

LPES Small Farms Fact Sheets*



Photos courtesy of USDA NRCS.

Protecting the Water on Your Small Farm

By Joe Harrison, Washington State University

Summary

Groundwater (such as wells) and surface water (such as rivers and lakes) are important sources of water for drinking and recreation in the United States. In recent years, reports of bacteria, nitrogen, chemicals, and other pollutants in groundwater and surface water have increased concerns about its quality. What causes water pollution? This fact sheet answers that question and discusses ways to protect water quality.

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Introduction

Clean water is a valued resource for human and farm animal use, recreation, irrigation, and fish and shellfish habitat. Pollution of our groundwater (such as wells) and surface water (such as rivers and lakes) is a concern across the United States.

Adoption of good management practices by animal owners is one way to ensure a supply of clean water. For more information on these practices, see the Small Farms fact sheets titled "The ABCs of Pasture Grazing," "Got Barnyard and Lot Runoff?" and "Small-Scale Farmers and the Environment: How to be a Good Steward."

Sources of Water Pollution

The sources of groundwater and surface water pollution are usually indicated by the terms "point" and "nonpoint."

Point source pollution comes from a single source such as a pipe or ditch. Nonpoint pollution is the result of many small pollution sources.

Figure 1 shows many of the interrelationships that occur among soil, manure, crops, and water and how nonpoint pollution occurs.

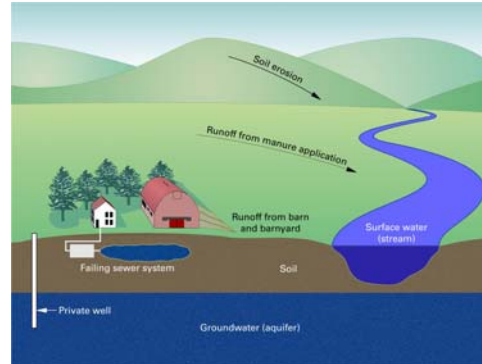


Figure 1. Potential sources of nonpoint source pollution.

Note: This drawing is not to scale.

Nonpoint pollution is often called "runoff." Runoff occurs when the soil receives more rain or irrigation than it can hold.

Areas that have been overgrazed, are not covered with grass, and where farm animals loaf can increase the chances of runoff (Figure 2).



Figure 2. Barnyard runoff flowing through nearby field.

Photo courtesy of USDA NRCS.



Pollution of surface water can occur from both point and nonpoint sources. In most cases, poor groundwater quality occurs when runoff containing dissolved nutrients and pesticides moves through the soil to the groundwater. This process, called leaching, is a natural one.

Point and nonpoint sources of pollution carry many types of pollutants such as pesticides; bacteria from manure or failing sewer systems; and nutrients from commercial fertilizers, manure, and sewer systems.

Water can be polluted by pesticides; bacteria from manure or failing sewer systems; and nutrients from commercial fertilizers, manure, and sewer systems.

Good Management Practices

Several good management practices have been successful

in protecting water quality. Three of these practices are fencing (Figure 3), limited animal access to streams and ponds for drinking water, and buffers along streams and rivers.



Figure 3. Fencing streams keeps farm animals from affecting water quality.

Photo courtesy of USDA NRCS.

The practices of fencing and limited access are meant to keep animal from having unlimited access to water and causing water quality problems (Figure 4).



Figure 4. Limited access watering for farm animals.

Photo courtesy of USDA NRCS.

The buffers along streams and rivers trap manure nutrients and bacteria, preventing them from entering surface water (Figure 5).



Figure 5. Grass buffers along streams help trap pollutants.

Photo courtesy of USDA NRCS.

Managing Manure to Protect Water Quality

Manure is a good source of the main nutrients needed

for plant growth: nitrogen, phosphorus, and potassium (see Small Farms fact sheet titled "The Value of Manure"). In addition, manure can provide organic matter. The organic matter increases the soil's ability to hold water and helps improve the soil's quality.

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The challenge for small farm owners who have animals or use manure as fertilizer is to know and use good management practices. These practices keep manure from washing into surface water and prevent nutrients like nitrogen from seeping into groundwater. Properly managed crops act as a filter to keep manure nutrients and bacteria from reaching groundwater (like wells) and surface water (like streams and ponds).



Properly managed crops act as a filter to keep manure nutrients and bacteria from reaching groundwater and surface water.

Collecting, storing, and applying manure

One simple rule to keep in mind is to collect manure when plants are not growing and apply it when they are growing. This works well with grasses but not with corn silage and annual grain crops such as wheat, barley, or oats. With these annual crops, the manure will need to be stored during the growing season and applied either before planting or after harvest.

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Manure use by crops

The nitrogen in fresh manure is in two forms: ammonia-nitrogen and organic nitrogen. To some extent, plants can use ammonia-nitrogen, but they prefer another type of nitrogen, nitrate-nitrogen. Nitrate-nitrogen is formed when small organisms in the soil change organic nitrogen to ammonia-nitrogen and then to nitrate-nitrogen.

When more manure nitrogen is applied than the plant needs or at times when the plant does not need it, extra nitrate-nitrogen can build up in the soil. When heavy rains occur or there is too much irrigation, the nitrate-nitrogen can be “washed” past the plant roots through the soil to groundwater. As a result, plants may lose nutrients and wells used for drinking may have higher levels of nitrate-nitrogen.

It is important to apply manure at rates that support plant growth. If too much manure is applied, the nutrients can wash into surface water. Bacteria in the water breaks down the nutrients. In the



process, the bacteria uses some of the dissolved oxygen that fish and other aquatic life need. In addition, bacteria from the manure may wash into nearby water, increasing bacteria levels. Higher bacteria levels in water can be a problem in drinking water sources as well as for recreational and commercial shellfish growers.

When the nitrogen and phosphorus in manure wash into surface water, it can result in a “nutrient-rich” environment in the water. In nutrient-rich water, algae can grow at unusually fast rates. When it dies and decays, too much oxygen may be removed from the water, which can then cause fish kills. Run-away algae growth can also cause discolored and bad-tasting water (Figure 6).



Figure 6. Algae-covered farm pond.
Photo courtesy of USDA NRCS.

When dirt washes from fields, it can be deposited in streams and rivers. It may cover gravel beds needed for fish spawning (development of fish eggs).

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Soil and Water Quality

Soil helps protect groundwater (like wells) and surface water (like streams and ponds). Soil can remove possible pollutants from runoff as it seeps through the soil toward groundwater. Some pollutants become attached to the soil particles. Small organisms that naturally live on these soil particles can digest the pollutants and change them into harmless materials.



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Soils that contain small amounts of organic matter, or clays, do not "hold" some pesticides well. Avoid over-applying pesticides on all soils, but especially sandy soils.

Disease-causing bacteria and viruses from sewer systems and manure application do not live long on most soils. They can enter groundwater and surface water under two conditions: When (1) the soil is extremely coarse (contains lots of gravel and sand) and (2) manure is overapplied and then is washed away by rain.

Nitrate-nitrogen can be removed from soil in two ways. Plants use it as a nutrient. In addition, some

soil organisms can change nitrate-nitrogen to a nitrogen gas when soil is waterlogged (usually during heavy rainy seasons).

Points to Remember

- Manure is a good source of the nutrients needed for plant growth.
- Properly managed crops act as a filter to keep manure nutrients and bacteria from reaching groundwater (like wells) and surface water (like streams and ponds).
- Too much nitrogen and phosphorus can cause surface waters to become overloaded with nutrients.
- Soil helps protect groundwater and surface water.
- Heavy rains or too much irrigation may cause nutrients and pesticides to seep through the soil.



Author

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For More Information

Educational Resources

<http://www.lpes.org/>—To view the Livestock and Poultry Environmental Stewardship (LPES) curriculum resources

<http://www.ree.usda.gov/1700/statepartners/usa.htm/>—To obtain state Cooperative Extension contacts

Environmental Regulations Resources

<http://www.epa.gov/npdes/afo/statecontacts/>—To obtain state environmental agency contact

Small Farm Resources

1-800-583-3071—USDACSREES Small Farm hotline

State-Specific Resources

The local contact for your land-grant university Cooperative Extension program is listed in the phone book under “Cooperative Extension” or “*(county name)* County Cooperative Extension.

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