

# Controlling phosphorus in animal waste management systems with mine drainage residuals

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## ABSTRACT

- Innovative cost-effective practices for substantially decreasing phosphorus in manure management systems are needed, as these systems are a significant source of non-point pollution to the Chesapeake Bay. This project will field-demonstrate the ability and cost-effectiveness of using mine drainage residuals (MDRs) to decrease soluble (water extractable) P in manure management systems. Soluble P can be decreased through additions of Fe, Al, and Ca solids from MDRs to the manure before field application.

- Successful implementation of this project will augment efforts to reduce the non-point phosphorous loadings received in the Chesapeake Bay and enhance efforts to remediate abandoned mine drainage in Bay tributaries.

## METHODS

- Three MDRs were initially evaluated. "Farmington" MDR was produced passively from an acid coal mine discharge; "Wilson" MDR was produced passively from an alkaline coal mine discharge; and "Brandy" MDR was produced by a lime process from an acid coal mine discharge.

- The initial field-demonstration efforts for this project included the assessment of soluble P and addition of MDRs to a dairy farm manure recycling system in Clinton County, PA. The second demonstration included land application of MDR treated manure and was conducted in Clearfield County, PA.



MDRs from a mine drainage treatment system during recovery (left) and after processing (right).



250,000-gallon manure storage tank with tractor pump (left) and manure being sprayed on fields in spring 2009 (right).

## PRELIMINARY RESULTS

- Results from the initial assessment of MDR addition at the Clinton County dairy farm indicated that the low concentrations of soluble P in the recycling system required amounts of MDR that would reduce the cost-effectiveness of phosphorus control using MDR.

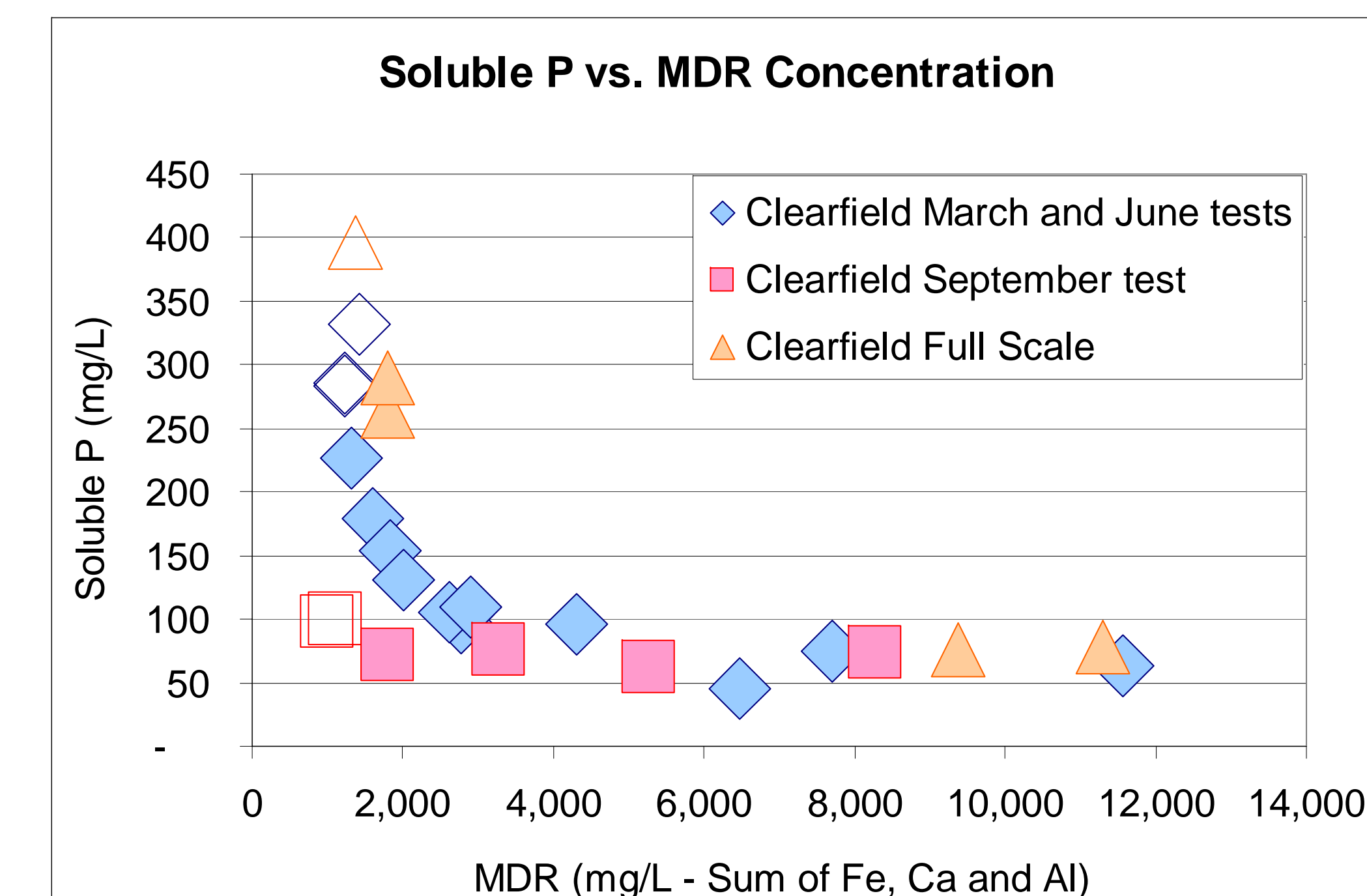
- Results from the MDR addition at the Clearfield County dairy farm, where the manure had substantially higher levels of soluble P, yielded consistent and cost-effective reduction in soluble P.

### Major nutrient concentrations for project manures

Site	Solids	N <sup>tot</sup>	K <sup>tot</sup>	P <sup>tot</sup>	pWE*
	%	mg/L			
Clinton Average	2.2	2,125	2,006	184	52
Clearfield Average	5.7	2,762	1,653	354	239

\* Water extractable P, per Kleinman et al. (2007)

## Effect of MDR additions on soluble P concentrations



Note: Hollow markers indicate control samples without MDR.

## NEXT STEPS

- Results from initial field-demonstrations will be transferred and applied to full-time demonstrations at a number of to-be-selected dairy farms throughout the West Branch Susquehanna River watershed.

- Project tours and outreach activities will target conservation districts, NRCS, DEP, and local farmers.

## ACKNOWLEDGEMENTS

