Wind Erosion

Wind erosion most frequently affects soils on the Prairies but wind may also cause problems on sandy soils in Ontario and during the winter on exposed fields in Prince Edward Island. Peat soils may also be affected.

Wind erosion occurs when strong winds blow over a smooth, exposed, loose, and dry soil surface. Depending on conditions, the wind speeds required to initiate erosion of mineral soils vary between 25 and 50 kilometre (km)/hour measured at 30 centimetre (cm) above the soil surface. Soil particles between 0.1 and 0.5 millimetre (mm) diameter are first to move. The wind pressure causes them to vibrate and, if their resonant frequency is achieved, they are ejected into the wind stream. Gravity quickly brings these particles back to earth but meanwhile they have gained considerable energy from the wind and they collide into the soil surface dislodging other particles. The process is called saltation and is very like an atomic chain reaction. Once a few soil particles are in motion the erosion process spreads very rapidly. Small soil particles and aggregates dislodged by these collisions are carried aloft by eddies in the wind, where they form dust clouds and may be transported for thousands of kilometers. Soil aggregates between 0.5 and 1 mm diameter generally don't travel far. They are rolled by impacts of saltating particles and the pressure of the wind. Saltation is just like sandblasting and can be very damaging to the soil and to growing crops.

Wind erosion is curtailed when the wind dies down, when all loose particles have been removed, or when moist, compacted or frozen soil is exposed at the surface. However there have been situations in Canada where the soil to the entire depth of tillage has been lost. When wind speeds die down, loose soil material is deposited on the soil surface. This makes the field especially susceptible to further erosion, unless a rain shower causes soil crusting or a tillage operation roughens the soil surface.

Peat soils, being much less dense than mineral soils, are more easily eroded by wind. Wind erosion of peat soils has not received much attention in Canada and the extent of the problem on agricultural soils has not been determined. Peat soils are frequently wet either at, or close to the surface thus limiting the amount of material which can be lost. Nevertheless, peat soils do blow causing spectacular dust clouds and degradation of this valuable resource.

Winds strong enough to cause wind erosion are a fact of life in many agricultural areas of Canada. In most situations there is enough vegetation and straw to prevent erosion. However, intensive tillage exposes soils, and the production of vegetation may be much reduced during extended periods of drought. In these cases, if the soil is dry and loose it will erode.

All forms of erosion reduce soil productivity due to loss of plant nutrients, soil organic matter loss, a reduction in the availability of water for crop growth, and ultimately a limitation in the volume of soil available for root growth.

Sandblast of growing plants is unique to wind erosion. It causes yield and quality losses. Plants vary in their tolerance with small grains being relatively tolerant of abrasion resulting from an 11 tonne (t)/hectare (ha) wind erosion event. Corn, soybeans and mature alfalfa have a moderate tolerance, vegetables have a low to very low tolerance, and seedling alfalfa and sugar beets have a very low tolerance to abrasion. Seedlings are usually worst affected by sandblast and in some situations re-seeding may be required.

Control of wind erosion usually relies upon the protection afforded by crop residues or growing crop; generally about 1200 kilogram (kg)/hectare (ha) (1000 pound (lb)/acre (ac)) of straw is required. Small grain residue is more effective than oilseed residues and corn stover. Standing and anchored residues

are about four times more effective than flat residues for erosion control. Growing crops are also effective in reducing wind erosion once there is enough material to absorb the force of the wind. Low disturbance direct seeding and chemical fallow are effective in maintaining enough residue for wind erosion control under most conditions.

In situations where intensive tillage is used, practices such as stripcropping, shelterbelts, and annual barriers must be used to control erosion. Erosion begins first at over-tilled field margins, from pockets of sandy soils, in locations where the wind is funneled, or at the top of ridges or knolls. These areas require special attention to control wind erosion. The assistance of a local agrologist or conservation technician is recommended to design and guide the implementation of a soil conservation plan to control wind erosion.

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