Clipping volume, GP, and nitrogen

Micah Woods

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Asian Turfgrass Center
www.asianturfgrass.com

PACE Turf
www.paceturf.org
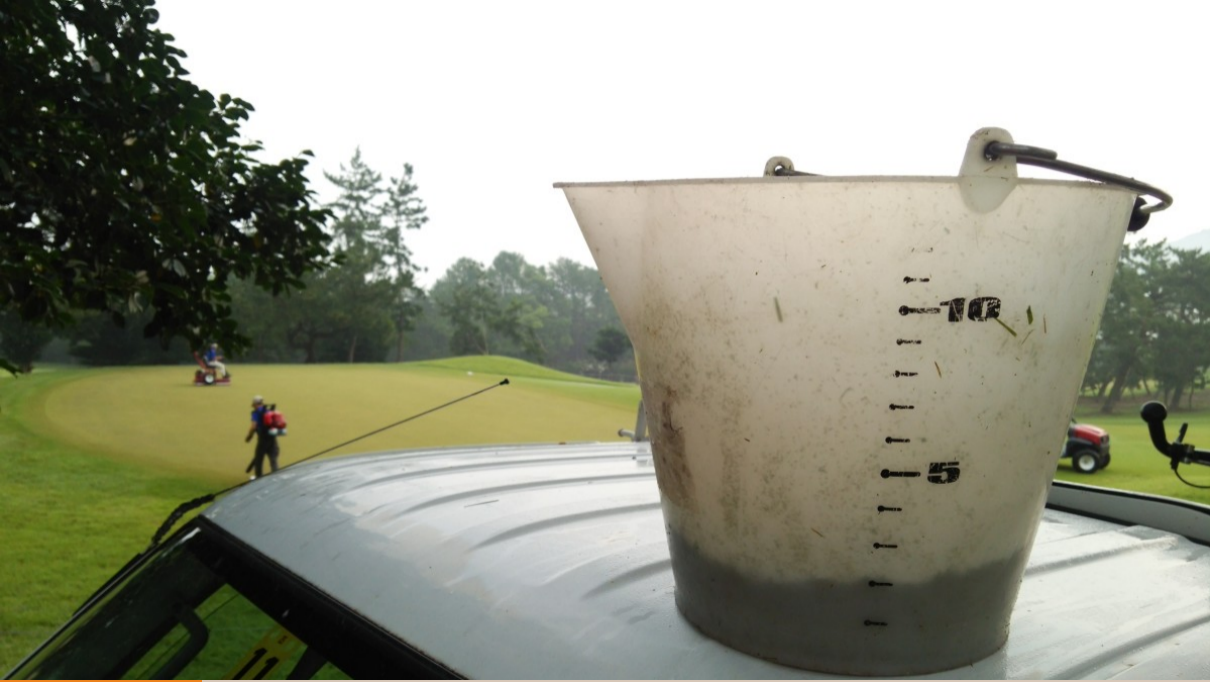
What's affected by the growth rate?

- divot recovery
- ball mark recovery
- nutrient use
- some diseases
- traffic damage
- green speed
- mowing requirement
- thatch (and everything associated with its management)

Estimating growth rate by clipping volume

Eric Johnson
@altshot2

Following

Nice day for harvest. #MLSN

Application of clipping volume

Example uses for the data

- Fine tune nutrient supply based on harvest
- When to mow again based on growth
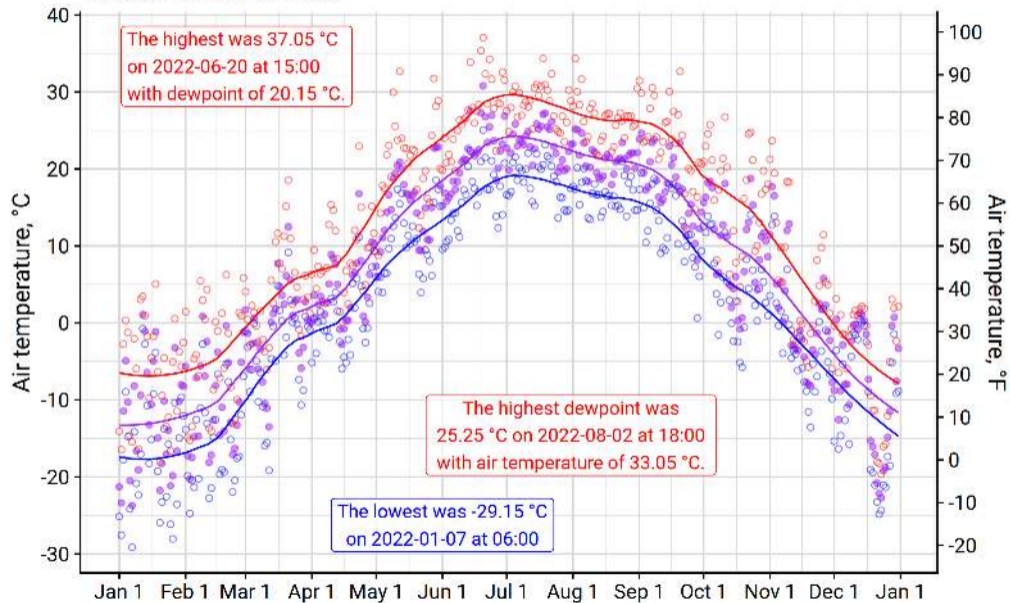- Growth regulator effect
- Topdressing requirement

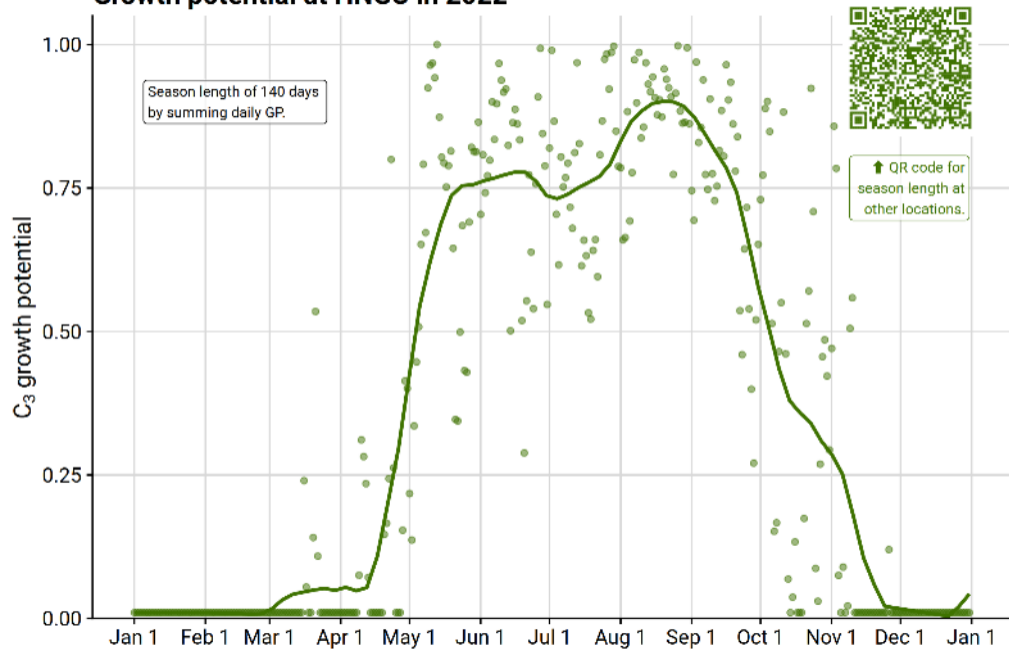# Hazeltine National Golf Club as an example

Hazeltine National GC, Minnesota, USA: September 2016

Daily temperature summary in 2022

Hazeltine National Golf Club

The highest was 37.05 °C on 2022-06-20 at 15:00 with dewpoint of 20.15 °C.

The highest dewpoint was 25.25 °C on 2022-08-02 at 18:00 with air temperature of 33.05 °C.

The lowest was -29.15 °C on 2022-01-07 at 06:00

Growth potential at HNGC in 2022

Season length of 140 days by summing daily GP.

↑ QR code for season length at other locations.

Predicted daily N by GP in 2022

Total annual N of 9.1 g by summing daily GP × max daily N

month	grams
1	0
2	0
3	0.1
4	0.2
5	1.4
6	1.5
7	1.6
8	1.8
9	1.5
10	0.8
11	0.2
12	0

N, g/m²/d

Monthly maximum N set at 2 g
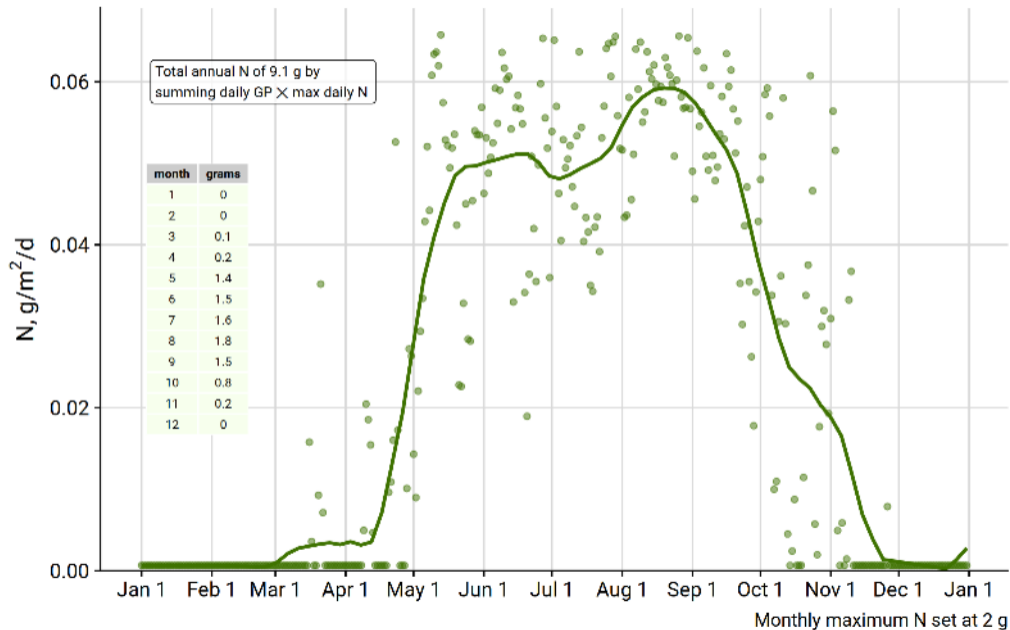
Clipping volume at HNGC in 2022

Green line is trailing 7 day average
Orange dashed line is trailing 30 day average
Blue dotted line is a locally weighted regression smooth
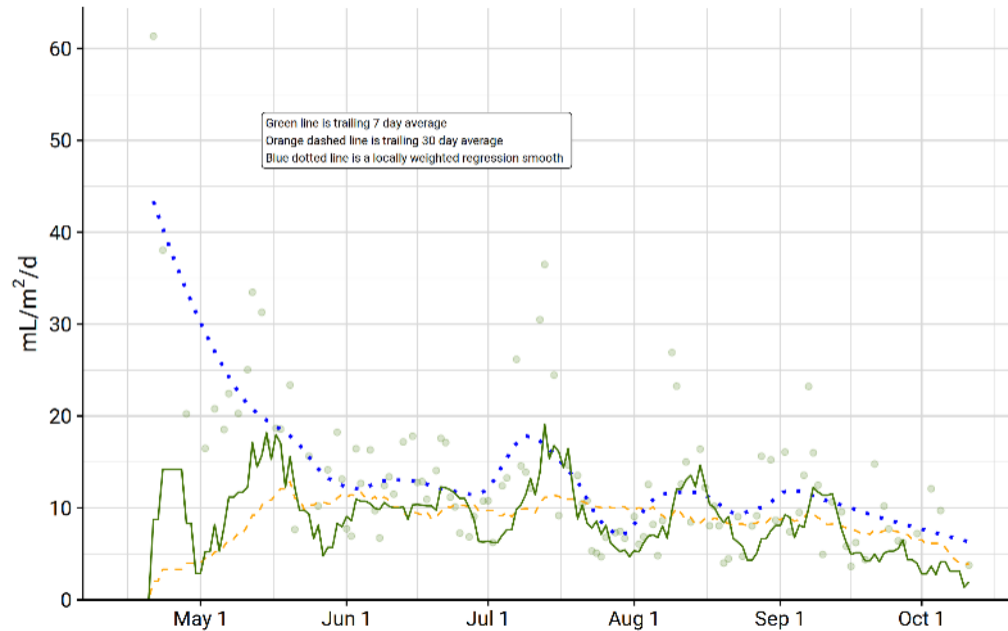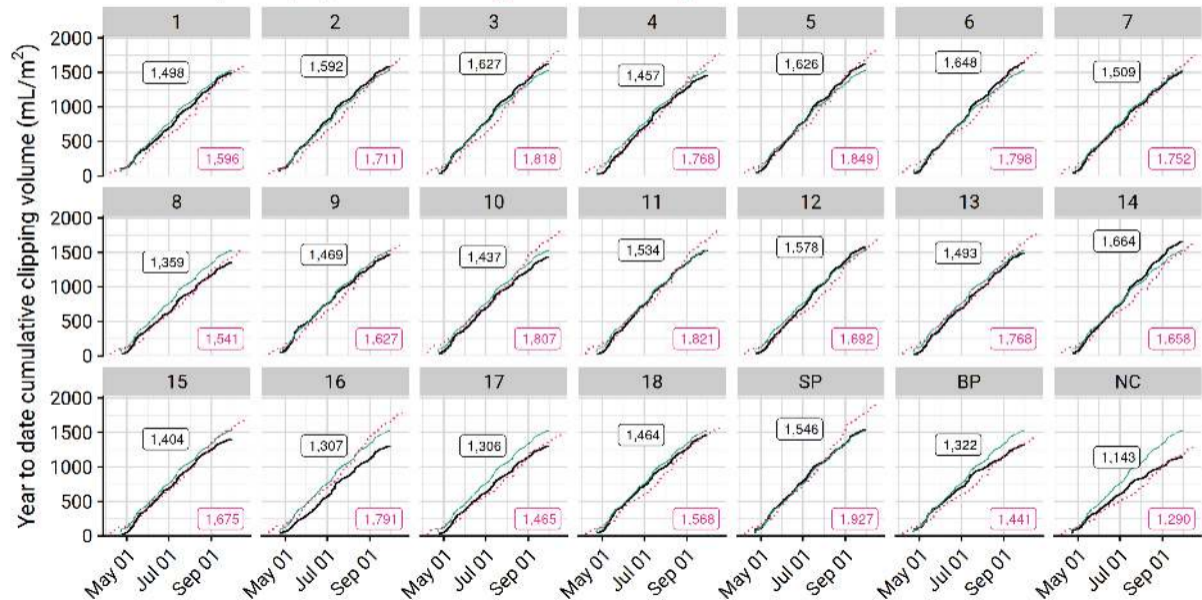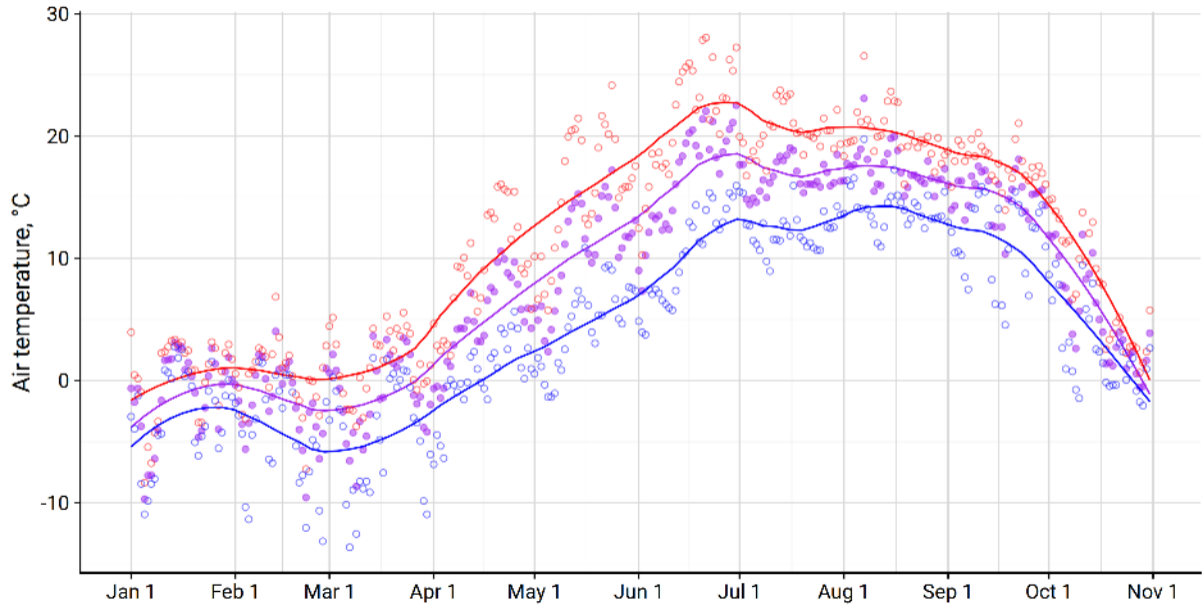
Cumulative clipping volume green by green

2022 in black, 2021 in pink, and the 2022 average across all holes in green.

Daily temperature summary in 2023
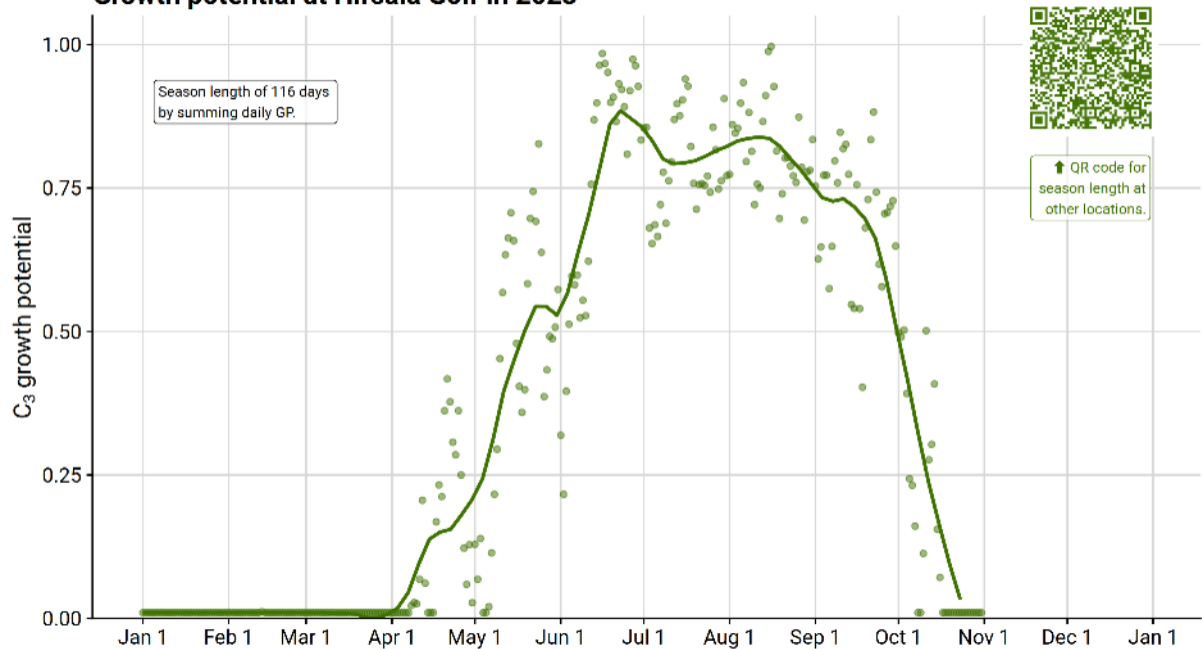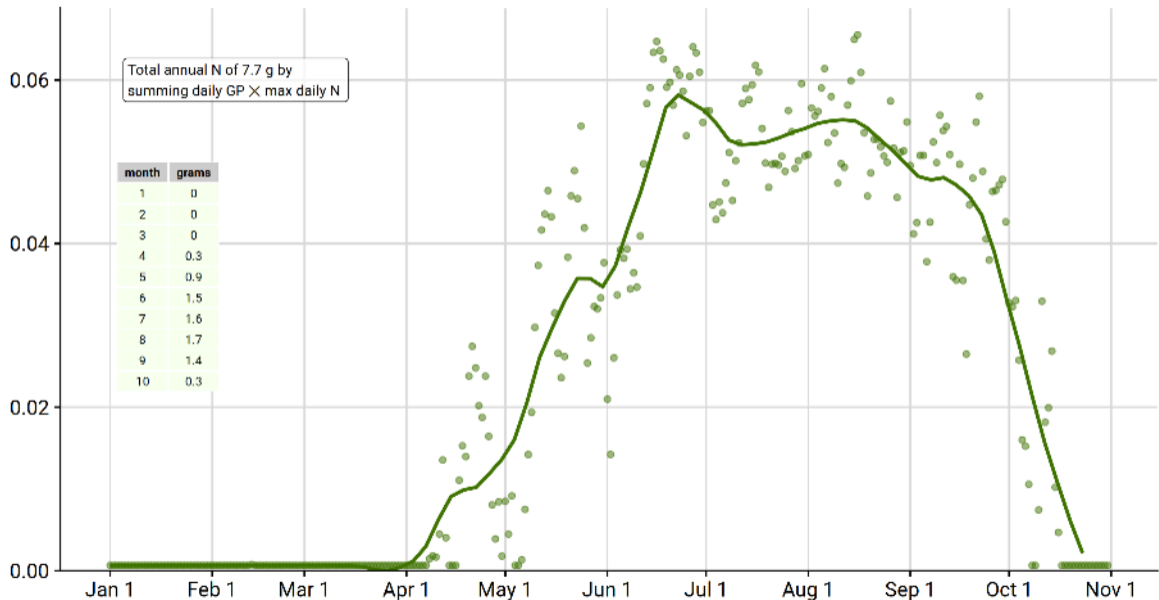
Hirsala Golf

Growth potential at Hirsala Golf in 2023

Season length of 116 days by summing daily GP.

↑ QR code for season length at other locations.

C_3 growth potential

Predicted daily N by GP in 2023

Total annual N of 7.7 g by
summing daily GP $\times$ max daily N

month	grams
1	0
2	0
3	0
4	0.3
5	0.9
6	1.5
7	1.6
8	1.7
9	1.4
10	0.3

N, g/m²/d

Jan 1   Feb 1   Mar 1   Apr 1   May 1   Jun 1   Jul 1   Aug 1   Sep 1   Oct 1   Nov 1

Monthly maximum N set at 2 g

Growth ratio

The growth ratio takes measured clipping volume and compares it to a temperature-adjusted expected value for clipping volume at that time of year.

Growth ratio

$$\frac{ClipVol}{20(GP)} = GR$$

where...

GR is the turfgrass growth ratio
ClipVol is the clipping volume, expressed in units of mL/m^2
20 is the *standard* amount of clippings, set at 20 mL/m^2
GP is the temperature-based turfgrass growth potential
developed by PACE Turf

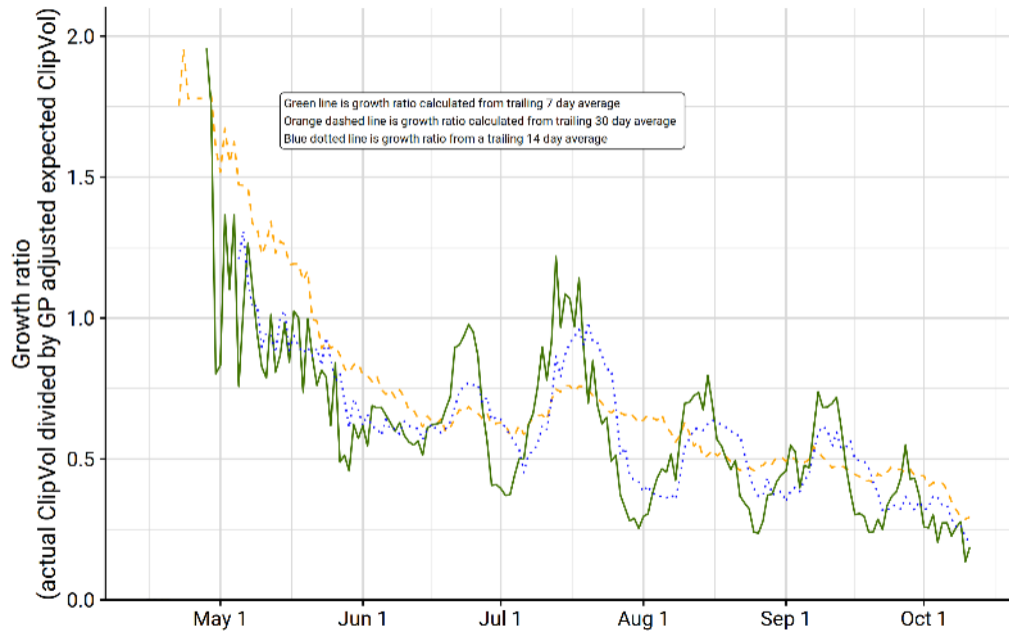# A growth ratio example

$$\frac{12}{20(0.5)} = 1.2$$

where...

1.2 is the turfgrass growth ratio
ClipVol (measured) is 12 mL/m^2
20 is the *standard* amount of clippings, set at 20 mL/m^2
GP is 0.5

Growth ratio at HNGC in 2022 (cut at max of 2)

Growth ratio
(actual ClipVol divided by GP adjusted expected ClipVol)

Green line is growth ratio calculated from trailing 7 day average
Orange dashed line is growth ratio calculated from trailing 30 day average
Blue dotted line is growth ratio from a trailing 14 day average

May 1 · Jun 1 · Jul 1 · Aug 1 · Sep 1 · Oct 1

N adjustment by growth ratio?

To increase growth
If the grass is growing more than the desired growth ratio, make the next N application at a rate of $Nrate_{normal}(\frac{0.6}{GR_{14days}})$.

To decrease growth
If the grass is growing less than the desired growth ratio, make the next N application at a rate of $Nrate_{normal}(\frac{0.6}{GR_{14days}})$.

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