biomonitoring in this stream.

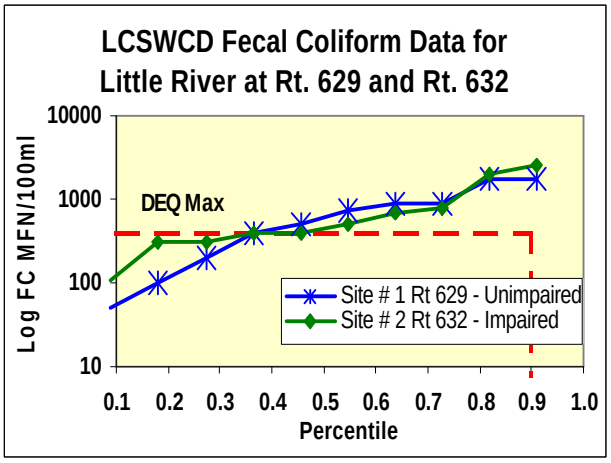
LCSWCD Aquatic Insect Data for Beaverdam Creek at Rt. 731 -- Site #4

Date	SOS Rating
Aug-99	Fair
Nov-99	Fair
Jun-00	Excellent
Feb-01	Good

Conclusion -- Local agency biomonitoring data at one station in the unthreatened portion of the stream show that the quality of the benthic macroinvertebrate community is marginal. The Beaverdam Creek segment from its confluence with the North Fork Goose Creek upstream to the confluence with North Fork Beaverdam Creek should be considered threatened for aquatic life.

6. Little River

Bacteriological Water Quality – LCSWCD has monitoring station #2 at Rt. 632 in the impaired portion of Little River Watershed, and station #1 at Rt. 629 in the unimpaired upstream portion. The data graph shows that the bacteriological quality of the upstream portion of Little River is similar to the downstream, impaired portion.



Conclusion – Local agency bacteriological monitoring at one station upstream from the unimpaired portion of the stream shows there is poor water quality. These data indicate the waters of Little River from the confluence with Hungry Run upstream to the Loudoun County line should be considered threatened for fecal coliform. This is consistent with the finding of the TMDL study that water quality is poor throughout the Goose Creek watershed.

7. Sugarland Run

Aquatic Life – LWC monitors at two sites on Sugarland Run using the EPA RBP protocol. The benthic macroinvertebrate communities at the two stations are generally rated as poor to fair. Monitoring data from a citizens group in Fairfax using the SOS protocol has found similar results at their upstream stations. DEQ has designated Sugarland Run waters threatened for aquatic life, but has not sampled the waters to assess the impairment.

LWC Benthic Macroinvertebrate Data for Sugarland Run 1999-2002

Date	EPA Biosurvey Condition Category
Sugarland Run @ Rt. 604 in Fairfax	
7/16/2002	Fair
Sugarland Run Downstream from Heritage High School	
6/3/2002	Fair
7/7/2002	Fair
1/9/2003	Poor

Conclusion – Citizen biomonitoring data from Loudoun County are consistent with citizen data from Fairfax in showing that waters in Sugarland Run from the mouth at the Potomac River to the county line at Rt. 7 are threatened for aquatic life.

VII. CONCLUSIONS

A healthy stream does not exist in isolation. Rather, it is the lowest point in an interconnected complex of ecosystems, and is influenced by land uses around it. Keeping excessive sediments, nutrients, organic materials, and harmful chemicals and bacteria out of streams requires the application of best management practices (BMPs). These BMPs need to be applied to the immediate stream banks, the drainage areas along the streams, and throughout the upstream drainage area. Good environmental stewardship involves applying BMPs and educating the public about wise watershed management.

Many waters in Loudoun County are already impacted by pollutants and are in need of BMPs. Stream monitoring data collected by DEQ provides a basis for a partial list of impaired and threatened waters. The list becomes more extensive when monitoring data from local agencies and citizen groups that sample in stream segments not monitored by DEQ are considered. These more complete lists are provided in Tables 3 and 4. These lists provide a focus for county and citizen efforts to protect the quality of Loudoun streams and to restore those that are impacted and unsuited for their intended use for aquatic life and as recreational waters.

Table 3. Comprehensive List of Impaired Waters in Loudoun County – 2003.

Stream Name	Cause[1]	Boundaries of Impaired Segment
IMPAIRED WATERS LISTED BY DEQ		
Piney Run	FC	3.5 mile segment from the mouth at the Potomac River upstream to the confluence with an unnamed lake
Catoctin Creek	FC	7.2 mile segment from its mouth at the Potomac River upstream to the confluence with Milltown Creek
North Fork Catoctin Creek	FC	4.1 mile segment from the confluence with Catoctin Creek upstream to a point 0.2 miles downstream of the Rt. 287 bridge
South Fork Catoctin	FC	17.3 miles from the mouth at Catoctin Creek upstream to the headwaters
Limestone Branch	FC	4.8 miles from the mouth at the Potomac River upstream to the headwaters, but not including two unnamed tributaries
Goose Creek	FC, Benthic	4.8 mile segment from the mouth at the Potomac River to the Goose Creek impoundment
North Fork Goose Creek	FC, Phosphorus	4.3 mile segment from the confluence with Crooked Run upstream to the confluence with an unnamed tributary approx. 0.25 m upstream from the Rt. 611 bridge
Beaverdam Creek	FC	6.3 mile segment from the confluence with the North Fork Goose Creek upstream to the confluence with North Fork Beaverdam Creek
Little River	FC, Benthic	6.1 mile segment from the confluence with Goose Creek upstream to the confluence with Hungry Run
Sycolin Creek	FC	7.1 mile segment from a point 0.3 miles upstream of Rt. 643 upstream to the headwaters
South Fork Sycolin Creek	FC	3.3 miles from the mouth at Sycolin Creek upstream to the headwaters

Stream Name	Cause[1]	Boundaries of Impaired Segment
Sugarland Run	FC	5.8 mile segment from the mouth at the Potomac River upstream to the confluence with Folly Lick Branch
OTHER IMPAIRED WATERS IN LOUDOUN COUNTY		
North Fork Catoctin Creek	FC	North Fork Catoctin Creek from the impaired segment starting at stream mile 4.1 to its headwaters
South Fork Catoctin Creek	Benthic	South Fork Catoctin Creek should be designated as impaired for aquatic life from Rt. 287 upstream to Rt. 690.
Middle Goose Creek	FC	Goose Creek from the confluence with the NF Goose Creek upstream to Rt. 50
Sycolin Creek	FC	Sycolin Creek from the mouth at Goose Creek to the current impairment at stream mile 2.85
Tuscarora Creek	FC	Tuscarora Creek from the mouth at Goose Creek upstream to the confluence with Town Run
Broad Run	FC	Broad Run from its mouth at the Potomac River upstream to the confluence with Horsepen Run

[1] Causes of Impairments: FC = Fecal Coliform Bacteria; Benthic – Aquatic Life

Table 2. Comprehensive List of Threatened Waters in Loudoun County – 2003.

Name of Waters	Data Base Used	Description
THREATENED WATERS LISTED BY DEQ		
North Fork Goose Creek	LWC Site 7 -- macroinvertebrates (moderate rating)	**Aquatic Life Use - Threatened -** 2.5 stream miles segment begins at the outlet from Sleeter Lake and continues downstream to the confluence with Jacks Run.
North Fork Goose Creek	DEQ – 1ANOG005.69 sufficient exceedances of the phosphorous screening value of 200 ug/L were recorded	**Aquatic Life Use - Threatened –** 4.3 miles segment begins at the confluence of an unnamed tributary to North Fork Goose Creek, approximately 0.25 river miles upstream from the Route 725 bridge, and continues downstream to its confluence with Crooked Run, approximately 0.35 river miles upstream from Route 729 bridge.
North Fork Beaverdam Creek	LWC Site 9 -- macroinvertebrates (moderate rating)	**Aquatic Life Use - Threatened** - 2.9 mile segment begins at the confluence of an unnamed tributary to the North Fork Beaverdam Creek, near the Rt. 730 bridge crossing the unnamed tributary, and continues downstream to the confluence with the main stem of Beaverdam Creek.
Tuscarora Creek	LWC Site 2 - macroinvertebrates (poor rating)	**Aquatic Life Use - Threatened** - 3.6 miles segment begins at the confluence of Town Branch to Tuscarora Creek, approximately 0.55 rivermile upstream of the Route 643 Bridge, downstream to its confluence with Goose Creek.

Name of Waters	Data Base Used	Description
Sycolin Creek	DEQ – 1ASYC002.03	**Drinking Water Supply - Threatened**[2] - 2.9 miles **s**egment begins at the confluence of an unnamed tributary to Sycolin Creek, approximately 0.23 rivermiles upstream from Route 643, and continues downstream to its confluence with Goose Creek.
Broad Run	DEQ – 1ABRB002.15	**Drinking Water Supply - Threatened**[1] - 2.9 miles segment begins at the confluence of Beaverdam Run to Broad Run, approximately 0.8 rivermiles upstream of Route 7, and continues downstream to its confluence with the Potomac River.
Sugarland Run	Friends of Sugarland Run	**Aquatic Life Use - Threatened** - 5.8 miles segment begins at the confluence of Folly Lick Branch to Sugarland Run and continues downstream to its confluence with the Potomac River.
OTHER WATERS THAT ARE THREATENED		
Piney Run	LCSWCD Site 13 at Rt. 685	**Fecal Coliform – Threatened** -- The portion of Piney Run extending from the unnamed lake at stream mile 3.5 upstream to its headwaters should be considered threatened for fecal coliform.
Limestone Branch	LWC Site 5 at Rt. 661 and Station 16 off of Rt. 740	**Aquatic Life – Threatened** -- Two unnamed tributaries to Limestone branch from their mouths at Limestone Branch to their headwaters.
North Fork Goose Creek	LCSWCD Site 3 at Rt. 733, site 7 at Rt. 729, and site 8 at Rt.782	**Fecal Coliform – Threatened –** North Fork Goose Creek from its mouth at Goose Creek upstream to the confluence of Crooked Run and the current impairment
North Fork Goose Creek	LCSWCD site 3 at Rt. 733, site 7 at Rt. 729, and site 8 at Rt. 782; NFGC site 1 at Rt. 762 and site 5 at Rt. 729; and LWC site 7 at Rt. 762	**Aquatic Life – Threatened -** North Fork Goose Creek from its mouth at Goose Creek upstream to the confluence of Crooked Run
Crooked Run	LCSWCD site 6 at Rt. 725	**Fecal Coliform – Threatened -** Crooked Run from its mouth to its headwaters
Beaverdam Creek	LCSWCD site 4 at Rt. 731	**Aquatic Life – Threatened -** Beaverdam Creek segment from its confluence with the North Fork Goose Creek upstream to the confluence with North Ffork Beaverdam Creek
Little River	LCSWCD site 1 at Rt. 629	**Fecal Coliform – Threatened -** Little River from the confluence with Hungry Run upstream to the Loudoun County line
Sugarland Run	LWC site #14 and 14B at Rt. 604	**Aquatic Life – Threatened -** Sugarland Run from the mouth at the Potomac River to the county line at Rt. 7

[2] Note: The Mn water quality criteria apply in public water supplies. This is a taste and odor criteria and plans for the 2003 triennial review are to have these criteria apply only at the intake. Therefore, this criterion [and the significance] will soon drop from the radar screen.

Most pollution comes from nonpoint sources that are not regulated by the state. These include runoff from agricultural activities and stormwater from residential communities and commercial areas. Improving land runoff and stormwater management practices to better protect stream water quality will rely upon voluntary measures by property owners along impacted streams and county stormwater management programs.

LWW's "State of Loudoun Streams: 2002" report published in 2003 highlighted steps that can be taken to better protect and restore Loudoun waters. One important step is watershed management planning. Loudoun County should collaborate with representatives of watershed stakeholder groups to support the development of watershed plans. Stakeholders need to include regional and state organizations engaged in larger watershed planning and goal setting. Inter-governmental collaboration is a key component to successful watershed planning and management. In addition, watersheds in Loudoun are part of the larger Potomac River and Chesapeake Bay watersheds, and management objectives from these larger watersheds need to be incorporated into County watershed plans.

Nonpoint pollution is a national problem, and there are many economic incentives being offer to property owners from Federal and state funding sources. Nevertheless, an individual's willingness to protect water from nonpoint sources depends upon recognition that there is an individual and public benefit to be gained. The challenge that faces Loudoun citizens is to better understand the benefit to be gained from protecting water quality. Loudoun County agencies and citizen environmental stewardship groups should collaborate to develop additional educational programs and projects on water quality and recreational uses.

ATTACHMENT A.
Virginia Water Quality Standards

Virginia's Department of Environmental Quality (DEQ) is responsible for the enforcement of the federal Clean Water Act. The State Water Control Law protects high-quality waters and provides for the restoration of other waters so they support reasonable public uses and aquatic life. Virginia has adopted water quality standards under Section 62.1-44.15(3a) to accomplish the law's purposes.

Water Quality Standards – Water quality standards consist of narrative and numeric criteria. These statements and numbers describe the water quality necessary for designated uses such as swimming and other water-based recreation, public water supply, and the support of aquatic life. DEQ uses these standards to limit the amount of pollutants discharged into surface waters.

Designated Use Standards – All streams in Loudoun County are designated for recreational uses including swimming and boating, and for the support of aquatic life. These designated uses determine the water quality criteria applicable to Loudoun streams. There are criteria for temperature, pH, dissolved oxygen, ammonia, chloride, and fecal coliform bacteria. These standards are listed in Table A.1. There are no standards for other parameters such as nitrogen, phosphorous, turbidity, suspended solids, or biological oxygen demand (BOD).

Table A.1. DEQ Water Quality Standards for Recreational Use in Piedmont Zones. (Source: 9 VAC 25-260-5 et seq. Water Quality Standards, 8/27/03)

Parameter	State Standard (Acute/Chronic)	Significance
Temperature	Maximum = 32^0C	Affects rates of chemical prosesses in cells and the water's dissolved oxygen content
pH	6.0 – 9.0	Level of acidity -- affects cell membrane functions
Dissolved Oxygen (DO)	Miniumu = 4 mg/l	Affects biological metabolism
Ammonia	0.18 – 6.67 mg/l as N chronic[1]	Form of nitrogen that in excess causes eutrophication and loss of dissolved oxygen; a toxin
Chloride	860/ 230 mg/l	Indication of salt content
Fecal Coliform Bacteria	200 colonies/100ml mean or 400 colonies/100ml single sample max[2]	Common bacteria in animals' digestive tracts. Indicator of human sewage or animal droppings.
E. coli Bacteria	126 colonies/100ml mean or 235 colonies/100ml single sample max.	More secific bacteria in animals' digestive tracts. Indicator of human sewage or animal droppings.

[1] Standard varies with temperature and pH

[2] Instantaneous standard is used with monthly sampling schedule. Single sample maximum must be met 90% of the time.

Bacteriological Indicators – Wastes from warm-blooded animals including human sewage, livestock, and wildlife release disease-causing organisms into streams. Fecal coliform bacteria are used to indicate the potential presence of human pathogens and the likelihood of a public health threat. Higher concentrations cause greater public health concerns. DEQ considers recreational waters to be impaired or unsuitable for use when more then 10% of the water samples collected over a 2-5 year period are greater than 400 fecal coliform colonies per 100 ml of sample (FC MFN/100ml). In 2003 DEQ adopted a new *E. coli* standard for water quality. *E. coli* are a more specific indicator of fecal pollution and a lower number is required than for fecal coliform. The fecal coliform standard will be applied to waters until DEQ has 12 *E. coli* samples, and then the *E. coli* standard will be applied. DEQ should have 12 *E. coli* samples at their Loudoun County monitoring stations by 2007.

Biological Condition Metrics – Aquatic insect (also called benthic macroinvertebrates) are monitored to measure the "biological condition" of a stream. Aquatic organisms include aquatic insects, crayfish and other crustaceans, clams and mussels, snails, aquatic worms, and other similar organisms. Aquatic insects comprise the largest diversity of these animals and include mayflies, stoneflies, caddisflies, and midges. The aquatic insect cycle nutrients, and are major food sources for fish and other aquatic animals. These organisms are excellent indicators for assessing streams because they cannot escape changes in water quality.

Each aquatic insect species has requirements the stream must provide for the insect to flourish. The quality of the water and the health of the stream environment can be assessed by determining the number and type of insects that live in a stream. If pollution impacts a creek, the number and type of aquatic insects will change. Four primary measurements or metrics are used in this report to assess the health of a stream. A summary of these metrics as described by EPA (1997)[3] is provided in **Table A.2**.

Table A.2. Summary of Standard Benthic Macroinvertebrate Metrics Recommended by EPA and Used in LWW Report.

Number of taxa	Number of families of organisms (taxa) present. A high number of taxa indicates a high diversity in the aquatic insect community and good stream health
EPT Index	Number of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) compared to the total number of individuals in the sample. These three families of insects indicate good water quality because they are most susceptible to pollution.
Percent	Proportion of individuals in the most dominant family (taxon)

[3] U.S. Environmental Protection Agency (EPA). 1997. Volunteer Stream Monitoring: A Methods Manual. EPA 841-B-97-003.

Dominant Taxon (PDT)	compared to the total number of organisms in the sample. The PDT should be **less than 20% in headwater streams** to indicate good conditions.
Modified Hilsenoff Biotic Index (MHBI)	Each taxon is assigned a pollution sensitivity or tolerance value. The MHBI is calculated by multiplying the number of individuals in each taxon with the sensitive value for the taxon. The MHBI should be **less than 2 in headwater streams** to indicate good conditions.

Reference Stream – Virginia's water quality standard includes a general requirement that all state waters are to be free of pollutants that are harmful to animal, plant, or aquatic life. This standard allows the state to consider stream habitat and aquatic insect populations as indicators of stream quality. To apply the standard, DEQ compares measurements from the stream being monitored with measurements from another stream of known good quality called a "reference stream." The reference stream represents the "natural," unimpaired conditions found in a stream of similar size and in the same geographic "ecoregion."

The reference streams used by DEQ is Catoctin Creek at Taylorstown for rocky bottom streams. Most streams in Loudoun County are rocky bottom streams. DEQ calculates the percent similarity between the monitored and reference streams for both the habitat and aquatic organisms.

Reference Conditions -- EPA (1997) recommends using "reference conditions" rather than reference streams to measure stream health since there are few sites left that reflects the best conditions. The reference condition is a composite of scores from sites that reflect the best physical, chemical, and biological conditions existing in the ecological region. EPA also provides generic criteria to calculate an overall biological condition score. Virginia has conducted a study and are expected to adopt a multimetrics biological index based on reference conditions in 2004.

ATTACHMENT B.
Comparison of LCSWCD and DEQ Fecal Coliform Data

There are six stations sampled by LCSWCD for fecal coliform bacteria that are near stations sampled by DEQ. These stations allow a graphical comparison to be made of the two data sets (no attempt is made to do a statistical comparison). These analyses are provided in the following graphs. In each case, the LCSWCD data consists of ten data points collected over three years. The DEQ data set consists of 20 or more samples collected over six years (1996-2001). These graphs show poor correlation for Catoctin at Taylorstown, moderately good correlation for Piney Run, NF Catoctin Creek, and NF Goose Creek, and very good correlation for Beaverdam Creek and Little River.