

**THE IMPACT OF GOLF COURSE CONSTRUCTION
AND MANAGEMENT ON SOIL QUALITY:
EVALUATING SOIL QUALITY WITH MULTIPLE INDICATORS**

by

GREGORY DENNIS PILLAR

B.S., University of Minnesota, Minneapolis, MN, 1999

A THESIS

submitted in partial fulfillment
of the requirements for the degree

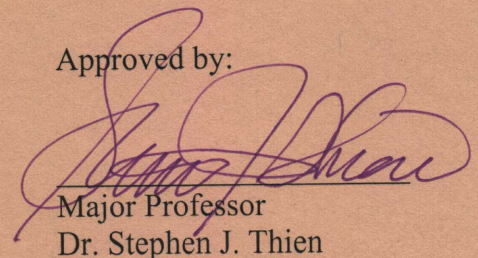
MASTER OF SCIENCE

Department of Agronomy
College of Agriculture

KANSAS STATE UNIVERSITY
Manhattan, Kansas

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Approved by:



Major Professor
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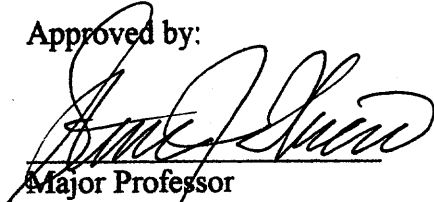
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ABSTRACT

Somewhere in the United States, on average, more than one new golf course opens every day. With the recent boom in golf course construction, there is greater need to understand the environmental impacts of construction and management of golf courses. Golf courses are only as sustainable as their weakest natural component, which is often soil quality. Little research has been conducted on the assessment of the long-term impact and sustainability of golf courses on the soil environment. A method for evaluating environmental quality of large-scale landscapes such as golf courses that connects scientific research and public use is in great demand. The development of a multiple indexing system to gauge the environmental quality of golf courses was used to examine the impact and influence of golf course construction and management on soil quality. The overlying goal was to use the multiple indexing system (spider/radar graphs) to assist golf course superintendents to evaluate environmental quality.

Two studies conducted at Colbert Hills Golf Course in Manhattan, KS were used to assess the impact of golf course management and construction on environmental quality. A small-scale study was used to evaluate the use of swine and dairy compost on high-sand greens and tee boxes. Seventeen soil quality indicators were monitored over six months from May to October 2000. Even over this short time these amendments influenced some of the soil quality indicators. The use of a multiple index system allowed for easy identification of areas requiring remediation or additional attention.

A second study was initiated in 1997-1998 to assess the impact of golf course construction on environmental quality. Measurements of native, or pre-construction conditions were made on a natural grassland site prior to construction to establish base-

line values for a host of physical, chemical, and biological soil quality indicators. After construction was completed in May 2000, the same sites were sampled each spring and fall. Using a multiple indexing system (spider/radar graphs), the status of eighteen different soil quality indicators were monitored. The construction of Colbert Hills and the resulting management have impacted numerous soil properties. The construction of the golf course had an immediate impact on soil quality indicators and while some such as aggregate stability and soil pH have started to slowly return to pre-construction conditions, others such as numerous biological properties continue to be at levels below the pre-construction conditions. Further work is recommended to closely monitor indicators that continue to be below or above established control limits. Additional research will help to strengthen soil quality indices as well as provide more conclusive evidence about the impact golf course management and construction has on environmental quality. Use of the spider/radar graphs to evaluate the status of environmental quality at Colbert Hills Golf Course has illustrated the promise this technique has as a management tool.

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