

Raise the Blade Business Research Sites Grass and Soil Assessment Methods¹

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Safety Considerations

This monitoring project involves a variety of potential hazards as follow:

- Risk of injury while loading and unloading the mower from the vehicle
- Dangers associated with using a lawn mower
- Potential injury while installing ring infiltrometer
- Risk of injury during transport from site to site
- Potential risk of stings by insects, exposure to sun, extreme temperatures or other weather-related hazards

To minimize risks, take into consideration the following guidance and safety considerations:

During Loading and Unloading of the Mower

- Use boards to create a ramp for the mower to push it into the vehicle rather than lifting it
- If lifting is necessary, ask someone for assistance in lifting the mower into the vehicle.
- Be sure to fold down its handle prior to placing in the vehicle.
- Secure the mower within the vehicle using straps or bungee cords to avoid it rolling around within the vehicle

While Using the Mower

- Follow all of the safety tips listed in the image below.

¹ Last updated May 2, 2019



In addition:

- Fill the gas can only while it is placed on the ground
- Adjust the mower height only when the mower is turned off

While installing the Ring Infiltrrometer:

- Bend your knees/lift with your legs rather than your back while hammering in the ring infiltrrometer
- Wear gloves to avoid getting a splinter
- Wear eye protection to protect against any flying objects that may be dislodged during the hammering in process

During Transport:

- Be sure to take UVM driver training before driving any University or rental vehicle to access research or outreach sites
- Pay attention to all traffic regulations
- Secure the lawnmower so that it does not have the ability to move about within the vehicle during transport

Risk of Stings and Weather

- Be sure to check the weather before heading to the field to monitor. If there is high risk of Thunderstorms or other extreme weather, plan to go to sites on a different day

- If you are severely allergic to insect stings, be sure to carry an epi-pen and have it clearly marked on a bag or bin from which you are working so that passers-by might find it easily in the event of an emergency
- Alert someone else to your planned field visit schedule for each day, including locations, hours expected to work, and campus sites you may need to visit to pick up or drop off supplies
- Wear sunscreen, hat, and clothing that will help protect you from the sun and other weather, yet will not put you at risk of injury from the lawnmower.
- Bring water and food with you to field sites to ensure you are able to be well hydrated and fed throughout your field visits
- Wash your hands before eating if you have been handling grass, soil or other organic materials at the sites

Logistical Planning and Guidelines

In 2018 and 2019, a full field season will be available to conduct this research project. From May – July, each site should be mowed once per week. In late July grass growth will likely be slowing enough to reduce mowing frequency to once every other week at each site. A calendar that identifies which sites will be monitored each week, and which weeks mowing will occur should be developed for the summer. An example calendar is shown below. Note that due to weather, the calendar schedule may be subject to change. Mowing can be difficult or even dangerous when the grass is wet, and infiltration should only be measured on days when there has been no rain.

At the start of the field season, follow directions below to plan a monitoring and mowing schedule for the summer (see calendar below). In addition, reserve a RSENR vehicle if you do not have your own. (Note: mileage will not be reimbursed for your travel within Burlington if you use your own vehicle.) Follow steps described here (<https://www.uvm.edu/rsenr/businesscenter/vehicles-trailers-and-gems>) to reserve the Prius or 4WD truck, and to pick up keys. Please avoid using the trucks at the Rubenstein Lab if at all possible, as those are in high demand among a number of students, staff and faculty. Use the following chart string when making your reservations in Outlook: 22 57000 300 201001 421 GCA01 034616 SPNS 0000 0000 0000. It is a good idea to make your reservations as far ahead of time as possible, as the RSENR vehicles are in high demand over the summer months.

Monitoring Methods

2017 Monitoring:

Soil compaction, organic matter, soil nutrients, vegetation composition and density, and infiltration rates were measured for the control and treatment on each site before the experiment began. Equal variance student T tests were used to measure whether the treatment and control started with similar parameter measurements. The vegetation height was assessed each week, before and after each mow. Photographs of the treatment and control of each site were taken after every mow to record to help determine lawn's health and drought resistance. The

vegetation composition and density were assessed every other week, and the infiltration rate was measured every other week from July through mid-August, and then assessed once a month for the continuation of the experiment.

2018 and 2019 Monitoring:

At each site, initially introduce yourself to the business manager on site. Then demarcate the control plot and test plot at each participating research demonstration site (see photos pages 9-13). At some sites this may require painting a line to allow landscapers to identify where not to mow. Do not paint lines without landowner permission. Whenever possible, simply use flags and signs to mark the sites.

Mow the **control area to a height of 2 inches** and allow clippings to fall to the ground to decompose. (This represents practices of, on average 52% of Lake Champlain Basin homeowners who maintain their grass to 2-3 inches in length, and 73% who allow clippings to remain on the land.) Mow the **treatment plot to 3 inches**, and also allow clippings to fall to the ground to decompose.

Sample Starting Calendar: Raise the Blade

This is an outline, you can approximate and choose the days of the week

2018 MAY						
SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4	5
6	7	8	9	10	11	12
13	14 UVM * ♀ DE * ♀	15 ML ♀ HS ♀	16 FV ♀	17	18	19
20	21 QC ♀ * CL ♀ *	22 EC ♀ * FM ♀ *	23 MH ♀ *	24	25	26
27	28 UVM ♀ DE ♀	29 ML ♀ * HS ♀ *	30 FV ♀ *	31	1 June	2

↓
and ~~etc~~
change schedule
will change
due to
weather, etc.

MoW
extra
infiltration this
week MoW
MoW
For initial
May measurements

↓
look
check
Kris

MoW = mow this week
* = infiltration test
♀ = vegetation composition & density tests

Codes

- MH Magic hat
- QC Queen City, Pringles
- DE Dealer.com
- FM Foam ~~...~~
- EC Echo
- ML Main Street Landscaping
- FV Facial Vanding
- HS Hubert Supply
- CL Curtis Lumber
- UVM - UVM

Business Sites

Eight businesses are participating in the research project. Their addresses and contacts for each site are listed in the table below.

	Business Name	Address	City	State	Email	Contact Name	Phone
1	UVM Jeffords Hall	63 Carrigan Dr	Burlington	VT	Mark.Starrett@uvm.edu	Mark Starrett	(802) 656-0467
2	Main St Landing	60 Lake St / 1 Main St	Burlington	VT	Owen@mainstreetlanding.com	Owen	802-316-6667
3	Foam Brewers / Lake Point Property Management	112 Lake Street	Burlington	VT	jkenyon@lakepointvt.com	Jeff Kenyon	802-777-0282
4	Curtis Lumber	315 Pine St	Burlington	VT	jpierson@curtislumber.com	Jason Pierson	802-598-5576
5	Farrell Vending	405 Pine St	Burlington	VT	Skipofvt@aol.com	Skip	
6	Queen City Printers	701 Pine St	Burlington	VT	aschill@qcpinc.com	Alan Schillhammer	802-864-4566
7	Dealer.com	1 Howard St	Burlington	VT	Jesse.Paul@coxautoinc.com	Jesse Paul	802-540-1130
8	Magic Hat	5 Bartlett Bay	South Burlington	VT	robert.kuntz@magichat.net	Robert Kuntz	W (802) 923-1435 C (303) 746-9266

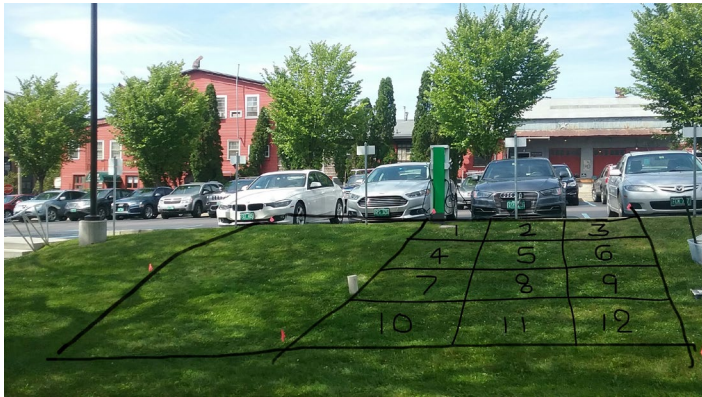
Soil Infiltration

To control for the amount of water in the soil prior to testing, soil infiltration tests are only done on days with no rain. Randomly place a ring infiltrometer on the control section of the site. Place a piece of wood on top of the upright pipe and drive it 2 cm into the soil with a heavy weight, such as the blunt side of a wood splitter. A line is drawn on the ring infiltrometer to mark this depth. Three lines have been drawn on the inside of the ring infiltrometer to use to estimate infiltration time. Fill the infiltrometer with water up to the highest line. Time how long it takes (in seconds) until the meniscus reaches the second line, and again how long it takes to reach the third line. While both times are recorded, in calculations, only the time it takes for the water to move from the second to third line is used. This allows a similar volume of water to enter the soil at each site prior to testing.

Vegetation Composition and Density

Using Google's random number generator, generate 6 numbers, each between 1 and 12. Do not repeat any numbers. Divide the control and treatment squares at each site into 12 sections. Visualize 3 sections on the shorter side, and 4 sections on the longer side (See image 1). Then, to begin each visual assessment, throw a 20-inch PVC pipe square from the side of the site into the section that corresponds to each number generated. This ensures a random selection of each area to be assessed. Determine the vegetation composition and density within each PVC square using a visual assessment. Average the 6 values that are determined.

Image 1. The division of the site for the density and vegetation composition tests.



Turf Density is a measure of the number of shoots per unit area. A visual rating of 1 to 9 is used with 9 equaling maximum density (Morris & Shearman, n.d.), as seen in image 2 below.

Image 2. Turf density of 9.



Next, visually estimate the percent bare ground, grass, weed, moss, dead vegetation, and clover like plants (*Lotus corniculatus*, *Trifolium repens*, *Trifolium pratense*) within the PVC pipe square.

Soil Compaction

Mentally divide both the control and treatment into 9 sections (See Figure 1). Measure soil compaction roughly in the middle of each of these squares. Measure the soil compaction to a depth of 300 penetration resistance units (psi) using a penetrometer. You can borrow the penetrometer (likely for the summer) from Dr. Sid Bosworth. To measure compaction, slowly push the penetrometer into the soil at a steady pace until the compaction reaches 300 psi. Record the depth of the base of the probe in the ground when 300 psi was reached. Record this measurement in centimeters on your data sheet.

Fig. 1 Grid for the visual division used in the soil compaction test.

1	2	3
4	5	6
7	8	9

Vegetation Height

Measure the average vegetation height in inches with a ruler in 5 to 10 different places on the control plot. You can mentally average these values. Also collect 5 to 10 vegetation height measurements in the treatment plot. Measure the vegetation height during every site visit. When the site is mowed, measure average grass height before and after mowing.

UVM Soil Test

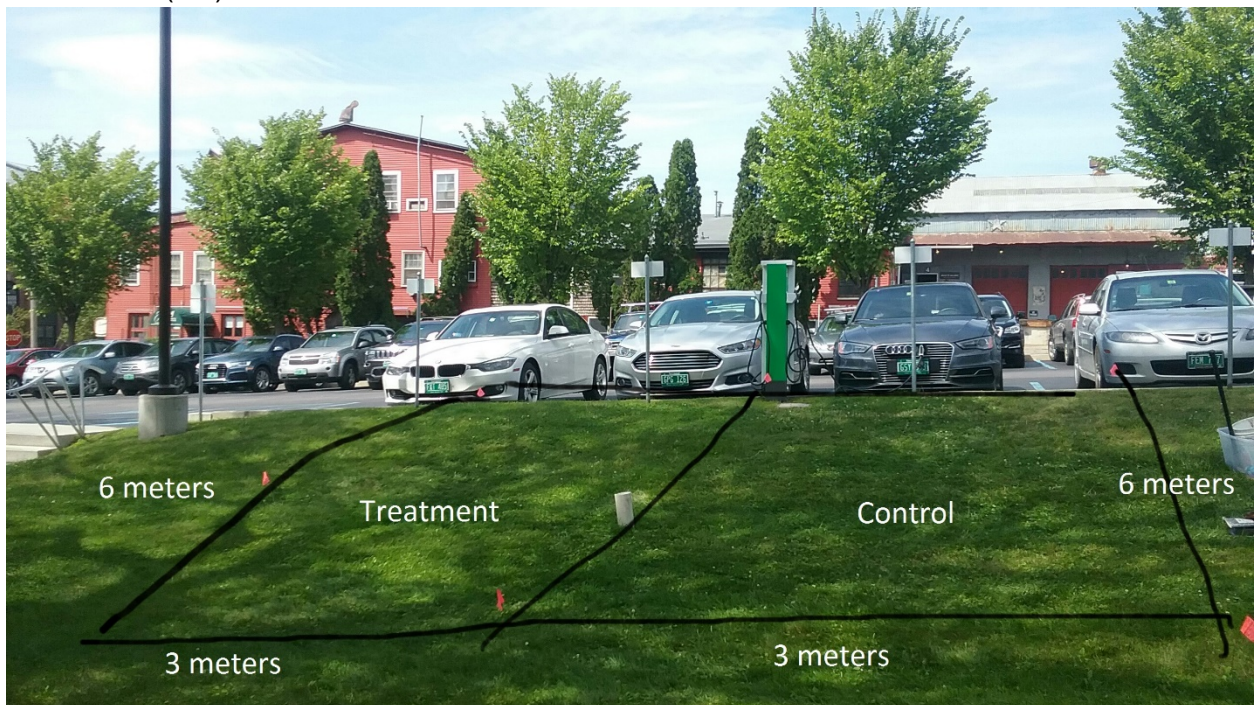
In fall 2019 soil samples will be collected using the same site map divisions that split each treatment and control site into 12 sections for the vegetation composition and density tests. To collect the soil samples, push a soil auger into the ground until it can go no further. Remove about one inch of grass and thatch from the top of the core obtained with the soil auger. Dump the remaining soil in the auger into a clean bucket after each core is taken. Remove pieces of grass, rocks, and large root masses from the soil and break down any clumps of soil in the sample. The combined sample should be mixed and inserted into a soil sample bag provided by the UVM Soil Testing Lab. Complete a field data sheet for each site and submit samples (marked with site and date) along with the data sheets to the lab for analysis.

Raise the Blade Sites

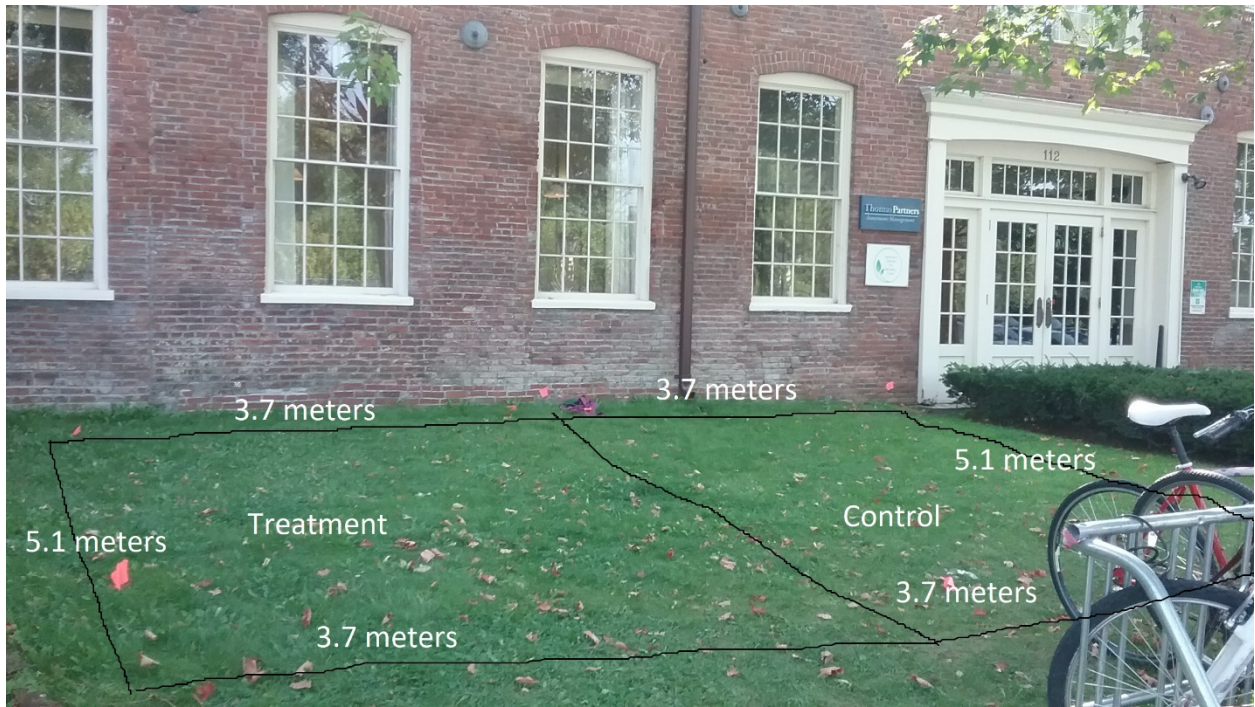
Curtis Lumber (CL):



Dealer.com (DE):



Foam Brewers/LakePoint Property Management (FM):



Farrell Vending (FV) Control:



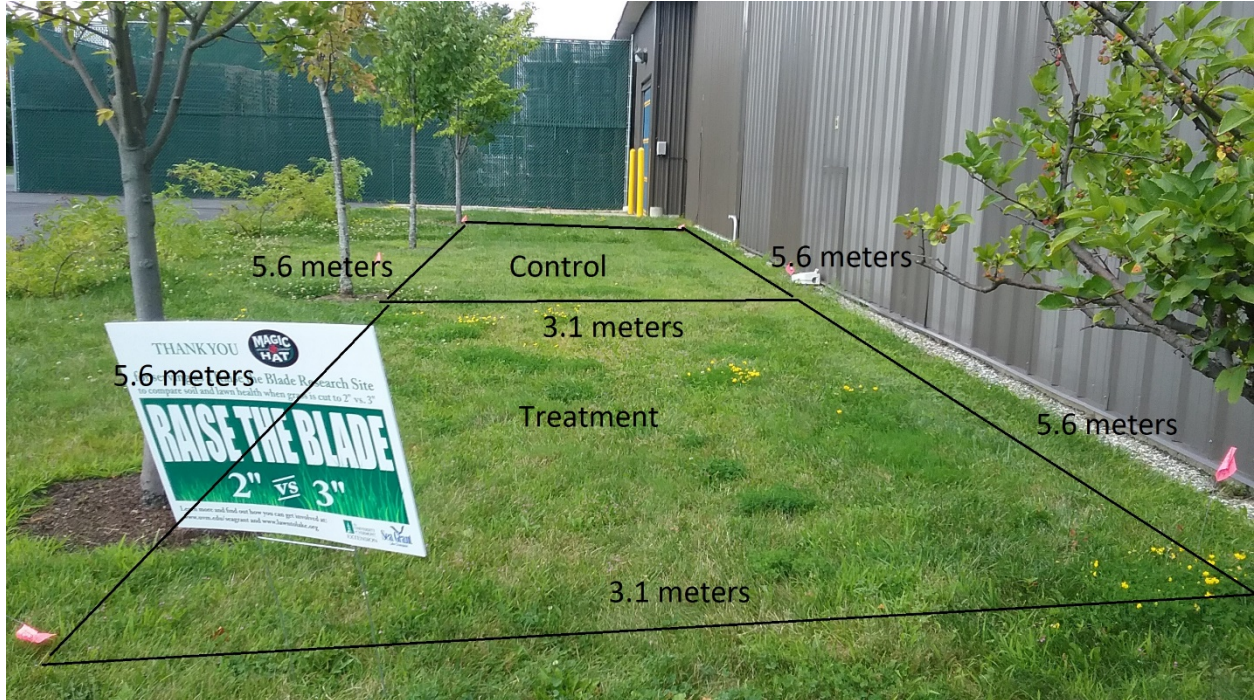
4 meters along building; 6.1 meters from building to photographer's location.

Farrell Vending (FV) Treatment:

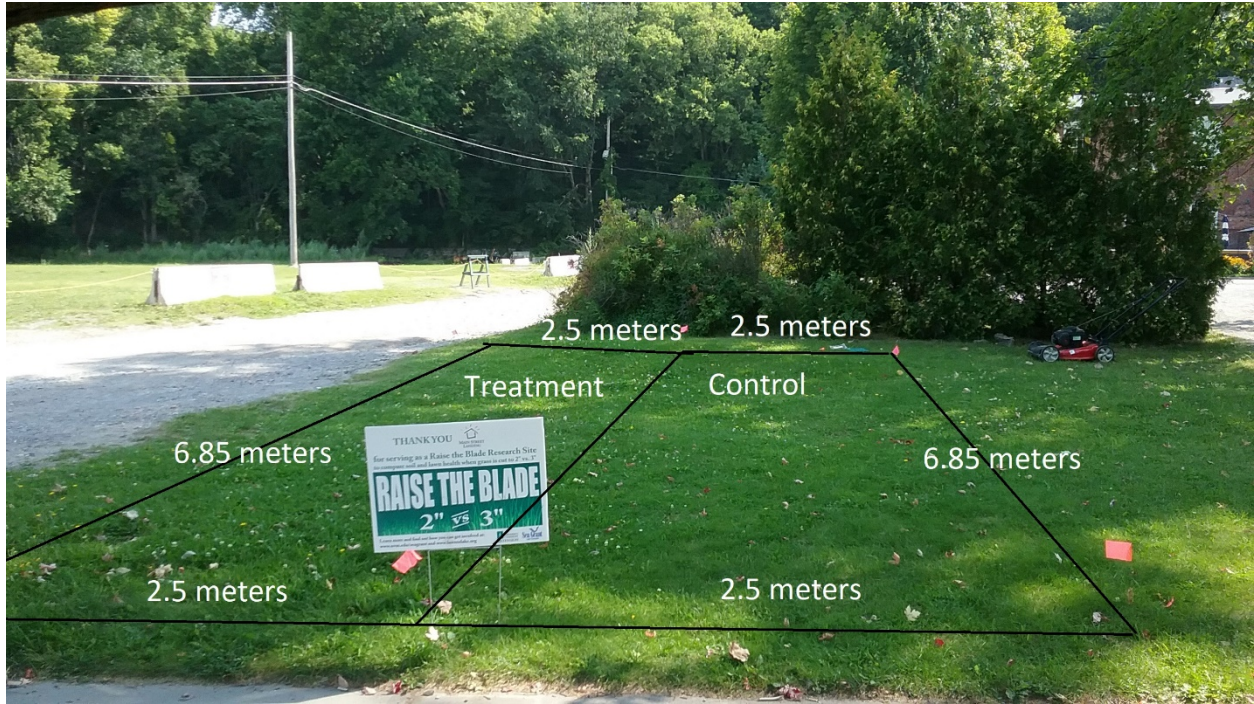


4 meters along building; 6.1 meters from building to photographer's location.

Magic Hat (MH):



Main St Landing (ML):



Queen City Printers, LLC (QC):



UVM:

