Great Smoky Mountain Rain Gauge Network Field Report 15 May 2013

Prepared by:
Douglas K. Miller

Field graduate research assistant (Duke University):
Greg Cutrell

Post-doctoral research assistant (Duke University):
Marta Angulo-Martínez

Undergraduate research students (UNC Asheville):
W. Massey Bartolini, J. Duncan Belew, Candice Boling, Ashley Felts, Douglas Hessler, Kurt Hibert, Nick Stone, Thomas Winesett

Volunteer assistants (other):
Hugh Parrot (Waynesville Watershed Officer) and Michael Kieser

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Status

Table 1: Gauge visits during the spring 2013. Comments: DD=gauge data download, MN=general gauge maintenance (cleaning, re-level), CV= clear vegetation, CA = calibration with two nozzles, SN=snow survey, and FI = fence installation.

Date	Gauges Visited	Technicians	Comments
7 Mar 2013	100, 100T, 302 (nearby)	Greg, Doug H	SN
29 Mar 2013	10, 104	Greg, Massey	DD, MN, CV, CA
30 Mar 2013	1, 3	Greg, Duncan	DD, MN, CV, CA
31 Mar 2013	-EASTER-	-EASTER-	-EASTER-
6 Apr 2013	100, 100T, 105, 114, 303	Greg, Thomas	DD, MN, CV, CA
8 Apr 2013	2, 5, 8, 106	Greg, Ashley	DD, MN, CV, CA
13 Apr 2013	111, 112, 107	Greg, Doug H	DD, MN, CV, CA, FI
14 Apr 2013	101, 102, 103	Greg, Doug H, Candice	DD, MN, CV, CA, FI
20 Apr 2013	103, 108, 110	Greg, Thomas, Marta	DD, MN, CV, CA
26 Apr 2013	4, 10, 104, 109, 110	Greg, Doug H	DD, MN, CV, CA
2 May 2013	305, 309, 310	Greg, Doug H	DD, MN, CV, CA
4 May 2013	115, 306, 311	Greg, Massey, Doug H, Michael	DD, MN, CV, CA
7 May 2013	301, 302	Greg, Doug M	DD, MN, CV, CA
8 May 2013	304, 307	Greg, Candice, Nick	DD, MN, CV, CA
9 May 2013	300, 308	Greg, Massey, Duncan	DD, MN, CV, CA

Gauge visitation in support of the Great Smoky Mountain Rain Gauge Network (GSMRGN) during the spring 2013 occurred over 13 days spanning a period of over six weeks in the March – May 2013 period. The primary purpose of the visits was [1] to perform calibrations on each gauge (using 50, 100 and 300 mm nozzles, two trials; 100 mm nozzle, one trial; 50 & 300 mm nozzles) [2] to complete maintenance tasks, [3] to download gauge observations that were made since the previous gauge visits in the fall 2011, and [4] clear vegetation. Twelve technicians and volunteers (listed on the front page) made the visits and performed the required work. It is important to note that the volunteers were NOT directly involved in any of the gauge visit tasks, but were volunteering to assist with personal safety should someone get injured during a particular series of gauge visits.

The general tasks completed at **every** gauge visit consisted of (1) field calibrations of each gauge [CA in Table 1], (2) gauge data download from the data loggers [DD in Table 1], (3) general gauge maintenance [MN in Table 1], and (4) clearing of vegetation from the gauge site [CV in Table 1]. Specialized tasks were to download data from the remaining T/RH sensors in the Great Smoky Mountain National Park and to conduct snow surveys after the passage of a winter storm on 6 March 2013. Task (1) involved completing (ideally) four calibration trials at each gauge using a 50, 100, and 300 mm nozzle, two trials per 100 mm nozzle, and a single trial using the 50 mm and 300 mm nozzle. This task required carrying extra water and extended each gauge visit by about 55 minutes, which presented a logistical challenge during certain trips. Task (2) merely required a serial port link between the field study laptop and the gauge data logger and consisted of pulling the data (often in files having two different formats) onto a desktop folder on the laptop, checking for completeness of the data, and comparing the data logger time to the actual time. The standard that has been chosen for this study is to maintain the clocks on Eastern Daylight Time, since most of the "warm" precipitation will be occurring during the season when EDT is in effect. Because of concerns regarding accuracy of the time on the ML1 data loggers, the standard was followed whereby the time from the Garmin GPS locators was used as guidance for accurate time since the GPS time (and each GPS satellite) is synched with the atomic clock of the U.S. Naval Observatory. Most ML1 data logger times were adjusted during the spring 2013 gauge visits to coincide with the EDT

given by the GPS locators and a test of the logger time accuracy can be assessed during the summer 2013 gauge visits. In response to suggestions made by Hydrological Services, the ML1 firmware was upgraded to help deal with the seemingly random time issues at each of the gauge locations. Time corrections during the spring 2013 gauge visits were generally done with the "T" command since the firmware upgrade procedure generally reset the logger time incorrectly. Task (3) required the upgrading of the firmware on the ML1 loggers, cleaning of debris from the funnel filter, cleaning the tipping buckets of debris (if necessary), cleaning the gauge drain ports, and re-leveling the gauge if it has come unleveled. Task (4) is required to insure that none of the surrounding vegetation overgrows the funnel top during the growing season, thereby reducing the catchment of the gauge. An extendable hand-saw was carried to each location, allowing the trimming back of tree limbs within about 16 feet of the ground. Snow surveys were undertaken at two spots along the Appalachian Trail (in proximity of gauge #302) and at Purchase Knob (near gauges #100 and #100T) to measure snow depth in the wake of a winter storm that passed through the area on 6 March 2013. The snow was completely melted at Purchase Knob. This was a second outing specifically designed for measuring snow depth and snow water equivalent during the cold season as part of this project. The first was undertaken early in November 2012 after the passage of Sandy.

The challenges encountered during some of the gauge visits in the spring 2013 were related primarily to abnormally cool and rainy weather conditions. Several trips had to be broken down to multiple daytime visits due to the remoteness of the gauges and the need to carry extra water for the calibrations, which made the hiking times to each gauge longer (e.g. g#300, 306, 308, 301, 302, 115, 311). Several gauges reported as having loose posts (g#110, g#301, and g#115) during previous visits were shored up in the spring 2013. Fencing was installed around two gauges (g#102 and g#107) positioned in cow pastures, locations where it was clear during recent visits that cows were potentially compromising gauge observations (e.g. using them as scratching posts). New gauge replacement covers were installed at two locations (g#107 and g#110) where the gauges had been documented as having the funnel collar come off after previous visits. Repeat trips to gauges #10 and #104 were made to correct for the change in date forced on the ML1 data loggers during the firmware upgrade process, which was not recognized until later during the spring 2013 gauge campaign. A return trip to gauge #103 was necessary after the calibration nozzles had not been packed in a backpack before the gauge hike during an earlier visit.

Details of every gauge visit along with each gauge precipitation and calibration data record can be found at http://blizzard.atms.unca.edu/dmiller/spr2013_visits.zip which contains sub-folders for each gauge that consist of the individual data files (often having at least two different formats), pictures taken at the gauge site during the visit, screenshots of the GPS (laptop) and ML1 logger time comparison, and a MS Word document that mirrors the notes made in the field journal during each gauge visit.

Plans for the summer months of 2013

Table 2: Planned gauge visits during the summer 2013. Comments: DD=gauge data download, MN=general gauge maintenance (cleaning, re-level), and CV= clear vegetation.

Date	Gauges Visited	Technicians	Comments
29 Jun 2013	1, 3	TBD	DD, MN, CV
30 Jun 2013	4, 10	TBD	DD, MN, CV
1 Jul 2013	2, 5, 8, 106	TBD	DD, MN, CV
6 Jul 2013	300, 301, 302, 308	TBD	DD, MN, CV
7 Jul 2013	305, 309, 310	TBD	DD, MN, CV
8 Jul 2013	101, 102, 103, 110	TBD	DD, MN, CV
12 Jul 2013	304, 307	TBD	DD, MN, CV
13 Jul 2013	303, 306, 311	TBD	DD, MN, CV

Gauge visitation in support of the GSMRGN during the summer 2013 will occur over at least eight days spanning a period of nearly three weeks in June and July 2013. The primary purpose of the visits will be to support the upcoming IPHEX field project by performing maintenance, downloading precipitation observations that were made since the previous gauge visits in March-May 2013, and checking if the ML1 logger times have drifted between visits. A primary maintenance issue will be to clear each gauge funnel of typical growing season debris (e.g. insects and leaves), to keep the "field-of-view" of the gauges clear of vegetation overgrowth, and to replace the HOBO 3V (2032) batteries. The higher elevation gauges during the summer period will be visited last as they were most recently visited during the spring 2013 campaign. Installation of Bounce fabric softener sheets, installed to discourage insect and spider habitation in the gauges during the warm season, has been discontinued as it is hypothesized that the scent attracted the attention of a bear at the Sunup Knob gauge (g#306), raising enough curiosity in the animal to push the gauge over on two different occasions. It has remained standing since it was last installed in March 2012, having not installed fabric softener sheets inside the gauge since then.

The general tasks completed at every gauge visit will consist of (1) gauge data download from the data loggers [DD in Table 2], (2) general gauge maintenance [MN in Table 2], and (3) clearing of vegetation from the gauge site [CV in Table 2]. Careful attention will be given to the success of the ML1 firmware upgrade in alleviating the time drift problem noted since detailed documentation of the problem began in 2011.

Details of every gauge visit along with each gauge precipitation and calibration data record will be posted at http://blizzard.atms.unca.edu/dmiller/sum2013_visits.zip which shall contain sub-folders for each gauge that consist of the individual data files (often having at least two different formats), pictures taken at the gauge site during the visit, screenshots of the GPS (laptop) and ML1 logger time comparison, and a MS Word document that mirrors the notes made in the field journal during each gauge visit.

J. Duncan Belew and W. Massey Bartolini are new undergraduate research students at UNC Asheville who have been added to the technician team during the spring 2013 gauge visits to help replace students who graduated in May 2013 (Nick Stone, Doug Hessler, Thomas Winesett, and Ashley Felts). Students Bobby Taylor and Daniel Thomas are new undergraduate research students at UNC Asheville who will be added to the technician team during the summer 2013 gauge campaign.