


Focus on a Farm

A Compendium of Scientific Work

**on a
New York State
Agricultural Watershed**

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July 2008

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February 2006



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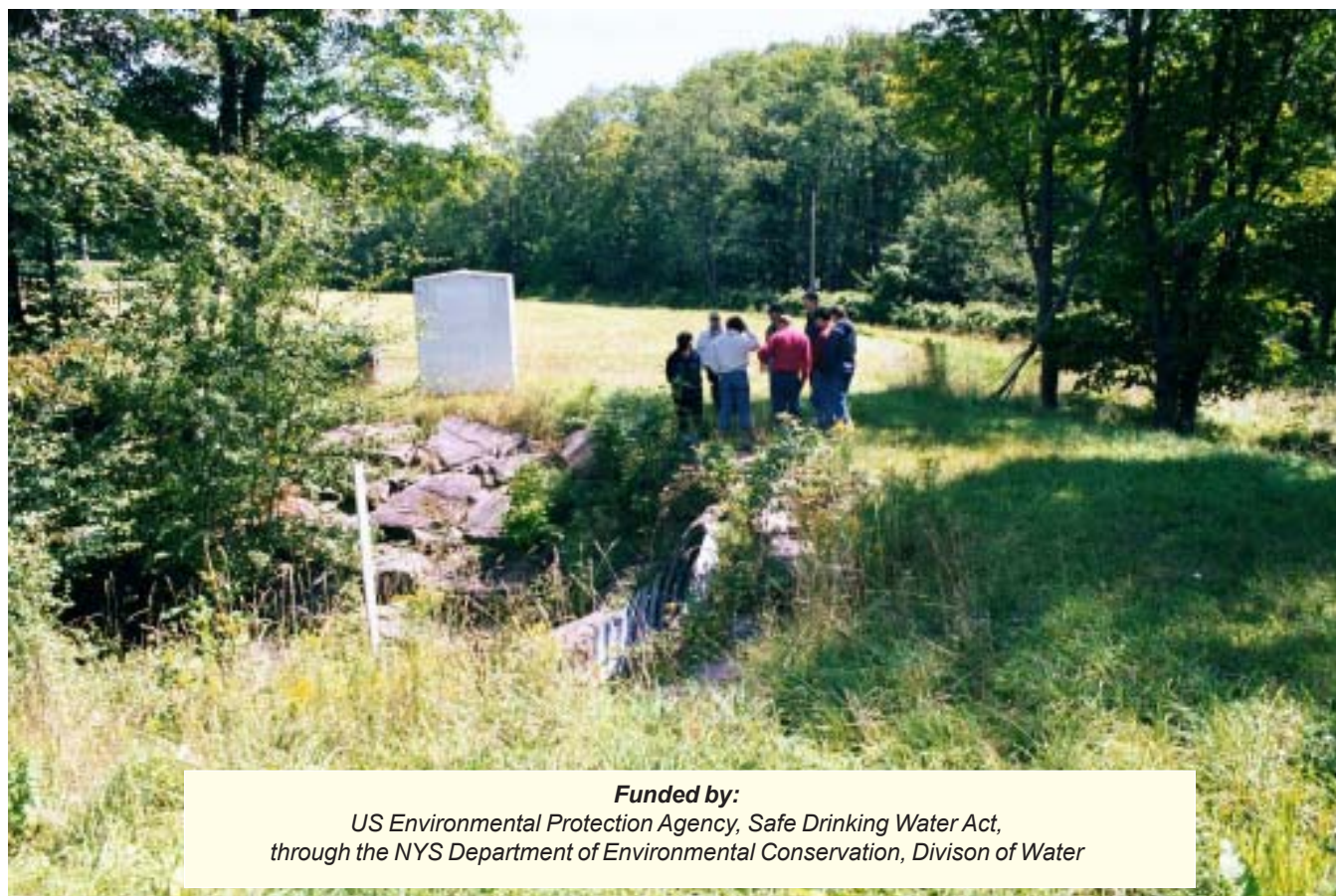


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Executive Summary

This document integrates and synthesizes multiple reports describing completed studies on a farm and nearby forested site in the Catskills region of upstate New York. Delaware County, through its Action Plan (DCAP), and the Watershed Agricultural Council (WAC), together with their watershed partners, have made a substantial investment in comprehensive scientific and technical work on two small watersheds — one devoted to farming and the other serving as a forested control basin with very little human activity. Much of this work is monitoring and assessment in the fullest sense, and represents a solid and comprehensive body of understanding that is of substantial interest and applicability, especially for the planning and management of phosphorus.

Paired Watersheds

Two basins were selected in 1992 as a pair after an exhaustive exploration by researchers from the New York State Department of Environmental Conservation (DEC). In order to enable detained water quality monitoring, several critical criteria for the two basins had to be met. Most importantly, a farm was needed that had a drainage basin with as few confounding factors as was feasible. Ideally this required finding a basin which constituted essentially the farm with no upstream influences. Second, the farm should serve as representative of the small dairy farms typically found in the New York City Watershed area and the pollution problems generally associated with them. Having located such a farm, it was then desirable that a second basin chosen as a “control” be located nearby and be of comparable size to that of the farm basin,

with similar topography and pattern of precipitation. The R Farm and the Shaw Road sites meet these criteria.

Monitoring Sites

Staff of the DEC installed automated monitoring stations on the outlets of the two tributaries draining the two sites. Monitoring to evaluate nutrients and sediment in the tributaries began in June 1993. A total of 7,225 samples were analyzed for load calculations during the study period. Of these, 4,473 were collected at the farm and 2,752 were collected at the control site. A little more than 1,300 samples were collected over a two year period prior to the adoption and implementation of management practices on the farm to establish baseline conditions. After a 17 month period during which best management practices (BMPs) were installed, monitoring resumed in November 1996 and ended in November 2006. An additional 5,900 samples were collected during the ten-year post-BMP period.

In conjunction with the DEC monitoring, multiple research projects have conducted field and laboratory studies to gain understanding of the sources and movement of nutrients and sediment especially as influenced by the management practices on the farm. Cornell scientists have tested several models to take advantage of the rich data set available from the DEC. This work confirms that repeated applications of manure, and the consequent enrichment of the soil, greatly enhances the movement of phosphorus to the stream.

In terms of reducing the risk of phosphorus moving to streams and quantifying the reductions, one of the most dramatic accomplishments was the precision feeding research

conducted by Cornell scientists (the storage of manure is thought to have contributed greatly to reducing loads from the farm as well). Their monitoring of the gains due to reducing the imports of phosphorus in feed to the farm could reduce the amount of phosphorus in manure by 30 percent or more.

The time series of data obtained from the two monitoring stations at the outlets to the two basins, when inspected by eye, did not obviously manifest clear improvements in water quality following the management practices. By developing and applying statistical methods using the paired data sets, the DEC researchers and their

colleagues were able to show significant reductions in farm losses of sediment and nutrients. This was confirmed by biological assessment of the farm stream. However, the farm stream has nutrient and sediment levels that remain substantially higher than that of the control site. There may be a level below which it is unreasonable to seek further improvements in water quality that drain farms devoted to animal production.

This study well demonstrates the scientific and statistical power of monitoring paired sites representing a farm, without confounding factors, and a control site having minimal human influences. In this regard, this study is unique.

