

National Fish and Wildlife Foundation  
Final Programmatic Report

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Project Name: Phosphorus Control in Farm Waste Management (PA)

Recipient Organization/Agency: Trout Unlimited

Recipient Organization Web Address: [www.tu.org](http://www.tu.org)

### **1) Summary of Accomplishments**

This project investigated the potential for using mine drainage residuals (MDR) for lessening the potential for phosphorus pollution from dairy and swine manure management operations. In Pennsylvania, a manure's potential for producing phosphorus pollution is evaluated by measuring its Phosphorus Source Coefficient (PSC). The project determined that an amendment of 10 g/L MDR to high-phosphorus manure decreased the PSC by 50%. Several MDRs were tested and the best performing one was from a lime treatment plant operated and maintained by the PA Department of Environmental Protection.

### **2) Project Activities & Results**

If your grant agreement included an approved logic framework, paste the logic framework table here – Not Applicable

#### **Activities**

Primary project activities are listed and discussed below:

- 1) Phase 1 project activities included the setup of project contracts and agreements, establishment of project plan with Farm A, determination of background phosphate levels through sampling of existing conditions, delivery of MDR, and first applications of MDR to the manure waste stream. All project activities were successfully implemented in a timely manner with no discrepancies. However, more contractual costs were incurred than salary/benefits costs for TU, thus an adjustment was made to the budget categories.
- 2) Phase 2 project activities included the scaling up MDR applications to full scale, evaluation of MDR addition impacts on the phosphate levels, the design and construction of a "Contact" device to hold and capture phosphate, a mid-project presentation, and the development and distribution of fact sheets to promote project awareness and preliminary findings. All project activities were successfully implemented in a timely manner with the exception of the design and construction of a "Contact" device to hold and capture phosphate. Based on the experience and results from the field demonstrations at Farm A and Farm B, it was determined that fabrication of such a piece of equipment would not be necessary. As a result, the funding that was obligated for this piece of equipment was reallocated to contractual costs to help fund additional sampling and lab analyses.

- 3) Phase 3 project activities included the continuation of MDR addition demonstrations and the implementation of the phosphate capture system and monitoring. The project activity of MDR addition demonstrations was successfully completed and the scope of work on this task was greatly expanded as a result of eliminating the second project activity for this phase (equipment and monitoring).
- 4) Phase 4 project activities included the demonstration of the most cost-effective phosphate control method, shutting down the project at the dairy farm, and development/printing/ distribution of the final report and presentations. The first two activities for this phase were not addressed because TU was not able to solicit a dairy farm on which to demonstrate the most cost-effective phosphate control method. As a result, TU modified the first two project activities to focus instead on getting feedback and formal advice from technical experts in the agriculture consulting industry to find out why efforts to solicit another dairy farm were unsuccessful, which of the methods previously demonstrated/identified would be more cost-effective, and how best to proceed with the use of MDR as a useful tool to control phosphate in land-applied dairy and swine manure. The final activity of development/printing/ distribution and presentations for this phase were successfully completed.

## **Results**

All project activities were successfully conducted and all project deliverables were accomplished with the exception of two items that are discussed here. The "Contact" piece of equipment was not fabricated based on the results of the field demonstrations at Farm A and Farm B. Additionally, the final field demonstration of the most cost-effective method of MDR utilization was not conducted due to TU's unsuccessful attempts to solicit another dairy farm for this activity. Funds that were budgeted for these project activities were reallocated to help fund additional collection and sampling of a variety of MDR and manure sources, additional MDR and manure dose/effect tests and lab analyses, lab analyses of MDR sources to screen for hazardous substances according to EPA Section 503 standards for biosolids used in land application, testing to determine effect of MDR upon crop yield, and increased collaboration and planning with agriculture technical experts from the USDA Agriculture Research Service, Penn State University Crop and Soil Science Department, Penn State University Dairy and Animal Science Department, Penn State University Cooperative Extension, Red Bam consulting firm, and TeamAg Inc. consulting firm. A detailed discussion of all the results are found in the final technical report, "Controlling P in Animal Waste Management Systems with Mine Drainage Residuals." The single most important result of the project is the demonstration and finding that an amendment of 10 g/L MDR to high-phosphorus manure decreased the phosphorus source coefficient (PSC) by 50%.

## **3) Lessons Learned**

The lessons learned from this project are numerous in terms of what works and doesn't work, where the use of MDR should be considered and where it would not provide such great benefits, and the cost-effectiveness of using MDR. Please refer to the final technical report for detailed discussions.

#### **4) Dissemination**

In April 2010, Dr. Bob Hedin (Iron Oxide Recovery) and Amy Wolfe (Trout Unlimited) co-presented a webinar presentation on the project for the Penn State University Agriculture and Environment Center's "2010 Manure Du Jour: Serving Pennsylvania's Best Practices on Animal Agriculture, Water Quality and Air Quality". Bob also gave oral presentations on the project at the American Society of Mining & Reclamation and PA Abandoned Mine Reclamation Joint Conference (2010) in Pittsburgh, PA, and at the International Mine Water Association Symposium in Sydney, Nova Scotia (2010). Iron Oxide Recovery and TU staff have also attended and presented posters and/or distributed fact sheets at the NFWF and Chesapeake Bay Funders Network Agriculture Networking Forum (2008-2010), Keystone Coldwater Conference (2010) and the "Innovating Policy for Chesapeake Bay Restoration" Conference (2011). Amy Wolfe has presented the project at a number of local meetings, such as for the West Branch Susquehanna Restoration Coalition and Western PA Coalition for Abandoned Mine Reclamation in 2010 and 2011.

Although there was not enough time to prepare and submit a paper to a peer-reviewed scientific journal within the timeframe of this grant, work is currently underway between project partners Bob Hedin (Iron Oxide Recovery), Chad Penn (Oklahoma State University), and Phil Sibrell (USGS) as the lead author to write such a paper that will provide laboratory determinations of sorption capabilities of MDRs (Penn and Sibrell), chemical characteristics of MDRs (Penn and Hedin), and results from manure testing (Hedin and Penn). The paper will be submitted to the Journal of Environmental Quality.

TU intends to continue public outreach on the benefits of using MDR as a tool to control phosphorus in dairy and swine manure land applications. TU will use the poster presentations, fact sheets, and powerpoint presentations it developed in partnership with Iron Oxide Recovery to continue this outreach as appropriate opportunities arise.

#### **5) Project Documents**

- a) Pictures are included on the enclosed CD.
- b) Fact sheets, 8"x11" versions of poster presentations, report by TeamAg Inc., and final technical report by Iron Oxide Recovery are enclosed and .pdf files of all are on the CD.