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Table 1: Gauge visits during the summer 2011. Comments: DD=gauge data download, MN=general gauge maintenance (cleaning, bounce sheet, re-level), CV= clear vegetation, CA = calibration with 100 mm nozzle, CB = capacitor & battery replacement, TR = T/R sensor data download, and OT = other.

Date	Gauges Visited	Technicians/volunteers	Comments
20 Jul 2011	1, 3	W. Groetsema, C. Zarzar	DD, MN, CV, CA
22 Jul 2011	100, 100T, 105, 109	M. Goldsbury, D. Miller	DD, MN, CV, CA
23 Jul 2011	4, 10, 104	D. Martin, M. Goldsbury	DD, MN, CV, CA
25 Jul 2011	111, 112, 107	D. Miller & Company	DD, MN, CV, CA, CB
27 Jul 2011	2, 5, 8, 106	M. Goldsbury, T. Winesett	DD, MN, CV, CA
30 Jul 2011	101, 102, 103, 108, 110	D. Martin, M. Talley	DD, MN, CV, CA, CB
1 Aug 2011	305, 309, 310	D. Miller, T. Winesett	DD, MN, CV, CA, CB, TR
3 Aug 2011	304, 307	W. Groetsema, C. Zarzar	DD, MN, CV, CA, CB, TR
8 Aug 2011	303, 306, 311	M. Goldsbury, C. Zarzar	DD, MN, CV, CA, CB, TR
10 Aug 2011	308, 107	D. Miller, G. Cutrell	DD, MN, CV, CA, TR, OT
17 Aug 2011	301, 302	D. Martin, W. Groetsema, R. David	DD, MN, CV, CA, CB, TR
25 Aug 2011	101, 106, 108	A. Woodward, T. Winesett	DD, MN, CA, CB, TR, OT
27 Aug 2011	303, 306	D. Miller	DD, MN, CV, CA, CB, TR
11 Sep 2011	108, 106	D. Miller	DD, MN, CA, CB, TR, OT
17 Sep 2011	308, 300, 306	D. Martin, A. Felts, C. Zarzar, R. David, D. Miller	DD, MN, CV, CA, CB, TR, OT

Gauge visitation in support of the Great Smoky Mountain Rain Gauge Network (GSMRGN) during the summer 2011 occurred over 15 days spanning a period of nearly nine weeks in the July – September 2011 period. The primary purpose of the visits was [1] to perform maintenance, [2] to download gauge observations that were made since the previous gauge visits in the spring 2011, [3] calibrate the gauges (ideally with three trials), [4] replace the lithium batteries and install capacitors in the 100 and 300 series gauges, and [5] move the new T/RH sensor cables from outside to the interior of the support arms for the 300 series gauges found in the GSMNP. Fourteen 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) gauge data download from the data loggers [DD in Table 1], (2) general gauge maintenance [MN in Table 1], (3) clearing of vegetation from the gauge site [CV in Table 1], and (4) calibrating the rain gauges [CA in Table 1]. Specialized tasks were to (a) replace the lithium batteries and capacitors in twenty of the 100 and 300 series rain gauges [CB in Table 1] and (b) move the new T/RH sensor cables to the interior of the T/RH support arm [TR in Table 1]. Task (1) 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, making corrections to the data logger clock if necessary. 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. Task (2) required the cleaning of debris from the funnel filter, cleaning the tipping buckets of debris (if necessary), cleaning the gauge drain ports, fixing a fresh “Bounce” fabric softener sheet inside the case of the gauge (throwing out the old sheet), and re-leveling the gauge if it has come unlevelled. Task (3) 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. Task (4) involved completing (ideally) three calibration trials at each gauge using a 100 mm nozzle. This task required carrying extra water and extended each gauge visit by about 45 minutes, which presented a logistical challenge during certain trips. Task (a) applied to the newer gauges having the ML1 data loggers that were installed either in the summer 2008 or 2009. The lithium batteries in these loggers were replaced and a capacitor was installed to the logger motherboard to provide a means to avoid the voltage drop problem that severely limited the data record, a problem first noted in some loggers during the spring 2010 gauge visit campaign. Several T/RH sensors were installed by Anna Wilson and a summer intern on the gauge posts of some of the 300 series gauges located in the Great Smoky Mountain National Park in June 2011 and Task (b) involved moving the electrical cables from outside to inside of the conduit/support arm to protect them from the elements (e.g., weather and bears).

The challenges encountered during some of the gauge visits in the summer 2011 were related to the extra weight and time required to complete the numerous tasks at each of the gauges and the difficulties encountered as a result of summer weather. There were several repeat visits to gauges (e.g., g# 107, 106, 108, 101, 303) due to weather or safety (e.g., heavy rainfall, gusty winds, lightning, darkness) conditions not allowing for calibration trials at the first visit. Some of the repeat visits (e.g. g# 108, 306, 308) were due to technical problems with the gauge itself. The Utah Mountain gauge (g#108) experienced problems with only alternate tips being counted, the Cosby Knob gauge (g#308) had a tree fall on it and required a repair at a local auto body shop to restore the shape of the gauge funnel, and the Sunup Knob gauge (g#306) was pushed over by a bear. Each of these problems has been addressed and the gauges have been repaired and/or reinstalled so that they are currently collecting rainfall observations. Three of the gauges installed in the summer 2007 were found to be tipped over (High Top g#3, Lickstone Bald g#2, and Beaty Spring Gap g#10) and have been re-installed with greater reinforcement of the base unit. Beaty Spring Gap (g#10) has had a consistent problem with being tipped over and will be relocated on Beaty Spring Gap if it is found to be tipped over again.

Details of every gauge visit along with each gauge precipitation and calibration data record can be found in folder “GAUGE-DATA-PMM” which contains sub-folders for each gauge that consists of the individual data files (often having at least two different formats) and a “history” MS Word document that mirrors exactly the notes made in the field journal during each gauge visit. The “history” files for each gauge were last updated by Ashley Felts and Doug Miller in September 2011.

Plans for the fall months of 2011

Table 2: Planned gauge visits during the fall 2011. Comments: DD=gauge data download, MN=general gauge maintenance (cleaning, bounce sheet, re-level), and CV= clear vegetation.

Date	Gauges Visited	Technicians	Comments
13 Nov 2011	1, 3	TBD	DD, MN, CV
11 Nov 2011	2, 5, 8, 106	TBD	DD, MN, CV
12 Nov 2011	4, 10, 104	TBD	DD, MN, CV
20 Nov 2011	111, 112	TBD	DD, MN, CV
5 Nov 2011	101, 102, 103, 108, 110	TBD	DD, MN, CV
23 Oct 2011	305, 309, 310	TBD	DD, MN, CV
6 Nov 2011	100, 105, 107, 109	TBD	DD, MN, CV
29 Oct 2011	303, 311	TBD	DD, MN, CV
19 Nov 2011	300, 306, 308	TBD	DD, MN, CV
30 Oct 2011	301, 302	TBD	DD, MN, CV
22 Oct 2011	304, 307	TBD	DD, MN, CV

Gauge visitation in support of the GSMRGN during the fall 2011 will occur over at least 11 days spanning a period of nearly six weeks in October/November 2011. The primary purpose of the visits will be to perform maintenance and to download precipitation observations that were made since the previous gauge visits in July - September 2011. A primary maintenance issue will be to clear each gauge funnel of typical late-summer and early fall debris (leaves, dead bugs) and to keep the “field-of-view” of the gauges clear of vegetation overgrowth. The higher elevation gauges during the October/November period will be visited first as the leaves on high elevation trees drop earlier in the autumn season.

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].

Details of every gauge visit along with each gauge precipitation data record will be updated in folder “GAUGE-DATA-PMM” which contains sub-folders for each gauge that consists of the individual data files (often having at least two different formats) and a “history” MS Word document that mirrors exactly the notes made in the field journal during each gauge visit.

It is anticipated that a new undergraduate research student at UNC Asheville will be added to the technician team in time for the autumn 2011 gauge visits to eventually help replace senior student Melissa Talley.