Soil and Water Conservation BMPs for Groundwater Protection from Pesticide

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Maintenance of soil organic matter through soil conservation practices plays an important role in providing a healthy environment for crop growth. Soil organic matter influences soil nutrient levels and physical conditions that control the exchange of water and gasses between plant and soil. Healthy plants are less likely to develop pest problems, reducing the need for pesticide applications.

Soil organic matter also is the primary substance that adsorbs or attenuates the movement of pesticides through the soil profile. As organic matter decreases, so does the soil's ability to adsorb pesticides that move through it.

Organic matter also plays an important role in maintaining stable soil structure, which affects soil permeability and water infiltration. Increased water infiltration may result in greater potential for pesticide leaching and groundwater contamination.

Management of organic matter is important to groundwater protection but is also extremely challenging due to the opposing effects on pesticide movement. The balance between increased adsorption and infiltration will have to be weighed for each management recommendation under many different environments.

Detailed discussion of best management practice (BMP) implementation for soil and water conservation is found in the references listed at the end of this fact sheet. Each reference title includes the source of information and the related BMP numbers.

BMPs

1. Utilize animal wastes, if available, as a source of organic matter and as a portion of nutrient inputs.
When added to the soil, animal wastes are a source of organic matter that helps absorb pesticides and protect groundwater. However, animal wastes are a potential source of nutrient pollution to groundwater and suface water. The nutrient content of the animal waste must be properly credited according to standard methods, and applications should be made according to fertilizer recommendations based on a reasonable yield goal and soil testing results.

2. Rotate low residue crops with green manure or with high residue crops that return larger portions of organic material to the soil.
This practice will help offset organic matter losses that occur during periods of inadequate protection from erosion.

3. Use reduced tillage methods wherever possible.
Reduced tillage practices help to maintain or improve soil organic matter content through improved protection from erosion and decreased mineralization of organic matter.

4. Use tillage to disrupt macropores if preferential movement of pesticides is a source of groundwater problems.
Although reduced tillage is beneficial with respect to soil erosion and maintaining of organic matter, it may promote movement of pesticides through soil macropores. In cases where preferential flow is demonstrated as a major factor in water movement, the practice of no-till or zero-till should be modified to include some method of surface disruption. Research results indicate that tillage disrupts macropore connections with the surface and often significantly reduces preferential flow. Excessive tillage to reduce preferential flow, however, would probably result in greater soil erosion.

5. Use soil conservation practices that reduce the force of the wind.
In addition to reduced tillage, these practices include field wind barriers and strip cropping. Wind erosion is most likely to be a problem on soils included in the high sensitivity groundwater category due to their coarse texture and long, flat slopes.

Use soil conservation practices that reduce the force of runoff water.
In addition to reduced tillage, these practices include grassed waterways and farming on the contour. Water erosion is not likely to be a critical problem on the soils included in the high sensitivity groundwater category due to their coarse texture and relatively low relief.

Further Information

This circular is one of seven **GROUNDWATER/PESTICIDE FACT SHEETS**. Please refer to the following fact sheets for additional information.

- AE-1110 What is the BMP Selection Process for Groundwater Protection from Pesticides?
- AE-1111 How is the Assessment Process for Ground-water Contamination from Pesticides Used for BMP Selection?
- AE-1112 Farmstead BMP Recommendations for Groundwater Protection from Pesticides
- AE-1113 Improved Pesticide Application BMPs for Groundwater Protection from Pesticides
- AE-1114 Integrated Pest Management (IPM) BMPs for Groundwater Protection from Pesticides
- AE-1115 Soil and Water Conservation BMPs for Groundwater Protection from Pesticides
- AE-1116 Irrigation BMPs for Groundwater Protection from Pesticides

References

Livestock Waste Facilities Midwest Plan Service Handbook 18 **BMP1**
Animal Waste Management NDSU Extension Circular AS-956 **BMP1**
North Dakota Fertilizer Recommendation Tables and Equations Based on Soil Test Levels and Yield Goals NDSU Extension Bulletin SF-882 **BMP1**
Soil Sampling for Fertilizer Recommendations NDSU Extension Bulletin SF-990 **BMP1**
Managing Nitrogen Fertilizer to Prevent Groundwater Contamination NDSU Extension Bulletin EB-64 **BMP1**
Crop Rotations for North Dakota NDSU Extension Bulletin EB-48 **BMP2**
Crop Rotations for Profit in North Dakota NDSU Extension Bulletin A-1059 **BMP2**
Conservation Tillage Systems and Management Midwest Plan Service Handbook No. 45 **BMP3 BMP5**
Zero Tillage Production Manual The Manitoba-North Dakota Zero Tillage Farmers Association **BMP3 BMP6**
Conservation Tillage Calendar for Spring Wheat and Durum NDSU Extension Circular SC-982 **BMP3 BMP6**
Water Quality: The Tillage Component NDSU Extension Bulletin AE-1072 **BMP3 BMP6**
Reduced Tillage Seeding Equipment NDSU Extension Bulletin AE-826 **BMP3 BMP6**
Soil Erosion Control - Clean Water Through Crop Management Programs NDSU Extension Bulletin SC-710 **BMP5 BMP6**
Soil a Threatened Resource NDSU Extension Circular SC-983 for further information **BMP5 BMP6**

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