

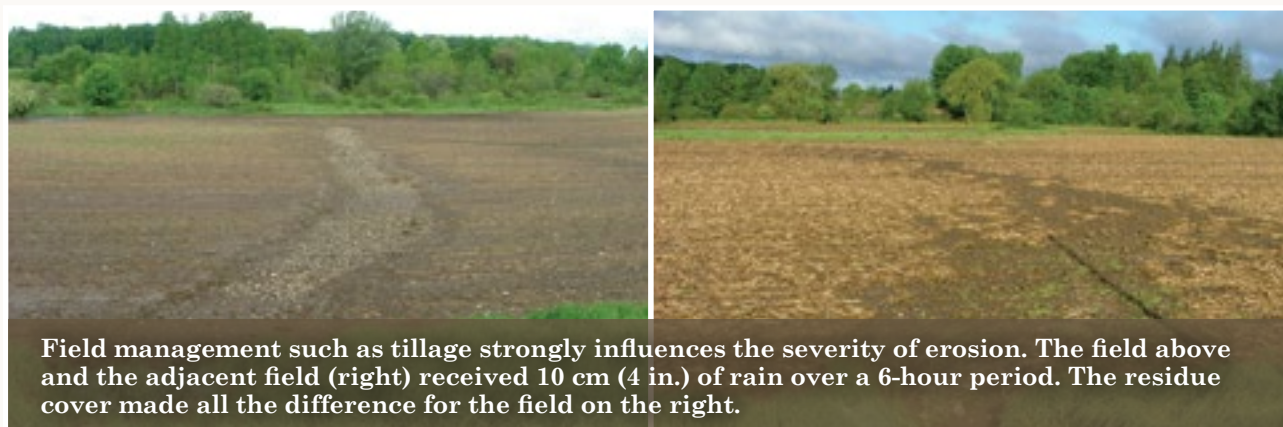
# The Foundation of Erosion Control

The measures you choose to control soil erosion will depend on many factors – including the type and scope of the problem on your farm, and your cropping and management systems.

## Other factors to consider:

- effects on your operation over the short and long term
- costs and maintenance requirements
- overall effectiveness of the preferred solution
- off-farm impact, e.g. road and ditch maintenance, impact on neighbours.

The solution may be simple and not that costly, especially when you compare it to the true cost of farming around or with the problem.



**Erosion** – whether it is wind, water or tillage – is a natural process with two distinct actions: soil detachment and movement. All erosion control methods are based on preventing detachment or reducing the carrying power of wind, water or tillage.

Managing water movement across a field is an important first step. Many erosion control structures take water underground or protect the soil surface from concentrated water flows.

Effective surface drainage systems such as drop inlets and other structures reduce overland flow of water, in turn reducing soil detachment and movement.

Keep a protective cover on your fields throughout as much of the year as possible. Diverse crop rotations and the use of cover crops out of season can serve to cover and protect the soil surface. Always look at your tillage system first: you can spend money on structures and other techniques, but they may not be effective without conservation tillage/cropping practices and crop rotations in place.

In soil conservation, a systems approach is encouraged to prevent, reduce and control erosion. Soil management BMPs improve soil quality and resilience to erosion and other forms of degradation. Conservation cropping and tillage BMPs keep soil covered. Surface drainage and erosion control structures manage the movement of water on cropland – reducing erosion and runoff.

**A Note on Watersheds** In this booklet, a watershed refers to an area of cropland where all surface water and groundwater flow to the same point. BMPs for runoff and erosion control are selected and designed based on watershed characteristics – including size, slope grade, slope length, cover and soil type.

# The Foundation of Erosion Control

## BMPs for soil, cropping and tillage

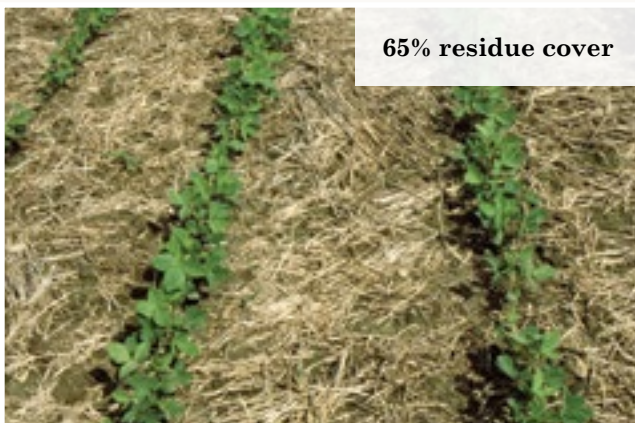
**Conservation cropping and tillage options are the foundation of all erosion control.**

A healthy soil is resistant to soil erosion. Conservation tillage, good crop rotation, cover crops, and organic matter additions are sound strategies for building soil health.



30% residue cover

An effective conservation tillage program leaves 30–70% of the soil surface covered with residue after planting throughout the rotation cycle.



65% residue cover

Crop residue protects soil particles from erosion and adds organic matter to the soil.



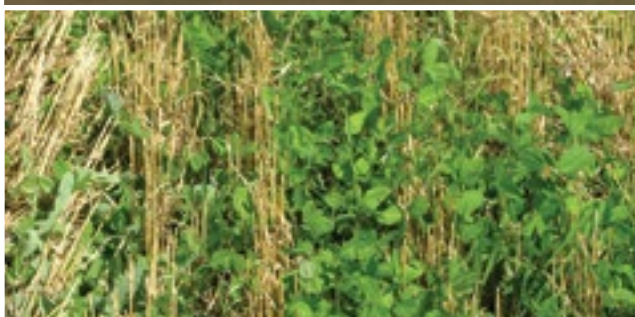
Seeding cover crops after early harvested field and vegetable crops keeps the soil covered and helps to anchor residue.



Crop rotations involving forage crops will reduce soil erosion by up to 40%.






Amendments like manure, compost or biosolids can increase soil organic matter and improve soil aggregate stability.



Red clover underseeded in wheat gives almost continuous cover and a nitrogen credit while improving soil.



# From Problem to Solution

WHAT ARE YOU SEEING?	TYPE OF EROSION	SUGGESTED SOLUTIONS
symptoms/observations	conditions where applicable	best management practices
<p>Erosion is evident on shoulder slopes of hills (i.e. white caps)</p> <p>More erosion is evident than expected based on soil types and slope</p> <p>Crops become stressed more quickly under adverse conditions in the shoulder slope area</p> <p>There is an accumulation of soil or layers of soil in lower-slope positions</p> <p>Yields are low on shoulder slopes and knolls</p>	<p><b>Tillage Erosion</b> see page 6 <i>Most commonly seen on:</i></p> <ul style="list-style-type: none"> <li>• rolling or gently sloping fields</li> <li>• fields that have been in conventional tillage for many years</li> </ul> <p>Note: effects may be seen many years after tillage is reduced</p> 	<p>Adopt mulch tillage or no-till</p> <p>Work across slope or with the contour</p> <p>Change tillage direction to move soil up slope</p> <p>Reduce speed/intensity of tillage</p> <p><i>More severe cases:</i></p> <ul style="list-style-type: none"> <li>• remediate (rebuild) by returning displaced soils to upper-slope positions</li> </ul>
<p>There is a buildup of soil at the bottom of the slope with no apparent rills or gullies</p> <p>Knolls are light-coloured</p> <p>Yields are low on shoulder slopes and knolls</p>	<p><b>Sheet Erosion</b> see page 6 <i>Most commonly seen on:</i></p> <ul style="list-style-type: none"> <li>• loams and clay loam soils with reduced water infiltration</li> <li>• fields with long shallow slopes or short steep slopes</li> </ul>  <p><i>To assist in designing a solution, consider the length of field and slope:</i></p> <ul style="list-style-type: none"> <li>• up to 152 m (500 ft) and up to 2% slope</li> <li>• longer than 152 m (500 ft) and greater than 2% slope</li> </ul>	<p><i>Start by:</i></p> <ul style="list-style-type: none"> <li>• increasing crop residue cover with mulch tillage or no-till</li> <li>• improving crop rotation (more cover)</li> <li>• adding organic amendments (e.g. manure)</li> <li>• changing cropping and tillage direction (cross-slope or cross-slope on contour)</li> </ul> <p><i>More severe cases:</i></p> <ul style="list-style-type: none"> <li>• establish strip cropping</li> <li>• construct field and diversion terraces</li> </ul>
<p>You see finger-like flow channel patterns on slope</p> <p>There is a clear path where water has been flowing</p> <p>You need to slow down when crossing an infield draw (natural drainageway) due to soil erosion</p>	<p><b>Rill Erosion</b> see page 9 <i>Most commonly seen on:</i></p> <ul style="list-style-type: none"> <li>• fields where water flow starts to concentrate</li> <li>• sloping fields</li> <li>• fields tilled or planted up and down slope</li> </ul>  <p><i>When designing a solution, consider the size of the watershed delivering stormwater to the rill area:</i></p> <ul style="list-style-type: none"> <li>• up to 2 ha (5 ac)</li> <li>• from 2 ha up to 10 ha (5–25 ac)</li> <li>• from 10 ha up to 14 ha (25–35 ac)</li> <li>• greater than 14 ha (35 ac)</li> </ul>	<p><u>Small rill</u></p> <p>Increase crop residue cover with mulch tillage or no-till</p> <p>Improve crop rotation</p> <p>Apply organic amendments</p> <p>Change cropping and tillage direction</p> <p>Install vegetated filter strip (preferably on contour)</p> <p><u>Large rill</u></p> <p>Construct a diversion terrace or water and sediment control basin (WASCoB), incorporating earthen berms or grassed waterways depending on site characteristics</p>

WHAT ARE YOU SEEING?	TYPE OF EROSION	SUGGESTED SOLUTIONS
symptoms/observations	conditions where applicable	best management practices
<p>Finger-like pattern of small channels in soil has grown to be large and deep e.g. 30–60 cm (1–2 ft) rills</p> <p>Size/depth of water flow-path does not allow vehicles to cross</p>	<p><b>Gully Erosion</b> see page 9  <i>Most commonly seen on:</i></p> <ul style="list-style-type: none"> <li>• areas of field with concentrated water flow</li> <li>• steeply sloping fields</li> <li>• soils with a high sand/silt content</li> </ul> 	<p><i>Follow this 2-step strategy:</i></p> <ol style="list-style-type: none"> <li>1. Reduce the amount of water flowing through the area by using water and sediment control basins (WASCoBs)/diversion terracing</li> <li>2. Stabilize the gully area by establishing permanent vegetative cover and grassed waterways/grade control structures</li> </ol>
<p>Concentrated runoff is flowing over the bank and into the watercourse</p> <p>Drainpipe outlets are unstable and soil has washed out from around them</p> <p>The banks of the stream or drainage channel are being undercut and scoured</p> <p>Livestock with uncontrolled access are causing damage to the banks</p>	<p><b>Bank Erosion</b> see page 21</p> 	<p>Fence livestock from watercourse</p> <p>Vegetate banks and establish buffer strips along bank edge</p> <p>Protect subsurface drainage outlets with rock riprap</p> <p>Construct rock chute spillways or drop-pipe inlets at critical points where concentrated flows enter the drainage channel</p>
<p>Airborne soil is regularly seen under windy conditions</p> <p>During winter, the snow cover has a brown colour</p> <p>Soil has accumulated on the leeward side of any type of barrier such as fence rows, buildings, trees, ditches or streams</p> <p>The soil surface appears smooth or rippled, like beach sand</p> <p>Crops have been exposed, sandblasted or buried by soil</p>	<p><b>Wind Erosion</b> see page 25  <i>Most commonly seen on:</i></p> <ul style="list-style-type: none"> <li>• large fields with little protection to reduce the wind speed</li> <li>• finely worked seedbeds</li> <li>• soils with a high sand content</li> </ul> <p><i>Consider the size of the problem:</i></p> <ul style="list-style-type: none"> <li>• is it isolated areas within a field?</li> <li>• is it large areas of the field or whole fields?</li> </ul> 	<p><i>Start by:</i></p> <ul style="list-style-type: none"> <li>• increasing crop residue cover with mulch tillage or no-till</li> <li>• diversifying crop rotation to increase residues and provide soil cover</li> </ul> <p>Roughen soil surface (contingency measure)</p> <p>Plant cover crops, windbreaks</p> <p>Improved soil moisture management (e.g. irrigation timing) may also be required</p>
<p>Evidence of severe erosion in the past</p> <p>Slopes are very steep</p> <p>There is complex topography or irregular-shaped portion of field</p> <p>Poor yields or inconsistent production most years</p> <p>Response to crop inputs is poor</p>	<p><b>Highly Erodible Land</b> see page 30  <i>All types of erosion:</i></p> <ul style="list-style-type: none"> <li>• tillage, water, wind</li> </ul> 	<p>Convert to permanent pasture or hay</p> <p>Convert to trees for timber production</p> <p>Retire to shrubs, grasses and trees for wildlife habitat and recreational use</p>