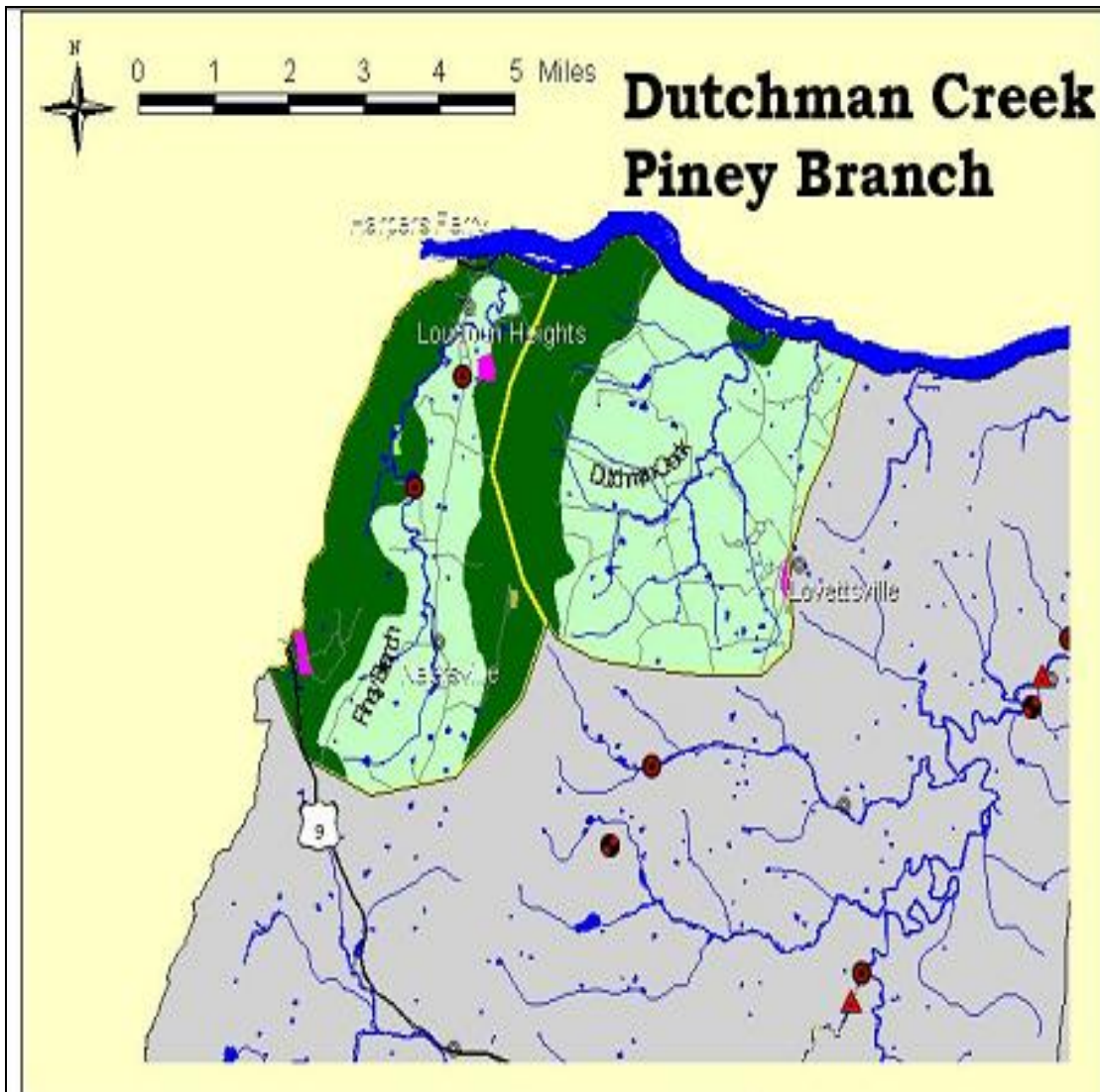


PINEY RUN WATERSHED

2005 PROFILE



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Watershed Description

Piney Run is a small, first and second order stream in the northwestern portion of Loudoun County. The watershed drains 9,700 acres or 15.2 square miles and includes the Sweet Run tributary. It is approximately 3 miles long and 6 miles wide, and runs from south to north. It flows into the Potomac River just downstream of Harpers Ferry, WV. There is a small waterfall at its confluence with the Potomac River that is near a takeout point for rafters and other boaters. In the summer months, hundreds of people, mostly youth, cool off in the Piney Run waters.

Piney Run flows in a valley between ridgelines to the west and east. In general, soils in the valley have high infiltration rates and low runoff potential, and soils at the higher elevations have low infiltration rates and high runoff potential. The average annual rainfall is 42.4 inches.



Piney Run monitoring site on Blue Ridge Center for Environmental Stewardship property.

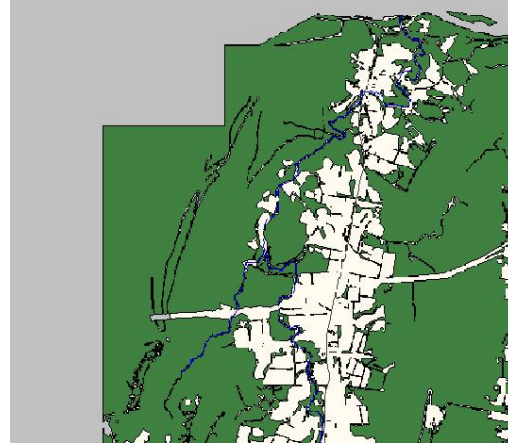


Sweet Run tributary monitoring site on BRCES property.

Land Use – Piney Run drains a rural area that is predominately mountain and valley basin. Land use type in the watershed is primarily forest (71%) and pasture (27%). The pasture land tends to be located closer to the stream, and the forest land along the ridge further from the stream. The steeper slopes along the ridge lines have remained largely forested. **Figure 1** shows forested lands (in green) and pasture lands (in white).

Impervious Surfaces -- Impervious surfaces include the roadways, driveways, rooftops and parking lots that do not allow infiltration of water from rainstorms and runoff. LEIP includes mapping impervious surfaces in the county using Lansat Imagery. They report that the amount of impervious surface in the piney Run watershed is 0.08%. As a general rule, a watershed with less than 10% of its area in impervious surfaces will not experience a noticeable impact on its hydrological characteristics.

Figure 1. Forest cover in the Piney Run watershed.



Water Quality Studies

Water Quality Standards -- Piney Run is listed by the Virginia Department of Environmental Quality (DEQ) as impaired for recreational use due to violations of the State’s water quality standard for fecal coliform bacteria. DEQ has one monitoring station at the 1.8 mile point in the stream. The impairment extends from the mouth at the Potomac River upstream to the 3.5 mile point and the confluence with Sweet Run. The remaining 32 miles of stream waters are not sampled by DEQ, and are not classified by DEQ. A summary of DEQ’s assessment of Piney Run is provided in **Table 1**.

Table 1. Assessment of Piney Run in DEQ’s 2004 303(d)/305(b) Integrated Report to EPA.

Watershed Monitoring Station	Meet Stnds	No Data	Citizen Data Show Problems	Citizen Data Show No Problems	Impaired
Piney Run	0	31.9	0	0	3.52
Sweet Run	0	3.56	3.56	0	0

Table 1 indicates that citizen data for Sweet Run shows a problem that needs follow-up by DEQ. This is based on macroinvertebrate data collected by LWC. Loudoun Soil and Water Conservation District (LSWCD also collects bacteria stream monitoring data at Rt. 685 (stream mile 4.2) upstream of DEQ’s impaired section. The LSWCD data show excessive fecal coliform bacteria concentrations in this upstream segment similar to the downstream segment. Unfortunately, these data are not accepted by DEQ and, consequently, this stream segment is not listed as showing problems.

Water Quality Studies – DEQ is required to conduct studies of all stream waters that do not meet water quality standards. The purpose of the study is to identify the source(s) of the pollution and quantify the pollution load(s) to the stream. DEQ studied the stream in 2003, and their report, “*Bacterial TMDL Piney Run, Loudoun County, Virginia,*” was published in March 2004.

DEQ used Bacteria Source Tracking (BST) and the Antibiotic Resistance Analysis (ARA) method to determine the relative contribution of bacteria by human, pet, livestock, and wildlife sources. Estimates were made of the numbers of these sources in order to calculate the annual pollution load contributed by each source.

- **Point Sources of Pollution** – There are two point sources that discharge under permit to Piney Run. Both sources discharge less than 1,000 gallons per day, and do not make a significant contribution to the stream pollution.
- **Humans and Pets** – 2000 Census data indicates there are 626 residents living in approximately 242 households in the Piney Run watershed. Bacteria from humans can enter the stream from straight sewage pipes and failing septic systems that discharge effluent to the perennial tributaries. The Department of Health estimates there are 9 straight pipes and 44 failing septic systems in the watershed. It is estimated that these homes have 900 dogs and 1,115 cats. Pollution from pets, especially dogs, can enter the stream through stormwater runoff.
- **Livestock** – Fecal wastes from livestock can be deposited directly in the stream if livestock have stream access, or transported to the stream in surface runoff from grazing or pastureland. LSWCD estimates there are 500 cattle and calves, 225 beef cows, and 350 horses in the Piney Run watershed.
- **Wildlife** – Like livestock, fecal wastes from wildlife can be deposited directly in the stream (muskrat, beaver, and geese), or it can be transported to the stream in surface runoff. The Department of Game and Inland Fisheries (DGIF) estimates that the biggest wildlife contributors are 1,600 deer and 120 raccoon.
- **Relative Yearly Fecal Bacteria Loads by Source** – DEQ combined the information on sources of pollution and estimated the average yearly fecal bacteria load contributed by different sources in the watershed. These relative loads are shown in **Table 2**. It is seen that approximately 70% of the fecal bacteria in Piney Run watershed come from cattle and horses.

Table 2. Estimated Relative Contribution of Fecal Bacteria in Piney Run by Different Sources.

Source	Number of Units	Contribution	Reduction Needed
Human	9 straight pipes, 44 failing systems	2.6%	94%
Pet	411 dogs	11%	94%
Livestock	725 cattle, 350 horses	68.9%	94%
Wildlife	1,611 deer, 119 raccoon	17.5%	18%

- **Estimated Load Reductions to Meet Water Quality Standards** – DEQ estimates that fecal coliform bacteria loads to Piney Run need to be reduced by 94% in all cases except for wildlife (18% reduction) if water quality standards are to be attained. This can be accomplished by repairing failing septic systems and straight pipes, fencing cattle out of streams and ponds draining into Piney Run, and allowing a natural riparian buffer to become established along the stream to help filter land runoff into the stream.

Watershed Monitoring

Stream Quality and Habitat Monitoring -- Water quality and stream health in the Piney Run watershed is marginally documented. DEQ has one chemical and bacteriological station that has been sampled since 1974. LSWCD has collected chemical, fecal, and aquatic insect data at two stations dating from 1999. LWC has collected aquatic insect data from one station on the Sweet Run tributary since 2001 and one station on Piney Run since 2003. A summary of the reportable data in the Piney Run watershed is provided in **Table 3**.

Table 3. Stream and Habitat Monitoring Data for the Piney Run Watershed.

Monitoring Sites	Water Flow	Chemical	Bacterial	Habitat	Aquatic Insects
Main Stem – Rt. 671		DEQ 1990-2004	DEQ 1990-2004		
Main Stem – Rt. 683		LSWCD 1999-2004	LSWCD 1999-2004		LSWCD 1999-2004
<i>Main Stem – Rt. 685</i>		LSWCD 1999-2004	LSWCD 1999-2001		LSWCD 1999-2001
<i>Main Stem – Above Sweet Run</i>				LWC 2004	LWC 2004
<i>Sweet Run Tributary</i>				LWC 2001-2004	LWC 2001-2004

Water Chemistry Conditions

The chemical quality of Piney Run is the major indicator used to determine whether the stream is fit for aquatic life and recreational uses. DEQ has collected chemical water quality data at the Rt. 671 bridge on Piney Run since 1990. These data show that chemical parameters meet state standards. Key chemical parameters are summarized in **Table 4**.

Table 4. Summary of Key Chemical Parameters Based Upon DEQ Data from Piney Run Between 1996 and 2001.

Parameter	Criteria	Observation	Condition
pH	Range of 6-9 units	Median pH level is 7.2	Criteria met
DO (Dissolved	Minimum of 4 mg/l	Median DO level is 10.1 with a range of 5.8 to 13.8 mg/l. Levels are consistently	Criteria

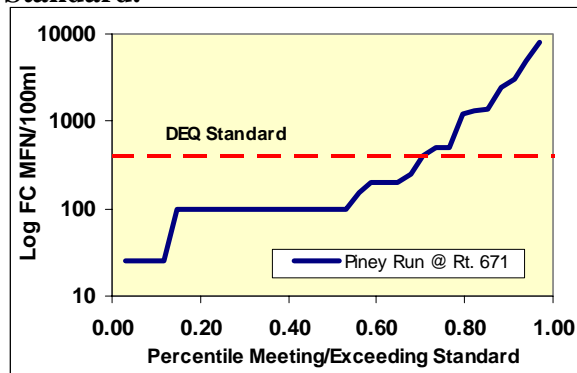
Parameter	Criteria	Observation	Condition
Oxygen)		between 8 and 14 mg/l which is good for aquatic life.	consistently met
BOD (Biological Oxygen Demand)	No DEQ standard -- EPA guideline is a maximum of 7 mg/L	Median BOD is 2 with a range of 0.6 to 6 mg/l. Levels are consistently at or below 2 mg/l suggesting low organic loads affecting stream water.	Criteria consistently met
Phosphorus	No DEQ standard -- EPA guideline of 1.0 mg/L	Median level of 0.1 mg/l suggests there is not excessive run-off of fertilizers from agricultural and other operations affecting the watershed.	Criteria consistently met
Nitrogen (as Nitrate)	No DEQ or EPA guideline	Median levels of 0.4 with a range of 0.1 to 4.6 mg/l. Trend towards increasing levels. These low levels of nitrogen in combination with low levels of phosphorus keep growth of aquatic plants and algae in check.	Low levels

LSWCD also has collected chemical data at two stations upstream and downstream from Rt. 671 beginning in 1999. These data show consistently good results. These data support DEQ's finding that the chemical quality of Piney Run is good.

Water Bacteriology Conditions

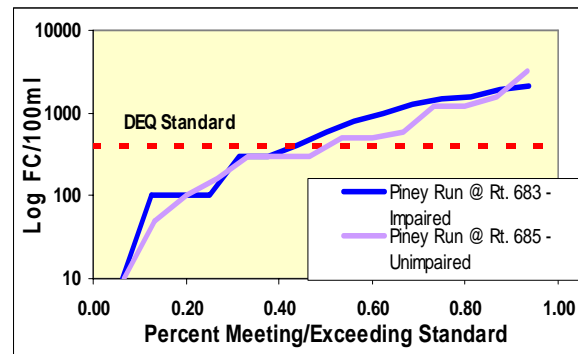
DEQ Data – Streams that are fit for use as recreational waters must have low levels of fecal contamination. DEQ has collected fecal coliform data in Piney Run since 1990. The most recent 1996-2004 fecal coliform bacteria levels are shown in **Figure 2**. The water quality does **not** meet state standards in that over 25% of the samples exceed 400 fecal coliform. There are periods when fecal coliform reach levels as high as 8000 cfu/100ml.

Figure 2. DEQ Fecal Coliform Data for Piney Run Showing % Samples Exceeding Standard.



Loudoun Soil and Water Conservation District – LSWCD has collected fecal coliform data in Piney Run at two sites upstream and downstream from the DEQ site since 1999. The data, plotted as cumulative percentages, are shown in **Figure 3**. These data also show that 40% to 50% of the samples exceed 1000, and that water quality standards are not being met even in the upstream area not classified by DEQ.

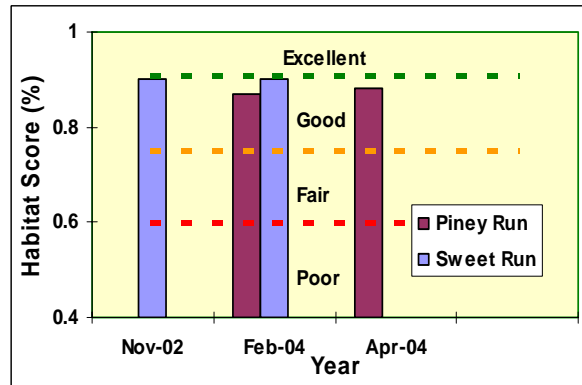
Figure 3. LSWCD Fecal Coliform Data for Piney Run Showing % Samples Exceeding Standard.



Stream Habitat Quality

Loudoun Wildlife Conservancy – LWC has collected stream habitat data in Sweet Run since 2002 and Piney Run starting in 2004. The LWC monitoring sites are on the Blue Ridge Center for Environmental Stewardship (BRCES) property. The property is largely hardwood forested with wide natural forested riparian buffers, and unaltered, meandering stream courses. Habitat conditions are very good as shown in **Figure 4**.

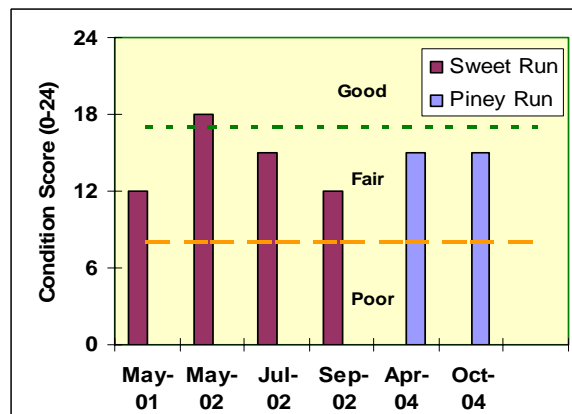
Figure 4. Stream Habitat Conditions in Piney Run and Sweet Run, 2002-2004



Aquatic Insect Populations

Loudoun Wildlife Conservancy – LWC has collected aquatic insect sample at two stations using the ANS protocol. These data suggest that the condition of the aquatic insect communities at the sampling sites are in the “fair” category. The type of insects present are predominately those that are moderately tolerant of pollution such as caddisflies, midge larvae, black flies, and flathead mayflies. There are only a few species sensitive to pollution, and those present are normally in low numbers.

Figure 5. Aquatic Insect Conditions in Piney Run and Saweet Run, 2002-2004



Overall Assessment of Stream Health

DEQ’s TMDL report on Piney Run provides good information on water quality conditions and sources of pollution affecting the watershed. These data are supplemented by bacteriological, stream habitat, and aquatic insect data collected by LSWCD and LWC.

The fecal coliform bacteria data for Piney Run show that the stream is impaired for use as recreational waters. The principal sources of pollution are cattle with access to the stream, deer and raccoons, pet dogs, and failing septic tanks systems. DEQ and LSWCD chemical data suggest that the water quality is otherwise good. The very limited stream habitat data are restricted to the Blue Ridge Environmental Center property that is all hard wood forest. The limited aquatic insect data suggest that the stream is marginally healthy. The results of various measurements of stream health are summarized on **Table 5**.

Table 5. Summary of Piney Run Stream Assessments that Measure Stream Health.

Monitoring Site	Environmental Parameters					
	Water Flow	Chemical Quality	Bacteria Quality	Habitat	Aquatic Insect	Impervious Surfaces
DEQ Rt. 734		Good	Poor-Impaired			Excellent
LSWCD Rt. 683		Good	Poor-Impaired			Excellent
LSWCD Rt. 685		Good	Poor-Impaired			Excellent
BREC-Piney Run				Good	Fair	Excellent
BREC-Sweet Run				Good	Fair	Excellent

References:

George Washington University. 2000. “Loudoun County Environmental Indicators Project (LEIP). Annual Report 2000. Ashburn, VA.

Virginia DEQ. 2004. “*Bacteria TMDL for Piney Run, Loudoun County, Virginia.*”