Regulating Wheat Farms in the Mid-Columbia to Enhance Water Quality

by
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version 2

The major water quality problem caused by wheat farming in the Mid-Columbia is sediment carried off cropland by water that subsequently flows into a stream or river.[1] Runoff occurs mostly during the winter when rainfall or snowmelt cannot soak in the frozen ground. Occasionally, it occurs during severe thunderstorms in the summer. For reasons that I will discuss below, developing effective and reasonable rules to regulate sediment from our cropland is an interesting and challenging problem.

The Setting

1. Water and sediment only occasionally run off cropland in the Mid-Columbia

I would estimate that over 90% of the runoff on my farm occurs when rain falls on frozen ground in the winter, when snow melts on frozen ground, or, most likely, when both rain and snow-melt occur at the same time. During many winters, we have no runoff. When runoff occurs, it happens for two or three days and then stops. Hence, we affect water quality in the streams and rivers for a maximum of about 6 to 7 days per year and then only in some years. For example, we had two severe floods during the winter of 1996/97. During the four years since then, we have experienced no runoff or erosion.

2. Major storms cause most of the run off

I would estimate that 80-90% of the runoff on my farm occurs during and immediately after major storms when floods are occurring in other parts of Oregon and Washington. Some of these storms are so severe that runoff would occur even if the land was in its native state.[2]

The goal

3. Reducing Erosion?

The goal is to develop effective and reasonable regulations to ensure that sediment and runoff from agricultural land do not exceed acceptable levels. Reducing sediment and runoff is closely related to, but not identical with, reducing erosion. Eliminating erosion from agricultural land would stop sediment from entering the rivers and streams and would eliminate most runoff. However, there are ways to reduce runoff and sedimentation without reducing erosion. For example, a farmer could burn and plow his very steep farmland each year and have severe erosion. If he built a big enough sediment dam on the only draw that left his farm, he could still eliminate all sediment from leaving

his property and could also trap flood water. He should be in compliance with a water quality plan.[3]

However, water quality and erosion are sufficiently closely related that it is reasonable, at least initially, to focus the rules in water quality plans on reducing erosion.

The Rules

4. Criteria for evaluating proposed rules

Ideally, any proposed rule to improve water quality in the watershed should satisfy four criteria.

A. Farmers should be able to accomplish the requirements and outcomes specified in the rules. It should be reasonable to hold farmers responsible for obeying the rules. Very adverse environmental conditions may require waiving the rules, but waivers should be needed only rarely. If waivers are needed often, a variance procedure must be established and this increases uncertainty and complexity in the regulatory process.

B. The rules should not require the regulators to make farming decisions. If the regulators are making farming decisions, e.g. approving tillage operations, they will require extensive knowledge about each farming operation – more knowledge than they can be expected to have. Also, if regulators make farming decisions, they must take responsibility for any bad outcome, e.g., low yields.

C. The rules should not substantially reduce the profitability of the farm. The rules should allow farmers enough flexibility that they can manage the other aspects of farming along with reducing runoff.

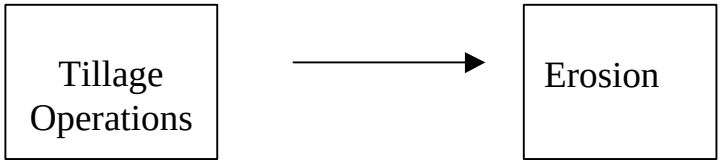
D. The rules should be stated in such a way that farmers can understand the concrete actions they are required to take. If the rules must reference technical material, e.g., the Revised Universal Soil Loss Equation (RUSLE), then adequate examples should be provided that illustrate how the rules would affect representative farms.

To make administration easier, it is often argued that a rule should also satisfy a fifth criterion. Determining whether a field is in compliance with the rule should require only an on-site inspection of the field's current condition. Knowledge of the condition of the field in pervious years should not be necessary in order to determine whether the field is currently in compliance with a rule. This simplifies administration because compliance can be determined without checking additional records and the administrator of the rules does not need to collect and store extensive historical information.

5. Two flawed approaches to reducing erosion

Attempts to develop a regulatory process to reduce erosion often start with a simple model.

Tillage Causes Erosion



This model of erosion suggests two approaches, both of which have major problems:

A. *Regulate Erosion Directly* --The simplest and most direct approach is to write plans that set explicit limits on the allowed amount of erosion and require the farmer to manage his tillage operations to keep erosion under the limits. This approach has at least three problems.

1. With current technology, it is not feasible to measure the actual erosion on individual fields or farms.

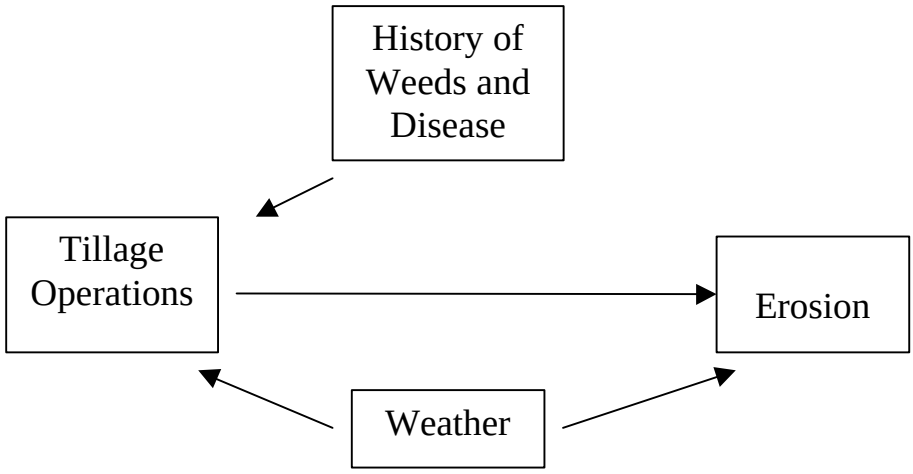
2. Except in a very general way, farmers don't know how different tillage operations relate to erosion, particularly erosion caused by weather conditions during the coming winter.

3. Most importantly, unique weather events in a given year are as important as tillage in determining the amount of erosion that occurs. Tillage systems that on average reduce erosion to an acceptable level will produce high rates of erosion during major storms. Hence, farmers often can not be held responsible for meeting the requirements in the plan; i.e., this approach violates criterion A (see page 2, item 4).

B. *Specify Tillage Operations* -- If outcomes can't be regulated, why not directly regulate tillage? When the 1985 Farm Bill gave the Soil Conservation Service the task of developing conservation farm plans, the SCS first tried to write the plans by specifying acceptable combinations of tillage operations, e.g., chisel plow, cultivate, rodweed twice, and seed. A tillage system was acceptable if, when evaluated using the USLE, it reduced average erosion to acceptable levels.

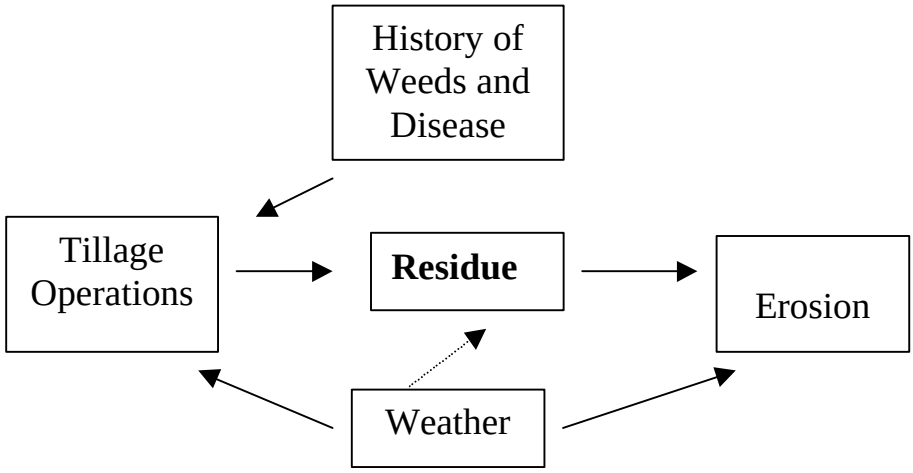
The problem with this approach is that weather conditions, disease history, and weed populations are different each year. The sequence of tillage operations must be adjusted to reflect yearly changes in the environment. Although I can specify my "normal" sequence of tillage operations, I almost never follow that sequence. Determining what tillage operations to use in producing a crop is the main expertise of a farmer. If the rules specified tillage sequences and practices, farmers would constantly need to ask permission to change their tillage sequence. The knowledge needed by the regulators to evaluate properly the requests to amend the sequence in the plan would be enormous. This approach violates criterion B (see page 2, item 4).

Both approaches are flawed because the model of how farming and erosion are related is more complicated.



6. <u>FSA conservation farm plans – using an intermediate goal</u>

The NRCS finally decided to regulate erosion by developing conservation farm plans that specified neither "best management practices" nor actual allowable erosion. Instead, the FSA conservation farm plans require farmers to maintain a minimum amount of crop residue on the surface of their fields. Crop residue is closely linked to average erosion, so the effect of the plans on average erosion can easily be calculated (with RUSLE). Farmers are free to use any sequence of tillage operations as long as they end up with the minimum required residue. Adequate residue levels become another goal that farmers must manage for along with crop production. Although weather and crop history cause variations in the amount of residue that any set of tillage operations will produce, the effect of environmental conditions on residue is less than the effect of weather on actual erosion. Farmers can reasonably be held responsible for meeting the residue requirements in their plans (at least during most years).[4]



By using an intermediate goal, i.e., residue, the FSA conservation plans require farmers to reduce average erosion while still allowing them the flexibility they need to respond to yearly changes in environmental conditions. The FSA conservation farm plans also satisfy all five of the criteria that I listed for evaluating rules (see page 2, item 4).

7. Writing plans that farmers can understand

Farmers are familiar with crop residue, can directly measure it on their fields, and have experience in managing residue levels. They do not understand the meaning of requirements written in terms of "RUSLE" or the "baseline reference standard." Specifying the requirements of the FSA conservation plans in terms of minimum required residue made the rules understandable and acceptable to farmers. It is more likely that water quality plans will be effective if they are also built on achievable concrete rules that farmers can read and understand.[5]

8. The Clean-Tillage Option

FSA conservation farm plans currently allow farmers to clean-till one out of every three crops; i.e., since summerfallow is used, clean-tillage can be used once every six years on each field. Occasional clean-tillage is a very important practice since it controls goatgrass and some diseases better than any other method. By using clean-tillage occasionally, farmers are able to maintain higher levels of residue during the other years. Having the clean-tillage option available may actually reduce average erosion.

The question of how often clean-tillage should be allowed needs additional study. However, clean-tillage is an important practice that needs to be allowed infrequently by any reasonable regulatory process.

9. Limiting actual or average erosion?

There is often confusion about whether rules should be developed to limit actual or average erosion. Because most erosion from cropland in the Mid-Columbia occurs during major winter storms, *no yearly limit on actual erosion is enforceable*. If the rules set yearly limits but exclude major storms, they are excluding the source of most erosion.

To be workable, rules should require that practices be in place that reduce average erosion over a period of years to acceptable levels.[6] Some years, actual erosion will be above the specified average level and many years it will be zero.

Endnote:

[1] The purpose of this paper is to discuss problems with regulating cropland, particularly cropland planted to wheat in the Mid-Columbia. I recognize that a comprehensive water quality plan must deal with many other issues, e.g., stream bank erosion, protecting riparian areas, and animal wastes.

[2] If watershed plans deal with major storms by saying that the rules don't apply while major storms are occurring, the regulations apply only to10-20% of the run off.

[3] By a similar argument, we believe that we may not be getting enough credit for our level terraces and sediment dams since these structures may have beneficial effects in reducing sedimentation that is in addition to their effects in reducing erosion.

[4] For example, a low yield on the previous crop may make it impossible for a farmer to achieve his required residue in a given year. I have suggested that FSA farm plans should be changed to require that farmers maintain a five-year average of residue above a minimum level. While there may be good reasons for low residue in any one year, a farmer can always maintain a five-year average of residue above the requirement. He can always be held responsible for obeying the rule. However, writing rules that require a five-year average of residue to exceed a specified amount would violate the fifth criterion (see page2).
I have been hiring a independent agent to measure the residue on all my fields for the last six years and believe that basing plans on residue history is feasible and that it would solve many of the remaining problems with conservation compliance.

[5] Translating a general technical rule, e.g., "average erosion must be reduced reduce to 67% of the baseline reference standard," into concrete, understandable rules that specify required minimum residue levels may require an appendix to the plan. The appendix would list the required residue levels for, say, the 20 main soil types in the watershed. This addition to the plan would be very worthwhile in allowing farmers to know what the plan actually means for them.

[6] The baseline reference standard is itself an average erosion rate – it is the average yearly erosion on clean-tilled plowed ground. It is somewhat inconsistent to specify yearly erosion limits in a plan that are reductions from an average erosion rate.