ceramic extraction cups embedded in diatomaceous earth and backfilled with a loamy sand. Each extraction cup is connected by tubing to individual collection bottles, which are in turn connected to a common vacuum line. The 36 columns were then seeded with either 'NuMex Sahara' bermudagrass or 'Monarch' tall fescue at the rates discussed above. Establishment and growth has been rapid in the greenhouse for both species, and a dense sward has developed. Columns are fertilized once each month with ammonium nitrate (NH_4NO_3) at a rate of 45 lbs. N/acre. Supplemental iron (Fe-EDDHA) has been added regularly to correct some incipient chlorosis in the young bermudagrass. Salinity by leaching fraction treatments were started in January and samples will be collected weekly and analyzed for nitrate and ammonium.

In addition to setting up the column experiment, an experiment was conducted in nutrient solution culture to examine the effects of salinity on nitrogen uptake. Briefly, two cultivars of tall fescue were grown in solution culture for four months. 'Monarch' was chosen as a relatively salt tolerant and 'Finelawn' as a salt sensitive cultivar. Nitrogen treatments were imposed to produce N-replete turf (no N stress) and moderately N-deficient turf (daily additions of nitrate at suboptimal rates to mimic the more typical turf condition). Rootzone salinity was imposed incrementally over four weeks to final salt concentrations of 0, 20, 40, and 80 mM using a combination of NaCl and $CaCl_2$ at a molar ratio of 8:1. Nitrogen uptake was measured for either nitrate and ammonium nitrogen over a 24 hour period and these results are currently being analyzed.

Dr. Daniel Bowman
Dr. Dave Devitt
Dr. Wally Miller

University of Florida, IFAS

Mobility and Persistence of Turfgrass Pesticides in a USGA Green

The first-year project objectives were to construct, install, and test lysimeters for collecting percolate water in a USGA-specification green; evaluate various methodology practices for pesticide analysis; develop a quality assurance and control (QA/QC) program; and to engage in preliminary data collection. These objectives have been completed.

Stainless-steel lysimeters were installed in a USGA-specification green at the University of Florida, IFAS, Ft. Lauderdale Research and Education Center. They were fitted with stainless-steel lines for off-site collection of percolate water. Lysimeter performance was tested in three ways to determine the completeness of sample recovery and to investigate the effect of sample residency time. It was determined that recovery equaled or exceeded 97 percent. The concentration of fenamiphos remained virtually unchanged after 4 days residency in the collection reservoir, whereas after 1 and 4 days residency, diazinon was only 94 and 0 percent, respectively, of that injected.

A 19-section, 33-page quality assurance/quality control plan was developed to delineate field and laboratory protocols for such items as sampling, calibration, error determinations, chemical analyses, data reduction and validation, corrective actions, and reporting.

Methods were validated for determining certain organo-phosphate pesticides in percolate water, thatch, soil, and grass clippings.

In a preliminary field study, fenamiphos applied to bermudagrass (*Cynodon* spp.) turf was observed primarily in thatch over a 7-day period. Fenamiphos in the underlying soil generally was only 10 percent of the amount found in the thatch, and seven days after application, fenamiphos in thatch was only 10 percent of the amount observed two days after application.

Dr. George H. Snyder
Dr. John L. Cisar

Pennsylvania State University

Surface Runoff of Pesticides and Nutrients Applied to Golf Turf

This year was dedicated to the establishment and characterization of the runoff plots. Plots were established with creeping bentgrass and perennial ryegrass. Shortly after germination, irrigation was used to produce steady-state runoff, and hydrographs were generated from the runoff data.

Ten weeks after seeding, fertilizer was applied at a rate of 1 lb N/1000 sq. ft. and plots were irrigated to produce runoff. Runoff and lysimeter samples were taken and frozen for analyses of nutrient content during the winter.

The hydrographs for the initial runoff show relatively high peak runoff rates and short time to peak flow. Hydrographs generated after turf establishment and fertilization show an increase in the time to runoff and a lowering of peak flows. Hence, it would appear that even young turfgrass areas can significantly reduce total runoff when compared to the early seedling stage.

Dr. Thomas Watschke

University of Massachusetts

Volatilization and Dislodegeable Residues of Pesticides and Nutrients Applied to Golf Turf

The objective of this study is to determine the gaseous losses and dislodgeable foliar residues of pesticides applied to golf course turf. To date, limited work has shown that volatile loss of some pesticides applied to turf approaches 15 to 25 percent of the total applied.

In the past 9 months, this laboratory has been responsible for the hiring, training (both academic and technical) and quality control for a full-time Ph.D. graduate student (Casey Murphy), a 1/2-time residue chemist (M.W. Brooks) and a 3/4-time work study technician (B. Chase). Relevant literature was reviewed concerning the environmental monitoring of mecoprop, triadimefon and trichlorfon. Procedures for the analysis of these three pesticides, both as airborne volatile and dislodgeable residues, were evaluated, modified, developed and implemented. Detection levels, extraction efficiencies, linearity of standard curves, interference due to environmental contaminants, mass balance recoveries from sampling devices and storage ability have been determined.

Upon method verification for triadimefon and trichlorfon, these materials were applied to turf (8/23/91-triadimefon and 9/28/91-trichlorfon). Airborne residues were assessed using the high-volume/theoretical profile shape method (i.e., high volume suction fan sampling air above the turfgrass area). Dislodgeable residue samples are determined by vigorously wiping cheese cloth over several one-square-foot areas. Volatile and dislodgeable samples were collected over a two week sampling period. Samples were extracted and prepared for storage. Quantification of these samples is now under way at the Massachusetts Pesticide Analysis Laboratory (MPAL).

Evaluation of a new derivatization method to analyze mecoprop is currently being carried out, and method verification for the analysis of isazofos will be initiated in 1992. Once concluded, these two pesticides will be applied to our experimental turf plot during the 1992 growing season.

Dr. Richard Cooper

University of Georgia

Evaluation of the Potential Movement of Pesticides Following Application to a Golf Course

The objectives of our project are to: 1) determine the potential movement of pesticides from treated bermudagrass and bentgrass greens through effluent entry into surface runoff and groundwater, and 2) determine the potential movement of pesticides from treated bermudagrass fairways by surface runoff and leaching.

The initial funding of this project was received during the spring of 1991 and work accomplished includes the development of greenhouse and field lysimeter installations, and laboratory methods for accurately quantifying the pesticides according to Good Laboratory Practice Standards. Analytical methods were developed to accurately determine 2,4-D, mecoprop, and dicamba at levels of 1, 100, and 20 ppb, respectively, in aqueous solution using partition extraction and electron-capture gas-chromatography analysis.

The greenhouse lysimeter facility has been constructed to simulate golf course greens with 'Penncross' bentgrass and 'Tifgreen' bermudagrass turf. Thirty-six individual lysimeters were constructed by mounting a turfgrass growth-box on a PVC column containing a soil profile developed according to USGA specifications. An automatic track-irrigation system was developed for controlling the rates and time for irrigation. The watering nozzles traverse a horizontal track located above the growth boxes at a speed of 10 ft./min. The