

Executive Summary
November 1997

**Characterization of Leaching at the Coeur d'Alene
Golf Course Floating Green**

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A knowledge base detailing nitrogen fate in sand-based golf greens is currently being developed through research conducted at the floating 14th green at the Coeur d'Alene Resort golf course, Coeur d'Alene, Idaho. This "signature hole" green is constructed on a concrete barge and floats on Lake Coeur d'Alene. All the irrigation water applied to the green is monitored as well as the amount of water leaching through the green. The leachate is stored in large tanks under the green and is periodically pumped back to shore. This project is also unique in that we are attempting to determine the location and form of nitrogen on a sand-based green under actual course playing conditions. The project aims to further open lines of communication between the golf course industry and the public by conducting research at a highly visible site.

The project to date has focused on background information gathering, equipment evaluation, and equipment purchasing. The design and layout of the floating green has led to a research methodology specific to this project. Site visits to the golf course have provided valuable information in regard to the experimental design.

The goal for winter 1997-1998 and spring 1998 is to complete installation of equipment and preliminary testing to insure accuracy and reduce possible experimental error. The majority of experimental data will be taken during 1998 and 1999. The progress expected to be made in the following year include: final installation and calibration of equipment, sample collection and analysis, analysis of the first year's data, and database construction. The anticipated results of this research will further the understanding of the fate of nitrogen in sand-based golf greens. Research findings will be presented at professional meetings and made available to the public via various media formats.

Progress Report
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First year funding by the USGA for the project arrived at Washington State University late July 1997. Therefore, much of the progress to date has been the initial planning, acquisition of background information, logistics, equipment evaluation, site visitations, and equipment acquisition.

Six meetings have been held with the golf course superintendent and five site visits have been made by Johnston, Pan, Golob (WSU Turfgrass Technician), and Chris Kleene (graduate student). The golf course superintendent (John Anderson) remains committed to making the site available for the project and to providing labor to routinely take clipping samples, record weights, collect routine leachate samples, etc. The original construction superintendent (Steve Maas) was contacted for construction "as built" details. Photos were also obtained from Steve Maas that illustrated construction details. A graduate student (Chris Kleene) was recruited to carry out the project as part of the requirements for a M.S. degree in Crop Sciences.

Chris Kleene met with Idaho Dept. of Environmental Quality, Coeur d'Alene, Idaho, personnel and made copies of the original construction drawings for the floating green site in order to better understand the drainage in the green and to determine how to best sample the leachate. Obtaining construction details and "as built" information was extremely important to planning the overall experimental design, sampling procedure, and equipment needs. Data on initial testing of the green conducted from 1990 to 1992 by Valley Laboratories and Analytical Resources, Inc. (Seattle, WA) for flow rate, nutrient analysis, and pesticide analysis were obtained and will be useful to compare changes over time.

The back green-side bunker was excavated and the leachate storage tank below the bunker was examined for drain pipe layout into, and within, the storage tank to determine the best method for collecting representative and accurate leachate samples. The flow into the bulk tank was measured at 1 GPM and was observed to be near zero at times. Accurate measurements and sampling of low flow rates in non-full pipes is extremely difficult, and hours of consultation with scientists, engineers, and technical representatives was required to resolve this issue. ISCO's automated refrigerated sampler and bubble flow rate module, in combination with a trapezoidal flume, were identified as the equipment most suitable for this project. Leachate samples taken during this preliminary phase of the study showed NO₃-N ranged from 2.23 to 2.40 ppm and NH₄-N was 0 ppm.

Equipment is currently being purchased for automatic sampling and refrigerated storage of leachate. An electronic digital scale for clipping weights and a freezer to store samples, etc. have been purchased and are on site. A meteorological tower and instrumentation and six micro-lysimeters are being acquired for additional leachate studies on the green. Equipment will be in operation for sampling in 1998. Preliminary data will be taken during the winter, with the bulk of sampling done in 1998 and 1999.

One presentation on the project was given at the Inland Empire Golf Course Superintendents' Assoc. annual meeting and trade show at Spokane. Two additional speaking opportunities have already been scheduled for 1998 at Billings, MT and Coeur d'Alene, ID.

Proposed Research Schedule and Anticipated Results

Jan. to Mar. 1998 Final equipment purchasing. Equipment installation and calibration. Initial data collection of leachate and clippings. Presentation to Peaks and Prairies Golf Course Superintendents' Assoc., Billings, MT.

Apr. to June 1998 Site visits as needed. Agronomic data collection and analysis of samples. Chris Kleene will write up literature review and M&M for thesis.

July to Aug. 1998 Site visits as needed. Data and sample collection and analysis.

Sept. to Dec. 1998 Site visits as needed. Sample collection and analysis. Data analysis and summarized for the year. Research presentation at Northwest Turfgrass Conf. annual meeting at Coeur d'Alene, ID.

The 1998 results will provide a preliminary basis for understanding the fate of nitrogen in sand-based golf greens in the Pacific northwest under actual playing conditions.