

Golf Courses and Bird Conservation: A Management Manual

Colorado Bird Observatory

Scott Gillihan

Start Date: 1996

Number of Years: 3

Total Funding: \$48,760

The Colorado Bird Observatory is creating a practical guide for golf course architects and superintendents to improve golf course habitat for bird species. *Bird Conservation on Golf Courses* will be available for purchase through USGA and Sleeping Bear Press in 1999. It is the first book that brings together the latest information on bird and bird habitat management as it applies to golf courses and similar settings.

The hands-on manual covers everything from general concepts, to specific techniques, and vital information on:

- Design and management for habitat conservation
- Management techniques for specific bird species
- Artificial nest structures
- Plants beneficial to bird populations
- Birds and golf course maintenance
- Dealing with *problem* birds

Wetlands Management Manual for Golf Courses

MACED

Don Harker

Gary Libby

Start Date: 1996

Number of Years: 3

Total Funding: \$35,000

Objectives:

Develop an illustrated wetlands management manual for golf courses that uses a general narrative overview, drawings, case studies, key restoration techniques and indicator species to walk managers through a process of understanding wetlands.

This project will create an illustrated booklet of key wetlands restoration techniques and case studies for golf course superintendents. A new revision of *Wetlands Management Manual for Golf Courses* is expected during the summer of 1999. The booklet should be available for purchase through USGA in early 2000.

The approach is to use a general narrative overview, drawings, case studies, key restoration techniques and indicator

species to walk managers through a process of understanding wetlands, leading to the ability to conserve, create/restore, and manage wetlands. The booklet will be as brief as possible and still cover the necessary material.

A reference method for the golf course manager to follow when working to conserve, restore, or construct a wetland was designed for the booklet. That method combines drawings with a plant species matrix. The drawing depicts (in aerial cross-section) different wetland conditions for the wetland types. A matrix contains the key species for that type and gives information about where in the wetland to plant a particular species, what restoration techniques to use, some wildlife value, flower color and size, and bloom period information. This easy reference approach is new and should prove to be a useful approach for land managers. †

Data Management System for Information on Wildlife Habitat on Golf Courses

Audubon International

Ron Dodson

Start Date: 1996

Number of Years: 3

Total Funding: \$77,500

Develop a computer-based system that accesses present and future wildlife and habitat information gathered from participants in the Audubon Cooperative Sanctuary Program.

Audubon International is computerizing its database of information gathered through its Cooperative Sanctuary System, a voluntary program for golf courses interested in creating and enhancing wildlife habitats and conserving and sustaining natural resources. The database will be open to golf course managers and others in the near future. Accessing data in this manner will help Audubon International staff to better direct members of the program in regard to conservation activities. In addition, it will establish a foundation from which wildlife research can be generated and give a clear picture of the resources presently under management by program members.

The creation of the *Managed Lands Database System* began in late August 1995. A review of all the *Resource Inventory Information* contained in hard copy at Audubon International headquarters was first completed. All member golf courses of the Audubon Cooperative Sanctuary Program System that completed a resource inventory form since 1991 were broken down into quantifiable information. This information was then transferred onto a standard form from which the data could easily be placed into a database. There are close to 950 bird species, 600 different species of reptiles and amphibians, and 100 species of mammals contained within the database.

A model was designed to help make entries into the database. This model included a very limited and general species list for birds, reptiles, amphibians, mammals, trees, and

even insects. It contained a breakdown of all habitat types such as desert, prairie, or woodland, and if the woodland was deciduous or coniferous. It also broke down the water features of the site, by number of ponds and pond acreage, number of lakes and lake acreage, and the amount of wetland area. The model also incorporated the address, state, and zip code and contact name for each site.

A series of reports can now be generated based on the *Resource Inventory Information* logged into the *Managed Land Database Information*. For example reports dealing with geographic regions, address information, land and water acreage, and habitats were developed. This kind of information is very useful and beneficial to the Audubon Cooperative Sanctuary Program and its members. [

Developing Methods to Enhance Amphibian Diversity on Golf Courses: Effects of Golf Course Construction on Amphibian Movements and Population Size

University of Rhode Island

Peter Paton

Start Date: 1998

Number of Years: 3

Total Funding: \$72,000

Objectives:

1. *Determine the pre-construction population size for amphibians breeding at ponds within the boundaries of a proposed golf course.*
2. *Determine pre-construction travel corridors and movement patterns for amphibians at this same site.*
3. *Quantify population size and movement patterns following construction on the golf course.*

Amphibian movement chronology and community structure was monitored in three ponds in the middle of the proposed golf course construction site starting mid-February 1998. A total of 7,911 amphibian captures representing 11 species were recorded since project initiation. In addition, two species of snakes and seven species of mammals were detected.

Experimental evidence showed that frogs prefer to move through wooded habitats rather than turf areas ($G = 3.6$, $P = 0.058$) or barren areas ($G = 9.2$, $P = 0.002$). This preliminary finding suggests that dispersal corridors from ponds to upland wintering areas will be more effective if designed to include woodlands. However, other research showed that amphibians would readily cross turf.

Experiments with various grass heights (0.25, 0.5, 1.0, and 2.5 inches) found no evidence that grass height affected frog movement patterns ($G=3.7$, $P = 0.29$). This suggests that

varying grass height is not a management option to increase frog use of a potential movement corridor.

Frogs readily crossed a 68 m (225 ft.) wide, mowed grass field, but there was little evidence of amphibian movement across a 175 m (575 ft.) wide grass field. This preliminary evidence suggests that the vast majority of fairways do not represent a dispersal barrier for most species of frogs in New England.

One of the most important scientific findings of this summer's research was that we documented non-random migration of metamorph frogs (e.g., newly transformed young) away from our monitored ponds. We established two 200-m long drift-fence arrays, 100 m to the east (habitat = woodlands) and to the west (habitat = woods and turf fields) of monitored ponds. Several species (Green Frog, Pickerel Frog, and Spotted Salamander) radiate out at random directions from breeding ponds. On the other hand, American Toads, Gray Tree Frogs, Spring Peeper, Wood Frogs, and Red-spotted Newts exhibited habitat preferences, most species were more likely to move through wooded habitats. This suggests that among some species of frogs, metamorphs have an innate genetic predisposition to migrate in specific directions. This has very important implications for management strategies.

Proposed research for 1999. Future funding for this research project during the 1999 field season will be used support three types of investigations: 1) we will continue monitoring natural movement patterns amphibians in the North Woods study site (this research will focus on adult movements to/from breeding sites, which was missed during the 1998 field season); 2) a series of experiments will be conducted in the North Woods area to further refine our knowledge of habitat characteristics of amphibian movement corridors, and 3) we propose to initiate a large-scale quantitative survey of the habitat characteristics of breeding sites used by amphibians on golf courses on southern New England, including habitat characteristics of potential movement corridors. [

Pesticides and Nutrients in Surface Waters Associated with Golf Courses and Their Effects on on Benthic Macroinvertebrates

University of Maryland

William Lamp

Start Date: 1998

Number of Years: 2

Total Funding: \$54,896

Objectives:

1. *Measure the concentration of pesticides and nutrients residing in the water column of streams associated with golf courses.*