Example GC: report on total soil organic material by depth

May 30, 2023

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1   Greens

The OM2 has gone up from autumn 2021 to 2022. There is only a minor increase in OM4 and OM6 over that same time period.

These values are slightly below average for other bent-Poa greens in the ATC database. However, after walking on the greens myself when I visited, and looking at the soil profiles, I think my plan for 2023 would be to keep the OM from going up any further. The climate there has temperatures quite suitable for grass growth, and I encourage you to use the clipping volume data as a guide for how much N fertilizer may be required. With this amount of organic material in the soil — and with the above average organic matter in the soil nutrient analyses, I think you will see a lot of N mineralized through the year.

Please let me know any questions about these results.

Total organic material time series
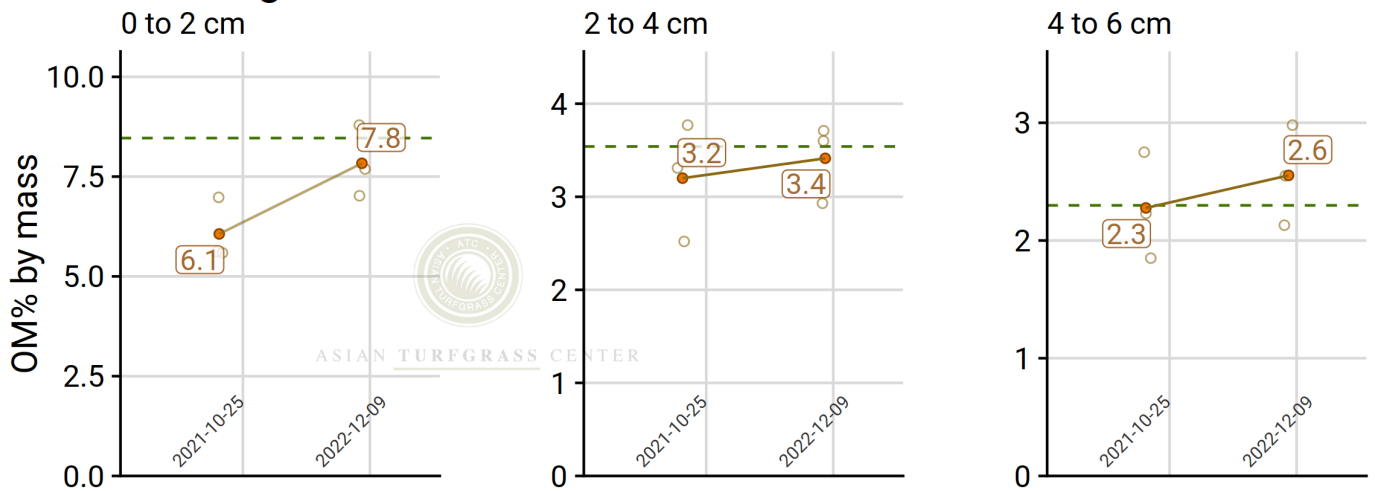
The horizontal dashed line marks the average value (50th percentile) of all bent-Poa samples at that depth.

The first thing I suggest looking at is the **total organic material time series**.[1] This shows what is changing in the soil—and where it is changing. By comparing the change in the soil to the maintenance work done in the same time period, one can determine if the maintenance work has been sufficient to manage the organic material at the desired level.[2]

All bent-Poa greens for comparison
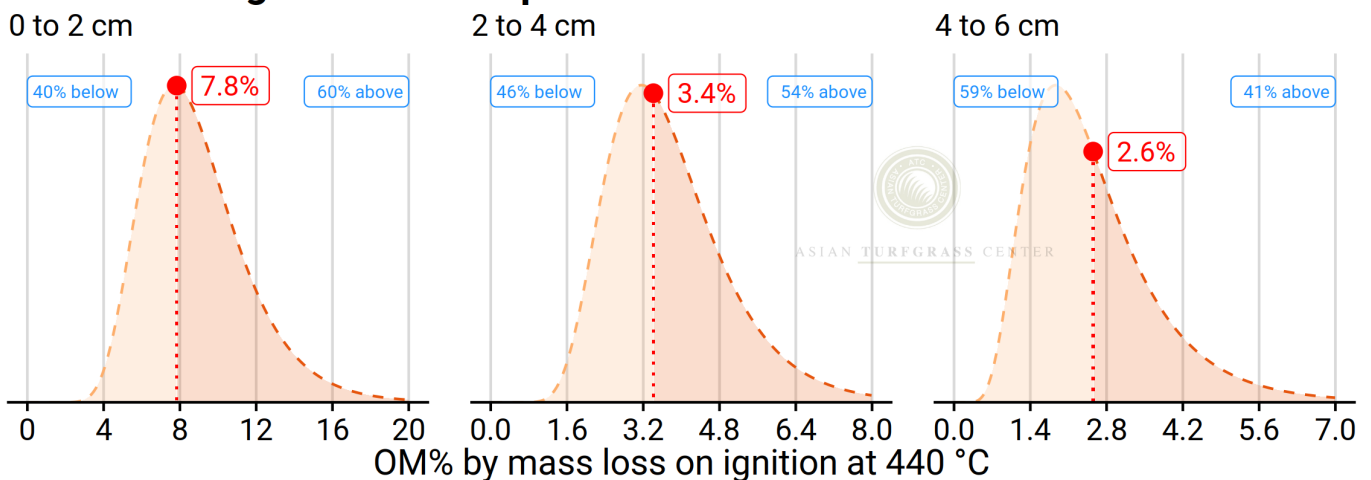
The area under the curve shows the % of bent-Poa greens testing above or below the Example GC 2022-12-09 average results.

All bent-Poa greens for comparison shows the average values from Example GC with background curves that show the distribution of test results from surfaces of bent-Poa. This curve shows what is normal for bent-Poa. Surface performance is most important; I don't recommend making changes just because of a difference between current test results and normal values for this species.

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[1] If this is your first test, you'll see a time series after you test a second time. Check Table 2 for normal ranges.

[2] These results should be used for site-specific decision making based on surface performance. For reference, general guidelines for turf in New Zealand and the UK use a maximum of 6% for the 0 to 2 cm depth, 4% for the 2 to 4 cm depth, and 3% for depths below 4 cm.

Total organic material by depth
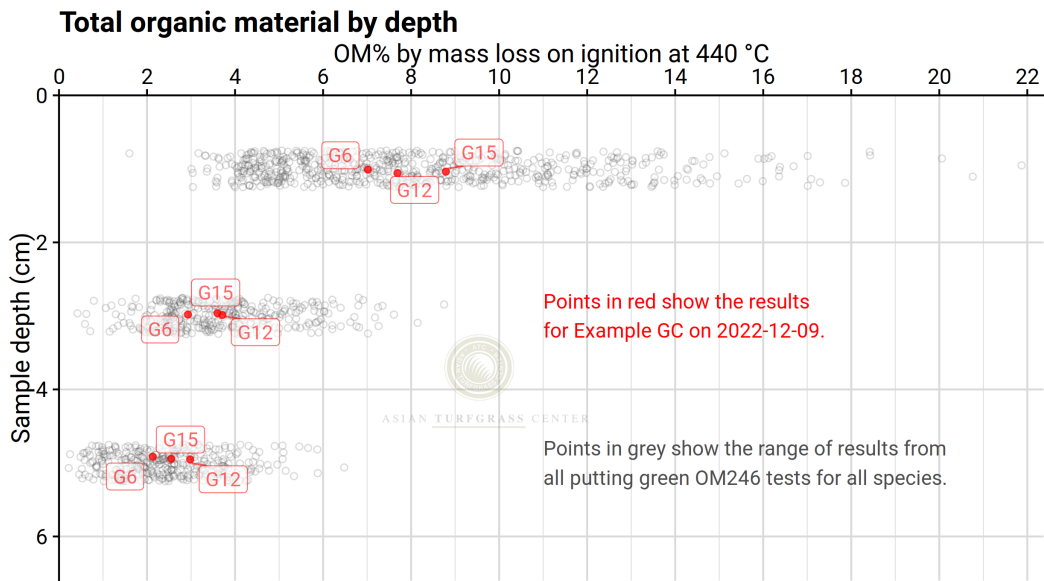
Another way to visualise these results is a scatterplot of **total organic material by depth**. The background points in grey are test results from other species. There is a wide range of total organic material by mass at the 0 to 2 cm depth; at present the measurements in the database range from a minimum of 1.6% to a maximum is 21.9%. There is more consistency at the deeper depths. Database values at the 2 to 4 cm depth range from 0.42% to 8.8%; the range at the 4 to 6 cm depth is 0.22% to 6.5%.
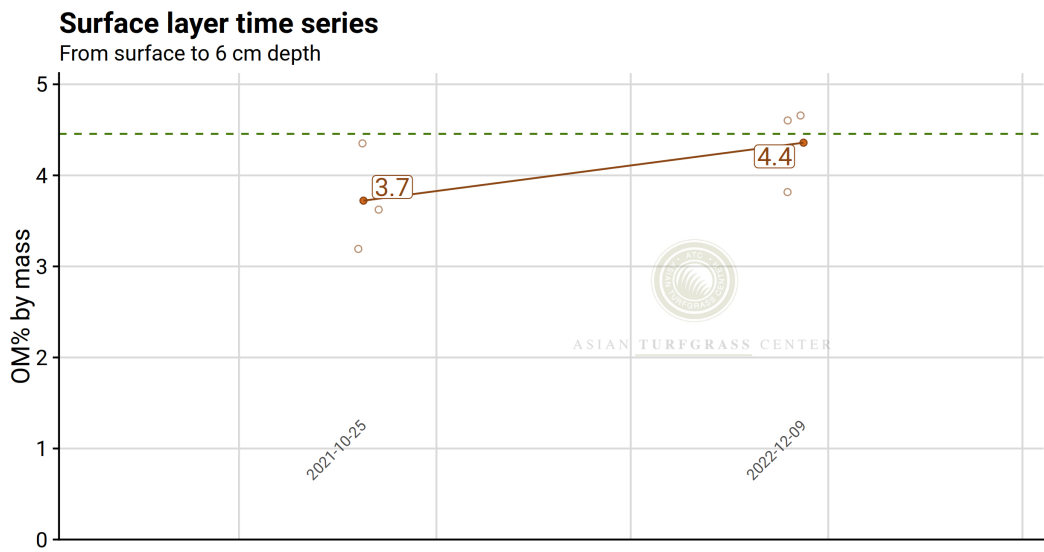
Surface layer time series
From surface to 6 cm depth

The horizontal dashed line marks the average value (50th percentile) of all bent-Poa samples.

The total organic material has been measured at multiple depths. Combining those measurements and adjusting for soil bulk density differences gives the **surface layer time series** to a 6 cm depth.[3]

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[3]These are shown to a 6 cm depth—that's 2.4 inches. You may be familiar with Dr. Carrow's recommendation (for southeastern USA growing conditions) that organic matter in the top 2 inches of a putting green rootzone stay below 4%. Calculation of 2 inch organic matter on 2022-12-09 gives an average of 4.8% for that depth with a range from 4.2% to 5.2%.

Table 1: These are the summarized data from Example GC with the most recent results shown in **bold text**.

Date	Depth (cm)	Total organic material by mass (%)		
		Minimum	Mean	Maximum
OM2				
2022-12-09	**0−2**	**7.0**	**7.8**	**8.8**
2021-10-25	0−2	5.6	6.1	7.0
OM4				
2022-12-09	**2−4**	**2.9**	**3.4**	**3.7**
2021-10-25	2−4	2.5	3.2	3.8
OM6				
2022-12-09	**4−6**	**2.1**	**2.6**	**3.0**
2021-10-25	4−6	1.9	2.3	2.8

1.2 Summary tables

The results from Example GC are shown in Table 1. If you are curious about the overall range of test results in the ATC database, and how these total organic material tests vary by grass species, you can find all that information in Table 2.

Note that this information is updated each time a new report is generated.

Tables 3 and 4 show the total organic material in the 0–6 cm layer and in the 0–2 inch layer. These values are calculated by combining the data from OM2, OM4, and OM6 samples submitted from the same greens. An adjustment is made for the mass in each layer, based on the expected bulk density of each layer given the organic matter content.

Generated with OM246 0.3.0 & typset in X⅃LATEX. Feature requests & bug reports at om246-report.

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Table 2: These are the data summarized by species based on the 1,781 OM246 measurements from putting greens in the ATC database as of 2023-05-30. The minimum (Min) and maximum (Max) values for each species are measured values. The Q_1, Q_2, and Q_3 values are generated 25th, 50th (median), and 75th quartiles from a Bayesian model of the data that incorporates partial pooling of information across species.

Species	Depth (cm)	Total organic material by mass (%)				
		Min	Q_1	Q_2	Q_3	Max
OM2						
bent-Poa	0–2	3.4	6.9	8.5	10.4	16.4
bentgrass	0–2	1.6	4.9	6.2	7.7	13.5
bermudagrass	0–2	3.0	5.8	7.6	9.8	20.8
fescue	0–2	4.1	4.3	4.7	5.3	5.5
Poa annua	0–2	3.8	5.8	7.6	10.0	16.1
seashore paspalum	0–2	3.0	3.7	4.9	6.2	13.5
zoysia	0–2	5.0	9.6	11.7	14.5	21.9
all	0–2	1.6	5.3	7.0	9.1	21.9
OM4						
bent-Poa	2–4	1.3	2.8	3.5	4.5	6.8
bentgrass	2–4	1.3	2.3	2.8	3.5	6.2
bermudagrass	2–4	0.4	2.6	3.6	5.0	8.2
fescue	2–4	1.1	2.1	3.1	4.6	4.4
Poa annua	2–4	2.7	3.8	4.6	5.5	7.0
seashore paspalum	2–4	1.1	2.0	2.4	3.0	4.0
zoysia	2–4	1.2	2.9	3.8	5.0	8.8
all	2–4	0.4	2.8	3.4	4.1	8.8
OM6						
bent-Poa	4–6	0.6	1.7	2.3	3.1	5.1
bentgrass	4–6	0.5	1.0	1.4	1.9	3.8
bermudagrass	4–6	0.2	1.6	2.3	3.4	6.5
fescue	4–6	1.0	1.5	2.0	2.7	2.6
Poa annua	4–6	1.7	2.4	3.2	4.1	5.7
seashore paspalum	4–6	0.9	1.2	1.5	1.9	2.5
zoysia	4–6	0.7	1.9	2.5	3.4	5.5
all	4–6	0.2	1.6	2.1	2.7	6.5

Table 3: These are the summarized data for the entire 0 to 6 cm layer, and for the 0 to 2 inch layer, from Example GC with the most recent results shown in **bold text**.

Date	Depth	Total organic material by mass (%)		
		Minimum	Mean	Maximum
0 to 6 cm layer				
2022-12-09	**0–6 cm**	**3.8**	**4.4**	**4.7**
2021-10-25	0–6	3.2	3.7	4.4
0 to 2 inch layer				
2022-12-09	**0–2 in**	**4.2**	**4.8**	**5.2**
2021-10-25	0–2	3.5	4.1	4.7

Table 4: These are the summarized data for the entire 0 to 6 cm layer, and for the 0 to 2 inch layer. These data are from 338 putting greens in the ATC database with total organic material (OM246) tests done at all three depths as of 2023-05-30. The minimum (Min) and maximum (Max) values for each species are measured values. The Q_1, Q_2, and Q_3 values are generated 25th, 50th (median), and 75th quartiles from a Bayesian model of the data that incorporates partial pooling of information across species.

Species	Depth (cm)	Total organic material by mass (%)				
		Min	Q_1	Q_2	Q_3	Max
0 to 6 cm layer						
bent-Poa	0−6 cm	2.7	3.6	4.5	5.6	7.1
bentgrass	0−6	2.2	2.6	3.3	4.1	6.7
bermudagrass	0−6	1.6	3.2	4.3	5.8	8.3
fescue	0−6	2.2	2.5	3.2	4.2	3.9
Poa annua	0−6	3.4	3.9	5.0	6.3	7.5
seashore paspalum	0−6	1.9	2.2	2.8	3.5	5.8
zoysia	0−6	2.3	4.3	5.4	6.7	8.8
all	0−6	1.6	3.1	4.0	5.0	8.8
0 to 2 inch layer						
bent-Poa	0−2 in	3.0	4.0	5.0	6.2	7.7
bentgrass	0−2	2.6	3.2	4.0	4.9	7.5
bermudagrass	0−2	1.8	3.6	4.7	6.2	9.6
fescue	0−2	2.4	2.9	3.6	4.6	4.2
Poa annua	0−2	3.7	4.1	5.2	6.5	8.0
seashore paspalum	0−2	2.1	2.6	3.3	4.2	6.6
zoysia	0−2	2.5	4.8	6.0	7.4	9.8
all	0−2	1.8	3.5	4.4	5.6	9.8