



# Erosion Control Systems

Authors: John E. Gilley and Bahman Eghball, USDA-ARS, Lincoln, Nebraska



Author's email  
jgilley1@unl.edu

Editing and Design:  
Forbes Walker  
Wanda Russell  
Gary Dagnan  
Anne Dalton  
University of  
Tennessee Extension

Developed by SERA-17,  
Minimizing Phosphorus  
Losses from Agriculture  
<http://sera17.ext.vt.edu/>



This project was funded in part under an agreement with the USDA-NRCS.

## Definition:

Erosion control systems may be a single or group of practices that prevent detachment and interrupt the transport of soil by rainfall, runoff, melting snow or ice and irrigation water. Since phosphorus is often attached to sediment particles, erosion control systems serve to decrease phosphorus delivery from agricultural areas.

## Purpose:

Erosion control practices are available to reduce the amount of soil particles and attached phosphorus from leaving the site. Keeping soil particles and nutrients on site can enhance soil properties and maintain productivity.

## How Does This Practice Work?

A variety of practices are available for controlling erosion on agricultural areas, including contouring, strip cropping, conservation tillage, terraces, buffer strips, diversions and grassed waterways. An erosion control system is a combination of practices that prevent soil detachment and interrupt the soil transport. Performing reduced tillage, residue management, contour farming, installing

grassed waterways in concentrated flow areas and using buffers to intercept runoff are examples of an erosion control system. Runoff, nutrient transport and downstream sedimentation are reduced when surface runoff is impounded in small depressions created by tillage operation.

Under strip cropping conditions, alternate parcels of different crops are grown on the same field. The strips with the greatest surface vegetative cover capture sediment eroded from upslope areas. The most effective strip cropping rotations include perennial grasses and legumes that alternate with grain and row crops.

On cropland areas, erosion potential is substantially reduced when residue from the previous crop is left on the soil surface. Residue serves to protect the soil surface by absorbing and dissipating raindrop energy, which significantly reduces soil detachment. Substantial reductions in erosion can result from small amounts of residue cover.

On steep land, terraces or broad channels are built perpendicular to the slope to reduce erosion by decreasing the uncontrolled flow length. Runoff travels at relatively low velocities

along the gentle grades used in terraces, reducing erosion and retaining soil particles in the field. Therefore, the amount of soil particles in surface water leaving terraced fields is decreased.

Buffer strips are designed to intercept runoff using permanent vegetation. Sediment is removed as overland flow approaches and enters buffer strips. Buffer strips also provide increased infiltration. Buffer strips can be located at a variety of locations within a landscape.

Runoff from terraces or other concentrated flow areas can be conveyed using grassed waterways, thus preventing erosion. Costly downstream sedimentation is reduced because the sediment transported by overland flow is deposited in the grassed waterways. Grassed waterways capture nutrients transported in runoff and serve as a means of treating gully erosion.

## Where This Practice Applies and Its Limitations:

All land users should consider erosion control as a key component for all land and management decisions. Rainfall characteristics, soil factors, topography, climate and land use all influence

soil loss. A variety of erosion-control practices could be used on a particular landscape. More than one erosion-control practice may be necessary for protection on areas with high soil-loss potential. Each erosion-control system should be composed of those practices that in combination will meet site-specific conditions.

### **Effectiveness:**

Erosion control practices have been successfully used to reduce soil loss and sediment transport for several decades. The erosion control practices employed at a particular site should be tailored to site-specific conditions. A combination of erosion control practices may be implemented to effectively control erosion from agricultural lands and sediment delivery to sensitive areas. One of the most effective means of reducing erosion is to maintain a vegetative or residue cover on the soil surface. A 30 percent soil surface coverage of wheat or corn residue, the minimum amount required to qualify as a conservation tillage system, can reduce soil loss by approximately 62 percent and 97 percent, respectively.

### **Cost of Establishing and Putting the Practice in Place:**

Contour farming and strip cropping are erosion control practices that can be easily implemented using existing farm imple-

ments. Adopting conservation tillage practices sometimes requires the purchase of specialized equipment suitable for use under high residue conditions. The establishment of buffer strips and grassed waterways can remove cropland areas from production.

By reducing excessive erosion and conserving water and nutrients, erosion control measures can also enhance profitability.

### **Operation and Maintenance:**

When contouring is used, the effectiveness of ridges in trapping runoff and reducing soil loss decreases as slope gradient becomes greater. To prevent runoff from large precipitation events from overtopping ridges, a small slope gradient along the row is desirable.

To improve erosion control under strip cropping conditions, the strips are usually planted on the contour in a rotation that shifts crops annually from one strip to the next. Strip widths are dictated by farm implement requirements.

With the increased availability of herbicides, the use of tillage for weed control under conservation tillage conditions has diminished. When tillage is performed, crop residues are maintained by using special implements that cause only minimal soil disturbance. To maintain sufficient residue cover for erosion control, no tillage is used before planting for some row crops such as soybeans.

On terraced fields, contouring is included as an erosion control practice, since crop rows are usually planted parallel to the terrace. Sediment accumulating in the terrace channel should be periodically removed and placed on the terrace bank.

Sedimentation may occur along the upslope portion of a buffer strip. Accumulated sediment must be removed to prevent flow channelization, one of the most common problems impacting buffer strip performance.

To prevent failure, a grassed waterway should not be used as a road, stock trail or pasture, especially during wet conditions. Care should also be taken when farm machinery crosses the waterway. The grassed waterway should be managed to stimulate new growth and control weeds, and an annual application of fertilizer is recommended.

### **References:**

USDA-NRCS and Cooperative Extension Service technical references and standards for conservation practices are available at local county offices.

### **For Further Information:**

Contact your local conservation district, USDA-NRCS or Cooperative Extension Service office. Cost-share may be available for the establishment of many of the erosion control practices.