



# Controlling Early Season Wind Erosion in Columbia Basin Potato Fields

WASHINGTON STATE UNIVERSITY EXTENSION FACT SHEET • FS025E

Loss of topsoil through wind erosion is a serious problem in the Columbia Basin. Eroded fields may have lower yield potential because of erosion's negative effects on fertility, soil structure, tilth, infiltration, and water holding capacity. The sand or sandy loam soils that are most susceptible to wind erosion are also those that most need the clay, silt, and organic matter particles that get blown away. These are the most valuable soil components and are not easily replaced. It may take 10 to 20 years to replace a quarter-inch layer of topsoil lost to wind erosion.

The off-farm effects of blowing dust from fields can also be serious. Road closures, traffic accidents, and respiratory problems have been associated with dust storms originating in agricultural fields.

There are two general strategies for controlling wind erosion:

1. Improve a soil's resistance to being moved by the wind. This can be done by keeping the soil wet, or by improving soil stability through the addition of organic matter such as green manures.
2. Reduce the velocity of the wind at the soil surface. This is usually accomplished by using physical barriers such as wind breaks, cover crops, or crop residues, or by increasing the roughness of the soil surface. This provides protection from higher velocity winds than strategy 1 does.

Currently, both of these strategies are being used by farmers to control wind erosion in Columbia Basin potato fields. The actual reduction of wind erosion through the use of these practices will depend on many factors including wind velocity, duration, direction, soil type, field history, and tillage. Farmers can contact their local Natural Resources Conservation Service office to get an estimate of actual losses based on local conditions.

Wind erosion in potato fields can occur any time the wind blows, but most often is a problem during the fall and spring. Fall wind erosion is difficult to control in recently harvested fields and field roads: the soil has been disturbed, lowering its resistance to erosion, and the small amount of residue from potato plants offers little physical protection. Often the best that farmers can do is to try to keep the soil

wet and, as much as possible, maintain crop residues on the soil surface. For spring wind erosion however, there are better solutions.

Wind erosion in the spring can be a serious problem until the potato plants grow big enough to protect the soil. In the Columbia Basin, this critical period lasts from late February to early May, but may be only 20 to 45 days for individual fields. To protect the soil during this period, farmers are using green manures (strategy 1) as well as crop residues and cover crops (strategy 2).

## Controlling Wind Erosion with Green Manures

Many Columbia Basin farmers use fall green manure crops before potatoes. This practice serves several purposes, including wind erosion control. In the fall, the growing green manure crop covers the soil and prevents wind erosion. When the crop is incorporated into the soil in the fall, it stimulates growth of soil microorganisms which, in turn, produce substances that bind soil particles together. In many years, this short-term effect is enough to control wind erosion through the next spring until potato plants are big enough to protect the soil. In a 2010 survey of potato growers, 81% of those growing a green manure (mainly mustard) indicated that reducing wind erosion was a moderate to large benefit of the practice.

However, during extreme wind events the effects of green manures on the soil may not be enough. Physical protection of the soil is needed, either with residues from the previous crop or with a cover crop that is maintained through potato planting.

## Controlling Wind Erosion with Crop Residues

Researchers with the USDA Agricultural Research Service (USDA-ARS) have shown that reducing tillage does not affect potato yields in sandy soils. By eliminating primary tillage and dragging off, they not only saved time and fuel, but also left more residues on the soil surface. These residues, at sufficient levels (Figure 1), will help reduce wind erosion (strategy 2).



Figure 1. Left: Wind erosion of an unprotected potato field. Note the battered and desiccated plants as well as the furrows that are filled in with wind-blown sediment. Right: A potato field protected by crop residues. Note the lack of sediment and the undisturbed plants. (Photos courtesy of Hal Collins, USDA-ARS.)

In the systems they studied, potatoes followed two years of sweet corn. In the conventional tillage system, two passes of a chisel chopper with packer were used for primary tillage in the potatoes and sweet corn, and a rod-weeder was used to drag off the potato hills. For the reduced tillage system, primary tillage was eliminated in the sweet corn years. Overall, 3 to 4 tillage operations were eliminated in the reduced tillage rotation (Table 1).

In two of the three years of the study, where Russet Ranger potatoes were produced under these systems, there were no differences in the yield or specific gravity, between the tillage systems. In one year, the total yields were similar but there were differences in the yields of different size grades, with the reduced tillage system producing a larger portion of tubers in the larger size grades. Increased preplant nitrogen (N) application was found to be important in

Table 1. Conventional vs. Reduced Tillage Operations in Potato<sup>1</sup> and Sweet Corn Production

<b>Potato Production</b>		
Operation	Conventional tillage	Reduced tillage
Residue management	Flail chop corn residues	Flail chop corn residues
Preplant fertilization	Valmar fertilizer spreader	Valmar fertilizer spreader
Primary tillage	JD 8760 and 13' Sunflower chisel/ chopper/packer (two passes)	None
Mark out	13-shank bed splitter	13-shank bed splitter
Drag off	6-row rod-weeder	None
Dammer dike	Dammer dike	Dammer dike
Harvest	3-row potato digger	3-row potato digger
<b>Sweet Corn Production (Years 1 and 2)</b>		
Operation	Conventional tillage	Reduced tillage
Preplant fertilization	Valmar spreader	Valmar spreader
Primary tillage	JD 8760 and 13' Sunflower chisel/ chopper/packer (two passes)	None
Planting	12-row JD planter following an Orthman strip-tiller	12-row JD planter following an Orthman strip-tiller
Harvest	Sweet corn picker	Sweet corn picker

<sup>1</sup> From A. K. Alva, H. P. Collins, and R. A. Boydston. 2009. Nitrogen Management for Irrigated Potato Production under Conventional and Reduced Tillage. Soil Science Society of America Journal, 73:1496-1503.

overcoming any immobilization of N by crop residues. The preplant N rate that produced the highest yields of quality tubers in this study was 100 lbs per acre.

Earlier research showed that reduced tillage systems worked with potatoes when:

- Residues are placed in the top 2–3 inches of soil, away from the seed piece.
- Residues are anchored to the soil. Large amounts of loose residue can cause planting and emergence, and sometimes harvest, problems.
- A “clearing shovel” is used ahead of the opening shoe at planting.

This research also showed that the reduced tillage system did not reduce yields and was more profitable than a system with more tillage.

## Controlling Wind Erosion with Cover Crops

A cover crop maintained through potato planting can provide protection of the soil surface and act as a mini-windbreak (strategy 2). Of the three methods covered in this publication, this provides the best control of wind erosion. In addition to controlling wind erosion, cover crops can scavenge nutrients and hold them in place.

Farmers have devised various ways of using cover crops depending on their location, previous crop, fumigation needs, and timing of potato planting. Following are the main operations involving cover crops that farmers can use and adapt to their own situations.

**Managing residue of previous crop.** Often, this is done using a “vertical tillage” implement such as a Great Plains turbo tiller. These implements do not invert the soil but cut residue and shallowly incorporate it into the soil. The timing of the tillage depends on the crop, but should be done as soon as possible after harvest. To do this, plan ahead to have equipment and labor readily available or other harvest operations will preclude this work until it is too late.

**Deep tillage.** Depending on the previous crop, the field, and the soil conditions, deep tillage may be needed. Use a chisel plow or similar implement. Moldboard plows are not recommended because they bury crop residues leaving the soil bare.

**Plant cover crop.** Winter wheat is the cover crop preferred by farmers using cover crops. While other cover crops may be used, winter wheat is the only one that provides late season growth and good winter hardiness. (Because of the wheat seed production in the region, cereal rye is not an option.) Seed is often “bin run,” uncleaned, untreated, whatever is cheapest, but beware of planting weeds with unprocessed seed.

The seeding rate will vary with the timing of planting and location—that is, whether you are in the northern or southern part of the Columbia Basin. A delay of a few days can greatly reduce the amount of cover produced.

Although you can plant more seed with later planting dates, this is not as effective as planting earlier. The goal is to provide enough plant cover to control erosion but not enough to impede potato planting. Green, soddy growth will be difficult to plant through. Conventional grain drills can be used, but may need to be preceded by a coulter cart or similar equipment to handle crop residues.

See Table 2 for some general planting and seeding guidelines. Adjust as needed for your situation.

**Table 2. Planting Periods & Seeding Rates for Wheat as a Cover Crop**

Planting period	Seeding rate (pure live seed, lbs per acre)
Early to mid September	30
Late September to early October	35
Late October to early November	40

After harvest of a wheat cash crop, if a green manure crop is not being grown, the volunteer wheat will generally serve well as a cover crop.

**Fumigation.** Some fields will not need fumigation (for example, following fumigated onions), others will need one fumigation and some will need to be fumigated more than once (for soilborne diseases and then for nematodes). To further complicate the situation, new regulations are changing the way fumigants are applied. An increasing number of acres are having metam-based products applied through ground rigs instead of through chemigation. The challenge is to fit the needed fumigation (product and application method) into a schedule that will allow a cover crop to grow enough to provide cover. This can be done through early fumigation, followed by a period to let the chemical dissipate, and then planting. It can also be done by late fumigation and even later planting (for instance, planting winter wheat that does not emerge until spring), or with spring fumigation into a growing cover crop.

**Marking out.** This can be done successfully in a growing cover crop with a minimum tillage tool that leaves most of the cover crop undisturbed while handling that which is tilled. The timing of this should be just before planting or after a sufficient time for dissipation of any spring fumigation.

In sandy soils, shallow tillage when the soil is wet will form clods that can also help resist wind erosion. This also applies to dammer diking.

**Planting potatoes.** Conventional planters can be used when the timing, seeding rate, and growth have been properly managed. A shank with a duck-foot point in front of each planting shoe is all that is usually required.

**Killing the cover crop.** This depends on the growth of the cover crop in relation to the desired potato planting date. If there is enough cover from fall growth, the crop can be sprayed out, usually with a glyphosate product, early in the spring, well before planting. If, however, a late-

planted cover crop needs more time to grow in the spring, it can be sprayed out after potato planting but before potato emergence. With later planted potatoes, metam-based fumigation (ground applied) can be used to kill the cover crop.

**Dammer diking/square-off hills.** With the right density of wheat growth, this can continue as normal, still leaving enough residues to control erosion in all but the worst wind storms.

Variations of this cover crop system are being used by farmers (see Figures 2, 3, and 4) in both the upper and

lower Columbia Basin. They report no negative effects on yield or quality of tubers. They also report no problems with the wheat residue by harvest time.

Wind erosion causes problems on and off the farm. If uncontrolled, it can close roads, cause traffic accidents and injuries, cause respiratory health problems, and be a nuisance to neighbors. It is the responsibility of every farmer to do what he or she can to prevent erosion and its complications. Adapt these guidelines to your own farm's unique conditions for a system that will allow you to control spring wind erosion in your potato crop.



*Figure 2. Cover-cropped fields, after potato planting. Both photos taken just after May 3, 2010, wind storm.*



*Figure 3. Potatoes emerging in cover cropped field, before (left) and after (right) dammer diking.*

*Figure 4. Potatoes emerging in sprayed out cover crop.*

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*Photos by Andy McGuire unless otherwise noted.*



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