

Data-Driven Best Management Practices for Water Quality Protection at Skaneateles Country Club

2018 Study of Improved Efficiency using GPS-Guided Sprayer Operation and Geo-Referenced Scouting Tool

Executive Summary:

A partnership between Winfield United, Frost Inc. and the Cornell Turfgrass program was established in 2018 for a research project at Skaneateles Country Club (SCC). Several goals were outlined for this project in 2018:

- 1.) Utilize GeoTech app for variable rate nutrient and moisture management
- 2.) Provide feedback on the GeoTech app, specifically the Reports function
- 3.) Calculate Return on Investment (ROI) of Frost Inc. Sprayer Technology

The initial plan was to use embedded satellite data within the GeoTech app to prescribe variable rate chemical applications. While monitoring conditions during the year, inconsistencies were noticed among these data and ground-truth observations. Satellite imagery resolution appeared to be inadequate to guide variable rate chemical application. Therefore, manual delineation of variable rate application zones will be required for the 2019 season.

The GeoTech scouting feature was tested throughout the growing season in a variety of different scouting locations to determine the types and formats of data that could be useful in enhancing implementation of IPM. It appeared inaccurate as mentioned above to guide a spray application and could be made more useful if it was able to accept the diverse amounts of data generated such as soil moisture and nutrient levels, pest incidence and severity, and surface performance.

By far, the biggest impact of this project in 2019 was the dramatic reduction in nutrient and pesticide use associated with the Frost Inc. GPS sprayer attachment. Consequently, a best management practice for water quality protection by reducing nutrient and pesticide use is available with GPS guided applications.

Specifically, product savings allows payback to be 1.3 years. Additionally, labor savings not included in the payback costs were reduced by 75%. Staff indicated a high level of satisfaction with both the accuracy and operation of the unit with no downtime.

In summary, we look forward to continued implementation of best management practices of water quality protection at Skaneateles Country Club with an improved GeoTech tool. Finally, variable rate wetting agent applications will be utilized in 2019 to enhance water use efficiency (irrigation BMPs).

GPS Sprayer Findings:

The average treatment area of greens, approaches and fairways went from 29 acres in 2017 to 24 acres in 2018 (table 1) with the use of GPS Technology, a reduction of 17%. Over the year, this equated to 71 fewer acres treated, and 445 fewer pounds of pesticides applied (table 2). Due to differences in chemical application methods (during 2017 approaches were included in fairway sprays while in 2018 they were included in greens sprays) acreage reduced by individual surface could not be quantified. There was no reduction in tee area treated due to their geometric shape.

The 17% reduction in acreage treated leads to both economical and environmental savings. Approximately \$85,000 was spent on pesticide and fertilizer applications at SCC in 2018. Factoring in a 17% reduction in product use, this equates to \$17,400 in chemical cost savings (table 3). Risk associated with pesticide applications is quantified through the Environmental Impact Quotient (EIQ). The use of GPS technology reduced pesticide risk by 2,146 FUEIQ-Acres (table 2). For reference, this roughly equates to one application of a “high-risk” chemical product to 20 acres.

Skaneateles experienced a drastic reduction in labor time allocated to chemical applications, most notably with fairway applications. Fairway applications previously required two team members on two sprayers for 8 hours each for a total of 16 hours of labor time. In 2018 it took one member 4 hours to complete fairways sprays, a 75% reduction in labor time.

A large qualification should be made however. In 2017, fairway sprays were made using a 2 gal/1000 square feet carrier volume, where it was reduced to 1 gal/1000 square feet in 2018. This halves the total spray volume, which leads to time reductions not associated with GPS technology. Still, this does not account for the entire decrease in labor time.

The GPS attachment allowed operators to spray at a faster speed as nozzles automatically adjust output rate based on vehicle speed. Visualization of spray coverage on the operating screen reduces overlap and subsequently additional passes which leads to time savings as well.

Table 1: Reduction in Acreage Treated due to Frost Inc. Sprayer Technology

	2017	2018
Area to treat greens, approaches, fairways	29 acres	24 acres
	Reduction	17%

Table 2: Reduction in Pesticide Usage due to Frost Inc. Sprayer Technology

Metric	Unit	2018 (projected w/out GPS)	2018 (observed w/GPS)	Savings
Pesticide treated area	acres*	416	345	71
Environmental Impact	EIQ-FUR**	13,279	11,133	2,146
Quantity of active ingredients applied	lbs	2,623	2,177	446
* The sum of treatment area for all pesticide applications				
** EIQ-FUR is a unitless risk quotient associated with toxicology data and quantity of active ingredient applied. A larger number indicates higher risk				

Table 3: Return on Investment (ROI) of Frost Inc. Sprayer Technology

	<u>2018</u> <u>(projected w/out GPS)</u>	<u>2018</u> <u>(observed w/GPS)</u>
<u>Spending on Chemical Applications</u>	\$102,400*	\$85,000
Economic savings, year one**		\$17,400
Cost of Frost Inc. Unit***		\$29,138
	ROI	1.26 years
* Calculated assuming observed spending includes 17% reduction from previous sprayer set-up		
** Does not include reduction in labor time of chemical applications due to complicating factors		
*** Includes up front installation, GIS mapping cost and yearly \$880 GPS error adjustment over 10 years with 4% interest rate		