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Agricultural best management practices for Conesus Lake: The role of extension and soil/water conservation districts

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ABSTRACT

Small sub-watersheds of the Conesus Lake catchment were the site of a project evaluating the ability of agricultural Best Management Practices (BMPs) to maintain soil and nutrients on the landscape and to reduce the impact of agriculture on downstream aquatic systems. Local agricultural agencies, with participation of local farmers, joined with scientists to focus attention on watershed issues, to develop and foster a sense of stewardship among the farming community, and to assist and coordinate collaboration among academic researchers, governing bodies, and the agricultural community. Cornell Cooperative Extension served as a liaison and as a resource and assisted in the development and implementation of voluntary BMPs in selected sub-watersheds of Conesus Lake. We discuss our approach to working with producers, the selection of watersheds for management, and our decision-making process for implementation of BMPs. Decisions to establish traditional structural and nonstructural management practices on sub-watersheds of Conesus Lake were based on field assessments, soil testing, the Phosphorus Index, and the software package Cornell Cropware. For example, the use of soil testing and the Cornell Cropware software allowed the cooperating farms to apply fertilizer only as needed for optimum crop production. Farmers achieved cost savings because previous plans had not given enough credit to soil reserves, manure, and sod crop nutrients. Low-cost voluntary practices based on well-established agricultural management practices have been combined with cost-shared (structural) practices in Conesus Lake watersheds to mitigate the impact of agricultural runoff on water quality and to improve cost efficiency of agricultural operations.

Introduction

Conesus Lake, one of the smaller Finger Lakes in western New York, is used for recreation and fishing and is a source of municipal water for five local communities. The shoreline area is densely populated with residences, primarily year-round homes. The upstream area is a mixture of agricultural land and mixed deciduous hardwood forests encompassing an area of 16,714 ha. In 1999 about half of the entire land use within the Conesus Lake watershed was and continues to be in agriculture. Much of the agriculture (>70%) is concentrated in the western sub-watersheds of the lake (Fig. 1, Table 1; SOCL, 2001). The deep, well-drained, glacially derived limestone soils that dominate the watershed are productive and support field crops (field corn, forages, winter wheat, soybeans), vegetable crops (dry beans, sweet corn), and a small acreage of vineyards. Dairy farms are the major animal agriculture with a few livestock and horse farms. More information on Conesus Lake and its surrounding watershed may be found in this issue (Makarewicz, 2009).

Stakeholders believed that the growth of shoreline aquatic macrophytes and algae was increasing in Conesus Lake. Agricultural runoff is widely known to be a significant contributor to algal blooms in aquatic habitats (e.g., McDowell et al., 2004, Beman et al., 2005). In Conesus Lake, studies have shown that plant biomass was especially prominent in areas where streams draining primarily agricultural watersheds entered the lake (D'Aiuto et al., 2006, Makarewicz et al., 2007). Consequently there was a general consensus that excessive plant growth in Conesus Lake was caused, at least in part, by repetitive agricultural runoff and nutrient loss from these fields (SOCL 2001, Bosch et al., 2009a, b; Moran and Woods, 2009). A purpose of the Conesus Lake Watershed Project was to implement management practices, so-called Best Management Practices (BMPs), and to determine if there were reductions in nutrients entering the lake from that farmland.

BMPs are actions, behaviors, or techniques that reduce pollution and the amount of runoff flowing into waterways and that cover a wide range of practices on the land. Non-structural BMPs include such practices that minimize site disturbance through sound planning and design and include cropping sequence, soil testing, fertilization rates, tillage practices, etc. For example, on dairy or livestock farms, soil testing is combined with manure analysis to develop manure application plans to make best use of recyclable manure nutrients. Structural BMPs include construction of manure lagoons, terraces, buffer strips, sediment control basins, etc. Contour strip cropping, where alternate strips of land are planted to row crops or sod crops

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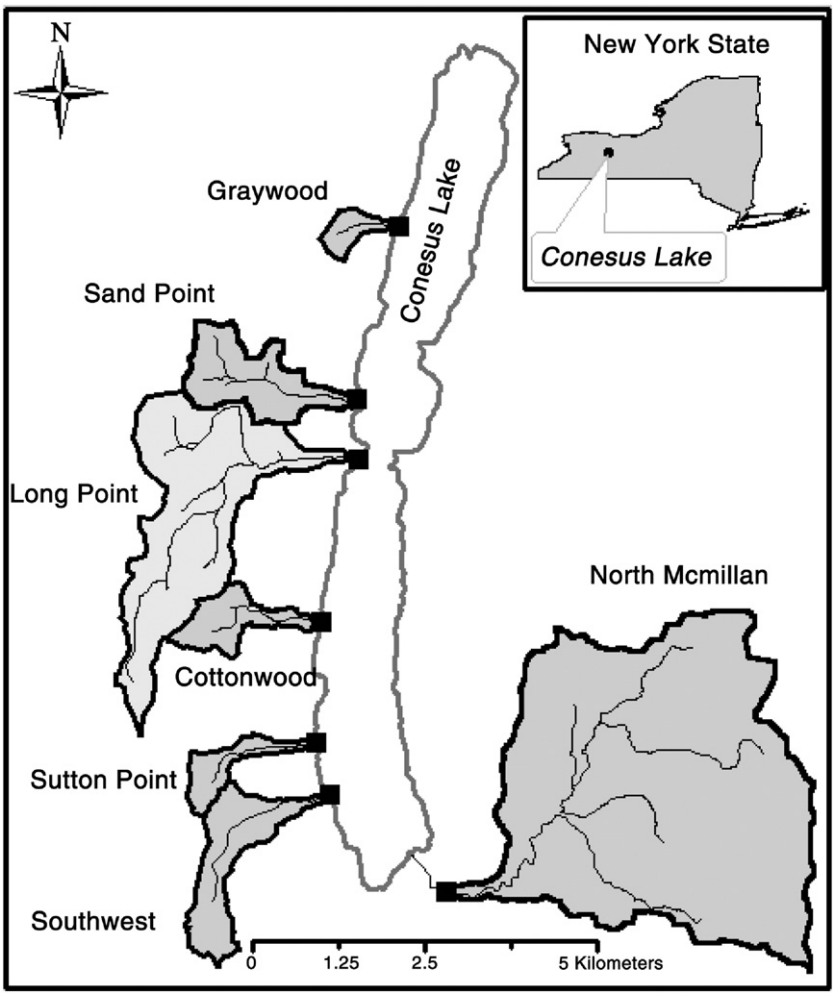

Fig. 1. Conesus Lake and sub-watersheds selected for the BMP-watershed manipulation study. Other sub-watersheds are not shown. Square symbols are the location of stream sampling sites discussed in Makarewicz et al. (2009).

perpendicular to the predominant slope, is an example of another structural BMP. By shortening the lengths of slope where water can flow freely (tilled strips), runoff and kinetic energy of water are reduced, and soil erosion is minimized. The recommended BMPs were all proven technologies, designed to meet or exceed Natural Resources Conservation Service (NCRCS) standards. This project was not an effort to evaluate new experimental management practices but to evaluate the impact of accepted NCRCS practices on downstream aquatic systems at the watershed level.

Cornell Cooperative Extension (CCE) connects the research knowledge of academic institutions to individuals, communities, families, and other agencies in New York to enhance their economic well-being and quality of life. Extension's part in this project had several important goals and involved multi-agency cooperation. The North West New York (NWNY) Team of Cornell Cooperative Extension served as the liaison between the cooperating farmers and academic researchers at The College at Brockport, SUNY Geneseo, and Rochester Institute of Technology. With technical assistance from the Livingston County Soil and Water Conservation District (SWCD), CCE planned and encouraged implementation of a series of best management agricultural practices. CCE also maintained their traditional effort of outreach to the agricultural community. Here we discuss the approach to working with producers and the various BMPs implemented on all study watersheds but focus on the results from the Maxwell Farm in the Graywood Gully sub-watershed.

Approach and methods

Voluntary farmer participation

Staff from the NWNY Team visited potential farm cooperators to explain the CSREES-USDA (Cooperative State Research Education Extension Service) funded program and to encourage voluntary participation. The contentious atmosphere that existed between the Conesus Lake Association (CLA) and the agricultural community was an issue prior to the start of the project. As expected, the farmers had questions relative to the use of their farm information, media publicity, and relationships with the CLA.

The Cornell Cooperative Extension Team and the Livingston County SWCD staff assured the farmers that no mandatory practices would be required, and there would be no retroactive enforcement of previous runoff problems if identified by the CSREES-USDA sponsored research. It was explained that there would be no release of personal information relative to individual farms without written permission. Also, the farm operators were skeptical of having researchers on their property. All agreed that the NWNY Team would be the intermediary between the BMP farms and academic researchers. When researchers needed to know more about specific farm practices, they would direct their questions to the NWNY staff. As a result of these discussions and agreements, the farmers in the three BMP watersheds agreed to participate.