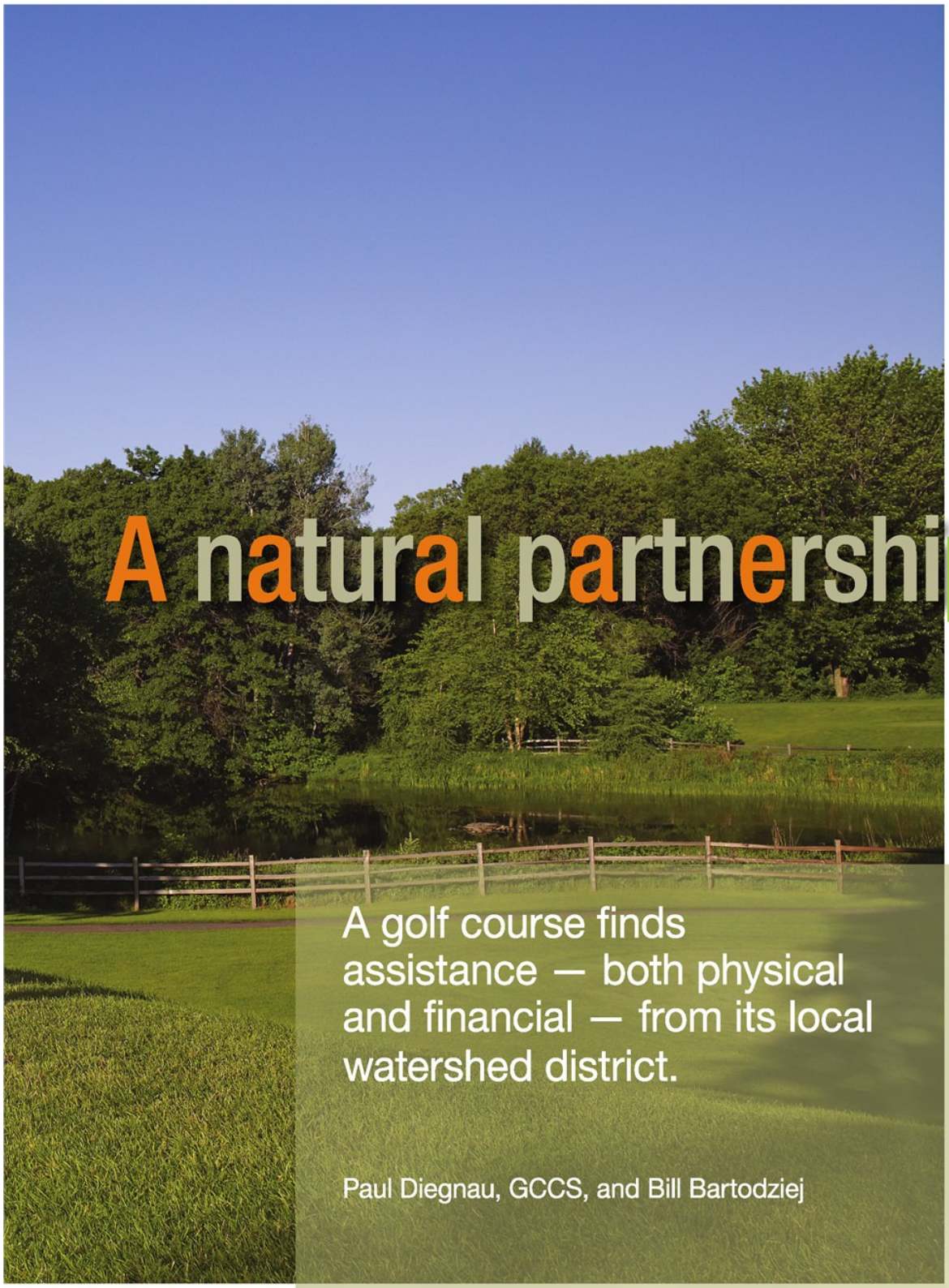
Paul Diegnau, CGCS (left) and Bill Bartodziej stand in front of the restored shoreland on No. 15 last month at Keller GC in St. Paul, Minn.. **Photo by David Bowman**



A natural partnership

A golf course finds assistance — both physical and financial — from its local watershed district.

Paul Diegnau, GCCS, and Bill Bartodziej

Out of the corner of your eye, you see a mother wood duck cruising on the water surface like a Navy hovercraft on maneuvers. You study the situation, gazing over stands of wetland wildflowers, and figure out that she is tending to her young — herding the innocent fluff balls to a safe haven. Now you just see a long row of eyes peeking out from beneath a downed tree that's spreading a matrix of branches just above the water surface — a perfect habitat. But you're not in a wildlife preserve or a state park; you're teeing off on the 15th hole of Keller Golf Course, in the heart of Twin Cities suburbia, a natural setting that attracts an amazing diversity of wildlife.

Owned by Ramsey County, Keller GC is a popular 18-hole municipal layout that opened in 1929 and is only a few miles from Minnesota's capital city, St. Paul. Built on 150 acres of rolling farmland, Keller began treeless and gradually morphed into a parkland-style golf course after massive tree plantings in the 1960s and '70s. The course has a rich history, having hosted a PGA Tour stop, the St. Paul Open for 38 years, the LPGA Tour for nine years and two majors, the 1932 and 1954 PGA Championships.

In 1996, new Keller superintendent (and this article's co-author) Paul Diegnau, CGCS, had a long-term vision to minimize the golf course's impact on the environment, striking a balance with the landscape, while restoring and preserving its unique natural features.

Since then, the facility has committed to preserving a top-flight golf experience and establishing an "urban nature preserve" on the property. In 2008, Keller received certification from the Audubon Cooperative Sanctuary Program. In 2009, co-author Diegnau was named the winner of the Minnesota GCSA Environmental Award.

Recognition spurred on a partnership

In Minnesota, local water planning and management is conducted by water districts. Keller GC resides in the Ramsey-Washington Metro Watershed District, along with seven other golf courses. Long before the Audubon certification and the GCSA award, Keller became a large blip on the watershed district's radar.

In 2003, the district's Landscape Ecology Awards Program recognized the work of Keller's 24-year GCSAA member superintendent and presented him with top honors in the commercial-government land category. This program acknowledges residents and managers for using land management practices that improve or preserve water quality and natural resources (for more information, go to: www.rwmwd.org). Watershed district administrator Cliff Aichinger says "what happens on Keller is especially important considering its close proximity to the Phalen Chain, the most prominent series of lakes in the St. Paul area."

Through the award process, this article's co-authors — the superintendent and a watershed district natural resources specialist — got to know each other, which opened the door for the district and Keller GC to discuss how the district's program objectives overlap with those of the course.

Water hazards, ponds, or wetlands

Keller GC has five small, shallow bodies of water varying in size from a tenth to three-quarters of an acre. Historical photographs reveal that three of the five ponds are natu-

Top: The diversity of native species (approximately 50) ensures that flowering will occur from April through October.
Above: Birds, turtles and other wildlife use natural structures, like rock outcroppings, fallen trees and aquatic plants for perching and cover.
Far Right: A mix of wetland and prairie plants were introduced to create a natural buffer between the fairway and pond.
Right: A view of No. 15 prior to the shoreland restoration. Diegnau was struggling with bank slumping, muskrat tunnels and erosion prior to the project.
Photos courtesy of Paul Diegnau, CGCS

Watershed staff collect aquatic insects to gauge the health of the wetland.

ral. In part, because of Keller's age and past management practices, all of these systems have suffered from accelerated nutrient loading. This has contributed to the build-up of substantial layers of bottom muck high in organic matter. These bottom sediments release phosphorus into the water column, which fuels plant growth.

Over the years, Keller decided to work with what was there, resisting the temptation of constantly battling these conditions to get sterile looking and seemingly pristine pond systems and coming to terms with the fact that the course's shallow wetland systems have human and ecological value without intensive management.

Tweaking course objectives, Keller's wetlands are free of heavy-handed chemical prescriptions. This goes against the traditional parkland-style golf course management approach and is one of the critical components in Keller's management philosophy.

Natural shorelands

As the vision for Keller unfolded, it became apparent that shore areas around the wetlands could be improved. The shores with turf leading to the water's edge were experiencing bank slumping, widespread tunneling from muskrat activity and erosion resulting in patches of exposed soil. Aesthetically, turf up to the wetlands was clean but lacked visual interest. The turf shores didn't fit into the natural image the course was trying to promote.

Replacing turf with native vegetation seemed a reasonable approach. Native plants, with their deep and complex root structures, do a better job at holding the shoreland slopes in place compared with the relatively shallow root systems of turfgrass. Taller native vegetation slows surface flow and aids in groundwater infiltration. From a water quality standpoint, reducing overland flow from the fairways to the wetlands works to decrease nutrient and other chemical loading. In addition to soil stabilization, a natural shoreland buffer with a variety of native plant species creates attractive habitat for wildlife and beneficial insects such as butterflies, bees and dragonflies.

In 2004, Keller and the watershed district discussed shoreland restoration options, with the district sharing experience gained through working on a couple of larger lake shoreland restoration projects. In addition to technical support, the district was able to offer Keller a 50 percent match on the project's total cost.

As the planning progressed, ecological restoration efforts focused on a natural wetland on the 15th hole. No. 15 is a fairly challenging par 3 with an elevated tee and green, and with the wetland consuming a decent amount of real estate down in a small valley. Keller golf pro Tom Purcell calls it "a picturesque hole that is laid out in a way that puts visual emphasis on the wetland."

An economical plan

The ecological restoration plan the district put together called for transforming a 400-foot-long by 15-foot-wide turf area on the fairway side of the wetland into a natural shoreland buffer. The target native plant communities consisted of shortgrass prairie in the upland, a wetland fringe along the shore and a shallow-water emergent zone 6 feet out from shore. Because of the project's high profile, we chose plant material to establish the buffer instead of seed. This is more expensive, but using plug material typically results in faster plant establishment. To offset plant material costs, volunteers and members of the watershed district and golf course staffs conducted site preparation and installation.

The first step was to spray the buffer area turf with a glyphosate herbicide labeled for aquatic use. After two weeks, we weed whipped the dead turf and covered it with a 2-inch layer of wood mulch. We chose shredded hardwood mulch for its extended lifespan and shredded wood fibers' propensity to lock together.

We then installed small prairie grass and forb plants (in 2-inch-diameter containers) through the wood mulch and into the dead turf using 1.5-inch spacing. We then planted wetland species that thrive in saturated soils (in 3-inch diameter containers) along the shore edge with the same spacing. We installed 2,670 prairie and 700 wetland plants over two days.

The shallow-water emergent zone contained patches of established invasive hybrid cattail. Left untreated, this cattail often will take over ponds and wetland systems. The restoration plan called for cattail control and the planting of native emergent species such as bur-reed, bulrush and arrowhead.

District staff spot sprayed cattail with glyphosate. Two weeks after treatment we installed 100 1-gallon emergent plants along the 400-foot stretch of shore, varying in depth from saturated soil to 6 inches of water. We staked 3-foot-tall wire fencing on the open water side of the plantings to deter waterfowl and muskrat feeding on the young plants.

Total material cost for the buffer res-

Left: Autumn colors frame the wetland and flow into the stately oak edge, creating a picturesque scene from No. 15 tee.
Above: To offset cost, site preparation and installation was conducted by volunteers as well as watershed and golf course staff.

toration was $3,500, with more than 90 percent going toward plants. A total of 80 hours was spent on site preparation and plant installation. At an average of $15 per hour for labor, the total labor expenditure was roughly $1,200. Watershed district and Keller CG staff spent 20 hours on design and project management at $35 per hour, totaling $700. The cost for this "in-house" project was roughly $14 per linear foot of shore, including materials and labor. Private restoration companies would charge between $90 and $130 per linear foot of shore for a comparable project.

Saving this sort of money was one of the major benefits of establishing our partnership. Keller GC was able to use an innovative management technique at a reasonable cost, and the district now has a high-profile, functioning and practical example of what can be done to effectively manage local water resources.

Growing up

The natural buffer has become well established, with approximately 50 species of native plants thriving in the shoreland area. You can spot flowers from the tee and the adjoining fairway from April into October. Plant heights vary from 1 foot to 5 feet. The taller plants are wetland species mainly growing in saturated soils along the shore. Shorter prairie species are present along the upland edge of the buffer.

Routine maintenance, consisting of spot herbicide treatments and pulling of weeds, averages 12 hours per year. Even though the time commitment is minimal, weed control in restorations like these is critical. In most cases, restorations without maintenance result in failure. In this case, watershed district and golf course staff share all maintenance activities.

In 2007 we installed a split-rail fence and small interpretive signs around the buffer. This helps communicate the message that the area around this particular water feature is special, and the fencing deters most golfers from searching for lost balls. The split-rail was effective in reducing traffic. However, as we know, certain players will climb over barbed-wire fences to retrieve balls. Fencing can only do so much.

The pros

The buffer restoration has resulted in valuable benefits to the wetland system and to the golf course. Through biological monitoring, the watershed district has learned that this particular wetland supports a large population of northern leopard frogs, one of the most substantial in the region.

We can't say that the buffer restoration immediately increased frog densities, but the natural buffer does improve habitat. Frogs and other animals use the shoreland area for breeding, feeding and hiding from predators. Lake and wetland studies have shown that wider buffers with relatively high native plant diversity are more attractive to fish and wildlife.

Cattail control has been effective, and in its place now are patches of arrowhead, bulrush and bur-reed. These species are lower growing than cattail and provide flowers and interesting foliage throughout the year. Aside from increased plant diversity, the shoreland fringe now contains pockets of open water where it's common to view wood ducks cruising the edge, great blue heron patiently hunting for leopard frogs and mallards efficiently skimming the water surface for duckweed.

Wetland plant species immediately along the shore, like lake sedge, blue flag iris and swamp milkweed, have taken hold and help stabilize the steeper banks that once had exposed soil. These species can put up with occasional flooding, and once established also can withstand dry periods.

One major advantage from a maintenance standpoint is that the muskrat burrows and cave-ins occurring in a natural buffer don't have to be repaired and actually are difficult to spot from outside the buffer. Muskrats are a constant battle on the course, and having less shoreland footage to repair is a plus.

One patron, a regular at Keller, said that even though No. 15 is a challenge, he can't wait to walk past the wetland to see what's in bloom and to look for wildlife. The diversity of native forb species means that flowering occurs from early spring through freeze-up in fall. There's always something interesting to view in the buffer. A good number of the prairie and wetland species are excellent butterfly attractants. For instance, on any day in late summer, it is common to see more than 50 monarch butterflies hovering

around the buffer, taking their turns feeding on the meadow blazing star and other blooming prairie species.

In terms of outreach and education, this project has helped us communicate the importance of natural buffers. Patrons have the opportunity to observe the happenings in the buffer area and ask questions like, "What plants are attracting all of the butterflies?" and "What is that heron fishing for?" We've also led numerous tours highlighting the buffer restoration work.

Keller GC also has been the catalyst for other projects. Joel Hanson, city administrator for the Twin Cities suburb of Little Canada, golfs at Keller and has been impressed with the use of natural plantings that enhance the beauty of the course. Keller "motivated me to incorporate a similar approach to beautify a number of stormwater management ponds in the city of Little Canada," he noted.

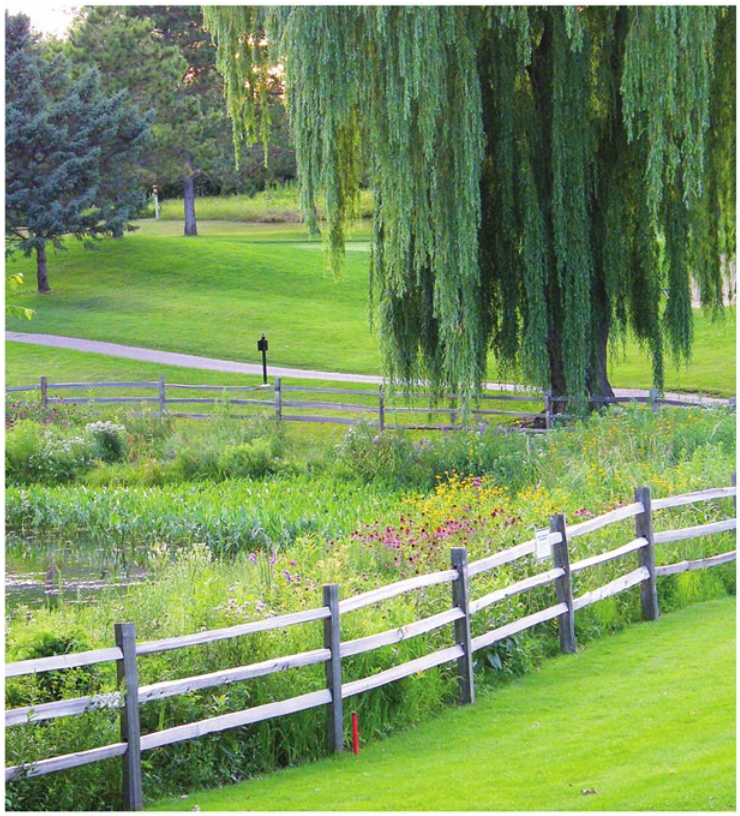
The cons

As with any management tool, the golf course superintendent must determine if natural buffers make sense for a course. To what extent natural areas are incorporated into courses has long been a topic of debate. In the United States, golfers have grown up with manicured turf leading to the water's edge. With this convention ingrained, a natural buffer may then come across as too wild and untidy. Most golfers are just not familiar with this type of management practice.

Keller GC confronted this perception with the addition of interpretive signs and a split-rail fence around the buffer. This efficiently communicates intention and clearly outlines management goals. A small percentage of golfers probably won't accept the look, but a majority is fine with the natural state of the shore once they understand its function.

One consequence of adding a natural buffer can be the risk of slowing down play. The buffer is marked as a water hazard, and by local rule, balls landing within the hazard are unplayable and considered a one-stroke penalty. The fence and the taller vegetation deter most golfers from looking for lost balls. Even at peak periods, the buffer hasn't caused significant backups.

In establishing and sustaining a high-quality natural buffer area, keep up with routine maintenance, otherwise invasive weed species likely will take over. Keller's natural buffer is managed, in part, by the watershed district free of charge. If the course were to contract this work out, it would cost around $700 per year. Although projects like these add another task for superintendents, it's likely that this maintenance is offset by reductions in herbicide use, mowing and repair of muskrat tunneling. This actually may result in cost savings over the long-term.



A cedar split-rail fence was added to create a distinct border between the fairway and the natural buffer. Some golfers will do anything to retrieve a golf ball, but a majority respect the fence and stay out of the natural area.

The partnership

The district and Keller GC staffs are pleased with the restoration project. The reviews from golf patrons, citizen natural resources advocates and the general public have been overwhelmingly positive. Because of the encouraging feedback, Keller restored another natural buffer area around a water hazard this year. The district again was there to provide technical and financial support.

A major golf course renovation plan will be considered over the next five years. If implemented, there's the potential of incorporating additional water management tools to the mix, such as rain gardens, infiltration basins and pervious pavers — a unique opportunity.

This natural partnership is bound by a common goal — improving the golf experience in a way that benefits the region's natural and water resources. This melding of the disciplines will continue to benefit Keller GC and the watershed district.

Check out your watershed district or local water management agency to see if cost-share or technical support is available. You never know — that first phone call may lead to huge benefits for your course and the community.

GCM

Paul Diegnau, CGCS, is a 23-year Class A member of GCSAA and the superintendent at Keller Golf Course in St. Paul, Minn. Bill Bartodziej is a natural resources specialist with the Ramsey-Washington Metro Watershed District in Minnesota.