



**Catoclin  
Watershed  
Project**

*Stewardship for the Catoclin Creek Watershed*

# **Citizen TMDL Outreach and Monitoring Results**

**2005-2007**

**Loudoun Watershed Watch**

## **A. INTRODUCTION**

Loudoun Watershed Watch (LWW) prepared this report for the February 27, 2008 reconvening of the Catoclin TMDL Implementation Steering Committee by the Virginia Department of Conservation and Recreation (DCR) and the Loudoun Soil and Water Conservation District LSWCD). The purpose of the Steering Committee meeting is to review progress towards implementing the Catoclin Creek bacteria TMDL. DCR and LSWCD also seek input on how to correct additional bacteria source problems in the watershed.

The Catoclin Creek Bacteria TMDL Implementation Plan (TMDL IP) seeks to improve water quality and remove Catoclin Creek from the state list of impaired waters. Catoclin Creek does not meet the state water quality standards for recreational use due to fecal pollution from non-point sources (NPS). DEQ conducted a “total maximum daily load” study (TMDL) that identified the various fecal pollution sources and load contributions. The study found that the principle sources of NPS are from livestock wastes being discharged into the creek, from wildlife, and from failing septic systems. The report recommended that livestock be excluded from streams in the Catoclin Creek watershed, and failing septic systems be upgraded.

Starting in the Summer of 2005, LSWCD began targeting farmers with livestock to accept Federal cost-sharing funds to install fencing to exclude livestock from streams in the Catoclin watershed. Cost share funds also covered alternative water supply systems and harden crossing, where applicable. Concurrently, the Loudoun County Health Department (LCHD) began identifying homes adjacent to streams in the watershed with inadequate onsite waste disposal systems. The LCHD worked with these homeowners to upgrade their systems to meet state standards.

**Citizen Role in Catoclin TMDL Implementation Plan** — The Catoclin TMDL IP includes two activities for local environmental organizations in Loudoun County to support the TMDL IP.

- **Community Outreach and Public Education** – Loudoun Watershed Watch (LWW) is to organize Catoclin watershed events, and provide educational materials and displays.

- **Citizen Monitoring** – LWW is to provide complementary monitoring to better define implementation progress.

**LWW's Catoctin Watershed Project** -- LWW has worked in partnership with the Loudoun Wildlife Conservancy (LWC) and other groups since 2005 to provide the citizen support. The "Catoctin Watershed Project" was organized in 2005 to help meet the stream monitoring and community outreach goals under the TMDL IP. Grant funding to support the CWP was obtained from:

- Canaan Valley Institute;
- DEQ;
- Chesapeake Bay Restoration Fund;
- Loudoun Wildlife Conservancy; and
- Citizen donations.

## **B. PROGRESS REPORT – COMMUNITY OUTREACH AND EDUCATION**

**Community Outreach Projects** – LWW and its supporting partners helped organized several community outreach projects. The purpose of the projects are to increase public awareness of the water quality problems and needs in the Catoctin Watershed, and to promote community stewardship and appreciation of the importance of Catoctin Creek as a valuable natural resource. These projects are:

- **2005 Riparian Tree Planting Day** – Watertown area with 50 participants and 500 trees planted
- **2005 Catoctin Creek Clean-up Day** – Taylorstown area with 60 participants
- **2006 Riparian Tree Planting Day** – Hamilton area with 65 participants and 300 trees planted
- **2008 Riparian Tree Planting Day** – Waterford area with 50 participants and 100 trees and shrubs planted
- **Taylorstown Stream Days** – Annual event organized by the Taylorstown Citizen Association



**Community Outreach Educational Materials** – LWW has produced several educational materials, and provides a website with educational materials.

- **Pamphlets** –  
*Citizen's Guide – Starting a Local Watershed Group*  
*Catoctin Creek – A Community Treasure*  
*Catoctin Creek – Water Quality Report Card*  
*Benefits of Clean Water Fecal Bacteria in Stream Water: Public Health Considerations*
- **Website** – Educational materials and monitoring data are provided on-line at [www.loudounwatershedwatch.org](http://www.loudounwatershedwatch.org).
- **Logo** – The CWP has a distinctive logo that is placed on educational materials and T-shirts.
- **Display** – There are Catoctin Watershed Project banners and a display used at community events.

### **Citizen Volunteer Stakeholder's Overall Contributions – 2005-2007 --**

Citizen volunteer organizations have made a substantial contribution to the TMDL IP. The volunteer time devoted to the TMDL IP are estimated as follows:

- **Community Outreach and Education** – publications, website, meetings, etc. = 1000 hrs volunteer time
- **Riparian Tree Planting and Stream Clean-up Projects** = 1000 hrs volunteer time
- **Stream Monitoring** – 61 sampling days, 700 samples, 1300 lab analyses = 1200 hrs volunteer time
- **Recognition** -- LWW received the 2007 Outstanding Organization Award from Virginia Citizens for Water Quality

## **C. BASELINE DATA – STREAM MONITORING**

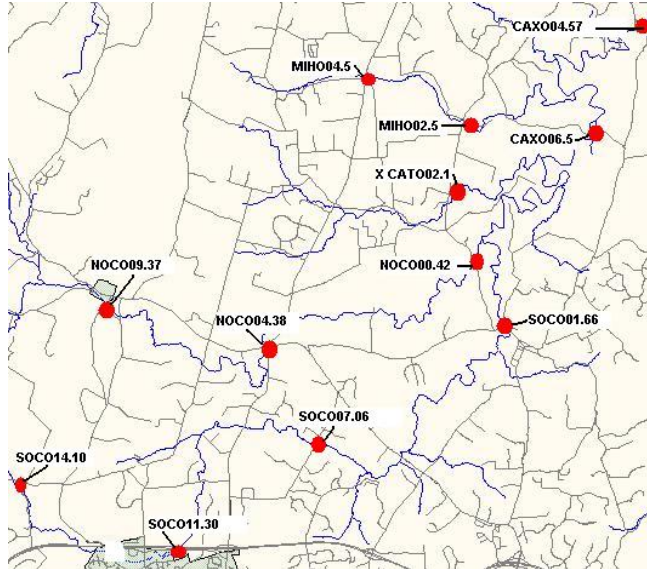
**Protocol and Sampling Stations** -- LWW began monitoring in June 2005 at 12 stations, twice monthly. Sampling stations are shown in **Figure 1**. Samples are analyzed to enumerate *E. coli* using the Coliscan Easygel protocol. Training was obtained from DEQ. Analyses are performed at the Leesburg STP laboratory. Since monitoring began in 2005, over 700 samples have been collected and analyzed. A one-year data analytical status report was prepared in 2006. The data and status report are available on LWW website.

**LWW Data Uses** -- Coliscan data is not official data that can be used by DEQ to classify state waters. However, Coliscan data can be used to suggest water quality patterns for DEQ to consider. Coliscan data can also be used to indicate progress being made to improve water quality, and to identify stream segments impacted by NPS pollution.

**Comparison of LWW and DEQ Data** – DEQ has one trend monitoring station at the Taylorstown Bridge in the Catoctin Creek watershed that is sampled approximately 10 times yearly. *E. coli* data are available since 2002. LWW also samples at this station

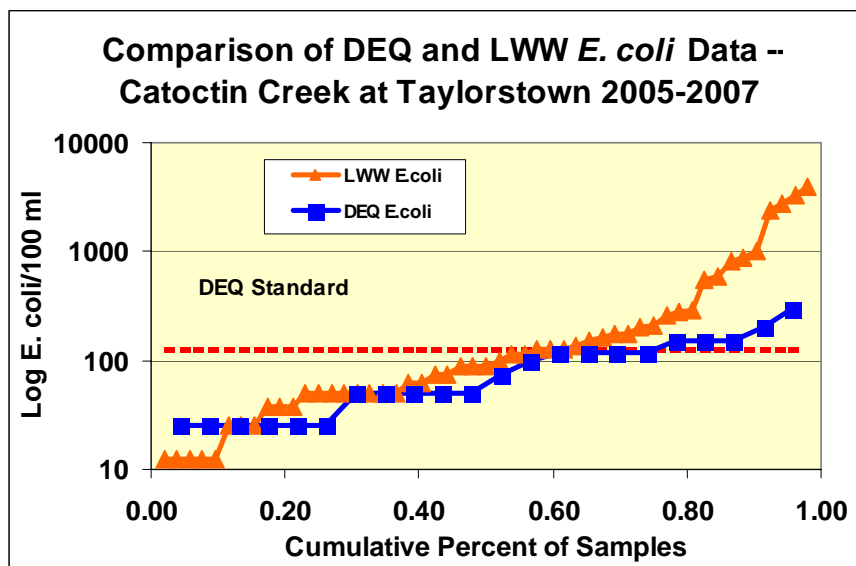
using the Coliscan Easygel protocol. These overlapping stations allow a comparison to be made between the official DEQ *E. coli* data and the LWW unofficial data.

**Figure 1. Loudoun Watershed Watch Stream Monitoring Stations for the Catoctin Watershed Project.**



The DEQ and LWW data are sorted by *E. coli* value, and plotted on a log scale against a cumulative percentile. This provides a straight line data plot, and allows a comparison to be made of the *E. coli* values at a particular cumulative percentile. A graph of these data are shown in **Figure 2**. Generally, DEQ and LWW data are well correlated except at higher *E. coli* levels where LWW data are more elevated.

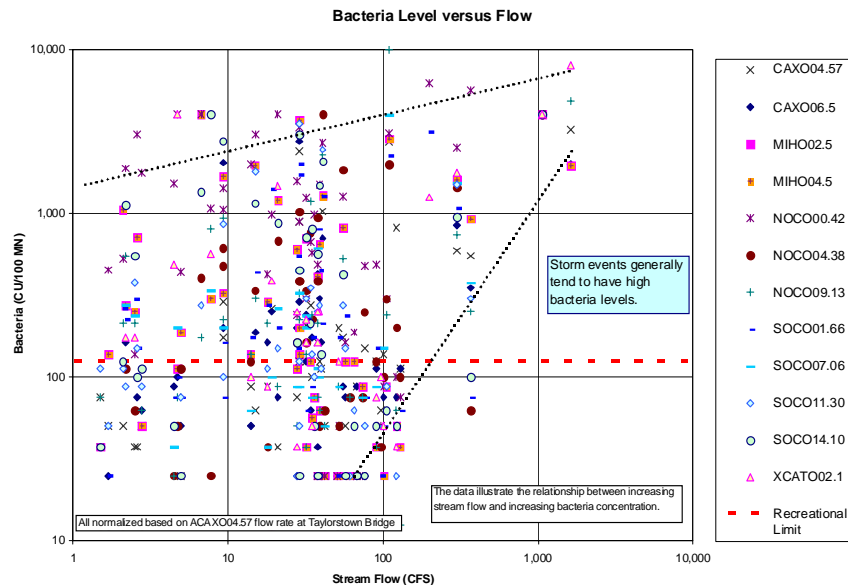
**Figure 2.**



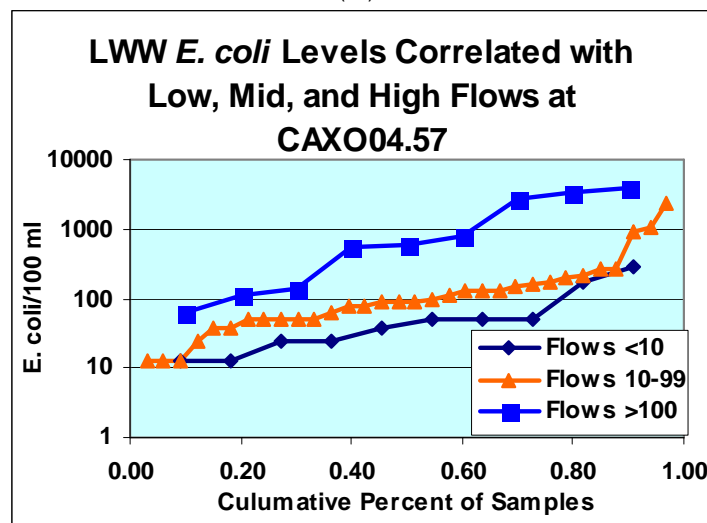
**Correlation Between Stream Flow and *E. coli* Levels** – The effects of stream flow on *E. coli* concentrations or loads is often considered an important factor in water quality trend analyses. A possible correlations was investigated in the DEQ TMDL study of Catoctin Creek, but no conclusion could be reached because the study was able to include only one high flow event. The TMDL report recommended additional high flow data be collected so a possible correlation could be assessed.

LWW investigate the effect of stream flow on *E. coli* using two approaches. **Figure 3** provides a scatter plot with *E. coli* levels on the y-axis and stream flow on the x-axis. This plot shows a positive correlation between *E. coli* levels and stream flow at the higher flow levels (>100 cfs). A correlation at the low (<10 cfs) and mid flows (10-100 cfs) is weak. In **Figure 4** the *E. coli* data are sorted by flow and plotted on a log-cumulative percentile graph, and the correlation between *E. coli* and flow levels appears stronger.

**Figure 3. Correlation Between LWW *E. coli* Data and Stream Flow – All Data**

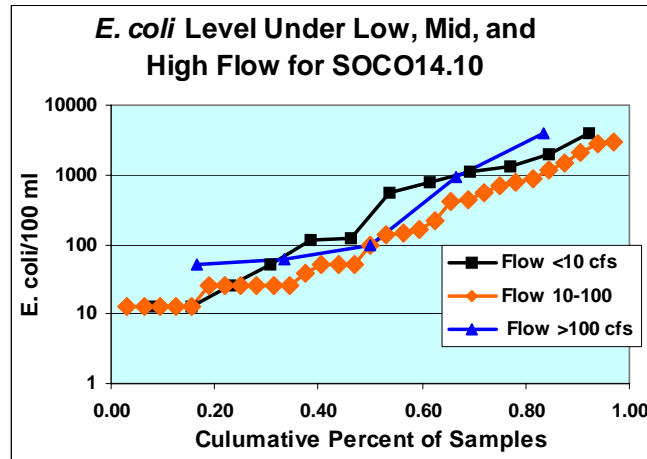


**Figure 4.**



The stronger correlation that shows at Taylorstown near the mouth of Catoctin Creek is not consistent throughout the watershed as shown in **Figure 5**. There appears to be a weak reverse correlation in the upper portion of the South Fork Catoctin Creek. Therefore, correlations between *E. coli* levels and flows vary by station.

**Figure 5.**



**Representativeness of LWW Data** – If there is a correlation between *E. coli* and flow levels, it is important that monitoring data is representative of different flow levels. The LWW data were analyzed to determine the degree to which samples taken representative of the frequency of the different flow regimes. The analysis is shown in Table 1. The sample frequency for the LWW data corresponded closely with the frequency of the different flow regimes.

**Graph 1.**

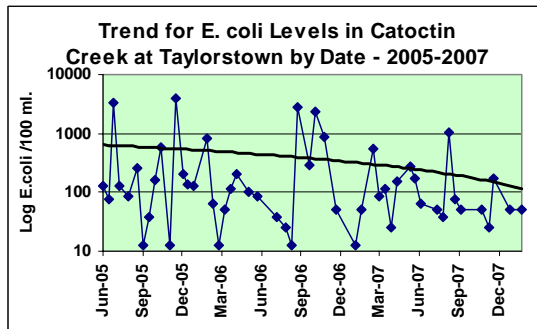
### Sample Distribution by Flow 2005-2007

Flow	LWW Sample Frequency	Flow Frequency
<10 cfs	25%	24%
10-100 cfs	55%	60%
>100 cfs	20%	16%

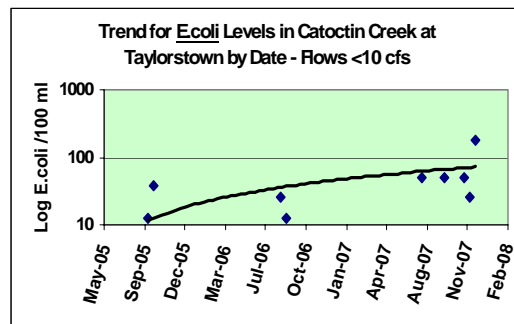
**Impact of 2007 Drought on Data Trends** – Drought conditions existed in the Cataoctin Creek watershed for an extended period in 2007 (>nine months). The LWW data from the Taylorstown station near the mouth of the watershed were analyzed to determine whether these drought conditions affected data trends. **Figure 6** shows a graph of the Taylorstown data that includes a trend line. It appears that there has been a substantial improvement in water quality over time. **Figures 7-9** show these data plotted by different flow regimes. The trend lines for these data show that there is improved

water quality only under the high flow regime, and there are few samples taken under high flow conditions in 2006 and 2007.

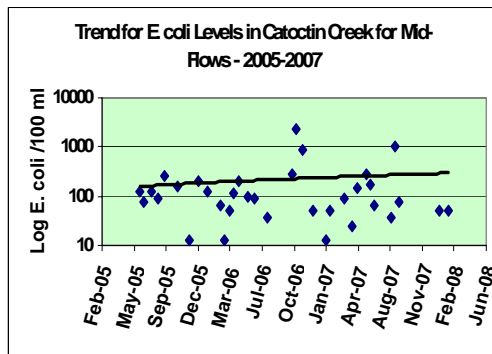
**Figure 6. Trend for All Data.**



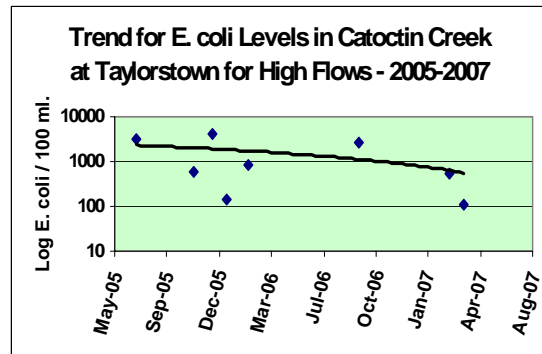
**Figure 7. Trend for Low Flow Data.**



**Figure 8. Trend for Mid-Flow Data.**



**Figure 9. Trend for High Flow Data.**



## D. PROGRESS REPORT – NPS POLLUTION

### Agriculture BMP Accomplishments --

Agriculture Fencing Achievement Based on 80% Performance Target							
Sub-watershed	Fencing Installed	Number of Livestock Excluded	TMDL Target-Fencing	% Achieved	Fencing Contracted	Number of Livestock to be Excluded	Total % Fencing Achieved
Catoctin Main Stem	3380	49	52,000	0.07	8440	86	0.23
South Fork Catoctin	8223	60	36,000	0.23	3825	45	0.33
NF Catoctin	3467	241	45,600	0.06	4490	117	0.17
<b>Totals</b>	<b>15070</b>		<b>133,600</b>	<b>0.11</b>	<b>16755</b>	<b>248</b>	<b>0.24</b>



Waste Disposal System Accomplishments  
Targeting Fencing “Hot Spots”  
Targeting Septic System “Hot Spots”

## **E. PROGRSS REPORT – WATER QUALITY TRENDS**

### **Water Quality Trend Analyses**

- **Moving Geometric mean –**
  - Transforms data to log values, and calculates averages of last 12 sample results
  - Reduces influence of very high numbers on the data set
- ***E. coli* Load Rates –**
  - Product of *E. coli* value and flow
  - Estimate of bacteria load in the water
  - TMDL purpose is to reduce the load in the stream

### **Ag BMP’s in Catoctin Main Stem**

#### **Water Quality Trend – Catoctin Mainstem**

### **Ag BMP’s in Milltown Creek**

#### **Water Quality Trend –**

#### **Milltown Creek**

#### **Water Quality Trend – Brens Run**

### **Ag BMPs in North Fork Catoctin**

#### **Water Quality Trend –**

#### **NF Catoctin Creek**

#### **Water Quality Trend –**

#### **Mouth NF Catoctin Creek**

### **Ag BMPs in South Fork Catoctin**

#### **Water Quality Trends --**

#### **SF Catoctin Creek-Upstream Section**

#### **Water Quality Trends in SF Catoctin Creek – Mid and Downstream Sections**

### **Overall Water Quality Trends**

- **Water quality trends vary by station:**
  - Suggests influence of local NPS pollution
  - Suggest hard to separate influence of drought from improvements due to BMP’s
  - Suggest that not enough BMP’s have been installed to influence water quality
- **Station by station analyses provided in Appendix A.**



- LWW has funding and volunteers to continue monitoring in 2008.

## **F. LESSONS LEARNED –CITIZENS IN A SUPPORTIVE ROLE**

### **Lessons Learned –**

#### **Outreach and Education**

- Community outreach can be successful as shown in 2005 and 2006.
- Difficult for a single volunteer group to organize outreach activities without other stakeholder support:
  - Need non-profit organization for grants
  - Need large number of experienced volunteers
  - Need collaboration with many organizations
- LWW sought collaborative agreement and support from LSWCD in 2007 – LSWCD declined
- LWW's community outreach program is currently inactive

### **Lessons Learned**

#### **Stream Monitoring**

- Volunteer citizen group can organize stream monitoring for a TMDL IP
- Monitoring data can assess trends, and the influence of flows and droughts on water quality
- A monitoring program based on Coliscan Easygel costs about \$1200/year, and grant funds are available.

## **G. RECOMMENDATIONS – GETTING BETTER RESULTS**

### **Where to Go From Here?**

With 3 ½ years behind us, we have learned that:

- Additional initiatives are needed in the TMDL implementation efforts
- Additional organizational mechanisms are needed to provide complimentary initiatives

### **Recommendations --**

#### **Stakeholder “Buy-In”**

We need to engage more Catoctin watershed stakeholders in the TMDL project:

- The Loudoun Watershed Management Stakeholder Steering Committee should be invited to help.

- The Catoctin TMDL IP should become a pilot for watershed restoration in the County.
- We should use the Catoctin TMDL IP to test new collaborative approaches between stakeholder groups and DCR.

#### **Recommendations –**

##### **Public Education**

There should be added TMDL education efforts that target new stakeholders moving into the Catoctin watershed.

- Grant funds should be sought to hire a community outreach educator/specialist.
- The “Education” and “Funding” subcommittees of the Watershed Management Stakeholders Steering Committee should be asked to help.

#### **Recommendations –**

##### **BMP Installation**

- We should try to obtain new incentive grants and cost-share funds from non-state/Federal sources to supplement the current Federal cost-share programs.
  - Funds for alternative fencing systems
  - Funds for flood damage repair
- Expanded stream monitoring should be used to identify NPS pollution “hot spots” and help target implementation efforts.

#### **Recommendations --**

##### **Volunteers and Stakeholder Organizations**

Finally, we need to better recognize volunteer stakeholder support:

- LWW Project manager: David ward
- LWW Volunteer monitors:
  - Fred fox    Claudia Kirk                      Kate Marincic
  - Kevin Oliver    Carolyn Randal                      David ward
- LWW Lab support:
  - David ward                      Darrell Schwalm
- Community outreach project leaders:
  - Mark Moszak                      Ann Larson                      Darrell Schwalm
- Other supporting organizations:
  - Town of Leesburg wastewater treatment
  - Loudoun wildlife conservancy
  - Earthward consulting