Lake Watch of Lake Martin volunteer monitors complete watershed studies with AU

The reason that this study was initiated was to assess water quality of Sandy Creek and quantify levels of pollutants flushing into Lake Martin from the Sandy Creek Watershed. The study focused on the Sandy Creek Watershed because it ranked HIGH priority for 1) siltation and a source of lake turbidity, 2) nutrient enrichment, 3) pathogen contamination, and 4) illegal dumping in the Tallapoosa River Basin Management Plan (available at www.adem.alabama.gov/programs/water/nps/files/TallapoosaBMP.pdf). It is also of high priority because, unlike many other tributary streams in the basin, it drains directly into Lake Martin.

At the conclusion of the first study in 2010, referred to as the 'Normal' study (since sampling events were conducted under normal, non-rain event conditions), a second study was proposed and conducted. The second study, referred to as the 'Rain Event' study, specifically targeted steam sampling directly after significant rainfall/runoff events.

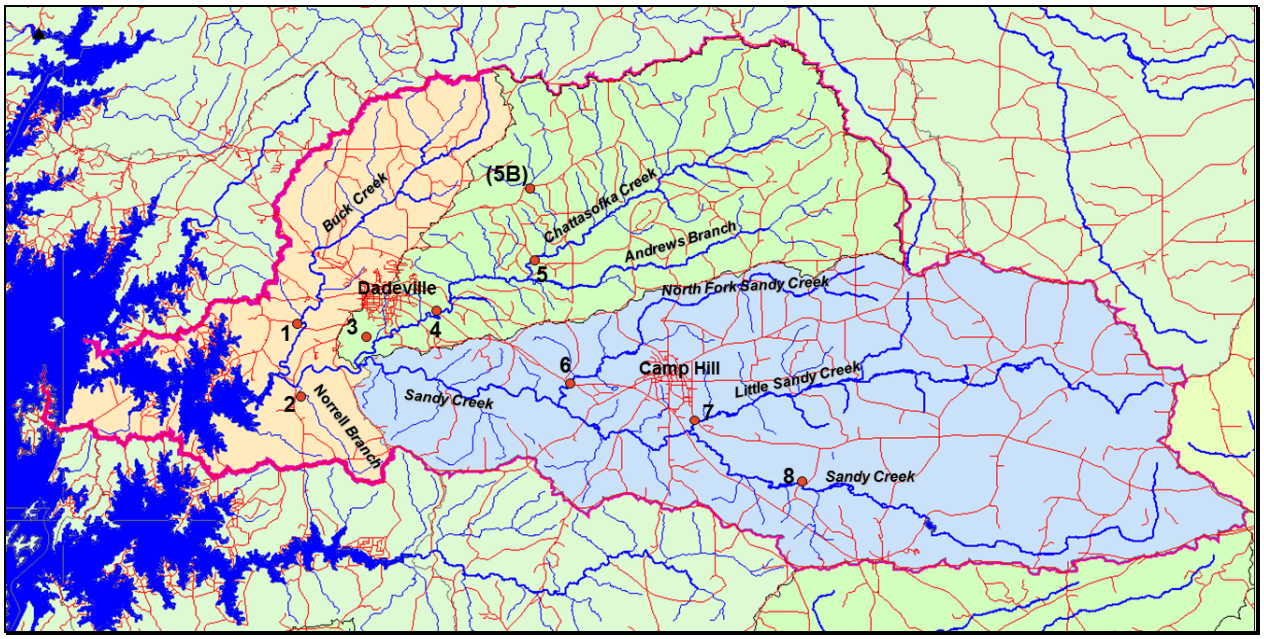
As is elaborated on in this summary, the studies found 1) excessive siltation and turbidity, 2) excessive nutrient levels, 3) excessive pathogen levels and 4) excessive dumping of trash in the Sandy Creek Watershed.

The Normal-event study was conceived in the spring of 2010 when Lake Watch of Lake Martin (LWLM) volunteer monitors met with Auburn University (AU) researchers and drafted a water quality study plan for the Sandy Creek Watershed. This watershed has been of particular concern as a source of pollution loading into Lake Martin for many years. The Sandy Creek Watershed, about 193 square miles, is the largest of the 22 watersheds (eleven-digit hydrologic units) in the Middle Tallapoosa River Basin. The Middle Tallapoosa Basin drains an area of 1,547 square miles, from Lake Wedowee Dam downstream to Lake Martin Dam.

LWLM volunteer Dick Bronson sampling Norrell Branch, a tributary of Sandy Creek

The group was aware of funding opportunities from the Middle Tallapoosa River Basin Clean Water Partnership (MTRBCWP), and submitted an initial proposal for the Sandy Creek Watershed 'Normal-event' study in 2010. The MTRBCWP funded the project, and field sampling was conducted monthly, June through September 2010.

Eight sites were identified on tributaries of Sandy Creek. Field work was divided in half with LWLM volunteer monitors sampling sites 1-4 and AU researchers sampling sites 5-8 (see map below, Sandy Creek Watershed is outlined in red). AU personnel trained the volunteers in sampling and field measurement techniques before starting the actual field sampling.



Sites 1-8 sampled during the Normal (2010) and Rain Event (2011-12) studies. Note that site #5 was relocated to site #5-B during the Rain Event study because the access road to site #5 was locked.

Parameters measured in the field included water temperature, dissolved oxygen and specific conductance. Water samples were collected for nutrient, sediment and *E. coli* analyses, which were conducted in the AWW water quality lab at AU.

Water quality results from the initial Normal-event study are summarized below:

- All sites had adequate dissolved oxygen (above 5 ppm, the minimum level for aquatic life, mandated by the Alabama Department of Environmental Management),
- Chattasofka Creek was high in nutrients (mean total nitrogen concentration > 1 ppm, mean total phosphorus concentration ~ 1 ppm),
- North Fork of Sandy Creek (downstream from Camp Hill) was highest in *E. coli* contamination (1 occurrence > 600/100mL, 2 occurrences > 200/100mL),
- Of the three sites on Chattasofka Creek, the site below the Dadeville WWTP was the LOWEST in *E. coli*,
- Norrell Branch was very low in alkalinity and hardness (less than 10 ppm, on average), and generally more susceptible to pollution, particularly acidic runoff (often associated with mining activities),

- All sites had relatively low sediment loads since none of the four sample dates in 2010 captured a rainfall-runoff event. During such an event, total suspended solids (TSS, a parameter that correlates well with stream suspended sediment loads) and nutrient concentrations would most likely be a lot higher.
- Go to http://blog.auburn.edu/aww/?p=119 to view graphs of water quality parameters.

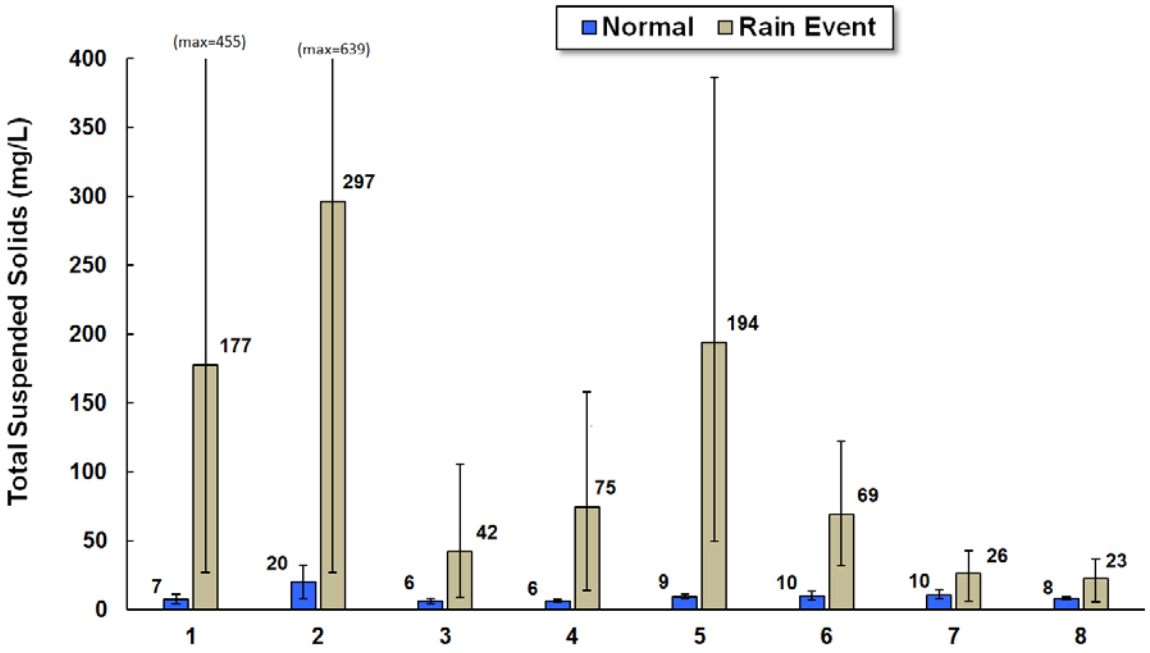
From years of on-the-lake experience, the LWLM volunteers knew that water quality conditions were much different during and after significant rain events. No water data were available to quantify how different. This data gap prompted the submission of the second proposal to the MTRBCWP for a repeat of the Sandy Creek Watershed study focusing on rain-event sampling, a.k.a. the Rain Event study.

The Rain Event study began in March 2011 and ended in October 2012. Four rain events were sampled. The study brought with it several challenges: thunderstorms with lightning bolts and strong winds, deep rushing waters, timing and coordination of sampling to try to capture peak flows, and very soggy sampling conditions. Note that sample site #5, the upper-most Chattasofka Creek site had to be relocated to site #5-B, a tributary of Chattasofka creek (at the Booger Hollow Road culvert crossing) because access to site #5 was blocked by a locked gate.

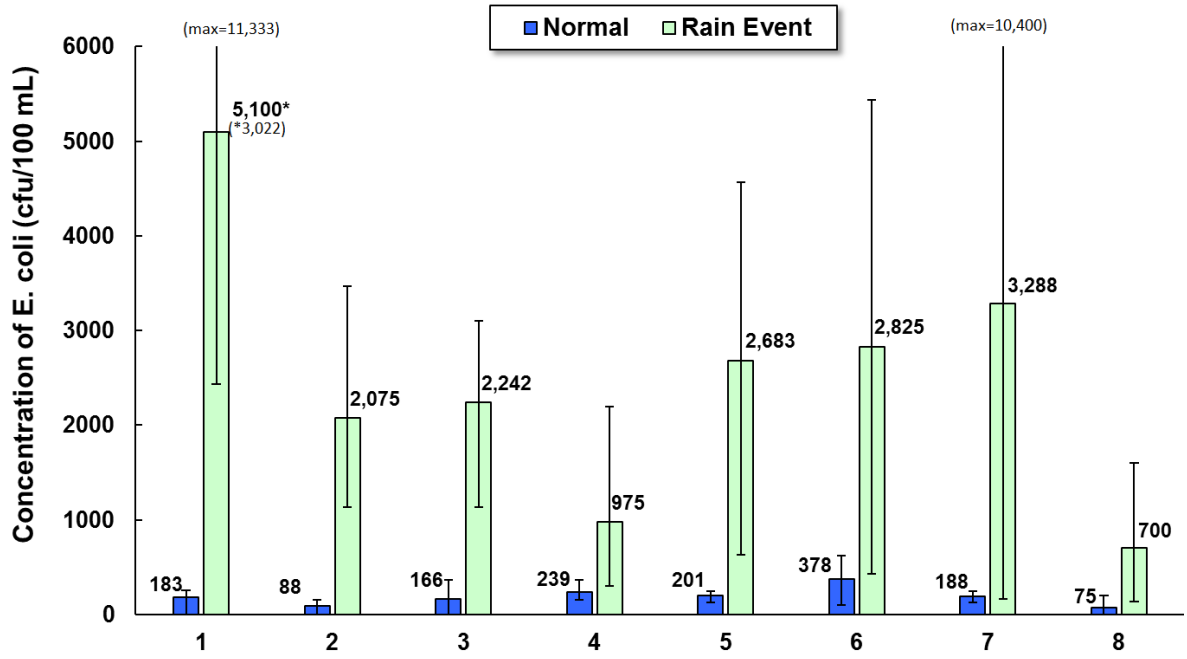
Lake Watch volunteer monitors Matt and Ann Campbell (above left) conduct field measurements during the first study (Normal event); Matt and Dick Bronson (above right) sample during a Rain Event outing.

Major differences were observed and measured during the Rain Event study when compared to the Normal study. Obvious differences were much higher water levels and stronger current in all streams. Other observational differences – some streams were extremely muddy, as is evident when examining the turbidity and total suspended solids (TSS) data (see graph below).

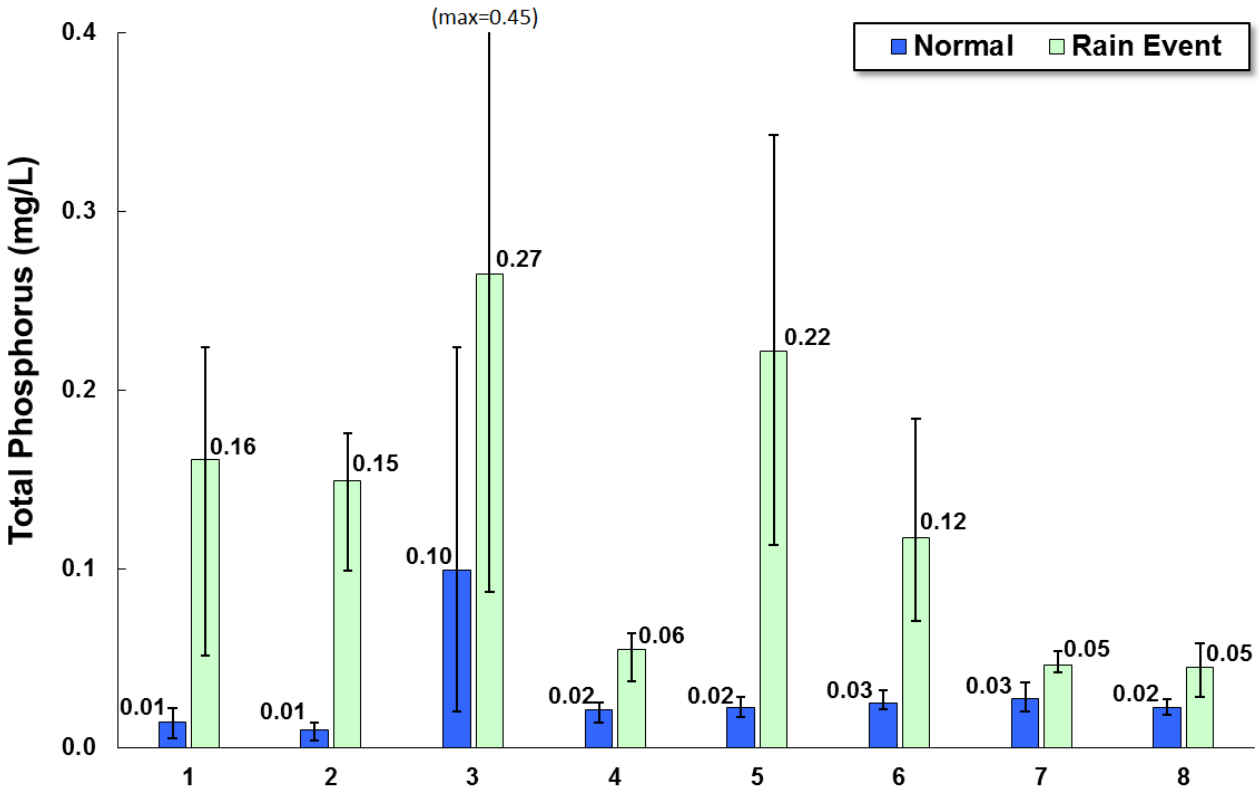
TSS levels were low in all streams during Normal sample events. Average TSS levels measured during Rain Event sampling ranged from three times to 25 times higher than levels during normal sampling. Tributary streams with the highest sediment loads during rain events were Norrell Branch (#2) followed by the upper-most Chattasofka site (#5-B, tributary to Chattasofka), with maximum sediment loads being contributed from Norrell Branch.



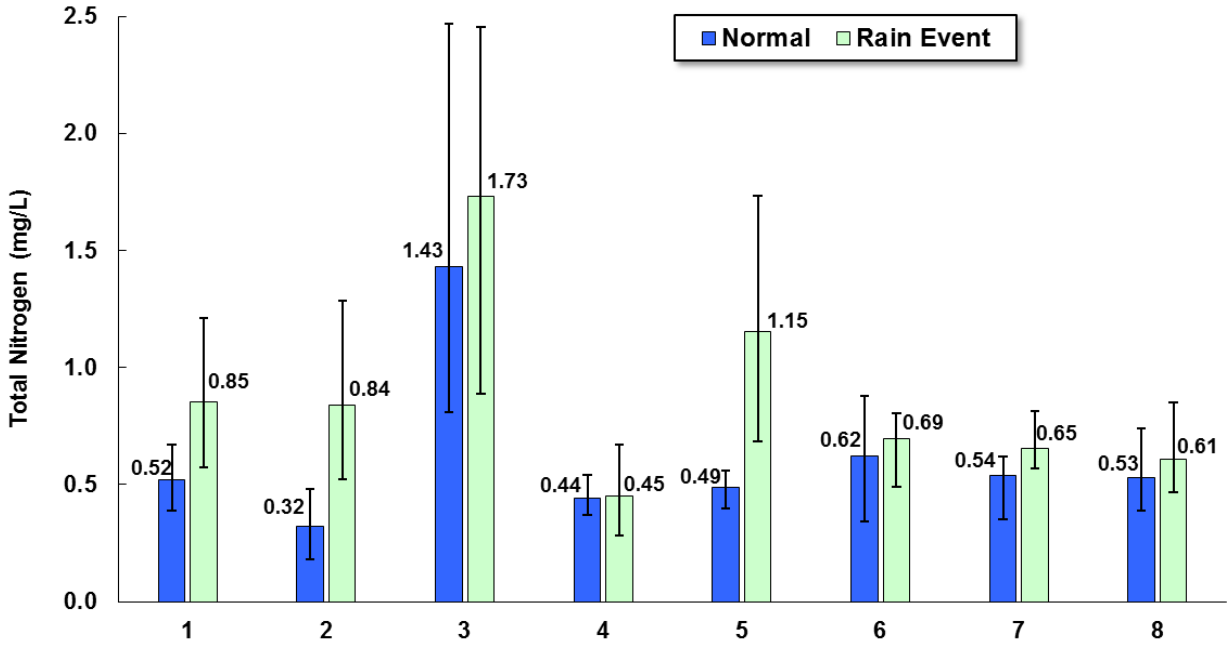
E. coli loads were low in all streams during Normal sample events (see graph below). *E. coli* levels measured during Rain Event sampling ranged from four times to 28 times higher than levels during Normal sampling. Tributary streams with the highest *E. coli* loads during rain events were Buck Creek (#1) followed by Little Sandy Creek (#7), with maximum *E. coli* loads being contributed from Buck Creek. Note that after the first rain event sampling, Dadeville municipal personnel promptly fixed a clogged sewage lift station along Buck Creek, so excluding the first high count at site #1 (11,333 *E. coli*/100 mL), the average fell to 3,022 *E. coli*/100 mL. Thus, after the repair, the highest loads actually came from Little Sandy Creek (#7).



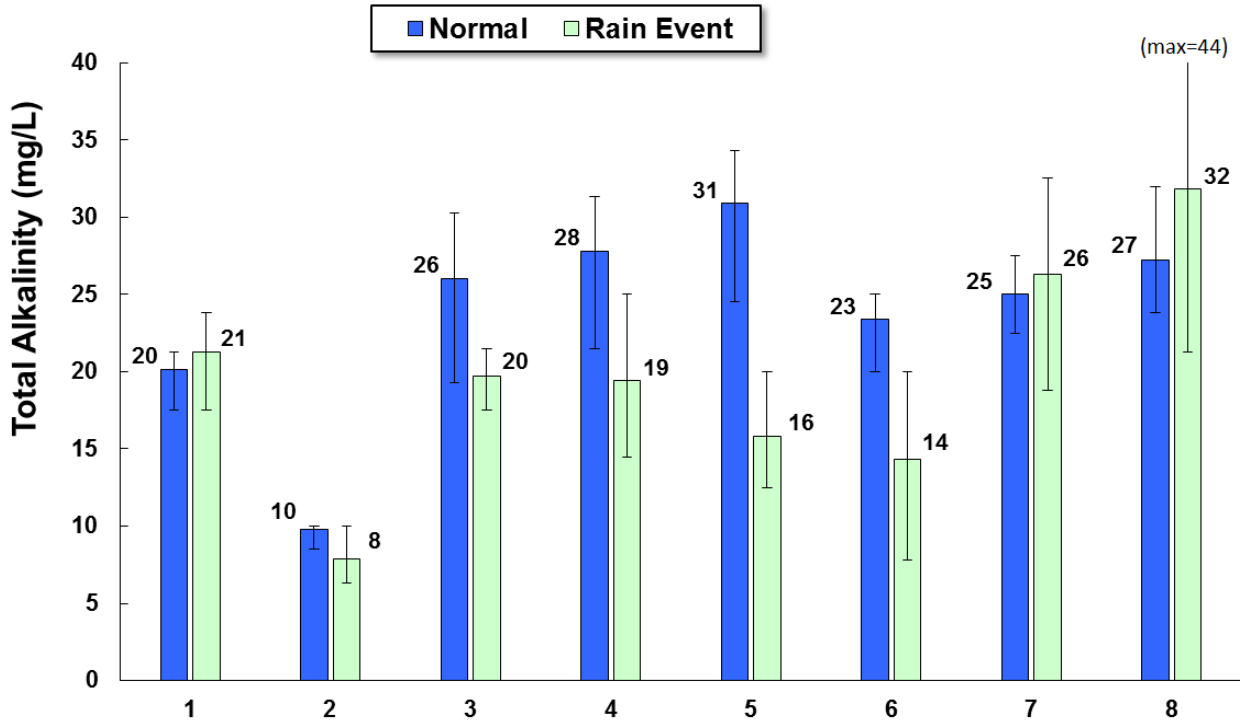
Total phosphorus (TP) levels measured during Normal sample events were relatively low in all streams except Chattasofka (#3, directly below the Dadeville WWTP; see graph below). Average TP levels measured during Rain Event sampling ranged from two times to 16 times higher than levels during Normal sampling. Tributary streams with the highest TP loads during rain events were Chattasofka (#3) followed by the upper-most Chattasofka site (#5-B, tributary to Chattasofka), with maximum TP loads being contributed from Chattasofka directly below the Dadeville WWTP. Note that it is common to have elevated nutrient levels (phosphorus and nitrogen) below WWTP outfalls.



Total nitrogen (TN) levels were relatively low in all streams except Chattasofka (#3, directly below the Dadeville WWTP) during Normal sample events (see graph below). Average TN levels measured during Rain Event sampling ranged from about the same to about 3 times higher than levels during normal sampling. Tributary streams with the highest TN loads during rain events were Chattasofka (#3) followed by the upper-most Chattasofka site (#5-B, tributary to Chattasofka), with maximum TN loads being contributed from Chattasofka directly below the Dadeville WWTP. Note that it is common to have elevated nutrient levels (phosphorus and nitrogen) below WWTP outfalls.



Total alkalinity was relatively low in all streams during Normal sample events (see graph below). Average alkalinity measured during Rain Event sampling increased in three streams and decreased in the other five streams. Norrell Branch (#2) had extremely low alkalinity levels, which would make it most susceptible (relative to the other streams) to any types of pollutants that impact pH, since its buffering capacity is very low.



As an outcome of this study, ADEM is pursuing a civil case against a mud bog operator in the upper Norrell Branch watershed for noncompliance with issued enforcement and applicable state and federal regulations. Field observations, photos and water data (TSS, turbidity) indicated very high levels of sediment entering Norrell Branch upstream of site #2. The data from the two Sandy Creek Watershed studies has been supplied to ADEM to support this civil case, and hopefully mitigate the heavy sediment loading into Norrell Branch, and on downstream, into Sandy Creek and Lake Martin.

An additional outcome of this study was the documentation of illicit dumping of trash into Little Sandy Creek at site #7 (see photos below). A letter was written by the Director of Alabama Water Watch and the President of Lake Watch of Lake Martin encouraging the mayor of Camp Hill to address this illegal dumping into a tributary of Alabama's only Treasured Lake, Lake Martin, via signage, clean-up events and enforcement actions. The mayor of Camp Hill has invited AWW personnel to speak at their town council meeting in November to share findings of the study. It is hoped that through outreach efforts this source of pollution will be eliminated.

Little Sandy Creek at the Martin Luther King Street Bridge in Camp Hill, AL. Photos taken 10/1/2012.

Lastly, pollutant levels throughout the Sandy Creek Watershed were quantified for both Normal and Rain Event periods. These data will be valuable in prioritizing and targeting watershed management efforts in reducing both point and nonpoint source pollutant loads into Sandy Creek and downstream, into Lake Martin.

AU project personnel would like to thank the MTRBCWP for making these studies possible through their grant program, and also thank the LWLM volunteer monitors who donated their time and talent in drafting and conducting these studies. The concerns, awareness and involvement of these local AWW volunteer water monitors translated into a collaborative effort to gather valuable water resource information in the Sandy Creek Watershed. This information is being used to improve resource management practices and water quality for Sandy Creek, and on downstream, for Lake Martin.