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Evaluating the Influence of the Forestry Reclamation Approach on the Hydrology of Appalachian Coal Mined Lands

Morgan F. Gerlitz
University of Kentucky, mfgerlitz@uky.edu
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Morgan F. Gerlitz, Student

Dr. Carmen T. Agouridis, Major Professor

Dr. Donald G. Colliver, Director of Graduate Studies

EVALUATING THE INFLUENCE OF THE FORESTRY RECLAMATION APPROACH ON THE HYDROLOGY OF APPALACHIAN COAL MINED LANDS

THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in Biosystems and Agricultural Engineering in the Colleges of Agriculture and Engineering at the University of Kentucky

By

Morgan F. Gerlitz

Lexington, Kentucky

Director: Dr. Carmen T. Agouridis, Extension Associate Professor of Biosystems and Agricultural Engineering

Lexington, Kentucky

2019

ABSTRACT OF THESIS

EVALUATING THE INFLUENCE OF THE FORESTRY RECLAMATION APPROACH ON THE HYDROLOGY OF APPLACHIAN COAL MINED LANDS

The Appalachian Region is a rich and diverse forest ecosystem impacted by present and past mining activities. The Surface Mining Control and Reclamation Act (SMCRA) of 1977 was enacted to resolve many of the environmental problems caused by surfacing mining, such as landslides, erosion, flooding, and poor water quality. As with many solutions, this one came with its own set of environmental problems due to compaction and the introduction of aggressive non-native grasses and shrubs altering hydrologic processes and ecosystem function. The Forestry Reclamation Approach (FRA) is a method for re-establishing forested ecosystems on mined lands. This project evaluated the effect of FRA on throughfall by comparing 10-, 20-, and 100-year old tree plots consisting of coniferous or deciduous trees. Throughfall rates were significantly impacted by tree type and age. Coniferous trees intercepted more rainfall than deciduous ones and the older trees tended to intercept the least. Presence/absence of leaves impacted throughfall depths for deciduous trees. Throughfall was significantly impacted by storm event characteristics. Results may help guide management of forested watersheds regarding strategies to reduce water yields on mined lands.

KEYWORDS: Reforestation, interception, hydrology, throughfall

Morgan F. Gerlitz

April 26, 2019

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By

Morgan F. Gerlitz

Carmen T. Agouridis
Director of Thesis

Donald G. Colliver
Director of Graduate Studies

April 26, 2019

This is for my family.

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1.1 INTRODUCTION

1.1.1 Appalachian Region

The Appalachian region covers about 531,000 km^2 including all of West Virginia and parts of Alabama, Kentucky, Ohio, Pennsylvania, and Virginia (ARC, 2019). This region, which is characterized by steep hillslopes and narrow valleys, is over 80% forested (Zipper, 2011). The rugged terrain is dominated by mixed mesophytic forest of oak (*Quercus sp*.), yellow poplar (*Liriodendron tulipfera*), hickory (*Cary sp.*), and American Beech (*Fagus grandifolia*) (Braun, 1950; Carpenter and Rumsey, 1976). The landscape is “mature” with a dense stream network that dissects the region coupled with high topographic relief (Davis, 1899). Underlain by Pennsylvanian sandstone, shale, siltstone, and coal parent material, soils are thin with limited fertility (Smalley, 1984; Kalisz et al., 1987). Coal mining is common in the region as is agriculture in the valleys.

1.1.2 Coal Mining – Historical Context

Numerous environmental problems, such as landslides, erosion, flooding, instream sedimentation, and poor water quality, prompted Congress to enact the Surface Mining Control and Reclamation Act (SMCRA) of 1977. These problems were largely associated with essentially unregulated mining and reclamation methods. For instance, operators commonly used the “shoot and shove” method whereby operators blasted rock to reach the coal seam and then pushed spoil over the edge of the bench. This practice created unstable outslopes and exposed high walls, some exceeding 100 ft in height (Zipper, 1990; Haering et al., 2004).

After the enactment of SMCRA, regulators focused on regrading to achieve land stability and approximate original contour (AOC) while reducing erosion and subsequent sedimentation of streams (Angel et al., 2005). This “mining-grading-topsoiling” mindset resulted in highly compacted lands planted with fast-growing herbaceous vegetation (Smith, 1980; Graves et al., 2000; AGI, 2006; Zipper et al., 2011). Trees, which were once planted at similar rates as grasses, in states such as Kentucky, gave way to grasses and legumes (Brothers, 1990). Tree survival on compacted lands, and in the face of fierce competition, was poor (Skousen et al., 2009; Zipper et al., 2011). Economically, hand planting trees was laborious and more costly than sowing grasses by mechanical means such as hydroseeders or airplanes. The reduced costs of planting grasses were appealing with the increased grading costs (Brothers, 1990). Socially, the less steep and more easily traveled landscape of the graded grassed lands was appealing to many landowners (Smith, 1980). Grasses, which grow more quickly than trees, allowed operators to meet reclamation bonding requirements within the required short term (e.g., five-year period, 90% ground cover) (Roberts et al., 1998; Holl et al., 2009; USEPA, 2011).

Even with the decline in coal production, surface coal mining is a major industry in northern and central Appalachia accounting for up to 20% of employed persons in some Kentucky and West Virginia counties (Ruppert, 2001; Bowen, 2018). As of 2008, coal extraction under the U.S. Surface Mining Control and Reclamation Act (SMCRA) had occurred on more than 600,000 ha (6,000 km^2) of the region with two-thirds in the Central Appalachian states of Kentucky, Tennessee, Virginia, and West Virginia (Zipper et al., 2011; Pericak, 2018). Since the early 1970’s, the Central Appalachian region has experienced an over 9% change in land use predominately associated with an increase in coal mining, decrease in forests, and an increase in grasslands/shrubs (Townsend et al., 2008; Sayler, 2016). The increase in grasslands/shrubs reflects the conversion of previously active mines to reclaimed or abandoned ones.

1.1.3 Hydrologic Impacts

Converting a forested watershed to a grassed one alters ecosystem functions such as nutrient cycling, water storage, carbon sequestration, habitat provision, temperature moderation (Saunders et al., 1991; Osborne and Kovacic, 1993; Mao and Cherkauer, 2009; Zipper et al., 2011). Hydrologic processes such as interception, infiltration, evapotranspiration, and runoff are altered due to changes in vegetation type (Negley, 2006; Sena et al., 2014) and increased soil compaction (Wells et al., 1983; Jorgensen and Gardner, 1987; Hoomehr et al., 2005; Simmons 2008; Ferrari, 2009). Conversion of forested lands to mined and then grasslands, increases runoff volumes and peak flows (Negley, 2006; Taylor et al., 2009) which can negatively impact receiving streams (Wiley and Brogan, 2003; Miller and Zégre, 2014). Increase runoff volumes and peak can result in eroded streambanks, incised channels, and homogenous streambeds (Booth, 1990; Rhoads, 1995).

Forests play a critical role in managing how water moves across the landscape. Forested canopy has the potential to intercept nearly 25% of the precipitation associated with a storm depending on tree age and type; storm depth, duration, and intensity; and wind speed (Jackson, 1975; Miralles et al., 2010). Llorens et al. (1997) found that a 33-year old pine forest (*Pinus sylvestris*) in the Mediterranean mountains of Spain intercepted, on average, 24% of rainfall over a 30-month period with a maximum rate of 49%. Bryant et al. (2005) measured interception rates ranging from 17-22% in five forest types (pine, mixed forest, lowland hardwood, pine planation, and upland hardwood) in Georgia. Diego et al. (2010), using the Climate Prediction Center morphing technique (CMORPH) precipitation product and the Gash analytical model, determined that needleleaf forests intercepted 22% of rainfall followed by broadleaf deciduous forests at 19% and then broadleaf evergreen forests at 13%. In a review of the literature, Levia et al. (2006) noted that between 77-83% of rainfall becomes throughfall in deciduous forests while coniferous forests display a wider range of 47-91%.

Prior work suggests interception and throughfall rates are linearly correlated with rainfall depth with greater interception rates occurring for small storms meaning greater throughfall rates occurred for larger ones (Helvey and Patric, 1965; Pressland, 1973, Carlyle-Moses, 2004). Pressland (1973) noted that rainfall duration is also correlated with interception rates. Tanaka et al. (2015) noted that rainfall depth and duration account for nearly the entire throughfall rate during the leafing and leafed phases of teak trees.

1.1.4 Reforestation

Forests in the Central Appalachians rank as one of the world's most diverse non-tropical ecosystems (Ricketts et al., 1999; Zipper et al., 2011). These forests provide habitat to numerous plants and fauna, sequester carbon, reduce runoff peaks and volumes, and protect water quality (Wickham et al., 2007; Ricketts et al., 2009). Post-SMCRA reclamation techniques, which promoted the conversion of forests to grasslands, meant the loss of these forested ecosystem services. The use of heavy earthwork equipment to grade and compact spoils resulted in low tree growth and survival, low infiltration rates, increased peak flows, and increased runoff volumes (Bonta et al., 1997; Bradshaw, 1997; Graves et al., 2000; Guebert and Gardner, 2001; Shukla et al., 2004; Skousen et al., 2009).

The Forestry Reclamation Approach (FRA) is a prescription for reclaiming mined lands in such a way as to promote tree growth while addressing pre-SMCRA concerns of land stability, erosion, and sedimentation concerns (Angel et al., 2005; Zipper et al., 2011). The FRA consists of five steps:

1. Create a suitable rooting medium, at least 4 ft deep, using topsoil, weathered sandstone, and/or best available material.
2. Minimize compaction by only loosely grading rooting medium.
3. Minimize competition by using tree-compatible ground covers.
4. Plant early successional trees for wildlife and soil stability and commercially valuable crop trees.
5. Use proper tree planting techniques.

Angel et al. (2005) and Zipper et al. (2011) provide details and research supporting each step. The Office of Surface Mining, Reclamation and Enforcement, through the Appalachian Regional Reforestation Initiative, provides Forest Reclamation Advisories to address questions related to reclaim coal mined lands for forested post-mining land uses.

Research indicates the FRA is effective at promoting tree growth and survival (Graves et al., 2000; Skousen et al., 2009; Sena et al., 2015), soil development (Miller et al., 2012; Sena et al., 2018), water quality improvements (Agouridis et al., 2012; Daniels et al., 2016), hydrologic benefits such as reduced peak flows and runoff volumes (Taylor et al., 2009a, 2009b; Sena et al., 2014).

Due to the short time for which FRA has been in practice (e.g., less than 25 years), the literature lacks direct comparisons between mature FRA forests and mature non-FRA forests. With regards to mature non-FRA forests, studies have investigated the changes of throughfall and runoff (Haydon 1995), evapotranspiration (ET) and water yield (Cornish 2001), and macropore development (Colloff 2010). Haydon (1995) found that interception and runoff had an inverse relationship that changed with the age of a mountain ash forest recovering from forest fire. Interception peaked around 30 years of age before declining. Cornish (2001) studied the water yield of a eucalypt forest following logging and found that water yield first increased and then declined past pre-logging levels over the 16-year study. Colloff (2010) found that macropore development and infiltration with reforestation of agricultural lands increased over time.

While these hydrologic changes were attributed to a number of factors as trees aged including increases in water use by growing trees, it may also be related to self-thinning of the forest causing a reduction in canopy cover. Self-thinning is a natural process by which larger trees outcompete smaller trees resulting in fewer trees per area as the tree biomass increases with stand age. A mature forest in Appalachia, such as that at Robinson Forest, has a tree density of around 150 trees per acre. With FRA, the recommended planted tree density is 700 trees per acre. This assumes an initial 70% survival rate on mine sites resulting in 490 trees per acre. Because of the young age of FRA, it has yet to be determined if these plots will experience self-thinning similar to that of natural forest regrowth.

1.2 OBJECTIVES

To date, no studies exist evaluating interception (and hence throughfall) rates associated with trees grown using the FRA. At what point do trees planted in accordance with FRA guidelines begin to intercept rainfall at rates similar to mature forests? How does tree type, coniferous versus deciduous, influence interception? This latter question has important implications for watershed managers in light of climate impacts such as the norther migration of trees species (Woodwall et al., 2009; Lafleur et al., 2010) and changing rainfall patterns (Dore, 2005) as well as potential land use changes such as the establishment and harvesting of woody biomass plantations (Xu et al., 2002).

The objective of this study was to evaluate the effect of the FRA on the throughfall by comparing 10-, 20-, and 100-year old tree plots consisting of coniferous or deciduous trees. Understanding how throughfall amounts vary with tree age and type is critical to designing reclamation strategies and managing post-mined landscapes to address critical watershed functions associated with water quantity and quality.

1.2 METHODS

1.2.1 Study Site

The research project was conducted at the University of Kentucky's Robinson Forest and the Little Elk Mine (formerly Starfire Mine) which are in southeastern Kentucky in the Cumberland Plateau section of the Appalachian Plateaus province of the Appalachian Highlands (Figure 1.1). These adjacently located study sites are situated in the Appalachian mixed mesophytic forest region, which is characterized by hills and valley with elevation differences ranging from 385 to 610 m (Smalley, 1986). The average annual rainfall is 118 cm and the climate is humid and temperate with summer temperatures ranging from 30 to 18°C and winter temperatures ranging from -5 to 6°C (Cherry, 2006; USDC, 2002). Weather is highly variable throughout the year with long periods of low intensity rainfall during the winter months and high intensity storm events that typically occur during the summer and early fall months (Husic et al., 2019).

Robinson Forest (latitude 37.450° N, longitude 83.183° W) is an approximately 6,000 ha research and teaching forest that consists of a main block approximately 4,200 ha in size and seven other discontinuous areas. The forest is characterized by steep-side slopes, averaging 45%, coupled with a hydrologically restrictive geologic layer consisting of interbedded sandstone, siltstone, shale, and coal (McDowell et al., 1981). Robinson Forest was clear cut between 1890 and 1920 with subsequent mixed-mesophytic forest regeneration dominated by oaks (*Quercus spp.*), hickories (*Carya spp.*), and yellow poplar (*Liriodendron tulipifera L.*) (Overstreet, 1984; Witt, 2012; Villines et al., 2015).

Little Elk Mine (latitude 37.400° N, longitude 83.117° W) is in Perry and Knott Counties. Since the early 1980s, the mine has operated as a mountain-top removal operation whereby multiple coal seams were extracted using dragline and truck/shovel techniques (Barton et al., 2017). In 1996 and 1997, 1-ha reclamation cells were created overtop reclaimed mined land, with a hay/pastureland post-mine land use, by utilizing spoil (non-acidic shale and sandstone overburden) from the active mining operation (Angel et al., 2006). Spoil was placed in accordance with the FRA (Burger et al., 2005; Zipper et al., 2011), and the site was planted with eastern white pine (*Pinus strobus*), white ash (*Fraxinus Americana*), black walnut (*Juglans nigra*), yellow poplar, white oak (*Quercus alba*), and northern red oak (*Quercus ruba*) bare root seedlings (1-0) (Angel et al., 2006).

1.2.2 Treatments

Treatments were comprised on 10-, 20-, and 100-year old coniferous and deciduous tree plots located at either Robinson Forest or Little Elk Mine. Tree plots were established as monocultures. A control or grass-only plot was established at Little Elk Mine adjacent to the 20-year old plots. For this study, each plot was 10 m x 10 m in size.

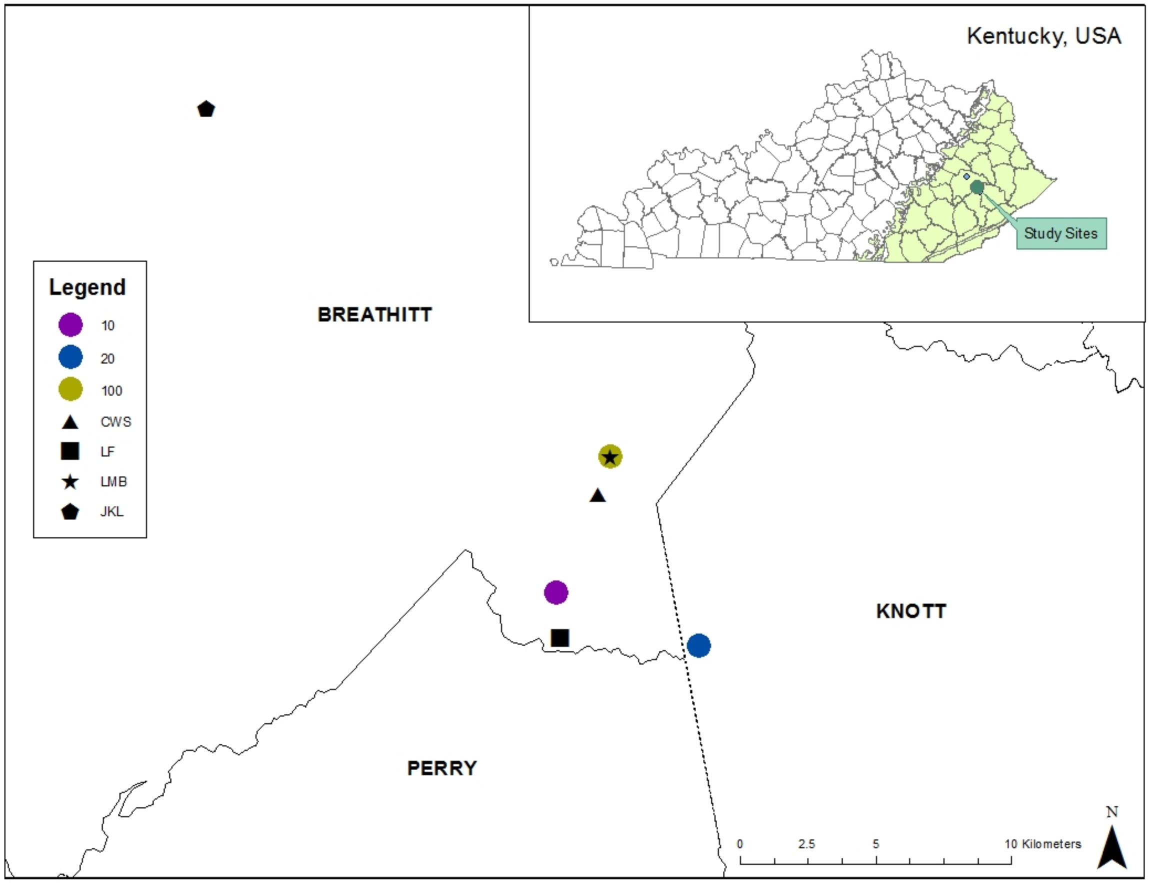

Figure 1.1. Tree plots are in eastern Kentucky (shaded area indicates Appalachian Plateaus physiographic province) near the intersection of Breathitt, Perry, and Knott counties. 10=10-year-old plots, 20=20-year-old plots, 100=100-year-old plots, CWS=Camp weather station, LF=Laurel Fork weather station, LMB=Little Millseat Branch weather station, and JKL=Jackson National Weather Service weather station.

1.2.2.1 10-year Old Plots

The 10-year old tree plots (37.428° N 83.177° W) were established on an 810-ha section of Robinson Forest that was mined during the mid-1990s. The site was ripped, in accordance with FRA No. 4 (Sweigard et al., 2007), and subsequently planted about 2007. The coniferous plot, used in this study, contained 25 loblolly pines while the deciduous plot contained ten red oaks (Table 1.1, Figures 1.2-1.3) (Appendix A). Autumn olive (*Elaeagnus umbellate*) has invaded the understory of the deciduous plot but not the coniferous one. The estimated overstory density, as measured by a Model-A spherical densiometer in June 2017, was 97% for the coniferous plot and 61% for the deciduous plot.

Table 1.1. Number of trees and equivalent density per plot.

Plot[1]	No. of Trees	Density (trees/km^2)
10C	25	2,500
10D	10	1,000
20C	21	2,100
20D	32	3,200
100C	17	1,700
100D	21	2,100
Control	0	0

[1]10C=10 year coniferous, 10D=10 year deciduous, 20C=20 year coniferous, 20D=20 year deciduous, 100C=100 year coniferous, 100D=100 year deciduous, and control = grass only.

Figure 1.2. The 10-year old coniferous tree plot contained 25 loblolly pines. Photo courtesy of Matt Barton, University of Kentucky, Agricultural Communications Services.

Figure 1.3. The 10-year old deciduous tree plot contained ten red oaks and had a thick understory dominated by autumn olive (Elaeagnus umbellate).

1.2.2.2 20-year Old Plots

The 20-year old tree plots (37.410° N 83.118° W) were established and planted at Little Elk Mine in 1997. The coniferous plot contained 21 white pines while the deciduous plot contained 32 white oaks (Table 1.1, Figures 1.4-1.5) (Appendix A). The estimated overstory density, as measured by a Model-A spherical densiometer in June 2017, was 94% for the coniferous plot and 96% for the deciduous plot.

Figure 1.4. The 20-year old coniferous plot contained 21 white pines.

Figure 1.5. The 20-year old deciduous tree plot contained 32 white oaks.

1.2.2.3 100-year Old Plots

The 100-year old tree plots (37.473° N 83.153° W) were established in the Little Millseat watershed which is a 77.9 ha watershed located in the main block of Robinson Forest. Elevations in the watershed range from 304 m to 451 m. The watershed is characterized by steep slope (25-60%), dense drainage network (drainage density of 0.0038 m m^{-2}), and a narrow valley with well-drained soils (Hayes, 1991; Cherry, 2006). The coniferous plot contained 17 eastern hemlocks (*Tsuga Canadensis*) while the deciduous plots each contained 21 white oaks (Table 1.1, Figure 1.6-1.7) (Appendix A). The estimated overstory density, as measured by a Model-A spherical densiometer in June 2017, was 93% for the coniferous plot and 95% for the deciduous plot.

Figure 1.6. The 100-year old coniferous tree plot contained 17 eastern hemlocks.

Figure 1.7. The 100-year old deciduous tree plots each contained 21 white oaks.

1.2.2.4 CONTROL

A control plot was established on a 20-year old traditionally reclaimed section of Big Elk Mine adjacent to the 20-year old tree plots. Reclamation was conducted in accordance with the Surface Mining Control and Reclamation Act of 1997 resulting in a highly compacted surface dominated by tall fescue (*Festuca arundinacea*) and sericea lespedeza (*Lespedeza cuneate*) (Figure 1.8). During the summer months, the grasses grew to a height of approximately 1.1 m which was greater than the height of the rain gauges. Appendix A contains a map of the throughfall collectors within the control plot. The control plot was not used in the statistical analyses (Section 1.2.4) but was used to validate precipitation measurements.

Figure 1.8. The control plot was dominated by grasses such as tall fescue and sericea lespedeza.

1.2.3 Hydrologic Data

Precipitation data were obtained from three University of Kentucky weather stations (Camp, Little Millseat, and Laurel Fork) and the National Weather Service's Jackson, Kentucky weather station (JKL, latitude 37.592° N, longitude 83.316° W). The Camp (CWS, latitude 37.461° N, longitude 83.159° W), Little Millseat (LMB, latitude 37.473° N, longitude 83.153° W), and Laurel Fork (LF, latitude 37.413° N, longitude 83.176° W) weather stations are all within 7.5-km radius of all the tree plots (Figure 1.1). The JKL weather station is about 20 km from the closest tree plot and 25 km from the furthest.

At the CWS and LMB weather stations, precipitation data were recorded at 15-min intervals while precipitation data were recorded at 60-minute intervals at LF and 5-min at JKL. All University of Kentucky weather stations used a tipping bucket rain gauge linked to a Campbell Scientific CR10X data logger to collect precipitation data (Cherry, 2006). To reduce the effect of local random errors associated with tipping bucket rain gauges, storm event data from all four weather stations were averaged (Ciach, 2002). Repeated measures ANOVA on Ranks were used to compare storm event depths and durations between the weather stations as well as the average of all four weather stations.

Twelve stands, with a 46 cm x 46 cm platform, were randomly distributed in each tree plot (Helvey and Patric, 1965; Bryant et al., 2005; Levia and Frost, 2006). Each platform stand was located 61 cm above the ground surface. A Rain Collector II tipping bucket rain gauges (Davis Instruments, Haywood, CA, USA) equipped with a Hobo Event Data Logger (Onset Computer Corporation, Cape Cod, MA, USA) was located atop each platform. The rain gauges were used to record throughfall timing and depth. Rain gauges were mounted on the corner of each stand. Biweekly, rain gauges were rotated clockwise around the stands to account for variations in canopy coverage to provide a more accurate representation of throughfall throughout the tree plots (Helvey and Patric, 1965; Lloyd, 1988; Bryant et al., 2005; Levia and Frost, 2006). Prior work indicated stemflow accounted for less than 2% of net rainfall, and as such, this parameter was not measured (Lorens, 1997). Though evaporation rates were not measured, losses from funnel type rain gauges, like the ones used in this study, were found to range between 0 and 4% of captured throughfall (Thimonier, 1998).

Throughfall data were collected for a one-year period (May 18, 2017 to May 19, 2018) (Appendix B). For each storm event, throughfall depths from all twelve rain gauges (throughfall stands) within each plot were aggregated to determine plot median throughfall depths. If a throughfall data collector's performance was compromised due to clogging (e.g., leaf litter accumulation or biofilm blockage of funnel tip) or wildlife damage to the tipping bucket, at the time of biweekly data download, data from that data collector was not used in computing the plot's storm event throughfall median value. On average, across the plots, approximately 10 rain gages were operational for a storm event.

Repeated measures ANOVA on Ranks were used to compare throughfall depths within treatments (plots) over multiple periods in time (Johnson et al., 2002; Singe et al., 2013). Median values were used due to the heterogenous (non-normal) distribution of throughfall within the plots (Table 1.2), a phenomenon noted by other researchers (Shachnovich et al., 2008; Tanaka et al., 2015). All plots showed a significant difference between tipping buckets. The greatest variability was seen in the 10-year deciduous plots and was attributed to the high variability of canopy cover due to poor oak survival that created micro-areas with little canopy cover and non-oak plants creating some areas of very dense cover.

Table 1.2. Results of comparing tipping buckets, within plots, using repeated measures ANOVAs. Values reported are median throughfall depths.

Tipping Bucket	Plot						
	10C	10D	20C	20D	100C	100D	Control
1	3.81	7.37	4.95	5.97	5.33	6.60	7.11
2	4.19	8.89	3.30	5.84	5.33	7.11	6.60
3	3.18	7.87	2.67	4.45	6.10	7.37	7.37
4	3.81	7.87	4.57	5.84	5.08	6.86	6.22
5	4.32	7.11	3.43	5.59	4.32	6.86	6.60
6	3.30	6.10	4.06	6.86	5.84	5.08	7.62
7	5.08	7.11	3.30	5.84	4.83	5.33	6.35
8	5.68	4.32	4.32	4.83	6.60	6.35	7.75
9	3.68	5.59	3.05	5.33	3.30	6.60	8.64
10	3.56	7.24	3.81	1.52	5.84	5.59	7.49
11	3.43	7.37	3.81	6.10	5.72	5.59	6.10
12	3.56	6.60	3.81	4.06	5.33	7.24	7.49
p-value[2]	<0.001	0.014	<0.001	<0.001	<0.001	<0.001	<0.001

[1]10C=10 year coniferous, 10D=10 year deciduous, 20C=20 year coniferous, 20D=20 year deciduous, 100C=100 year coniferous, 100D=100 year deciduous, and control = grass only.

[2]*p*=value noted for within column (plot) comparisons.

1.2.4 Statistical Analysis

A generalized linear mixed model (GLMMIX) in Statistical Analysis Software 9.4 (SAS, 2016) was used to test for differences in natural log transformed throughfall depths due to tree age (10, 20, and 100 years) and tree type (coniferous, deciduous) (α=0.05) (Appendix C). Storm intensity, storm duration, and leaf-on (May through September) and leaf-off (November through February) periods served as covariates. Storm depth was not included in the model because it was highly correlated with storm duration (Section 1.3.1, Appendix D). Storm intensity and duration were modeled as random effects. The Tukey test was used for multiple comparisons between tree plot type and age when significant differences were present (α=0.05).

1.3 RESULTS AND DISCUSSION

1.3.1 Precipitation Characteristics

A total of 113 storm events occurred during the study period of May 2017 through May 2018. Total rainfall depths ranged from 1,261 mm at LMB to 1,434 mm at LF while rainfall durations ranged from 15 minutes at CWS to 37 hours at LF. Most rainfall events were small and short (Figures 1.9-1.10) (Appendix D). Levia (2006) found storm magnitude and duration were important factors affecting throughfall. Across all weather stations, about 85% of the recorded storms had rainfall depths of 20 mm or less and durations of 12 hours or less. The two storms with the highest reccurrence interval were close to the 5-year storm depth at 41.4 mm and 39.3 mm for 1.11 hr and 0.96 hr, respectively. The third highest reoccurrence interval was for a 6.25 hr storm with 57.0 mm of rainfall. Most of the storms were below the 1-year recurrence interval. Rainfall depth and duration displayed significant positive relationships for all four weather stations (Appendix D) as well as the average of these stations (Figure 1.11). Table 1.3 shows the comparison of median storm event depth and duration between the weather

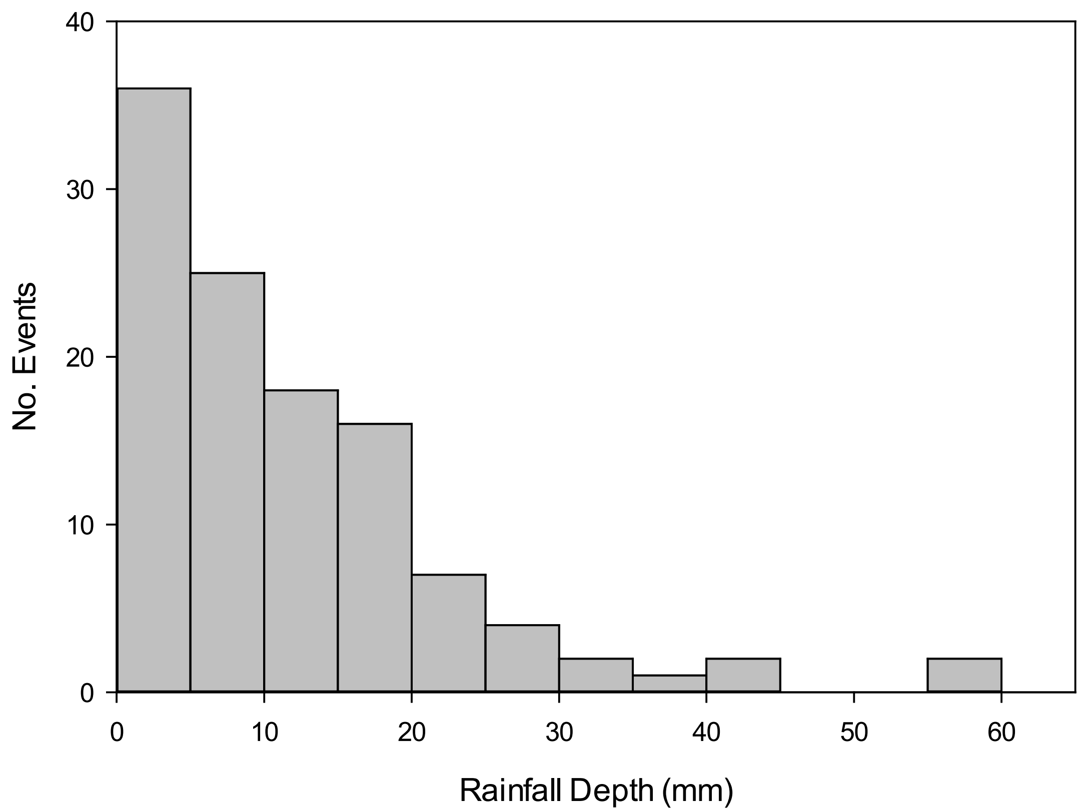

Figure 1.9. Distribution of rainfall depths as averaged over all four weather stations.

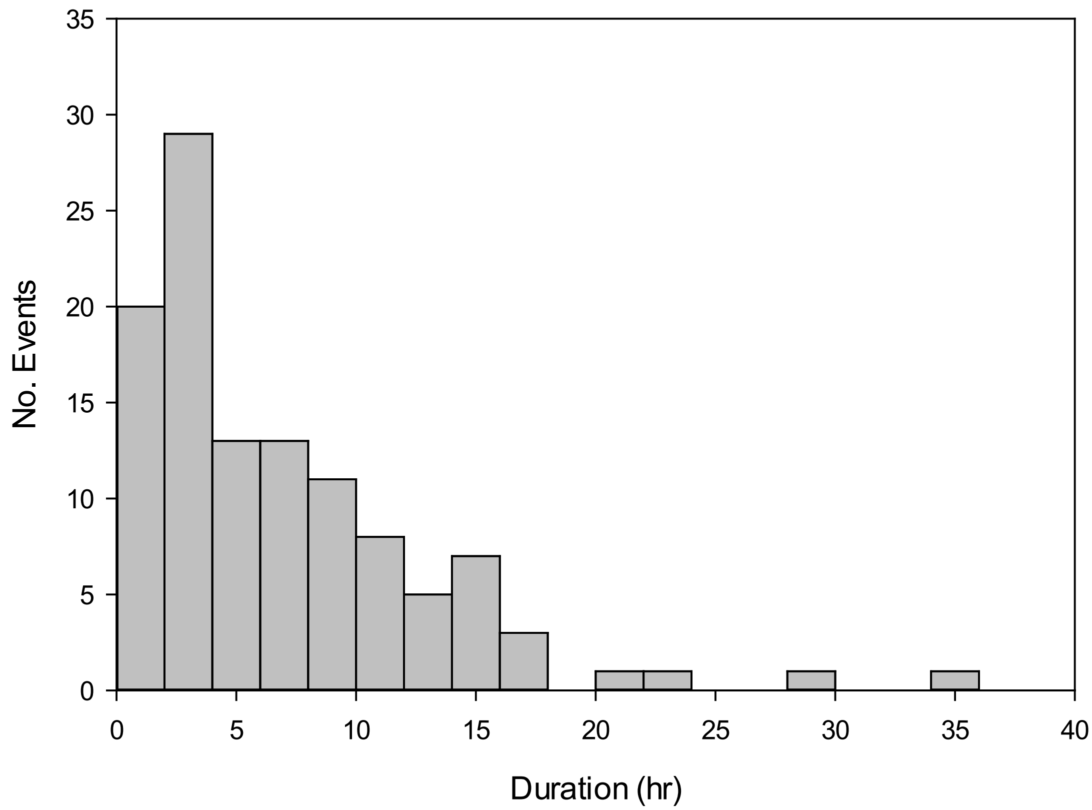

Figure 1.10. Distribution of rainfall durations as averaged over all four weather stations.

Table 1.3. Results of comparing storm event depth and duration from weather stations using repeated measures ANOVAs.

Weather station[1]	Median depth (mm)	Median duration (hr)
CWS	8.64 ab	5.00 b
LMB	7.62 b	4.85 b
LF	9.14 a	6.00 a
JKL	8.20 ab	5.45 b
Average (n=4)	8.45 ab	5.14 b

[1]CWS=Camp, LMB=Little Millseat Branch, LF=Laurel Fork, and JKL=Jackson.

Statistical differences within column noted by differing letters (α=0.05).

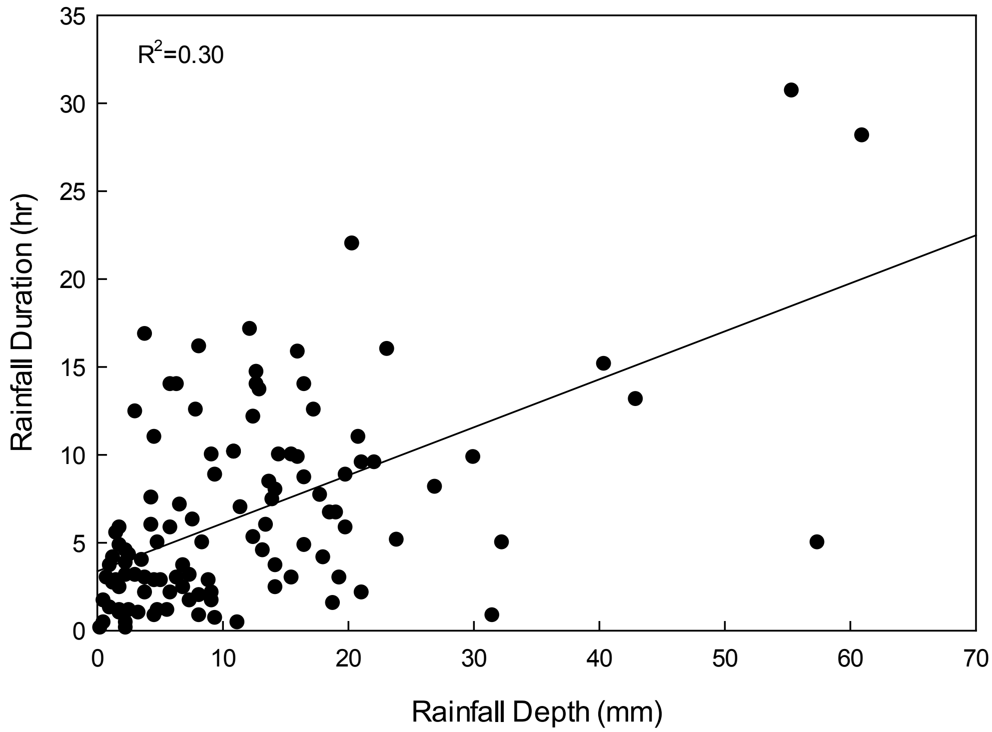

Figure 1.11. The relationship between rainfall depth and duration for the Camp weather station was significant (R^2=0.30, p<0.001).

stations. The LF weather station had a significantly higher median storm event depth as compared to LMB and a significantly longer median duration as compared to all other weather stations individually and averaged. The LF weather station recorded data at the largest interval, 1 hour, which may account for its difference with regards to median storm duration. However, it is also possible that this difference is due to localization of storm events across this region. The significant linear relationship between depth and duration, at these weather stations, was similar but stronger than that found by Austen and Claborn (1974) who noted a correlation of 0.409 between these two parameters for storm events in Lubbock, Texas.

Storm events displayed seasonal differences across winter (December-February), spring (March-May), summer (June-August), and autumn (September-November) time periods for duration and average intensity but not depth (Tables 1.4-1.5). No statistical differences were found betweenwinter and summer storm event depths. Storm event durations were significantly longer during the winter months as compared to the summer ones. Summer storms were significantly more intense as compared to winter events. Long periods of low intensity rainfall during the winter months and high intensity storm events in the summer and early fall are typical for this region (Husic et al., 2019).

Table 1.4. Results of comparing seasonal variations in storm event durations using a one-way ANOVA. Values displayed are medians and units are in mm.

Weather station[1]	Winter[2]	Spring	Summer	Autumn
CWS	8.30 a	5.00 ab	3.35 b	5.00 ab
LMB	8.85 a	4.63 ab	4.15 b	6.00 ab
LF	9.50 a	5.50 a	3.00 b	8.89 a
JKL	8.78 a	5.15 ab	4.00 b	6.43 ab
Median (n=4)	9.02 a	5.03 ab	3.31 b	6.25 ab

[1]CWS=Camp, LMB=Little Millseat Branch, LF=Laurel Fork, and JKL=Jackson.

[2]Winter=December through February, spring=March through May, summer=June through August, and autumn=September through November.

Statistical differences within rows noted by differing letter (α=0.05).

Table 1.5. Results of comparing seasonal variations in storm event average intensities using a one-way ANOVA. Values displayed are medians and units are in mm.

Weather station[1]	Winter[2]	Spring	Summer	Autumn
CWS	1.23 b	1.64 ab	2.76 a	1.28 b
LMB	1.24 ab	1.45 ab	2.20 a	1.13 b
LF	1.10 b	1.28 ab	1.94 a	1.09 b
JKL	1.15 b	1.39 b	2.56 a	1.34 b
Average Median (n=4)	1.12 b	1.55 ab	2.37 a	1.23 b

[1]CWS=Camp, LMB=Little Millseat Branch, LF=Laurel Fork, and JKL=Jackson.

[2]Winter=December through February, spring=March through May, summer=June through August, and autumn=September through November.

Statistical differences within rows noted by differing letter (α=0.05).

1.3.2 Throughfall Characteristics

Througfall was significantly affected by storm event duration and depth but not intensity considering both tree types (coniferous and deciduous) and all ages (10, 20, and 100 years) (Appendix E). Increases in depth and duration resulted in significantly larger throughfall depths while the effect of increased intensity increased throughfall depths for the 10- and 100-year old plots but not the 20-year old ones. Prior research has shown that throughfall rates are related to storm duration and intensity (Llorens et al., 2003; Levia and Frost, 2006). Crockford and Richardson (2000) noted that interception was strongly related to rainfall duration and intensity as higher interception rates were generally associated with low intensity long duration events and low interception rates were often linked to high intensity short duration events. Bryant et al. (2005) noted that short duration, low level intensity storms were associated with lower throughfall depths (i.e., higher interception rates) for five forest communities in western Georgia, USA. Miralles et al. (2010) noted that regions such as Schandinavia and northern Canada that are characterized by long duration storm events had higher intereption losses than areas dominated by short duration convective storms yielding large annual rainfall amounts.

1.3.3 Control

For the control site (grass only), throughfall data were collected for 99 storm events during the period of June 2017 through May 2018. During this period, 1165 mm of rainfall occurred of which 1088 mm or about 93% was recorded in the throughfall collectors. It is possible that some rainfall was interecepted by the grasses in the summer, though it is also likely that the difference between precipitation and throughfall depths may be attributable to localized (micro) variations in rainfall patterns and losses from evaporation, splash, and wetting of the collector surface (Thimonier, 1998; Levia and Frost, 2006). In some instances, negative throughfall values were recorded (e.g., throughfall depths exceeding rainfall depths). Similar occurrences were noted in prior throughfall studies with some authors attributing this cause to wind (Robson et al., 1994; Crockford et al., 2000; Levia and Frost, 2006).

1.3.4 Treatment Effects

Throughfall was significantly influenced by tree type (coniferous, deciduous) and age (10, 20, 100 years). Considering all ages, coniferous trees had significantly lower throughfall depths as compared to deciduous trees (Table 1.6). The median throughfall depth for coniferous trees (all ages combined) was 3.8 mm and was 5.8 mm for deciduous trees (all ages combined). The effect of age depended on tree type (Figure 1.12). For coniferous trees, significant differences were present between the 10- and 100-year plots as well as the 20- and 100-year plots but not the 10- and 20-year plots. For deciduous trees, the 20-year plot differed significantly from the 10- and 100-year plots; however, the 10- and 100-year plots did not differ. Unlike the other plots, the 10-year deciduous plot contained large numbers of invasive shrubs such as Autumn Olive can impact tree growth, and hence canopy cover, in the plot (Orr et al., 2005; Dukes et al. 2009). Canopy cover for the 10-year deciduous plot in June 2017 was much lower, at 61%, than the over plots which had values of 93% or greater.

Table 1.6. Results of the comparison of tree type and age. Values displayed are median throughfall depths.

Age (years)	Coniferous	Deciduous
10	3.50 b,y	6.17 a,x
20	3.34 b,y	5.00 a,y
100	4.84 b,x	6.21 a,x

Statistical differences within row (a,b) and columns (x,y) noted by differing letter (α=0.05).

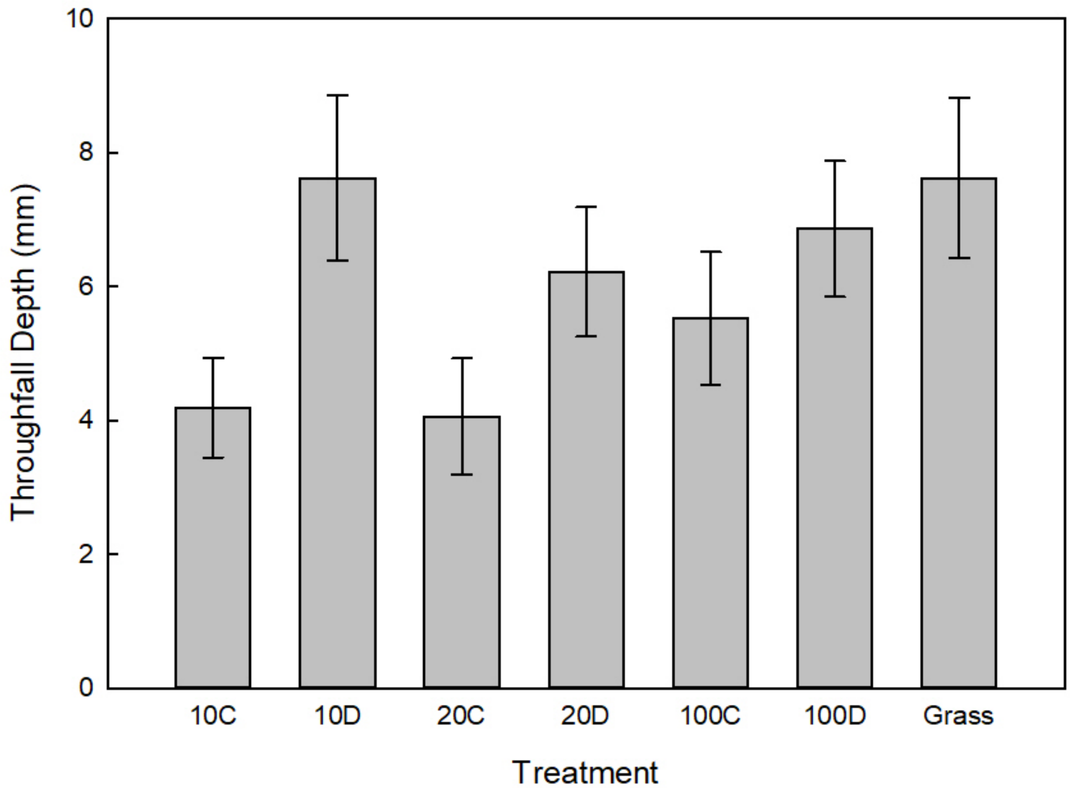

Figure 1.12. Throughfall depth depended on tree type and age. C indicates coniferous, D is deciduous, and the numbers indicate tree age in years. Error bars indicate standard error for each plot.

As the plots aged, the difference between coniferous and deciduous throughfall depths decreased from 2.67 mm at 10-years to 1.66 mm at 20-years and 1.37 mm at 100-years. The increase in throughfall depth over time and the reduction in differences between vegetation types with age may be attributable in part to self-thinning (Westoby, 1984; McCarthy et al., 1991). Recognizing that throughfall depths decrease with age could have watershed implications, particularly in instances where tree stands are not allowed to fully mature such as with woody biomass production where stands may be harvested between 10- and 20-years of age (Caldwell, 2018). Such strategies may benefit disturbed landscapes such as mined lands which undergo drastic ecosystem changes that often result in the transformation of forested environments to grassed ones (Zipper et al., 2011) and hence increased runoff peaks and volumes (Jorgensen and Gardner, 1987; Guebert and Gardner, 2001; Shukla et al., 2004). As demonstrated by Kuczera (1987) and Haydon et al. (1996), interception and water yield is not a linear relationship with forest age. Interception increases rapidly peaking between 20 and 40 years before steadily declining. Similarly, water yields are nonlinear, however with a reversed curve meaning yields rapidly decrease to their lowest between 20 and 40 year before steadily increasing.

Interception rates, defined here as the amount of rainfall that did not become throughfall, varied with tree type and age (Figure 1.13). The highest interception rates occurred with the 10- and 20-year old coniferous plots where about 44% and 40% of rainfall, respectively. The lowest interception rate occurred with the 10-year old deciduous plots. At about 6%, this plot was equivalent to the control (grass only) plot. The lower level of overstory density in this plot meant that some throughfall collectors were essentially in the “open” with no canopy cover above them. The interception rates found in this study have a wider range than those reported by Bryant et al. (2005) for five forest communities. The researchers recorded interception rates between 17 and 22% for stands 13-65 years old. While interception rates decreased temporally for the coniferous plots, the opposite occurred for the deciduous plots and within a relatively short time span. Interception rates for the 20-year old deciduous plot were equivalent to those for the 100-year deciduous plot.

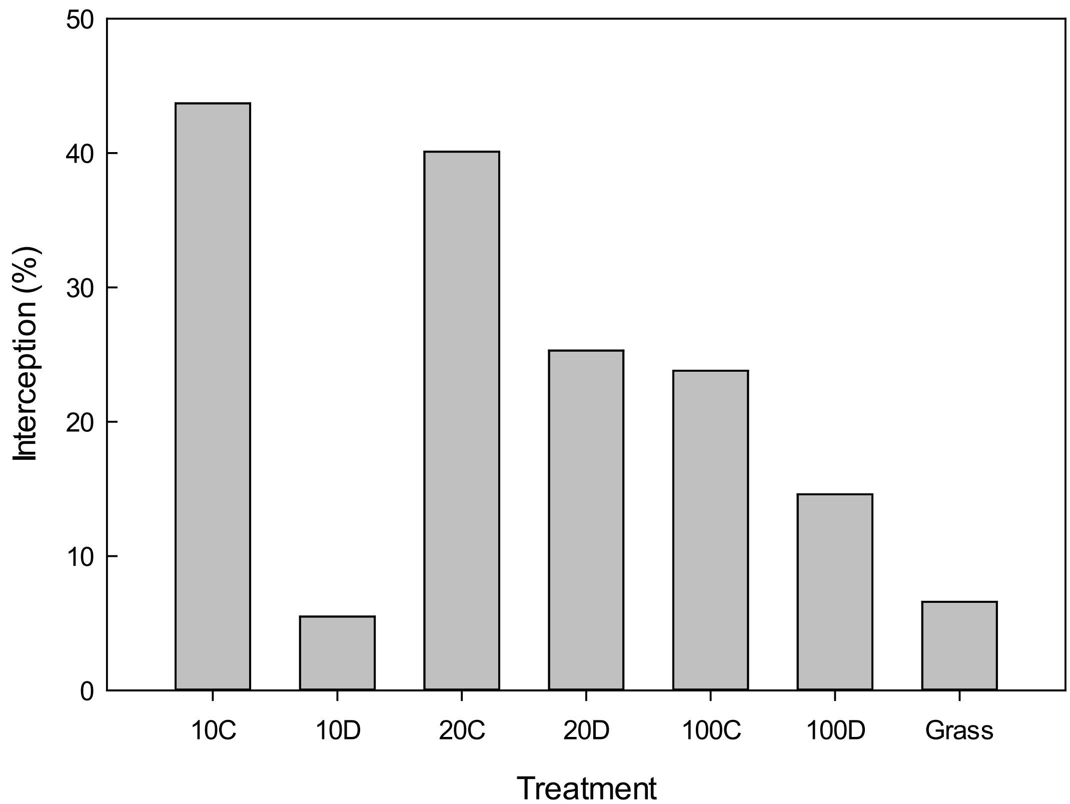

Figure 1.13. Interception rates for each plot. C indicates coniferous, D is deciduous, and the numbers indicate tree age in years.

For deciduous trees, the throughfall depths were significantly influenced by the presence or absence of leaves (i.e., leaf on and leaf off) (Table 1.7). The median throughfall depth, for all years combined, was 7.52 mm with leaves on and 5.55 mm with leaves off. When examining the interaction between year and presence/absence of leaves, only the 100-year old plot was significant at $\alpha=0.05$; the 10-year old plot was significant at $\alpha=0.10$ ($p=0.055$).

Table 1.7. Results of the comparison of presence/absence of leave for deciduous plots. Values displayed are median throughfall depths.

Age (years)	Leaves Present	Leaves Absent
10	7.48 a	5.00 a
20	5.26 a	4.92 a
100	10.81 a	6.95 b

Statistical differences within row noted by differing letter (α=0.05).

No significant difference was noted between the leaf on and leaf off period for the 20-year old plot. These findings were unexpected but may be reflective of seasonal rainfall characteristics, as the period when leaves were on the trees corresponded to times of high intensity, short duration precipitation events, and the importance of stemflow especially during the winter months. Herwitz (1987) found branch surfaces, which are porous and hydrophilic, were more effective at intercepting rainfall than leaves, particularly when these surfaces were already wet. The cohensive properties of water enhance the ability of wet branches to funnel water to the forest floor.

1.4 CONCLUSIONS

Precipitation patterns in this study followed a seasonal trend with the highest intensity, shortest duration storms occurring during the summer months and the least intense, longest duration storms occurring during the winter months. Higher average precipitation levels occurred in 2018 as it was the wettest year on record. Rainfall characteristics significantly influenced throughfall patterns across the treatments. Tree type and age significantly influenced throughfall rates with coniferous trees intercepting more rainfall as compared to deciduous ones. For coniferous trees, throughfall depths were significantly greater for the 100-year plot as compared to the 10- and 20-year old plots. Self-thinning is a potential cause for this difference, indicating that FRA stands are regrowing in a way similar to that of a natural forest stand. For the deciduous plots, the presence of invasive species in the 10-year plot resulted in large areas of open canopy and hence higher throughfall depths. Interestingly, interception rates for the 20-year plot were similar to those for the 100-year plot suggesting the low period of interception may be temporary. While it is not clear whether invasive species caused poor survival of the 10-year oak trees or if poor survival allowed incursion of the invasive species, the results from this study show the importance of species survival rates on interception and that low survival rates could negatively impact or at least delay the hydrologic recovery of the area. Hall (2017) concluded that coniferous trees (shortleaf and loblolly pine) experience more rapid growth than deciduous trees (northern red oak, white oak, and chestnut oak) on reclaimed mined lands, a benefit for outcompeting invasive grasses which are common to such areas. Furthermore, loblolly pine had better first year survival than shortleaf pine when planted on restored mine sites and may be a good choice to prevent incursion of invasive grasses and shrubs.

It is likely that these results were influenced by the amount of precipitation received in 2018. Since the rainfall was not the result of a few high intensity storms, but rather many events, it is possible that prior storm events increased the amount of throughfall seen across all plots.

The FRA is a proven method for re-establishing forested ecosystems on mined lands (Graves et al., 2000; Skousen et al., 2009; Agouridis et al., 2012; Sena et al., 2015). Results from this study indicate that the trees grown using the FRA are following an expected pattern with regards to throughfall (Kuczera, 1987; Haydon et al., 1996) and compliment prior FRA-focused runoff and infiltration studies (Taylor et al., 2009a; Taylor et al., 2009b; Sena et al., 2015). Knowing mean annual streamflow is inversely related to interception, it is hypothesized that mined watersheds reforested using the FRA will exhibit decreased water yields for at least 20-40 years before experiencing a sustained increase as the forest matures. These patterns indicates that using FRA will allow natural hydrologic function to be restored and could reduce the flooding that is associated with sites restored as grassland.

It is possible that mined lands may experience hydrologic benefits from the establishment of woody biomass plantations. With a turnover of younger forest stand, biomass plantations could help further reduce runoff from restored mine sites as more interception is seen in tree stands prior to maturity. Furthermore, current climate predictions indicate that Kentucky may become wetter over the long term and younger tree stands could potentially reduce the impacts of increased precipitation.

CHAPTER 2: FUTURE WORK

While this study demonstrated the presence of a significant difference between tree type and age regarding throughfall, understanding the causes of these differences would be enhanced by the inclusion of additional tree characteristics, such as basal area and leaf area index, in the analyes. The availability of plots between 20- and 10-years old may also help understand if throughfall follows the curves presented by Kuczera (1987) and Haydon et al. (1996). Given the extreme amount of precipitation received in 2018, future work could examine how throughfall changes with normal and dry years.

Precipitation and throughfall are only two components of the hydrologic cycle. Measurements of stemflow, infiltration rates, and runoff would provide a more holistic understanding of how FRA influences localized hydrology at the plot scale for future extrapolation to the watershed-scale. Linking watershed-scale streamflow analyses to throughfall would be a next step to predict future watershed impacts from afforestation via FRA. Doing so would allow for the evaluation of the potential impact of woody biomass plantation establishment and even shifts in tree species such as from climate change (Woodall et al., 2009).

APPENDIX A: PLOT MAPS

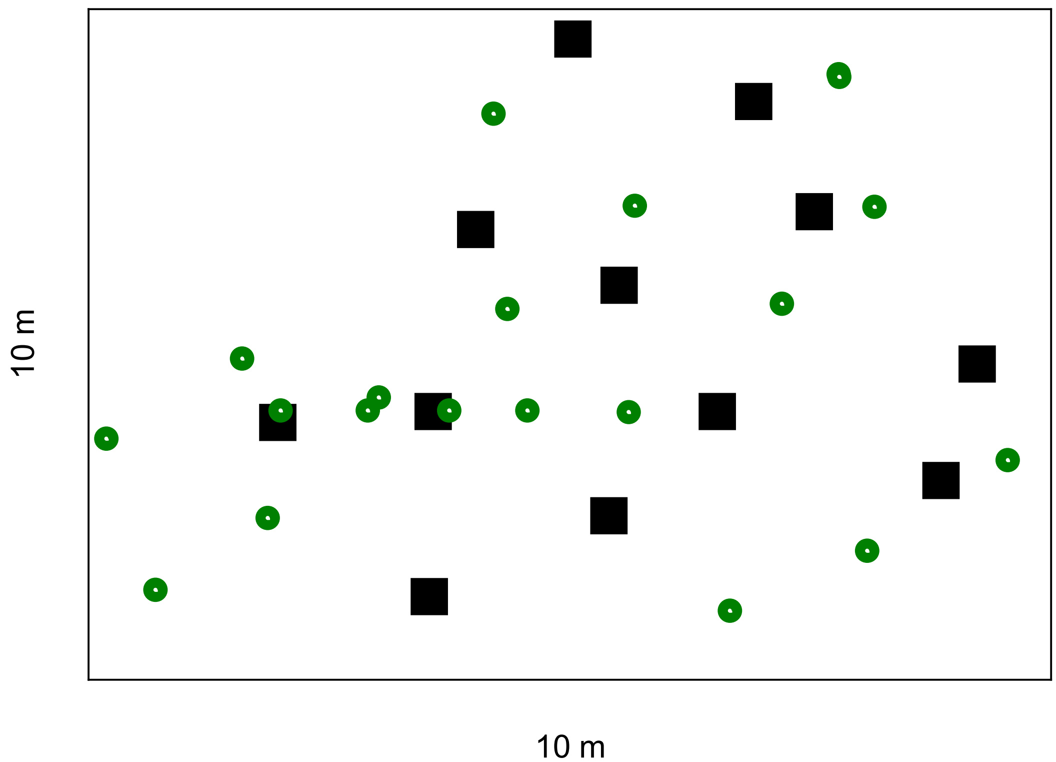

Figure A.1. 10-year old coniferous plot. The black squares represent the throughfall collector stands, and the green circles represent the trees (typical diameter of 15 cm). Markers are not to scale.

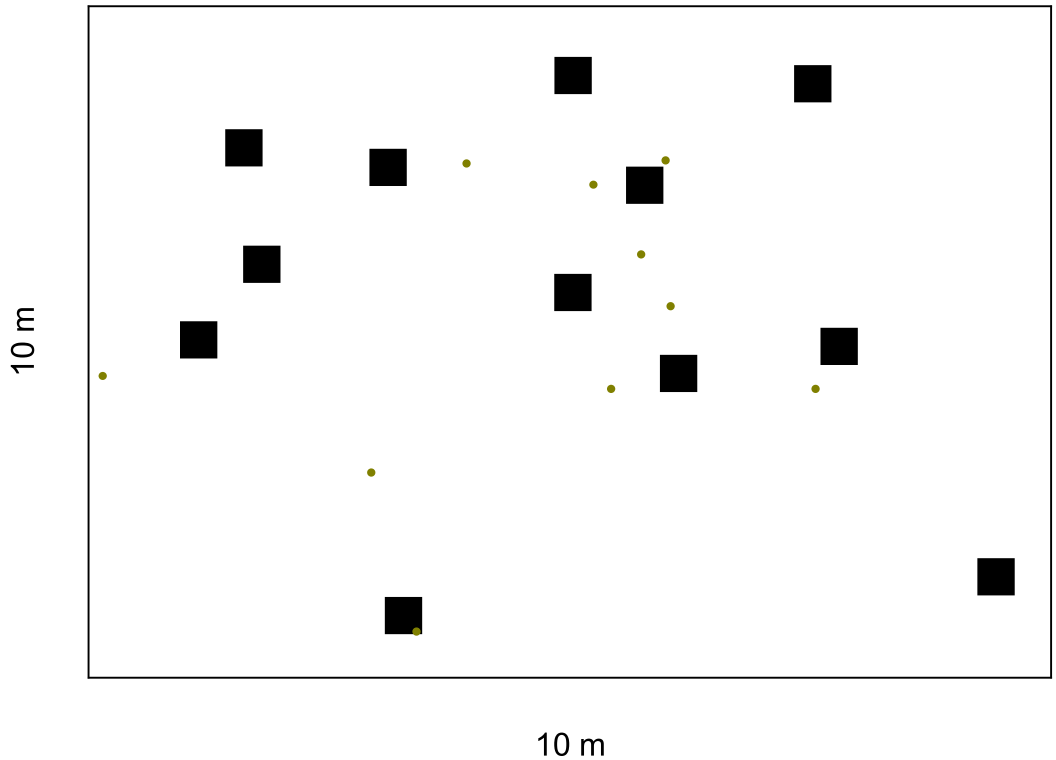

Figure A.2. 10-year old deciduous plot. The black squares represent the throughfall collector stands, and the green circles represent the trees (typical diameter of 5 cm). Markers are not to scale.

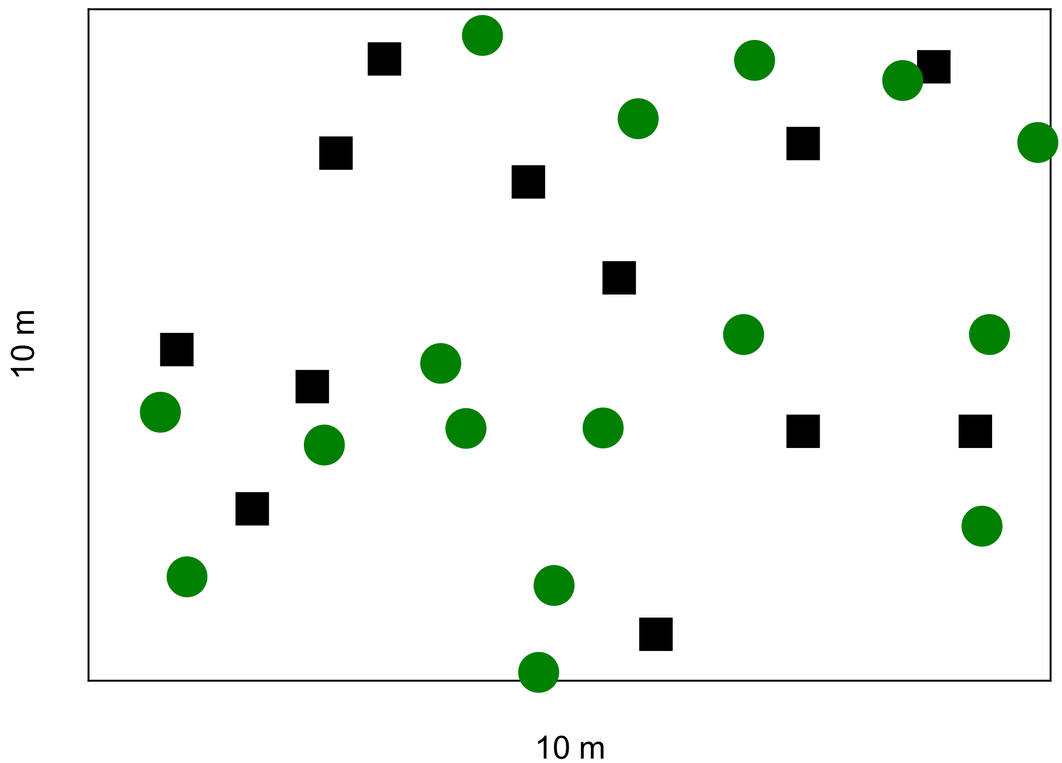

Figure A.3. 20-year old coniferous plot. The black squares represent the throughfall collector stands, and the green circles represent the trees (typical diameter of 25 cm). Markers are not to scale.

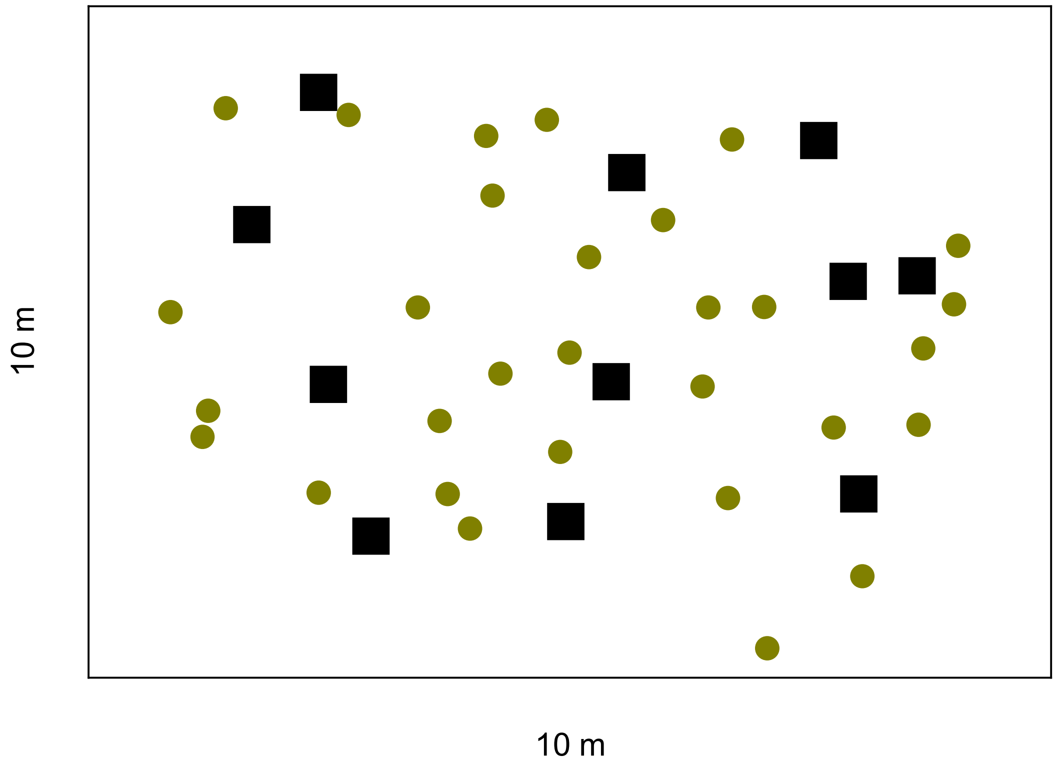

Figure A.4. 20-year old deciduous plot. The black squares represent the throughfall collector stands, and the green circles represent the trees (typical diameter of 15 cm). Markers are not to scale.

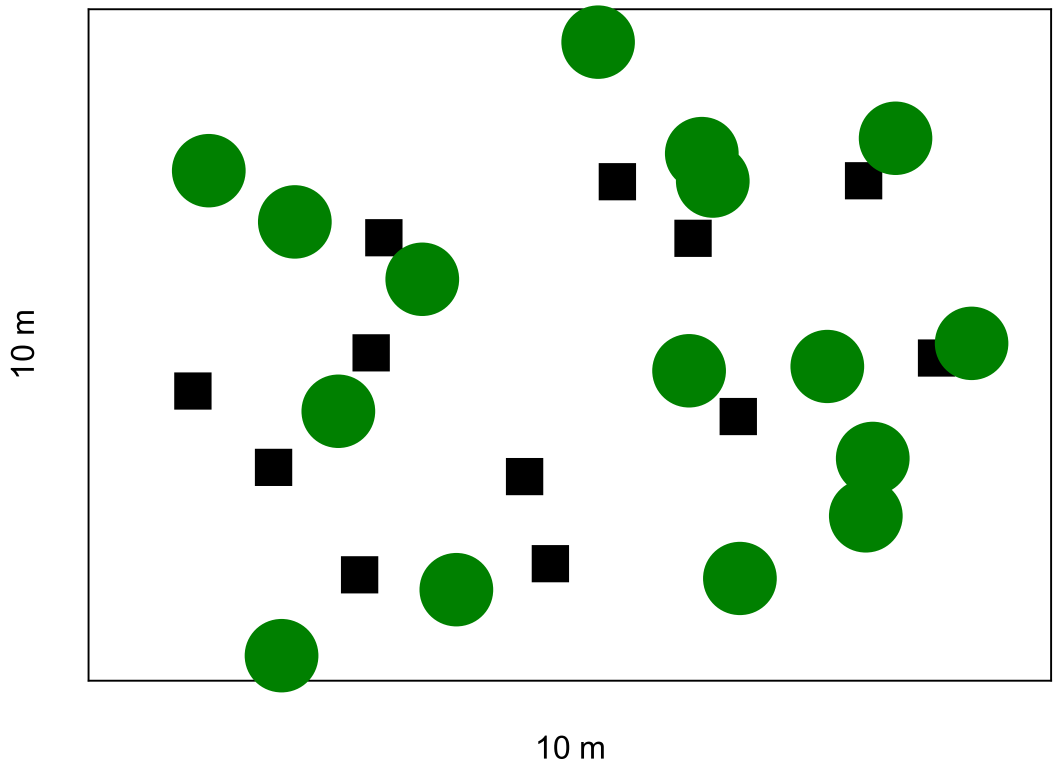

Figure A.5. 100-year old coniferous plot. The black squares represent the throughfall collector stands, and the green circles represent the trees (typical diameter of 46 cm). Markers are not to scale.

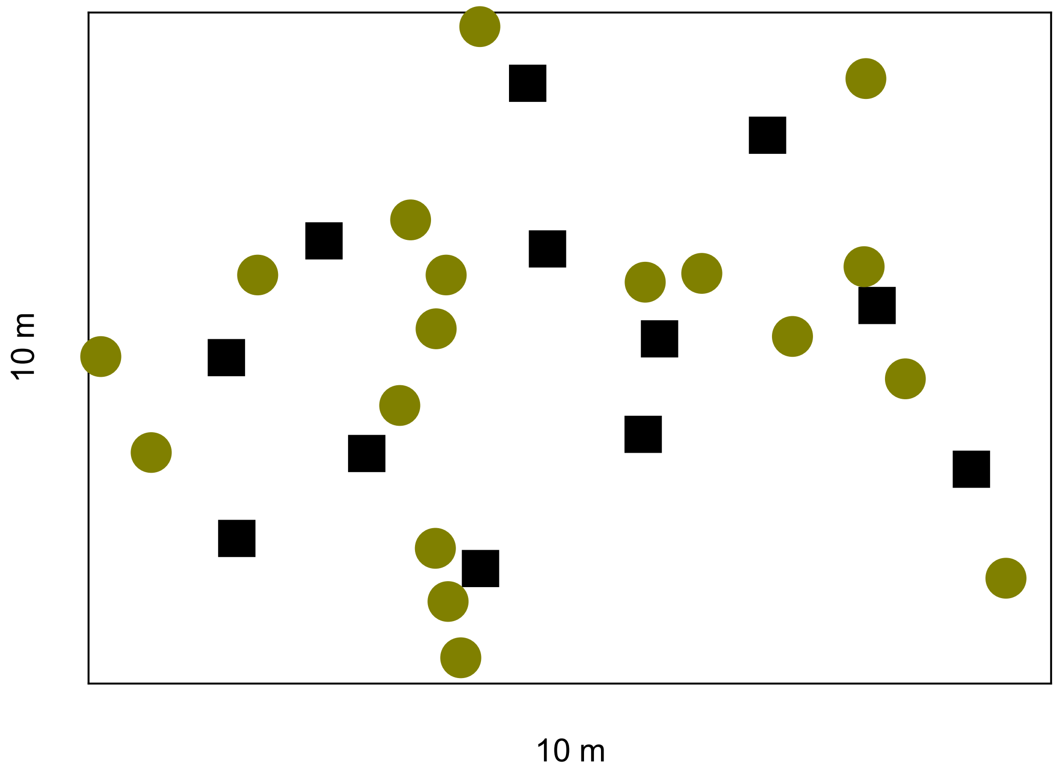

Figure A.6. 100-year old deciduous plot. The black squares represent the throughfall collector stands, and the green circles represent the trees (typical diameter of 25 cm). Markers are not to scale.

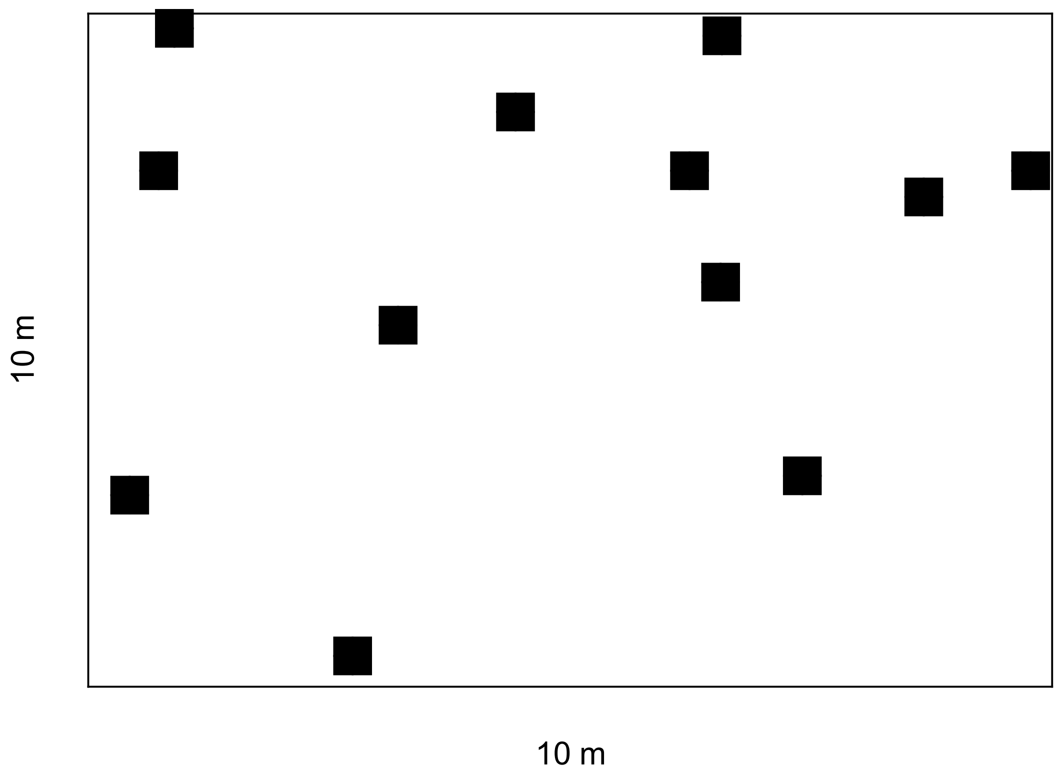

Figure A.7. Control (grass only) plot. The black squares represent the throughfall collector stands. Markers are not to scale.

APPENDIX B: THROUGHFALL DATA

Table B.1. Throughfall data for the 10-year old coniferous plot.1

Date/Time	Throughfall Collectors												Mean	Median
	10C-1	10C-2	10C-3	10C-4	10C-5	10C-6	10C-7	10C-8	10C-9	10C-10	10C-11	10C-12		
5/18/17 14:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/19/17 6:45	28.70	29.21	33.53	33.02	31.24	28.70	38.61	29.72	26.16	nd	24.38	29.21	30.23	29.21
5/19/17 23:00	4.83	4.83	6.60	5.59	5.33	4.83	4.83	4.83	4.83	nd	4.06	4.83	5.03	4.83
5/20/17 20:30	12.19	14.99	19.05	14.48	14.22	14.73	17.53	17.27	13.46	nd	10.92	16.00	14.99	14.73
5/21/17 5:45	3.56	3.56	3.30	2.79	2.29	0.00	3.05	2.54	2.54	nd	2.54	2.54	2.61	2.54
5/23/17 14:00	6.60	4.06	6.10	7.11	6.10	nd	5.84	5.84	7.37	nd	4.06	5.33	5.84	5.97
5/24/17 11:00	10.67	8.38	12.45	13.21	10.67	nd	2.29	13.46	13.46	nd	6.10	11.18	10.19	10.92
5/24/17 19:00	0.76	0.76	0.76	0.76	1.02	nd	0.51	1.02	0.76	nd	0.76	1.02	0.81	0.76
5/25/17 8:00	5.59	6.10	4.57	6.60	4.32	nd	nd	7.11	4.57	nd	2.54	4.83	5.14	4.83
5/27/17 17:30	5.59	5.84	7.11	6.35	4.83	nd	nd	6.10	5.08	nd	4.06	4.83	5.53	5.59
5/30/17 20:15	2.03	2.29	2.79	2.54	3.05	nd	nd	2.54	2.54	nd	1.78	2.79	2.48	2.54
5/31/17 16:00	2.54	3.30	3.05	2.79	2.79	nd	nd	2.79	2.29	nd	2.03	3.30	2.77	2.79
6/4/17 23:00	11.43	13.72	19.30	17.02	15.49	nd	nd	16.51	18.03	nd	4.32	13.72	14.39	15.49
6/12/17 16:30	8.89	7.11	8.13	8.13	8.64	8.89	6.35	8.38	7.62	7.11	6.60	8.13	7.83	8.13
6/13/17 17:00	4.83	4.32	7.37	3.81	4.83	4.32	4.06	4.83	4.32	3.56	4.32	3.56	4.51	4.32
6/14/17 12:15	21.59	22.10	20.32	10.92	17.78	19.81	14.73	13.97	16.00	14.73	12.95	17.02	16.83	16.51
6/15/17 16:00	11.43	13.21	14.99	nd	12.70	11.94	9.14	11.68	11.18	11.68	11.18	11.68	11.89	11.68
6/19/17 3:00	12.95	11.94	13.72	nd	11.68	12.70	7.87	10.16	8.89	9.14	8.64	11.43	10.83	11.43
6/22/17 13:00	5.59	5.59	5.84	nd	3.56	5.33	3.05	3.56	3.56	4.06	3.56	4.32	4.36	4.06
6/23/17 17:30	3.05	3.30	3.81	nd	2.29	2.79	1.02	2.54	2.29	2.79	2.54	2.79	2.66	2.79
6/24/17 2:45	0.25	0.51	0.51	nd	0.25	0.25	0.00	0.25	0.25	0.25	0.25	0.25	0.28	0.25
7/4/17 9:30	6.35	5.59	7.87	5.08	5.84	4.83	3.81	5.08	5.84	5.33	4.06	6.35	5.50	5.46
7/5/17 15:45	6.56	6.05	4.06	3.05	6.56	1.27	2.29	3.81	3.30	3.56	3.05	3.56	3.93	3.56
7/6/17 15:15	1.27	1.27	0.76	0.76	1.02	0.00	0.51	1.02	0.76	0.76	0.76	1.27	0.85	0.76
7/7/17 23:15	3.81	3.81	2.54	2.79	3.56	0.00	3.05	2.79	3.30	2.79	2.79	3.81	2.92	2.92
7/14/17 20:45	22.10	24.13	nd	21.08	25.40	7.87	20.07	20.83	19.30	25.91	20.32	20.07	20.64	20.83
7/23/17 3:00	1.27	1.02	nd	1.78	1.78	2.29	0.51	1.78	2.03	1.52	1.78	1.27	1.55	1.78
7/24/17 16:30	1.52	1.27	nd	1.27	1.78	1.78	0.76	1.52	1.78	1.27	1.02	1.02	1.36	1.27
7/27/17 13:30	10.16	10.41	nd	9.40	11.43	10.16	5.84	8.64	9.14	10.41	8.38	6.86	9.17	9.40
7/28/17 12:30	18.03	29.21	nd	20.57	29.21	22.86	nd	17.53	21.59	23.11	19.05	18.03	21.92	21.08
8/4/17 11:45	8.89	10.16	nd	5.08	8.38	8.38	nd	7.11	6.10	5.33	6.60	6.35	7.24	6.86
8/10/17 2:15	3.05	3.30	2.03	2.54	3.30	2.54	2.79	2.29	2.79	2.79	2.54	2.03	2.67	2.67
8/10/17 10:15	2.03	3.30	1.27	1.78	2.29	2.29	2.29	1.52	1.78	1.52	2.29	1.78	2.01	1.91
8/14/17 6:45	7.87	9.14	7.87	7.11	8.38	7.62	7.37	6.60	7.62	7.11	7.37	6.10	7.51	7.49
8/14/17 17:00	2.29	1.78	2.54	2.03	2.03	2.03	1.27	1.78	2.29	1.78	2.03	1.52	1.95	2.03

Table B.1 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10C-1	10C-2	10C-3	10C-4	10C-5	10C-6	10C-7	10C-8	10C-9	10C-10	10C-11	10C-12		
8/14/17 23:00	4.57	6.10	4.06	4.57	4.32	4.32	4.06	3.30	3.56	3.56	4.32	3.30	4.17	4.19
8/15/17 5:30	10.67	11.18	10.41	9.40	6.86	10.41	6.35	9.65	9.14	9.65	8.89	8.38	9.25	9.53
8/16/17 12:00	2.29	2.03	2.03	1.52	1.52	1.52	1.02	1.52	1.02	1.02	1.52	1.27	1.52	1.52
8/18/17 4:30	5.08	6.60	4.06	4.57	2.03	5.33	4.32	3.56	3.56	3.81	4.83	3.81	4.30	4.19
8/22/17 16:15	nd	12.45	12.19	10.67	4.57	11.18	11.94	11.43	2.03	12.95	11.18	11.43	10.18	11.43
8/28/17 12:45	nd	2.54	2.29	2.79	0.00	2.79	1.78	0.76	0.00	2.79	2.54	1.78	1.82	2.29
9/1/17 2:30	nd	10.67	15.75	12.45	2.79	14.22	7.87	12.19	nd	12.19	9.65	3.56	10.13	11.43
9/1/17 14:45	nd	11.18	7.62	8.64	6.60	10.41	9.40	5.84	nd	9.65	8.64	7.62	8.56	8.64
9/5/17 9:30	nd	14.22	9.65	7.87	9.91	10.92	9.14	6.35	3.56	10.41	8.89	7.37	8.94	9.14
9/11/17 20:30	1.52	1.52	1.52	1.52	1.02	0.00	1.27	1.27	0.76	1.27	0.76	0.51	1.08	1.27
9/13/17 17:45	5.33	5.33	2.29	5.08	3.81	4.32	5.84	3.05	2.79	3.30	4.06	2.54	3.98	3.94
9/19/17 14:30	4.32	4.06	3.05	3.81	3.56	4.57	4.32	5.33	3.81	4.57	3.81	3.56	4.06	3.94
10/8/17 0:30	32.51	29.21	nd	30.73	24.13	34.04	23.62	33.53	35.81	34.80	22.86	27.69	29.90	30.73
10/10/17 17:45	13.46	15.75	nd	16.00	14.73	15.49	14.48	14.99	15.24	14.99	11.18	11.18	14.32	14.99
10/15/17 16:00	12.45	15.75	nd	11.68	13.97	12.95	14.73	12.95	12.45	12.95	11.94	9.91	12.88	12.95
10/23/17 8:45	17.53	26.16	nd	18.80	22.61	24.38	27.43	27.94	21.59	22.35	20.57	20.07	22.68	22.35
10/28/17 4:45	10.92	8.38	4.57	5.33	7.62	9.65	6.60	6.35	7.11	6.35	6.35	6.10	7.11	6.48
10/29/17 15:30	0.51	0.76	nd	0.51	0.76	0.51	0.51	0.51	0.76	0.51	0.76	0.51	0.60	0.51
11/3/17 10:30	1.27	1.02	0.25	0.51	0.51	1.02	1.02	0.51	0.25	0.51	0.76	0.76	0.70	0.64
11/6/17 4:30	3.05	2.54	1.78	2.03	2.54	3.56	2.29	nd	2.79	2.54	2.54	2.54	2.56	2.54
11/7/17 4:30	1.27	1.27	1.78	1.24	1.52	2.29	0.76	nd	2.03	1.78	1.27	1.02	1.48	1.27
11/8/17 4:15	0.76	0.76	0.76	1.02	1.27	2.03	0.25	nd	1.52	1.02	1.02	0.51	0.99	1.02
11/13/17 1:00	0.00	0.25	0.00	0.00	0.00	0.25	0.25	nd	0.00	0.25	0.00	0.25	0.12	0.25
11/15/17 17:00	0.51	0.76	0.00	0.25	nd	0.51	0.51	0.25	0.00	0.25	0.51	0.51	0.37	0.51
11/18/17 19:45	5.59	5.33	3.56	4.32	nd	5.59	6.35	7.11	5.08	7.62	3.81	5.84	5.47	5.59
11/30/17 17:00	0.76	0.51	0.00	0.25	nd	0.76	0.51	0.51	nd	0.51	0.51	0.51	0.48	0.51
12/5/17 9:00	3.81	nd	0.76	3.81	nd	7.11	6.86	5.84	nd	5.33	4.32	5.59	4.83	5.33
12/22/17 14:45	3.81	nd	9.40	7.87	9.40	12.45	12.19	8.13	8.89	7.62	6.60	8.64	8.64	8.64
12/23/17 6:30	14.73	nd	14.48	11.43	12.45	18.54	17.02	14.73	13.46	13.97	12.45	13.97	14.29	13.97
12/24/17 19:00	1.02	1.27	0.25	1.27	0.51	0.51	0.51	nd	0.25	0.25	1.02	0.51	0.67	0.51
1/8/18 9:15	3.56	nd	1.52	3.81	4.32	nd	nd	4.32	3.56	3.05	3.30	3.05	3.39	3.56
1/11/18 16:30	1.02	1.02	0.25	0.51	0.76	1.27	-	0.51	0.51	0.76	0.76	0.51	0.66	0.64
1/11/18 23:15	1.78	1.27	1.52	1.02	1.52	2.79	0.51	1.78	2.03	2.03	nd	1.27	1.59	1.52
1/12/18 12:15	3.30	6.10	2.54	2.79	4.83	4.83	1.27	4.32	4.83	4.32	nd	4.32	3.95	4.32
1/27/18 19:15	4.83	2.54	1.02	2.54	4.32	6.35	1.27	2.79	4.57	5.59	nd	4.06	3.63	4.06
2/1/18 13:00	4.57	3.30	2.03	5.08	5.33	6.10	nd	4.57	4.57	4.83	nd	4.06	4.45	4.57

Table B.1 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10C-1	10C-2	10C-3	10C-4	10C-5	10C-6	10C-7	10C-8	10C-9	10C-10	10C-11	10C-12		
	10.67	13.72	10.92	nd	13.46	14.48	5.08	9.14	12.95	13.21	nd	8.89	11.25	11.94
2/4/18 20:30	0.76	0.76	0.25	0.00	0.00	0.51	0.51	nd	0.25	0.76	0.76	0.25	0.44	0.51
2/6/18 22:30	13.46	2.54	9.91	6.60	13.97	17.26	7.11	13.72	16.51	16.26	nd	12.95	11.84	13.46
2/10/18 6:00	32.77	54.61	26.67	38.86	36.58	46.74	nd	30.99	34.54	36.32	nd	34.04	37.21	35.43
2/11/18 16:45	3.05	3.05	3.05	3.05	3.30	3.81	nd	2.54	4.32	3.56	nd	3.30	3.30	3.18
2/14/18 19:00	1.78	2.03	2.29	nd	1.78	1.02	1.78	nd	1.78	2.03	1.52	1.52	1.75	1.78
2/16/18 6:30	5.84	8.64	1.52	7.11	7.37	8.13	9.14	5.59	6.86	5.59	nd	4.83	6.42	6.86
2/17/18 11:45	11.18	12.95	9.14	13.46	12.95	14.48	14.99	12.45	13.21	13.46	nd	10.41	12.61	12.95
2/24/18 6:15	3.05	4.57	3.56	3.30	2.79	5.08	nd	2.03	2.03	2.29	nd	3.05	3.18	3.05
2/24/18 22:00	0.76	1.52	1.27	0.51	0.51	1.52	nd	0.76	0.76	0.51	nd	1.02	0.91	0.76
2/25/18 2:45	6.10	8.38	7.11	7.62	8.13	9.40	nd	4.57	6.86	6.35	nd	7.62	7.21	7.37
2/28/18 6:45	0.76	1.02	0.25	0.51	1.52	1.78	0.51	0.76	0.76	1.27	0.25	0.51	0.83	0.76
3/1/18 0:15	5.84	9.40	2.54	8.13	4.83	8.38	8.64	6.86	4.83	5.33	5.84	6.86	6.46	6.35
3/6/18 5:15	0.76	nd	0.25	0.51	0.51	1.02	1.27	0.51	0.00	0.51	0.51	0.51	0.58	0.51
3/11/18 21:00	6.10	nd	3.56	6.35	6.86	6.86	6.60	5.84	3.81	6.60	6.10	7.62	6.03	6.35
3/14/18 12:30	0.00	nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/17/18 18:00	1.52	2.03	1.78	nd	1.52	1.02	1.27	nd	1.02	1.27	1.27	1.02	1.37	1.27
3/19/18 19:30	2.79	nd	3.81	4.57	5.08	6.86	3.30	5.08	nd	5.08	3.81	4.32	4.47	4.45
3/20/18 18:30	0.25	nd	0.00	0.00	0.25	0.25	0.25	0.25	nd	0.25	0.25	0.25	0.20	0.25
3/21/18 11:00	0.00	nd	0.00	0.00	0.00	0.00	0.00	0.00	nd	0.00	0.00	0.00	0.00	0.00
3/24/18 8:30	19.30	nd	40.13	43.43	28.96	36.58	25.15	36.83	nd	33.27	23.11	38.35	32.51	34.93
3/28/18 9:45	12.19	nd	9.40	10.92	9.91	18.29	13.72	8.89	7.62	10.16	9.65	12.45	11.20	10.16
3/29/18 1:00	2.54	nd	3.05	2.79	3.56	4.57	2.79	3.30	4.06	2.54	2.54	2.79	3.14	2.79
3/29/18 17:00	5.84	nd	5.33	6.86	7.11	8.38	8.38	6.60	4.83	5.59	5.84	7.87	6.60	6.60
3/30/18 4:00	0.51	nd	0.51	0.25	0.51	0.76	0.76	0.76	0.51	0.51	0.51	0.76	0.58	0.51
4/1/18 20:30	10.41	nd	16.26	13.21	13.46	18.54	9.40	12.19	16.26	12.95	9.65	12.45	13.16	12.95
4/3/18 23:45	18.29	nd	18.03	15.75	21.34	16.76	21.84	22.86	13.72	18.03	15.24	23.88	18.70	18.03
4/9/18 4:45	0.51	2.54	2.54	2.79	2.03	1.02	1.78	nd	2.29	2.54	1.78	1.52	1.94	2.03
4/15/18 7:00	6.86	nd	4.83	3.56	6.35	6.86	5.59	5.08	4.57	4.83	4.83	7.87	5.56	5.08
4/16/18 3:15	0.25	nd	-	-	0.25	0.25	0.25	nd	0.25	0.51	0.25	0.51	0.25	0.25
4/19/18 0:00	0.51	nd	0.25	0.25	0.51	0.51	0.25	nd	0.51	0.51	0.51	0.76	0.46	0.51
4/23/18 5:45	2.29	nd	4.32	5.33	4.32	5.59	4.06	nd	4.06	7.62	3.05	4.57	4.52	4.32
4/24/18 4:30	7.37	nd	6.60	5.59	7.11	11.18	4.32	nd	7.11	6.86	5.08	6.35	6.76	6.73
4/25/18 8:15	0.25	nd	0.25	0.25	0.25	0.51	0.76	nd	0.00	0.25	0.25	0.25	0.30	0.25
4/26/18 19:00	0.51	nd	0.51	0.51	0.51	1.02	0.00	nd	0.76	0.51	0.25	0.51	0.51	0.51
5/4/18 15:30	3.05	nd	2.79	2.03	3.56	2.79	3.05	nd	2.54	2.54	2.29	3.56	2.82	2.79

Table B.1 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10C-1	10C-2	10C-3	10C-4	10C-5	10C-6	10C-7	10C-8	10C-9	10C-10	10C-11	10C-12		
5/5/18 2:45	14.48	nd	21.34	nd	18.03	21.34	10.92	nd	14.48	13.97	12.95	16.00	15.95	14.48
5/6/18 7:00	1.78	nd	3.05	nd	1.78	2.54	1.52	nd	nd	1.27	1.78	1.78	1.94	1.78
5/16/18 19:30	nd	35.05	51.31	45.21	nd	nd	37.34	nd	40.13	36.58	33.27	32.77	38.96	36.96
5/18/18 13:15	nd	3.81	3.81	5.08	nd	nd	3.05	nd	4.06	3.05	3.56	3.05	3.68	3.68
5/18/18 23:30	nd	3.81	4.32	4.57	nd	nd	3.81	nd	3.05	0.51	3.05	0.51	2.95	3.43
5/19/18 16:00	nd	2.79	3.56	2.29	nd	nd	3.81	nd	2.79	0.76	2.79	0.51	2.41	2.79
Mean	6.24	7.68	6.21	6.76	6.71	7.47	6.05	7.26	6.39	6.55	5.44	6.33		
Median	3.81	4.19	3.18	3.81	4.32	4.83	3.30	5.08	3.68	3.56	3.43	3.56		

[1]nd=no data.

Table B.2. Throughfall data for the 10-year old deciduous plot.1

Date/Time	Throughfall Collectors												Mean	Median
	10D-1	10D-2	10D-3	10D-4	10D-5	10D-6	10D-7	10D-8	10D-9	10D-10	10D-11	10D-12		
5/18/17 14:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/19/17 6:45	nd	nd	47.50	nd	51.56	39.37	nd	nd	58.93	49.53	47.50	nd	49.06	48.51
5/19/17 23:00	nd	nd	4.83	nd	5.59	6.35	nd	nd	6.10	nd	7.87	8.64	6.56	6.22
5/20/17 20:30	nd	nd	24.64	nd	25.15	16.00	nd	nd	27.69	nd	25.40	13.46	22.06	24.89
5/21/17 5:45	nd	nd	4.06	nd	5.33	3.30	nd	nd	3.81	nd	6.60	4.83	4.66	4.45
5/23/17 14:00	nd	nd	10.16	nd	14.48	nd	nd	nd	10.41	nd	12.45	11.68	11.84	11.68
5/24/17 11:00	nd	nd	16.76	nd	18.80	nd	nd	nd	21.08	nd	23.62	18.54	19.76	18.80
5/24/17 19:00	nd	nd	1.52	nd	2.03	nd	nd	nd	1.27	nd	1.27	2.03	1.63	1.52
5/25/17 8:00	nd	nd	10.67	nd	19.05	nd	nd	nd	13.97	nd	16.00	14.48	14.83	14.48
5/27/17 17:30	nd	nd	9.14	nd	11.94	nd	nd	nd	13.46	nd	11.94	11.94	11.68	11.94
5/30/17 20:15	nd	nd	2.79	nd	4.83	nd	nd	nd	4.83	nd	4.06	4.06	4.11	4.06
5/31/17 16:00	nd	nd	3.81	nd	4.83	nd	nd	nd	4.57	nd	4.06	4.57	4.37	4.57
6/4/17 23:00	nd	nd	25.15	nd	31.24	nd	nd	nd	35.05	nd	30.99	21.08	28.70	30.99
6/12/17 16:30	14.22	nd	12.70	13.21	13.97	6.86	13.46	9.91	7.62	13.72	7.11	7.11	10.90	12.70
6/13/17 17:00	7.87	nd	5.59	7.87	7.37	2.54	6.35	5.84	3.81	6.60	4.57	3.81	5.66	5.84
6/14/17 12:15	28.19	nd	26.42	27.18	32.00	13.21	26.92	27.69	nd	26.42	16.00	14.73	23.88	26.67
6/15/17 16:00	18.80	nd	15.75	18.03	nd	13.21	14.48	21.84	14.48	nd	17.02	15.49	16.57	15.75
6/19/17 3:00	22.86	nd	14.99	22.10	nd	13.97	14.48	15.75	nd	22.86	10.92	9.14	16.34	14.99
6/22/17 13:00	10.92	nd	10.67	10.41	nd	5.08	8.38	6.10	nd	15.75	4.32	2.29	8.21	8.38
6/23/17 17:30	7.62	nd	5.84	6.60	nd	4.83	4.32	6.86	nd	10.41	3.56	nd	6.25	6.22
6/24/17 2:45	0.76	nd	1.02	1.02	nd	0.51	0.51	0.25	nd	1.27	0.51	nd	0.73	0.64
7/4/17 9:30	10.92	nd	nd	10.92	7.37	7.37	7.62	0.76	5.59	11.43	15.75	9.14	8.69	8.38
7/5/17 15:45	6.35	nd	nd	6.60	3.30	4.32	5.33	1.02	2.79	6.35	5.33	6.35	4.78	5.33
7/6/17 15:15	3.81	nd	nd	3.81	1.78	1.27	2.03	0.51	1.27	3.30	3.30	2.54	2.36	2.29
7/7/17 23:15	6.10	nd	nd	6.10	5.08	3.56	4.32	0.25	3.30	6.35	6.60	4.83	4.65	4.95
7/14/17 20:45	40.13	nd	nd	34.80	18.29	40.39	17.78	25.15	29.46	33.53	36.32	26.67	30.25	31.50
7/23/17 3:00	4.83	nd	nd	4.83	3.05	2.54	2.29	0.51	2.54	4.57	2.79	2.79	3.07	2.79
7/24/17 16:30	3.05	nd	nd	3.30	1.78	1.78	1.27	0.51	1.52	3.05	2.79	nd	2.12	1.78
7/27/17 13:30	20.07	nd	nd	18.80	12.19	6.10	10.16	7.87	nd	11.43	20.32	nd	13.37	11.81
7/28/17 12:30	40.89	nd	nd	39.37	19.30	nd	24.89	26.42	nd	41.91	21.59	nd	30.63	26.42
8/4/17 11:45	10.16	nd	nd	10.16	6.60	nd	4.06	3.30	nd	10.41	6.35	nd	7.29	6.60
8/10/17 2:15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8/10/17 10:15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8/14/17 6:45	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8/14/17 17:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Table B.2 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10D-1	10D-2	10D-3	10D-4	10D-5	10D-6	10D-7	10D-8	10D-9	10D-10	10D-11	10D-12		
8/14/17 23:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8/15/17 5:30	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8/16/17 12:00	3.81	nd	2.79	3.81	3.56	2.29	5.84	3.81	1.02	nd	2.54	2.29	3.18	3.18
8/18/17 4:30	8.89	8.38	9.14	8.38	9.91	7.87	14.48	8.89	5.84	nd	7.11	6.60	8.68	8.38
8/22/17 16:15	22.10	20.57	10.67	21.34	18.80	16.00	23.11	22.35	15.49	nd	nd	14.73	18.52	19.69
8/28/17 12:45	5.33	5.08	5.84	5.33	7.37	4.57	7.62	3.30	3.05	nd	nd	2.79	5.03	5.21
9/1/17 2:30	23.62	23.11	26.42	24.38	29.21	nd	41.40	16.26	16.26	nd	nd	18.03	24.30	23.62
9/1/17 14:45	17.53	17.78	13.21	18.29	12.45	nd	27.70	16.51	6.10	nd	nd	14.48	16.00	16.51
9/5/17 9:30	19.05	18.80	14.73	18.80	15.75	nd	27.69	17.27	nd	nd	nd	12.45	18.07	18.03
9/11/17 20:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9/13/17 17:45	11.18	9.65	9.65	11.18	11.18	8.64	10.41	19.56	8.64	9.65	8.89	9.65	10.69	9.65
9/19/17 14:30	8.13	7.87	5.08	7.87	6.60	6.10	7.87	10.16	9.65	7.11	7.37	6.35	7.51	7.62
10/8/17 0:30	58.42	56.13	65.53	63.25	nd	48.01	49.02	89.15	52.07	59.44	nd	63.25	60.43	58.93
10/10/17 17:45	23.11	24.89	23.88	24.38	nd	20.32	23.11	34.54	nd	24.38	nd	23.37	24.67	23.88
10/15/17 16:00	22.61	26.67	14.73	25.65	nd	23.37	23.37	30.99	nd	24.64	nd	23.11	23.90	23.37
10/23/17 8:45	40.13	46.74	43.43	45.72	nd	35.81	39.88	61.98	nd	43.69	nd	42.42	44.42	43.43
10/28/17 4:45	10.92	13.72	14.48	13.72	10.16	17.02	15.24	24.38	10.92	13.97	11.68	11.43	13.97	13.72
10/29/17 15:30	0.76	0.76	0.76	1.02	0.76	1.02	1.27	1.52	1.02	0.76	1.02	0.76	0.95	0.89
11/3/17 10:30	2.03	2.54	2.79	2.29	2.29	2.03	2.03	1.52	1.27	2.29	1.78	1.78	2.05	2.03
11/6/17 4:30	7.37	7.87	2.79	7.11	7.62	6.86	6.60	6.60	5.33	7.62	5.59	7.11	6.54	6.99
11/7/17 4:30	3.30	4.57	3.56	4.32	4.32	2.54	3.30	3.56	3.56	4.32	3.30	4.83	3.79	3.56
11/8/17 4:15	1.78	2.54	2.29	2.54	2.54	2.03	2.03	1.78	2.03	2.54	2.29	2.29	2.22	2.29
11/13/17 1:00	0.76	1.02	0.25	0.76	0.76	0.25	0.51	0.76	0.51	1.02	0.51	0.51	0.64	0.64
11/15/17 17:00	1.27	2.03	1.78	2.03	2.29	1.02	1.02	nd	1.52	2.03	1.52	1.27	1.62	1.52
11/18/17 19:45	12.45	13.46	4.32	12.95	20.57	10.67	9.40	nd	8.13	11.68	10.67	11.18	11.41	11.18
11/30/17 17:00	1.78	2.29	0.00	2.29	0.76	1.27	2.03	0.00	1.02	2.29	1.78	1.27	1.40	1.52
12/5/17 9:00	11.18	13.97	2.54	14.48	7.11	10.67	10.41	nd	9.14	12.19	10.67	12.95	10.48	10.67
12/22/17 14:45	15.24	19.05	20.83	19.05	5.33	15.49	15.75	nd	17.02	2.29	16.00	13.97	14.55	15.75
12/23/17 6:30	28.96	31.24	27.69	32.77	17.78	27.18	28.45	nd	20.07	19.81	25.40	22.10	25.58	27.18
12/24/17 19:00	0.00	nd	0.00	0.25	0.00	nd	nd	0.00	0.00	0.25	0.25	0.00	0.08	0.00
1/8/18 9:15	6.10	9.14	nd	8.89	3.81	8.13	5.84	nd	6.86	8.89	9.14	6.10	7.29	7.49
1/11/18 16:30	2.03	2.29	2.29	2.03	0.00	1.27	1.78	nd	1.52	2.03	1.78	1.52	1.69	1.78
1/11/18 23:15	2.79	4.06	4.06	3.56	nd	2.29	2.29	nd	3.56	3.56	3.30	3.05	3.25	3.43
1/12/18 12:15	7.62	10.67	8.13	10.67	0.51	7.87	7.62	nd	5.84	10.16	9.65	7.11	7.80	7.87
1/27/18 19:15	8.64	12.45	15.24	11.68	nd	8.64	2.79	nd	11.43	11.68	10.41	9.40	10.24	10.92
2/1/18 13:00	7.37	9.65	10.16	nd	nd	9.40	6.10	nd	5.33	9.91	9.65	7.37	8.33	9.40

Table B.2 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10D-1	10D-2	10D-3	10D-4	10D-5	10D-6	10D-7	10D-8	10D-9	10D-10	10D-11	10D-12		
2/4/18 4:15	15.49	15.24	21.84	nd	nd	13.97	13.46	nd	16.76	16.51	17.02	17.53	16.43	16.51
2/4/18 20:30	0.00	0.25	0.00	0.25	0.25	0.25	0.00	0.00	0.00	0.00	nd	0.00	0.09	0.00
2/6/18 22:30	22.61	25.65	29.46	nd	nd	20.57	20.57	nd	26.92	27.43	nd	9.40	22.83	24.13
2/10/18 6:00	52.83	66.29	74.42	nd	60.71	44.45	57.66	nd	56.90	66.29	55.63	52.58	58.78	57.28
2/11/18 16:45	6.60	8.13	7.87	nd	5.84	7.11	7.11	nd	3.81	8.38	7.87	6.35	6.91	7.11
2/14/18 19:00	0.25	0.51	0.25	0.25	0.25	0.51	0.51	0.51	0.25	0.25	nd	0.25	0.35	0.25
2/16/18 6:30	12.45	15.49	nd	nd	11.18	12.95	14.73	nd	8.64	15.75	12.95	11.18	12.81	12.95
2/17/18 11:45	17.27	19.56	nd	nd	17.78	14.48	18.29	nd	16.51	21.34	17.27	15.49	17.55	17.27
2/24/18 6:15	nd	11.18	10.16	nd	9.91	7.11	8.38	nd	8.89	9.40	8.89	7.87	9.09	8.89
2/24/18 22:00	0.00	3.05	3.30	0.25	2.79	2.03	2.54	nd	2.29	2.79	2.29	2.29	2.15	2.29
2/25/18 2:45	2.54	17.02	10.41	3.05	13.97	13.46	14.73	nd	11.43	14.22	13.72	13.21	11.61	13.46
2/28/18 6:45	1.52	2.54	2.79	0.25	2.29	1.52	0.25	nd	2.29	0.76	2.29	1.52	1.64	1.52
3/1/18 0:15	13.97	15.75	16.76	nd	13.46	13.46	9.91	nd	11.94	7.37	12.95	11.43	12.70	13.21
3/6/18 5:15	1.78	3.05	3.05	nd	2.54	1.78	1.02	nd	0.00	0.25	2.29	1.52	1.73	1.78
3/11/18 21:00	6.60	8.89	9.14	nd	5.84	5.84	7.37	nd	6.35	6.35	8.13	5.84	7.04	6.48
3/14/18 12:30	1.27	1.78	0.76	nd	0.51	0.25	0.51	nd	0.25	0.51	1.27	0.51	0.76	0.51
3/17/18 18:00	0.25	nd	0.51	0.51	1.02	0.76	0.25	0.51	nd	0.51	0.51	0.51	0.53	0.51
3/19/18 19:30	6.86	9.40	9.40	nd	8.64	6.86	6.86	nd	7.62	6.86	7.62	6.60	7.67	7.24
3/20/18 18:30	0.51	1.52	0.76	nd	0.76	0.76	0.76	nd	0.25	0.51	1.27	0.25	0.74	0.76
3/21/18 11:00	1.02	1.52	0.51	nd	0.00	0.00	0.25	nd	0.51	0.25	0.51	0.00	0.46	0.38
3/24/18 8:30	24.38	43.43	43.18	nd	36.83	30.99	38.61	nd	35.31	28.45	41.66	43.94	36.68	37.72
3/28/18 9:45	13.46	20.57	20.32	7.87	34.80	16.26	16.26	nd	16.26	19.05	18.03	15.49	18.03	16.26
3/29/18 1:00	3.56	5.59	6.10	nd	7.62	3.56	4.32	nd	5.08	5.08	6.35	4.06	5.13	5.08
3/29/18 17:00	10.67	15.49	12.95	nd	20.57	10.41	12.45	nd	11.94	13.97	12.70	13.46	13.46	12.83
3/30/18 4:00	1.78	3.05	1.02	nd	3.05	1.27	1.78	nd	1.02	2.54	2.54	1.52	1.96	1.78
4/1/18 20:30	14.48	23.37	22.35	nd	37.85	14.73	19.56	nd	17.27	19.05	22.10	15.49	20.62	19.30
4/3/18 23:45	18.03	37.59	20.32	30.99	37.08	26.92	33.27	nd	23.37	32.26	29.21	28.96	28.91	29.21
4/9/18 4:45	1.02	nd	0.51	1.02	1.27	1.52	0.51	1.52	1.52	1.52	0.51	1.02	1.09	1.02
4/15/18 7:00	2.79	13.97	7.62	13.46	23.11	7.62	11.68	nd	8.38	12.45	11.68	7.87	10.97	11.68
4/16/18 3:15	0.00	1.78	1.52	2.54	2.54	1.27	1.52	nd	0.76	2.03	1.78	0.76	1.50	1.52
4/19/18 0:00	0.51	2.29	1.02	2.29	2.29	0.76	1.52	nd	1.02	2.29	1.78	0.25	1.45	1.52
4/23/18 5:45	8.13	11.68	12.70	11.94	13.21	7.37	6.86	nd	11.68	10.67	10.67	8.64	10.32	10.67
4/24/18 4:30	2.54	1.02	12.70	12.19	14.99	3.30	12.70	nd	9.91	11.18	12.45	6.35	9.03	11.18
4/25/18 8:15	0.00	0.25	0.51	1.52	1.27	0.51	1.02	nd	0.76	1.27	1.27	0.51	0.81	0.76
4/26/18 19:00	0.25	0.00	1.78	2.03	1.52	0.00	1.02	nd	1.27	1.52	1.52	0.25	1.02	1.27
5/4/18 15:30	nd	3.05	4.06	5.08	9.65	1.52	5.33	nd	3.81	5.84	5.08	2.54	4.60	4.57

Table B.2 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10D-1	10D-2	10D-3	10D-4	10D-5	10D-6	10D-7	10D-8	10D-9	10D-10	10D-11	10D-12		
5/5/18 2:45	nd	nd	15.49	24.13	41.91	nd	22.10	nd	18.29	23.62	24.64	nd	24.31	23.62
5/6/18 7:00	nd	nd	1.52	3.56	6.86	nd	nd	nd	nd	1.27	3.05	nd	3.25	3.05
5/16/18 19:30	59.44	55.88	45.72	65.79	60.71	nd	74.42	nd	45.97	66.80	56.39	44.45	57.56	57.91
5/18/18 13:15	8.38	6.86	7.87	9.14	13.21	nd	4.57	4.32	4.32	6.86	8.89	2.29	6.97	6.86
5/18/18 23:30	6.35	4.06	nd	6.60	nd	nd	nd	nd	4.60	7.11	nd	0.76	4.92	5.48
5/19/18 16:00	6.86	5.84	nd	7.11	nd	nd	nd	nd	4.06	7.11	nd	nd	6.20	6.86
Mean	10.99	12.84	11.56	11.84	11.61	9.16	11.53	11.54	9.85	12.10	10.58	9.78		
Median	7.37	8.89	7.87	7.87	7.11	6.10	7.11	4.32	5.59	7.24	7.37	6.60		

[1]nd=no data.

Table B.3. Throughfall data for the 20-year old coniferous plot.[1]

Date/Time	Throughfall Collectors												Mean	Median
	20C-1	20C-2	20C-3	20C-4	20C-5	20C-6	20C-7	20C-8	20C-9	20C-10	20C-11	20C-12		
5/18/17 14:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/19/17 6:45	77.47	38.10	33.53	48.26	33.27	36.83	35.31	46.23	46.99	37.85	26.67	42.16	41.89	37.97
5/19/17 23:00	10.92	6.60	6.86	8.64	7.87	7.62	6.60	7.37	7.87	8.13	7.37	7.87	7.81	7.75
5/20/17 20:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/21/17 5:45	4.57	1.52	1.52	3.56	1.78	1.78	2.03	1.78	0.76	2.29	2.54	1.52	2.14	1.78
5/23/17 14:00	10.16	6.35	6.10	9.91	5.08	5.84	7.37	7.87	5.84	6.86	7.62	6.60	7.13	6.73
5/24/17 11:00	nd	nd	11.43	13.97	10.92	nd	12.95	10.16	16.76	13.72	12.70	12.95	12.84	12.95
5/24/17 19:00	0.00	0.00	0.00	0.25	0.00	nd	0.00	0.25	0.25	nd	0.25	0.00	0.10	0.00
5/25/17 8:00	nd	nd	6.60	11.43	8.89	nd	6.60	6.35	5.59	11.18	9.14	7.87	8.18	7.87
5/27/17 17:30	nd	nd	5.08	5.08	8.89	nd	4.06	10.67	6.86	8.13	10.41	11.18	7.82	8.13
5/30/17 20:15	nd	nd	1.52	2.79	1.52	nd	1.78	1.78	3.05	2.03	2.29	3.30	2.23	2.03
5/31/17 16:00	nd	nd	1.27	2.54	2.03	nd	2.03	2.29	2.79	2.54	2.79	3.30	2.40	2.54
6/4/17 23:00	nd	19.05	13.21	21.08	16.51	21.84	17.78	21.59	16.26	nd	21.84	15.24	18.44	18.42
6/12/17 16:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/13/17 17:00	2.29	1.02	0.76	1.52	0.76	0.76	1.27	0.51	0.25	1.52	1.78	0.51	1.08	0.89
6/14/17 12:15	8.89	2.79	3.30	7.87	4.06	2.79	4.83	3.30	3.05	6.10	5.08	4.83	4.74	4.45
6/15/17 16:00	1.78	0.25	0.51	1.27	0.51	1.27	1.02	0.76	0.00	0.76	1.02	0.51	0.80	0.76
6/19/17 3:00	25.40	9.91	11.94	19.81	13.21	11.43	14.48	11.68	10.92	19.05	15.49	13.46	14.73	13.34
6/22/17 13:00	10.67	4.32	5.33	10.92	5.08	5.33	7.62	4.57	3.05	12.19	8.64	5.08	6.90	5.33
6/23/17 17:30	1.27	2.79	2.54	6.35	3.30	4.06	4.57	4.06	2.03	6.10	5.59	nd	3.88	4.06
6/24/17 2:45	nd	0.51	0.51	1.27	0.76	0.51	0.76	0.76	0.51	1.02	1.02	0.51	0.74	0.76
7/4/17 9:30	8.64	7.37	4.83	9.40	4.57	6.10	7.62	6.10	1.52	7.37	8.13	6.60	6.52	6.99
7/5/17 15:45	nd	1.78	1.52	3.81	2.54	1.78	2.79	2.03	1.27	2.79	2.29	2.79	2.31	2.29
7/6/17 15:15	nd	0.51	1.02	3.05	1.52	0.76	1.78	0.76	0.25	2.29	2.29	1.52	1.43	1.52
7/7/17 23:15	nd	3.05	2.54	3.56	2.29	4.32	3.81	2.54	1.27	3.81	3.81	3.56	3.14	3.56
7/14/17 20:45	nd	14.48	14.48	18.29	20.07	21.34	18.54	13.97	17.53	16.76	16.76	24.13	17.85	17.53
7/23/17 3:00	nd	4.32	2.54	3.30	3.56	5.33	5.59	4.32	3.05	3.81	5.08	3.81	4.06	3.81
7/24/17 16:30	nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/27/17 13:30	nd	9.91	9.14	14.22	13.97	11.68	16.00	7.11	8.89	13.21	12.95	16.76	12.17	12.95
7/28/17 12:30	nd	15.75	18.54	19.30	18.03	21.34	18.29	13.72	16.26	19.81	17.02	24.64	18.43	18.29
8/4/17 11:45	nd	6.60	7.87	13.21	10.16	9.40	12.70	7.62	10.67	11.18	9.65	10.92	10.00	10.16
8/10/17 2:15	2.54	1.02	1.02	2.03	1.02	0.76	1.27	1.27	0.51	1.52	1.27	1.02	1.27	1.14
8/10/17 10:15	5.08	2.03	2.54	3.81	2.54	2.29	3.05	2.54	2.29	3.56	2.29	2.54	2.88	2.54
8/14/17 6:45	4.57	3.56	2.79	4.32	2.03	2.54	2.79	3.81	2.79	3.05	3.05	2.54	3.15	2.92
8/14/17 17:00	1.27	0.51	0.51	0.76	0.25	0.25	0.76	0.76	0.25	0.51	0.76	0.51	0.59	0.51

Table B.3 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	20C-1	20C-2	20C-3	20C-4	20C-5	20C-6	20C-7	20C-8	20C-9	20C-10	20C-11	20C-12		
8/14/17 23:00	14.73	7.11	7.62	11.94	8.89	8.38	10.67	8.89	8.89	10.41	8.64	8.38	9.55	8.89
8/15/17 5:30	4.83	4.06	4.32	7.11	4.06	3.56	4.57	5.33	4.57	4.83	4.83	4.57	4.72	4.57
8/16/17 12:00	3.30	0.51	0.76	0.51	0.25	1.52	1.02	1.02	0.51	0.51	0.51	1.02	0.95	0.64
8/18/17 4:30	10.92	3.56	5.33	9.91	8.13	4.83	6.86	4.57	6.10	7.37	7.11	7.11	6.82	6.99
8/22/17 16:15	22.10	13.21	12.19	12.45	15.49	16.76	13.21	12.19	12.95	13.72	12.45	16.26	14.41	13.21
8/28/17 12:45	2.03	1.27	1.27	2.29	1.02	0.76	1.52	2.03	1.02	1.52	1.78	1.27	1.48	1.40
9/1/17 2:30	15.24	13.97	11.68	9.40	12.19	15.75	nd	18.54	12.70	10.16	17.27	11.43	13.49	12.70
9/1/17 14:45	22.86	12.70	15.24	24.64	20.57	17.78	nd	18.80	21.08	22.61	20.57	22.61	19.95	20.57
9/5/17 9:30	22.35	10.41	9.40	18.54	11.94	10.67	nd	16.26	14.48	16.51	9.65	14.99	14.11	14.48
9/11/17 20:30	0.51	0.25	0.00	0.00	0.00	0.51	0.25	1.02	0.00	0.00	0.51	0.00	0.25	0.13
9/13/17 17:45	8.64	3.56	3.81	7.11	4.32	4.06	5.08	7.62	3.56	6.10	5.33	4.06	5.27	4.70
9/19/17 14:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/8/17 0:30	nd	49.53	49.28	44.70	39.12	33.78	61.98	57.40	29.46	37.85	51.31	27.94	43.85	44.70
10/10/17 17:45	nd	13.97	10.67	17.02	13.72	13.46	11.68	15.49	15.24	8.38	14.73	11.18	13.23	13.72
10/15/17 16:00	12.95	10.67	11.94	11.94	14.48	14.48	11.94	11.43	15.75	11.94	10.92	14.22	12.72	11.94
10/23/17 8:45	48.77	27.69	26.42	39.37	32.77	28.96	31.75	42.42	30.73	36.32	37.08	31.24	34.46	32.26
10/28/17 4:45	18.03	8.64	6.86	10.41	7.62	10.41	9.40	6.86	4.57	9.65	8.13	9.65	9.19	9.02
10/29/17 15:30	0.51	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.28	0.25
11/3/17 10:30	4.06	0.76	1.27	3.30	1.78	1.02	1.78	1.02	1.52	2.03	1.27	2.29	1.84	1.65
11/6/17 4:30	5.33	2.03	1.02	4.06	0.25	2.79	1.52	2.79	1.78	3.56	2.29	2.79	2.52	2.54
11/7/17 4:30	2.29	2.03	1.27	1.02	0.25	2.29	1.78	2.54	0.25	1.02	1.78	1.02	1.46	1.52
11/8/17 4:15	2.79	2.29	1.27	1.02	0.25	2.29	1.52	1.78	0.25	1.27	1.27	1.78	1.48	1.40
11/13/17 1:00	0.51	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.25	0.25	0.00	0.25	0.15	0.13
11/15/17 17:00	1.02	0.00	0.25	1.02	0.25	0.00	0.25	0.51	0.00	0.76	0.51	0.25	0.40	0.25
11/18/17 19:45	6.86	10.16	6.60	6.86	6.35	11.68	5.08	6.10	6.86	8.89	7.11	7.11	7.47	6.86
11/30/17 17:00	0.51	0.25	0.25	0.25	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.13
12/5/17 9:00	9.40	5.59	4.83	8.89	7.62	7.62	3.30	7.62	5.59	8.64	6.86	7.11	6.92	7.37
12/22/17 14:45	18.29	12.45	nd	16.51	10.16	9.91	8.89	14.48	7.37	11.43	13.21	9.65	12.03	11.43
12/23/17 6:30	27.69	18.80	nd	26.16	16.76	21.59	15.24	22.86	16.00	9.65	17.02	18.54	19.12	18.54
12/24/17 19:00	0.25	0.25	nd	0.25	0.25	0.25	0.25	0.00	0.25	nd	nd	nd	0.22	0.25
1/8/18 9:15	7.37	2.54	nd	6.35	5.08	4.32	3.30	7.11	5.08	nd	4.83	2.29	4.83	4.95
1/11/18 16:30	0.00	0.00	nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/11/18 23:15	1.52	2.54	nd	2.54	2.54	1.02	3.30	1.27	0.25	1.52	2.29	1.52	1.85	1.52
1/12/18 12:15	12.45	5.34	nd	8.13	7.62	7.37	6.35	4.57	6.86	9.14	6.35	8.13	7.48	7.37
1/27/18 19:15	10.41	4.06	nd	8.89	4.57	4.83	5.08	9.91	5.08	8.64	7.11	5.84	6.77	5.84
2/1/18 13:00	7.11	5.59	nd	6.10	7.37	7.37	5.08	5.59	7.62	6.60	3.81	8.13	6.40	6.60

Table B.3 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	20C-1	20C-2	20C-3	20C-4	20C-5	20C-6	20C-7	20C-8	20C-9	20C-10	20C-11	20C-12		
2/4/18 4:15	16.26	15.49	nd	18.03	12.45	12.70	11.18	18.29	9.91	18.80	14.22	14.73	14.73	14.73
2/4/18 20:30	0.76	0.25	nd	0.25	0.76	0.25	0.25	0.25	0.25	0.51	0.51	0.25	0.39	0.25
2/6/18 22:30	29.72	20.07	nd	28.96	19.56	20.57	21.34	32.51	14.99	24.38	27.18	23.11	23.85	23.11
2/10/18 6:00	69.60	40.64	nd	66.55	44.45	39.88	44.70	77.47	29.46	47.75	53.59	51.05	51.38	47.75
2/11/18 16:45	6.60	3.30	nd	2.79	2.54	3.05	2.29	3.81	3.05	2.79	1.78	3.81	3.26	3.05
2/14/18 19:00	1.78	0.00	nd	1.52	1.02	0.51	1.02	2.03	0.51	1.52	1.27	0.51	1.06	1.02
2/16/18 6:30	10.67	7.62	nd	9.91	9.14	10.41	8.13	9.65	9.91	11.18	6.35	11.68	9.51	9.91
2/17/18 11:45	22.86	19.56	nd	18.29	13.72	16.76	13.97	23.11	11.18	11.94	11.94	16.26	16.33	16.26
2/24/18 6:15	7.37	1.27	nd	5.59	2.29	2.03	2.29	5.33	1.78	2.54	3.56	2.03	3.28	2.29
2/24/18 22:00	1.52	0.51	nd	1.78	1.27	1.27	1.02	2.03	1.27	nd	0.25	1.02	1.19	1.27
2/25/18 2:45	6.35	8.64	nd	12.45	3.30	10.41	8.13	14.73	9.14	nd	4.32	9.40	8.69	8.89
2/28/18 6:45	1.78	0.51	nd	1.02	0.25	0.51	0.76	1.27	0.00	1.02	1.27	0.51	0.81	0.76
3/1/18 0:15	13.97	7.11	nd	12.19	9.40	9.40	6.86	14.99	5.59	13.46	11.18	8.89	10.28	9.40
3/6/18 5:15	2.03	0.25	nd	2.54	1.27	0.51	1.52	1.78	0.76	2.03	1.27	1.02	1.36	1.27
3/11/18 21:00	4.83	3.81	nd	4.06	3.56	5.08	4.06	5.33	3.05	4.06	3.81	4.32	4.18	4.06
3/14/18 12:30	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3/17/18 18:00	0.25	0.00	nd	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.07	0.00
3/19/18 19:30	8.13	5.84	nd	1.52	3.81	3.81	5.84	5.84	2.79	4.32	3.56	3.81	4.48	3.81
3/20/18 18:30	0.76	0.25	nd	0.25	0.76	0.76	0.25	0.25	0.25	0.25	0.00	0.51	0.39	0.25
3/21/18 11:00	0.00	0.00	nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/24/18 8:30	50.04	45.21	nd	19.30	42.93	25.91	37.85	32.26	28.45	26.67	27.43	25.91	32.90	28.45
3/28/18 9:45	17.02	7.11	nd	11.68	9.65	7.62	7.37	13.97	8.64	11.94	10.16	9.40	10.41	9.65
3/29/18 1:00	4.83	2.03	nd	2.54	1.78	2.54	1.78	2.54	1.52	1.78	1.52	2.03	2.26	2.03
3/29/18 17:00	13.46	7.37	nd	12.19	9.65	10.41	5.59	13.21	8.13	11.68	8.89	8.64	9.93	9.65
3/30/18 4:00	0.51	0.25	nd	0.76	1.27	0.76	0.51	0.51	1.02	0.51	0.51	0.76	0.67	0.51
4/1/18 20:30	20.07	15.49	nd	14.73	7.37	19.30	12.45	18.80	12.19	11.94	10.92	14.73	14.36	14.73
4/3/18 23:45	12.95	16.00	nd	12.45	14.73	20.07	8.89	20.07	15.75	16.26	11.43	13.46	14.73	14.73
4/9/18 4:45	1.27	2.03	nd	0.51	1.02	1.27	2.03	2.29	0.76	1.02	1.27	1.02	1.32	1.27
4/15/18 7:00	6.60	5.33	nd	8.13	6.60	6.60	3.81	8.13	6.86	7.11	2.79	6.60	6.23	6.60
4/16/18 3:15	0.25	0.25	nd	0.25	0.76	0.51	0.51	0.25	0.51	0.25	0.25	0.25	0.37	0.25
4/19/18 0:00	0.25	0.25	nd	0.51	1.27	0.76	0.51	0.25	0.76	0.25	0.25	0.25	0.48	0.25
4/23/18 5:45	2.54	5.33	nd	4.83	4.83	2.54	3.05	2.54	0.76	2.54	3.05	3.56	3.23	3.05
4/24/18 4:30	4.06	2.54	nd	3.30	2.03	4.83	2.29	4.32	2.29	3.05	1.78	3.05	3.05	3.05
4/25/18 8:15	0.00	0.00	nd	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.07	0.00
4/26/18 19:00	0.25	1.02	nd	0.76	0.25	0.25	0.51	1.02	0.00	0.51	0.76	0.25	0.51	0.51
5/4/18 15:30	3.05	3.30	nd	4.06	5.08	4.06	2.54	4.06	5.59	1.27	1.27	4.06	3.49	4.06

Table B.3 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	20C-1	**20C-2**	**20C-3**	**20C-4**	**20C-5**	**20C-6**	**20C-7**	**20C-8**	**20C-9**	**20C-10**	**20C-11**	**20C-12**		
5/5/18 2:45	29.46	23.88	nd	20.57	17.53	23.62	21.59	28.70	20.57	nd	nd	23.11	23.23	23.11
5/6/18 7:00	2.54	1.52	nd	1.02	1.27	1.78	1.02	1.52	1.52	1.78	nd	1.78	1.57	1.52
5/16/18 19:30	23.88	10.67	nd	8.89	nd	14.48	10.92	14.48	11.94	10.92	14.48	12.45	13.31	12.19
5/18/18 13:15	24.64	13.46	nd	15.75	nd	10.92	17.02	16.26	12.70	13.21	18.29	11.94	15.42	14.61
5/18/18 23:30	7.11	3.30	nd	5.84	nd	3.30	4.06	4.32	5.59	5.84	5.33	5.08	4.98	5.21
5/19/18 16:00	2.79	1.78	nd	1.78	nd	nd	1.78	1.52	2.29	2.54	2.03	2.29	2.09	2.03
Mean	9.94	6.76	6.05	8.41	6.77	7.22	6.78	8.36	6.23	7.41	7.18	7.32		
Median	4.95	3.30	2.67	4.57	3.43	4.06	3.30	4.32	3.05	3.81	3.81	3.81		

[1]nd=no data.

Table B.4. Throughfall data for the 20-year old deciduous plot.[1]

Date/Time	Throughfall Collectors												Mean	Median
	20D-1	20D-2	20D-3	20D-4	20D-5	20D-6	20D-7	20D-8	20D-9	20D-10	20D-11	20D-12		
5/18/17 14:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/19/17 6:45	56.64	57.40	45.47	51.05	55.88	53.09	59.44	nd	48.01	nd	58.42	40.64	52.60	54.48
5/19/17 23:00	10.41	8.89	8.89	9.40	10.41	9.91	10.67	7.37	9.65	nd	11.18	5.33	9.28	9.65
5/20/17 20:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/21/17 5:45	4.32	3.30	3.30	4.83	4.57	4.06	5.84	3.30	3.81	nd	4.32	2.03	3.97	4.06
5/23/17 14:00	11.18	10.41	8.13	11.43	11.94	12.19	10.41	nd	8.13	nd	12.45	11.94	10.82	11.30
5/24/17 11:00	20.07	18.80	15.24	15.75	15.24	12.45	17.27	nd	12.70	nd	17.02	17.78	16.23	16.38
5/24/17 19:00	0.76	0.25	0.25	0.51	0.51	0.25	0.51	nd	0.25	nd	0.51	0.25	0.41	0.38
5/25/17 8:00	14.48	11.94	9.91	12.70	13.21	15.24	13.72	nd	8.89	nd	14.48	11.94	12.65	12.95
5/27/17 17:30	11.94	4.32	6.60	7.62	7.37	7.37	10.16	nd	1.78	nd	4.32	1.78	6.32	6.99
5/30/17 20:15	4.57	1.78	2.29	2.54	1.78	1.52	2.79	nd	0.25	nd	nd	0.76	2.03	1.78
5/31/17 16:00	4.06	3.56	2.29	2.03	2.03	1.27	3.56	nd	0.76	nd	nd	0.51	2.23	2.03
6/4/17 23:00	41.40	34.80	14.99	23.11	22.86	19.81	24.64	nd	30.99	nd	nd	32.77	27.26	24.64
6/12/17 16:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/13/17 17:00	nd	2.29	0.76	2.03	2.03	2.54	1.78	1.52	1.78	0.76	nd	1.78	1.73	1.78
6/14/17 12:15	nd	8.38	4.57	6.35	6.35	7.62	7.11	5.59	5.33	5.33	nd	9.65	6.63	6.35
6/15/17 16:00	nd	0.76	1.52	1.78	1.52	1.02	1.02	1.02	1.78	1.52	nd	0.76	1.27	1.27
6/19/17 3:00	nd	25.15	12.19	16.76	16.76	18.29	15.24	14.99	16.76	12.19	nd	20.57	16.89	16.76
6/22/17 13:00	nd	10.16	7.87	10.41	10.41	12.19	9.40	9.65	6.60	nd	nd	8.64	9.48	9.65
6/23/17 17:30	nd	7.37	5.59	7.11	6.60	8.13	6.10	5.08	6.60	nd	nd	4.57	6.35	6.60
6/24/17 2:45	nd	1.27	0.51	1.02	1.02	1.52	1.27	1.02	0.51	nd	nd	0.76	0.99	1.02
7/4/17 9:30	nd	8.89	6.60	12.70	9.14	9.40	10.16	7.62	9.91	3.81	nd	6.86	8.51	9.02
7/5/17 15:45	nd	3.81	3.05	3.30	3.56	3.56	3.30	2.79	3.30	1.78	nd	3.56	3.20	3.30
7/6/17 15:15	nd	3.05	2.03	2.29	2.79	2.79	2.79	1.27	2.03	0.76	nd	1.52	2.13	2.16
7/7/17 23:15	nd	6.10	3.56	5.08	5.33	5.33	5.59	3.56	4.83	0.51	nd	3.56	4.34	4.95
7/14/17 20:45	nd	26.16	14.73	20.07	21.08	26.16	14.73	14.22	21.59	8.13	nd	19.81	18.67	19.94
7/23/17 3:00	nd	5.08	5.08	5.84	4.57	7.11	5.84	3.56	5.33	2.29	nd	4.57	4.93	5.08
7/24/17 16:30	nd	0.51	0.00	0.00	0.25	0.51	0.00	0.25	0.25	0.00	nd	0.25	0.20	0.25
7/27/17 13:30	nd	18.29	12.70	17.02	14.99	17.02	16.26	12.45	14.22	4.57	nd	13.97	14.15	14.61
7/28/17 12:30	nd	17.27	14.73	17.27	14.48	20.57	16.00	16.26	12.95	nd	nd	16.51	16.23	16.26
8/4/17 11:45	nd	15.49	14.22	10.16	10.16	15.49	14.48	10.41	13.72	8.64	nd	12.19	12.50	12.95
8/10/17 2:15	2.54	2.54	1.27	1.78	2.03	2.03	4.32	1.02	2.54	1.27	2.29	1.52	2.10	2.03
8/10/17 10:15	4.83	5.33	2.03	4.32	3.81	3.56	9.65	2.54	4.32	2.54	3.81	2.03	4.06	3.81
8/14/17 6:45	4.32	5.59	2.29	4.32	nd	4.32	5.33	3.30	5.33	2.79	4.06	3.05	4.06	4.32
8/14/17 17:00	1.52	1.78	0.51	0.76	nd	1.02	nd	0.76	1.27	0.51	0.76	1.02	0.99	0.89

Table B.4 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	20D-1	20D-2	20D-3	20D-4	20D-5	20D-6	20D-7	20D-8	20D-9	20D-10	20D-11	20D-12		
8/14/17 23:00	13.21	15.49	6.10	nd	nd	8.64	nd	8.13	nd	2.79	11.18	7.87	9.18	8.38
8/15/17 5:30	3.56	9.14	3.05	nd	nd	5.33	nd	5.33	nd	1.02	5.08	5.33	4.73	5.21
8/16/17 12:00	nd	2.03	nd	nd	nd	1.78	nd	0.76	nd	0.25	1.02	1.02	1.14	1.02
8/18/17 4:30	nd	9.40	nd	nd	nd	7.37	nd	5.08	nd	2.03	7.37	0.76	5.33	6.22
8/22/17 16:15	nd	16.76	nd	nd	nd	17.53	nd	15.49	nd	14.99	6.86	nd	14.33	15.49
8/28/17 12:45	2.79	1.27	nd	nd	nd	2.03	nd	2.03	nd	1.27	1.52	1.52	1.78	1.52
9/1/17 2:30	nd	nd	nd	nd	nd	19.05	nd	10.16	nd	nd	22.61	nd	17.27	19.05
9/1/17 14:45	nd	nd	nd	nd	nd	23.62	nd	9.14	nd	nd	nd	nd	16.38	16.38
9/5/17 9:30	nd	nd	nd	nd	nd	17.78	nd	5.08	nd	nd	nd	nd	11.43	11.43
9/11/17 20:30	0.51	0.25	0.25	0.51	0.25	2.03	0.51	0.25	0.76	0.25	1.02	0.25	0.57	0.38
9/13/17 17:45	9.65	7.87	3.81	7.87	9.14	9.14	7.37	4.06	5.59	7.62	6.86	6.10	7.09	7.49
9/19/17 14:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/8/17 0:30	60.45	56.64	23.37	36.07	nd	45.72	nd	37.85	41.66	nd	42.93	nd	43.08	42.29
10/10/17 17:45	7.62	16.26	13.97	5.08	nd	18.54	nd	14.73	nd	nd	9.91	nd	12.30	13.97
10/15/17 16:00	7.62	16.76	12.70	11.18	nd	11.68	nd	16.76	12.45	nd	9.91	nd	12.38	12.07
10/23/17 8:45	40.64	38.86	30.48	43.69	38.61	34.29	45.97	38.10	28.45	28.70	44.20	41.66	37.80	38.74
10/28/17 4:45	16.00	16.51	11.43	9.40	4.83	7.87	10.16	15.75	9.14	4.06	12.19	10.41	10.65	10.29
10/29/17 15:30	0.51	0.51	0.51	0.51	0.25	0.25	0.25	0.51	0.51	0.25	0.51	0.00	0.38	0.51
11/3/17 10:30	3.81	4.32	2.03	2.54	2.29	2.29	1.78	3.30	2.03	1.52	3.56	2.03	2.62	2.29
11/6/17 4:30	4.32	4.83	4.32	4.32	3.30	3.81	4.57	4.06	3.05	1.78	4.32	3.56	3.85	4.19
11/7/17 4:30	3.30	2.29	1.27	2.29	1.02	1.78	3.30	0.76	1.02	1.27	2.79	1.27	1.86	1.52
11/8/17 4:15	4.32	2.03	1.02	2.03	0.25	1.27	2.54	1.02	1.02	1.02	2.54	1.52	1.71	1.40
11/13/17 1:00	1.02	1.02	0.76	0.76	0.51	1.02	0.25	0.51	0.76	0.51	0.76	0.51	0.70	0.76
11/15/17 17:00	1.52	1.02	1.27	1.27	1.27	1.52	1.27	1.02	1.02	0.51	0.51	1.02	1.10	1.14
11/18/17 19:45	11.43	12.19	19.05	12.19	12.19	11.68	13.46	12.70	10.92	6.60	11.94	11.68	12.17	12.07
11/30/17 17:00	0.00	1.27	1.02	1.02	0.76	1.27	0.76	0.76	0.76	0.51	1.52	0.76	0.87	0.76
12/5/17 9:00	8.64	9.40	11.94	9.65	10.16	10.92	11.18	12.70	9.40	4.06	11.43	9.14	9.88	9.91
12/22/17 14:45	14.99	12.95	12.19	11.94	13.97	13.21	13.72	13.72	12.45	10.16	15.24	12.19	13.06	13.08
12/23/17 6:30	22.61	22.35	23.11	19.81	22.61	21.84	23.11	23.37	22.35	20.57	24.64	23.88	22.52	22.61
12/24/17 19:00	0.51	0.76	0.51	0.76	0.76	1.02	1.02	0.25	0.76	0.25	0.76	0.51	0.66	0.76
1/8/18 9:15	7.11	7.87	6.35	6.10	8.13	6.86	7.37	6.10	5.59	5.59	7.37	6.10	6.71	6.60
1/11/18 16:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	nd	0.00	0.00	0.00	0.00
1/11/18 23:15	3.81	3.05	2.29	3.05	2.03	2.54	2.29	2.79	3.56	nd	3.81	2.79	2.91	2.79
1/12/18 12:15	10.16	10.16	8.64	9.65	10.67	9.40	9.40	8.64	9.65	nd	11.68	9.14	9.74	9.65
1/27/18 19:15	9.40	7.87	18.03	7.87	9.14	8.64	7.87	7.62	6.35	nd	10.16	8.89	9.26	8.64
2/1/18 13:00	7.87	8.89	9.40	7.37	6.86	7.11	7.37	8.13	7.37	nd	9.14	8.13	7.97	7.87

Table B.4 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	20D-1	20D-2	20D-3	20D-4	20D-5	20D-6	20D-7	20D-8	20D-9	20D-10	20D-11	20D-12		
2/4/18 4:15	17.02	13.97	10.16	14.73	15.24	12.95	16.00	14.73	14.73	nd	16.00	14.73	14.57	14.73
2/4/18 20:30	1.02	1.27	1.02	1.27	1.02	1.02	0.76	0.76	1.02	nd	1.02	1.27	1.04	1.02
2/6/18 22:30	28.70	25.40	20.07	23.88	25.91	24.64	25.40	21.08	20.83	nd	28.70	25.91	24.59	25.40
2/10/18 6:00	54.86	52.83	59.69	48.77	58.93	54.61	53.09	48.01	49.02	nd	60.71	52.58	53.92	53.09
2/11/18 16:45	6.60	5.08	4.83	5.33	6.10	4.57	4.83	4.06	4.32	nd	6.10	5.08	5.17	5.08
2/14/18 19:00	2.03	1.78	1.78	1.78	2.03	2.03	2.03	1.52	2.03	nd	1.52	1.52	1.82	1.78
2/16/18 6:30	12.70	12.70	12.70	11.43	12.19	11.94	12.45	12.45	12.19	nd	14.99	12.70	12.58	12.45
2/17/18 11:45	23.37	18.54	13.97	15.75	18.54	16.76	15.24	15.49	16.00	nd	20.57	19.30	17.60	16.76
2/24/18 6:15	6.60	6.10	19.05	6.60	7.11	6.86	6.86	5.59	6.60	nd	6.35	5.84	7.60	6.60
2/24/18 22:00	2.29	2.03	4.32	2.03	2.03	2.03	2.54	1.52	2.29	nd	2.54	2.03	2.33	2.03
2/25/18 2:45	13.21	13.21	13.46	14.22	14.22	13.97	14.73	13.21	13.97	nd	13.97	13.21	13.76	13.97
2/28/18 6:45	2.29	2.03	1.27	2.03	1.78	2.03	1.52	1.78	1.52	nd	2.03	1.78	1.82	1.78
3/1/18 0:15	12.19	10.41	9.65	12.45	12.19	13.21	12.70	11.43	11.43	nd	14.22	9.91	11.80	12.19
3/6/18 5:15	2.54	2.54	2.03	2.54	2.29	2.79	2.54	2.79	2.29	nd	2.79	2.03	2.47	2.54
3/11/18 21:00	6.60	7.11	6.86	6.35	7.87	7.11	7.37	6.60	7.87	nd	9.40	7.87	7.37	7.11
3/14/18 12:30	0.25	0.76	0.51	0.51	0.51	0.51	0.51	0.51	0.51	nd	0.76	0.25	0.51	0.51
3/17/18 18:00	0.51	0.25	0.51	0.51	0.51	0.51	0.51	0.51	0.51	nd	0.51	0.51	0.48	0.51
3/19/18 19:30	9.91	6.60	5.84	6.86	7.62	6.86	7.37	6.35	7.11	nd	7.87	6.35	7.16	6.86
3/20/18 18:30	1.27	1.27	1.02	1.52	1.52	1.27	1.02	1.02	0.76	nd	1.52	1.02	1.20	1.27
3/21/18 11:00	0.76	1.27	0.25	0.51	0.76	1.02	0.76	0.51	0.76	nd	1.52	0.76	0.81	0.76
3/24/18 8:30	43.94	33.53	28.96	33.78	33.53	33.02	34.54	33.53	31.24	nd	41.15	35.56	34.80	33.53
3/28/18 9:45	12.95	11.43	11.94	nd	13.21	13.97	13.72	12.70	11.94	nd	13.72	10.16	12.57	12.83
3/29/18 1:00	3.05	3.30	2.54	nd	2.79	3.05	3.05	2.29	2.29	nd	3.05	2.79	2.82	2.92
3/29/18 17:00	9.91	10.67	12.19	nd	11.68	12.70	12.19	12.70	10.16	nd	11.68	10.67	11.46	11.68
3/30/18 4:00	2.03	2.03	2.29	nd	2.03	2.03	2.03	1.78	1.52	nd	2.29	2.03	2.01	2.03
4/1/18 20:30	20.32	16.51	13.46	nd	17.02	16.51	16.00	14.73	15.24	nd	20.07	16.51	16.64	16.51
4/3/18 23:45	18.03	20.07	31.24	nd	19.30	20.57	20.57	22.61	19.56	nd	16.26	20.07	20.83	20.07
4/9/18 4:45	2.03	1.52	2.03	nd	1.52	1.78	2.03	1.27	1.52	nd	1.78	1.78	1.73	1.78
4/15/18 7:00	9.65	10.16	10.41	nd	10.41	10.92	11.18	11.43	9.91	nd	13.97	9.91	10.80	10.41
4/16/18 3:15	1.52	1.78	2.79	nd	1.52	1.78	1.52	1.52	1.52	nd	1.78	1.52	1.73	1.52
4/19/18 0:00	2.54	2.29	2.79	nd	2.29	2.54	2.29	2.03	2.79	nd	2.29	2.03	2.39	2.29
4/23/18 5:45	7.11	7.37	8.13	nd	7.11	7.87	6.60	6.60	7.37	nd	9.14	7.87	7.52	7.37
4/24/18 4:30	6.10	5.59	4.06	nd	5.84	5.59	5.59	5.08	5.59	nd	6.10	5.08	5.46	5.59
4/25/18 8:15	0.76	0.76	0.51	nd	0.51	0.51	0.51	0.25	0.76	nd	1.02	0.51	0.61	0.51
4/26/18 19:00	1.27	1.52	1.02	nd	1.52	1.52	2.03	0.76	1.27	nd	1.52	1.02	1.35	1.40
5/4/18 15:30	5.84	4.83	4.57	nd	5.59	6.35	5.33	7.37	6.35	nd	7.87	5.33	5.94	5.72

Table B.4 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	20D-1	20D-2	20D-3	20D-4	20D-5	20D-6	20D-7	20D-8	20D-9	20D-10	20D-11	20D-12		
5/5/18 2:45	31.75	29.21	21.84	nd	26.92	32.51	28.96	25.15	29.46	nd	30.99	27.69	28.45	29.08
5/6/18 7:00	2.79	2.29	1.78	nd	2.03	2.79	2.29	1.52	2.03	nd	3.30	2.29	2.31	2.29
5/16/18 19:30	24.13	13.97	8.38	16.00	17.02	23.62	16.00	11.43	15.75	nd	20.32	15.24	16.53	16.00
5/18/18 13:15	25.15	17.53	8.89	20.07	21.34	25.15	20.83	15.24	18.54	nd	19.81	14.22	18.80	19.81
5/18/18 23:30	7.87	6.86	2.79	6.60	7.37	7.62	7.87	4.57	6.60	nd	7.62	6.35	6.56	6.86
5/19/18 16:00	4.57	4.06	1.78	3.56	4.06	4.32	4.32	4.32	3.56	nd	4.32	3.56	3.86	4.06
Mean	10.21	9.48	7.88	8.82	8.63	9.47	8.93	7.64	8.19	3.89	9.80	7.81		
Median	5.97	5.84	4.45	5.84	5.59	6.86	5.84	4.83	5.33	1.52	6.10	4.06		

[1]nd=no data.

Table B.5. Throughfall data for the 100-year old coniferous plot.[1]

Date/Time	Throughfall Collectors												Mean	Median
	100C-1	100C-2	100C-3	100C-4	100C-5	100C-6	100C-7	100C-8	100C-9	100C-10	100C-11	100C-12		
5/18/17 14:30	0.76	0.00	0.76	0.51	0.00	0.25	0.25	0.25	0.00	0.25	0.25	nd	0.30	0.25
5/19/17 6:45	56.39	62.99	68.07	50.80	42.93	49.78	47.75	69.09	33.27	52.58	58.93	nd	53.87	52.58
5/19/17 23:00	3.81	5.33	5.33	3.81	3.05	3.56	3.81	3.81	2.54	4.83	nd	nd	3.99	3.81
5/20/17 20:30	22.35	25.15	27.43	19.81	19.30	17.78	20.32	27.18	19.05	18.80	nd	nd	21.72	20.07
5/21/17 5:45	5.33	6.35	7.37	5.33	4.83	5.84	4.83	7.11	3.56	5.33	nd	nd	5.59	5.33
5/23/17 14:00	8.89	7.11	11.43	8.13	4.06	6.60	8.38	8.89	nd	9.40	nd	nd	8.10	8.38
5/24/17 11:00	12.70	14.48	14.22	12.95	9.40	12.95	13.72	17.02	nd	12.19	nd	nd	13.29	12.95
5/24/17 19:00	1.52	1.52	2.54	1.02	1.02	1.52	1.27	2.54	nd	1.02	nd	nd	1.55	1.52
5/25/17 8:00	nd	16.00	14.22	10.67	13.97	12.70	12.45	13.72	nd	nd	nd	nd	13.39	13.72
5/27/17 17:30	nd	8.13	5.59	8.64	7.37	7.37	6.35	3.81	nd	nd	nd	nd	6.75	7.37
5/30/17 20:15	nd	nd	nd	3.81	2.79	nd	2.29	nd	nd	nd	nd	nd	2.96	2.79
5/31/17 16:00	nd	nd	nd	9.65	10.16	nd	7.37	nd	nd	nd	nd	nd	9.06	9.65
6/4/17 23:00	nd	nd	nd	10.92	8.64	nd	13.97	nd	nd	nd	nd	nd	11.18	10.92
6/12/17 16:30	7.37	6.86	6.86	5.84	5.33	5.84	4.57	6.60	4.06	6.10	6.10	6.10	5.97	6.10
6/13/17 17:00	11.94	15.24	14.22	11.43	9.91	12.45	9.14	11.68	7.62	13.21	14.22	11.43	11.87	11.81
6/14/17 12:15	nd	18.29	12.70	12.19	11.68	15.24	13.21	16.76	9.40	18.29	18.80	12.95	14.50	13.21
6/15/17 16:00	nd	12.95	nd	8.38	9.65	9.14	9.14	8.89	nd	8.64	9.65	8.38	9.43	9.14
6/19/17 3:00	nd	nd	nd	nd	nd	19.30	6.35	nd	nd	15.75	nd	nd	13.80	15.75
6/22/17 13:00	nd	nd	nd	nd	nd	9.91	2.54	nd	nd	3.05	nd	nd	5.16	3.05
6/23/17 17:30	nd	nd	nd	nd	nd	6.86	nd	nd	nd	nd	nd	nd	6.86	6.86
6/24/17 2:45	nd	nd	nd	nd	nd	0.76	nd	nd	nd	nd	nd	nd	0.76	0.76
7/4/17 9:30	5.59	3.05	6.10	4.57	2.79	4.83	3.30	5.84	2.03	5.08	4.57	4.06	4.32	4.57
7/5/17 15:45	14.99	16.51	16.76	11.18	12.70	15.49	12.95	15.75	12.45	13.46	nd	14.48	14.25	14.48
7/6/17 15:15	5.59	5.33	7.11	4.57	5.08	5.59	3.81	5.59	2.79	5.33	nd	5.59	5.13	5.33
7/7/17 23:15	6.10	5.08	6.86	2.03	4.32	5.59	5.08	6.60	3.81	7.62	nd	4.06	5.20	5.08
7/14/17 20:45	nd	16.51	12.95	12.45	12.95	14.99	11.43	16.26	11.68	14.48	nd	12.45	13.61	12.95
7/23/17 3:00	13.72	14.22	12.70	12.95	12.95	13.46	11.18	16.51	10.16	15.24	nd	12.95	13.28	12.95
7/24/17 16:30	2.79	2.29	3.05	2.29	1.78	2.54	2.54	2.79	1.27	4.32	nd	2.29	2.54	2.54
7/27/17 13:30	nd	20.57	24.89	nd	nd	22.61	nd	17.53	10.16	17.53	nd	nd	18.88	19.05
7/28/17 12:30	nd	4.32	21.59	nd	5.59	14.73	nd	16.51	nd	12.19	nd	nd	12.49	13.46
8/4/17 11:45	nd	3.30	6.86	nd	3.81	6.35	nd	6.86	3.05	5.84	nd	nd	5.15	5.84
8/10/17 2:15	5.59	nd	9.14	5.08	3.81	nd	4.83	5.08	4.06	5.84	6.86	5.84	5.61	5.33
8/10/17 10:15	6.10	nd	9.40	4.32	4.06	nd	6.10	7.37	4.83	7.11	6.35	6.60	6.22	6.22
8/14/17 6:45	6.86	9.40	nd	nd	nd	nd	5.84	7.37	3.81	7.62	8.13	nd	7.00	7.37
8/14/17 17:00	3.30	nd	4.32	nd	nd	nd	2.54	3.81	2.29	1.27	3.81	nd	3.05	3.30

Table B.5 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	100C-1	100C-2	100C-3	100C-4	100C-5	100C-6	100C-7	100C-8	100C-9	100C-10	100C-11	100C-12		
8/14/17 23:00	3.81	nd	3.81	nd	nd	nd	3.56	3.81	1.78	0.76	3.05	nd	2.94	3.56
8/15/17 5:30	5.33	nd	7.37	nd	nd	nd	6.35	4.32	4.32	4.83	7.87	nd	5.77	5.33
8/16/17 12:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8/18/17 4:30	1.78	nd	3.30	nd	nd	nd	2.54	2.03	2.03	3.56	3.05	nd	2.61	2.54
8/22/17 16:15	3.81	nd	14.48	nd	nd	nd	14.48	nd	20.57	16.51	33.02	nd	17.15	15.49
8/28/17 12:45	5.33	nd	5.08	nd	nd	nd	5.08	6.10	2.54	6.10	5.33	nd	5.08	5.33
9/1/17 2:30	nd	nd	nd	nd	nd	nd	12.95	nd	nd	nd	16.51	nd	14.73	14.73
9/1/17 14:45	nd	nd	nd	nd	nd	nd	14.99	nd	nd	nd	20.83	nd	17.91	17.91
9/5/17 9:30	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
9/11/17 20:30	0.76	0.25	1.27	0.51	0.25	0.51	0.51	0.51	0.25	0.76	1.02	0.51	0.59	0.51
9/13/17 17:45	5.08	6.10	6.60	5.08	3.56	5.84	5.84	3.81	3.56	6.86	6.10	4.57	5.25	5.46
9/19/17 14:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.02	0.00
10/8/17 0:30	42.94	43.69	nd	nd	35.05	40.39	39.37	32.51	nd	51.82	56.64	52.07	43.83	42.94
10/10/17 17:45	9.91	3.30	nd	nd	3.05	2.79	2.03	nd	7.87	2.54	nd	2.54	4.25	2.92
10/15/17 16:00	11.18	0.51	nd	nd	0.25	3.30	nd	nd	nd	0.51	nd	1.02	2.79	0.76
10/23/17 8:45	40.39	45.97	42.93	27.94	33.02	40.13	31.24	34.04	24.64	nd	39.88	36.07	36.02	36.07
10/28/17 4:45	8.38	11.43	2.54	8.13	5.08	8.89	4.57	13.97	4.83	11.68	11.68	8.64	8.32	8.51
10/29/17 15:30	0.25	0.51	0.25	0.25	0.25	0.25	0.00	0.51	0.25	0.00	0.00	0.25	0.23	0.25
11/3/17 10:30	0.25	0.25	0.25	0.25	0.00	0.25	0.25	1.78	0.00	0.51	0.51	0.25	0.38	0.25
11/6/17 4:30	2.79	4.06	3.05	0.51	2.03	3.05	2.54	5.33	2.29	3.05	3.56	3.30	2.96	3.05
11/7/17 4:30	1.27	1.02	1.27	0.51	0.51	1.02	0.25	2.54	0.51	2.03	1.78	1.02	1.14	1.02
11/8/17 4:15	1.78	1.02	1.02	0.25	0.51	1.02	0.25	2.29	0.76	2.03	1.78	1.02	1.14	1.02
11/13/17 1:00	0.25	0.76	0.25	0.51	0.25	0.76	0.51	1.02	0.25	1.27	0.76	0.76	0.61	0.64
11/15/17 17:00	1.02	0.76	1.02	0.76	0.25	0.76	0.51	1.02	0.00	0.76	1.02	0.76	0.72	0.76
11/18/17 19:45	11.18	13.46	13.97	11.18	12.95	12.70	9.91	12.45	10.41	10.92	12.70	11.43	11.94	11.94
11/30/17 17:00	0.51	0.25	0.51	0.51	0.25	0.25	0.00	0.51	0.00	0.25	0.51	0.51	0.34	0.38
12/5/17 9:00	10.92	13.97	11.68	9.14	11.68	10.67	7.62	13.21	6.86	9.91	12.70	11.43	10.82	11.18
12/22/17 14:45	16.00	14.22	11.18	16.00	13.97	16.76	11.43	20.07	8.38	17.27	19.30	17.53	15.18	16.00
12/23/17 6:30	23.62	30.23	15.49	24.89	20.83	29.21	22.10	32.26	16.76	25.65	29.21	27.69	24.83	25.27
12/24/17 19:00	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
1/8/18 9:15	5.84	4.57	nd	5.84	5.59	5.59	4.06	6.86	2.54	7.37	9.14	6.35	5.80	5.84
1/11/18 16:30	1.78	1.52	1.52	0.76	1.02	1.02	1.02	1.78	0.76	1.52	1.52	1.52	1.31	1.52
1/11/18 23:15	3.56	3.05	3.56	2.54	1.78	2.79	1.78	3.81	2.29	3.56	3.56	3.56	2.98	3.30
1/12/18 12:15	7.87	10.16	11.94	6.35	6.60	8.38	6.35	12.70	8.38	10.16	10.67	9.14	9.06	8.76
1/27/18 19:15	9.40	9.14	13.21	10.16	8.38	10.92	9.40	14.73	7.11	15.24	13.72	11.43	11.07	10.54
2/1/18 13:00	11.18	15.24	12.19	11.18	8.64	10.92	7.37	13.97	11.18	15.49	13.21	12.45	11.92	11.68

Table B.5 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	100C-1	100C-2	100C-3	100C-4	100C-5	100C-6	100C-7	100C-8	100C-9	100C-10	100C-11	100C-12		
2/4/18 4:15	14.73	14.99	17.78	16.51	14.48	15.75	12.70	18.29	9.40	20.07	17.02	15.49	15.60	15.62
2/4/18 20:30	0.51	0.51	0.76	0.25	0.51	0.51	0.25	0.51	0.25	0.51	0.51	0.25	0.44	0.51
2/6/18 22:30	20.07	17.78	23.88	20.07	14.22	19.56	17.27	26.67	13.97	27.69	25.15	21.59	20.66	20.07
2/10/18 6:00	51.05	54.86	60.96	56.64	44.45	54.10	51.82	70.36	37.85	66.80	60.96	63.75	56.13	55.75
2/11/18 16:45	1.78	4.57	3.30	3.05	1.78	3.05	2.54	4.06	3.30	5.08	4.06	4.06	3.39	3.30
2/14/18 19:00	0.51	1.27	1.02	0.51	0.51	0.51	0.76	1.52	0.51	0.51	0.51	1.02	0.76	0.51
2/16/18 6:30	5.33	14.99	13.21	11.94	10.16	12.45	11.18	16.51	9.40	14.48	14.22	12.70	12.21	12.57
2/17/18 11:45	2.54	16.26	16.76	15.24	12.45	14.99	15.75	17.02	10.41	18.54	18.03	17.27	14.61	16.00
2/24/18 6:15	2.54	6.60	7.11	5.33	4.57	6.35	4.83	6.35	3.56	5.33	6.35	5.84	5.40	5.59
2/24/18 22:00	1.02	2.29	2.79	2.03	1.78	2.29	2.03	2.54	1.52	2.03	3.05	1.78	2.10	2.03
2/25/18 2:45	9.91	12.45	13.97	10.16	10.92	10.92	10.16	13.46	8.38	10.67	13.21	11.18	11.28	10.92
2/28/18 6:45	1.52	1.78	1.52	0.51	0.76	0.76	0.25	1.78	0.25	1.02	2.03	1.02	1.10	1.02
3/1/18 0:15	14.22	13.97	13.46	10.67	10.92	12.19	9.40	13.21	8.13	10.92	14.48	12.19	11.98	12.19
3/6/18 5:15	1.52	1.27	2.03	0.76	0.51	1.02	0.51	1.78	0.51	1.27	2.03	1.02	1.19	1.14
3/11/18 21:00	6.35	8.13	5.33	5.33	5.84	6.60	3.56	nd	6.10	7.11	5.33	6.35	6.00	6.10
3/14/18 12:30	0.25	0.00	0.00	0.00	0.25	0.00	0.00	nd	0.25	nd	0.51	0.25	0.15	0.13
3/17/18 18:00	0.76	1.02	0.51	1.02	0.76	0.76	0.51	nd	0.76	1.52	1.52	0.76	0.90	0.76
3/19/18 19:30	6.35	5.33	6.10	5.59	3.56	4.83	3.30	nd	3.30	6.10	6.86	5.33	5.15	5.33
3/20/18 18:30	0.51	1.02	0.25	0.25	0.25	0.51	0.25	nd	0.25	0.51	1.02	0.25	0.46	0.25
3/21/18 11:00	0.00	0.00	0.25	0.00	0.25	0.00	0.25	nd	0.25	0.00	0.25	0.25	0.14	0.25
3/24/18 8:30	40.39	50.80	38.61	35.31	35.56	38.10	25.91	nd	30.23	46.23	45.47	35.56	38.38	38.10
3/28/18 9:45	18.80	20.32	18.29	16.00	23.88	18.80	13.97	23.37	11.43	18.54	18.03	19.05	18.37	18.67
3/29/18 1:00	4.83	4.57	4.32	3.56	3.30	4.32	2.79	4.57	2.79	4.32	5.33	4.06	4.06	4.32
3/29/18 17:00	12.95	15.24	12.45	8.64	13.97	13.72	10.16	15.24	9.65	12.95	14.73	11.94	12.64	12.95
3/30/18 4:00	3.56	4.83	3.05	3.56	3.05	3.81	2.79	4.83	2.54	4.57	3.56	3.56	3.64	3.56
4/1/18 20:30	19.56	23.11	20.32	15.75	18.80	20.83	17.27	17.27	13.46	26.42	24.64	19.30	19.73	19.43
4/3/18 23:45	29.46	40.64	32.77	29.97	35.31	35.05	27.69	36.58	25.65	30.99	42.93	30.99	33.17	31.88
4/9/18 4:45	1.02	0.51	1.27	1.02	0.51	1.27	0.25	1.27	0.25	1.78	1.52	0.76	0.95	1.02
4/15/18 7:00	11.68	14.48	13.21	6.60	7.37	10.67	8.38	11.68	6.10	11.68	14.00	9.40	10.44	11.18
4/16/18 3:15	1.27	1.78	1.27	0.00	0.51	1.02	0.76	1.52	1.02	1.02	1.78	0.76	1.06	1.02
4/19/18 0:00	0.51	0.76	0.25	0.51	0.51	0.76	0.51	0.51	0.51	0.76	0.76	0.76	0.59	0.51
4/23/18 5:45	8.13	7.37	9.14	7.11	5.59	8.13	5.59	8.13	3.81	9.65	11.43	6.60	7.56	7.75
4/24/18 4:30	13.72	14.73	13.97	11.94	12.19	15.49	12.19	14.73	7.37	17.02	17.02	12.45	13.57	13.84
4/25/18 8:15	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.51	0.25	0.51	0.51	0.25	0.32	0.25
4/26/18 19:00	0.76	0.51	0.76	0.76	0.25	0.76	0.25	1.02	0.00	0.76	1.52	0.76	0.68	0.76
5/4/18 15:30	2.54	4.32	2.79	3.30	2.79	3.30	2.79	2.29	2.29	3.81	3.81	3.30	3.11	3.05

Table B.5 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	100C-1	100C-2	100C-3	100C-4	100C-5	100C-6	100C-7	100C-8	100C-9	100C-10	100C-11	100C-12		
5/5/18 2:45	18.54	25.15	22.35	19.56	18.03	20.07	12.70	22.86	12.19	22.10	21.08	20.32	19.58	20.19
5/6/18 7:00	2.79	4.06	3.56	2.79	2.29	2.54	nd	4.83	1.52	3.30	3.05	2.54	3.02	2.79
5/16/18 19:30	23.88	30.23	28.45	23.11	24.64	24.89	22.10	26.67	17.02	27.43	22.61	26.67	24.81	24.77
5/18/18 13:15	5.08	5.33	5.59	3.81	4.06	4.32	4.06	6.60	3.05	4.57	5.08	5.59	4.76	4.83
5/18/18 23:30	4.32	5.33	4.57	3.81	4.32	4.32	4.57	5.08	3.05	4.57	4.06	5.08	4.42	4.45
5/19/18 16:00	5.08	3.56	5.59	3.81	4.32	4.57	4.06	5.08	2.79	4.32	5.08	4.83	4.42	4.45
Mean	8.64	10.46	9.86	8.10	7.86	9.45	7.74	10.62	6.15	9.73	10.97	8.91		
Median	5.33	5.33	6.10	5.08	4.32	5.84	4.83	6.60	3.30	5.84	5.72	5.33		

[1]nd=no data.

Table B.6. Throughfall data for the 100-year old deciduous plot.[1]

Date/Time	Throughfall Collectors												Mean	Median
	100D-1	100D-2	100D-3	100D-4	100D-5	100D-6	100D-7	100D-8	100D-9	100D-10	100D-11	100D-12		
5/18/17 14:30	0.51	0.76	0.51	0.0	0.0	0.0	0.0	0.51	0.0	0.0	0.0	0.0	0.19	0.00
5/19/17 6:45	46.74	68.07	64.52	58.42	55.12	52.07	62.23	62.48	52.58	56.13	57.91	53.09	57.45	57.02
5/19/17 23:00	4.32	6.35	4.83	4.06	3.56	3.30	4.57	4.83	4.32	4.06	5.08	4.83	4.51	4.45
5/20/17 20:30	25.40	20.07	25.15	20.83	20.07	14.99	19.56	22.10	17.53	23.88	27.94	18.80	21.36	20.45
5/21/17 5:45	4.32	4.57	5.59	6.10	5.33	4.06	6.86	3.56	6.86	3.30	4.57	6.10	5.10	4.95
5/23/17 14:00	11.43	5.59	nd	nd	8.64	7.87	7.87	12.45	nd	10.41	10.41	9.40	9.34	9.40
5/24/17 11:00	16.51	nd	nd	nd	12.70	9.40	17.02	17.02	nd	17.27	10.67	14.48	14.38	15.49
5/24/17 19:00	1.02	nd	nd	nd	1.52	1.02	0.76	1.27	nd	1.78	1.52	2.29	1.40	1.40
5/25/17 8:00	10.41	nd	nd	nd	13.46	10.92	nd	12.45	nd	15.49	12.45	14.22	12.77	12.45
5/27/17 17:30	6.86	nd	nd	nd	7.37	3.30	nd	8.64	nd	9.91	4.83	6.35	6.75	6.86
5/30/17 20:15	6.60	nd	nd	nd	6.60	5.08	nd	6.10	nd	5.59	7.37	5.33	6.10	6.10
5/31/17 16:00	12.95	nd	nd	nd	15.49	10.67	nd	16.51	nd	11.43	13.46	12.19	13.24	12.95
6/4/17 23:00	21.34	nd	nd	nd	16.76	19.56	nd	25.40	nd	19.30	22.10	20.83	20.76	20.83
6/12/17 16:30	7.87	14.48	12.45	10.67	7.87	6.60	8.13	12.95	8.64	7.37	8.64	8.38	9.50	8.51
6/13/17 17:00	11.43	14.73	13.46	12.45	12.95	9.65	14.73	12.95	20.83	13.72	17.78	13.97	14.05	13.59
6/14/17 12:15	13.46	24.89	21.59	15.75	15.24	8.64	12.19	8.13	16.00	13.97	13.72	14.48	14.84	14.22
6/15/17 16:00	7.11	6.10	6.86	7.62	4.06	4.83	5.84	3.56	2.29	5.33	7.37	6.35	5.61	5.97
6/19/17 3:00	20.57	20.57	23.62	23.37	13.72	12.45	12.45	24.64	nd	16.76	16.00	18.80	18.45	18.80
6/22/17 13:00	11.43	11.43	10.92	11.94	6.86	6.35	13.97	9.14	nd	9.65	8.64	12.95	10.30	10.92
6/23/17 17:30	8.89	nd	nd	9.40	nd	5.08	nd	nd	nd	4.06	8.13	8.38	7.32	8.26
6/24/17 2:45	1.02	nd	nd	0.76	nd	0.25	nd	nd	nd	0.51	0.51	0.76	0.64	0.64
7/4/17 9:30	3.81	5.84	3.56	5.33	6.60	4.32	5.08	3.30	6.86	4.83	6.10	9.65	5.44	5.21
7/5/17 15:45	14.22	17.02	17.02	16.76	13.46	13.46	14.99	17.53	17.27	14.48	13.46	15.24	15.41	15.11
7/6/17 15:15	5.33	8.89	7.87	8.13	7.37	6.10	4.32	5.33	7.11	5.33	6.86	10.41	6.92	6.99
7/7/17 23:15	6.60	8.64	6.35	7.87	8.38	4.32	0.25	6.35	9.14	8.13	8.89	12.70	7.30	8.00
7/14/17 20:45	12.95	17.02	17.02	15.49	11.68	11.18	11.18	7.11	14.73	11.68	11.94	12.70	12.89	12.32
7/23/17 3:00	12.95	16.00	12.45	8.13	12.70	7.62	9.65	17.02	10.92	10.92	20.32	nd	12.61	12.45
7/24/17 16:30	4.83	8.64	4.83	3.56	3.56	1.78	1.52	nd	4.83	1.78	2.79	6.86	4.09	3.56
7/27/17 13:30	22.35	26.42	26.16	nd	10.41	nd	nd	nd	nd	nd	18.54	24.89	21.46	23.62
7/28/17 12:30	25.40	34.80	22.10	nd	nd	nd	nd	nd	nd	nd	nd	33.53	28.96	29.46
8/4/17 11:45	4.83	4.32	7.37	nd	4.32	4.06	nd	nd	2.03	nd	nd	4.06	4.43	4.32
8/10/17 2:15	7.87	11.43	9.14	6.10	5.84	5.33	5.84	9.65	5.84	6.60	4.57	7.11	7.11	6.35
8/10/17 10:15	7.62	8.13	8.13	5.59	7.37	2.29	7.11	7.62	6.86	4.83	6.10	5.33	6.41	6.99
8/14/17 6:45	10.41	8.64	9.14	nd	3.30	1.02	6.10	9.91	nd	nd	5.84	nd	6.79	7.37
8/14/17 17:00	5.84	3.30	6.35	nd	nd	nd	4.32	4.06	nd	nd	3.30	nd	4.53	4.19

Table B.6 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10C-1	10C-2	10C-3	10C-4	10C-5	10C-6	10C-7	10C-8	10C-9	10C-10	10C-11	10C-12		
8/14/17 23:00	4.32	4.83	5.08	nd	nd	0.51	4.06	4.57	nd	nd	3.81	nd	3.88	4.32
8/15/17 5:30	8.89	6.10	8.38	nd	nd	nd	7.87	8.38	nd	nd	6.10	nd	7.62	8.13
8/16/17 12:00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.25	0.0	0.0	0.0	0.0	0.02	0.00
8/18/17 4:30	3.05	4.83	4.32	nd	nd	nd	1.02	4.32	nd	nd	2.29	nd	3.30	3.68
8/22/17 16:15	25.65	33.02	29.97	nd	nd	10.41	5.08	29.46	nd	nd	24.13	nd	22.53	25.65
8/28/17 12:45	6.35	7.11	7.37	6.86	nd	5.33	nd	6.35	nd	nd	5.59	nd	6.42	6.35
9/1/17 2:30	nd	8.13	nd	nd	nd	9.40	nd	nd	nd	nd	nd	nd	8.76	8.76
9/1/17 14:45	nd	8.64	nd	nd	nd	9.40	nd	nd	nd	nd	nd	nd	9.02	9.02
9/5/17 9:30	nd	23.11	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	23.11	23.11
9/11/17 20:30	1.52	1.78	1.27	1.02	1.27	1.27	0.76	1.02	2.03	1.27	1.27	1.27	1.31	1.27
9/13/17 17:45	4.83	9.40	3.81	8.64	3.05	2.79	2.79	2.54	3.81	2.29	5.08	2.54	4.30	3.43
9/19/17 14:30	0.25	0.25	0.25	0.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.00
10/8/17 0:30	nd	nd	nd	35.56	nd	28.45	nd	nd	nd	nd	25.91	nd	29.97	28.45
10/10/17 17:45	nd	nd	nd	3.05	nd	nd	nd	nd	nd	nd	nd	nd	3.05	3.05
10/15/17 16:00	nd	nd	nd	9.65	nd	nd	nd	nd	nd	nd	nd	nd	9.65	9.65
10/23/17 8:45	26.16	39.12	38.35	38.35	38.35	28.70	33.53	39.37	43.18	32.26	25.40	32.00	34.57	35.94
10/28/17 4:45	8.89	16.76	12.70	9.91	10.92	8.89	9.65	12.70	13.21	11.94	13.97	11.94	11.79	11.94
10/29/17 15:30	0.25	0.25	0.25	0.25	0.51	0.0	0.0	0.25	0.25	0.25	0.25	0.25	0.23	0.25
11/3/17 10:30	0.51	1.02	0.51	0.76	0.25	0.25	0.25	0.51	0.76	0.51	0.51	1.27	0.59	0.51
11/6/17 4:30	3.05	4.57	4.57	7.11	4.57	3.56	3.81	3.56	5.33	4.57	1.78	3.81	4.19	4.19
11/7/17 4:30	2.03	2.29	2.03	2.29	3.56	1.78	1.27	2.54	2.79	3.05	2.79	3.56	2.50	2.41
11/8/17 4:15	2.03	2.03	2.03	2.03	3.30	1.78	1.27	2.54	2.29	3.30	0.51	3.30	2.20	2.03
11/13/17 1:00	1.27	0.76	1.52	1.52	1.27	0.76	0.25	1.02	1.27	1.27	0.0	1.27	1.02	1.27
11/15/17 17:00	1.27	1.27	1.27	1.52	1.27	0.76	0.25	0.76	1.52	1.52	1.27	1.27		1.27
11/18/17 19:45	6.10	6.35	6.60	6.60	nd	6.60	5.33	6.35	7.62	6.86	5.84	7.37		6.60
11/30/17 17:00	1.27	1.27	1.27	1.02	1.02	0.76	1.02	1.02	1.52	1.02	1.02	nd		1.02
12/5/17 9:00	13.97	11.94	12.70	13.21	12.70	9.65	8.64	12.19	13.72	12.45	10.16	nd		12.45
12/22/17 14:45	16.26	17.27	18.29	18.29	18.03	nd	13.97	16.76	18.03	19.56	15.49	17.02		17.27
12/23/17 6:30	27.18	26.67	26.67	27.94	29.46	nd	25.15	27.18	29.72	29.97	23.37	27.94		27.18
12/24/17 19:00	0.25	0.25	0.25	0.25	0.25	nd	0.0	0.25	0.25	0.25	0.25	0.25		0.25
1/8/18 9:15	6.86	6.35	6.86	7.11	6.86	nd	5.33	5.84	7.37	7.11	4.57	6.10	6.40	6.86
1/11/18 16:30	1.78	1.78	2.03	1.78	1.78	1.52	0.51	1.78	2.03	2.03	1.78	1.78	1.71	1.78
1/11/18 23:15	2.79	3.05	3.30	3.56	3.05	2.03	2.03	3.05	3.30	3.56	2.54	3.05	2.94	3.05
1/12/18 12:15	9.91	9.91	10.67	11.43	11.18	8.64	9.65	10.41	10.67	9.65	5.08	10.41	9.80	10.16
1/27/18 19:15	11.18	12.19	12.95	13.72	12.70	7.62	9.14	11.68	13.21	11.94	8.89	11.94	11.43	11.94
2/1/18 13:00	10.92	10.67	10.92	12.45	12.70	9.65	11.94	11.18	12.19	11.18	6.86	12.19	11.07	11.18

Table B.6 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10C-1	10C-2	10C-3	10C-4	10C-5	10C-6	10C-7	10C-8	10C-9	10C-10	10C-11	10C-12		
2/4/18 4:15	15.24	16.51	17.27	18.54	17.02	14.73	13.72	17.27	18.03	14.99	10.41	16.00	15.81	16.26
2/4/18 20:30	0.76	0.51	0.76	1.27	0.76	0.76	0.51	0.51	0.51	0.76	0.51	1.02	0.72	0.76
2/6/18 22:30	19.56	24.38	22.86	27.94	24.38	23.62	19.30	21.59	23.62	20.57	16.51	19.30	21.97	22.23
2/10/18 6:00	50.80	62.23	61.72	64.52	61.98	49.02	45.97	74.93	63.50	66.29	46.23	57.15	58.70	61.85
2/11/18 16:45	5.08	4.83	4.83	4.57	6.10	3.05	5.59	4.57	4.06	4.57	3.81	5.33	4.70	4.70
2/14/18 19:00	1.27	1.02	1.27	1.27	1.27	0.76	0.51	1.02	1.52	0.76	0.25	1.02	0.99	1.02
2/16/18 6:30	13.97	13.21	14.73	14.48	16.00	11.94	11.43	14.22	16.26	14.22	4.57	16.76	13.48	14.22
2/17/18 11:45	15.24	17.53	17.78	17.27	18.80	15.49	14.99	17.78	19.56	16.00	12.95	16.26	16.64	16.76
2/24/18 6:15	6.86	7.11	8.13	8.13	6.86	5.33	4.83	6.86	7.37	6.86	nd	4.83	6.65	6.86
2/24/18 22:00	2.29	2.54	2.29	2.29	2.29	1.78	2.03	2.29	2.54	2.29	1.52	2.29	2.20	2.29
2/25/18 2:45	11.18	11.94	12.45	12.70	11.43	10.41	10.16	13.72	12.95	11.43	9.14	13.46	11.75	11.68
2/28/18 6:45	1.78	1.78	2.03	1.78	1.78	0.76	0.51	1.02	2.03	1.78	1.52	2.03	1.57	1.78
3/1/18 0:15	13.97	13.97	14.73	13.72	13.97	9.65	11.18	16.51	16.00	13.21	8.38	15.75	13.42	13.97
3/6/18 5:15	2.03	2.03	1.78	1.78	2.03	0.76	0.76	1.52	2.29	2.03	1.52	2.03	1.71	1.91
3/11/18 21:00	9.65	8.38	9.65	8.13	10.16	6.60	6.10	9.14	9.14	9.14	nd	10.67	8.80	9.14
3/14/18 12:30	0.76	0.25	0.76	0.51	0.76	0.25	nd	1.02	1.02	0.25	0.51	0.76	0.62	0.76
3/17/18 18:00	2.03	1.78	2.03	1.27	2.03	1.02	1.02	1.78	2.03	1.78	0.25	2.29	1.61	1.78
3/19/18 19:30	6.35	7.11	7.62	6.35	6.35	4.83	4.32	5.08	6.60	7.37	5.59	10.41	6.50	6.35
3/20/18 18:30	1.27	1.27	1.27	1.02	1.27	0.51	0.76	0.76	1.78	1.27	0.76	1.02	1.08	1.14
3/21/18 11:00	0.76	0.76	0.51	0.76	1.27	0.0	0.25	0.51	1.02	0.51	0.51	0.76	0.64	0.64
3/24/18 8:30	31.50	29.21	32.51	32.00	32.51	29.72	26.92	14.48	37.59	35.56	18.29	36.07	29.70	31.75
3/28/18 9:45	18.29	19.81	19.30	20.07	19.56	12.70	18.03	23.11	19.05	20.32	12.95	24.13	18.94	19.43
3/29/18 1:00	5.33	5.84	5.59	4.83	5.33	4.32	5.33	5.08	4.57	5.33	4.06	5.08	5.06	5.21
3/29/18 17:00	14.73	12.70	14.99	13.21	13.46	11.18	12.95	17.27	16.26	15.24	6.10	16.76	13.74	14.10
3/30/18 4:00	4.06	3.56	4.06	3.30	4.83	3.30	4.06	4.06	4.83	3.81	3.05	4.32	3.94	4.06
4/1/18 20:30	20.32	22.86	23.37	18.80	22.10	17.78	17.78	22.10	19.05	21.84	11.43	23.62	20.09	21.08
4/3/18 23:45	32.51	33.02	36.07	31.75	33.53	29.72	26.42	34.29	33.27	30.99	28.45	35.81	32.15	32.77
4/9/18 4:45	1.78	1.52	2.29	1.52	1.52	nd	0.51	1.52	2.03	1.78	1.52	1.52	1.59	1.52
4/15/18 7:00	12.95	12.19	14.99	10.67	12.70	nd	12.70	12.19	11.43	11.68	9.40	13.72	12.24	12.19
4/16/18 3:15	2.03	1.52	2.29	2.03	2.29	nd	1.52	2.03	2.54	2.03	2.03	2.29	2.06	2.03
4/19/18 0:00	1.27	1.27	1.52	1.27	1.27	nd	0.76	1.27	1.02	1.27	1.02	1.52	1.22	1.27
4/23/18 5:45	9.14	8.89	11.43	10.41	8.13	nd	8.89	7.87	9.65	10.16	7.87	9.91	9.31	9.14
4/24/18 4:30	13.72	17.53	17.78	15.24	13.97	nd	15.24	13.46	14.99	16.51	10.16	16.51	15.01	15.24
4/25/18 8:15	0.76	1.02	1.02	0.76	1.02	nd	0.76	1.02	0.76	0.76	0.76	0.76	0.85	0.76
4/26/18 19:00	1.27	1.02	1.52	1.52	1.27	nd	1.27	1.02	1.27	1.02	1.27	2.03	1.32	1.27
5/4/18 15:30	4.06	3.56	4.32	3.56	3.30	nd	3.30	3.81	3.81	3.81	2.79	3.81	3.65	3.81

Table B.6 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	10C-1	10C-2	10C-3	10C-4	10C-5	10C-6	10C-7	10C-8	10C-9	10C-10	10C-11	10C-12		
5/5/18 2:45	20.57	23.62	21.84	23.37	21.08	nd	20.83	20.07	14.73	20.32	14.48	22.35	20.30	20.83
5/6/18 7:00	3.30	3.81	3.56	3.05	3.56	nd	3.56	3.30	nd	2.79	2.79	nd	3.30	3.30
5/16/18 19:30	32.51	32.77	47.50	32.00	41.91	31.50	36.32	35.81	36.32	30.23	29.72	47.50	36.17	34.29
5/18/18 13:15	5.08	4.57	7.37	5.33	7.11	4.57	4.83	3.56	6.10	4.60	3.05	7.62	5.32	4.95
5/18/18 23:30	3.56	3.05	4.83	4.57	5.84	3.05	4.06	4.32	4.32	2.54	2.79	4.57	3.96	4.19
5/19/18 16:00	5.33	4.57	6.60	3.81	4.32	4.32	2.54	5.33	3.81	3.05	3.05	5.59	4.36	4.32
Mean	9.62	10.96	11.06	10.28	9.97	8.13	8.46	10.19	10.23	9.67	8.43	10.83		
Median	6.60	7.11	7.37	6.86	6.86	5.08	5.33	6.35	6.60	5.59	5.59	7.24		

[1]nd=no data.

Table B.7. Throughfall data for the control (grass only) plot.[1]

	Throughfall Collectors													
Date/Time	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	C-12	Mean	Median
5/18/17 14:30	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/19/17 6:45	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/19/17 23:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/20/17 20:30	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/21/17 5:45	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/23/17 14:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/24/17 11:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/24/17 19:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/25/17 8:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/27/17 17:30	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/30/17 20:15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5/31/17 16:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6/4/17 23:00	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6/12/17 16:30	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6/13/17 17:00	nd	nd	2.29	2.54	2.29	2.54	nd	nd	nd	nd	nd	nd	2.41	2.41
6/14/17 12:15	nd	nd	7.11	7.62	6.60	7.11	nd	nd	nd	nd	nd	nd	7.11	7.11
6/15/17 16:00	nd	nd	2.29	2.03	1.78	2.29	nd	nd	nd	nd	nd	nd	2.10	2.16
6/19/17 3:00	nd	nd	16.00	19.81	17.78	17.53	nd	nd	nd	nd	nd	nd	17.78	17.65
6/22/17 13:00	nd	nd	9.91	11.18	9.91	10.92	nd	nd	nd	nd	nd	nd	10.48	10.41
6/23/17 17:30	nd	nd	7.62	8.64	8.38	8.13	nd	nd	nd	nd	nd	nd	8.19	8.26
6/24/17 2:45	nd	nd	1.02	1.27	1.02	1.27	nd	nd	nd	nd	nd	nd	1.14	1.14
7/4/17 9:30	nd	10.41	9.91	11.18	9.65	9.91	nd	10.92	10.67	10.92	10.67	9.91	10.41	10.54
7/5/17 15:45	nd	4.32	4.32	4.57	4.32	4.57	nd	4.32	4.06	4.57	4.32	4.32	4.37	4.32
7/6/17 15:15	nd	3.56	3.05	3.30	3.30	3.30	nd	3.30	3.30	3.30	3.30	3.05	3.28	3.30
7/7/17 23:15	nd	6.35	5.33	5.84	5.84	5.84	nd	5.84	5.84	6.10	6.10	5.84	5.89	5.84
7/14/17 20:45	nd	27.69	27.69	27.94	26.42	21.08	nd	24.64	23.11	24.89	23.88	17.27	24.46	24.77
7/23/17 3:00	nd	7.11	6.35	6.86	6.10	6.35	nd	7.37	6.86	7.37	7.11	5.59	6.71	6.86
7/24/17 16:30	nd	0.76	0.76	0.76	0.76	0.76	nd	0.76	0.76	0.76	0.76	0.25	0.71	0.76
7/27/17 13:30	nd	20.07	20.07	19.81	18.80	19.05	nd	21.34	19.81	21.08	20.32	19.81	20.02	19.94
7/28/17 12:30	nd	31.50	31.50	31.50	30.48	30.48	nd	33.78	31.24	32.77	31.50	28.19	31.29	31.50
8/4/17 11:45	nd	9.65	9.40	9.65	9.65	9.40	nd	6.35	5.59	6.10	9.14	14.22	8.92	9.40
8/10/17 2:15	nd	2.79	2.54	2.79	2.54	2.54	1.02	2.79	2.79	2.79	2.54	2.54	2.52	2.54
8/10/17 10:15	nd	4.57	4.32	4.32	4.57	4.32	1.78	4.83	4.06	4.83	4.06	4.32	4.18	4.32
8/14/17 6:45	nd	4.57	4.06	4.57	4.32	4.32	1.52	4.83	4.32	4.83	4.32	4.32	4.18	4.32
8/14/17 17:00	nd	1.78	1.52	1.52	1.52	1.52	nd	1.52	1.52	1.52	1.27	1.27	1.50	1.52

Table B.7 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	C-12		
8/14/17 23:00	nd	13.72	11.43	12.45	13.46	13.21	6.35	13.72	13.46	13.97	12.19	12.70	12.42	13.21
8/15/17 5:30	nd	5.84	4.57	5.33	5.84	5.33	3.30	5.84	5.84	5.84	5.33	5.59	5.33	5.59
8/16/17 12:00	nd	1.78	1.52	2.03	1.78	1.52	0.76	1.78	1.78	1.78	1.52	1.52	1.62	1.78
8/18/17 4:30	8.13	9.91	7.87	9.40	9.65	8.13	6.60	9.91	9.40	9.91	8.38	8.89	8.85	9.14
8/22/17 16:15	17.53	20.57	19.81	22.10	21.08	18.54	17.53	22.10	21.34	21.84	20.83	18.54	20.15	20.70
8/28/17 12:45	2.54	3.30	3.05	3.30	3.05	3.05	2.03	3.05	3.05	3.30	3.05	3.05	2.98	3.05
9/1/17 2:30	9.65	13.97	12.95	15.24	15.75	12.95	6.35	12.45	13.72	14.48	11.94	11.94	12.62	12.95
9/1/17 14:45	25.40	28.70	28.96	29.97	27.18	16.26	17.53	22.35	29.72	22.86	21.59	26.67	24.77	26.04
9/5/17 9:30	17.02	nd	21.34	21.59	21.59	18.03	16.76	21.59	20.07	22.61	20.32	19.81	20.07	20.32
9/11/17 20:30	1.52	1.52	1.78	1.78	1.52	1.52	1.02	1.78	1.78	1.78	nd	1.78	1.62	1.78
9/13/17 17:45	7.87	8.38	8.38	8.64	8.64	8.13	4.83	9.14	8.64	8.89	nd	8.64	8.20	8.64
9/19/17 14:30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10/8/17 0:30	55.12	57.40	59.44	60.20	49.02	62.74	41.15	62.99	63.75	61.21	nd	58.67	57.43	59.44
10/10/17 17:45	15.75	17.53	18.29	19.81	nd	18.54	16.76	19.05	18.29	18.54	nd	18.54	18.11	18.42
10/15/17 16:00	18.80	22.10	21.84	22.86	nd	23.11	18.80	22.86	21.08	21.59	nd	21.37	21.44	21.72
10/23/17 8:45	47.50	45.97	46.48	52.83	nd	51.05	47.24	47.75	47.24	49.28	nd	44.20	47.96	47.37
10/28/17 4:45	14.73	15.49	14.48	14.99	13.72	15.49	nd	14.73	13.97	14.99	nd	13.72	14.63	14.73
10/29/17 15:30	0.76	0.76	1.02	0.76	1.02	0.76	nd	0.76	0.76	0.76	nd	0.76	0.81	0.76
11/3/17 10:30	3.81	3.81	4.06	4.32	4.06	4.32	nd	4.06	4.06	4.06	nd	4.06	4.06	4.06
11/6/17 4:30	5.59	6.10	5.84	6.60	5.84	5.84	nd	6.10	6.35	6.10	nd	5.59	5.99	5.97
11/7/17 4:30	3.30	3.81	3.30	3.30	3.30	3.81	nd	3.81	3.30	3.56	nd	3.05	3.45	3.30
11/8/17 4:15	2.54	3.30	2.54	2.54	3.05	3.05	nd	3.30	3.05	2.79	nd	2.29	2.84	2.92
11/13/17 1:00	1.27	1.27	1.27	1.52	1.02	1.27	nd	1.27	1.52	1.27	nd	1.27	1.30	1.27
11/15/17 17:00	1.78	1.78	1.78	nd	1.52	1.78	nd	1.78	1.78	2.03	nd	1.78	1.78	1.78
11/18/17 19:45	14.48	14.73	nd	nd	16.26	15.49	nd	15.24	15.24	16.00	nd	14.73	15.27	15.24
11/30/17 17:00	1.52	1.27	1.27	nd	1.27	1.27	nd	1.27	1.27	1.27	nd	1.27	1.30	1.27
12/5/17 9:00	12.45	13.21	12.70	nd	15.49	13.97	nd	13.72	13.21	14.48	nd	13.21	13.60	13.21
12/22/17 14:45	14.22	16.76	18.29	nd	17.78	18.03	nd	17.53	16.76	17.27	nd	14.73	16.82	17.27
12/23/17 6:30	21.59	28.19	30.73	nd	32.51	30.73	nd	30.73	30.23	30.48	nd	25.15	28.93	30.48
12/24/17 19:00	1.02	1.27	1.27	nd	1.52	1.27	nd	1.27	1.27	1.02	nd	1.02	1.21	1.27
1/8/18 9:15	7.11	9.65	9.91	nd	9.65	9.40	nd	8.38	9.14	8.64	nd	7.87	8.86	9.14
1/11/18 16:30	0.0	0.0	0.0	nd	0.0	0.0	nd	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1/11/18 23:15	3.05	3.30	3.56	nd	3.81	3.81	nd	3.81	3.81	3.56	nd	3.56	3.58	3.56
1/12/18 12:15	10.41	11.94	11.18	nd	15.49	12.70	nd	12.70	12.95	12.70	nd	11.18	12.36	12.70
1/27/18 19:15	8.89	9.65	11.68	nd	11.43	10.67	nd	10.41	10.92	10.67	nd	9.65	10.44	10.67
2/1/18 13:00	8.89	9.40	10.41	nd	10.41	10.92	nd	9.91	10.16	10.16	nd	8.89	9.91	10.16

Table B.7 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	C-12		
2/4/18 4:15	13.72	18.80	18.29	nd	18.03	13.72	nd	17.27	17.02	17.02	nd	14.73	16.51	17.02
2/4/18 20:30	1.27	1.78	1.27	nd	1.52	1.52	nd	1.52	1.52	1.27	nd	1.27	1.44	1.52
2/6/18 22:30	23.62	29.72	28.96	nd	36.83	33.27	nd	29.21	34.54	29.46	nd	28.45	30.45	29.46
2/10/18 6:00	52.58	59.44	62.48	nd	78.74	64.01	nd	65.28	71.37	67.82	nd	59.44	64.57	64.01
2/11/18 16:45	6.60	7.62	7.37	nd	8.38	7.87	nd	8.64	8.64	7.62	nd	7.62	7.82	7.62
2/14/18 19:00	2.29	2.29	2.79	nd	2.79	2.54	nd	2.54	2.54	2.79	nd	2.29	2.54	2.54
2/16/18 6:30	14.73	17.27	19.05	nd	19.81	17.78	nd	18.80	19.30	18.29	nd	17.53	18.06	18.29
2/17/18 11:45	18.03	20.57	23.37	nd	24.38	21.34	nd	23.11	23.37	22.61	nd	20.57	21.93	22.61
2/24/18 6:15	7.11	5.59	8.38	nd	7.87	7.87	nd	8.13	7.87	8.38	nd	8.13	7.70	7.87
2/24/18 22:00	2.03	1.52	2.29	nd	2.54	2.54	nd	2.79	2.54	2.79	nd	2.29	2.37	2.54
2/25/18 2:45	12.95	nd	14.99	nd	16.76	17.02	nd	17.02	17.02	17.53	nd	14.73	16.00	16.89
2/28/18 6:45	2.29	2.29	2.54	nd	2.03	2.29	nd	2.29	nd	2.29	nd	2.29	2.29	2.29
3/1/18 0:15	12.45	14.48	14.48	nd	17.02	14.73	nd	14.99	nd	14.73	nd	13.97	14.61	14.61
3/6/18 5:15	3.05	2.03	3.30	nd	3.30	3.30	nd	3.05	nd	3.05	nd	2.79	2.98	3.05
3/11/18 21:00	6.10	9.40	9.65	nd	10.16	9.40	nd	9.40	nd	8.64	nd	8.64	8.92	9.40
3/14/18 12:30	0.51	1.02	0.76	1.27	0.76	0.76	nd	1.02	nd	0.76	nd	1.02	0.87	0.76
3/17/18 18:00	0.51	0.51	0.51	nd	0.51	0.76	nd	0.76	nd	0.51	nd	0.51	0.57	0.51
3/19/18 19:30	8.13	6.60	9.14	nd	11.94	9.40	nd	9.91	nd	8.64	nd	9.14	9.11	9.14
3/20/18 18:30	1.78	1.78	2.29	nd	2.54	1.78	nd	2.03	nd	2.03	nd	1.78	2.00	1.91
3/21/18 11:00	1.78	2.79	2.54	nd	2.29	2.03	nd	2.54	nd	2.29	nd	2.03	2.29	2.29
3/24/18 8:30	29.21	29.21	50.04	nd	46.74	44.96	nd	45.47	nd	39.12	nd	35.56	40.04	42.04
3/28/18 9:45	13.72	14.73	15.24	nd	16.00	15.75	nd	15.49	nd	14.48	nd	14.48	14.99	14.99
3/29/18 1:00	3.05	3.30	3.05	nd	4.06	3.30	nd	3.56	nd	3.30	nd	3.30	3.37	3.30
3/29/18 17:00	13.97	13.97	14.48	nd	19.30	14.73	nd	14.99	nd	14.48	nd	13.72	14.95	14.48
3/30/18 4:00	2.79	3.05	3.30	nd	3.81	3.05	nd	3.05	nd	2.79	nd	3.05	3.11	3.05
4/1/18 20:30	16.76	19.56	22.10	nd	24.38	18.29	nd	20.83	nd	19.05	nd	19.05	20.00	19.30
4/3/18 23:45	22.35	24.38	25.15	nd	31.75	23.88	nd	26.67	nd	25.40	nd	23.62	25.40	24.77
4/9/18 4:45	2.79	2.54	2.79	nd	2.29	2.29	nd	2.54	nd	2.29	nd	2.29	2.48	2.41
4/15/18 7:00	12.95	13.46	15.49	nd	16.76	14.22	nd	14.22	nd	13.46	nd	13.46	14.26	13.84
4/16/18 3:15	2.03	2.29	2.29	nd	3.05	2.29	nd	2.29	nd	2.29	nd	2.29	2.35	2.29
4/19/18 0:00	3.30	3.30	3.81	nd	3.30	3.30	nd	3.56	nd	3.30	nd	3.05	3.37	3.30
4/23/18 5:45	9.91	nd	9.65	nd	10.41	8.89	nd	9.91	nd	9.91	nd	9.40	9.72	9.91
4/24/18 4:30	6.86	nd	7.11	nd	7.11	6.86	nd	7.11	nd	6.60	nd	7.37	7.00	7.11
4/25/18 8:15	0.76	nd	1.02	nd	0.76	0.76	nd	0.76	nd	0.76	nd	0.76	0.80	0.76
4/26/18 19:00	1.78	nd	1.78	nd	1.52	1.52	nd	1.78	nd	1.78	nd	1.78	1.71	1.78
5/4/18 15:30	7.11	nd	8.13	nd	4.57	7.62	nd	8.13	nd	7.62	nd	7.11	7.18	7.62

Table B.7 (continued).

Date/Time	Throughfall Collectors												Mean	Median
	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	C-12		
5/5/18 2:45	25.65	nd	24.89	nd	26.16	28.96	nd	34.29	nd	32.00	nd	29.21	28.74	28.96
5/6/18 7:00	2.79	nd	nd	nd	3.81	3.30	nd	3.56	nd	3.05	nd	3.05	3.26	3.18
5/16/18 19:30	14.48	7.11	18.29	nd	15.75	nd	nd	19.05	nd	18.54	nd	16.51	15.68	16.51
5/18/18 13:15	12.45	16.76	15.49	nd	12.70	nd	nd	21.84	nd	20.57	nd	15.49	16.47	15.49
5/18/18 23:30	4.06	5.59	4.06	nd	6.10	nd	nd	6.86	nd	6.60	nd	5.84	5.59	5.84
5/19/18 16:00	3.56	4.06	4.32	2.79	nd	nd	nd	4.57	nd	4.32	nd	4.06	3.96	4.06
Mean	10.24	10.97	11.10	11.16	11.08	10.92	11.12	11.74	12.60	11.54	9.38	10.65		
Median	7.11	6.60	7.37	6.22	6.60	7.62	6.35	7.75	8.64	7.49	6.10	7.49		

[1]nd=no data.

APPENDIX C: THROUGHFALL DISTRIBUTIONS

Throughfall distributions displayed a significant right skew, a non-zero excess kurtosis, and were significantly non-normal per the Shapiro-Wilk test (Table C.1, Figures C.1-C.7) (Kim, 2013). Due to data skewness, a natural log transformation was used for statistical analyses.

Table C.1. Skewness characteristics of throughfall data.

Plot[1]	Skewness	Excess Kurtosis[2]
10C	2.070	3.589
10D	1.930	1.118
20C	2.226	3.069
20D	2.247	3.367
100C	2.263	3.362
100D	2.196	3.649
Control	2.172	3.020

[1]10C=10 year coniferous, 10D=10 year deciduous, 20C=20 year coniferous, 20D=20 year deciduous, 100C=100 year coniferous, 100D=100 year deciduous, and control = grass only.
[2]Determined by subtracting 3 from kurtosis (proper). Value of zero represents a perfectly normal distribution.

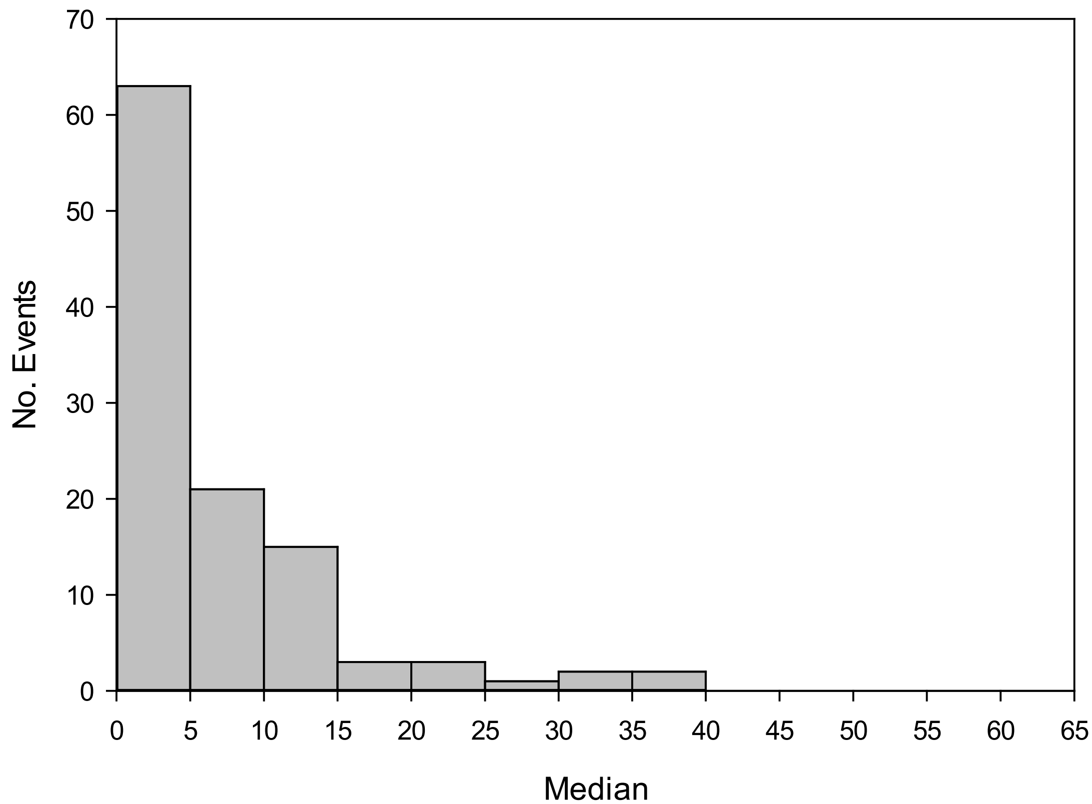

Figure C.1. Distribution of throughfall depths for the 10-year old coniferous plot.

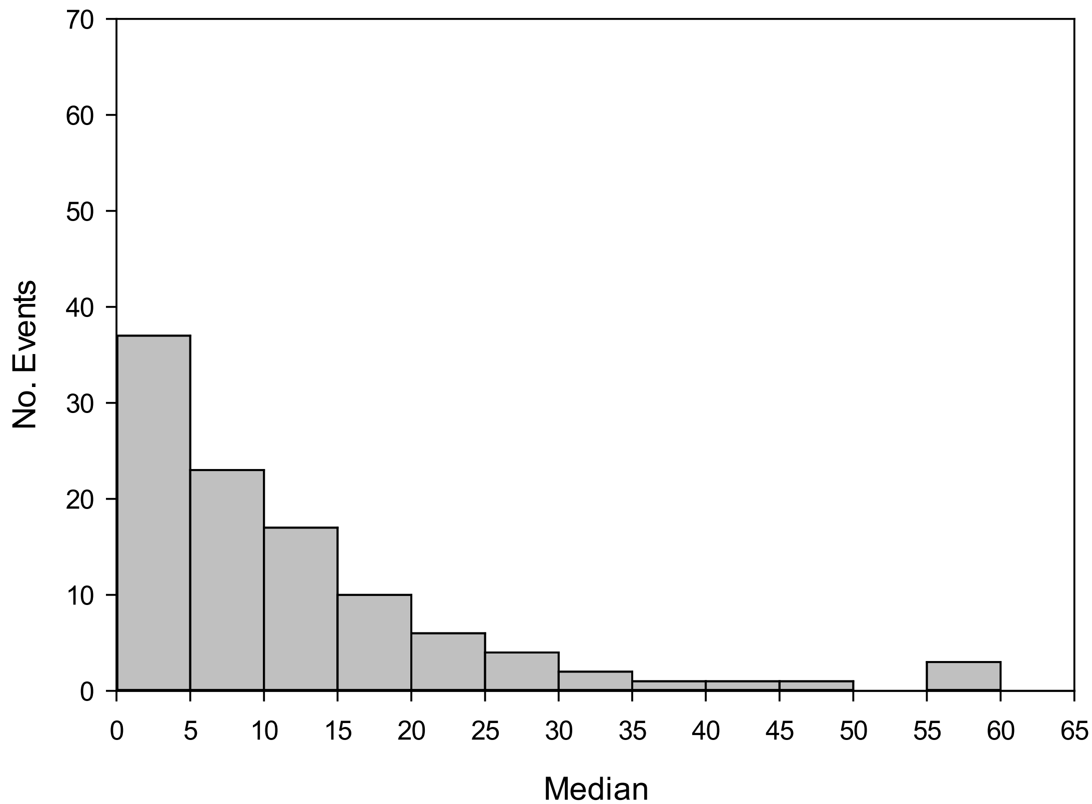

Figure C.2. Distribution of throughfall depths for the 10-year old deciduous plot.

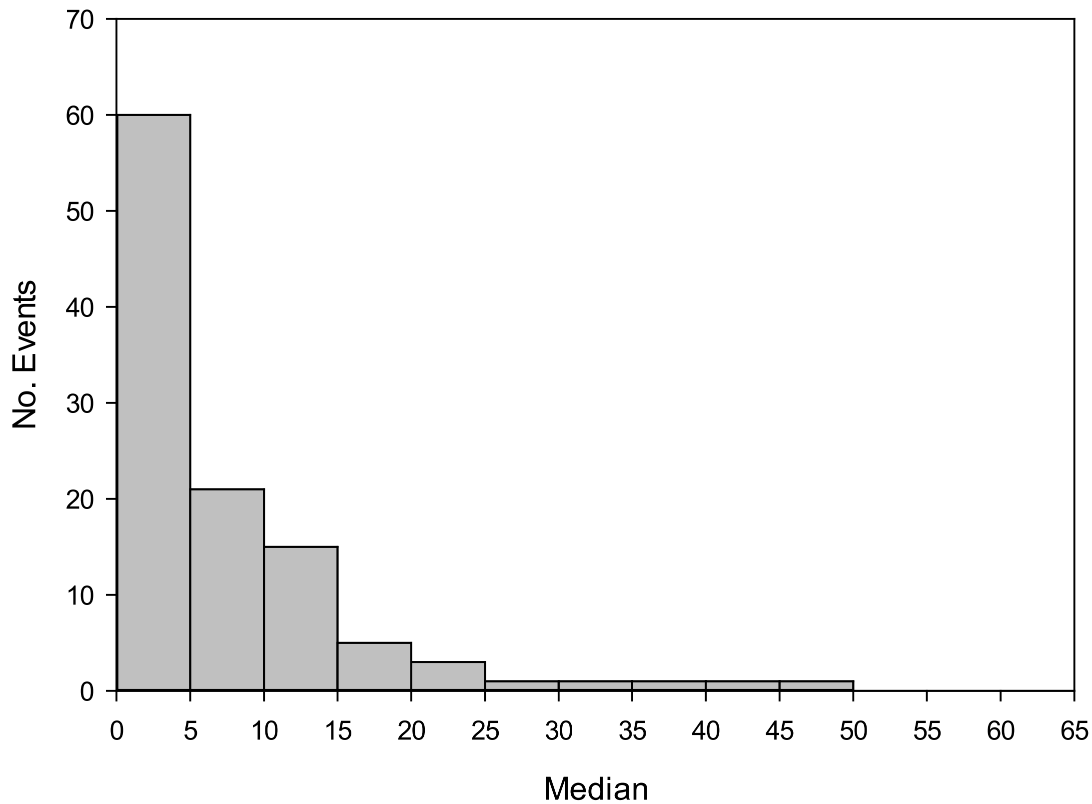

Figure C.3. Distribution of throughfall depths for the 20-year old coniferous plot.

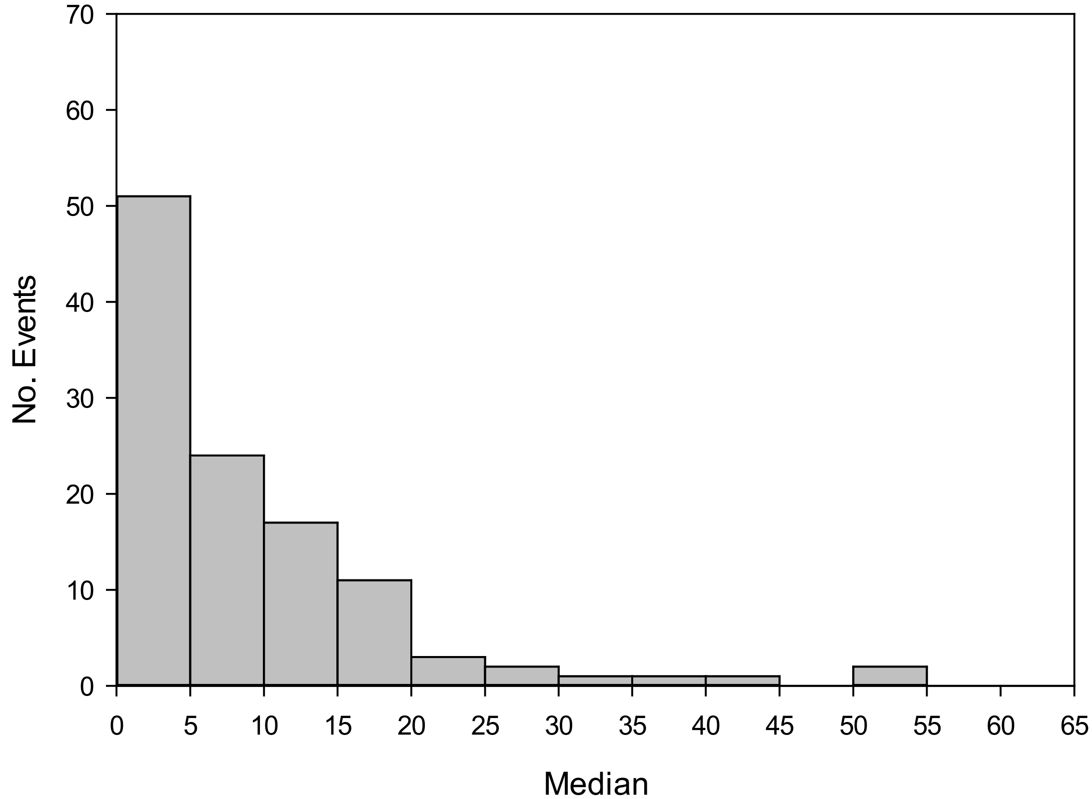

Figure C.4. Distribution of throughfall depths for the 20-year old deciduous plot.

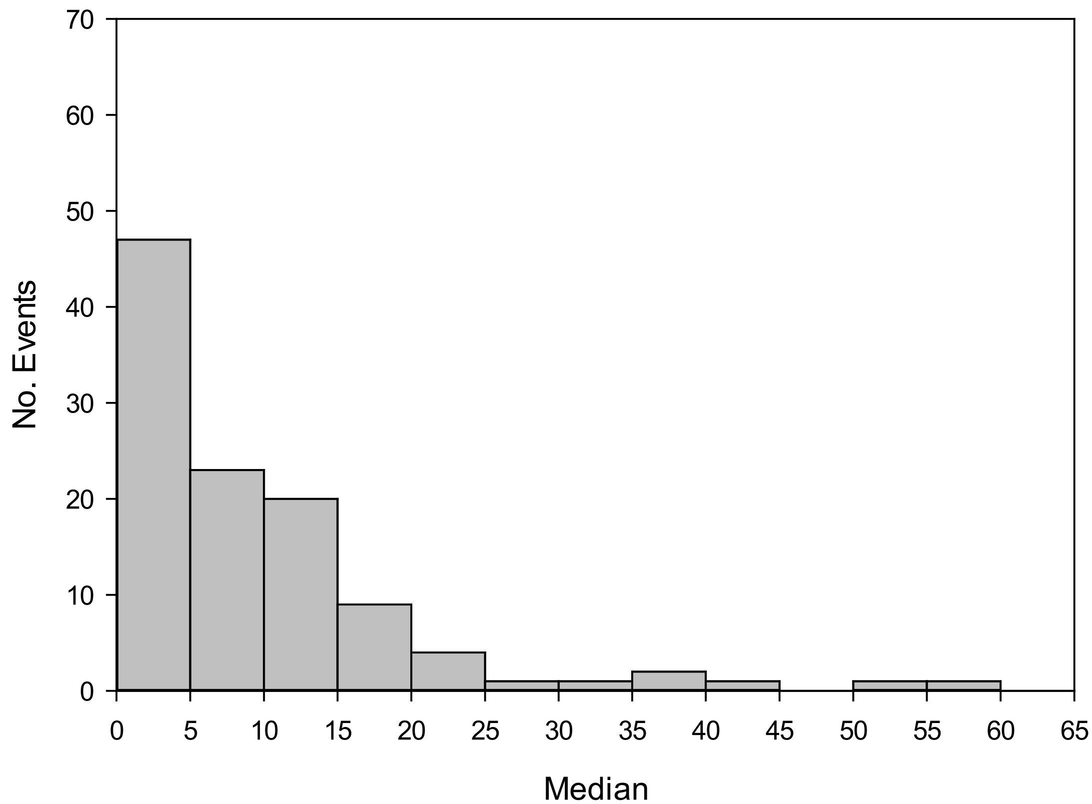

Figure C.5. Distribution of throughfall depths for the 100-year old coniferous plot.

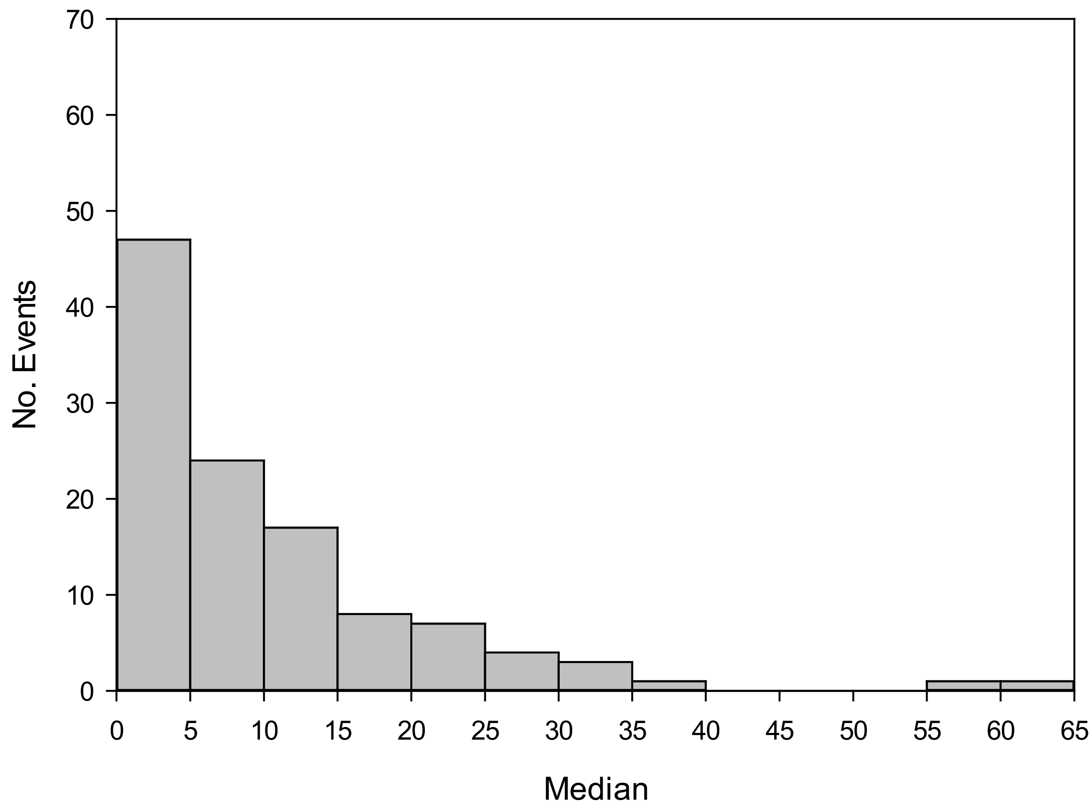

Figure C.6. Distribution of throughfall depths for the 100-year old deciduous plot.

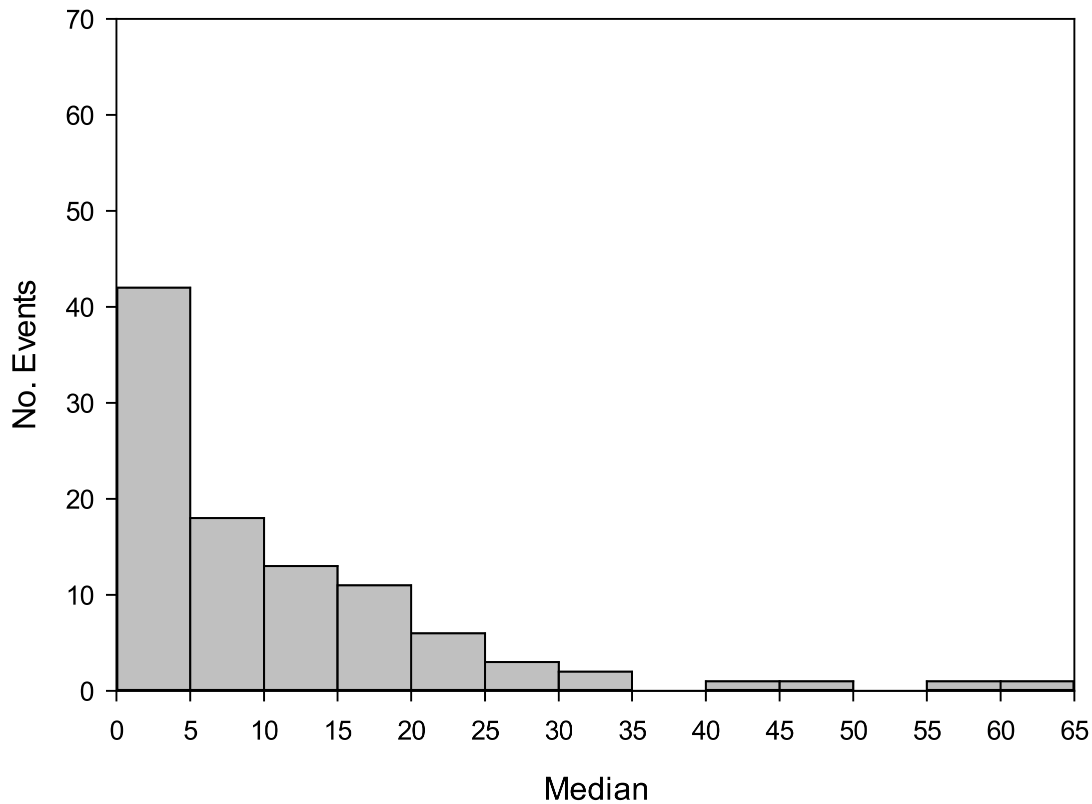

Figure C.7. Distribution of throughfall depths for the control (grass only) plot.

APPENDIX D: RAINFALL CHARACTERISTICS

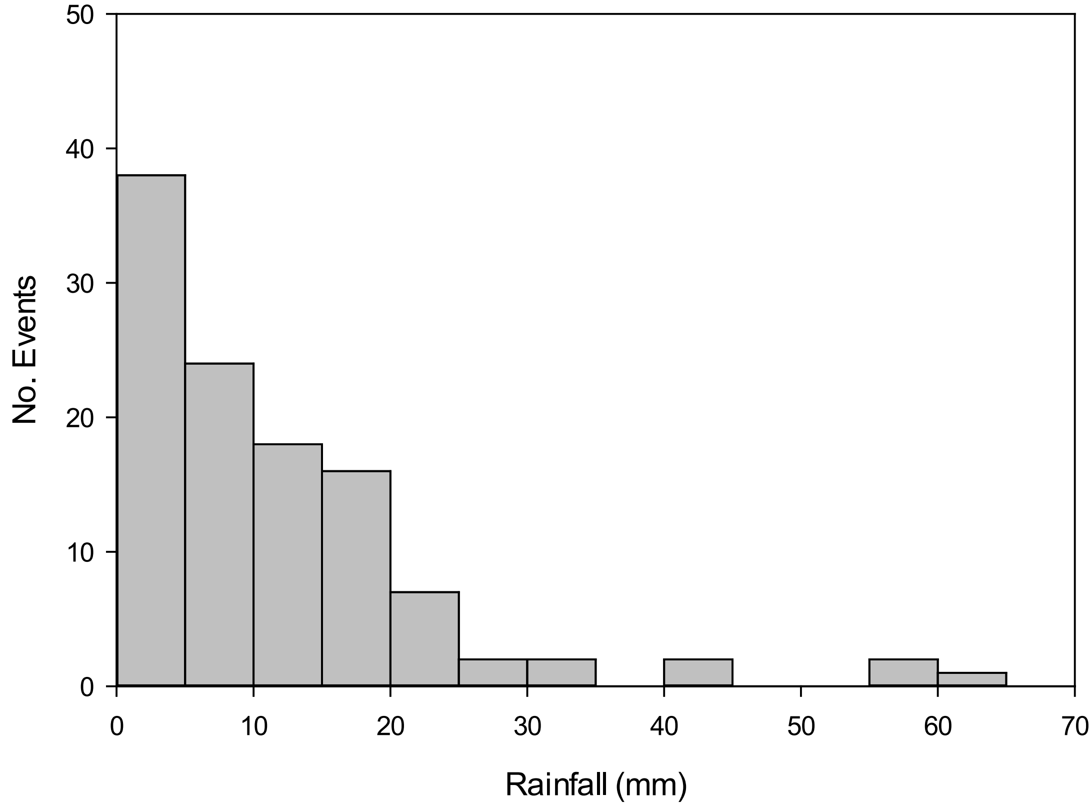

Figure D.1. Distribution of rainfall depths for the Camp weather station.

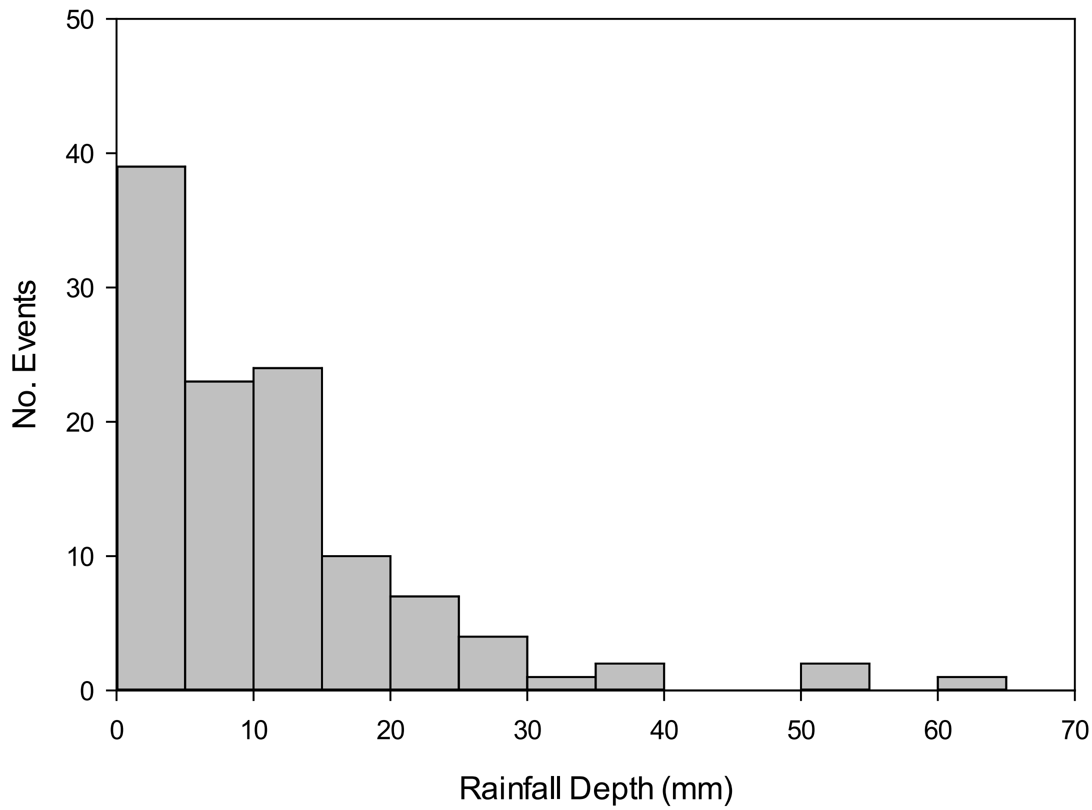

Figure D.2. Distribution of rainfall depths for the Little Millseat Branch weather station.

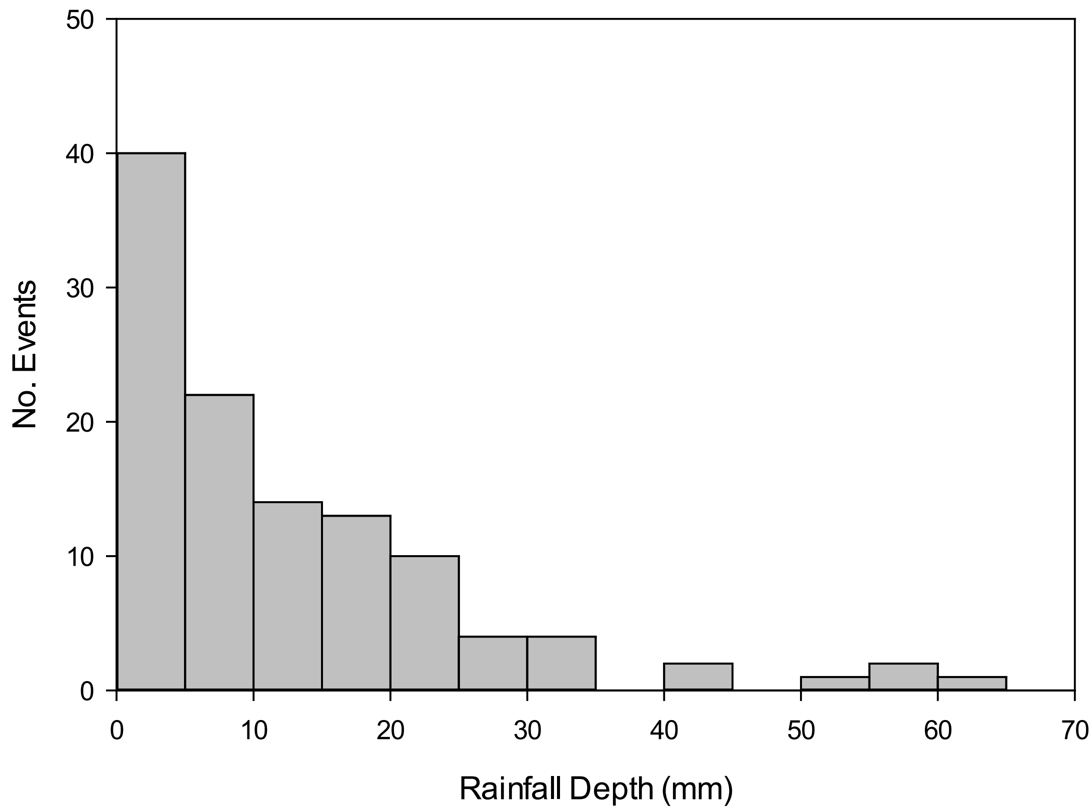

Figure D.3. Distribution of rainfall depths for the Laurel Fork weather station.

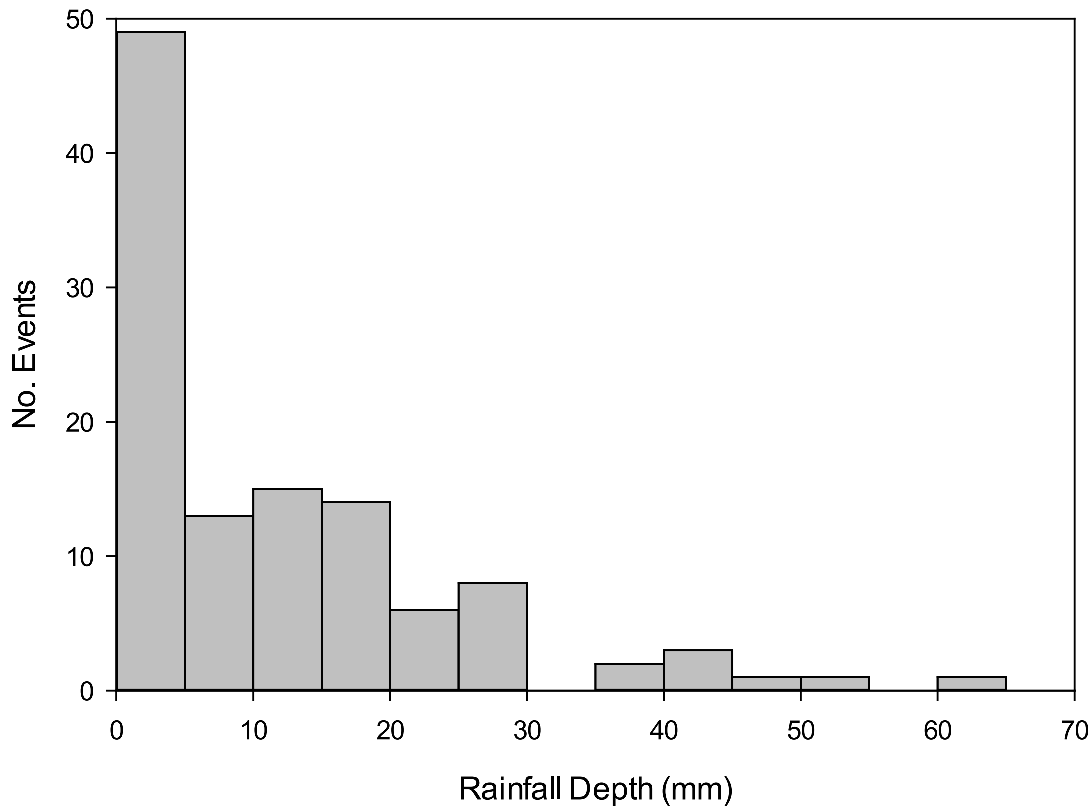

Figure D.4. Distribution of rainfall depths for the Jackson weather station.

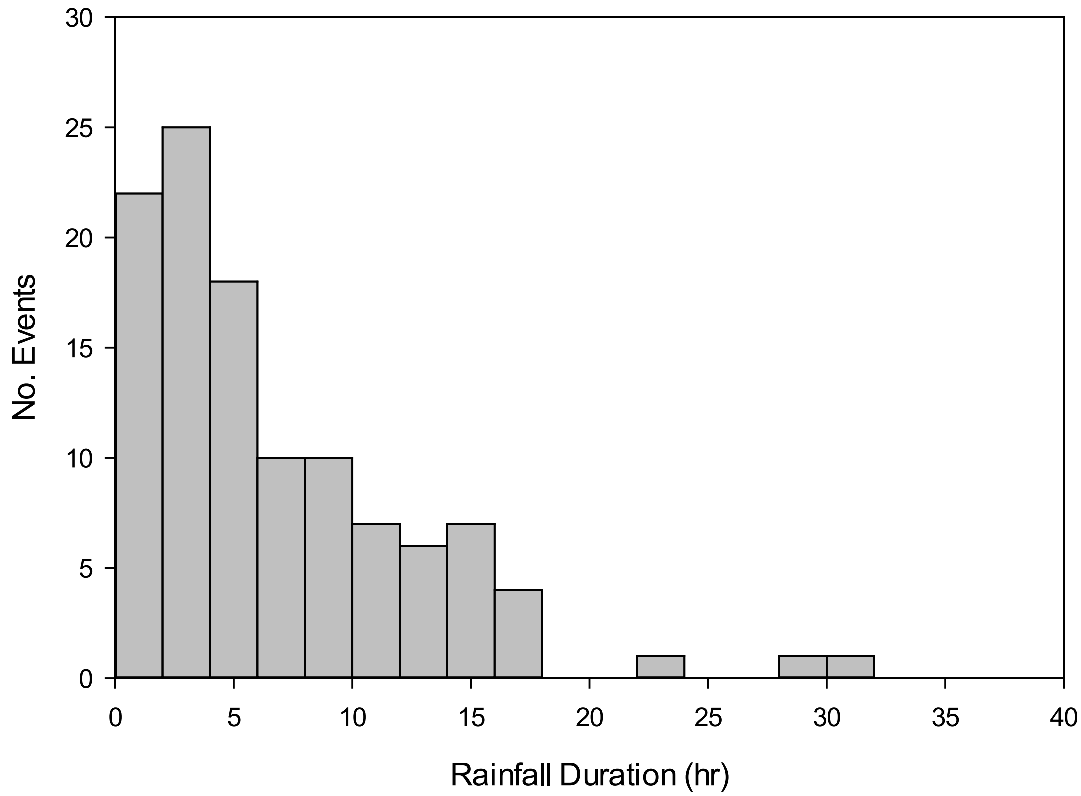

Figure D.5. Distribution of rainfall duration for the Camp weather station.

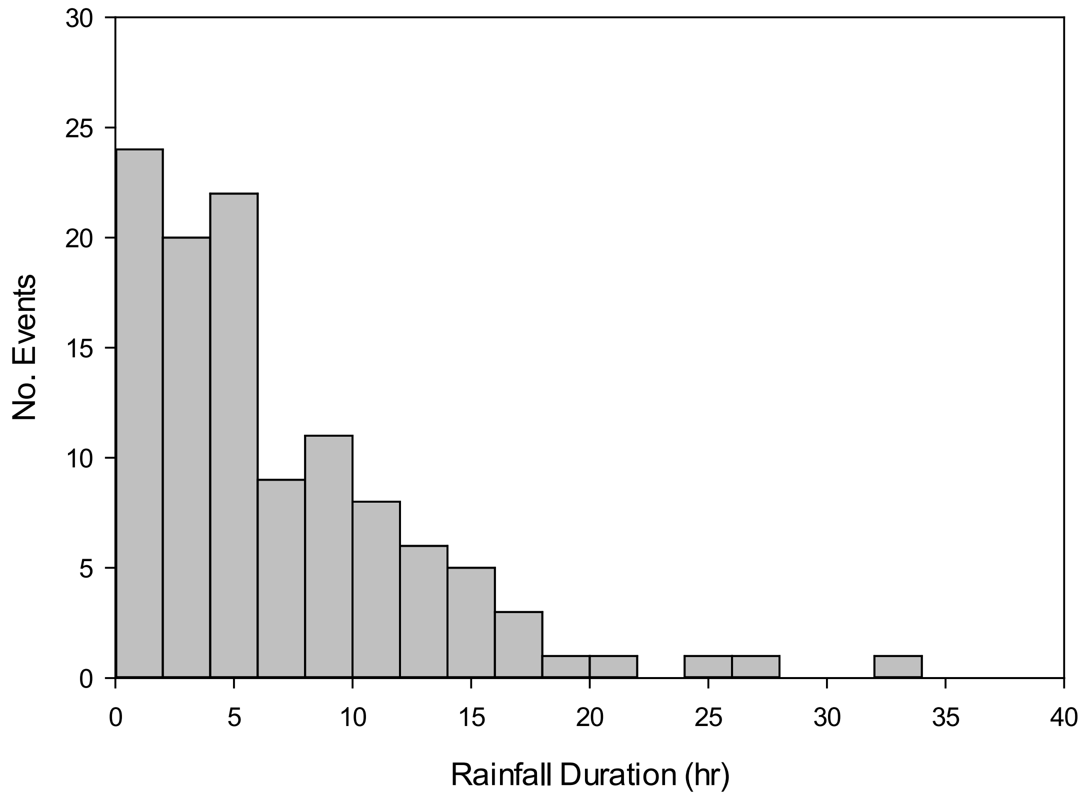

Figure D.6. Distribution of rainfall duration for the Little Millseat Branch weather station.

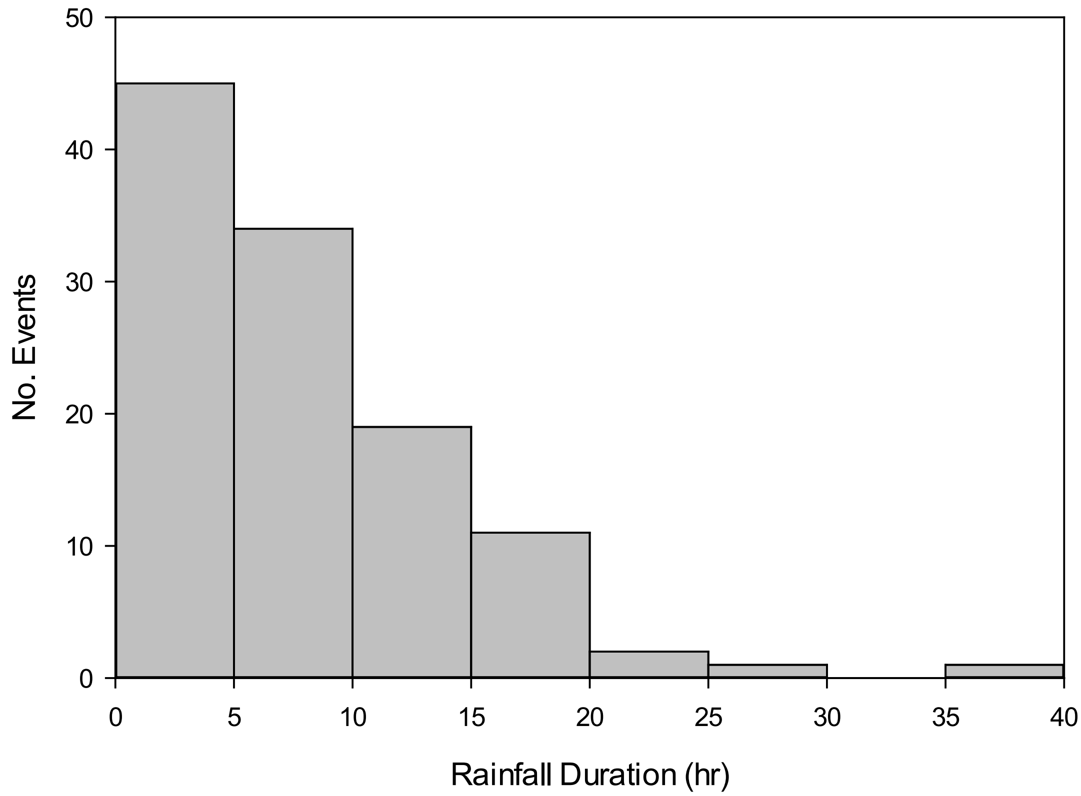

Figure D.7. Distribution of rainfall duration for the Laurel Fork weather station.

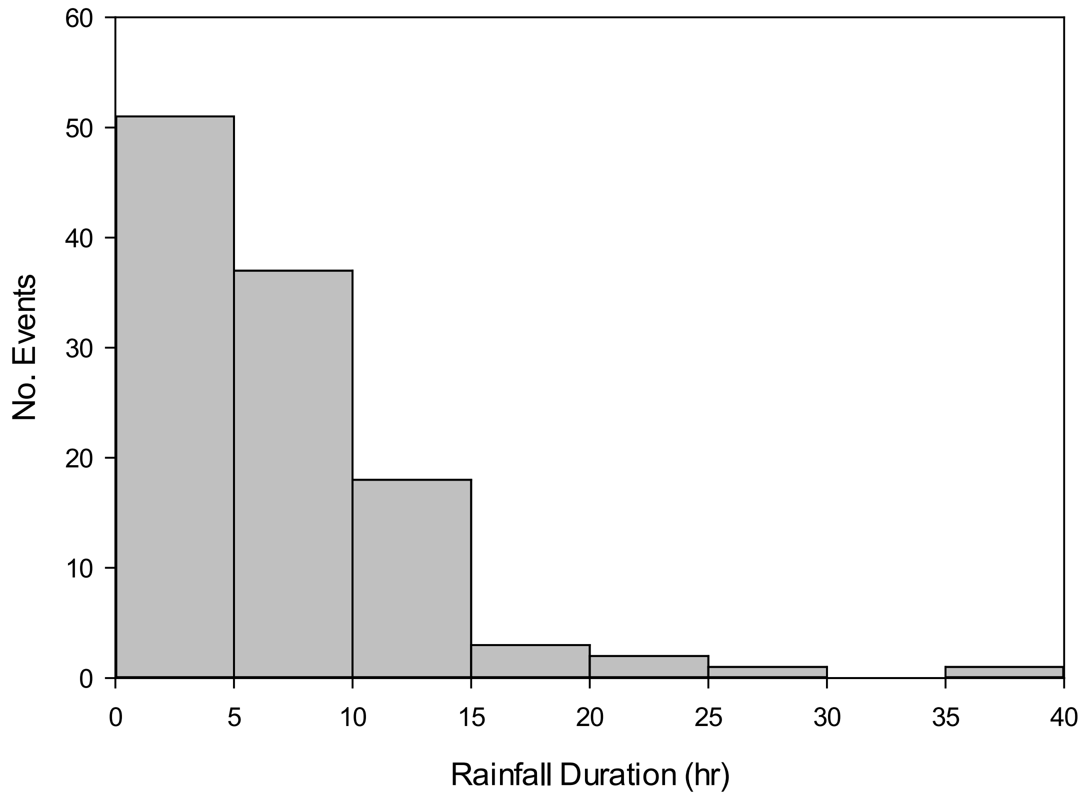

Figure D.8. Distribution of rainfall duration for the Jackson weather station.

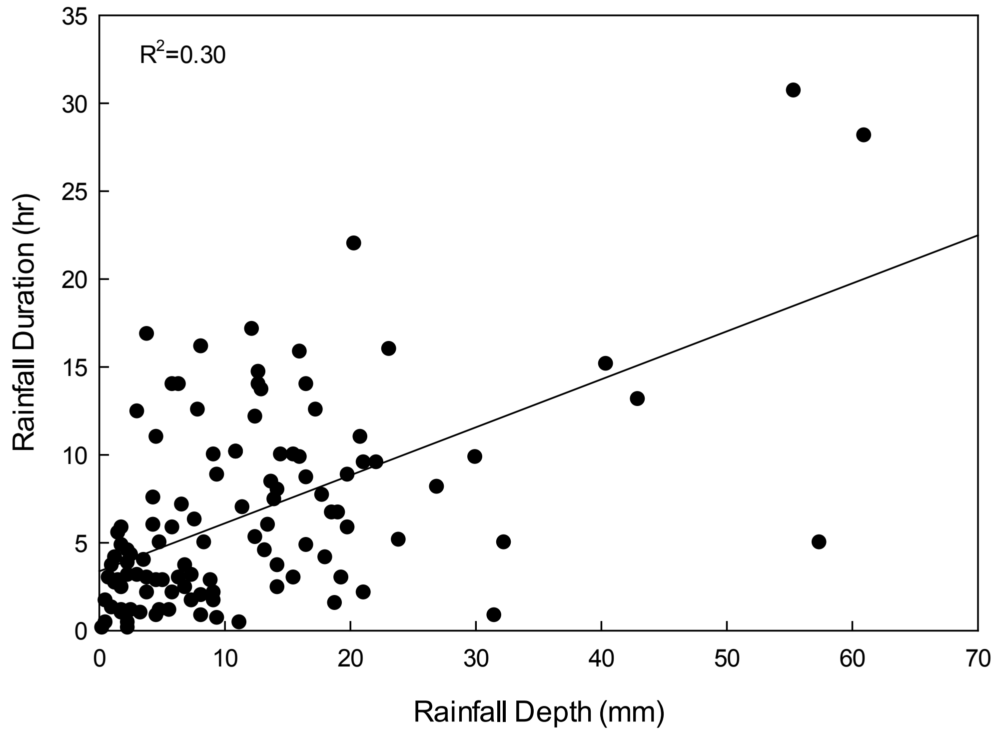

Figure D.9. The relationship between rainfall depth and duration for the Camp weather station was significant (R^2=0.34, p<0.001).

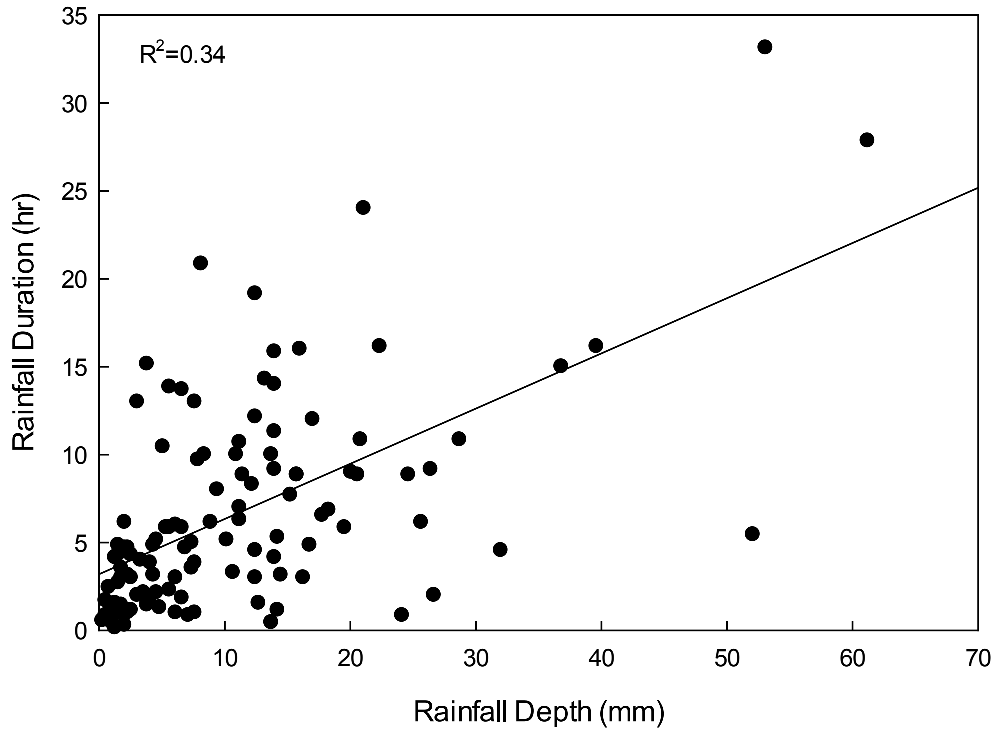

Figure D.10. The relationship between rainfall depth and duration for the Little Millseat Branch weather station was significant (R^2=0.34, p<0.001).

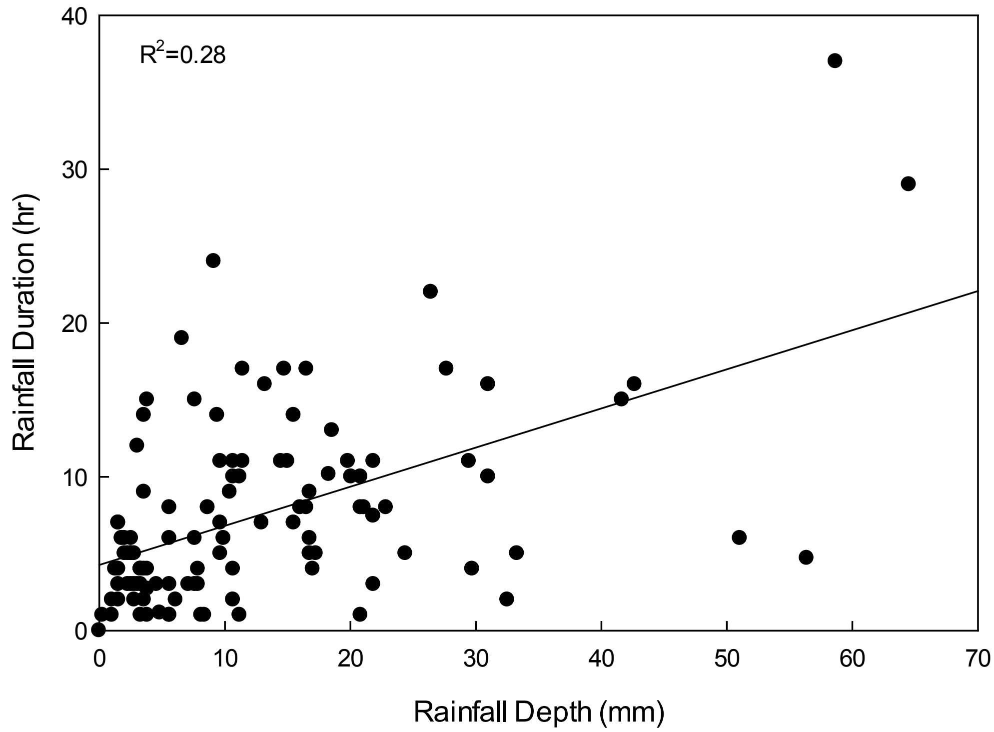

Figure D.11. The relationship between rainfall depth and duration for the Laurel Fork weather station was significant (R^2=0.28, p<0.001).

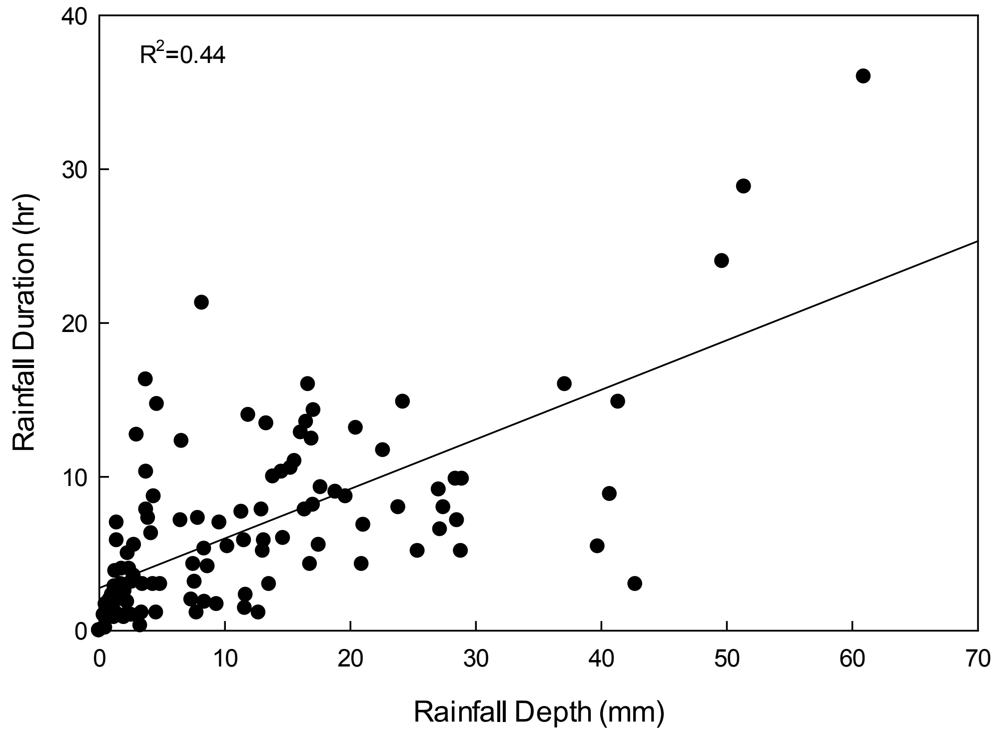

Figure D.12. The relationship between rainfall depth and duration for the Jackson weather station was significant (R^2=0.44, p<0.001).

APPENDIX E: THROUGHFALL AND RAINFALL RELATIONSHIPS

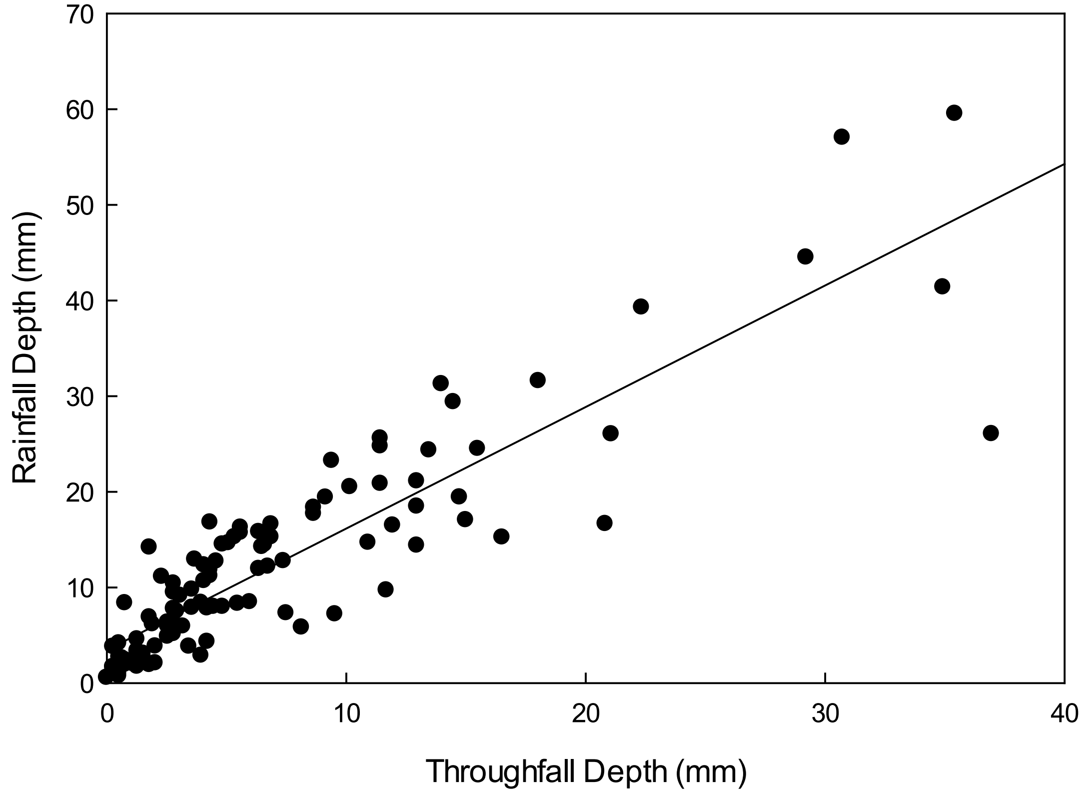

Figure E.1. Relationship between throughfall depth and rainfall depth for the 10-year coniferous plot (R^2=0.0.79, p<0.001).

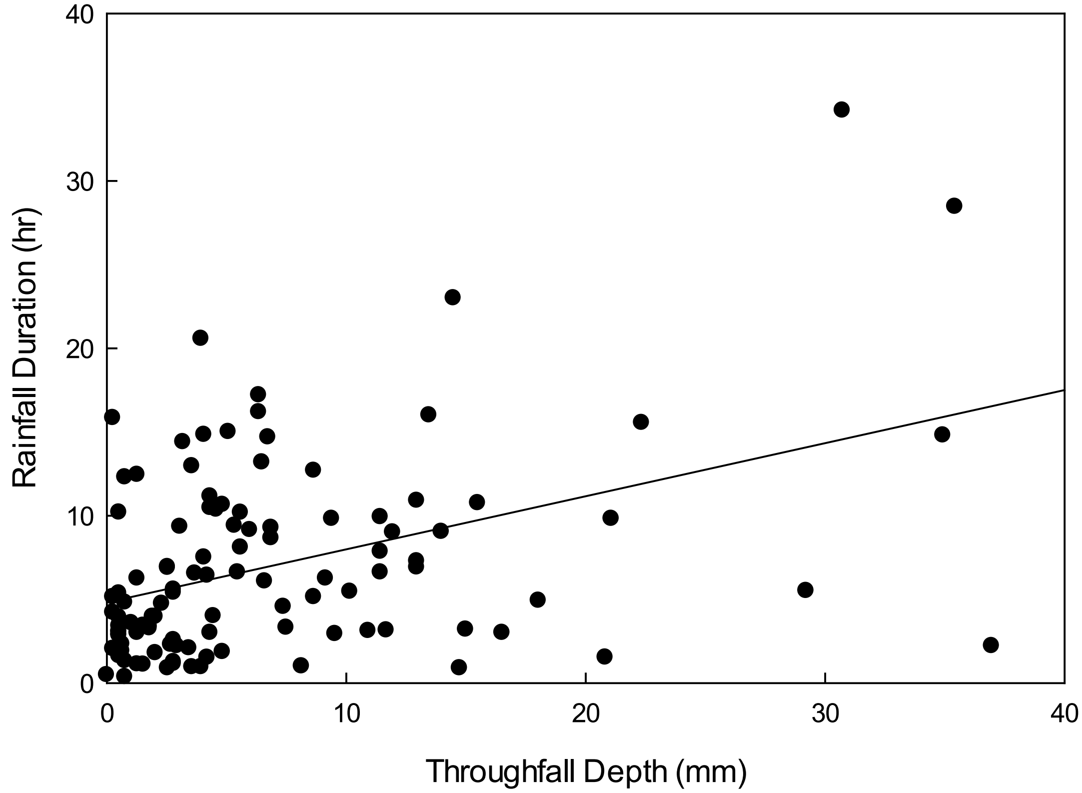

Figure E.2. Relationship between throughfall depth and rainfall duration for the 10-year coniferous plot (R^2=0.0.18, p<0.001).

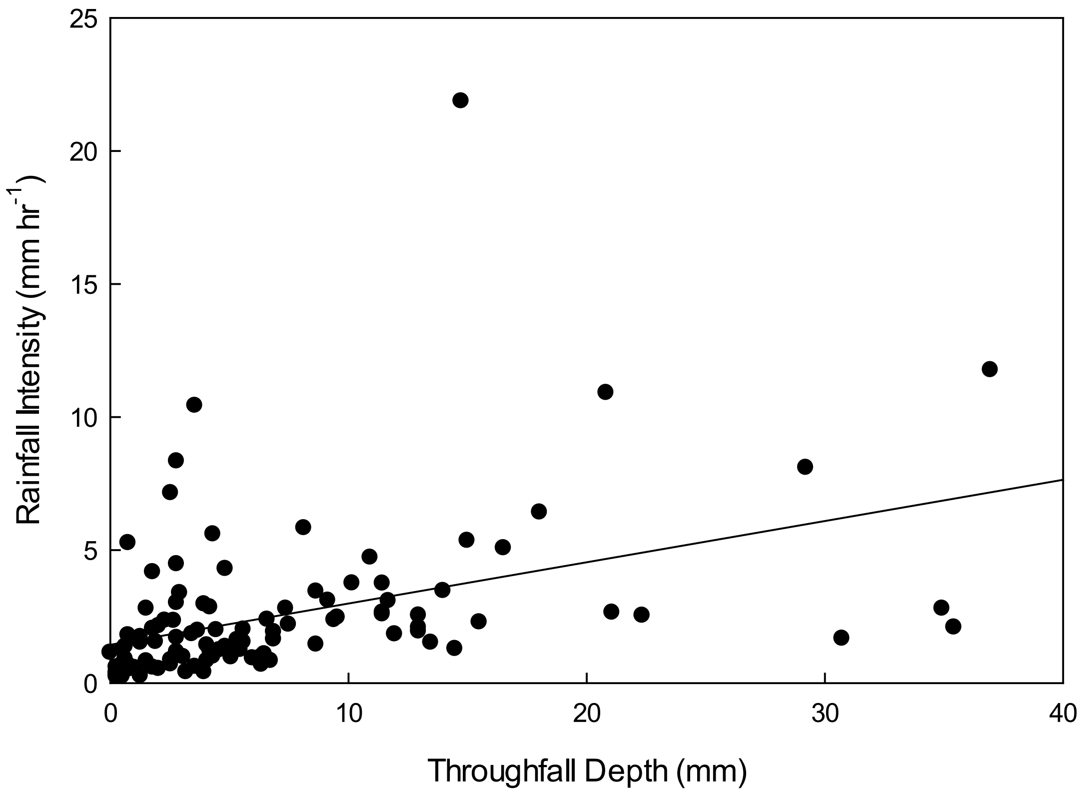

Figure E.3. Relationship between throughfall depth and rainfall intensity for the 10-year coniferous plot (R^2=0.17, p<0.001).

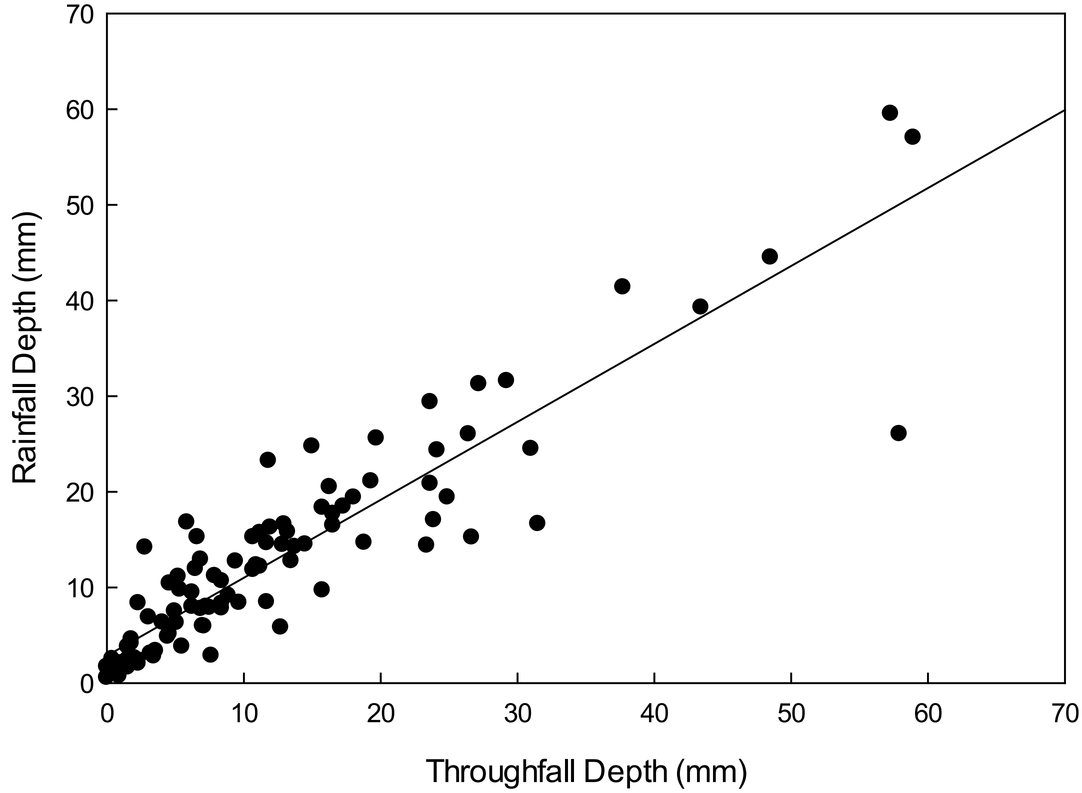

Figure E.4. Relationship between throughfall depth and rainfall depth for the 10-year deciduous plot (R^2=0.83, p<0.001).

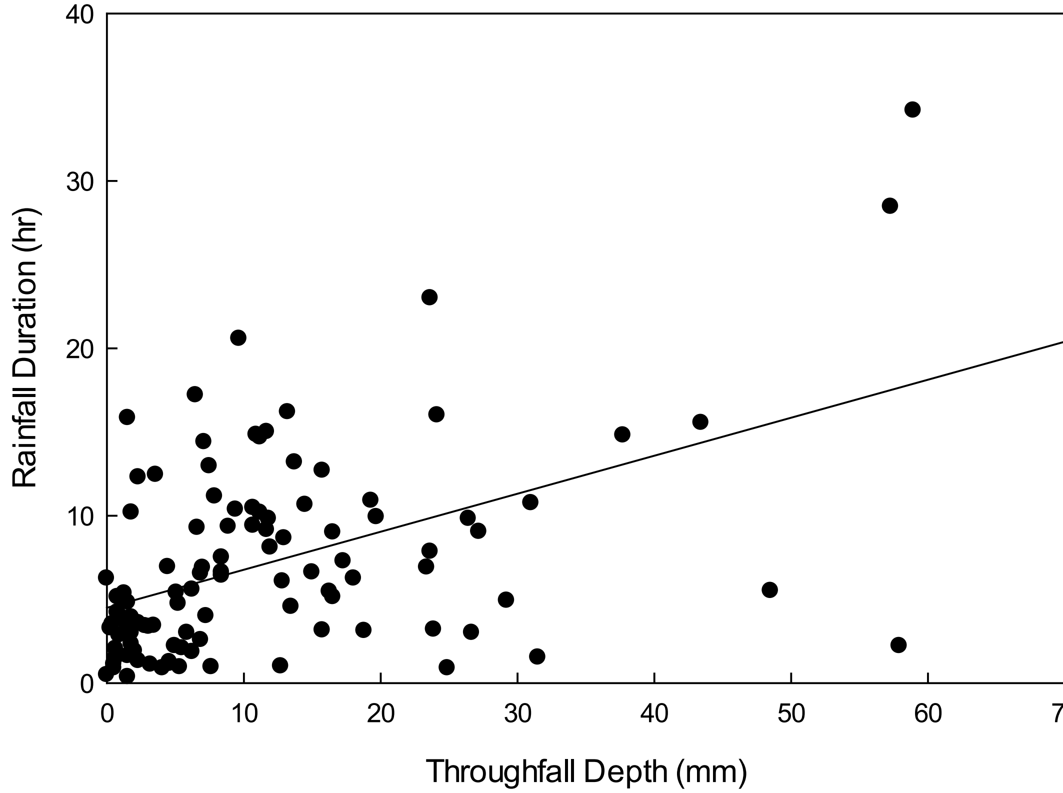

Figure E.5. Relationship between throughfall depth and rainfall duration for the 10-year deciduous plot (R^2=0.24, p<0.001).

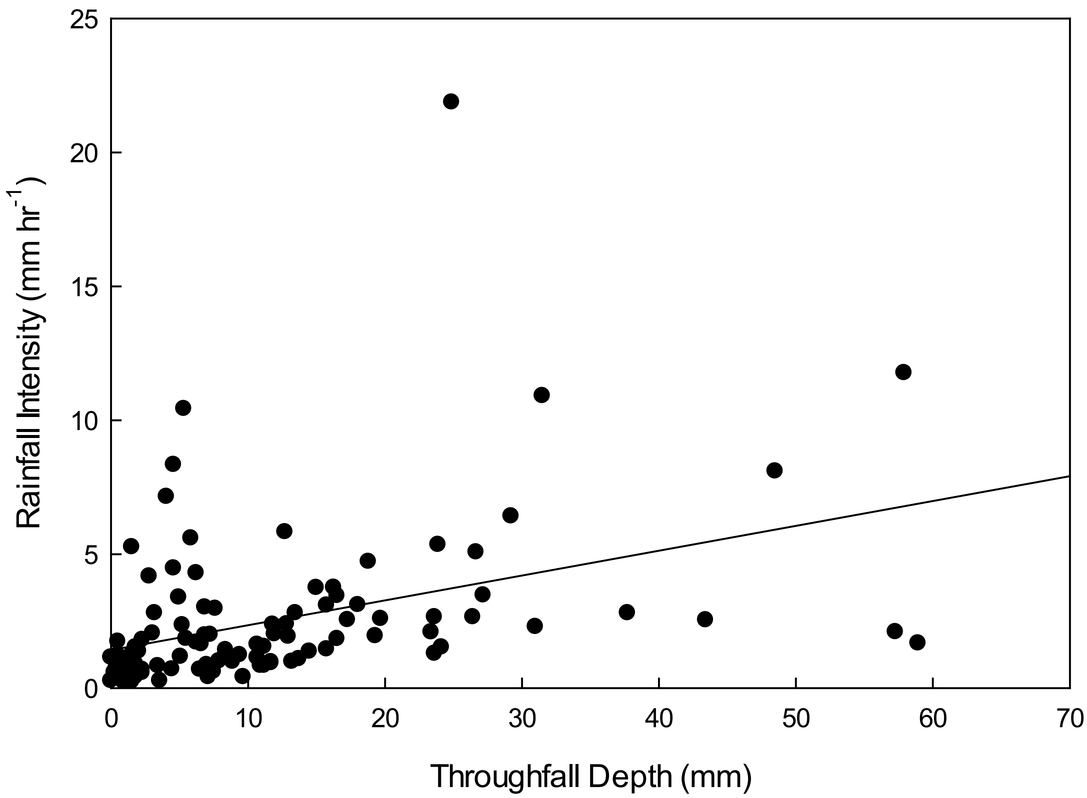

Figure E.6. Relationship between throughfall depth and rainfall intensity for the 10-year deciduous plot (R^2=0.16, p<0.001).

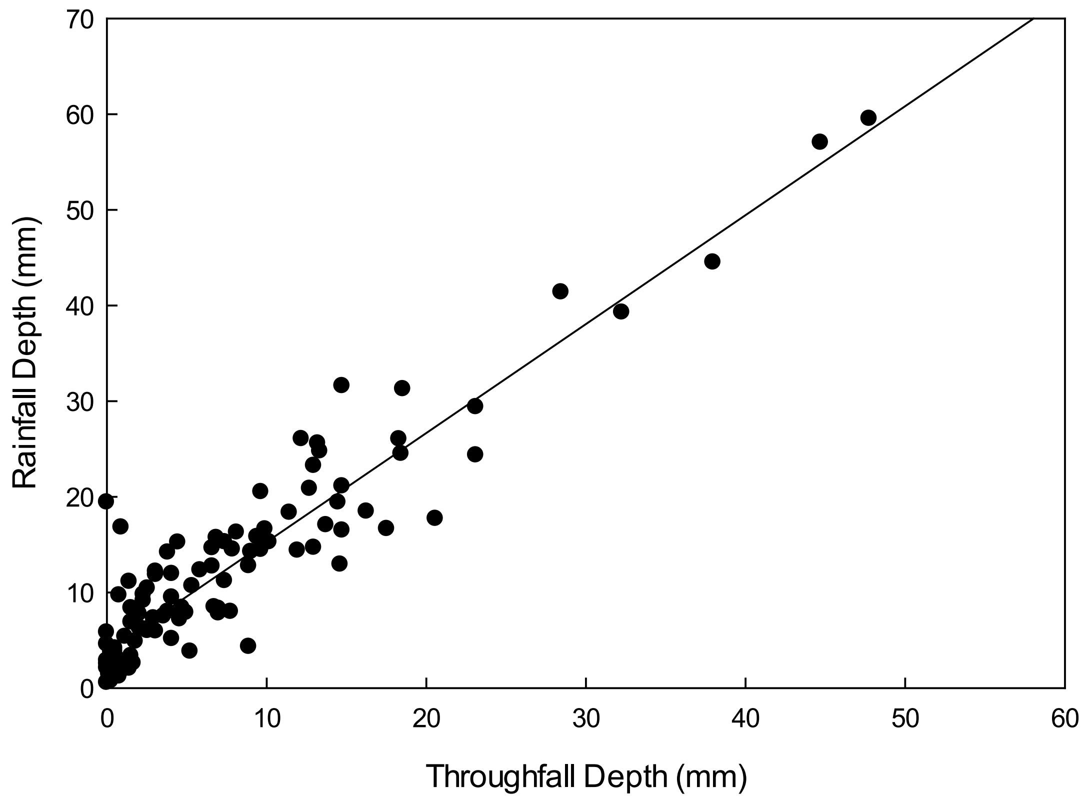

Figure E.7. Relationship between throughfall depth and rainfall depth for the 20-year coniferous plot (R^2=0.87, p<0.001).

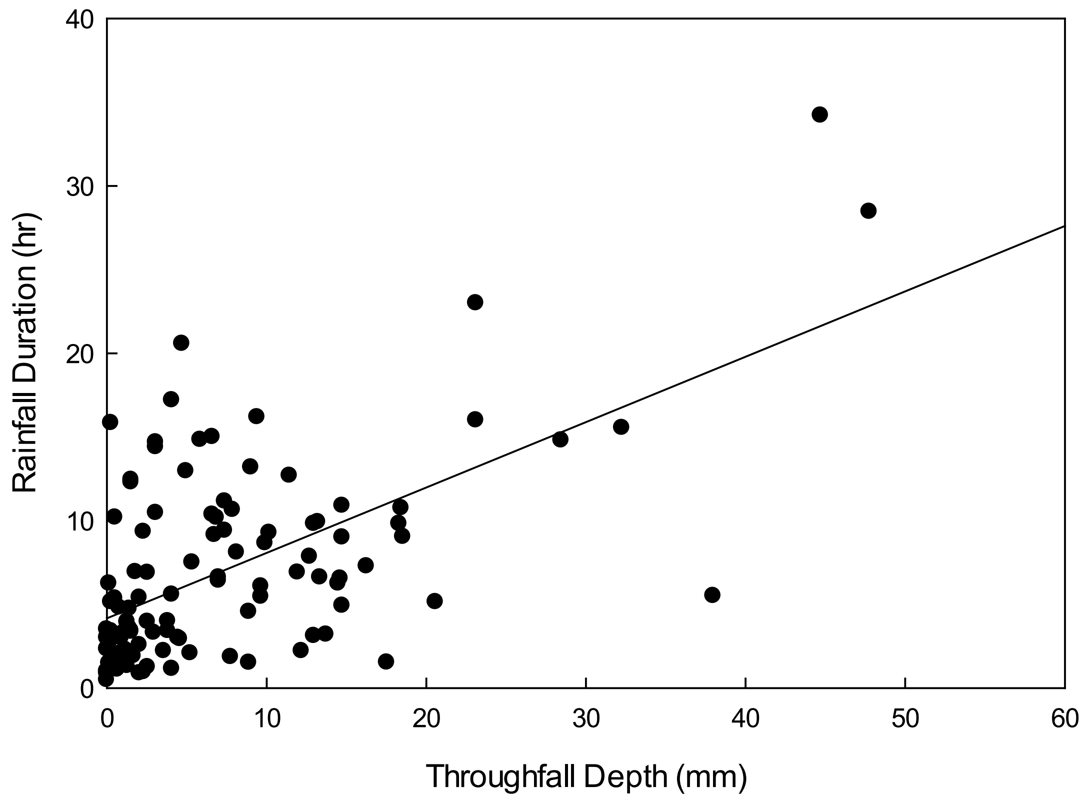

Figure E.8. Relationship between throughfall depth and rainfall duration for the 20-year coniferous plot (R^2=0.37, p<0.001).

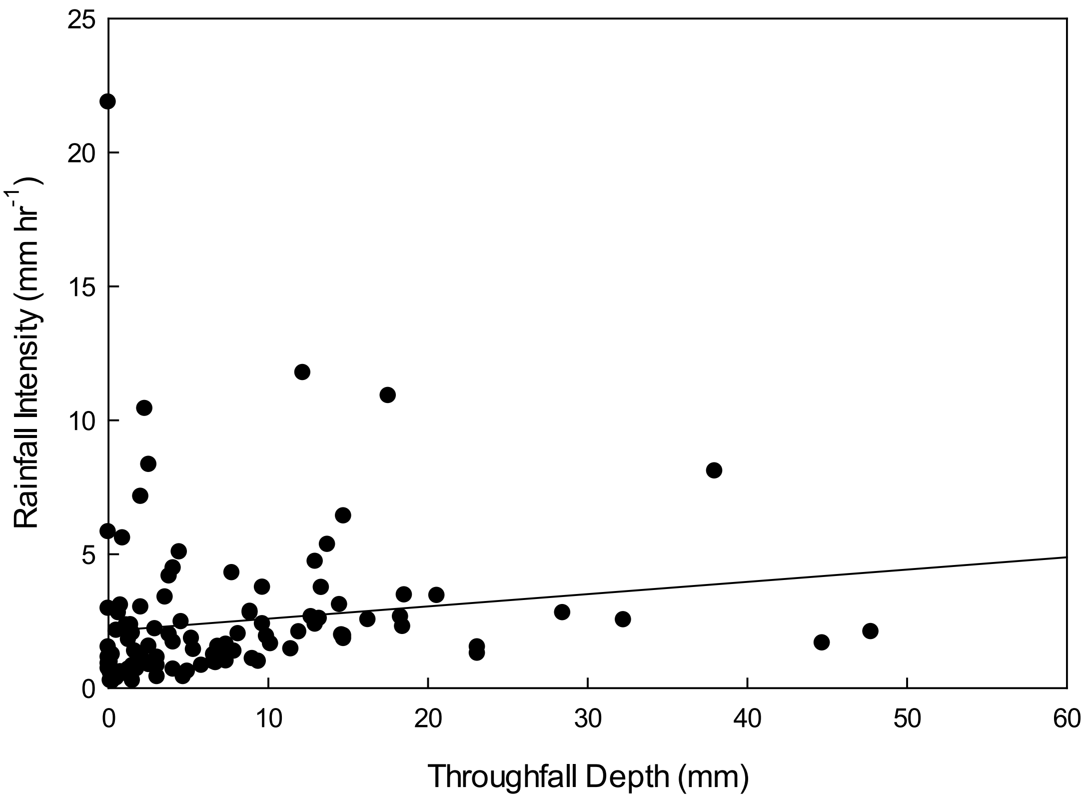

Figure E.9. Relationship between throughfall depth and rainfall intensity for the 20-year coniferous plot (R^2=0.02, p=0.137).

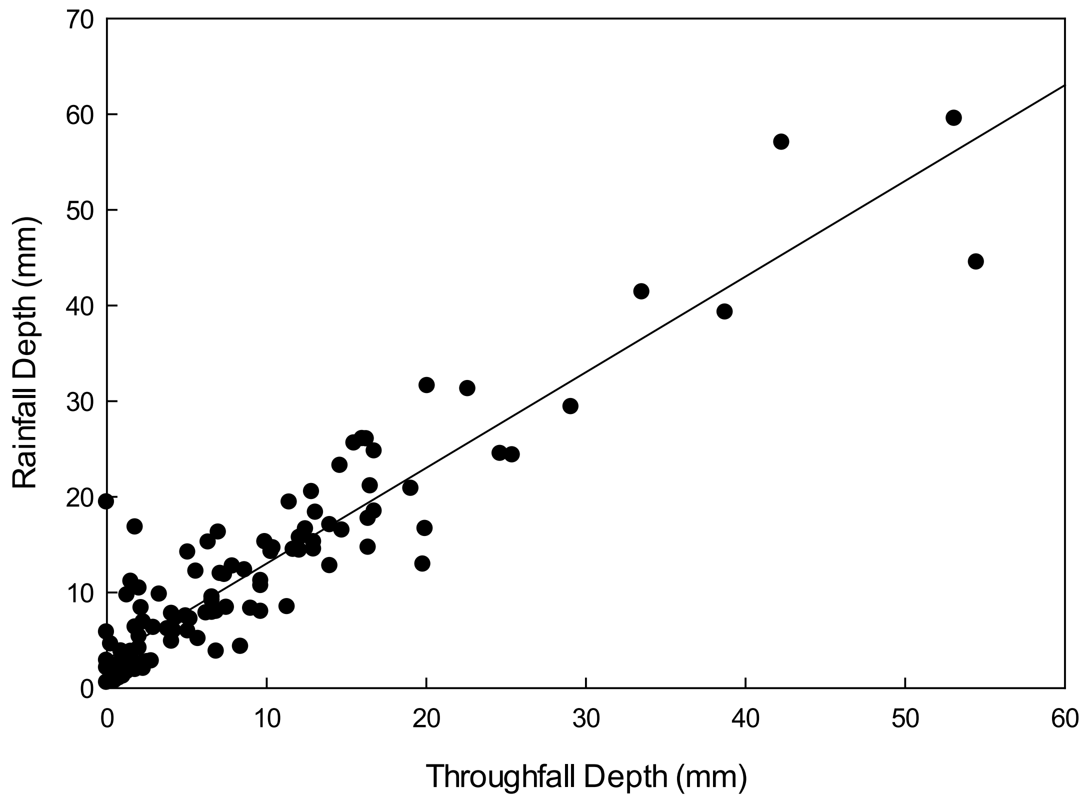

Figure E.10. Relationship between throughfall depth and rainfall depth for the 20-year deciduous plot (R^2=0.86, p<0.001).

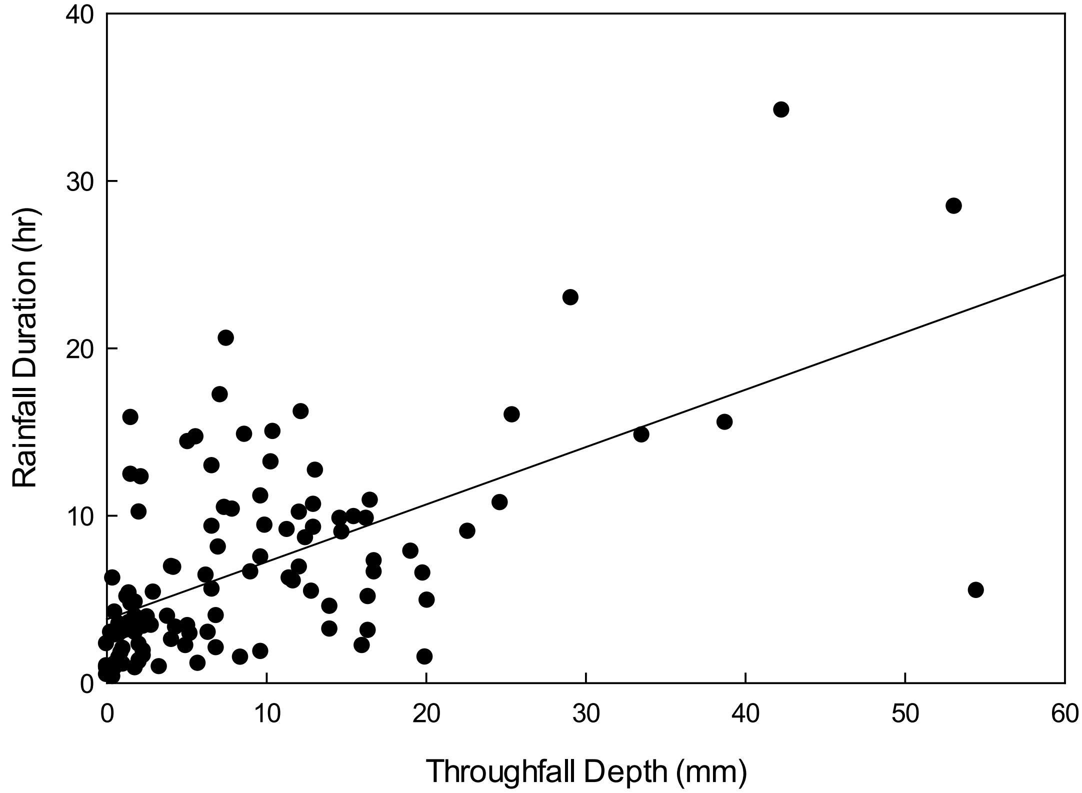

Figure E.11. Relationship between throughfall depth and rainfall duration for the 20-year deciduous plot (R^2=0.36, p<0.001).

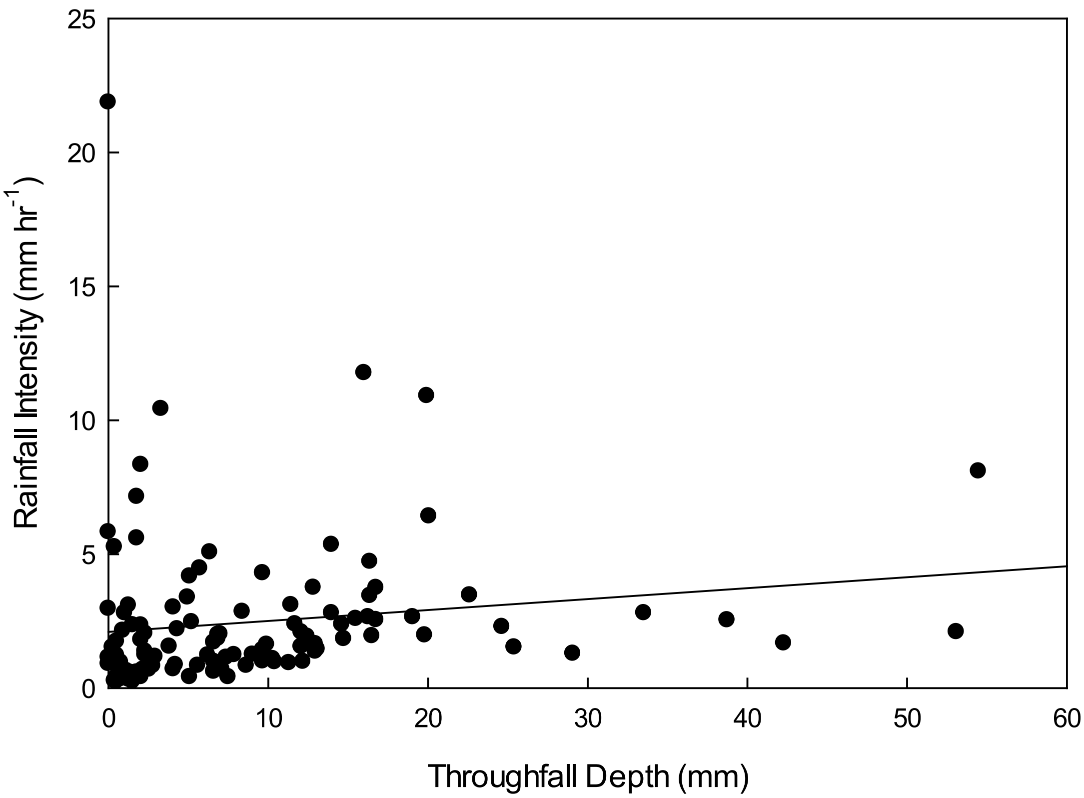

Figure E.12. Relationship between throughfall depth and rainfall intensity for the 20-year deciduous plot (R^2=0.02, *p*=0.123).

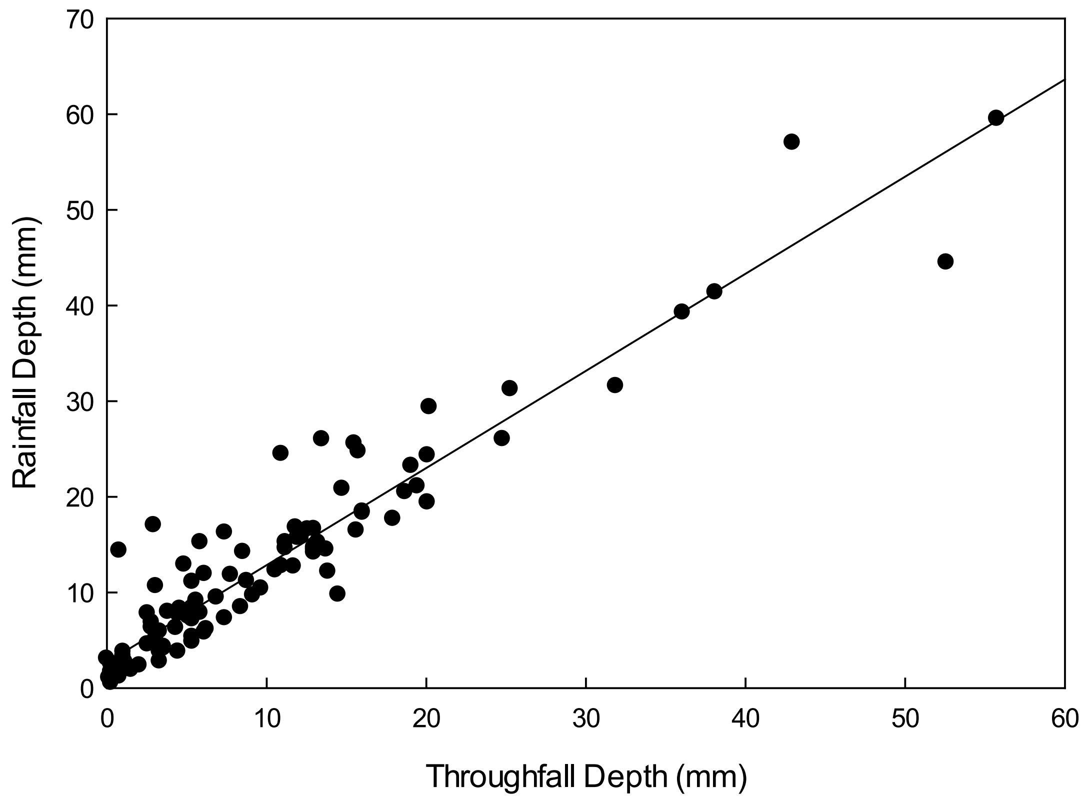

Figure E.13. Relationship between throughfall depth and rainfall depth for the 100-year coniferous plot (R^2=0.90, p<0.001).

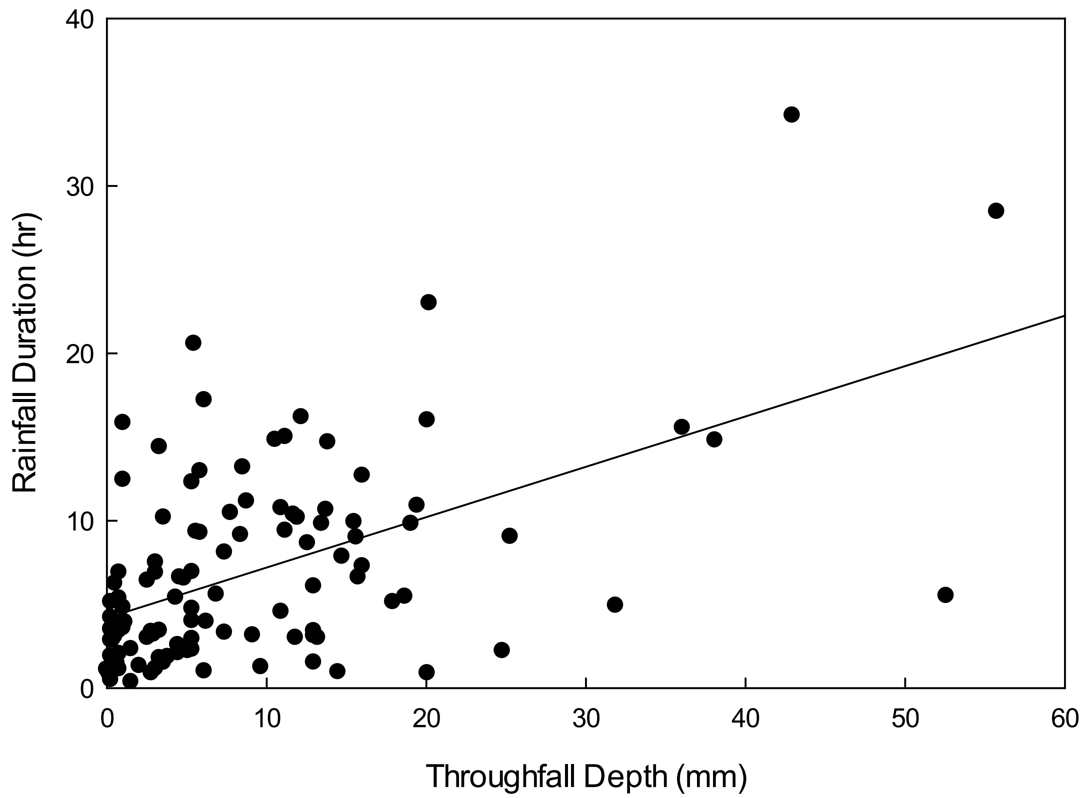

Figure E.14. Relationship between throughfall depth and rainfall duration for the 100-year coniferous plot (R^2=0.29, p<0.001).

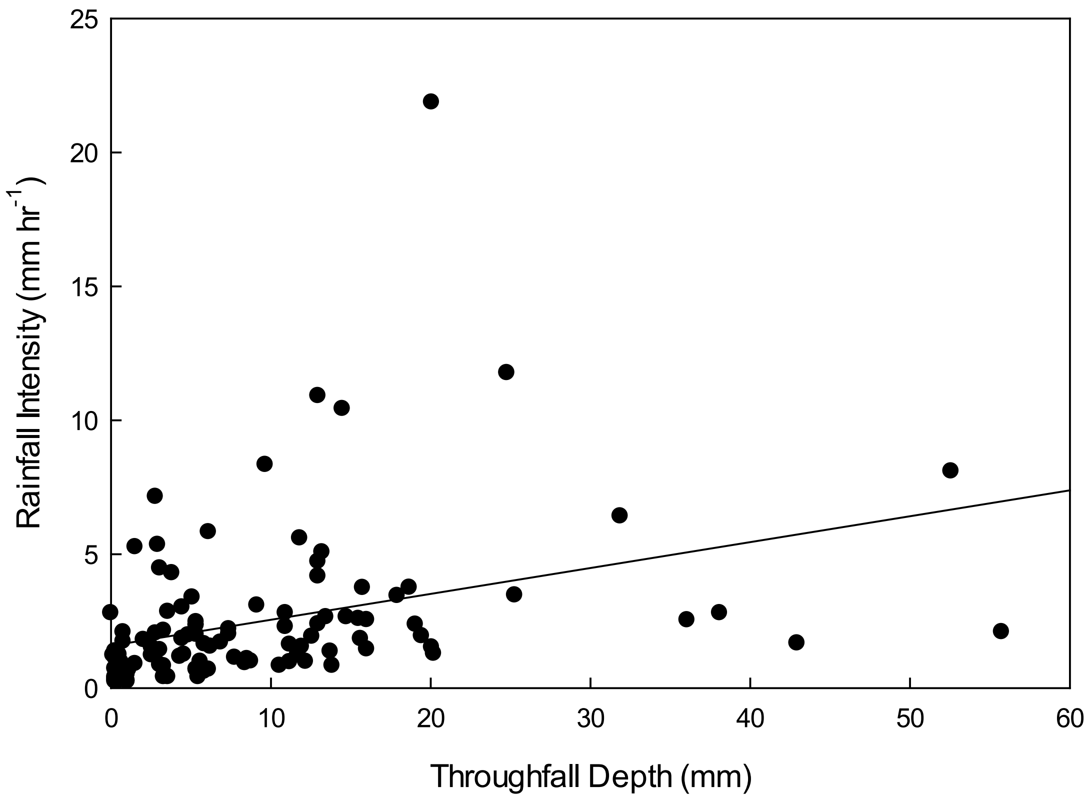

Figure E.15. Relationship between throughfall depth and rainfall intensity for the 100-year coniferous plot (R^2=0.12, p<0.001).

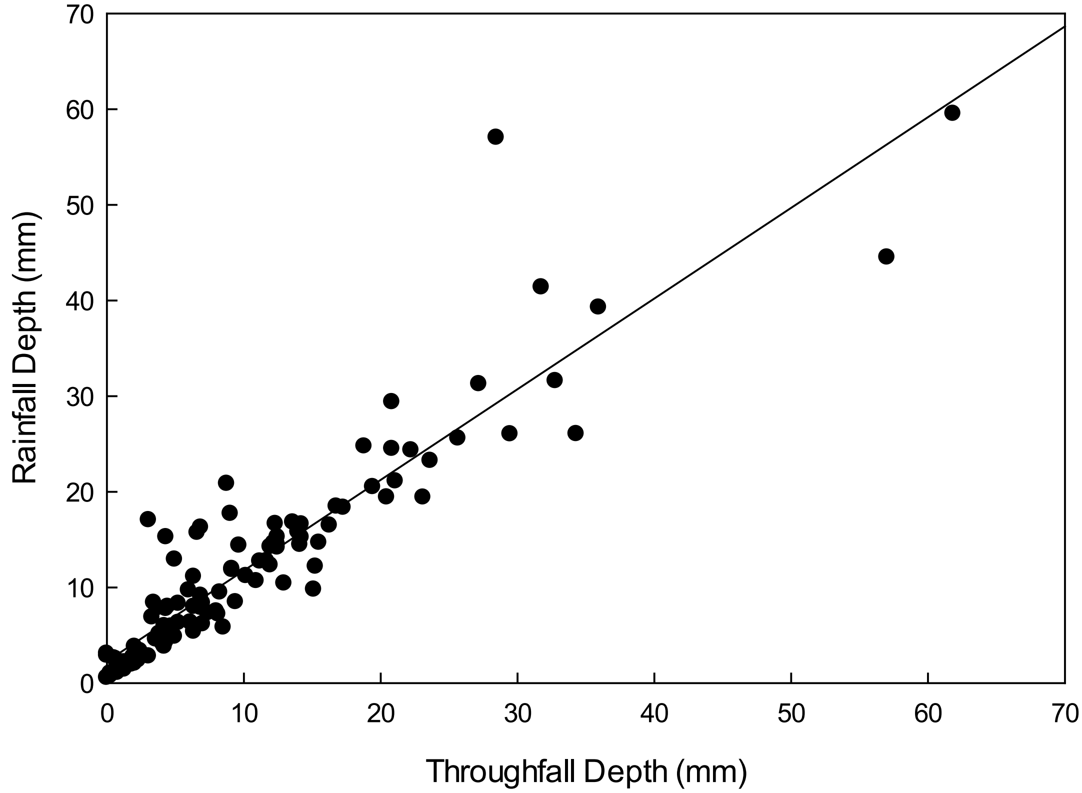

Figure E.16. Relationship between throughfall depth and rainfall depth for the 100-year deciduous plot (R^2=0.85, p<0.001).

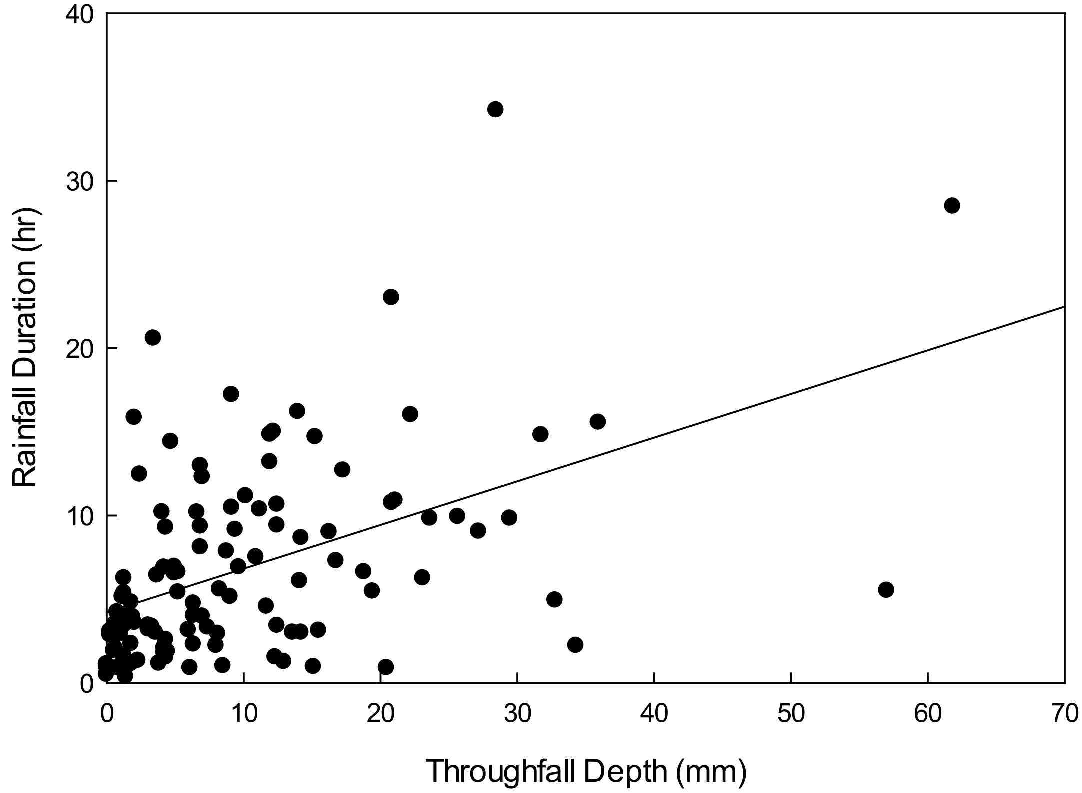

Figure E.17. Relationship between throughfall depth and rainfall duration for the 100-year deciduous plot (R^2=0.23, p<0.001).

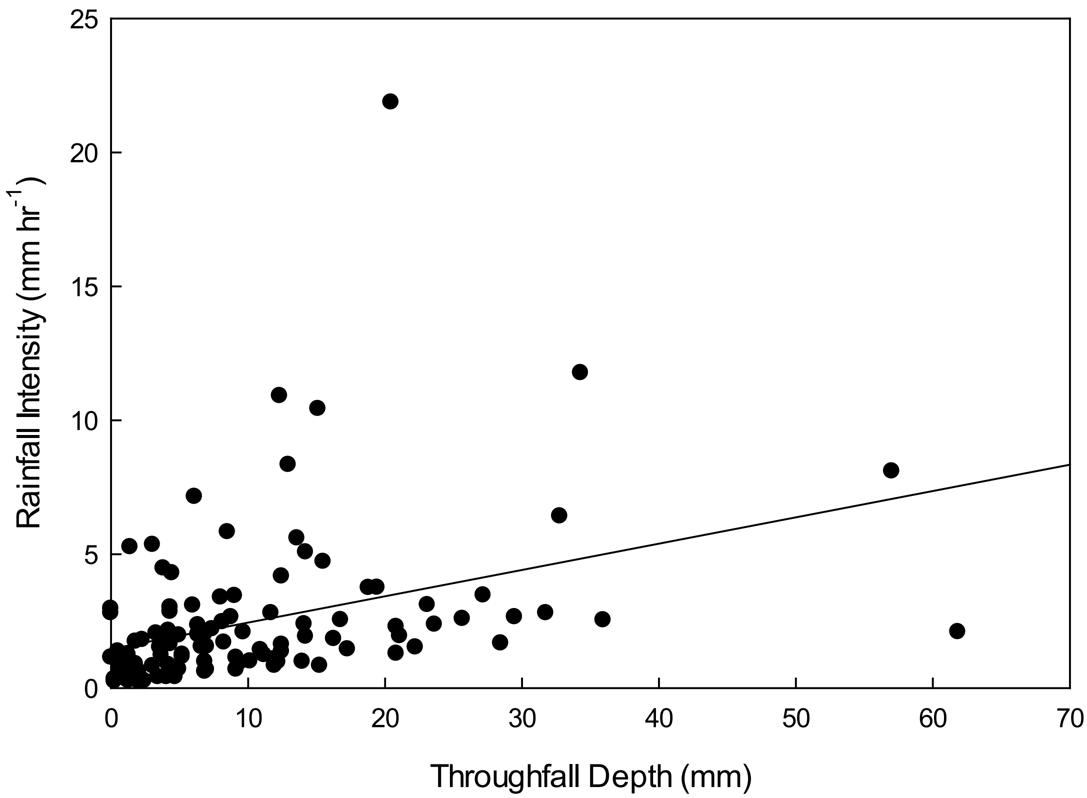

Figure E.18. Relationship between throughfall depth and rainfall intensity for the 100-year deciduous plot (R^2=0.14, p<0.001).

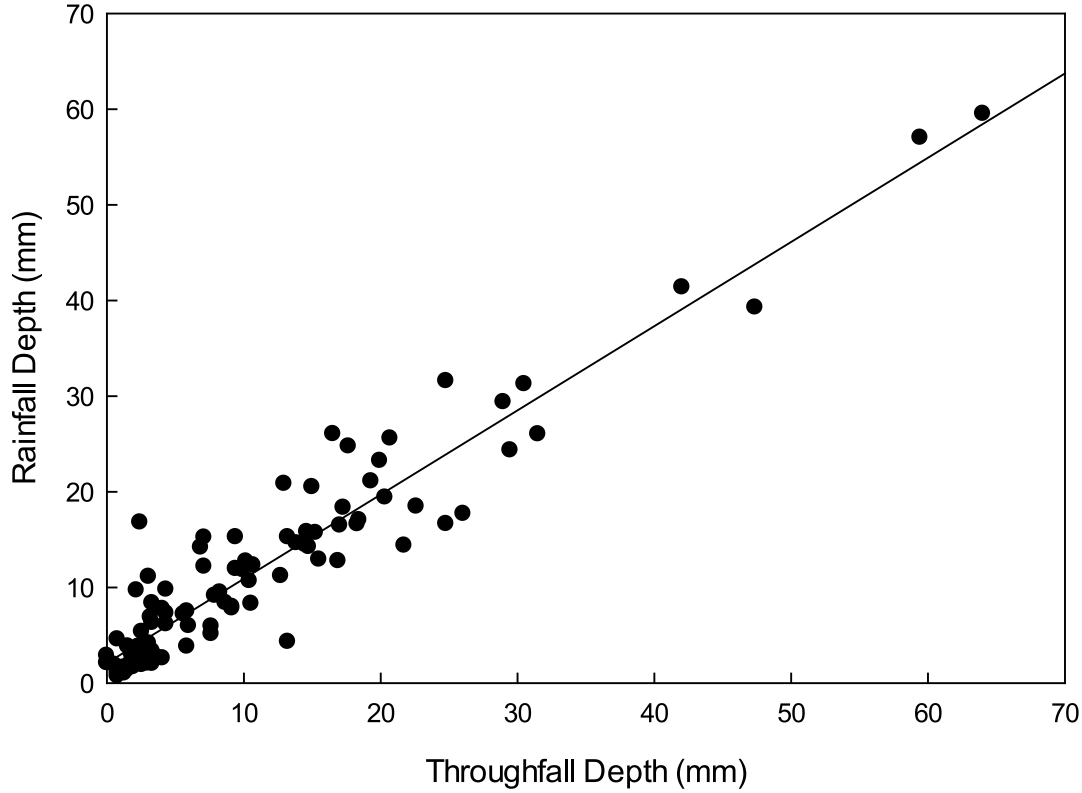

Figure E.19. Relationship between throughfall depth and rainfall depth for the control (grass only) plot (R^2=0.90, p<0.001).

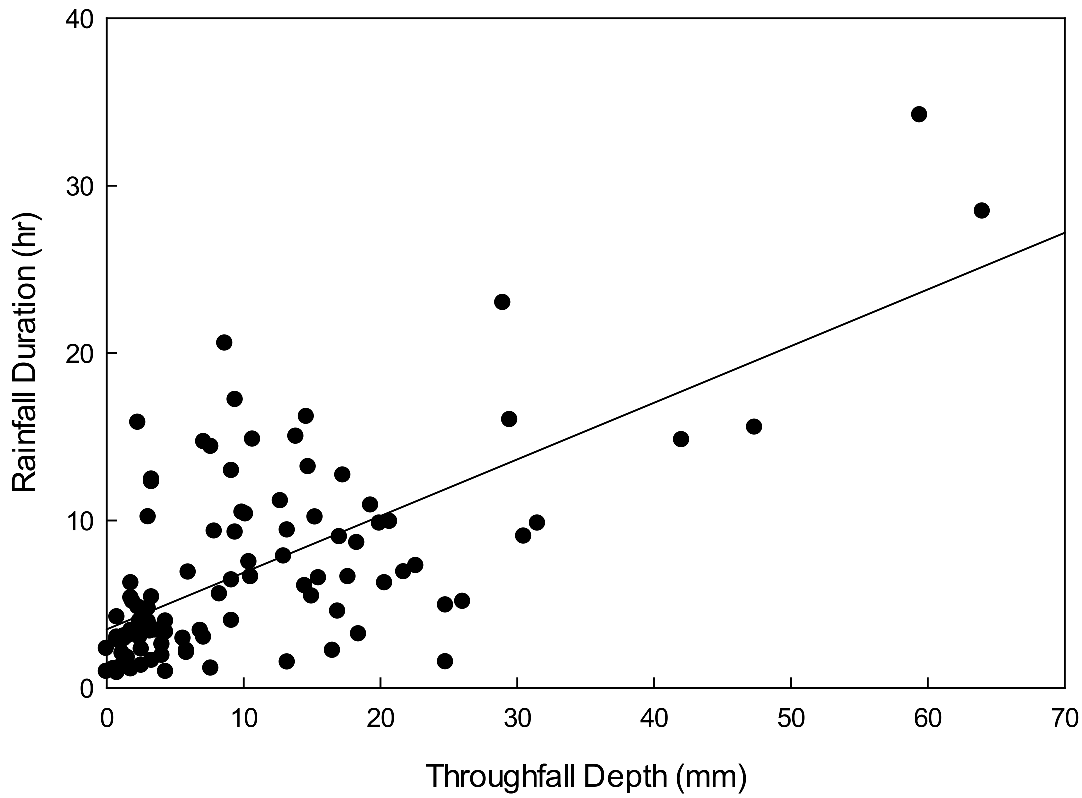

Figure E.20. Relationship between throughfall depth and rainfall duration for the control (grass only) plot (R^2=0.45, p<0.001).

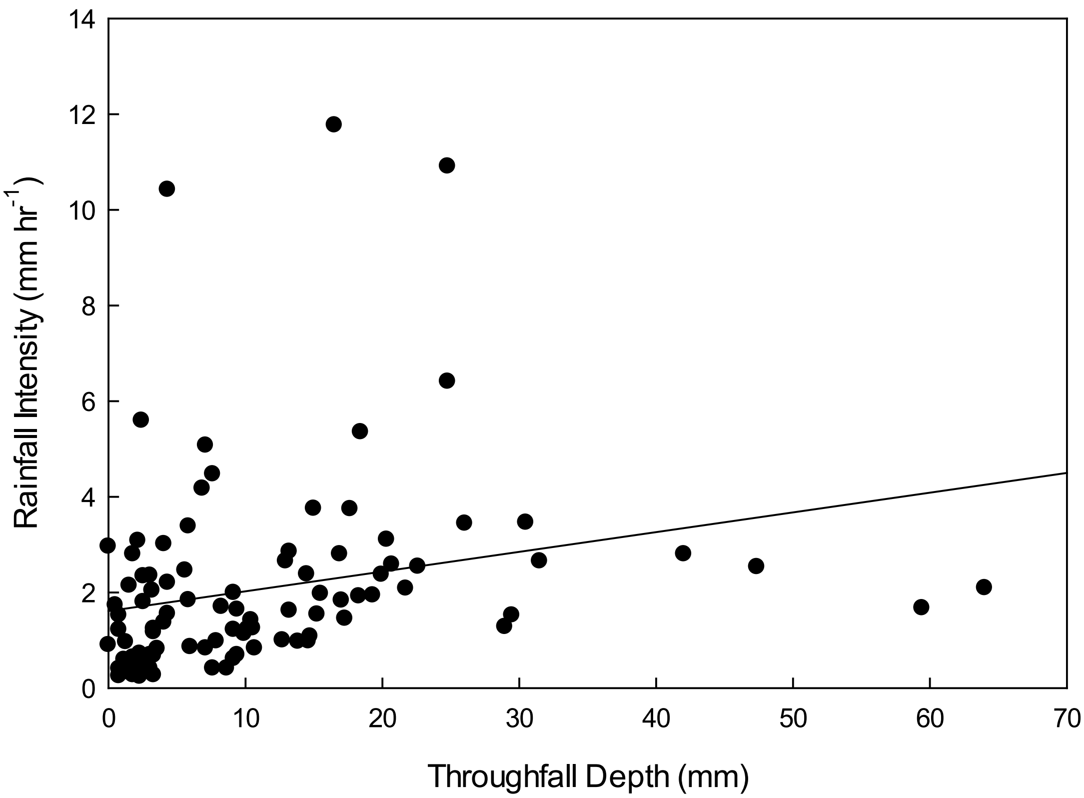

Figure E.21. Relationship between throughfall depth and rainfall intensity for the control (grass only) plot (R^2=0.06, p=0.016).

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VITA

PLACE OF BIRTH

Chicago, Illinois

EDUCATION

A.A.S. Mechanical/Manufacturing Engineering Technology, Washtenaw Community College, Ann Arbor, Michigan, 2005.

B.S. Mechanical Engineering, University of Wisconsin – Madison, Wisconsin, May 2008.

Graduate Certificate, Stream and Watershed Science, University of Kentucky, Lexington, Kentucky, December 2017.

PROFESSIONAL EXPERIENCE

Graduate Research Assistant, Department of Civil Engineering, University of Kentucky, Lexington, Kentucky, August 2018 - Present Advisor: Dr. James Fox.

Graduate Research Assistant, Department of Biosystems and Agricultural Engineering, University of Kentucky, Lexington, Kentucky, August 2011 – August 2018. Advisor: Dr. Carmen Agouridis.

Associate Engineer, Kautex-Textron, Troy, Michigan. 2013 to 2015.

English Teacher. Omeida Language College. Yangshuo, Guangxi, China. 2010 to 2011.

Engineer / Technical Writer. L-3 Communications EOTech. Ann Arbor, MI. 2008 to 2009.

PROFESSIONAL ASSOCIATIONS

Vice President of Water Professional Student Chapter, University of Kentucky. 2017.