

October 23, 2018

2018 PRM RESULTS

Quail Hollow Golf Course, Boise ID



INTRODUCTION

Performance Resource Management is a premium agronomic service designed to deliver superior results. PRM improves playing conditions while saving water and other operational costs, which greatly benefits the business of operating a golf course.

Qualitative results that have been recorded this season include:

1. Improved turf density
2. Reduced hand watering
3. A reduction in wet spot severity

PRM has monitored multiple, quantitative data points that have contributed to the qualitative results that were observed over the season.

This report highlights the agronomic improvements that have been observed at Quail Hollow Golf Course over the course of the 2018 season. Notable, quantitative improvements include:

1. Thatch Reduction
2. Root Zone Expansion
3. Drainage Improvement
4. Compaction Reduction (Probe Depth)

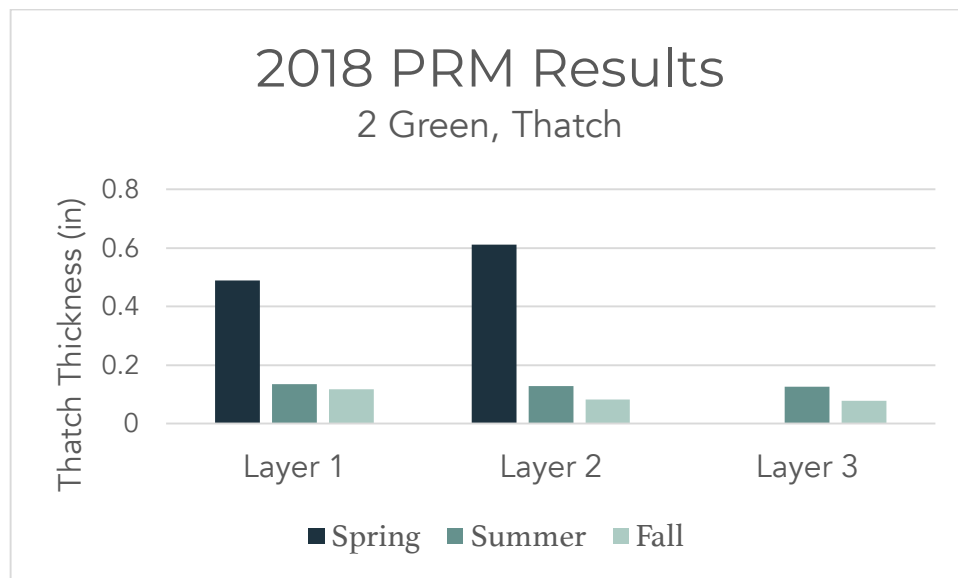
Charts, graphs, and tables included in the '18 PRM Results Report reference data representative of trends observed across the greens. Agronomic data has been gathered by PRM.

PRM included an on-site visit and consultation with Dr. Brian Horgan of the University of Minnesota on September 18th of this year. We expect to continue to see improvements throughout next year with the 2019 PRM program.

THATCH REDUCTION

Excess thatch is a problem many golf courses struggle with across the valley. Thatch layering creates a perched water table, limiting drainage, the effectiveness of irrigation and the efficiency of root development. Managing organic material has posed a challenge for decades, and significant progress has been recorded this year.

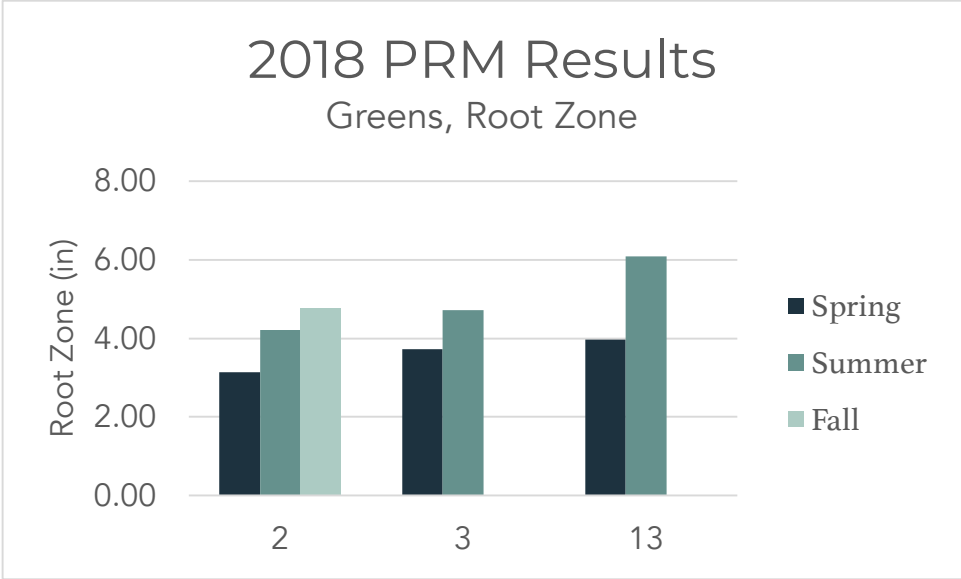
The first 2-3 prominent layers of thatch were measured in the Spring, Summer, and Fall (*note: layer 3 was not distinguishable in the Spring*). The chart below shows the decrease in thatch, by layer, over time. For example, the first layer of thatch decreased from 0.49 inches in the Spring to 0.12 inches in the Fall, a 76% reduction in the first layer of thatch (chart derived from table below).



Average Thatch Thickness (in)				
2	Spring	Summer	Fall	% reduction
Layer 1	0.49	0.13	0.12	76%
Layer 2	0.61	0.13	0.08	87%
Layer 3		0.13	0.08	38%

ROOT ZONE EXPANSION

The deeper roots can go into the soil, the more efficient the plant can be in transporting nutrients and surviving extreme temperature and drought. Running PRM this season caused the root zone to expand.

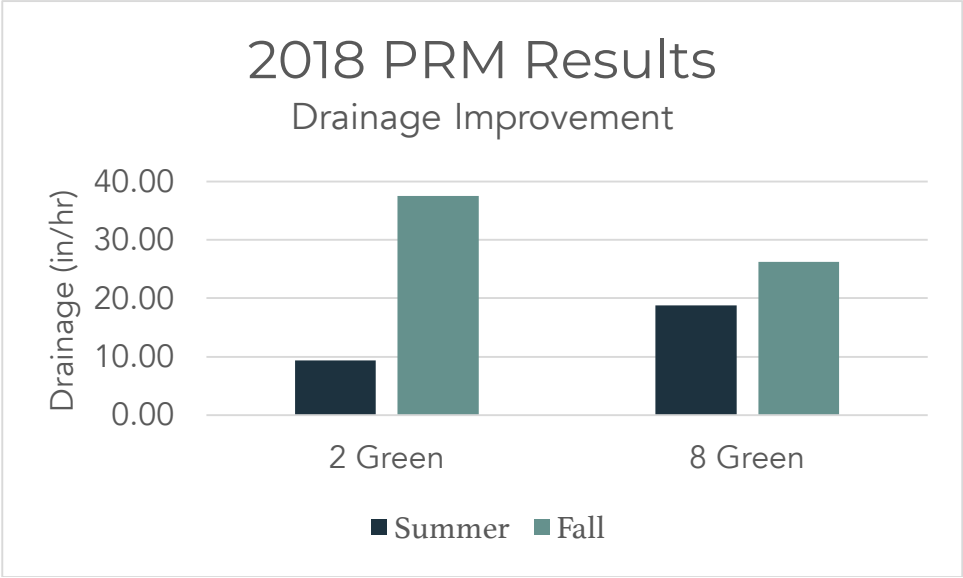


Root Zone (in)				
Location	Spring	Summer	Fall	% increase
2	3.15	4.21	4.78	52%

DRAINAGE IMPROVEMENT

Drainage is the result of a combination of agronomical factors that are interrelated. Reducing thatch and compaction allows water to flow through the soil profile, causing increased root development. All have been observed over the 2018 season.

Drainage is measured with an infiltrometer, which measures the rate water goes into the ground in inches per hour.

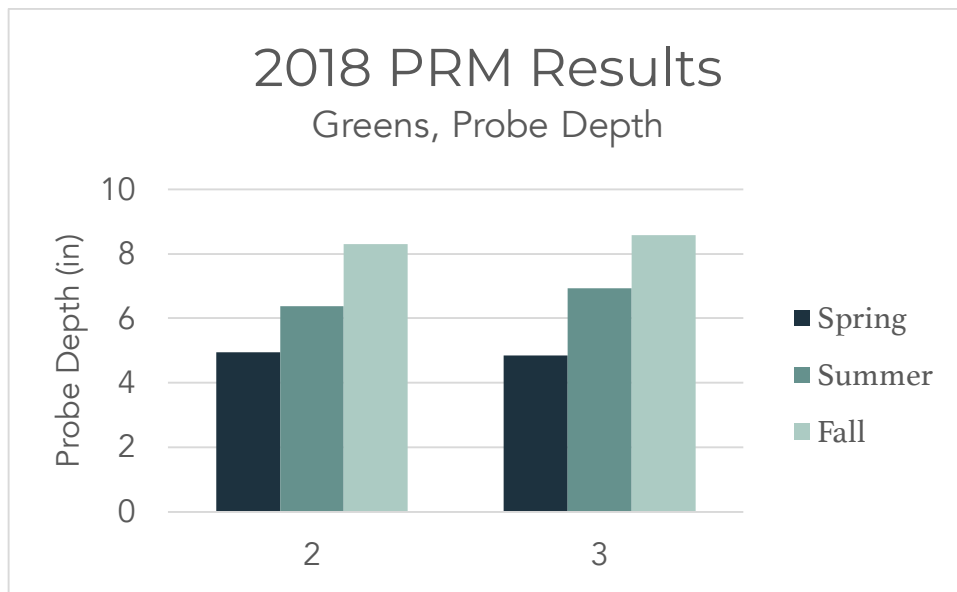


Drainage Improvement (in/hr)			
Location	Summer	Fall	Increase
2 Green	9.38	37.50	300%
8 Green	18.75	26.25	40%

COMPACTION REDUCTION

The less compaction there is, the better the drainage and the deeper the root systems can be. We observed a reduction in compaction in addition to improved drainage and deeper root systems over the course of the 2018 season.

Note: There is an inverse relationship between compaction and probe depth. In the charts below, the greater the value, the less compaction. The charts below indicate that compaction was reduced over the course of the season, as probe depth is a positive indicator of reduced compaction.



Total Depth (in)				
Location	Spring	Summer	Fall	% increase
2	4.95	6.38	8.30	68%
3	4.85	6.93	8.57	77%

RECOMMENDATION

Based on the results from running the PRM program during the 2018 season, we recommend scaling up the PRM program for the 2019 season to improve playing conditions and agronomy course-wide.