

Balancing Pest Management and Biodiversity Conservation on Golf Courses

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Objectives:

1. Determine the best managed golf course habitat for dead-wood insects and the optimal distance from fairway management practices for that habitat.
2. Digitize approximately 40 Midwestern golf courses to determine the current amount and connectivity of potential dead-wood habitat.

Start Date: 2009

Project Duration: two years

Total Funding: \$7,304

Insects that inhabit dead-wood are an important but under-appreciated natural resource within North America. Within the dead-wood insects, there is an incredible diversity even just within the beetle species. The larvae of these beetles help to break down dead-wood and release nutrients back into the soil, while many of the adult beetles are often associated with flowers and are important pollinators. Furthermore, these insects serve as a major food source for birds, mammals, and other woodland animals. Unfortunately, the services that these insects provide to ecosystems are often overshadowed by the damage caused by the few invasive and native pest insects. Nevertheless the conservation of dead-wood insects is crucial for the long-term health of managed and natural landscapes.

Dead-wood habitat has become increasingly rare as agriculture and urban land use has spread. While most urban environments are poor choices for the conservation of dead-wood habitat, golf courses, by incorporating dead trees or logs into their landscapes, are uniquely suited to this purpose and with minimal effort could serve as nodes of biodiversity for sur-

rounding landscapes. Management of golf courses to promote dead-wood habitat would not only increase the number of beneficial decomposers but would also serve to increase the number of beneficial predators of wood-boring insects. These predators, such as woodpeckers, are effective natural defenses against both pest and invasive species.

While the conservation of dead-wood habitat on golf courses should be relatively easy to achieve, it will require the evaluation of several criteria. We used saproxylic beetles to determine two of those criteria. Research was conducted at the Birck-Boilermaker Golf Complex at Purdue University and utilized both the established Ackerman Hills course and the newer Kampen course. Sentinel logs were used as a non-intrusive and replicable method of determining the beetle species in an area. This technique consists of leaving standardized lengths of logs in an area over the summer and then rearing out the adult beetles in the lab for identification.

To determine the effect of fairway management on dead-wood habitat quality, four sentinel log transects were placed at the edge of fairways, extending perpendicularly into adjacent wooded or grassy areas. These transects consisted of paired sets of logs, freshly cut oak and dried oak, at 1, 2, 4, 8, 16, and 32 meters from the turf edge.

To examine which environments present on these golf courses are the best habitat for dead-wood boring insects, we placed 10-meter grids of four sentinel logs in three different types of environments: grassy meadow, managed glade, and forest. These groups of sentinel logs consisted of one log each of freshly-cut maple, freshly-cut pine, dried maple, and dried pine. All sentinel logs were placed on the courses in April 2009 and will be removed at the end of November 2009.

To rear the adult insects out of individual logs, banks of rearing tubes



The banded flower longhorn beetle provides two ecosystem services - the larvae decompose dead wood and the adults pollinate flowers of many plants.

were constructed in our lab using 12-inch ID black HDPE culvert pipe.

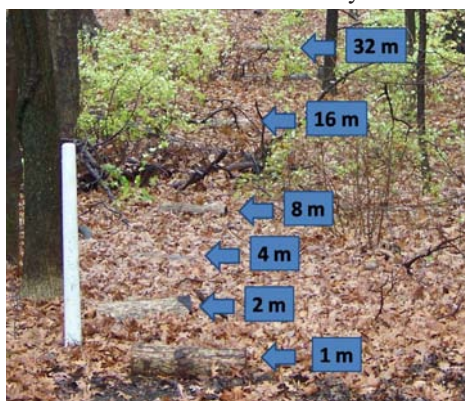
Finally we have begun formulating a list of at least 40 Midwestern golf courses and digitizing aerial photographs of those courses in GIS. We will use the digitized maps of Purdue's courses to develop a value of connectivity for each habitat patch using an area-weighted distance measure. This measure will then be compared to the diversity and abundance of beneficial species at the sampling locations. These findings will allow us to develop recommendations towards the management of dead-wood habitat on these courses and to project those recommendations onto other courses throughout the Midwest.

Summary Points

- Research is underway to determine the effect, if any, of fairway management practices on dead-wood insect species, both pest and beneficial, as well as the most appropriate habitat for conserving dead-wood habitat for beneficial species.

- Seventy-two individual rearing tubes have been constructed at Purdue University and will be loaded with sentinel logs at the end of November 2009.

- Work has begun to digitize approximately 40 Midwestern golf courses using aerial photographs and GIS. These digital maps will allow for spatial analysis of habitat patches within each course and improve conservation recommendations.



Transect of sentinel logs at different distances from the edge of a fairway.