

be conducted on several golf courses along the *Grand Strand* area near Myrtle Beach, South Carolina. †

Conservation of Native Pollinators on Golf Courses

Xerces Society

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Start Date: 1997

Number of Years: 3

Total Funding: \$136,500

Objectives:

The aim of the project is to foster and increase insect pollinator populations including native bees, wasps, moths, flies, and butterflies to offset the effects of habitat fragmentation, and to augment the species composition of native plants in the out-of-play areas to produce continuous flowering throughout the growing season.

In the late summer of 1997, consulting scientists and Xerces Society staff visited several golf courses in eastern Washington and Oregon to rate their appropriateness for study. The interest of the golf course superintendent in participating in the plant and pollinator enrichment program also was determined. Soon after conducting the site visits and interviews, the project team selected four golf courses for inclusion: Wildhorse Resort in Mission, OR; Veterans Memorial Golf Course in Walla Walla, WA; Horn Rapids Golf Course in Richland, WA; and Coeur d'Alene Resort in Coeur d'Alene, ID.

Insect Surveys. The research scientists then initiated surveys on Wildhorse, Veterans Memorial, and Horn Rapids to obtain a background estimate of the number of individuals and species of flower-visiting *Hymenoptera* (bees and wasps) present in late summer and fall. The survey was implemented by a Master of Science student at Washington State University. Coeur d'Alene Resort was declared a reference site because of its abundance of insects and native plant communities.

In late spring of 1998 through fall of 1998, the same estimation process was implemented under Dr. Heidi Dobson at Whitman College in Walla Walla, Washington. In addition to collecting specimens, nesting block stations using blocks of wood drilled with varying sized holes to attract a diversity of hole nesting bee and wasp species were set up. The blocks were attached to 3-foot posts and placed in the ground at each golf course and in a reference site approximately one mile away. The reference sites were chosen for quality of native vegetation.

Preliminary analysis of these nesting blocks is in Table 12. Entomologists at the USDA Bee Biology and Systematics Laboratory in Logan UT have opened the blocks, extracted, and dissected each nest into its component cells. After recording this data, the cells were placed in gel capsules and stored at 3 to 5 °C for the winter. Next spring they will be returned to the golf

course where the bees and wasps will be allowed to emerge normally.

Collection Technique. The baseline data at Wild Horse Horn Rapids and Veterans Memorial has been obtained using a passive trapping technique with colored plastic cereal bowls. The bowls were filled with a dilute solution of detergent and water that attracts bees, wasps and flies. The insects land on the surface of the solution and drown. The trap bowls were laid out once per week in transects in the out-of-play areas of the three courses. The survey design called for alternation of the 45 three colored bowls (15 each, white, yellow, and blue), at 10 to 15 feet apart.

The surveying activities are ongoing; however, the project scientists have identified the specimens from 1997. Thus far, 79 species of bees (all native except for the introduced honeybee) and 51 species of wasps from weekly collections in August, September, and October 1997 were trapped at the three golf courses. Specimens from the 1998 season are being prepared for identification at the USDA laboratory. Data will be available next year. The bees include a wide range of species from genera whose members tend to be somewhat specialized in their flower-foraging habits (*Anthidium*, *Dianthidium*, *Megachile*, *Andrena*, *Nomadopsis*), to those that are quite generalized (all genera in the bee family *Halictidae*).

The wasps also represent a surprising diversity for such a brief sampling period. All are predaceous on arthropods, many of which are considered pests. For example, all *Eumenidae* capture caterpillars, many *Larridae* (*Liris*, *Larropsis*, *Tachytes*, and *Tachysphex*) prey on *Orthoperans* (grasshoppers and crickets). *Oxybelus* and *Bembix* are valuable because they hunt and kill flies, and *Podalonia* is a cutworm predator. Although it is early in the analysis, a pattern of abundance seems to be present among the three courses. For a number of *Hymenoptera* individuals captured per bowl trap, Wildhorse had significantly more than the other two golf courses. Walla Walla had significantly more than Horn Rapids (Wildhorse averaged from 8.9 to 19.1 insects per bowl; Walla Walla averaged from 1.4 to 6.8 insects per bowl; and Horn Rapids averaged only 1.0 to 3.7 insects per bowl). This result was somewhat surprising in that Horn Rapids, on cursory inspection, appeared to have the highest representation of native plant species. At the same time, the total vegetation cover at Horn Rapids appeared rather low.

Project scientists have also analyzed the 1997 data for the influence of bowl color but have found no consistent differences among colors.

Native Plant Surveys. During the 1997 field season, the project team contracted with a local botanist and soil scientist to conduct plant and soil analyses of Wildhorse and Veterans Memorial Golf Courses. The goal was to develop a list of native plants occurring historically in the two geographic areas. From these lists, the researchers created a list of target plants for augmenting the existing plantings in the out-of-play areas of the two golf courses. The plant lists were annotated to provide fuller information on each plant species to make it easier for course superintendents to choose and purchase plants. A botanist employed by the Horn Rapids Golf Course produced a plant list

Table 12. Nesting blocks were set out on each golf course (onsite) and in three additional reference sites (off-site). Each nesting block was drilled with rows of varying sized holes (50 total) to attract different genera and species of bees.⁸

Site Description	No. of Blocks	Hole Size	No. of Nests	Cells per Nest	Bees	(Bee Type)	Wasps
Wildhorse Onsite	17	4	2	0			
		5	57	7.7			
		5	80	8.3			
		7	25	5.4			
Totals			164		142	(leafcutter)	24
Horn Rapids Off-site	20		7	9	5	(leafcutter)	2

Note: More nesting block data will be tabulated by next year. The nesting blocks were still being actively used at the end of the 1998 reporting period and were not shipped to the USDA laboratory in Logan, UT for analysis.

(also included in this report) for that area, but did not do a soil analysis or an historic comparison.

Future Objectives. Having established baseline data for 1997, the next step is to identify the insects collected during the full field season of 1998. That information will be furnished by the USDA Bee Biology and Systematics Laboratory in Logan, UT during 1999. A major 1998 through 1999-project goal is to increase the numbers of native plants used in the out-of-play landscaping of the three golf courses. The annotated plant lists are being used by superintendents to purchase landscaping materials. The Xerces Society is also supplying plants for this initial enrichment. The pre-enrichment data on native bees, wasps, plant, and nest-sites will then be used as a baseline to compare insect data gathered in subsequent, post-enrichment years. The plant enrichment program is beginning in late fall 1998 and will continue throughout the project. The project scientists also plan to expand the use of nesting sites on the golf courses to bolster the local populations of native bees and wasps. Sand nests, nesting blocks, trap nests, and log nests will be added in appropriate locations. The nests will be analyzed for species and number of cells.

During 1999, the Xerces Society will produce a *Pocket Guide to Insect Pollinators*. This guide is for the lay audience and will include color illustrations and basic life history information for the common groups of North American pollinating bees, wasps and flies. The guide will allow a lay person to identify the groups of bees, wasps, and flies that are the ubiquitous pollinators. It also will provide sufficient information on the appearance, habits, and life histories of most native bees and wasps. As material for the publication is produced, Xerces will produce educational sheets for the golf courses. The aim of this project is to educate people about the major groups of pollinating insects, to encourage them to use pollinator-attracting plants in their own backyards, and to notice and appreciate beneficial insects while spending time outdoors. As people gain knowledge about the diversity of insects

responsible for pollination and the habitat requirements for sustaining pollinators, native plant restoration efforts will gain momentum and insect pollinators will thrive. The pocket guide will be produced under rigorous scientific standards, emphasize the beauty and fascinating biology of pollinators, and encourage the reader to appreciate these beneficial insects. 1

The Audubon Cooperative Sanctuary System Program for Golf Courses

Audubon International

Ron Dodson

With support from the United States Golf Association, the Audubon Cooperative Sanctuary Program (ACSP) for Golf Courses was created in 1991. The ACSP promotes ecologically responsible land management and natural resource conservation. Participation in the program assists golf land managers to plan, organize, implement, and document comprehensive environmental management programs on golf courses, while preserving the natural heritage of the game of golf. The goals of the program are to:

1. Enhance wildlife habitats on existing golf courses by working with the golf course superintendent and providing advice for ecologically sound course management;
2. Encourage active participation in conservation programs by golfers, golf course superintendents, golf officials, and the general public;
3. Recognize the people who are actively participating in environmentally responsible projects; and