NON-TILLAGE OPTIONS – CONSERVATION STRUCTURES FOR STREAMS AND DITCHES

STABILIZATION OF STREAMBANKS

All Ontario farmers must remove excess water from farmland through surface and subsurface drainage. Most land does benefit from artificially-improved drainage. Just look at the extent of private and municipal drainage in Ontario!

Ditches and streams in rural areas are too often viewed simply as drainage outlets for agricultural land.

Unfortunately, local and downstream impacts are often overlooked in drainage planning:

- ▸Fisheries and wildlife concerns must be addressed.
- ▸Flooding impacts must be considered. In many instances, maintenance or minor alterations may be all that is necessary to satisfy drainage concerns. See the booklet on Farm Forestry and Habitat Management for more information.

Streambank stabilization begins on the land near the stream. Keep erosion to a minimum with a well thought out conservation farm plan.

Cropland should be separated from the watercourse with permanent buffer strips at least three metres (10 feet) in width. Buffer strips can help filter out sediment in run-off water while stabilizing the streambanks.

Vegetation along stream corridors offers habitat for wildlife and reduces maintenance costs. Bird populations will increase, which can reduce the number of insects and pests.

A well-constructed municipal drain.

A five-year-old tree planting with shrubs, grass and brush piles offers habitat to wildlife along a drain corridor.

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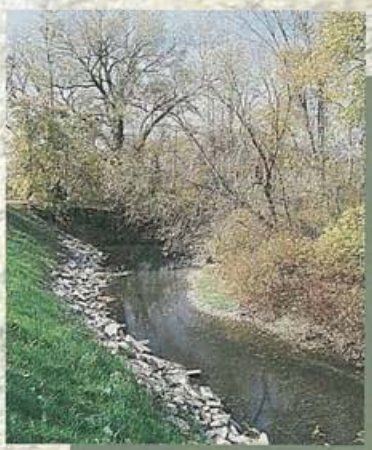
A diversion along a stream directs field run-off to a temporary ponding area. Water then is released slowly into the stream through a vertical pipe inlet leading to a tile drain.

Ideally, a combination of meadow, shrubs and trees will be established along the buffer to offer diversity to wildlife. Straightening field boundaries next to meandering streams or on flood prone areas, improves management efficiency.

Bring surface run-off from nearby fields into the watercourse at as few locations as possible. Use diversions, terraces and grass waterways where necessary. Complete these projects with rock chutes or drop inlets designed to resist erosion.

All watercourses will suffer some bottom scour and bank erosion. Municipal drains, designed for the efficient removal of run-off water will erode, even if precautions have been taken to reduce erosion in vulnerable areas with rock or vegetation. During low flow periods, the channel will try to regain a meander pattern to reach a balance with nature. Allowing the stream to regain its natural shape will likely improve water flow and water quality. Then, only ongoing maintenance will be necessary.



Properly-sized, irregular-shaped rocks with a filter blanket underneath, protect the lower bank while vegetation protects the upper portion.

Run-off flows from cropland and into a drain through a rock chute. Rough field stone with filter cloth underneath is used to protect the chute. Angular stone locks together to hold everything in place.

A log crib structure provides bank protection and fish habitat.

Fish habitat and protection devices, such as "lunker" structures, can also help stabilize banks.

An interceptor tile drain removes seepage and strengthens the streambanks.

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A diversion restricts water flow to one side of this stream while a machinery crossing is installed.

Any work carried out in or around water in Ontario requires a work permit from the Ontario Ministry of Natural Resources, before starting the project... IT'S THE LAW!

It may be necessary to repair and protect certain sections of streambanks where considerable erosion occurs. Among the most commonly-used materials are rock, vegetation, log cribs or gabion baskets.

Streambanks may slump and become a problem when groundwater seeps out along the bank. Tile drains can be installed to intercept the seepage and may provide a less costly alternative to some surface protection techniques.

Debris, sediment and channel structure all offer good stream habitat. Too much material, however, may cause problems, up rooted trees, excessive sediment or logs spanning the channel should be removed.

Methods used to minimize damage to the stream could include:

- ►Use the smallest equipment feasible (ie. a chainsaw and a winch to remove or reposition a log).
- ►Work only from one side of the channel.
- ►Construct sediment basins downstream from the work area.
- ►Do not carry out work in critical fish spawning or egg incubation periods.
- ►Use temporary dams or diversions during construction.

Other approvals may be required from the provincial government, agencies or the municipality. Refer to the legislation listed at the beginning of the section.

EFFECTS OF STREAM MODIFICATIONS

MINOR ALTERATIONS TO STREAMS:

- ►Tends to preserve water quality.
- ►Provides less flood relief locally but does not create downstream problems.
- ►Maintains wetlands and water table.
- ►Creates diverse habitat.

A CHANNELIZED STREAM:

- ►Tends to degrade water quality.
- ►Relieves local flood problems but may increase flooding downstream.
- ►Could drain wetlands and lower water table.
- ►Provides very little habitat for wildlife or fish.

NON-TILLAGE OPTIONS – CONSERVATION STRUCTURES FOR STREAMS AND DITCHES

TILE DRAIN OUTLET STABILIZATION

Tile drain outlets should be installed in a manner which does not cause an obstruction or erosion in a receiving watercourse.

A properly-installed tile outlet.

LIVESTOCK FENCING AND STREAM CROSSINGS

Livestock should be restricted from all watercourses. They trample banks and destroy vegetation increasing erosion and contaminating water with manure.

Many fencing alternatives are available. Modern systems will withstand severe flood water and ice flow and cost as little as $1.64/m ($0.50/ft.) installed (1991). Watering facilities such as nose pumps, side-hill spring boxes or a solar-powered pumping system may be installed if livestock do not have access to other water sources.

An acceptable livestock crossing restricts stream access at all times. The crossing could be at bank-level such as a bridge or culvert, or a low-level crossing such as a series of culverts, or single rectangular concrete conduit. Fencing must extend over the crossing during the seasons that livestock are on pasture.

This part of the stream offers excellent fish habitat. As little as eight years ago, livestock had direct access to the stream and had removed all grass cover.

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MACHINERY CROSSINGS

In addition to designs suitable as crossings for livestock, machinery crossings may also include low-level crossings. Concrete, stone or other man-made products such as the plastic confinement system shown are options.

▲ High tensile fences bend when subjected to ice and debris flow, but snap back to their original position afterwards.

Solar panels can be used to charge batteries to power a water pump and high tensile electric fence to restrict livestock from the creek.

This low-flow crossing gives livestock access to pasture on both sides of the creek. Culverts allow normal stream flow to move beneath, while major flows can pass over the crossing without damaging it.

The plastic confinement system looks like a honey comb. When filled with gravel, it makes a relatively inexpensive machinery crossing.

Weeds and grass should be kept away from an electric fence so that it is not shorted out. Herbicides may be carefully applied in the fall to control grass.

▲ A single culvert combined with permanent fencing keep livestock from a water-course. The channel narrowed itself which provides better fish habitat.

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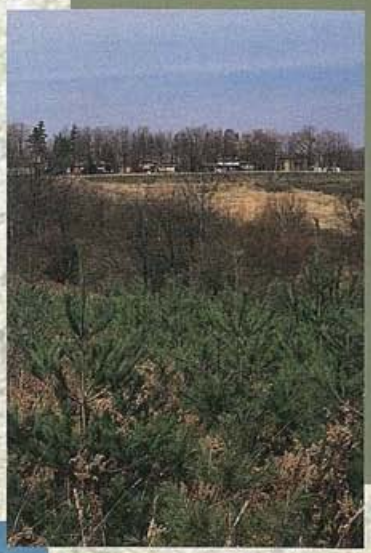
FRAGILE/MARGINAL LAND RETIREMENT

As discussed in the introduction, farmland is best used within its capability. In many instances, land is not suited to intense agricultural production. These lands, generally classified as marginal or fragile land, should be retired to pasture, grasslands or woods.

Marginal land includes relatively level land which is not subject to severe erosion but due to poor drainage, stoniness or shallow soils, is not suited for cultivation.

Fragile lands could include areas alongside creeks, lakes and wetlands that may be subject to severe erosion or flooding. Fragile areas may also include land which is too steep for regular cultivation, for example slopes in excess of 15%. These areas are prone to severe water and wind erosion or damage from tillage and are best suited to pasture, hay or woods.

Few options exist for these lands. Farmers must decide if production from these areas makes economic sense. Increased use of fertilizers, new crop varieties and management may sustain crop yields in the short-term but as soils become less productive because of erosion, profitable farming will also suffer. Refer to the booklet on Farm Forestry and Habitat Management for alternatives on these lands.



This 15% slope has been taken out of crop production and planted with white pine.

Cropping land immediately next to a swamp or wetland is most often not profitable.

Include trees, shrubs and grass to offer diverse habitat to wildlife. Each should be considered when retiring land.

Fragile land can be too steep for safe farming and is sensitive when cultivated.

TROUBLE SHOOTING

PROBLEM DESCRIPTION	SITUATION	SOLUTIONS
Excessive sheet erosion on a hillside, 180 metres (600 feet) long with 4% slope. Due to soil types and livestock base, conservation tillage is not a preferred option at this time. Would like to try strip cropping but forages are not grown. Rotation includes corn, winter wheat and barley planted across the slope.	Although cropped across the slope, the field exceeds the slope length limit of 90 m (300 ft.) Run-off will be experienced regularly with noticeable soil movement.	Strip crop with 50% - winter wheat or barley and 50% - corn on critical slope. Try mulch-till on small acreage as a trial.
Natural drainage way through farm receives run-off from neighbours' land before entering property. Low area is in grass but rills developing along edges and appears higher in middle.	Excessive soil erosion upslope and on fields alongside caused build-up of sediment in the waterway.	Prepare and construct grass waterway to meet the requirements of the input area, soil type and slopes. Keep it large enough to handle at least the peak run-off expected during a one in ten year storm. Never cultivate or plant parallel to the waterway. Control erosion on land coming into the waterway (at least from your own fields) with conservation management to reduce soil movement.
Practising no-till across the slope, but still experiencing rilling through natural drainage ways.	No matter what the tillage or conservation management system, at some time run-off will occur, and if not protected, erosion will result.	Options which may reduce erosion include: improved tile drainage, grass waterways, or terracing (water and sediment control basin).
Bank slumping along a natural watercourse on the property. I have an old foundation at my disposal, can I lay it on the bank to fix the problem?	Cause may be excessive stream velocities, or overland flow from upland, or bank seepage.	Determine nature of problem. Contact necessary approval agency as legislation applies on all work done on any stream or municipal drain. They may suggest alternatives or forward you to appropriate specialists. You may even come up with an approved solution on your own. This will depend somewhat on the magnitude of the problem and the sensitivity of the stream.
In one corner of an 'L' shaped field the land falls off abruptly. Rills are forming down the rows where it is cropped up and down the slope. This land is regularly no-tilled to either corn, soybeans or wheat.	Water will always tend to concentrate and flow down the rows. Rilling will be common.	Why not try staying on the contour by turning the corner of the 'L'. A triangular piece of land will be left out (most likely less area than you think) and could be planted to grass or trees. This will improve farmability at very little expense.
Have established contour buffer strips across a sensitive slope on the farm. Yet still noticing that the area immediately upslope is wet for extended durations in the spring and after rain.	The buffer strips are designed to intercept run-off water and sediment from above. Eroded soil which is trapped in the buffer is affecting the natural drainage of the area.	May need to improve drainage with tile system. Delay spring field work in this area if possible. Also, vegetation in buffer should be able to withstand wet soil conditions.

TROUBLE SHOOTING CONTINUED

PROBLEM DESCRIPTION	SITUATION	SOLUTIONS
A high percentage of the seedlings planted as a windbreak are dying.	Possible causes of low survival are poor stock, poor site preparation, weed competition, lack of moisture, or rodent damage.	Handle stock with considerable care. Prepare site the year before by eliminating troublesome weeds and establishing grass. Following planting, keep weed pressures down with chemical sprays, tillage, or manual clipping. Control rodents with bait or tree wraps. Water if possible during droughts.
Weed pressures are high and appear to be out-competing new tree seedlings.	Possible causes are poor site preparation or inadequate grass and weed control at time of planting.	Mechanically control weeds with mulches such as wood, paper or plastic. Clip grass and weeds as necessary. Chemically control weeds and grasses with recommended herbicides. Control competition for 3 to 5 years to ensure maximum growth and survival.
I want to plant a windbreak on my own. How do I determine the number of trees I need?	Any landowner can purchase trees and plant them. Information on site preparation, planting and maintenance is readily available if you know where to look.	Good information is available from MNR, OMAF or your local Conservation Authority. Tree spacing depends on species selected. Norway spruce and white spruce should be planted at 2 m (7 ft.) spacing. White cedar and wildlife shrubs are placed 1.5 m (5 ft.) apart. Hardwood trees at a 3 m (10 ft.) spacing. Multi-row windbreaks should maintain at least 2 m (7 ft.) spacing between rows. Adjust for maintenance equipment used for cultivating or spraying.
I have tried removing my livestock from the river that flows through my pasture with permanent fencing. But every year the fence is damaged during the winter/spring.	High floodwater and ice can easily destroy some permanent fence systems.	High tensile electric fencing is an alternative. It is designed to withstand ice flows. With electric fence, position the lowest wire high enough to avoid shortage from vegetation. Clip or chemically spray vegetation. If fencing such as page wire is preferred it must be located out of the floodplain, away from potentially damaging ice.
I work my fields across the slope and do not see any visible erosion except on my headlands. The field slope is only about 2% grade and only 120 metres (400 feet) long.	Working across the slope does not mean on the true contour. Run-off water will follow the crop rows when working across the general slope. When the run-off reaches the headland, it will turn downslope, and collect, whether there was a dead furrow or not.	Any slope over 2% should have grass field borders. If this is not acceptable, turn the rows upslope slightly at the ends to follow the contour and direct water into the field. However, you may just be moving the problem somewhere else in the field.