

Sinking Creek Watershed Assessment

604(b) Water Quality Planning Grant

**Tennessee Department of
Environment & Conservation**

Division of Water Pollution Control

**Final Report
4th Quarter Report
July - September 2003**

**Prepared by
First Tennessee Development District
and
East Tennessee State University**

INTRODUCTION

Sinking Creek is listed on the state's 303(d) list as not supporting its intended uses. It is rated as non-body contact for the presence of fecal coliform bacteria in the water. The Sinking Creek Watershed Alliance has taken on the task of improving the water quality in Sinking Creek, and one of the first steps in this process is a watershed assessment.

A yearlong assessment of land use in the Sinking Creek watershed was completed on September 30, 2003. Population counts for wildlife, livestock, and domestic animals were completed monthly by a team of ETSU students and one faculty member. An agricultural land use assessment was completed in November 2002 (first quarter) and May 2003 (third quarter), and the septic system survey was initiated in March 2003 (second quarter). The sixth and final survey detailed possible environmental impact areas along the creek, which was an ongoing process performed whenever survey activities were in progress.

A final presentation on the project is to be given to the Boone Watershed Partnership at its November meeting and a final presentation is to be given to the Sinking Creek Watershed Alliance at its November 19, 2003 meeting. The results of the project including the final report are posted on the Boone Watershed Partnership website at www.geocities.com/boonewatershed.

DATA

Survey data was collected by a research team composed of ETSU students, and headed by Ingrid Luffman. Christopher L. Craig, First Tennessee Development District served as Project Administrator. Each survey is discussed below, along with a summary of the results from the fieldwork. Each chart shows the parameter of interest (primarily population) plotted by stream mile, which allows for comparisons between surveys, and also facilitates future incorporation of tributary data and water quality data.

The raw survey data is included in the Appendices, where latitude and longitude coordinates (obtained using a GPS unit in the field) as well as stream mile is recorded for each observation.

Agricultural Survey

The Agricultural Surveys were completed in Fall 2002 and Spring 2003. Agricultural activities are minimal in this watershed and are primarily found in the lower portion of the watershed (mile 0 to 2) and consist of hay fields and household vegetable gardens (although some of these are large in size). At mile 2.0 there is a nursery and greenhouses. At stream mile 6.3 and 6.5 there are two hay fields, of approximately 10 acres and 8 acres, respectively. Data collected in November 2002 and April 2003 is included in Appendix A.

In summary, agricultural impact areas occur at stream mile 6 and from stream mile 0 to 2.

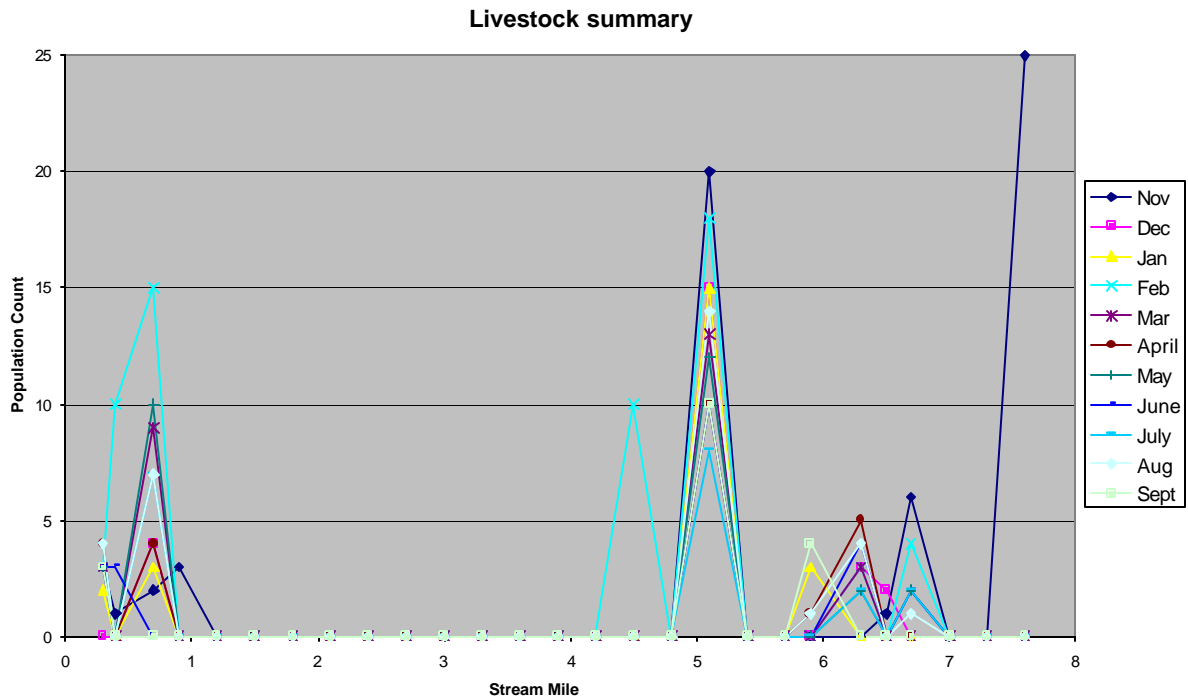
Livestock Survey

Both livestock and agricultural activities were restricted to the upper and lower areas of the watershed since the middle portions are built-up residential, commercial and industrial areas. The number of livestock and associated acreage is approximate, however, with a few notable exceptions, livestock populations are minimal, limited to less than five animals per site. The detailed monthly counts are attached in Appendix B.

Figure 1 displays livestock counts per stream mile by month. As expected, most sites with livestock populations were repeat hits month by month. The areas of interest in Figure 1 are those where monthly data series converge. In particular, there are three such areas.

The first area of interest is near the sinkhole (stream mile 0 to 1). In this area cattle, horses and a small number of free-range poultry have direct access to a tributary of Sinking Creek. Several different properties with probable impact to the creek are identified in this segment, indicating that any BMPs to be initiated in this area would need to be coordinated with several individuals.

The second area of interest is located at stream mile 5.1 (Pleasant View Road area). Each month large numbers of cattle (ten to fifteen or more) have direct access to a 500 foot long segment of the stream.



The third area of interest is along Dry Creek Road, near where it intersects with Sinking Creek Road at mile 6.0-7.0. Mainly horses are found to populate this area, and are moved around from field to field within a one mile segment of the creek.

Figure 1 Livestock counts for Sinking Creek by stream mile.

Domestic Animal Survey

The distribution of the domestic animal population, is summarized in figure 2 below. Domestic animals were scattered fairly evenly throughout the watershed, with consistend sightings near the sinkhole (mile 0-1) and at stream mile 5.1 (Pleasant View Road area). The actual number of domestic animals was low, however, averaging two to three dogs per sighting.

Domestic Animal Summary

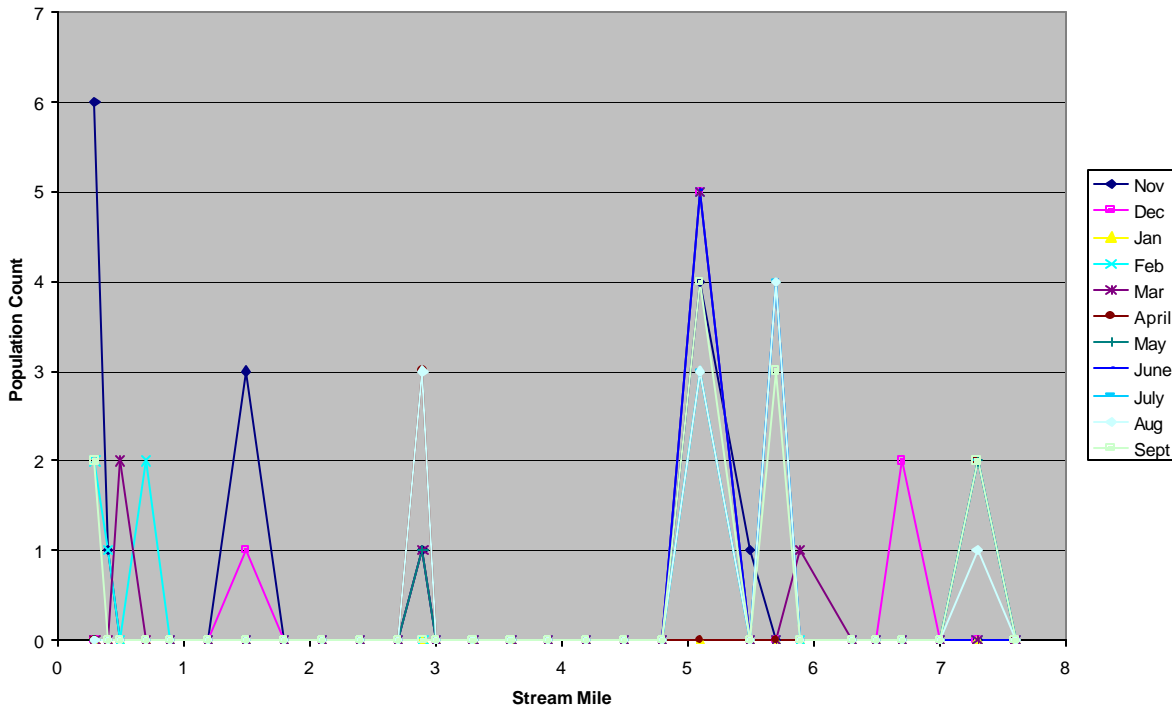


Figure 2 Domestic animal counts for Sinking Creek by stream mile.

Wildlife Survey

Thirty-six sites were selected for a wildlife abundance survey, and were monitored monthly for a period of 15 minutes at each site. Monitoring times were selected to occur during one of four daily time windows: within two hours of dawn, noon, mid-afternoon and dusk. The wildlife survey sites are listed and described in Table 1 below. The sites were chosen to coincide with a water quality assessment, currently underway but not part of this study. Each site "C" corresponds to a water quality sample site. Additional sites were chosen situated between each water quality sample site as appropriate.

In response to preliminary water quality results, two sites on Catbird Creek, a tributary of Sinking Creek, were selected. Catbird Creek enters Sinking Creek at stream mile 2.8, and it was deemed appropriate to expand the wildlife assessment to include this major tributary.

Table 1 Wildlife Sample Sites

	#	Description	Latitude	Long.	Str. Mile
1	1A	316 Sinking Creek Rd	36°20.335 ' N	82°17.829' W	0.3
2	1B	213 sinking Creek Rd	36°20.227 ' N	82°18.006' W	0.4
3	1C	244 Sinking Creek Rd (pump station)	36°20.128 ' N	82°18.046' W	0.5
4	2A	Round bend from pump stn	36°20.015 ' N	82°18.115' W	0.7
5	2B	169 Sinking Creek Rd	36°19.892 'N	82°18.253' W	0.8
6	2C	150 Sinking Creek Rd (bridge)	36°19.832 'N	82°18.260' W	0.9
7	3A	Corner of Sinking Crk Rd and 91, unnamed tributary	36°19.671 'N	82°18.315' W	-
8	3C	Sinking Creek Baptist Church (climb down between parking lot and bridge near first stake, site is along creek near lower stake)	36°19.684 'N	82°18.461' W	1.2
9	4B	125 Greenlea Rd, near mailbox for this house	36°19.567 'N	82°18.538' W	1.4
10	4C	Joe Carr Rd (labeled Rush Rd. on map, but Joe Carr on street sign, stake is down near creek by bridge)	36°19.521 'N	82°18.603' W	1.5
11	5A	King Springs Rd	36°19.336 'N	82°19.972' W	1.9
12	5B	Creekside Nursery	36°19.276 'N	82°19.126' W	2.1
13	5C	Dave Buck Rd (Bridge crosses creek, upstream side)	36°19.134 'N	82°19.290' W	2.3
14	6A	Rich Acres Freewill Baptist Church	36°19.058 'N	82°19.403' W	2.5
15	6C	Bridge by old pump station (Orlando Dr)	36°18.781 'N	82°19.617' W	2.9
16	7C	King Springs Baptist Church (bridge)	36°18.755 'N	82°19.690' W	2.9
17	8A	Gaging station (need to drive towards Elizabethton, then turn around and take Legion St./Milligan Hwy offramp. Pull off on off ramp near gaging station. Stake	36°18.693 'N	82°19.803' W	3.2

		close by.			
1 8	8C	Bosch, corner of Quarry Rd, near entrance to Bosch	36°18.472 'N	82°19.953' W	3.4
1 9	9A	O &A Home, just past 2 nd building	36°18.312 'N	82°20.085' W	3.5
2 0	CB 1	Plymouth Road Crossing (Catbird Creek)	36°17.775 'N	82°19.980' W	1.3
2 1	CB 2	South Roan Crossing (Catbird Creek) Tipton Haynes	36°17.775 'N	82°19.980' W	1.8
2 2	9B	Corner of Quarry and South Roan near stop sign	36°18.194 'N	82°20.196' W	3.8
2 3	9C	Lafe Cox @ Buffalo Rd (cart storage for golf course)	36°17.886 'N	82°20.736' W	4.4
2 4	10A	Walk along cart path upstream about 125 yds. Stake is on L near 14 th tee	36°17.821 'N	82°20.810' W	4.5
2 5	10B	Pleasant View Road at bridge crossing	36°17.531 'N	82°21.209' W	5.1
2 6	10C	Hickory Springs Rd, by bridge	36°17.430 'N	82°21.399' W	5.3
2 7	11A	2127 Sinking Creek Rd	36°17.230 'N	82°21.742' W	5.7
2 8	11C	Miller Lane	36°17.103 'N	82°21.812' W	5.8
2 9	12A	David Miller Rd at bridge crossing	36°17.030 'N	82°21.860' W	5.9
3 0	12C	Berea Freewill Baptist Church (stake near lg tree)	36°16.958 'N	82°21.946' W	6.0
3 1	13A	Stake is before bridge near sign "one lane bridge"	36°16.813 'N	82°22.053' W	6.3
3 2	13B	Harvey Lane Bridge (lower bridge – not main road)	36°16.435 'N	82°22.109' W	6.7
3 3	13C	Jim McNeese Rd (on bridge)	36°16.029 'N	82°22.163' W	7.2
3 4	14A	Pull-off on RHS 0.1 mi from 13C, stake 20 ft off road	36°15.926 'N	82°22.054' W	7.3
3 5	14B	Pull off on RHS 0.3 mi from 14A, stake 20 ft off road	36°15.726 'N	82°21.922' W	7.8
3 6	14C	1.1 mi from 14b, pull off on RHS. Watch for rocks blocking trail (also high pressure gas pipeline markers). Walk down trail about 100 yards, take left turn at junction and follow trail to stream.	36°14.811 'N	82°22.056' W	8.8

Wildlife summary

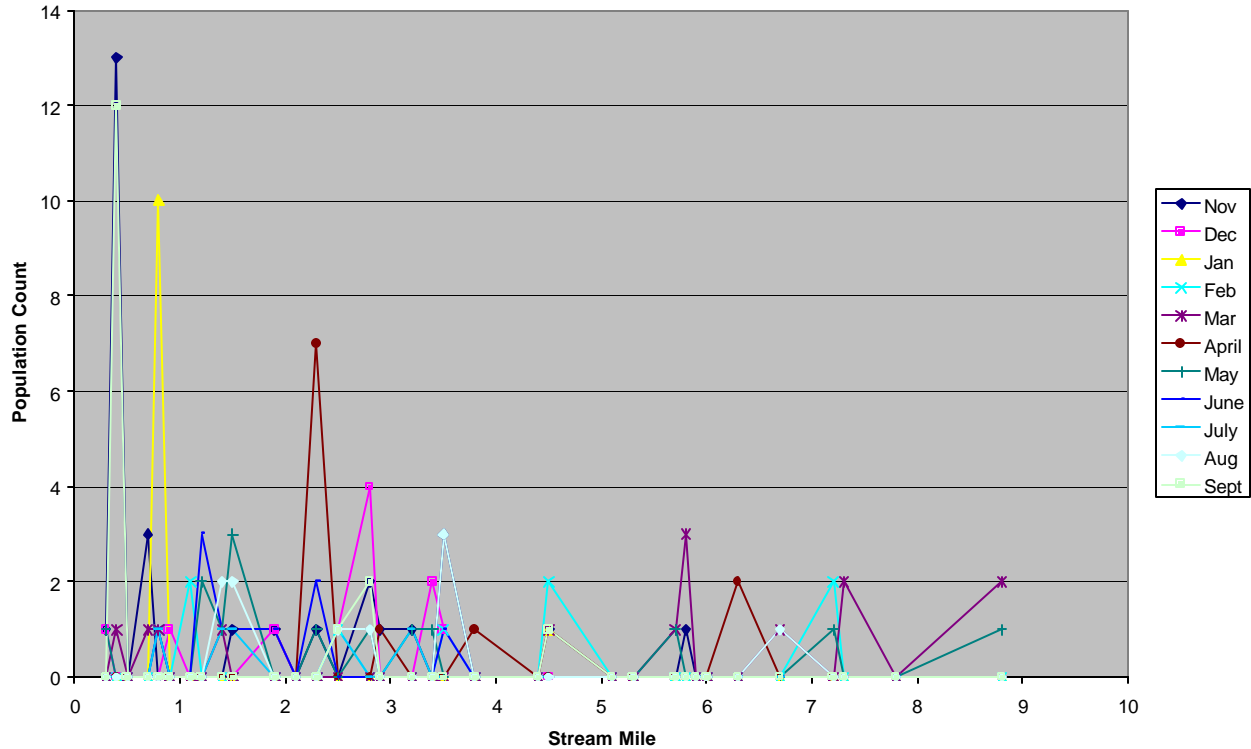


Figure 3 Wildlife population count for Sinking Creek by stream mile.

Figure 3 indicates the distribution of wildlife throughout the watershed. Animals sighted include deer, ducks, geese, skunk, raccoon, rabbits, squirrels and songbirds. Songbirds were not included in the above data on recommendation by the US Forest Service in Erwin, TN

As in previous surveys, the areas of interest are where monthly data series coincide. For wildlife, there is no one segment that stands out in this respect, other than possibly between stream mile 0 and 1, where consistently a family of ducks is sighted in or near a tributary to Sinking Creek. Notice, however, that the overall numbers of wildlife sighted are low, and therefore it is expected that their impact on the stream is minimal.

The monthly data sheets containing specifics are attached as Appendix C.

Septic Survey

A door-to-door septic survey was initiated in mid-March, and continued through the beginning of June. Properties with creek frontage, and also those within 50 feet of Sinking Creek were identified from tax records, resulting in 244 lots in the target group.

A team of researchers surveyed each property with the purpose of identifying areas of septic system use, as well as age and upkeep data for each system. Each property was surveyed using the form below (Figure 4).

Septic Survey

Premise number/Address:	
Date surveyed:	
Name of observer:	

Do you own or rent the property?

- Own
 Rent

Note: if rental, stop here! -- we are not authorized to proceed with the survey.

How long occupied residence: _____
Number of people in residence: _____

Type of system:

- Septic tank City Sewer Unknown

If septic system, when was system installed?

- Within last 5 years 15+ years ago
 5-9 years ago Don't know
 10-14 years ago

When was tank last serviced?

- Within last 5 years
 5-9 years ago
 10-14 years ago
 15+ years ago
 Don't know

Type of premise:

- Single family unit
 Duplex
 Modular unit
 Other

Comments:

The results of the survey indicated that there were three main areas of septic system use – below mile 1.0, between mile 1.5 and 2.5 (a previously unknown area of septic system use) and above stream mile 7.0.

A joint meeting of the water quality researchers and the land use researchers to compare water quality results with land use data narrowed our focus to a segment of the creek between mile 1.5 and mile 2.5. Upstream of mile 2.5 the water quality is acceptable, but downstream it declines significantly.

In light of this, the properties located between miles 1.5 (Joe Carr Road) and 2.5 (Orlando Drive) were surveyed an additional three times to attempt to reach residents who were not available on the first try. As a final step, the Johnson City Water and Sewer Database was consulted to determine if the remaining properties were hooked up to the sewer system. If not, it was assumed that these properties used a septic system.

The survey identified a neighborhood within the target area that is relying solely on septic systems, many of which are 15 years old or older. As a follow-up to evaluation of survey data, TDEC employees in at the Johnson City EAC were dispatched to evaluate the septic system failure threat in the neighborhood in question and to perform dye tests where necessary. This step is beyond the scope of this study.

The survey results are attached as Appendix D.

Improper Waste Disposal and Illicit Discharge

Members of the survey team made note of areas with possible negative environmental impacts. Conversations with residents also proved particularly fruitful in identifying such areas.

Sources of sediment and trash were noted as well as the location of drainage pipes, dumping and construction areas. Table 2 identifies these areas by stream mile and by geographic coordinates (latitude and longitude).

Table 2 - Environmental Impact Areas

Illegal Dumping/Illicit Discharge/Environmental Impact Areas				
Date	Geog Coordinates	Stream Mile	Photo *	Description
5/17/03	36 19.892'/82 18.253'	0.8		remodeling waste, same color as 169 Sinking Creek Rd (across street)
1/25/03	36 19.832'/82 18.260'	0.9		large dump area: trash, scrap metal, concrete
9/28/03	36 19.671'/82 18.315	1.0 (enters)		construction within 15' of creek, no silt fence, bank erosion
2/5/03	36 19.274'/82 19.120'	2.1	6 (feb)	potted plants (pots included!) in stream (Nursery), 15 tires in creek, flood debris
3/20/03	36 19.276'/82 19.126'	2.1		plants, soil, pots also one uptake(?) pipe
9/28/03	36 19.274'/82 19.120'	2.1	6 (feb)	15 tires in creek, flood debris, trash, bank erosion within last few months
3/20/03	36 19.134'/82 19.290'	2.3		sediment source - new construction, gully erosion from parking lot runoff
3/20/03	36 19.058'/82 19.403'	2.5		green drainage pipe running into creek
3/20/03	36 18.755'/82 19.690'	2.9		soapy bubbles in water
3/20/03	36 18.472'/82 19.953	3.4		parking lot runoff enters stream about 100 ft upstream from stake
3/20/03	36 17.775'/82 19.980	2.8 (enters)		source of stormwater runoff into Catbird Creek
3/20/03	site CB2	2.8 (enters)		evidence of animal access to stream (probably cattle, could be deer?)
3/20/03	36 18.194'/82 20.196'	3.8		detention basin overflow channel - no bank stabilization, silt fences down
11/27/02	Clyce Distributing	4.1	2-2 (nov)	drainage pipe
11/27/02	Boone Distributing Co	4.3	2-3 (nov)	drainage pipe
12/21/02	36 17.821'/82 20.810	4.5		pipe discharging water into stream (on/off)
12/18/02	36 17.528'/82 21.049'	4.9	1-21,22 (dec)	soap suds in water
12/18/02	36 17.569'/82 20.993'	4.9	1-20 (dec)	discharge from laundry facility
1/25/03	36 17.531'/82	5.1		cattle direct access to stream, some bank

Illegal Dumping/Illicit Discharge/Environmental Impact Areas				
	21.209			destruction
12/21/02	36 17.430'82 21.399	5.3		laundry wastewater pipe feeds directly into stream
* first number is disk, second is photo and in parentheses is month				
I.e. 1-21,22 (nov) means november photos, disk 1, photos 21 and 22.				

SUMMARY OF FECAL LOAD

The data presented in this report is in the form of population counts, however, it is well known that fecal load production varies significantly from animal to animal. Hence, an estimate of load for fecal coliform on Sinking Creek was made using the data collected as well as the load estimates by source shown in Table 3.

Source	Daily fecal production million cfu/day	Equivalent number to one beef cattle	percent of day in creek
human	1950	16.9	N/A
cat	0.000504	65476190	
dog	409	80.7	1
horse	420	78.6	2
beef cattle	33000	1	8
dairy cattle milked	25200	1.3	5
dairy cattle heifer	11592	2.8	5
sheep	27000	1.2	
deer	347	95.1	1
raccoon	113	292	10
muskrat	25	1320	50
beaver	0.2	165000	
goose	799	41.3	50
duck	2430	13.6	50
mallard	2430	13.6	50
wild turkey	93	354.8	5
Sources: ASAE, 1998; Map Tech, Inc., 2000; Metcalf & Eddy, 1979; EPA, 2001. Little Creek TMDL Tables 3-11 and 3-16 and p3-28			

The data from this table, combined with the population counts for wildlife, domestic animals and livestock were used to estimate the fecal coliform load per stream mile on Sinking Creek.

This estimate is shown graphically in figure 5, and indicates very strongly that the largest contributor to fecal loads is from livestock at and around stream miles 0.6, 5.1 and 7.8. Contributions from wildlife (ducks) at stream mile 0.4 is significant, while contributions from domestic animals is negligible and is not large enough to register on this chart.

Daily contribution breakdown (cfu/day)

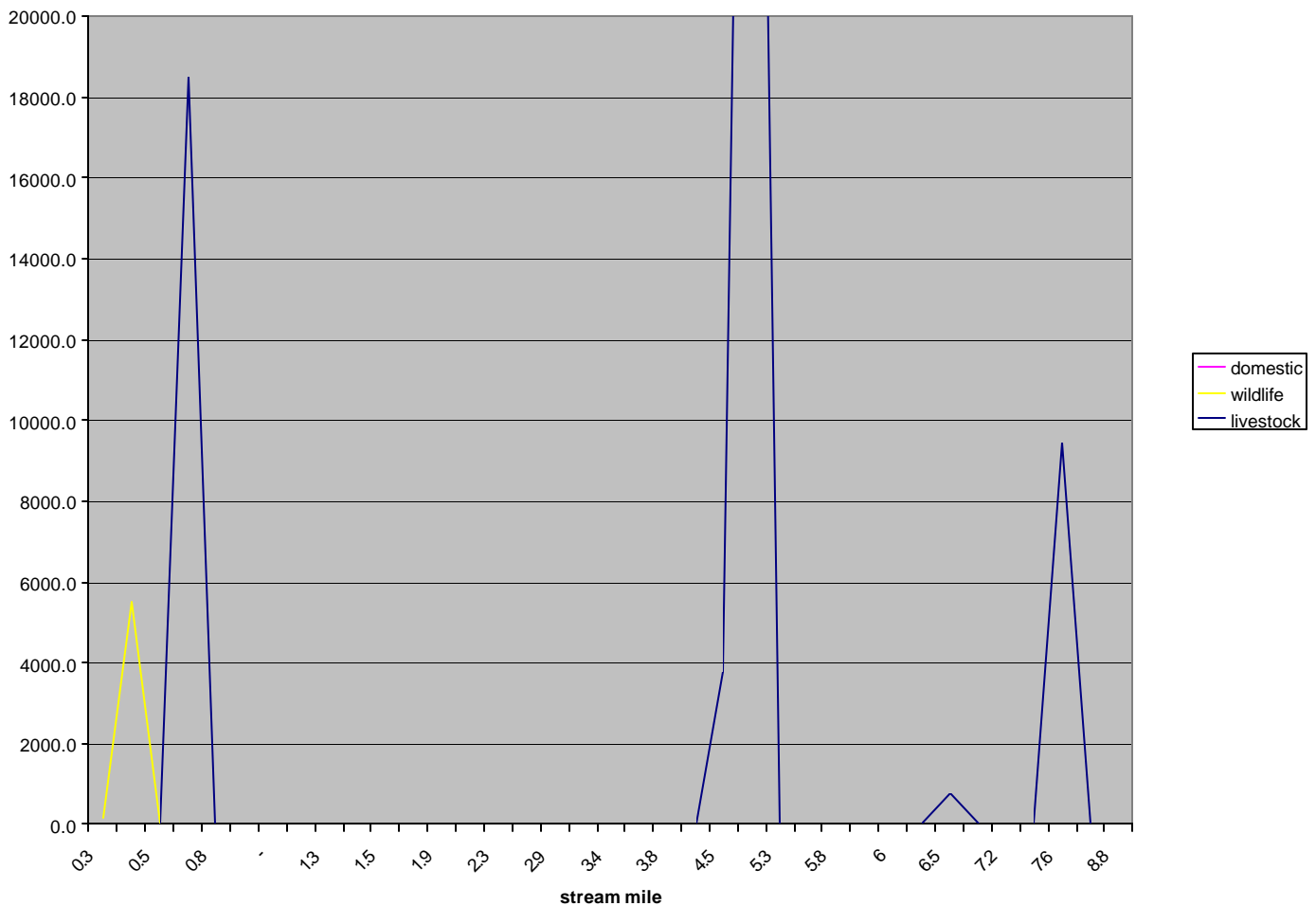


Figure 4 Estimated contribution to fecal load by source and stream mile