

Turfgrass to be Positive Sequester of Carbon,

"Corrected" UC-Irvine Study Shows . . .

The Toro Company partners with leading researchers to further improve efficiency

BLOOMINGTON, Minn. (February 22, 2010) – Scientists from the Department of Earth System Science at the University of California – Irvine recently published a paper in the journal Geophysical Research Letters on January 22, 2010 titled, "Carbon Sequestration and Greenhouse Gas Emissions in Urban Turf." This study adds significantly to the body of knowledge documenting the carbon benefits of turfgrass.

Upon initial release, the UC-Irvine paper was carefully studied by scientists in The Toro Company's Center for Advanced Turf Technology (CATT) and its conclusions were recognized as inconsistent with research conducted by the company. In particular, the CO₂ emissions reported for fuel use by turf maintenance equipment was an order of magnitude higher than work done by Toro's research team. Upon recalculation, Toro scientists uncovered the math error made in computing the carbon produced as CO₂ during mowing. The error was missed during the peer review process prior to publication of the paper by the American Geophysical Union (AGU). Toro scientists contacted Dr. Amy Townsend-Small, the lead author on the paper, with their research and observations back in late January. Appropriate changes have since been made and sent to the AGU for correction.

"With the error corrected, turfgrass is actually found to be a net positive sequester of carbon," said Dana Lonn, managing director of Toro's CATT group. "In other words, properly maintained turfgrass actually traps and utilizes carbon thus removing it from the atmosphere. We credit the authors for tackling a complex and comprehensive issue. Consistent with what we have found in working with leading research institutions, this study provides a solid foundation for future work. With further improvements in technology to increase efficiency and reduce fuel consumption, grass can become an even greater asset."

The objective of the UC-Irvine study was to comprehensively examine the balance between greenhouse gas emissions incurred in turf maintenance and carbon sequestered in the soil. It also highlights the importance of optimizing the use of all resources in turf management including water, fuel, fertilizers and electricity to maximize the storage potential of plant-soil systems.

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"Toro recognizes the importance of this issue for the environment and for the industry," Lonn added. "As the corrected UC-Irvine study points out, turf can be a net sink for atmospheric carbon and can, therefore, help reduce greenhouse gas emissions. Turfgrass can be part of the solution."

Toro and its CATT group, as a result of talking with thousands of customers over the last decade, have furthered the development of alternative fuels and irrigation technologies to better manage resources and improve turf management practices.

On the water management front, Toro has deployed improved sprinkler nozzles that reduce water consumption by up to 30% and irrigation scheduling systems that utilize weather data and soil moisture sensors to assure that precisely the right amount of water is applied. In addition, the company has developed technology to quantify siteconditions including soil properties, plant health, topography and sprinkler performance that will further improve the precision of irrigation. In the area of fuel efficiency, Toro has developed a number of advanced technologies to reduce fuel consumption and carbon emissions. These advances include:

- The first company in the industry to approve B20 biodiesel fuel for most commercial and landscape contractor turf maintenance equipment.
- Equipment that utilizes propane, which contains less carbon as a fuel and emits fewer greenhouse gas pollutants.
- The development of lithium ion battery-powered walk greensmowers for the golf market.
- The development of a hybrid greensmower for the golf market. • The development of a fuel cell powered greensmower, which demonstrates the feasibility of hydrogen as a fuel for specialty application.
- A partnership with NYSERDA and the NY State Office of Parks, Recreation and Historic Preservation to provide a fleet of three utility vehicles powered by hydrogen technology. These vehicles have been extensively tested at Niagara Falls and Bethpage State Park.

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Toro recognizes the importance of this issue and would like to work with researchers to carry these studies to the next level. Toro scientists propose further study regarding the following issues:

- Evaluate sites in other parts of the country. Variations in climate, turf types and maintenance practices will change the balance of carbon sequestration and resource utilization.
- Look at machine choices and management practices to more thoroughly understand how to reduce fuel consumption.
- Measure actual inputs of water and nutrients or use the best available technology to estimate resource inputs of water and fertilization. Advanced technology should be applied to assure the minimum use of water.
- Quantify the carbon sequestration potential of turf. There are likely to be differences that are dependent upon local soil conditions, turf species, intensity of management, turf use and climate.

In summary, grass when properly maintained is beneficial to the environment as a positive sequester of carbon and, with continued improvements in management practices, can become an even greater asset.

About The Toro Company

The **Toro Company** (NYSE: TTC) is a leading worldwide provider of turf and landscape maintenance equipment, and precision irrigation systems. With sales of more than \$1.5 billion in fiscal 2009, Toro's global presence extends to more than 140 countries through its reputation of world-class service, innovation and turf expertise. Since 1914, the company has built a tradition of excellence around a number of strong brands to help customers care for golf courses, sports fields, public green spaces, commercial and residential properties, and agricultural fields.

More information is available at www.toro.com.

