Jennifer Gilbert
ISEQ Work Summary as of December 2004

Vegetative filter strips (VFS) are a common tool used in controlling non-point source phosphorus (P) losses to surface waters. Typically, VFS are considered to control P by slowing runoff velocity and trapping sediment bound P in the VFS, thereby keeping the P out of the water. This technique works well in areas where there are high erosion rates. In those environments the dominant form of P transport is as particulate-P, and bound to sediments. Here in Delaware this is not the case. The landscape in this area of the country is gently sloping to flat and the water table is high and seasonally at the soil surface. Delaware's Sussex County is one of the densest poultry producing counties in the country. The over application of poultry manure and inorganic fertilizer has increased soil test phosphorus (STP) levels in the soil to the high and very high range – in excess of what is required to grow corn crops. These conditions create a scenario where the dominant form of P movement is in the dissolved form in surface and shallow subsurface flow during rain and irrigation runoff events.

It is in this setting that I am evaluating how effective VFS are at containing P and controlling losses from agricultural land to surface waters. The objectives of this study are three fold: firstly, to assess the effectiveness of using VFS as a P management tool in landscapes where soils are already saturated with respect to P; secondly to use modeling techniques to guide the use of VFS as a P management tool so that they are used where they will be most effective; and thirdly, to evaluate techniques for improving VFS performance to make their use more effective over a variety of landscapes.

The first stage of this research project involved collecting soil samples from agricultural fields and adjacent VFS. After reviewing close to 50% of all farms in Delaware that are participating in the Conservation Reserve Enhancement Program (CREP) by taking land out of production to install VFS, eight sites were chosen based on soil type, VFS width, age of the buffer, and type of grass mixture used - warm season or cool season. Soil samples were analyzed for multiple forms of P as well as for pH, organic matter, aluminum, iron, and calcium content. Next, an experiment was run to determine the capacity of these VFS and field soils to hold on to existing and retain additions of P. It was found that the P sorption capacity, the ability to bind P, was not related to whether the soil was from a VFS or field, but instead related to the initial P and Al content of the soil.

The next stage of this project was to use the Riparian Ecosystem Management Model (REMM), a field scale model that simulates hydrology, plant growth and nutrient transport within riparian buffer to simulate P movement into and through VFS. Data from the first portion of the project were compared to model calculations to determine if the model accurately represented soil characteristics of the Mid Atlantic Coastal Plain. New parameters for model calculations were identified and upcoming research will focus on calibrating REMM to work for Delaware VFS including a field and lab-scale model verification study. In the future, the third portion of this project will include a study of VFS amendments to enhance their function as P sinks and therefore their overall usefulness.

Vegetated Filter Strips are increasingly being recommended, and in some cases required to reduce non-point source pollution. Information gained from the completion of this research project will help determine the most appropriate places to use VFS, or where other management tools may be more effective.