

Sustainable Golf Courses in the 21st Century

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Unless you've been living in a cave for the past 10 years, you've witnessed the rise of a buzzword: sustainability. It's hard to turn on the evening news or read the newspaper without hearing the word. If you need more evidence, type "sustainability" into Google and navigate through the myriad of web sites that appear. The golf industry has not been immune from the sustainability concept. Ronald G. Dodson is the author of a book devoted to sustainability in golf (Dodson, 2005). The goal of the USGA Turfgrass and Environmental Research program is to "develop turfgrasses and cultural systems with enhanced stress tolerance and reduced supplemental water requirements, pesticide use and costs." Although the word is not used, the sustainability overtones are unmistakable. To make the point that this is a worldwide issue, the R&A (the governing body of golf outside of the USA and Mexico) maintains a web site (www.bestcourseforgolf.org) to help golf course managers "achieve best practices in sustainable course and club management."

Not wanting to fall behind, I enrolled in a course called "Sustainable Development in the 21st Century" a few years ago. One of the assignments was to read *Natural Capitalism* (Hawken et al., 2000). I enjoyed the book because it was a welcome departure from the standard doom and gloom of the typical environmental text. In the book, the authors present the idea that the environmental challenges with which we are presently faced can not only be overcome, but can be used to enhance the economic bottom line. For example, installing super efficient windows may cost 15 - 20% more up front, but heating and cooling costs can be reduced by 97%. In addition to energy savings, smaller (less expensive) heating and cooling units can be installed resulting in an even quicker cost recovery. With the price of energy these days, it doesn't take a mathematician to conclude that those extra up-front costs will be recovered many times over.

This line of thinking sounds familiar, doesn't it? Construct your putting greens correctly now to avoid problems later. Using a pest resistant grass leads to less pesticide use. An extra dollar spent now can prevent three dollars being spent down the road. But there is more to the story than just building things properly. Sustainability also means reducing waste, or finding a use for it. For example, the University of Wisconsin - Madison operates a combined heating and power plant. The waste heat generated in the power plant is captured and used by the heating plant. The "waste" heat is used to heat campus buildings,

resulting in reduced operational costs and significantly lower CO₂ emissions than if the power and heat plants were operated separately.

These two examples illustrate the two ingredients of a sustainable system: #1) use efficient materials and #2) turn waste into something useful. To date, the lion's share of research on improving the sustainability of golf courses has focused on developing resource-efficient grass species and identifying management practices that conserve resources. Drs. Mike Casler, John Stier, and Chris Williamson are leaders in this



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area of research which falls under category #1. This type of research is extremely important, and will continue to be a cornerstone of the sustainability movement in golf. To date, less work has been done to address the second ingredient of sustainability. Natural Capitalism forced me to think about areas where waste could be turned into something useful on our golf courses and below are two areas where we can do better.

Wastewater

Today, the majority of courses built are associated with housing developments. Houses generate wastewater which flows into the sewer system and off to a water treatment plant. As urban growth continues, treatment plants are burdened by high capacity, and use substantial amounts of energy to treat the water. The processes that occur at a wastewater treatment plant are similar to the processes that occur when wastewater infiltrates through the soil or through wetlands. Soils and wetlands are some of our most treasured resources because they have the ability to function like a wastewater treatment plant, and you can't beat the price.

Therefore, an obvious solution to the traditional water treatment system is to create wetlands where the wastewater from homes can be treated naturally. The

naturally treated water could be used to irrigate the golf course. You might be thinking that this is already being done in the arid Southwest and even in humid Southeast. But in those areas, wastewater is generated by the homes, delivered to a water treatment plant, and then pumped back to the golf course. Notice the inefficiency? Not only would the electricity be reduced but also the significant amount of infrastructure and maintenance associated with a sewer system.

One problem that has been identified with effluent water use is that sometimes the golf course needs to take more water than is required by the grass. A solution to this is to incorporate areas for production of a biofuel like switchgrass where any excess wastewater could be applied to avoid saturating the golf course. The biofuel could be harvested and sold for profit or used in heating the local homes, clubhouse, or turf maintenance shop in the winter.

Here in Wisconsin, we wouldn't need to worry much about salinity and sodicity issues in the soil as much as other areas of the US where rainfall is sparse. The spring snowmelt and periodic heavy rains would keep our soils relatively free from salt build up. Sure, we'd need to pay more attention to the quality of our water but these issues are relatively minor compared to the benefits.



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Carbon Dioxide

Along with water, carbon dioxide (CO₂) is another hot topic in the sustainability arena. Carbon dioxide in the atmosphere is likely contributing the observed changes in climate around the world. It has been long known that grasslands are good at taking CO₂ from the air and storing (or sequestering) it below ground. Recent work has found that turfgrass areas are pretty good at this too (Milesi et al., 2005, Pouyat et al., 2006). But we don't really need researchers to tell us that because we are out there removing the organic matter that builds up each year. Although the turfgrass takes CO₂ from the air and stores it in the soil, the equipment (mowers, pumps, etc.) used to maintain the golf course consumes fuel which adds CO₂ back to the air. My guess is that the CO₂ added by machinery is probably equal to or more than the CO₂ stored by the grass. But to my knowledge nobody can say for sure.

A sustainable system will have zero CO₂ emissions. How can we possibly achieve this goal? In the wastewater example we were utilizing a valuable resource that was being wasted or used inefficiently. While not exactly a waste product, there is energy in sunlight and wind that is not being utilized. Wind and/or solar energy could be converted to electricity. Several electric mowers are available on the market, and Frank Rossi's research suggests that the quality of cut from an electric mower is just as good if not better than that from their gas powered counterparts. Although electric equipment seems to be improving every year, we'll need a sustained effort from the major equipment manufacturers in this area. Fuel use by heavy equipment may be unavoidable, but the majority of fuel on a golf course is consumed by the mowers. And fuel use by these types of equipment could probably be easily canceled out by the carbon that the turfgrass adds to the soil.

We have a long way to go before these goals can become a reality. There are many research questions to be answered, and many technologies that need improvement. Initial investments will be high, but long term payoffs will occur. Possibly more important than the economics of building sustainable courses is the change in public opinion on the impacts of golf courses on the environment that will occur. I think we have an opportunity to force a 180 degree change in this arena. But like Jon Jennings of the Chicago Golf Club said about fairway topdressing at the 2006 Golf Turf Symposium in Kohler, you have to be committed to it. There is no half-way. In the decades to come we need to focus on changing from being a user of water to a wastewater filter, and from contributing to CO₂ in the atmosphere to removing it. The public will have no choice but to recognize the benefits (or ecosystem services, if you're looking for a new buzzword) that golf courses provide. It would be an opportunity to make golf courses *a necessary component* of a sustainable neighborhood

by cleaning wastewater and removing CO₂ from the air. Of course, the golf course will remain a green space for wildlife and a place for the locals looking to blow off some steam after work and on the weekends. It is in the best interest of all organizations with an investment in the future of golf to pursue these avenues and I look forward to helping make this vision become a reality.

Endnote:

You can read Natural Capitalism in its entirety at: <http://www.natcap.org/>

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