# NON-TILLAGE OPTIONS – CONSERVATION STRUCTURES FOR CROPLAND

Good artificial drainage may be the key to successful implementation of other best management practices.

An aerial view of two parallel, narrow base terraces with tile outlet. Designed to break up the slope length, terraces reduce erosion by up to 75% and allow more intense crop rotation.

## TILE DRAINAGE AND WATER TABLE MANAGEMENT

Good land drainage is necessary for all farm operations. There is no question about the value of tile drainage to farm production on some soils. It will increase the yield of most crops and improve the efficiency of the overall operation by artificially removing excess water from soil.

Subsurface drainage is an important conservation practice. It can reduce surface run-off during some seasons by allowing more water to soak into the soil.

In the past, underground tiles were installed simply to remove excess water from soil. Recently, however, research shows these drains may also serve as a water supply or irrigation system. By regulating water flow in the drains, groundwater levels are maintained near the bottom of the crop root zone. Good soil moisture levels results in increased crop production.

In the United States, this is now an accepted best management practice. Nutrients and chemicals are used more efficiently by the crop rather than being released out of a tile drain.

## TERRACES

Terraces reduce erosion by controlling and managing surface run-off. A terrace is a channel with a supporting downslope ridge constructed across the slope. Terraces break up long slopes into a series of short ones with each one collecting excess water from an area above it. The collected water is then removed from the field safely.

Terraces are the most expensive conservation practice. However, they allow for more intensive row cropping while keeping erosion in check. Studies in the United States show crop yields on terraced land are 10 to 15% higher than those on erodible land that is not terraced. Full recovery of construction costs can occur in as little as three years.

Terraces make more economic sense when combined with other conservation practices such as contouring, strip cropping, or conservation tillage.

Producers may construct their own terraces by renting a tractor-pulled earth scraper.

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## RECOMMENDED TERRACE SPACING WITH AND WITHOUT A CONSERVATION MANAGEMENT SYSTEM

| FIELD SLOPE (%) | WITHOUT CONSERVATION MANAGEMENT SYSTEM METRES | (FEET) | WITH CONSERVATION MANAGEMENT SYSTEM METRES | (FEET) |
|---|---|---|---|---|
| 0 - 1 | 90 | (300) | 120 | (400) |
| 2 - 3 | 75 | (250) | 110 | (350) |
| 4 - 5 | 55 | (180) | 90 | (300) |
| 6 - 8 | 45 | (150) | 75 | (250) |
| 9 - 12 | 35 | (120) | 60 | (200) |

Steepness of slope, soil erodibility, crop type, management and rainfall, all determine terrace spacing. Adjustments are then allowed for matching equipment dimensions and fitting the topography better. Where more than one terrace is planned, care must be taken to ensure the ridges are parallel.

Suitable outlets for the collected water behind the terrace include either vertical pipe intakes outletting into tile drains, or grass waterways. Conservation tillage and contouring are necessary to maintain terrace systems.

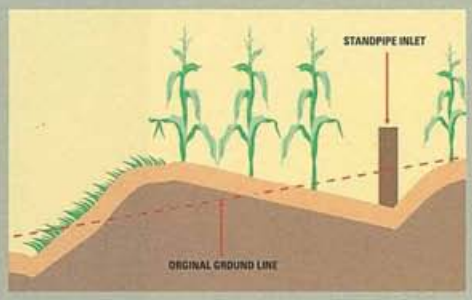
Terraces are a big investment, but they provide a farmer with more options in planning a cropping system. Terraces must be built right and maintained. It is a good idea to get experienced help to plan a terrace system.

Contour strip cropping, a narrow base tile outlet terrace and no-till corn/spring grain/hay rotation can virtually eliminate erosion on this site.

Properly-designed and installed inlets make tile outlet terraces successful. They must be kept clear of debris for efficient operation.

## THERE ARE THREE CHOICES TO TERRACE DESIGN: BROAD BASE, GRASS BACKSLOPE AND NARROW BASE.

***BROAD BASE***
The entire terrace is farmed,it is restricted to field slopes under 8%. Care must be taken not to work down the ridges during field operations. Costs are twice that of narrow base terraces.




***GRASS BACKSLOPE***
Suited to steeper land, the backslope is seeded to permanent vegetation.

***NARROW BASE***
Both front and back slopes are steep and seeded to permanent vegetation. Using bulldozers to construct, the costs should be less than $2.25/ft (1991) to complete.

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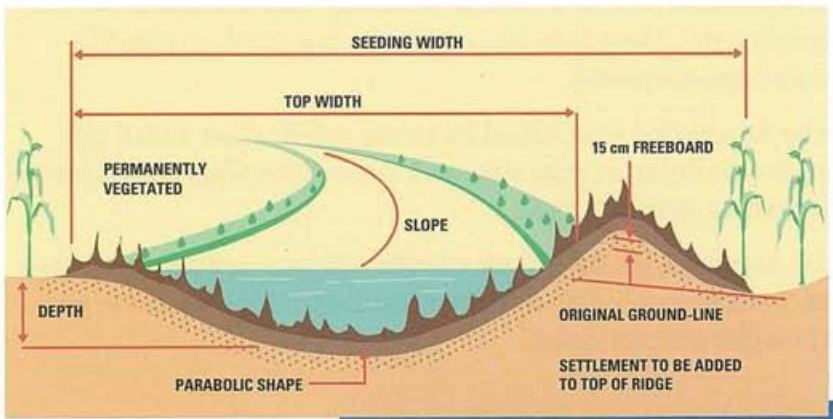
A water and sediment control basin complements other practices by controlling water erosion where surface run-off concentrates.

## WATER AND SEDIMENT CONTROL BASIN

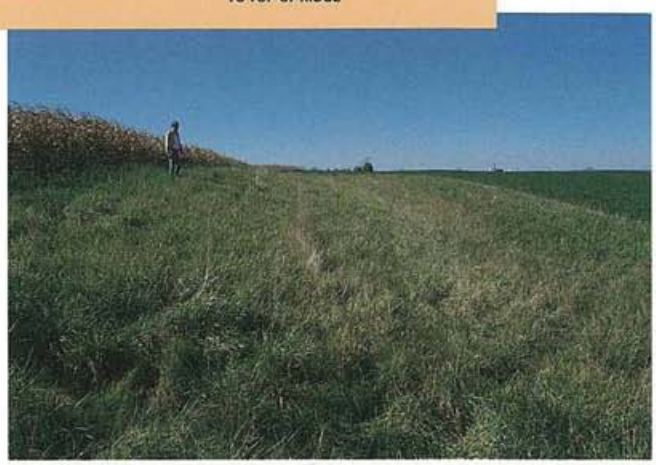
These structures are built across drainage ways and work like small dams. They intercept concentrated run-off temporarily and release it through a tile drain. Relatively inexpensive to install, these terraces will complement a conservation management system on land with irregular and non-uniform slopes.

## DIVERSION TERRACE

A diversion is a channel with a supporting ridge on the lower side, constructed across the slope to intercept surface run-off, carrying it safely to an outlet. Use this system where land cannot be terraced because of topography or because it belongs to someone else. Diversions will carry substantial amounts of water and should be permanently vegetated.




A cross-section of a diversion.



Diversions act like an eavestrough on the side of the hill to reduce slope lengths on irregular land. This system directs water to a grass waterway.

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## GRASS WATERWAYS

Grass waterways are broad, shallow channels protected against erosion by grass cover. They serve as outlets for terraces, diversions, contour rows or as passageways for surface flows entering the farm from other land.

Water will often collect along natural depressions in the field and run off. This is common to almost every farm. The success of a soil conservation program often requires a well-maintained grass waterway. Modern equipment will cross a grass waterway without difficulty.

Grass waterways must be wide and deep enough to handle all rains without damage. They must also be shaped to allow easy crossings by farm machinery. Crop rows should always enter the waterway at right angles.

The waterway must be well-drained to encourage vigourous grass growth and to protect the waterway from rutting when farm machinery crosses it. Tile drains can be installed along one, or both sides. A surface inlet may be installed at the upper end of the waterway to intercept long-running, overland water flow.

Occasionally, grade control is required to maintain the waterway through steep slopes. Irregular-shaped rock over a filter cloth is the most commonly used material.

A combination rock and timber control structure reduces the grade and helps control surface flow.

A well-constructed and vegetated grass waterway works well with contour farming.

Generally, bulldozers are used to construct grass waterways in Ontario. Proper design ensures a good investment.

A good dense mat of grass must be established quickly. Straw mulch will help seeds germinate and offer protection against run-off until the grass grows.