

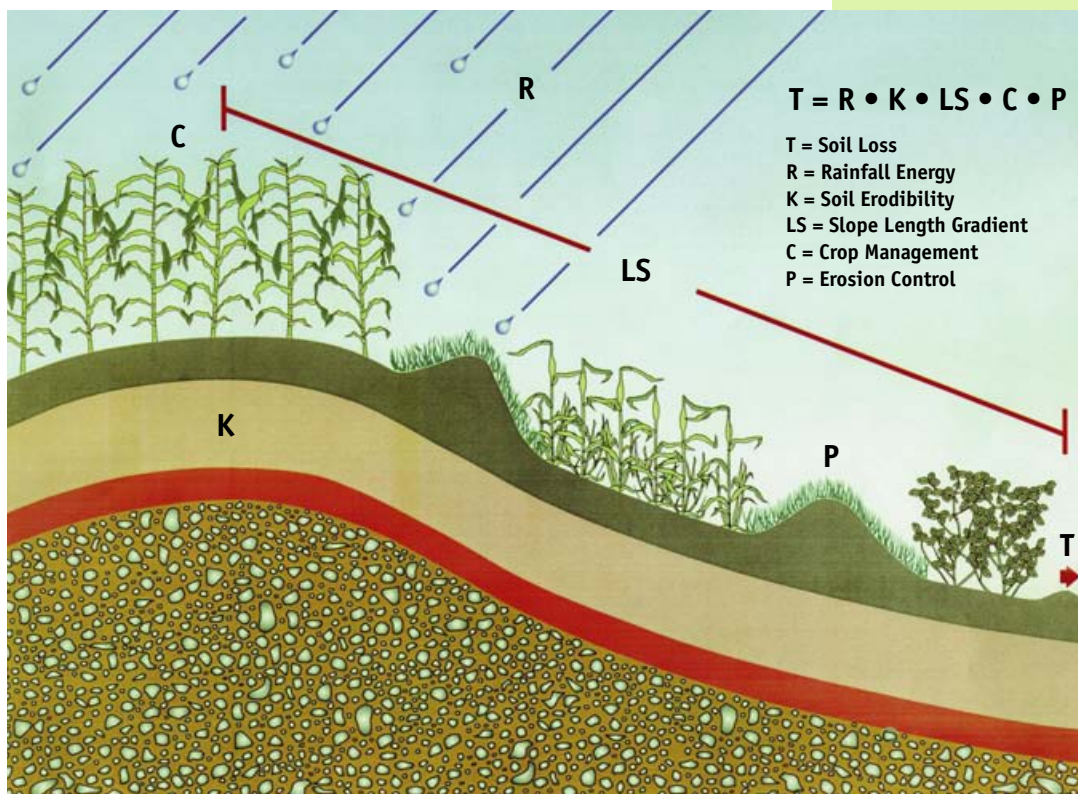
SOIL AND WATER CONSERVATION ON ADJACENT CROPLAND

By themselves, buffer strips cannot control erosion and runoff from cropland. Much of the risk of surface runoff and concentrated flow from cropland can and should be managed in the field by soil and water conservation structures and practices. Buffer strips are one part of this soil and water conservation system – to repeat, they are the last line of defence.

The systems approach is perhaps best described when using the Universal Soil Loss Equation in the example and illustration below.

A producer has a loamy field with a 5% slope. In a bare soil condition, he can lose up to 10 tonnes/ac./yr. of topsoil. With the following BMPs, he can reduce his losses.

BEST MANAGEMENT PRACTICE	ESTIMATED REDUCTION IN SOIL LOSS
SPRING TILLAGE	15%
REDUCED TILLAGE	50%
STRIP CROPPING + REDUCED TILLAGE	65%
TERRACING + NO-TILL	85%



The factors that affect erosion and runoff relate to rainfall frequency and intensity, steepness and length of slope, soil type, crop cover, and erosion control measures.

A bare field with long slopes, silt loam soils and no erosion control measures could lose a surprising amount of soil in a single rainfall. Soil conservation practices are intended to protect the soil from the destructive forces of rainfall and snowmelt – and keep the soil in place.

If cropland soil and water conservation BMPs reduce soil loss by up to 80 percent, then buffers can be designed for other functions – such as bank stability, fish habitat and carbon sequestration.

In this chapter we'll look briefly at:

- soil and cropland conservation practices and structures, and
- BMPs for nutrient and pesticide application on nearby cropland.

We don't go into great detail about these practices, as there is already a wealth of information in other excellent resources. These include other titles in this BMP series, to which we'll refer you throughout the chapter.



Cover crops and plowdowns are examples of soil conservation options that build soil and prevent cropland runoff. Use in concert with cropland buffer strips. Soil conservation options range from reduced tillage practices (e.g., no-till, chisel plow) to slope management (e.g., strip cropping), to soil management practices that improve soil quality and reduce runoff.

Grassed waterways can safely convey concentrated flow from cropland before it enters surface waters.



A variety of erosion control structures can be designed to reduce soil loss and safely convey surface water through a tile intake to a properly protected outlet.



This terrace ridge intercepts surface flows to form a temporary pond which slowly drains to a tile system.

Concentrated Flow

On the field slope illustrated on page 93, the soil loss and runoff would be even greater if there were draws or convergent pathways for water to run downhill. Unchecked, these draws can lead to rills and gullies. To prevent this, or to reduce potential risks, you must:

- ▶ protect the draw
- ▶ reduce the grade
- ▶ reduce the length of run, OR
- ▶ divert the flow below the surface.

In fact, most erosion control structures are designed to attain one or more of these goals. For example, water and sediment control basins reduce the slope length and divert the flow below the surface.

Planning

Consider the following factors in the planning process:

- ▶ **future land use** – whether the land will remain in its current land use
- ▶ **slope, slope length, soil type, in-field watershed size** – must be considered when designing structures for size and safety
- ▶ **cropping and tillage practices** – how compatible a particular structure would be for current crop rotation, tillage options
- ▶ **cost of options** – which option provides the most value for the investment required.

Erosion control structures are very effective, and can also be quite expensive. Minimize the need for structures by blending appropriate conservation cropping and tillage options.



SOIL MANAGEMENT

Don't underestimate the value of healthy soils near riparian areas. Soil management BMPs improve soil quality and build resistance to erosive forces by adding organic matter, improving soil structure and increasing infiltration rates.

Soil management BMPs include cover crops, crop rotation and reduced tillage systems.

See the BMP books, *Soil Management and No-Till: Making it Work*, for more details.



Where conventional tillage is used, it will take many years using a good crop rotation to build up organic matter. In conservation cropping systems, organic matter levels may increase more quickly.

Reduced tillage systems, including no-till, maintain soil quality and will reduce erosion and runoff rates.



Cover crops such as fall-planted oats and barley will tie up nutrients and protect the soil between crops.



Crop rotations that include annual and perennial crops will add organic matter, help maintain soil quality, and keep soils covered longer throughout the year.

CROPLAND CONSERVATION PRACTICES

Conservation practices are non-tillage practices intended to control erosion by reducing the effect of slope and increasing soil cover. They can be designed for effective water or wind erosion control.



Field strip cropping maintains strips of row crops, cereals and forages at uniform widths across the main, simple slope. On complex slopes, this makes it easier to manage than contour strip cropping.



Contour strip cropping – alternate strips of row crops, cereals and forages on the contour – slows surface flow and increases infiltration rates.



CROPLAND CONSERVATION STRUCTURES

Erosion control structures are designed to control erosion and safely convey surface water to an adequate outlet. You should seek technical advice for design and construction.

Common examples include grassed waterways, drop pipe structures, terraces and water and sediment control basins.

For more on cropland conservation structures, see the BMP book, *Field Crop Production*.



Water and sediment control basins are earthen embankments across draws, with retention basins and drop pipe structures to convey water to an adequate tile outlet. The duration of temporary ponding is carefully engineered to reduce the risk of damaging the crop.

Grassed waterways are dish-shaped, graded and grassed channels placed in draws with subsurface drainage tile, intended to divert and transfer runoff to a properly protected outlet.



NUTRIENT AND PESTICIDE APPLICATION ON ADJACENT CROPLAND

Cropland erosion and runoff rates can be curbed somewhat with soil and water conservation BMPs. To drastically reduce the potential for contaminated runoff, combine those BMPs with BMPs for nutrient and pesticide application.

SEPARATION DISTANCES

For those farmers who are required by the *Nutrient Management Act Regulation 267/03* to have a Nutrient Management Plan (NMP), the following minimum separation distances for the application of nutrients on cropland adjacent to surface water must be adhered to.

- ▶ No person shall apply nutrients on cropland adjacent to surface water unless there is a vegetated buffer strip with a minimum width of 3 metres from top of bank.
- ▶ No person shall apply commercial fertilizer of agricultural source material (e.g., manure) within 13 metres (43 ft.) of surface water unless one of the following application methods is used: applied using injection or band method; materials are incorporated within 24 hours; materials are applied to a living crop; or the material is applied to a high crop residue (>30% cover) field.
- ▶ Effective immediately, irrespective of whether a NMP is required, no person shall apply non-agricultural source materials (e.g., biosolids) within 20 metres (65 ft.) from the top of the nearest bank of surface water.

In all cases, no materials can be applied within the minimum 3-metre (10 ft.) vegetated zone.

For more detailed information on separation distances for nutrient application, please refer to Regulation 267/03.

NUTRIENT APPLICATION

- ▶ Complete and follow your Nutrient Management Plan. It will help balance crop nutrient requirements with manure applications.
- ▶ Calibrate manure application equipment.
- ▶ Develop a monitoring and contingency plan for manure application.
- ▶ Apply your manure and fertilizer when soil conditions are right and when the crop needs it. Where suitable, pre-till tile-drained lands before applying liquid manure – this will break up large pores and reduce infiltration to tiles.
- ▶ Incorporate manure within 24 hours following application.
- ▶ Avoid working on wet soils and in wet weather, and you'll avoid nutrient loss, runoff, soil compaction and tile effluent. Avoid spreading manure if:
 - ▷ rainfall occurs shortly before application OR
 - ▷ heavy rains are forecast within 12–24 hours of spreading on tile-drained lands.
- ▶ Comply with separation distances for nutrient application as regulated by legislation or as stated in your Nutrient Management Plan.

For more detailed information, refer to the Ontario Regulation made under the *Nutrient Management Act, 2002 (267/03)* and the Nutrient Management Protocol. Please see the back cover for links.



Use injection carefully as a method to ensure immediate incorporation of applied nutrients.



Monitor tile outlets after applying liquid manure.

PESTICIDE APPLICATION

- ▶ Employ Integrated Pest Management strategies. Identify, monitor, and determine critical pest and economic thresholds – before selecting pest control methods.
- ▶ Read and follow the label instructions before making application.
- ▶ Ensure you comply with recommended separation distances. If not otherwise stated, leave 15-metre (50 ft.) buffer strips between your treatment and the top of the bank along the watercourse or water body.
- ▶ Select nozzles to attain the droplet size spectrum that will bring about proper coverage and deposition and to reduce drift.
- ▶ Calibrate your application equipment before using it.
- ▶ Don't spray pesticides if weather is inappropriate, e.g., rain or high wind. Washed-off insecticides and fungicides can cause off-site damage and reapplication is expensive.

For more information on pest management, see the BMP books, *Integrated Pest Management* and *Pesticide Storage, Handling and Application*.

When applying pesticides, follow label directions for separation distances from environmentally sensitive areas. Here, the boom has been carelessly extended over the buffer, destroying established vegetation.



Select nozzle size and application conditions that will minimize spray drift.



Tiles can outlet into buffer areas for pre-treatment before discharging.