Conservation buffers and water quality

Conservation buffers are an effective and cost-efficient best management practice that can be used to improve water quality. They can be different-sized areas or strips in permanent vegetation that minimize soil erosion by reducing surface runoff. Conservation buffers also can trap and degrade a portion of runoff adsorbed to sediments or dissolved in water; they are seldom effective in trapping all pesticides in runoff. Conservation buffers can be used along with other best management practices to protect water quality.

There are several types of buffer strips. Contour grass strips or wind trap strips have rows of different perennial vegetation that reduce wind damage to young plants, conserve soil moisture, and minimize soil erosion. In field borders, vegetation can be planted for traveling machinery and as turning areas. Other buffers are used for water control and water quality improvement, such as filter strips, grassed waterways, riparian buffer zones, wellhead protection areas, and wetlands. All these practices have one thing in common--prevention of further degradation of soil and water quality by reducing soil erosion and nutrient loading to surface and groundwater, moderating water temperatures, and preventing water contamination. Other benefits include reducing water runoff from fields and downstream flooding, increasing profitability by taking marginal land out of production, reducing soil erosion and nutrient and pesticide loading in runoff by 50 percent, removing 75 percent of sediment from water runoff, minimizing odor, and establishing natural vegetation.

Riparian buffer.

Enlarge [1]

Well-designed buffer strips can effectively minimize the movement of soil sediment, nutrients, pesticides, and pathogens through the soil profile and from the field as runoff, thereby improving water quality. Also, well-designed buffer strips improve wildlife habitat and air quality by reducing chemical emissions. Intensive management of conservation buffers is required to maintain their effectiveness in trapping pollutants. Sediment trapped by buffers changes land shape and may cause runoff to flow parallel to buffers rather than across them. For example, sediment trapped in the center of grassed waterways may cause runoff to flow along the edge of waterways, eroding gullies and increasing concentrated flow. Sediments need to be removed from these areas and vegetation reestablished when necessary. It is critical to minimize the load of sediment in the runoff flowing across buffers by using soil conservation practices or best management practices to the source fields. Conservation buffers have been shown to be very effective in facilitating pesticide degradation and in

lessening pesticide concentrations in subsurface water flow. Because buffers increase water infiltration, concern has been expressed that leaching of pesticides and nitrate might be increased, possibly to shallow groundwater. However, cycling runoff through buffer soil prior to discharge to streams by subsurface flow is much better than allowing surface runoff to directly enter streams. Pesticides can be absorbed and degraded and nitrate taken up by plants, or denitrification can occur within buffers.

Buffers may require mowing for weed control or other reasons. Mowing can have a positive or negative impact on the efficiency of buffers in trapping pollutants. Mowing encourages some grass species to tiller and produce denser vegetation at the soil surface. However, short cutting of stiff-stemmed grass species may reduce the flow retardence of vegetation. Actively growing vegetation is biologically active in absorbing and degrading pesticides, and supplying carbon for microbial degradation. One of the functions of conservation buffers is to trap nutrients such as nitrogen and phosphorus. Periodic harvest of buffer vegetation removes trapped nutrients from the system, preventing eventual release to the soil and potential movement to water.

Herbicides trapped by buffers are degraded in the soil by microbial and chemical processes. Herbicides may be taken up by some buffer plants through the roots or foliage and metabolized. However, excessive loads of certain herbicides could injure buffer plants. Most buffer studies have reported either no injury to buffer grass or only slight injury. Although herbicide concentrations in runoff are usually tolerated by buffers, direct application or drift of some herbicides can be harmful to grasses or woody plants. Care should be taken to turn off sprayer booms and use control drip nozzles when driving over buffers.

Turning machinery on buffers is another consideration. Driving heavy equipment on buffers leads to soil compaction and reduced water infiltration. It also can cause ruts when soil is wet. Ruts may encourage concentrated flow that bypasses the filtering ability of the buffer. Also, grazing of livestock on buffers may reduce buffer efficiency due to soil compaction and reduced grass height. Planning a grazing system that allows quick, intensive foraging under good soil conditions is essential. Removing livestock when soils are wet reduces potential damage to buffers.

This article originally appeared on page 99 of the IC-484(13) -- June 12, 2000 issue.

Source URL:
http://www.ipm.iastate.edu/ipm/icm//ipm/icm/2000/6-12-2000/consbuffers.html

Links:
[1] http://www.ipm.iastate.edu/ipm/icm//ibuffer.html

IOWA STATE UNIVERSITY
University Extension