

990 Hammond Drive, Suite 400  
Atlanta, Georgia 30328  
Tel: 770-394-2997  
Fax: 770-396-9495  
[www.brownandcaldwell.com](http://www.brownandcaldwell.com)

May 13 , 2011



Mr. Chris Daigle  
Work Management Coordinator  
The University of Georgia  
Physical Plant Division  
1180 E. Broad Street  
Athens, Georgia 30602-5410

16-137588-500

Subject: Lilly Branch Water Quality Monitoring Report  
University of Georgia, WO #1121891/001, amended

Dear Mr. Daigle:

In accordance with the February 2011 amendment to the UGA-Tanyard Creek MS4 Water Quality Sampling Project, Brown and Caldwell (BC) is providing this letter report to the University of Georgia (UGA) Physical Plant Division summarizing water quality monitoring performed at Lilly Branch during the fall of 2010 and the winter of 2011. This report contains sections describing the sampling events, results, summary and recommendations.

## **WATER QUALITY SAMPLING**

### **Lilly Branch Monitoring**

Lilly Branch is a small tributary of the North Oconee River that flows east through the eastern portion of the UGA campus. It begins in the Five Points area of Athens and enters campus at Foley Baseball Field. The stream then flows in pipes and culverts through campus until it daylighted downstream of East Campus Road. Lilly Branch is not included on the Georgia Environmental Protection Division's (EPD's) most recent 2010 305(b)/303(d) list for not supporting its designated use; however, historical sampling by BC and others on campus at UGA has indicated concern with bacteria levels in the stream.

**Bacteriological Monitoring** - Beginning in fall 2010, three new sampling locations located on Lilly Branch were added to the Tanyard Creek and MS4 sampling program, shown on Figure 1. MP-8 is located just upstream of the Foley Baseball Field and represents the watershed upstream of UGA's campus. MP-9 is located between the Coverdell Center and the indoor tennis center. This location is sampled from a manhole where the stream is piped/within a culvert. MP-10 is located just downstream of East Campus Drive where the stream daylighted for a short distance of approximately 20 linear feet. MS4-3, a previously sampled site, is located at the downstream end of Lilly Branch approximately 500 feet upstream of the confluence with the North Oconee River. Six new sites were included in sampling performed during the winter of 2011. These sites (MP-11 through MP-16) were chosen for bacteria monitoring to help characterize the water quality of waters entering Lilly Branch from six separate small urban drainage areas on the UGA campus. Figure 2 shows these six additional monitoring locations and their individual drainage areas. A Photo Log showing all sampling locations on Lilly Branch is provided in Attachment A.

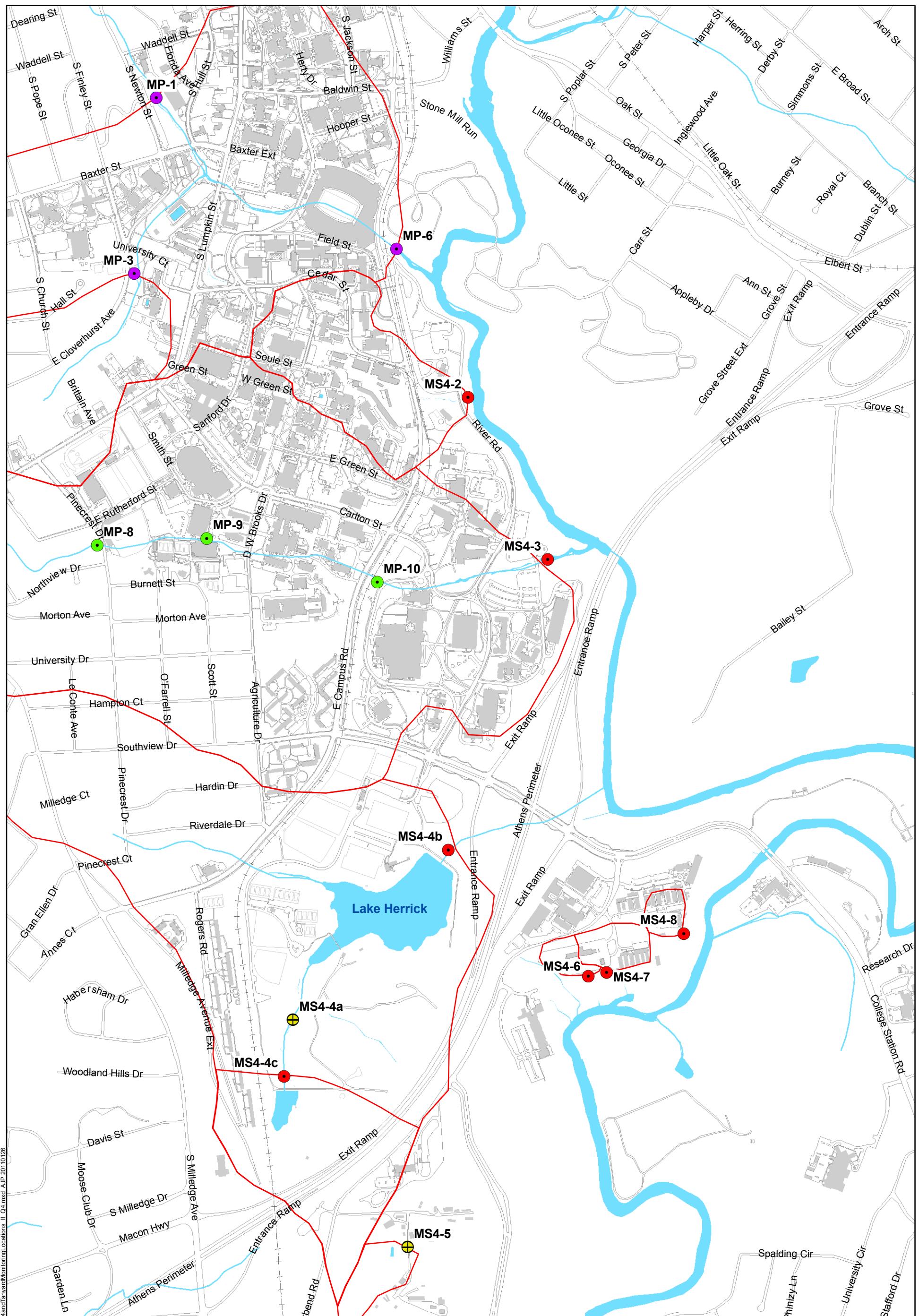


Figure 1: Water Quality Monitoring Locations

- Tanyard Creek Monitoring Locations
- Lily Branch Monitoring Locations
- MS4 Monitoring Locations
- Abandoned Monitoring Location
- Streets
- UGA Buildings
- Railroads
- Streams
- Watersheds

N  
W E  
S  
0 500 1,000 1,500  
Feet  
1 inch = 900 feet

Brown AND Caldwell

Basemap provided by UGA Physical Plant Department

Field parameters including pH, dissolved oxygen, temperature and conductivity were measured during each sampling event. The samples were laboratory analyzed for bacteria including fecal coliform and Escherichia coli (*E. coli*) using Standard Methods 9222D and 9222B, respectively. The GA EPD uses fecal coliform, a subset of total coliform, as an indicator of pathogens in State waters. This is a more accurate test than total coliform to detect fecal material; however, it, contains at least one organism that originates in woody debris and so is not considered by the USEPA as a reliable proxy for pathogens originating in human fecal material. Instead, the US EPA recommends testing for *E. coli* to determine if waters will cause digestive system illness. *E. coli* is a type of bacteria in the fecal coliform group that comes from warm blooded animals, including humans. Since the GA EPD currently only has water quality standards for fecal coliform instead of *E. coli*, we have sampled for both fecal coliform and *E. coli* in this investigation. The GA EPD plans to develop water quality standards for *E. coli*, so these tests for *E. coli* may be useful historical water quality data in the future.

### Sampling Results

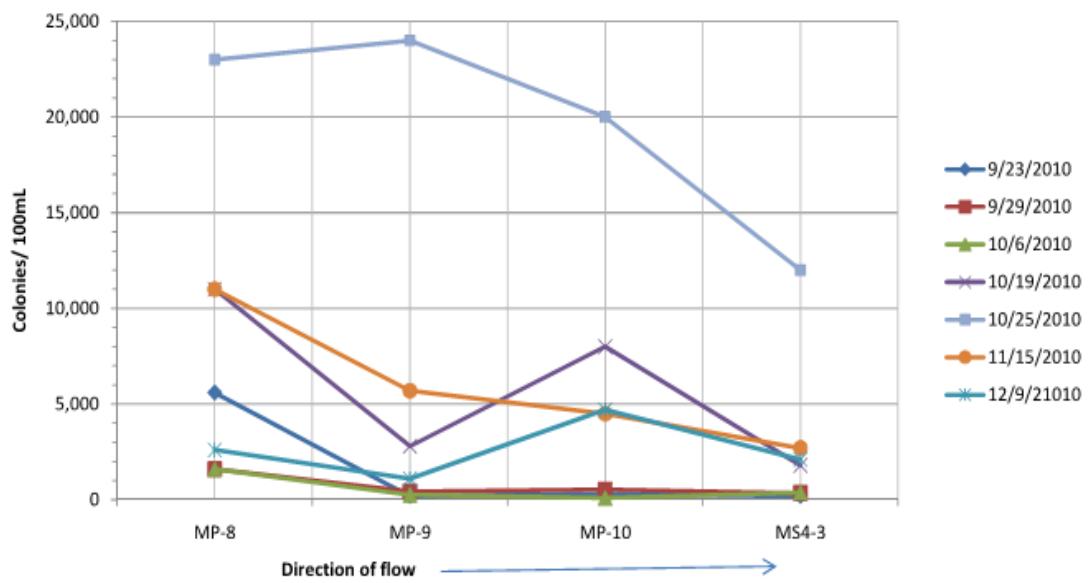
Monitoring at Lilly Branch included four bacteria samples collected within a 30-day period during the fall of 2010 at sites MP-8, MP-9, MP-10 and MS4-3. Additional monitoring took place in late fall, which included bacteria monitoring as well as a suite of other parameters during both a dry and wet event. One additional wet event was sampled in the fourth quarter on October 25, 2010 since the wet event was not captured during the third quarter of 2010. In the first quarter of 2011 another four bacteria samples were taken, within a 30-day period, at sites MP-8 through MP-10, MS4-3, and also at the new sites MP-11 through MP-16. Results from the fall 2010 bacteria sampling are shown on Tables 1 and 2 and Figures 3 and 4 below. Figure 5 shows precipitation in the Athens area during the time of sampling. Daily precipitation data was obtained from the United States Geological Service (USGS) stream gauge number 02217770 on the North Oconee River at College Street in Athens. The analytical laboratory reports will be provided in the Annual Report to be submitted to UGA in July 2011.

Table 1. Fall 2010 Lilly Branch Fecal Coliform and *E. Coli* Results

Fall 2010	Site MP-8		Site MP-9		Site MP-10		Site MS4-3		Weather Conditions
Date	Fecal Coliform (Colonies/100 ml)	<i>E. Coli</i> (MPN/100 ml)	Fecal Coliform (Colonies/100 ml)	<i>E. Coli</i> (MPN/100 ml)	Fecal Coliform (Colonies/100 ml)	<i>E. Coli</i> (MPN/100 ml)	Fecal Coliform (Colonies/100 ml)	<i>E. Coli</i> (MPN/100 ml)	
9-23-10	1,600	1,200	180	150	310	250	200	220	Dry
9-29-10	1,600	1,500	430	400	540	500	350	330	Dry
10-6-10	1,600	1,100	260	180	90	63	380	310	Dry
10-19-10	11,000	9,800	2,800	2,300	8,000	6,100	1,800	1,300	Dry
Geometric Mean	2,591	2,099	487	397	589	468	468	414	

**Table 2. Quarterly Sampling - Lilly Branch Fecal Coliform and *E. Coli* Results**

Fall 2010	Site MP-8		Site MP-9		Site MP-10		Site MS4-3		Weather Conditions
Date	Fecal Coliform (Colonies/100 ml)	<i>E. Coli</i> (MPN/100 ml)	Fecal Coliform (Colonies/100 ml)	<i>E. Coli</i> (MPN/100 ml)	Fecal Coliform (Colonies/100 ml)	<i>E. Coli</i> (MPN/100 ml)	Fecal Coliform (Colonies/100 ml)	<i>E. Coli</i> (MPN/100 ml)	
10-25-10	23,000	20,000	24,000	17,000	20,000	16,000	12,000	8,700	Wet (2.6 in total)
11-15-10	11,000	9,200	5,700	5,200	4,500	4,400	2,700	2,200	Wet (0.14 in total)
12-9-10	2,600	2,200	1,100	1,000	4,700	3,900	2,100	1,900	Dry



**Figure 3. Fall 2010 Fecal Coliform Sampling at Lilly Branch**

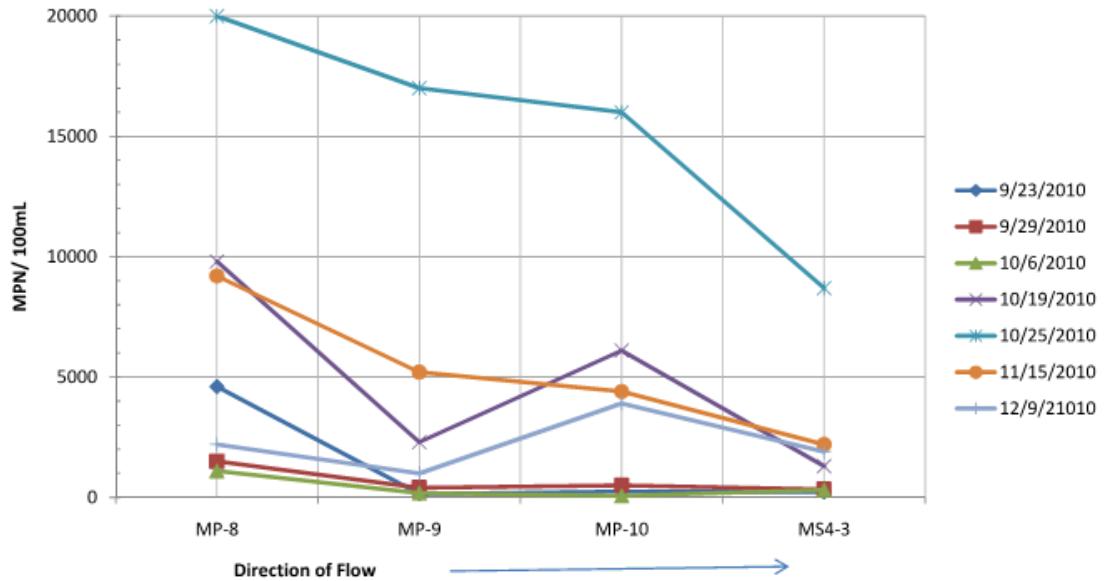


Figure 4. Fall 2010 *E. Coli* Sampling at Lilly Branch

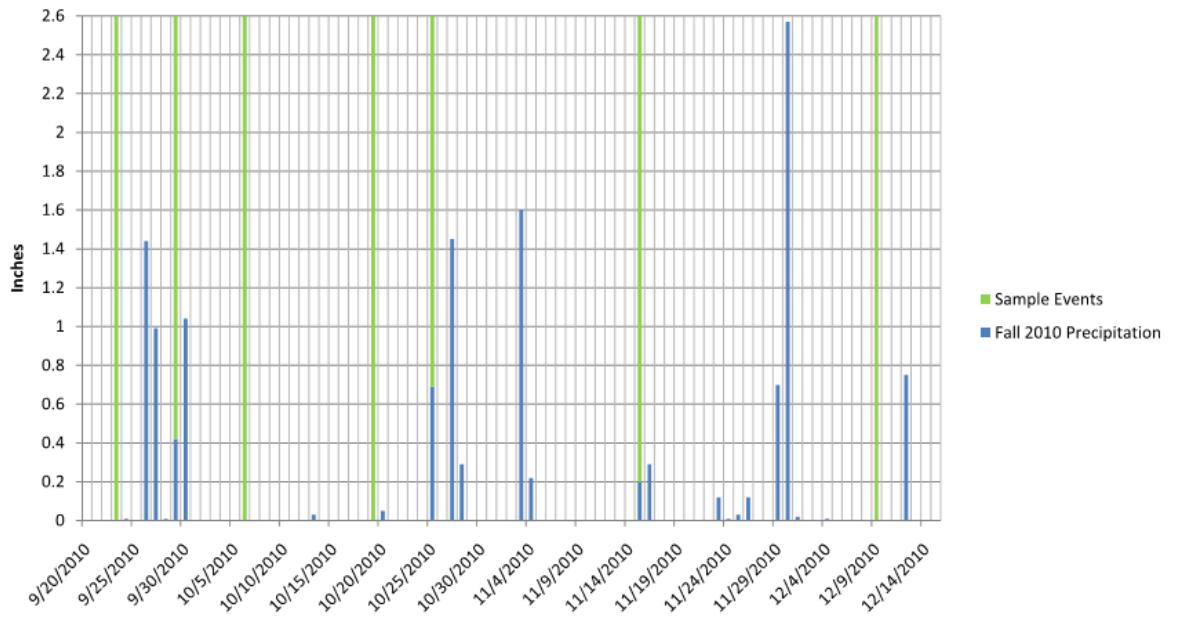


Figure 5. Fall 2010 Sampling Events and Precipitation

According to the GA EPD Rules for Water Quality, for the months of May through October, when water contact recreation activities are expected to occur, fecal coliform is not to exceed a geometric mean of 200 colonies per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200/100 ml (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 300 colonies per 100 ml in lakes and reservoirs and 500 colonies per 100 ml in free-flowing freshwater streams. For the months of November through April, fecal coliform is not to exceed a geometric mean of 1,000 colonies per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours and not to exceed a maximum of 4,000 colonies per 100 ml for any sample.

The geometric mean of bacteria levels at each sampling site during fall 2010 sampling exceeded the GA water quality regulations limit of 200 col/100ml. For each sample event, both fecal coliform and *E. coli* levels were highest at site MP-8, which is the most upstream site sampled and indicates water quality coming onto the UGA campus from the Five Points area of Athens. For three of the four events, MP-10 results were higher than MP-9 or MS4-3, suggesting there may be a bacteria source between MP-9 and MP-10 that warrants further investigation.

During the wet weather events on October 25 and November 15, 2010, shown on Table 2 and Figures 3 and 4, the trend continued with MP-8 results showing the highest concentration of both fecal coliform and *E. coli*; however, MP-10 results were not higher than the other two. During wet weather, levels of bacteria decrease in a downstream direction. During the dry weather sampling in December, Site MP-10 had higher results than all the other sites, but MP-8 has the second highest concentration. In general, Figures 3 and 4 indicate trends of higher bacteria levels at MP-8 followed by MP-10. These results suggest that further investigation into sources upstream of MP-8 and in the drainage areas between MP-9 and MP-10 may be warranted.

The geometric mean sampling is performed regardless of the weather per the regulations. During the quarterly sampling, one dry weather event, defined as less than 0.2 inches in the prior 72 hours, and one wet event, defined as at least 0.2 inches within 24 hours, were sampled. The geometric mean sampling was done from September 23 through October 19. The quarterly dry event was on December 9 while two quarterly wet events occurred on October 25 and on November 15. A graph showing precipitation and the six sampling events that occurred in the fall of 2010 is shown on Figure 5. Historically, Athens receives 3.65 inches of precipitation during September. The Athens area received 3.94 inches of rain during the 30-day period of sampling. Athens received 3.91 inches between September 24 and 30, and the sampling results from September 23, 29 and October 6 did not vary greatly in bacteria levels, which were lower than subsequent levels. The October 19 sampling event indicated significantly higher bacteria counts at all stations on Lilly Branch and then the October 25 sampling event indicated even higher concentrations. The period from October 1 through October 19 received only 0.03 inches of rain. This suggests that several wet events concentrated within a few days result in lower levels of bacteria. The high bacteria concentrations on October 19 potentially indicate a dry weather bacteria source upstream of MP-8, such as leaking sanitary sewer pipes. The significantly higher

concentrations during the October 25 rain event indicate a combination of a dry weather source (i.e. leaking sanitary sewer pipes) and a wet weather source, such as stormwater runoff. Bacteria sources in urban stormwater runoff typically include pet waste, refuse, and also wildlife sources. Additionally, during storms, increased pressure on the sanitary sewer system may result in infiltration and inflow (I&I). This is generally a problem in older sewer systems. Over time pipes crack and break, roots clog the system, and sewer manholes corrode. This causes the integrity of the sewer system to become compromised and allows outside water to enter the system.

Results from the winter 2011 bacteria sampling are shown on Table 3 and Figures 6 and 7 below.

**Table 3. Winter 2011 Lilly Branch Fecal Coliform and *E. Coli* Results**

Date	MP-8		MP-9		MP-10		MS4-3		Weather Conditions
	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	
2-23-11	1,400	1,200	800	520	1,400	1,000	190	220	Clear, dry
2-24-11	5,400	5,200	450	450	470	440	160	150	50°F, dry
3-09-11	470	370	2,800	2,200	5,700	4,400	4,400	3,400	Overcast, 55°F, wet. Rained total of 0.88 in. Rained 0.67 in. on the 6 <sup>th</sup> , 0.47 in. on the 5 <sup>th</sup> .
3-24-11	800	550	430	310	700	490	2,300	1,700	Clear, 60°F, dry
Geometric Mean	1,298	1,062	811	632	1,273	987	745	661	

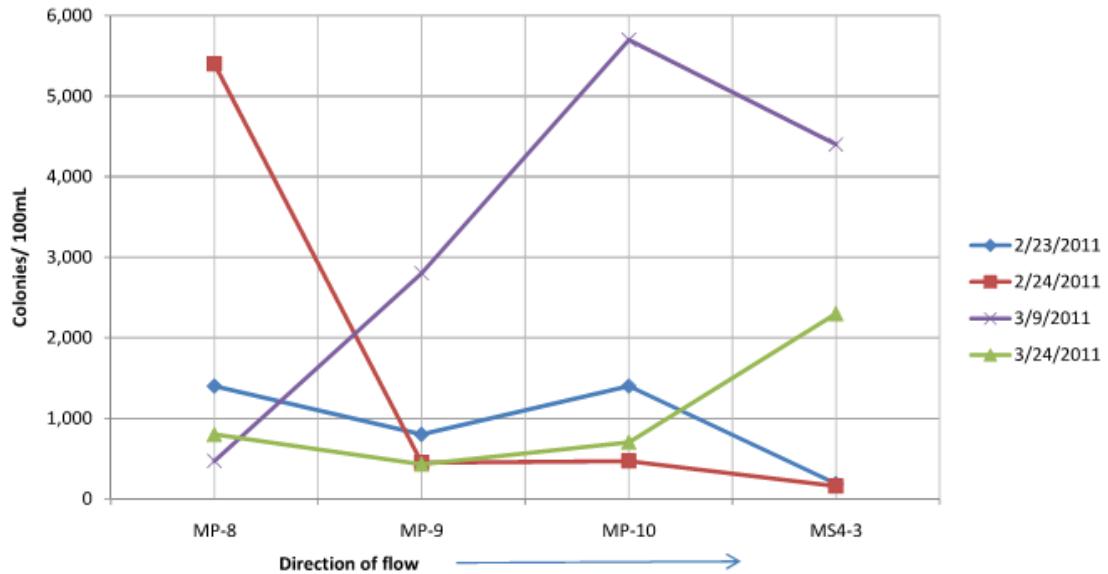


Figure 6. Winter 2011 Fecal Coliform Sampling at Lilly Branch

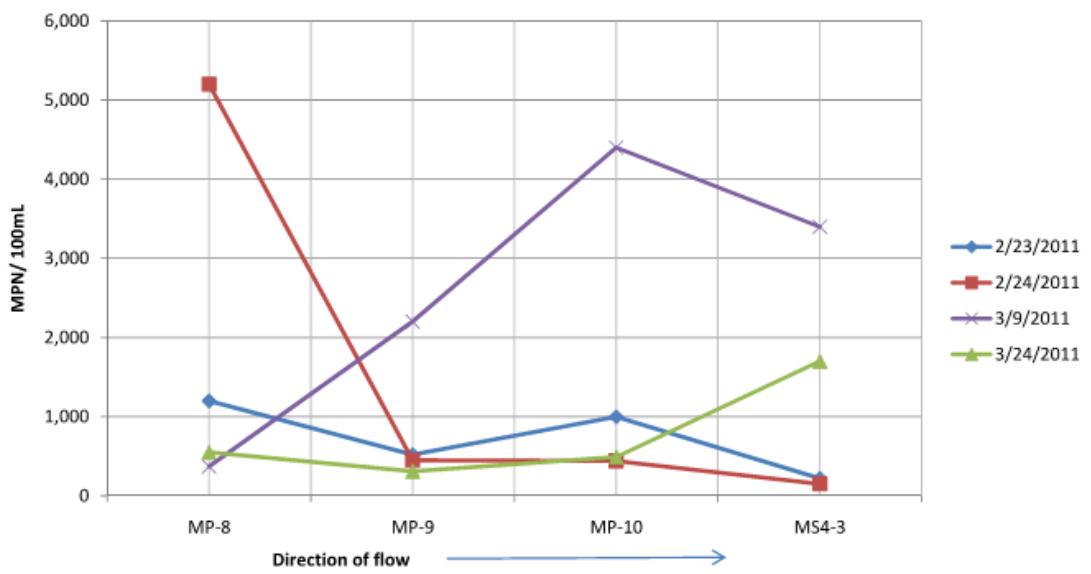


Figure 7. Winter 2011 E. coli Sampling at Lilly Branch

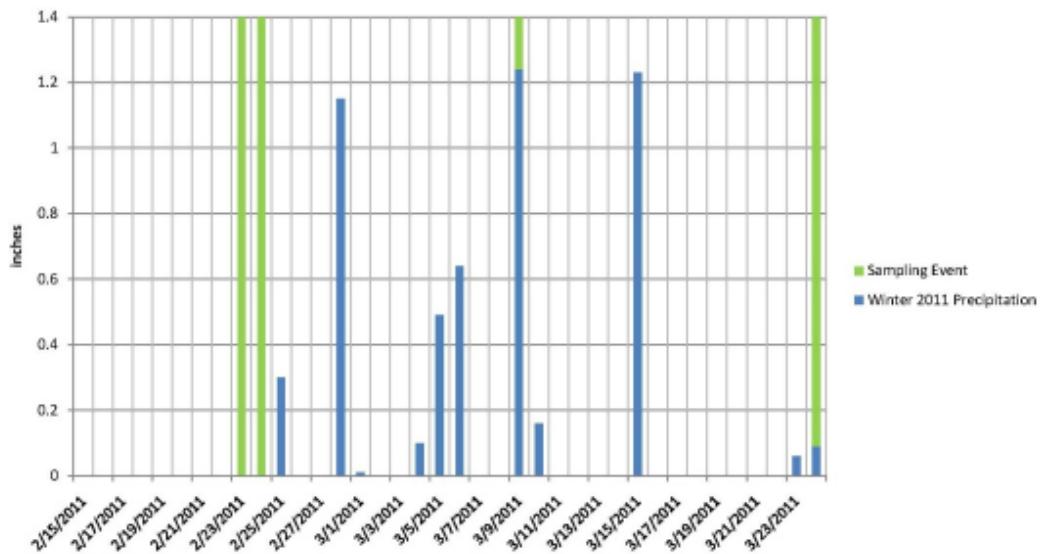


Figure 8. Winter 2011 Sampling Events and Precipitation

As shown in Table 3 and Figures 6 and 7 above, samples from MP-8 and MP-10 exceeded the geometric mean limit of 1,000 col/100ml for fecal coliform during the November-April time frame. The geometric mean was highest at MP-8, followed closely by MP-10. This is consistent with the fall 2010 sampling bacteria results. During each sampling event, fecal coliform and *E. coli* levels increased between MP-9 and MP-10, particularly during wet weather. *E. coli* levels increased all but once (on February 24, 2011, when they dropped slightly). Also, during the wet weather event on March 9, the trend changed, as shown on Figures 4 and 5, and MP-8 had lower bacteria levels than the downstream samples. During the wet weather event, bacteria increased moving downstream with the highest levels measured at MP-10. These concentrations indicate a potential wet weather source on the UGA campus between MP-9 and MP-10. MS4-3 was slightly lower than MP-10 during the wet weather event. This trend for the wet weather event is opposite from that observed during the fall 2010 wet weather event. MS4-3 bacteria results generally were lower than those measured at MP-10, but on March 24, 2011 there was a noticeable rise in both fecal coliform and *E. coli* at this location.

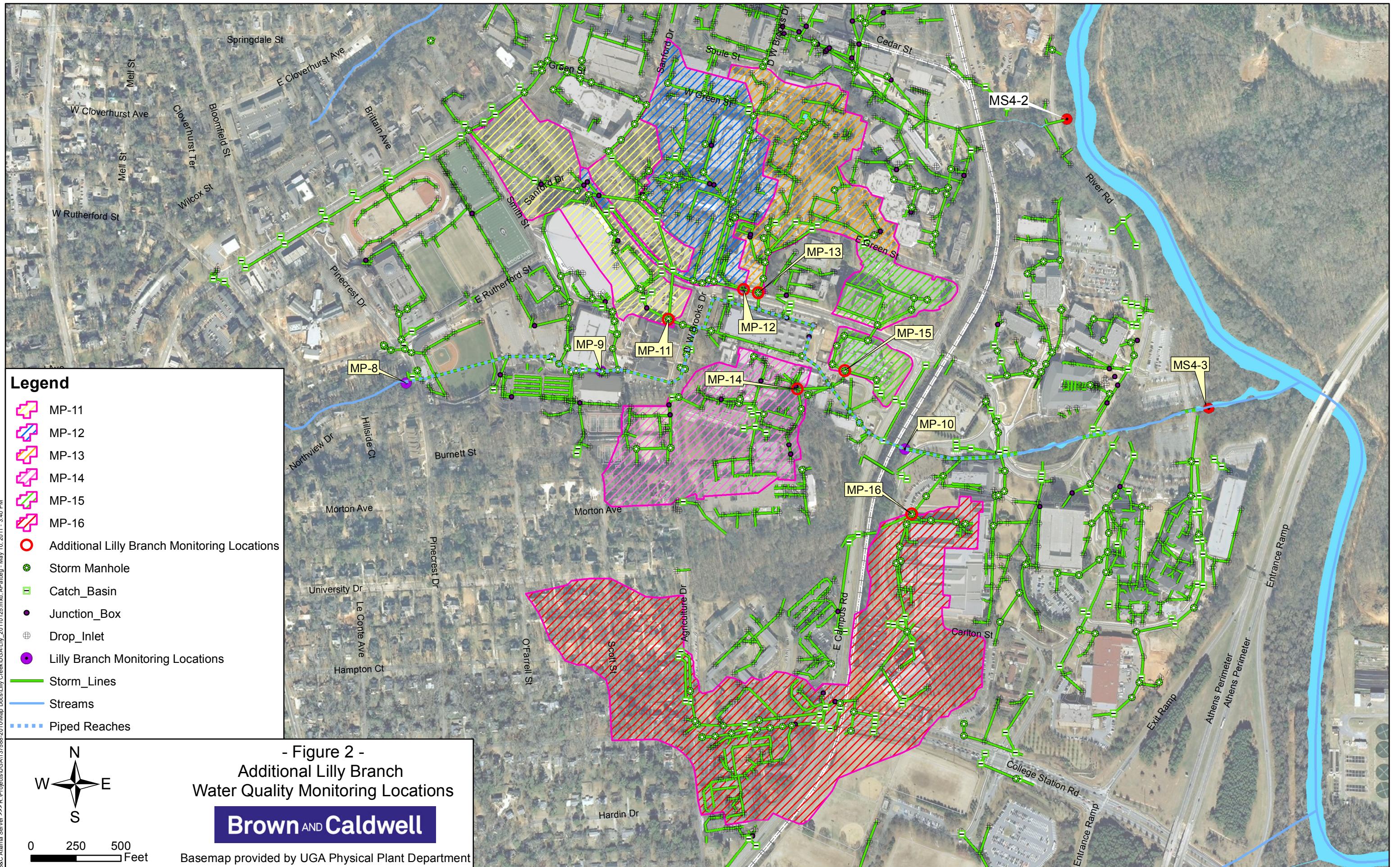
The period from February 15 to February 25 was dry, with no measurable precipitation. Bacteria levels in Lilly Branch exceeded the regulatory limit at locations MP-8 and MP-10 with concentrations at MP-9 and MS4-3 approaching the limit. Although levels were not as high as in fall 2010, the relatively high concentrations of bacteria in the stream during a period of dry weather indicates a potential dry weather source, such as leaking sanitary sewer pipes and/or compromised septic systems. During the time period of February 28 through March 9, prior to and during the wet sampling event, precipitation totaled 3.63 inches. With the exception of the MP-8 sample, other locations were significantly higher during the wet event than during the other three dry events. This indicates a stormwater

runoff source of bacteria on the UGA campus since fecal coliform concentrations were 470 Col./100 ml at MP-8 and then increased to 2,800 and 5,700 Col./100 ml at MP-9 and MP-10, respectively.

Figure 2 shows the locations and drainage areas of sampling sites MP-11 through MP-16. These locations are at stormwater pipes prior to discharge to Lilly Branch. These locations were selected to attempt to isolate potential sources of bacteria from the individual stormwater outfalls. MP-11 drains an area around and upstream of the coliseum. Flow was observed and sampled during dry weather. Reports of a groundwater spring in this area have been made. MP-12 drains the area around Miller Plant Sciences up to Shelling dining Hall at Green Street. MP-13 drains the area around the U.S. Forest Service Building upgradient to the Ecology Building. MP-14 drains the area around the Driftmeir Engineering building down to portions of the Veterinary Medicine buildings. MP-15 drains the area from the Animal Health Research Center up to Aderhold and Green Street. MP-16 is the largest drainage area and drains portions around the Ramsey Center, Family Housing and the residential area west of Agriculture Drive. All locations except MP-15 had flow during dry weather, likely indicating groundwater flow; however, on March 24, 2011, the MP-14 outfall was dry and was therefore not sampled. Results from bacteria sampling at these sites are presented on Table 4.

During dry weather, bacteria levels at locations MP-11, MP-12, MP-14 and MP-16 were relatively low while the location at MP-13 had relatively higher levels of bacteria. In fact, on the February 24 sampling event, bacteria levels at MP-13 were two orders of magnitude higher than the others. There appears to be a source of bacteria in the drainage area of MP-13 during dry weather, such as a leaking sanitary sewer pipe.

During wet weather (March 9), all sites except MP-12 were significantly higher in bacteria concentrations than during dry weather. On March 9, Sites MP-14 (5,300 Col/100ml) and MP-16 (2,500 Col/100ml) were the highest in bacteria. MP-14 is upstream of MP-10 and appeared to contribute to the increased bacteria levels that were detected there on March 9. Further, high levels of bacteria were measured at MS4-3 on March 9. This location is at the bottom of the watershed and received contributions from all locations, but MP-14 and MP-16 appear to have contributed significantly to these levels. On the day of wet weather sampling, MP-9, upstream of sites MP-11 through MP-16, had fecal coliform levels of 2,800 Col/100ml, and MP-10, just downstream of sites MP-11 through MP-16, had fecal levels at 5,700 Col/100ml. During the rain event, it appears that stormwater runoff contributed significantly to bacteria levels in Lilly Branch. Sources are potentially livestock and animals at the Veterinary School, pet waste, and wildlife. It could also be from application of manure as a fertilizer.



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**Table 4. Fecal Coliform and *E. Coli* Results for Stormwater Drainage to Lilly Branch**

Date	MP-11		MP-12		MP-13		MP-14		MP-15		MP-16		Weather Conditions
	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	Fecal coliform Col./100 ml	<i>E. Coli</i> MPN/100 ml	
2-23-11	40	20	50	30	280	220	40	20	-	-	90	63	Clear, 50°F, Dry
2-24-11	BRL	BRL	7	4	1,400	1,200	47	41	-	-	21	20	Clear, 50°F, Dry
3-09-11	180	120	30	20	800	550	5,300	4,100	370	270	2,500	2,800	Overcast, 55°F, Wet
3-24-11	20	3	20	7	80	52	-	-	-	-	50	60	Clear, 60°F, Dry
Geometric Mean	19	8	21	11	398	295					124	121	

### Quarterly Water Quality Monitoring at MP-8 and MS4-3

One dry weather sample and one wet weather event sample were collected during the 3<sup>rd</sup> and 4<sup>th</sup> quarters of 2010 and the 1<sup>st</sup> quarter of 2011 at MP-8 and MS4-3 on Lilly Branch. MP-8 represents the water quality of Lilly Branch as it enters the UGA campus and MS4-3 is located downstream just before the confluence with the North Oconee River. The samples were analyzed during two quarters (Q3 and Q1) for TSS, VOCs, total nitrogen, total phosphorus, dissolved metals (arsenic, copper, lead and zinc), and hardness. During Q2, the samples were analyzed for TSS, total nitrogen, and total phosphorus. Field parameters including pH, dissolved oxygen, temperature and conductivity were also measured during each sampling event. Tables 5 to 7 summarize the laboratory results of the dry and wet sampling events on Lilly Branch. Generally, during wet weather events, TSS, metals and total phosphorus were higher than during dry events. Total nitrogen was more often higher during dry events than wet events. These observations are typical of urban stormwater runoff. No VOCs were detected at the sampling locations. Generally, nutrients were not higher at the downstream location than the upstream location. Some increases in metals concentrations were observed at the downstream location indicating more runoff from roads, parking lots and buildings. Further discussion of this data will be contained in the Annual Report to be submitted to UGA in July 2011.

Table 5. Dry and Wet Weather Sampling Results for Lilly Branch Sites  
Q3 2010

Q3 2010	Site MP-8		Site MS4-3	
	Dry	Wet	Dry	Wet
	9-23-2010	10-25-2010	9-23-2010	10-25-2010
Total Suspended Solids (mg/L)	BRL	12.5	2.5 <sup>J</sup>	32
VOCs (µg/L)	BRL	BRL	BRL	BRL
<b>Dissolved Metals</b>				
Arsenic (µg/L)	BRL	BRL	2.78 <sup>J</sup>	11.8
Copper (µg/L)	BRL	6.92	BRL	0.970 <sup>J</sup>
Lead (µg/L)	0.0930 <sup>J</sup>	1.12	—	—
Zinc (µg/L)	BRL	10.0	BRL	17.2
<b>Nutrients</b>				
Total Phosphorus (mg/L)	0.042	0.171	0.058	0.191
Total Nitrogen (mg/L)	0.8	1.0	1.8	0.9
<b>Hardness</b>				
Calcium/ Magnesium as CaCO <sub>3</sub> (mg/L CaCO <sub>3</sub> )	32.7	18.5	56.1	16.6

<sup>J</sup> – Estimated value.

BRL – below mean detection limit

Table 6. Dry and Wet Weather Sampling Results for Lilly Branch Sites Q4 2010				
Q4 2010	Site MP-8		Site MS4-3	
	Dry	Wet	Dry	Wet
	12-9-2010	11-15-2010	12-9-2010	11-15-2010
Total Suspended Solids (mg/L)	3.0 <sup>J</sup>	8.5	BRL	9.5
<b>Nutrients</b>				
Total Phosphorus (mg/L)	0.029 <sup>J</sup>	0.06	0.056	0.121
Total Nitrogen (mg/L)	2	1.3	2	2.1

<sup>J</sup> – Estimated value.

BRL – below mean detection limit

Table 7. Dry and Wet Weather Sampling Results for Lilly Branch Sites Q1 2011				
Q1 2011	Site MP-8		Site MS4-3	
	Dry	Wet	Dry	Wet
	2-23-2011	3-9-2011	2-23-2011	3-9-2011
Total Suspended Solids (mg/L)	BRL	2.0 <sup>J</sup>	BRL	76.7
VOCs (µg/L)	BRL	BRL	BRL	BRL
<b>Dissolved Metals</b>				
Arsenic (µg/L)	BRL	BRL	BRL	1.07 <sup>J</sup>
Copper (µg/L)	BRL	0.625 <sup>J</sup>	BRL	8.49
Lead (µg/L)	BRL	BRL	BRL	0.995 <sup>J</sup>
Zinc (µg/L)	BRL	10.1	14.0	29.6
<b>Nutrients</b>				
Total Phosphorus (mg/L)	BRL	0.050 <sup>J</sup>	BRL	0.418
Total Nitrogen (mg/L)	1.5	1.1	2.3	1.9
<b>Hardness</b>				
Calcium/ Magnesium as CaCO <sub>3</sub> (mg/L CaCO <sub>3</sub> )	30.6	33.5	75.2	20.8

<sup>J</sup> – Estimated value.

BRL – below mean detection limit

## Summary and Conclusions

The following summary and conclusions are made based on the data collected:

- Fecal coliform and *E. coli* results follow the same trends through the sampling period and at all sampling locations. This indicates that the source of fecal coliform is predominantly from humans or other warm-blooded animals.
- Fecal coliform levels at all four Lilly Branch monitoring locations exceeded the GA Water Quality Standards during the warm weather months (Fall 2010).
- Fecal coliform levels at two of the four Lilly Branch monitoring locations (MP-8 and MP-10) exceeded the GA Water Quality Standards during the cool weather months (Winter 2011).
- During dry weather, bacteria levels are significantly high at site MP-8, which is where Lilly Branch enters the UGA campus. This indicates a potential dry weather source of bacteria, such as leaking sanitary sewer pipes or compromised septic systems, coming from the Five Points area of Athens.
- In general, bacteria concentrations at MP-8 (upstream of Foley Field) are the highest of all the Lilly Branch sampling locations during both dry and wet weather with MP-10 (downstream of East Campus Drive) the second highest.
- During the winter 2011 wet weather event, bacteria concentrations increased significantly at all the sites on the UGA campus.
- MP-13, draining the area around the U.S. Forest Service building, had concentrations of bacteria that were two orders of magnitude higher than the other stormwater outfall sampling locations during dry weather. There appears to be a source of bacteria in the drainage area of MP-13 during dry weather, such as a leaking sanitary sewer pipe.
- MP-14 and MP-16 had significantly higher concentrations of bacteria during wet weather than the other stormwater outfall sampling locations. Potential sources of bacteria in stormwater runoff are livestock and animals at the Veterinary School, pet waste, and wildlife.

## Recommendations

- Investigate sources of bacteria from the Five Points area of Athens. There appears to be a dry weather source of bacteria such as leaking sanitary pipes or compromised septic systems. The UGA Environmental Law Practicum performed sampling and stream walk investigation upstream of MP-8 and found potential sources of bacteria from stormwater outfall pipes during dry weather<sup>1</sup>. Further sampling and laboratory analysis during both dry and wet weather would be warranted to isolate a source.

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<sup>1</sup> Eason, J., Hambrick, T., Kanine, J., Kelly, J., and L. Satterfield. Current Status of Lilly Branch: Implications for Watershed Management and Rehabilitation. Spring 2011.

- Investigate potential sources of bacteria in the MP-13 drainage area in and around the U.S. Forest Service building. This could include dye testing of sanitary pipes within the buildings during dry weather to look for potential leaking pipes.
- Investigate sources of bacteria in stormwater runoff in the drainage areas of MP-14 and MP-16. This may include housekeeping issues with livestock and animals at the Veterinary School.
- Continue quarterly bacteria sampling at locations MP-8, MP-9, MP-10 and MS4-3. Consider geometric mean sampling again in the fall of 2011 if some of the above recommendations are implemented and sources are found. Implement improvements such as Best Management Practices and/or repairs and perform bacteria monitoring to measure improvements.

BC appreciates the opportunity to perform this sampling and reporting for UGA. If you have any questions regarding this letter report, please contact Jill Stachura at (770) 673-3679.

Very truly yours,  
Brown and Caldwell



Gwen Bristow  
Project Scientist

JOS:GB:dcm



Jill O. Stachura  
Project Manager

Attachments

Lilly Branch Photo Log  
University of Georgia  
Athens, GA



Remarks: Looking upstream at Lilly Branch from Pinecrest Drive. MP-8 sampling location.



Remarks: Looking downstream at Lilly Branch. MP-8 sampling location.

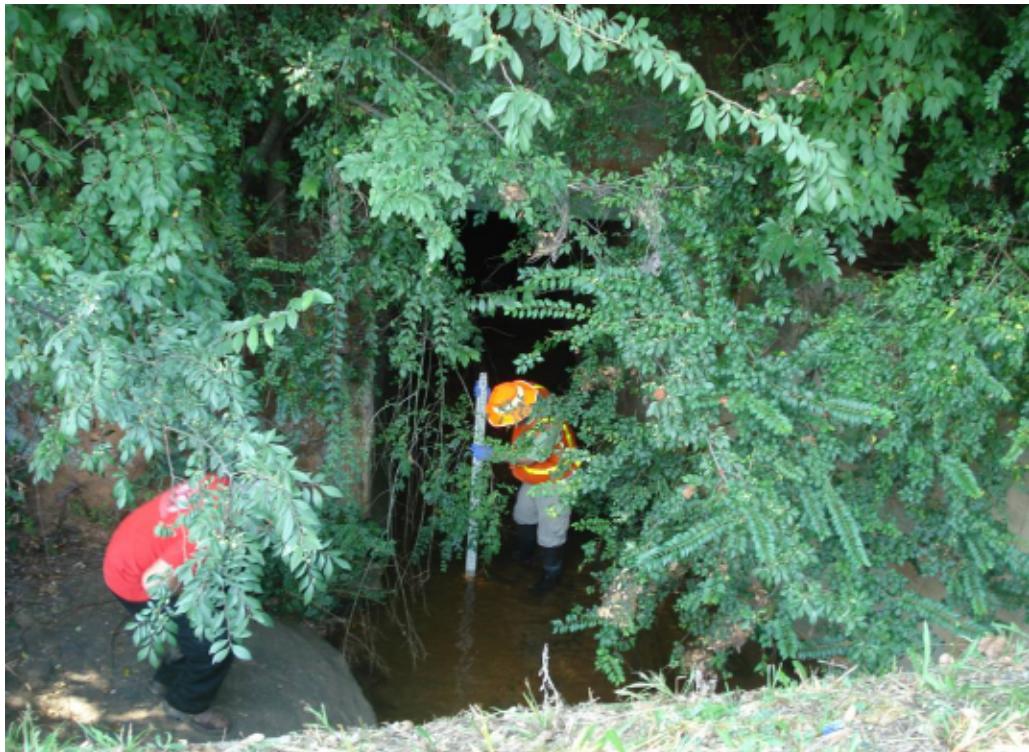
Lilly Branch Photo Log  
University of Georgia  
Athens, GA



Remarks: MP-9 sampling location



Remarks: MP-9 - interior



Remarks: MP-10 sampling location



Remarks: MP-10

Lilly Branch Photo Log  
University of Georgia  
Athens, GA



Remarks: MP-11 sampling location



Remarks: MP-11 - Interior

Lilly Branch Photo Log  
University of Georgia  
Athens, GA



Remarks: MP-12 sampling location



Remarks: MP-12 – Interior. Sampled from pipe with arrow.

Lilly Branch Photo Log  
University of Georgia  
Athens, GA



Remarks: MP-13 sampling location



Remarks: MP-13 – Interior (sampled from pipe shown with arrow)



Remarks: MP-14 sampling location



Remarks: MP-14 – Interior – flow sampled from pipe with arrow.

Lilly Branch Photo Log  
University of Georgia  
Athens, GA



Remarks: MP-15 sampling location



Remarks: MP-15 Interior (wet weather location only)



Remarks: MP-16 sampling location



Remarks: MP-16 Interior – sampled from main culvert

Lilly Branch Photo Log  
University of Georgia  
Athens, GA



Remarks: Lilly Branch downstream of MP-10 south of Lamar Dodd School of Art



Remarks: Lilly Branch east of River Road and upstream of MS4-3



Remarks: MS4-3 Sampling location



Remarks: Downstream of MS4-3. Vertical banks and extensive areas of bank failure.



Remarks: Downstream of MS4-3. Sand and gravel bed with some floodplain development at mid-reach.



Remarks: Confluence of Lilly Branch with North Oconee River