

PLANT MATERIALS BUFFER TO CONTROL DAIRY LOAFING AREA RUNOFF

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Abstract. A plant materials buffer to control dairy loafing area runoff was planted in 1991 along Clear Creek on the Wright's Dairy Farm in Gilmer County, Georgia. Clear Creek, is a crystal clear trout stream that originates at Burnt Mountain, about four miles upstream from the Wright Dairy. The Wright Dairy is the first farmland below Burnt Mountain. The farm consists of a 650 acre mountain farm, a dairy operation with 180 milk cows and 660,000 broilers. Although an animal waste lagoon (built in 1981) was handling wastes from the dairy barns, there still remained the problem of runoff from the cows loafing lot. Water washed soil and manure down the slope and into the creek. The remaining farmland consisted of pastureland. A subdivision is located down the valley from the farm where a number of non-farmers are building homes along Clear Creek . The subdivision dwellers noticed the muddy water and an unusual odor in Clear Creek as the stream passed by their property. The dairy loafing area was affecting the water quality of Clear Creek by contributing non-point source pollutants. To address the non-point source pollution a plant materials multi-species buffer consisting of a diversion, filter /buffer strip, constructed wetland, riparian restoration, streambank stabilization and fencing.

INTRODUCTION

Dairy loafing areas are a potential source of groundwater and surface water contamination. For the purpose of this report, the term “loafing area” is used to describe any area on a dairy near the barn where the milking herd gathers. On intensively managed dairies where grazing is controlled, there is a small field or corral where the herd is kept when it is not in the barn or on pasture. On less intensively managed dairies, this is usually an area of a pasture where there is high traffic at the barn entrance or exit.

In a recent study to determine the source of high nitrate in wells of dairies located in the Little River/Rooty Creek Hydrologic Unit in the Piedmont region of Georgia, the leaching from loafing areas was the most likely source (Drommerhausen et al, 1995).

Dairy loafing areas are a potential source of groundwater and surface water contamination. There are more than 4,000 dairies within the service area of the Jimmy Carter Plant Materials Center. Runoff from most of these loafing areas can be considered to be inadequate.

There is little research information on runoff from dairy loafing areas. In contrast, there are many few field demonstration or evaluation where alternatives were considered that included plant materials buffers to address the resource concerns. H. Howard of the U.S. EPA Laboratory in Athens, Georgia monitored the water quality of a stream below a dairy in the Piedmont region of Georgia. The stream received runoff from a dairy loafing area and the discharge from a lagoon routed through a constructed wetland. Although the

wetland was effective in reducing the N & P discharge from the lagoon, the runoff from the loafing area was the principal source of the N and P in the stream (accounting for 93 to 100 % of the total load, depending on the form of N and P).

SITE INFORMATION

In 1991 a comprehensive plant materials field planting that consisted of a multi-species riparian buffer was established on Franklin Wright's Dairy Farm, located in Gilmer County, Georgia, to address problems associated with the dairy loafing area. The loafing area was located down slope from the dairy, and to Clear Creek, a perennial trout stream where the cattle were allowed to obtain drinking water and access to Clear Creek. Clear Creek is a crystal clear trout stream that starts at Burnt Mountain, about four miles upstream. Although an animal waste lagoon was handling wastes from the dairy barns, there still remained the problem of runoff from the cows loafing area. Water washed soil and manure down the slope and into Clear Creek. In addition, to compound the problem, a new subdivision where homes were built along Clear Creek, down the valley from the Wright Dairy.

MATERIALS AND METHODS

An integral part of this system is a streambank stabilization and a diversion with small constructed wetland cells along the channel to intercept non-point source pollutants from the loafing area runoff. The loafing area was moved 150 ft. upslope, therefore, the dairy cows no longer had access into Clear Creek. Bankers dwarf willows (*Salix cotteti*; streamco willow, Halifax maidencane and alder were planted along the streambank. A filter strip/buffer was planted to reed canarygrass and marshhay cordgrass from the creek edges to the diversion channel. Several rows of trees and shrubs were planted on both sides of Clear Creek to restore the riparian buffer. The constructed wetland cells were planted with wetland plant materials, such as Restorer giant bulrush (*Scirpus californicus*) cattail (*Typha latifolia*) and Halifax maidencane (*Panicum hemitomon*).

The riparian restoration plant materials consisted of sycamore, water oak, black gum, river birch, silver maple, red maple and Ellagood autumnoline.

RESULTS AND DISCUSSION

The plant materials for this demonstration were selected to serve multiple purpose. Those purposes included rapid growth, dense rooting ability, regeneration ability for the trees and shrubs, stiff stems for the grass filter, wetland plants that can tolerate nutrient load in the constructed wetland cells, reduce stream temperature in trout stream, and to clean up the runoff from the dairy loafing area. The desire was to develop an effective buffer in as short a time as possible to effectively trap sediment and process chemicals and to demonstrate to landowners that a buffer can reduce nutrients runoff from dairy loafing areas.

The right combination of trees, shrubs, grass, wetland plants can improve water quality by removing sediment and chemical before they reach the surface water. A properly cared for buffer area also can moderate flooding, recharge underground water supplies, prevent loss of soil by erosion, and preserve wildlife habitat. Trees selected for rapid growth can provide landowners with valuable biomass, timber and nut crops.

Since 1991 there has been dramatic alteration in the appearance and functioning of this plant material buffer. After seven growing season, Bankers dwarf willow have stabilized the eroding streambanks. Reed canarygrass, the dominant grass, has developed into a dense stand that effectively stops concentrated flows and runoff from the constructed wetland cells, allows for infiltration. Reed canarygrass can tolerate wetter sites than Kentucky 31 tall fescue, the dominate pasture grass in the area. The constructed wetland cells consisting of wetland plant vegetation traps the non-point source pollutants in the

runoff water from the dairy loafing area. The wetland plants and microbes in the root zone breakdown the nutrients prior to the water enters the filter strip. Therefore, the water quality is enhanced before it reaches the riparian (tree) buffer. The trees and shrubs have increased the root biomass along the stream. The tree canopy shades the creek which reduces the water temperatures and enhances habitat for trout. (Ellagood autumn olive provides late winter food for songbirds another wildlife.) This suggests better soil stabilization, absorption of infiltrated water, and soil-root microbe non-point source interaction characteristics within the plant materials buffer zone. Overall the plant materials buffer system seems to be functioning as expected. This system offers dairy farmers an alternative for controlling non-point source runoff from dairy loafing areas.