QUARTERLY PROGRESS REPORT

October 1, 2000 - December 30, 2000

PROJECT TITLE: Environmental Impacts of Lead Pellets at Shooting Ranges & Arsenical Herbicides on Golf Courses in Florida

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COMPLETEION DATE: 3/31/2001 **PHONE: 352-392-1951**

WORK ACCOMPLISHED DURING THIS REPORTING PERIOD:

- Based on the project milestones (Table 1) and for further study in developing best management practices (BMPs), additional soil samples and plant/water samples were collected from two shooting ranges in south Florida. One is a normal shooting range. Another is a well-constructed range with baffles and turf grass.
- Soil samples were characterized in laboratory. Leachability tests were conducted using EPA method 1311 (TCLP) and method 1312 (SPLP). Plant and water samples were also analyzed.
- Fractionation tests of Pb in highly contaminated soils from several shooting ranges were conducted using X-ray diffraction.
- Analyses of total, TCLP, and SPLP Pb in soils show that in well-constructed shooting ranges, only soils from the bottom and middle of the backstop berm need to be cleaned.
- Spatial distributions of total, TCLP, and SPLP Pb in soils of shooting ranges were plotted using GIS ArcView and Surfer® 7.

SIGNIFICANT RESULTS ACHIEVED:

- Lead was predominantly found in carbonate form in backstop berms that contain appreciably higher amounts of total, TCLP, and SPLP Pb. High Pb concentrations are likely needed to support Pb-carbonate formation.
- High Pb concentrations were found in surface water samples collected from the backside ponds of berms from both rifle (63 ppb) and pistol (65 ppb) ranges. However, in a well-constructed rifle range, only a few ppb Pb was found in surface water in the range.
- No lead contamination was found in ground water samples from the well-constructed shooting range in south Florida. BMPs of shooting ranges need to be established.
- Soil Pb was elevated in the order of pistol > rifle > shotgun ranges from the same site. Lead concentration was not evenly distributed in soils within shooting ranges.
- When a shooting range has been operated more than 14 years, surface soils in the range need to cleaned-up. When the range has been in operation for less than 8 years, only soils from or close to the backstop berm need to be cleaned-up.

Table 1. Project Milestones

Tasks	1st quarter	2nd quarter	3rd quarter	4th quarter
Sample Collection	⊗	⊗		
Sample analysis	⊗	⊗	⊗	
Leachability test			⊗	×
Fractionation test			⊗	×
Quarterly report	⊗	⊗	⊗	×
Annual report				×

⊗: Task that has been accomplished according to the originally proposed timetable.

×: Task need to be accomplished in accordance with the proposal.

INFORMATION DISSEMINATION ACTIVITIES:

- A presentation titled "Lead Contamination in Soils of Florida Shooting Ranges" was given at the 92nd annual meetings of American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America at Minneapolis, MN, November 5-9, 2000.
- A paper titled "Determination and Assessment of Soil Lead Contamination in Florida Outdoor Shooting Ranges" was submitted to the 6th International Conference on the Biogeochemistry of Trace Elements to be held at the University of Guelph from July 29 to August 2, 2001.
- A paper titled "Feasibility of Using Phosphate Amendments to Stabilize Heavy Metals in Lead Contaminated Soils: Field Demonstration" was submitted to the 6th International Conference on the Biogeochemistry of Trace Elements to be held at the University of Guelph from July 29 to August 2, 2001.
- A manuscript titled "Environmental Impact of Lead Bullets in Soils of Florida Shooting Ranges" was prepared for publishing at the Soil and Crop Science Society of Florida Proceedings.

TAG MEETINGS:

- The research team will contact the technical advisory group members for this project and to schedule a half-day TAG meeting in early April at the University of Florida, Gainesville, FL. based on the time availability of all TAG members.

WORKS TO BE ACCOMPLISHED DURING THE NEXT THREE MONTHS:

- Leachability and chemical fractionation tests for soil samples from different ranges will be conducted in the last quarter of this fiscal year (Table 1).
- New soil and pellet samples need to be collected from one more shooting range in south Florida to confirm our hypothesis that more hydrocerussite tend to be formed in wet environments
- Correlation analysis of Pb reaction and soil properties in Florida shooting ranges.
- Preparation of quarterly and annual reports.