Of Rivers, Fairways, and Buffers

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All summer I played the wall between two embattled adversaries from Wisconsin's north woods. On one side was a part-time newspaper journalist, on the other a UW-Extension county agent. Both claimed to have scientific data on their side. The issue? Nutrient movement from turf into Wisconsin's pristine lakes and rivers. The odd thing is that in this case the journalist was not anti-turf, if anything, his take on the situation was that because turf vegetation covers so much more of the land area than conventional crops, it should result in less nutrient movement into surface waters. The county agent wasn't necessarily wrong, either, when he suggested we simply don't have good information on the relative efficiency of various types of vegetative (plant) buffers around our lakeshores and that turf fertilizers might increase the nutrient loading into surface waters, causing algal blooms and degrading overall water quality. In fact, despite the sharpness and bitterness of their news articles, the two adversaries had the same goal: to keep Wisconsin's surface waters clean. Therein lies the rub-while many groups ranging from grassroots organizations to state politicians and even long-term national associations promote ways to keep nutrients out of water, relatively little data exist to support any of their programs. And data are crucial for two primary reasons: 1) Economics, and 2) the Environment. If we develop misguided programs, we end up wasting taxpayer dollars. In fact poor programs may actually worsen the environment, either costing more money in the long run to fix the problems or causing such devastation the problem(s) cannot be "fixed".

One of the best examples is the movement towards using "native" or "prairie" vegetation around bodies of water to reduce runoff and pollutants from entering surface waters. Golf courses are easy targets because they are easily identified as man-made and their use is limited to golfers. In Wisconsin the terms "native" and "prairie" are often used interchangeably. Some environmental and/or prairie advocacy groups would like to see turf areas surrounding bodies of water replaced by prairie plantings. This may or may not make sense. One could argue that since historically southern Wisconsin was oak savannah, prairie plantings could be a reasonable alternative to turf. In the north, however, mixed forests (deciduous and coniferous) have been the dominant type of vegetation for several thousand years. In an effort to keep our surface waters pure several pertinent questions need to be asked: 1) Is turf itself a net polluter; if so, how can management be altered to make turf more environmentally benign, 2) Are prairie plantings inherently better for the environment than turf, and 3) Should prairie plantings be used in lieu of forest in traditional forested areas as vegetative buffers around water bodies? Other questions begged to be asked, including why or how is one type of vegetation better than another.

The United States Golf Association (USGA) and many state turf organizations have funded studies to determine runoff quantity, nutrients, and pesticides from golf course fairways. By and large the studies indicate runoff occurrence and pollutants are minimal. However, the idea of using non-turf buffer strips continues to gain support due to the overwhelming perception that "natural is good". Scientists at

Oklahoma State University (OSU) have conducted a couple of studies regarding the use of buffer strips to reduce fairway runoff. One study which has received a lot of national attention showed the width of a buffer strip composed of unmowed bermudagrass had little effect on containing fairway runoff: a narrow strip was as effective as a wider strip (Cole et al, 1997). In November OSU scientists presented data at a national conference showing a stepwise sequence of progressively taller cutting heights of bermudagrass was only marginally better at slowing runoff from a simulated fairway than a single height of taller-cut bermudagrass (Moss et al., 2002). These data, while important to our understanding of how buffer strips may or may not work, do nothing to show that prairie buffer strips are better than turf buffer strips.

Support for prairie buffer strips comes largely from the idea that tall vegetation is better at slowing runoff than shorter vegetation. The idea is largely sound when one recalls watching water puddle on greens during a heavy rain while we cannot see it puddle on the adjoining surrounds or rough. Getting back to the first question I posed, though, is turf a net polluter? One needs to know how much runoff is actually occurring and the level of nutrients in the runoff, as well as the source of the nutrients. The common perception is that the nutrients in runoff are coming directly from fertilizer. Is this true? At least one study indicated rainwater itself contained significant amounts of N and P (Sharpley et al., 1985). Another study from the Great Plains region reported runoff data from both grazed and ungrazed, fertilized and unfertilized, prairie pastures over several years. Soil types varied between pastures, but the net results indicated an average of approximately 0.9 lb N and 0.9 lb P per acre occurred in runoff each year regardless of other variables (Smith et al., 1992). The other standout information was that the levels of N and P in the runoff were similar to, or more, than levels reported from various turf studies. Kussow (1997) reported an average of 0.24 lb N/A and 0.32 lb P/A in annual runoff from a simulated urban lawn on a 5% slope. The most important point may be that approximately 80% of the nutrient runoff occurred when the soil was frozen (Kussow, 1998), a time period when many researchers do not collect samples because automated systems freeze and researchers do not like to collect samples manually during cold temperatures. Taken collectively, information culled from these and other projects indicate that the greatest source of nutrient loading from vegetated areas may be due to N and P leaching from dead foliage during late winter/early spring when the soil is frozen and most conducive to runoff. If so, areas with greater biomass aboveground (e.g., prairie) may result in more nutrient losses in runoff than areas with less biomass (e.g., turf).

During autumn 2002 the USGA approved a grant proposal for Dr. Kussow and myself to investigate the properties of prairie and turf buffer strips to reduce runoff volume, sediment, and nutrient runoff from golf course fairways. The objectives are to 1) determine the inherent nutrient loading from prairie and turf vegetation, particularly during the establishment phase, 2) quantify runoff and sediment in runoff from prairie and turf vegetation, and 3) establish base information on the ratio of buffer strips to managed turf for use in refining predictive runoff models. The research will be conducted at the Wisconsin River Golf Club (WRGC) in Stevens Point, WI. The superintendent, Mr. Todd Blankenship, will be in charge of the day-to-day data collection as part of his M.S. project through UW-Stevens Point.

Plots will be installed in the roughs of three golf course fairways. The experimental design will be a randomized complete block with treatment replications on each of three fairways. Vegetative buffers will vary in width to provide three fairway:buffer strip ratios to provide information necessary for engineers and architects to model and design fairways to mini-

mize surface runoff, nutrient, and sediment loading. Buffer strips will be composed of either a fine fescue "no-mow" vegetation, prairie vegetation, or no buffer.

Both runoff and leachate water samples will be collected on a regular basis throughout the year. Samples will be analyzed to determine total volume, sediment, N, and P. One of the important facets of the project will be to document the sediment and nutrient losses which occur during the establishment phase, particularly important as prairie vegetation can take several years to become established during which time significant runoff pollution could occur.

The project is being co-funded by both the USGA and the Northern Great Lakes Golf Course Superintendents Association. This will be the first project of its type to compare the differences between turf and prairie vegetation buffers for their potential to minimize runoff pollutants. The implications are potentially huge as local and state mandates throughout Wisconsin and the U.S. seek to restrict turf usage in favor of "native" plantings.

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