Case Study: Measuring Clipping Volume at the Robert Trent Jones Golf Course at Cornell University:

For those on social media you've probably heard of "clipping volume", notably through the use of a hashtag #clipvol that has conveniently earmarked tweets concerning the topic. For those who haven't, the concept is simple: mow it, measure it, mark it down…

The concept has been explored in depth by Dr. Micah Woods in his electronic book "One Bucket at a Time" which you should read if you are searching for the fundamentals of this concept. This post however, will focus on the first year of clipping volume collection at the Robert Trent Jones (RTJ) Golf Course at Cornell University, and what was learned from this endeavor.

In conjunction with David Hicks, the golf course superintendent, we collected clipping volume measurements on the 5th and 7th greens at the RTJ course. It should be noted that Dave, while a willing participant, was initially skeptical of the clipping volume concept and whether the data would be useful. If you would like to listen to our podcast with Dave discussing this project, you can do that here:

Study Focus:

An emphasis was placed on practicality. In many situations it's not feasible to collect clippings on every green, so for this case study we choose to measure only two greens. Choosing only two greens makes collection and analysis of clipping volume easier, and illustrates what we would consider a "Level 1" implementation of clipping volume, allowing a superintendent to metaphorically dip their toe in the water before diving in.

The two greens measured were at opposite ends of the performance spectrum, with the 5th green being particularly difficult to manage and the 7th green a historically high performer on the property. The contrast in performance made it ideal to track growth of both greens as they are representative of others on the property.

Finally, and perhaps most importantly, we agreed that the goal of collecting clippings in 2018 was to simply observe. How much does growth vary under Dave's traditional management? Is there an optimal growth rate for his greens? How much does growth vary from day to day, or week to week? We did not want Dave to react to the data as much as simply being aware of it.

Data Collection and Analysis:

Clipping volume was measured in liters after every mowing event in 2018 from May through September on the 5th and 7th greens at the RTJ course. Each of the three

buckets on the ride-on mower were measured separately to indicate abnormalities in mower set-up by reel. The measurement bucket and recording sheet were kept in a pump house so data could be collected on rainy days (fig 1).

The area of each green was measured on the ground in order to convert clipping volume measurements (in liters) to a volume per unit area measurement. Data was converted to units of ml/m^2. Many individuals collecting clipping volume express measurements in L/100m, an order of magnitude smaller.

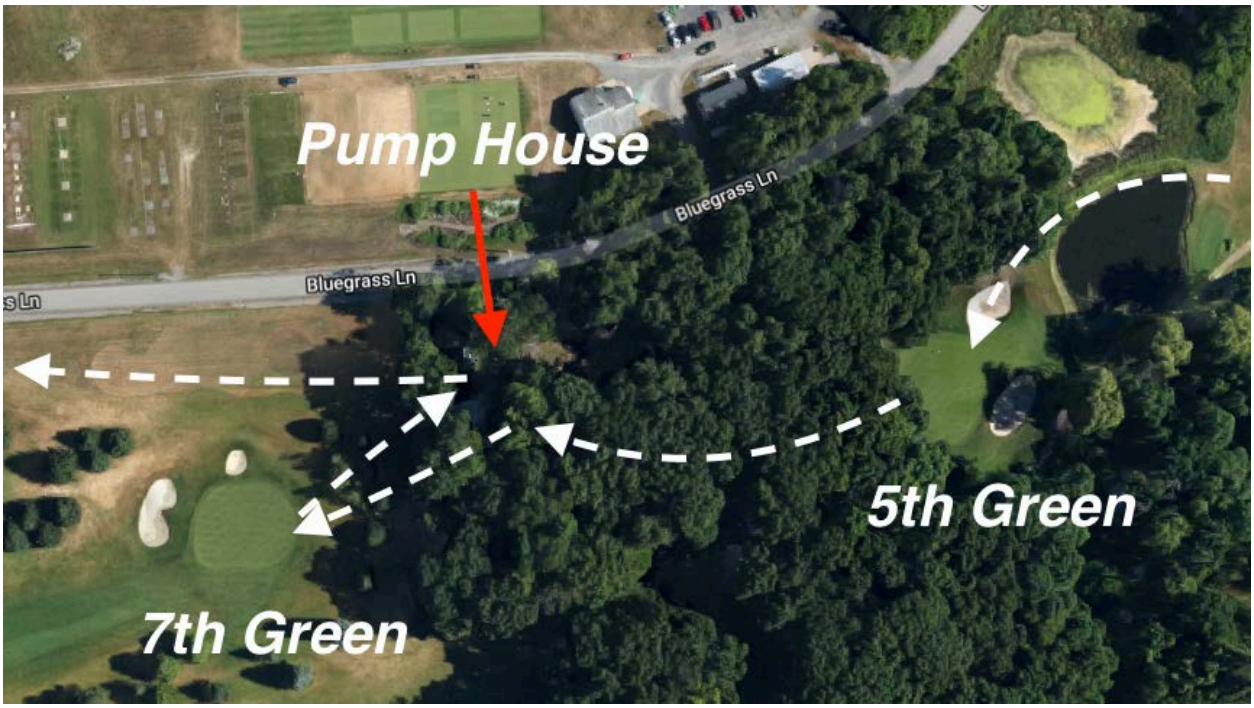

Figure 1 – Schematic of greens mower operator path to mow and collect clippings on both greens

Results and Observations:

Clipping volume is shown on a 5-day rolling average (fig. 2). Significant differences occurred between greens at certain times during the growing season. For example, more growth was observed on the 5th green in May, and less growth than the 7th green in August and September. As seen in figure 1, both greens have drastically different growing environments, no doubt playing a role in their growth rate. While magnitude differences were noticed between greens, overall trends in growth (increasing or decreasing) were similar for the majority of the year

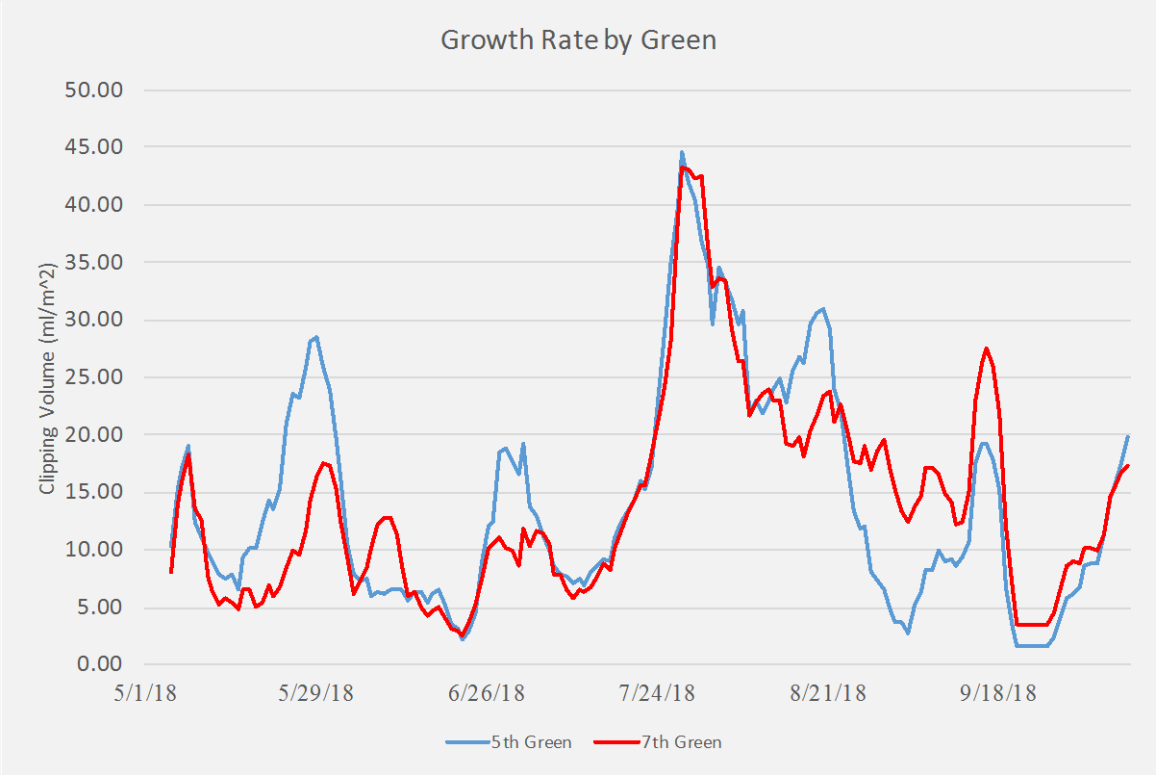

Figure 2 – 5-day Rolling Average of Clipping Volume

The fluctuation in growth rate is starkly evident, as growth rate dipped as low as 3 ml/m^2 in June, and as high as 43 ml/m^2 in July. It may be even more surprising when one considers that a plant growth regulator program using Primo (trinexepac-ethyl) was employed in accordance with growing degree day re-application intervals. Why then, did we observe these peaks and valleys of growth?

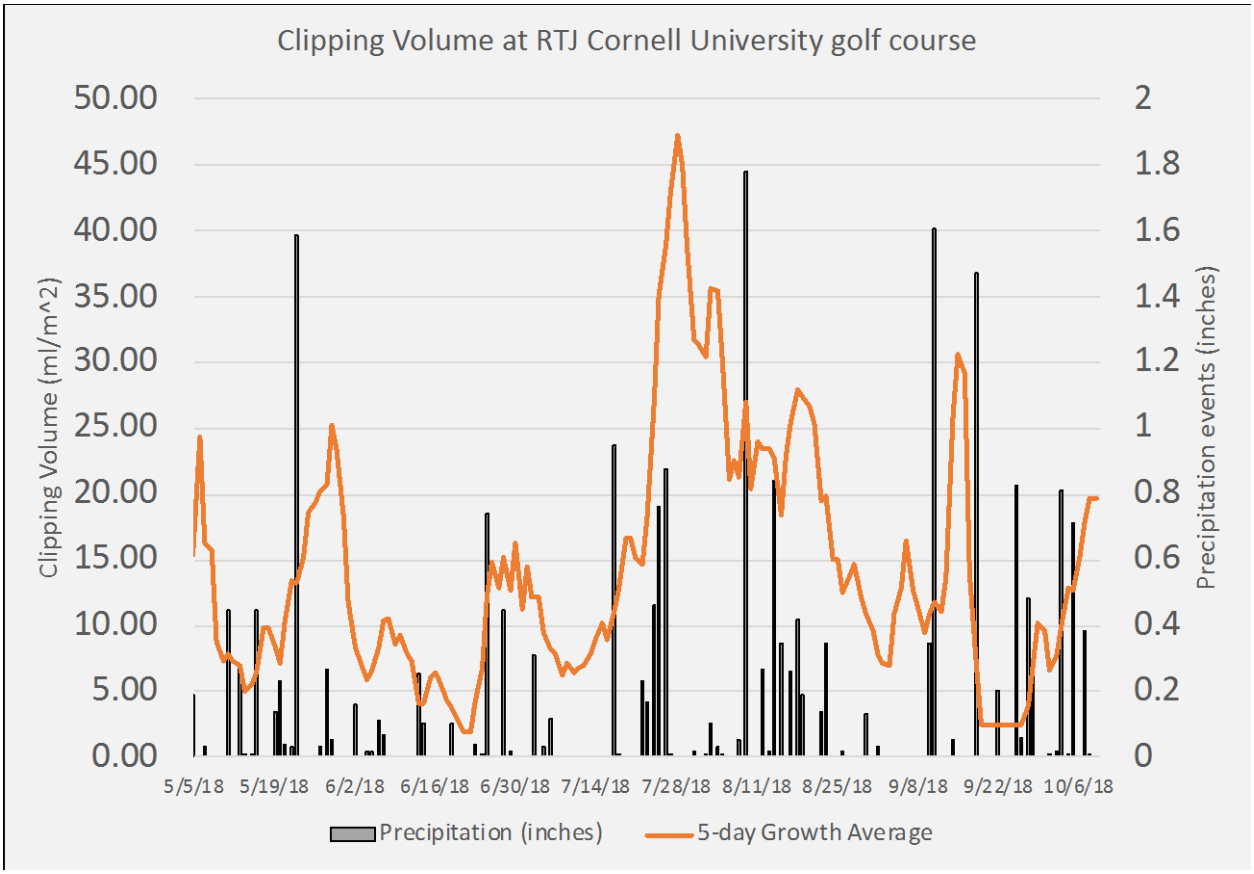

Figure 3 – 5-day average of growth rate and precipitation events

As expected, climate exerts a large influence on grass growth rate, however it was surprising to see the magnitude of the influence following persistent rainfall that lead to very wet soil conditions. Figure 3 shows the average growth along with daily precipitation events. Notice a slight lag time between large rain events and spikes in growth.

It could be hypothesized that moist, warm soil is an ideal environment for soil microbes involved in mineralization of nitrogen from soil organic matter. Microbial activity is stimulated under these conditions, and is responsible for the conversion of nitrogen into a useable form by the plant that may be driving turf growth flushes.

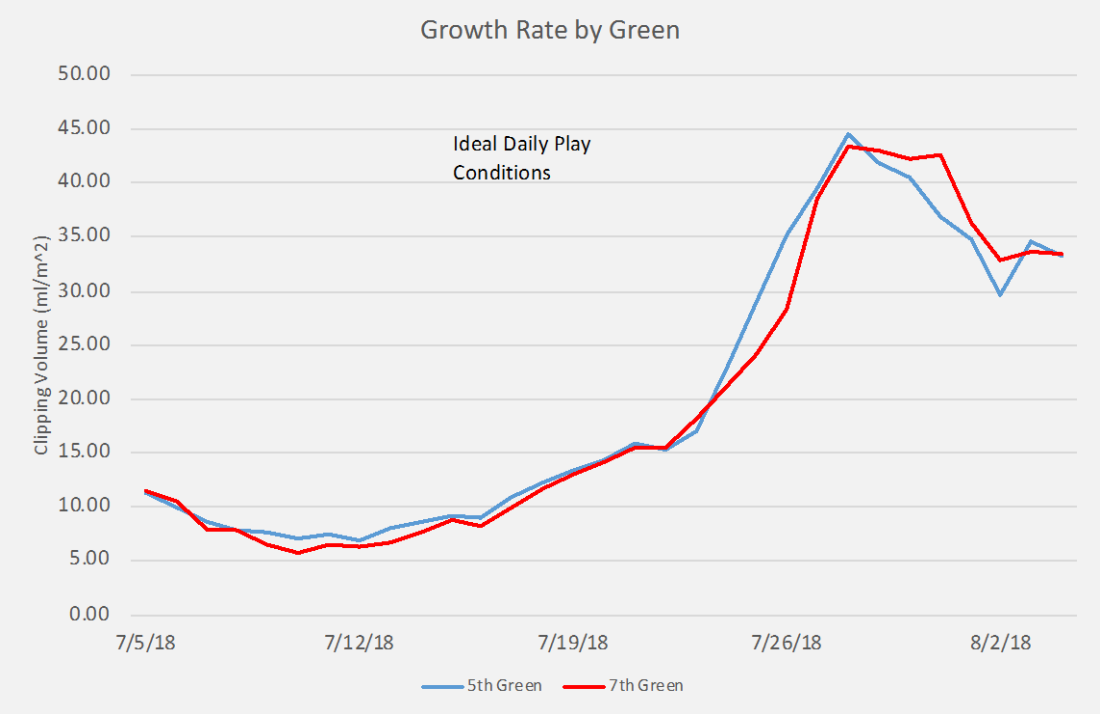

Figure 4 – Ideal Growth Rate for Daily Play

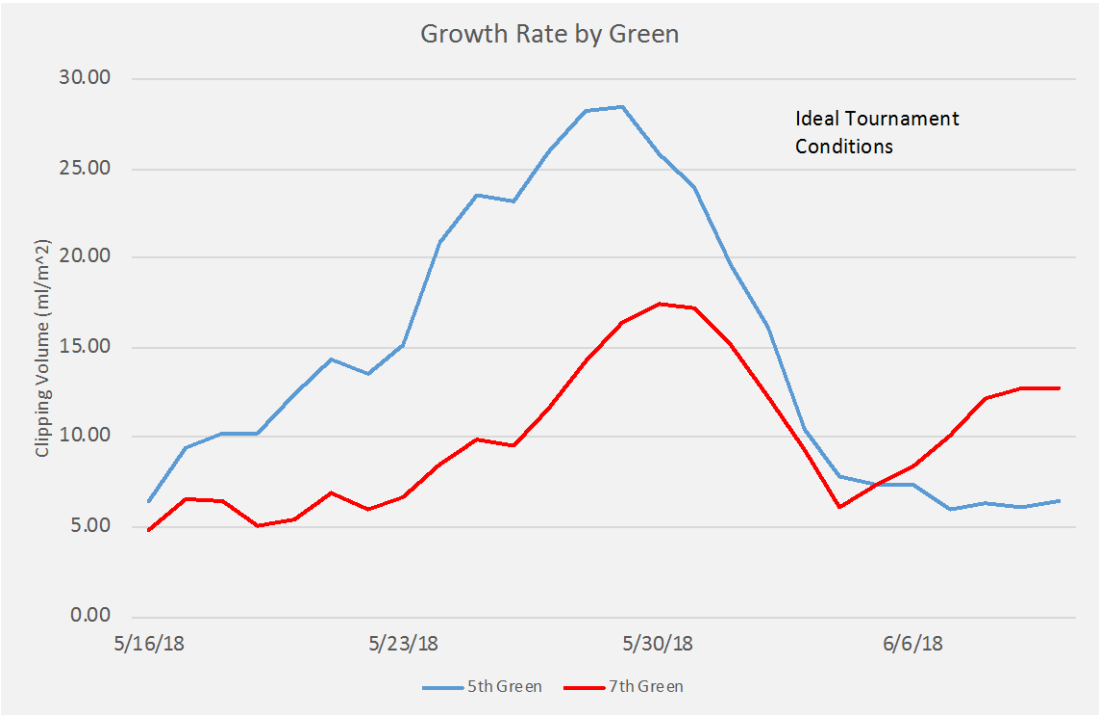

Figure 5 – Ideal Growth Rate for Tournament Play

A common observation from individuals using clipping volume is that optimum greens conditioning coincides with their clipping volume stabilizing at approximately 10 ml/m^2 (1 L/100 m^2). Our findings were similar, noting ideal conditions for daily play occurring when clipping volume was 10-15 ml/m^2 (figure 4).

Further, when the RTJ golf course hosted the New York State High School Golf Championship (NYSPHSAA) in June, clipping volume dipped to nearly 5 ml/m^2 as green speeds and firmness of the surfaces increased.

Finally, measuring each bucket on the triplex proved useful to the mechanic in mower set-up. In fact, the very first day of measuring clippings, 12 liters were measured from the right bucket compared to 8 liters in the left bucket. One may think this is due to the clean-up pass, however the clean-up pass was taken with the left reel on the outside! Interestingly, no streaking of turf was noted on the greens, meaning this issue would have gone unnoticed without the data clipping volume supplied.

There are of course many unanswered questions, first of which: how much can we actually control growth? It appears mother nature holds much of the control, but we have yet to explore the effect adjusting management techniques (fertilizer, PGR rates, irrigation practices, etc.) has on growth rate.

As we stated earlier, the goal of 2018 was to simply observe how growth rate changed under Dave's normal management routine. In 2019, we plan to continue measuring growth at the RTJ golf course. We plan to more accurately track management practices in order to measure growth rate response to daily tasks (mowing, rolling, fertilizing, irrigation, etc.). We also plan to intensively monitor playability (speed, firmness, smoothness) on the surfaces to quantify changes in performance relative to clipping volume.