1. Effectiveness of vegetative filter strips at reducing runoff from crop fields

Water runoff from crop fields often carries pollutants, such as soil sediments, nutrients, and herbicides, that can have adverse effects on water quality. One way to minimize this problem is through the use of vegetative filter strips – primarily grass waterways and buffer strips. The percent reduction in pollutant movement from crop fields varies, depending on many factors. Research in Kansas can provide some general estimates, however.

**How pollutants move**

Soil sediments are physically transported by running water. As the rate of water flow slows, sediments settle out. For example, when silt-laden surface runoff encounters a terrace channel, the water usually slows as it flows along the gently sloping channel. Sediments are deposited in a process called sedimentation, with the heaviest particles dropping out first. Some herbicides (e.g. trifluralin) and nutrients (e.g. some forms of phosphorus) are strongly adsorbed by soils and are transported and deposited in a similar manner. Nitrates and most herbicides are not strongly adsorbed to soils and may be dissolved in runoff water. For example, atrazine, metolachlor, alachlor, and acetachlor move mainly with the water. Practices that reduce sediment loss, but not water runoff, do not reduce losses of nitrate or herbicides that are dissolved in water.

**Reducing sediment loss**

Vegetative filter strips are generally planted to sod-forming grasses that help hold the soil in place, slow the runoff velocity, and provide some filtering action. Slowing the runoff velocity results in sedimentation. Larger soil particles tend to settle out readily. Finer clay particles remain suspended much longer and may require days to settle out, even in water that is not flowing.
Reducing loss of dissolved nutrients and herbicides

Vegetative filter strips can remove nitrates and herbicides (atrazine, for example) dissolved in runoff water to the extent that the water infiltrates into the underlying soil. If soil in the filter strip is already saturated when the runoff event occurs, there will be little or no further infiltration, with essentially no nutrient or herbicide removal from the water. On the other hand, if the soil under the sod is dry, much greater infiltration may occur, which will reduce the amount of dissolved nutrients or herbicides leaving the field.

Types of filter strips

1. **Grass Waterways** are the most common type of vegetative filter strip in Kansas. These structures are designed to move water from terrace channels to lower field elevations without soil erosion. Sod-forming, cool-season grasses such as smooth bromegrass or western wheatgrass usually line the channel. In a well-designed and maintained system of terraces and waterways, most soil sediments settle out in the terrace channels, with some additional sedimentation in the waterway. This is a widely used and effective method to reduce soil loss, and the loss of nutrients or herbicides adsorbed onto the soil. Grass waterways are not very effective, however, for removing soluble nutrients or herbicides dissolved in runoff water.

For one thing, the area of the entire field is usually many times greater than the area of the waterway. For example, if the surface runoff water from a 50-acre field drains through a 2-acre waterway, the area ratio is 25:1, and one would not expect much of the runoff water to infiltrate in such a small area. Furthermore, waterways usually follow the most direct route downhill, so are often quite steep. By design, waterways serve mainly as grass-lined conduits to move runoff water out of the field. There is little opportunity for water to infiltrate the underlying soil.

Grassen waterway. Photos by Dan Devlin, K-State Research and Extension.
2. Buffer Strips at lower elevations of fields, and Riparian Strips along stream banks intercept surface runoff water from crop fields. These might be ordinary grassed fence rows that runoff water crosses as it leaves fields, or strips of grasses, shrubs, and trees lining the banks of streams. For effective removal of soil sediments by these buffer strips, runoff water must flow in a shallow, even layer across the filter strip. Since these areas often have less slope than waterways, erect grasses such as bluestem and Indiangrass may provide better filtering than smooth bromegrass or fescue. Buffer strip/turn row combinations at the lower ends of fields that have been furrowed are ideal for treating surface water runoff. In such situations, small amounts of runoff water flow down each furrow, entering the buffer strip in a very controlled, systematic way. As with all vegetative filter strips, the key to sediment deposition is to slow the water flow.

The extent to which buffer strips and riparian strips remove dissolved herbicides depends on the retention time of the water in the strips, and the amount of water infiltration into the soil. At K-State’s Foster Site Field near Rossville in Shawnee County, surface runoff water from a corn field was uniformly distributed over a 33-foot grass buffer area, planted to smooth bromegrass, at the edge of the field. The grass buffer reduced the loss of soluble herbicides by 50 percent. This demonstration system was designed to achieve very uniform distribution of the runoff water, a key to these high levels of herbicide reduction.

Another research site was established on a 5-acre field in Geary County. Three treatments were established in a narrow buffer area (40-feet wide): American plum with a native grass strip; American plum with a fallow strip; and a “weedy” plot left fallow for 7 years following a single cultivation to allow natural succession. All three buffer plots reduced runoff contaminants. The reduction in total suspended solids for all plots was more than 90 percent, using simulated runoff data with irrigation. For total phosphorus, reductions ranged from 40 percent from the plum/grass buffer plot to 60 percent from the fallow plot. Under the same simulated irrigation conditions, the reduction in total nitrogen runoff ranged from 35 to about 45 percent, with the most reduction again found from the fallow plot.
3. **Settling Basins** around inlets to tile-outlet terraces are especially effective at reducing soil sediment loads. These basins are usually planted as part of the field, but they could be planted to grasses and act as the setback zone for herbicides such as atrazine. Such basins are designed to
retain water for up to 24 hours, giving most of the larger sediment particles time to settle out. Their effect on soluble nutrient and herbicide removal would be proportional to the amount of runoff water that infiltrates into the soils of the settling basin.

**Summary**

Well-designed and maintained vegetative filter strips of all types can be very effective in trapping and removing soil sediments from surface runoff waters. Simply reducing surface runoff velocity is sufficient to settle out larger sediments. On average, about 75 percent of soil sediments are removed in this way. Removal of dissolved herbicides requires that the runoff water infiltrate into the soils of the filter strips. For minor runoff events, the removal rate may be 100 percent if all runoff infiltrates into the soil of the filter strip. During prolonged rainy periods, infiltration may not occur at all after the soils become saturated. Data indicates that on average, only about 25 percent of the herbicide load is removed by filter strips designed for that purpose. Therefore, crop producers must use practices that retain the herbicides at the application site, and minimize herbicide loss through surface water runoff.

For more information, see:

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2. Tips for dealing with common bunt (stinking smut) of wheat

Based on some feedback from recent pre-plant wheat meetings, it appears that the disease common bunt (stinking smut) has been a persistent problem for some producers this year. Common bunt is a serious problem because most grain buyers have very low tolerances of wheat grain containing the bunted kernels. Loads of grain containing the disease often kernels receive significant price discounts ($0.70 or more) or may be rejected outright.

Common bunt is a fungal disease that impacts the developing grain of wheat and completely replaces the normal white starchy contents of the kernels with black spores of the fungus. These black spores are released when harvest or other handling of the grain disturbs the disease kernels. The fungus also produces a foul fishy odor.
The disease is primarily considered to be seedborne and is easily spread by contamination of seed with the black powdery spores of the fungus. Infection takes place when the contaminated seed is planted and the spores germinate to invade the seedling plants. Some producers are describing situations that suggest that the fungus may be surviving directly in the soil of some fields. In this case, spores could contaminate the seed at planting, and cause the infection of the young wheat plants.

The management of common bunt (stinking smut) requires careful attention to details of several key control practices:

1. Cleaning Equipment: Any equipment that came into contact with the diseased grain should be carefully cleaned to remove the black powdery spores. Obvious sources of contamination include combine, trucks, augers, and storage bins used during the harvest or transportation of grain. Planting equipment may also be an issue on farms with a history of common bunt. The equipment should be washed with a pressure washer and soapy water.

2. Certified seed: The seed certification process requires inspection of common bunt and most certified seed should be free of common bunt. Keep in mind that this seed can be easily contaminated by contact with the spores of the fungus. Failure to clean the equipment used to transport, store, and plant the new seed will severely reduce the value of this management option.

3. Fungicide seed treatment: This is probably the most effective tool for management of common bunt in wheat. Fungicide seed treatments including Raxil MD, Dividend XL, Dividend Extreme, and Charter F2 all provide excellent control of common bunt. Seed coverage is very important to the success of a fungicide seed treatment. I strongly encourage farmers who know they have bunt on their farms to have their seed commercially treated with a fungicide. Other methods of applying seed treatment (hopper box, auger application) have a place, but may not provide enough coverage to address a common bunt problem. Kansas Crop Improvement maintains list of seed conditioners. This is a good place to start when searching for someone to apply a seed treatment to wheat seed produced on your farm. You can find this information at: http://www.kscrop.org/resources/2009%20KCIA%20Approved%20Conditioners.pdf.

In some situations it may be more practical to purchase certified seed that has already been treated with a fungicide.
Producers who follow these recommendations carefully should see a dramatic reduction of common bunt on their farm. Unfortunately, it may take three or more years of careful attention to all of these details to completely eliminate the disease from their farm. Attention to detail and persistent management is critical to management of this frustrating disease problem.

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3. Fall Field Day at South Central Kansas Experiment Field

The South Central Kansas Experiment Field Fall Field Day will be held August 31 at the Field at 10620 South Dean Road near Hutchinson. The Field Day will start at 6 p.m.

Field Day Topics:
Welcome and Introductions: Bill Heer
Agricultural Plants for Biofuels: Scott Staggenborg
Effects of Winter Annual Weed Control on N Uptake in Corn: Nathan Mueller
Canola Varieties and Performance Results: Mike Stamm
Wheat Varieties and Performance Results: Jim Shroyer
New Options for Marestail Control: Doug Shoup

Speakers:
Bill Heer, South Central Kansas Experiment Field, Hutchinson
Scott Staggenborg, Cropping Systems, Agronomy, K-State
Nathan Mueller, Graduate Student, Agronomy, K-State
Mike Stamm, Canola Breeder, Agronomy, K-State
Jim Shroyer, Extension Agronomy State Leader, K-State
Doug Shoup, Crops and Soils Specialist, Southeast Area Research-Extension Center, Chanute

-- Bill Heer, Agronomist-In-Charge, South Central Kansas Experiment Field
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4. Comparative Vegetation Condition Report: August 10–24 -- Request for feedback

K-State’s Ecology and Agriculture Spatial Analysis Laboratory (EASAL) produces weekly Vegetation Condition Report maps. The most recent VCR maps from EASAL are below:
Map 1.
The Vegetation Condition Report for August 10 – 24, from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that areas of below-normal vegetative greenness continue to expand along the boundaries of the western divisions and the central division. This is particularly evident in Ness, Trego, Rooks, and northern Pawnee counties. The poor condition also continues in south central Kansas in Meade and Clark counties and is becoming visible in Comanche and Barber counties.
Map 2. The U.S. Corn Belt comparison to the 21-year average shows the rapid deterioration of conditions in the eastern areas of the Corn Belt. Michigan, Illinois, and Kentucky have seen a noticeable drop in vegetative condition. Hot temperatures with below-normal rainfall are the main reason for this decline.
Map 3. During this period, the Vegetative Condition Comparison shows the decline in condition visible in the Corn Belt extends to the Atlantic Seaboard and up through New England. The effects of the extended hot, dry summer are becoming increasingly visible. Much of the marked difference in Pennsylvania is due to unusually rapid crop development and early drydown due to high temperatures this summer. Crops were planted earlier in Pennsylvania than in surrounding states, so the browning effect of rapid crop development is most noticeable at this time in Pennsylvania.

**Request for feedback**

We would like to receive your comments on the Vegetative Condition Report maps that we have included weekly in the Agronomy e-Updates this year.

* Are the maps interesting or useful to you and others you work with?
* How are you using the information in these maps, if at all?
* Do you have any comments or suggestions for us on these maps?

We’d like to hear from you. If you would like to respond, please email Dr. Kevin Price at: kpprice@ksu.edu

And thank you for your interest!

-- Mary Knapp, State Climatologist
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-- Kevin Price, Agronomy and Geography, Remote Sensing, Natural Resources, GIS
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These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, or Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu