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## EC98-758 Farm\*A\*Syst Nebraska's System for Assessing Water Contamination Risk Worksheet 11: Land Application of Manure

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# Farm A Syst

WORKSHEET 11

## Nebraska's Farm Assessment System for Assessing the Risk of Water Contamination

### Land Application of Manure

#### Why should I be concerned?

Stewardship of soil and water resources should be a goal of every livestock producer. Management decisions made relative to land application of livestock manure will influence the ability to attain that goal.

If land application of manure is managed improperly, it can be a source of:

- High nitrates in drinking water.
- Nutrient loading of surface waters.
- Pathogens in surface waters used for recreation and drinking water supply.

If land application of manure is managed properly, it can:

- Reduce purchases of commercial fertilizers.
- Improve soil characteristics.
- Reduce erosion.

The goal of Farm\*A\*Syst is to help you protect the groundwater that supplies your drinking water and recreational uses of surface waters.

#### How will this worksheet help me protect my drinking water?

- It will take you step-by-step through your manure application practices.
- It will evaluate your activities according to how they might affect the groundwater that provides your drinking water supplies.
- It will provide you with easy-to-understand "risk level scores" that will help you analyze the relative safety of your manure application practices.
- It will help you determine which of your practices are reasonably safe and effective, and which practices might require modification to better protect your drinking water.

#### How do I complete the worksheet?

Follow the directions at the top of the chart on the next page. It should take you 15 minutes to complete this worksheet and determine your risk level.

Information derived from Farm\*A\*Syst worksheets is intended only to provide general information and recommendations to farmers regarding their own farm practices. It is not the intent of this educational program to keep records of individual results.



# Land Application of Manure: Assessing the Risk of Surface Water and Groundwater Contamination

1. Use a pencil. You may want to make changes.
2. For each category listed on the left that is appropriate to your farm, read across to the right and circle or mark the statement that best describes practices or conditions on your farm. (Skip and leave blank any categories that don't apply to your farm.)
3. Then look above the description you circled to find your "risk number" (1, 2, 3, or 4) and enter that number in the blank under "YOUR RISK."
4. Allow about 15-30 minutes to complete the worksheet and figure out your risk for land application of manure.

|                                                                        | HIGH RISK<br>(risk 4)                                                                                                                                              | HIGH-MODERATE RISK<br>(risk 3)                                                                                                                                                             | MODERATE-LOW RISK<br>(risk 2)                                                                                                                                                                        | LOW RISK<br>(risk 1)                                                                                                                              | YOUR RISK |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Does sufficient land base exist for land applying nutrients in manure? | Manure nutrient production is unknown;<br>OR<br><b><i>Insufficient crop acres are available to safely utilize manure nitrogen.</i></b>                             | Total manure nutrient production is known AND Sufficient crop acres are available to safely use manure nitrogen but soil phosphorus levels are commonly greater than 100 ppm. <sup>1</sup> | Total manure nutrient production is known and sufficient crop acres are available to safely use manure <b>nitrogen</b> only and soil phosphorus levels are generally less than 100 ppm. <sup>1</sup> | Total manure nutrient production is known and sufficient crop acres are available to safely use manure <b>nitrogen</b> and <b>phosphorus</b> .    |           |
| <b>IS MANURE APPLIED AS A NUTRIENT RESOURCE?</b>                       |                                                                                                                                                                    |                                                                                                                                                                                            |                                                                                                                                                                                                      |                                                                                                                                                   |           |
| Value given to manure nutrients for crop production                    | Commercial fertilizer applications are not reduced to reflect manure application.                                                                                  | Only phosphorus application is reduced or eliminated to reflect manure application.                                                                                                        | Phosphorus application is reduced or eliminated. AND Some commercial nitrogen reduction has occurred.                                                                                                | Commercial fertilizer added to address only deficit in nitrogen or phosphorus following manure nutrient crediting.                                |           |
| Location of application                                                | Manure is regularly applied to: frozen or snow-covered land; OR unharvested areas such as pasture or grassed waterways; OR fields that flood with some regularity. | Manure is applied regularly to cropland nearest the livestock housing without consideration of crop nutrient requirements.                                                                 | Manure is distributed relatively evenly over most cropland on the farm.                                                                                                                              | Manure is distributed to cropland at rates based upon nitrogen or phosphorus needs of individual crops with preference given to non-legume crops. |           |
| Uniformity of application                                              | Fields receiving manure are not covered uniformly                                                                                                                  | Some effort is made to cover field uniformly with manure                                                                                                                                   | All fields receiving manure are covered as evenly as practical.                                                                                                                                      | All fields receiving manure are covered as evenly as practical AND Spreader distribution pattern is known and operator compensates for variation. |           |

**Bold Italic type:** Besides representing a higher-risk choice, this practice also violates Nebraska law.

<sup>1</sup>Bray and Kurtz No. 1 soil phosphorus test.



|                                                                             | HIGH RISK<br>(risk 4)                                                                                                                                                  | HIGH-MODERATE RISK<br>(risk 3)                                             | MODERATE-LOW RISK<br>(risk 2)                                                                           | LOW RISK<br>(risk 1)                                                                                                                                                                           | YOUR RISK |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>INFORMATION AVAILABLE TO CREDIT CROP AVAILABLE NUTRIENTS FROM MANURE</b> |                                                                                                                                                                        |                                                                            |                                                                                                         |                                                                                                                                                                                                |           |
| Are nutrient concentrations in manure known?                                | No manure analysis or book value estimate of nutrient value is used.                                                                                                   | Book value for estimating nutrients is used.                               | Manure analysis is done once per year.                                                                  | Manure analysis is done prior to each primary period of land application.                                                                                                                      |           |
| Manure application rate                                                     | Spreader application rates are not known.                                                                                                                              | A rough estimate of manure application rate is available.                  | A good estimate of manure application rate is known.                                                    | Calibrated manure application equipment within past 3 years.                                                                                                                                   |           |
| Manure application records                                                  | Records of manure application are not kept.                                                                                                                            | Record of individual field manure applications for past year is available. | Record of individual field manure applications for past 3 years is available.                           | Permanent record of individual field manure applications is maintained.                                                                                                                        |           |
| Soil testing:<br><br>• Basic soil test                                      | No soil testing                                                                                                                                                        | Infrequent                                                                 | Every 4 to 5 years                                                                                      | Every 1 to 3 years                                                                                                                                                                             |           |
| Soil testing:<br><br>• 2 to 3 foot soil test for nitrates                   | Infrequent or no soil testing.                                                                                                                                         | Every 3 to 5 years.                                                        | Every other year.                                                                                       | Annual soil testing of all fields.                                                                                                                                                             |           |
| Nutrient management plan                                                    | No end of the year summation of nutrient application (including manure) is completed<br>OR<br>No advanced plan of manure allocation to individual fields is completed. | _____                                                                      | An end of the year summation of nutrient applications from all sources (including manure) is completed. | An end of the year summation of nutrient applications from all sources (including manure) is completed<br>AND<br>A plan for allocating manure to individual fields is completed for next year. |           |
| Nutrient management plan gives credit to nutrients including:               | No nutrient management plan.                                                                                                                                           | Commercial fertilizer only.                                                | Commercial fertilizer and soil residual nutrients.                                                      | Commercial fertilizer, soil residual nutrients, irrigation water nitrates, legumes, and manure.                                                                                                |           |



|  | HIGH RISK<br>(risk 4) | HIGH-MODERATE RISK<br>(risk 3) | MODERATE-LOW RISK<br>(risk 2) | LOW RISK<br>(risk 1) | YOUR RISK |
|--|-----------------------|--------------------------------|-------------------------------|----------------------|-----------|
|--|-----------------------|--------------------------------|-------------------------------|----------------------|-----------|

**LAND APPLICATION SITE CHARACTERISTICS: GROUNDWATER RISKS**

|                                                               |                                                                                             |                                                                                            |                                                                                                                 |                                                                                                             |  |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--|
| Some sites have a depth to water table of:                    | Less than 20 feet.                                                                          | Between 20 and 50 feet.                                                                    | Between 50 and 100 feet.                                                                                        | Over 100 feet.                                                                                              |  |
| Some sites have a soil depth and permeability of:             | Coarse-textured soils (sandy, sandy loam) to gravel. Very shallow (less than 20 in.).       | Moderately well-drained coarse-textured soils (sands, sandy loam). Shallow (20-30 inches). | Moderately well-drained medium- or fine-textured soils (loam, silt loam, clay loams, clays). 30-40 inches deep. | Well-drained medium- or fine-textured soils (loam, silt loam, clay loams, clays). More than 40 inches deep. |  |
| If manure or lagoon effluent is applied by irrigation, it is: | Applied on saturated soils or soils prone to flooding where leaching of nitrates is likely. | Applied outside of the growing season of the crop under irrigation.                        | Applied only during the crop growing season.                                                                    | Applied as light applications (less than the soil moisture deficit) during the crop growing season.         |  |

**LAND APPLICATION SITE CHARACTERISTICS: SURFACE WATER RISKS**

|                                                                |                                                                                                         |                                                                                                                             |                                                                                                                |                                                                                         |  |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--|
| Slope of some sites for:<br>• Annual crops<br>• Perennial crop | 10% +<br>15% +                                                                                          | 6 to 10%<br>9 to 15%                                                                                                        | 1 to 5%<br>4 to 8%                                                                                             | Flat to 1%<br>Flat to 3%                                                                |  |
| Surface water location with respect to some land sites         | No buffer <sup>1</sup> , moderate slope.                                                                | Less than 20 foot buffer <sup>1</sup> , moderate slope.                                                                     | 20 to 50 foot buffer <sup>1</sup> , slight slope.                                                              | Greater than 50 foot buffer <sup>1</sup> , slight or no slope.                          |  |
| Frequency of flooding for some sites                           | Frequently                                                                                              | Occasionally                                                                                                                | Rarely                                                                                                         | Never                                                                                   |  |
| Conditions of application                                      | Manure is applied under winter conditions to snow-covered or frozen fields from which runoff is common. | Manure is applied under winter conditions to snow-covered or frozen fields with minimum slope and limited runoff potential. | Winter application is avoided. Manure is applied in late summer or fall on land to be planted to spring crops. | Manure is applied primarily to growing crops or within several weeks prior to planting. |  |

***Bold Italic type:*** Besides representing a higher-risk choice, this practice also violates Nebraska law.

<sup>1</sup>Cropland, grass or wooded buffer receiving NO manure application.

**Your groundwater vulnerability score from *Worksheet 2* was \_\_\_\_\_**

Note: If the surface texture, subsurface texture, or depth to groundwater used to calculate this score are not characteristic of the site conditions present for the activities/practices discussed in this worksheet, calculate a new vulnerability score for this site.

If your groundwater vulnerability score is:

- 1 to 1.4: your site has a **LOW VULNERABILITY** to pollution reaching groundwater.
- 1.5 to 2.4: your site has a **MODERATE-LOW VULNERABILITY** to pollution reaching groundwater.
- 2.5 to 3.4: your site has a **HIGH-MODERATE VULNERABILITY** to pollution reaching groundwater.
- 3.5 to 4.0: your site has a **HIGH VULNERABILITY** to pollution reaching groundwater.

**Your surface water vulnerability score from *Worksheet 2* was \_\_\_\_\_**

Note: If the surface texture, slope toward surface water, or distance from surface water used to calculate this score are not characteristic of the site conditions present for the activities/practices discussed in this worksheet, calculate a new vulnerability score for this site.

If your surface water vulnerability score is:

- 1 to 1.4: your site has a **LOW VULNERABILITY** to pollution reaching surface water.
- 1.5 to 2.4: your site has a **MODERATE-LOW VULNERABILITY** to pollution reaching surface water.
- 2.5 to 3.4: your site has a **HIGH-MODERATE VULNERABILITY** to pollution reaching surface water.
- 3.5 to 4.0: your site has a **HIGH VULNERABILITY** to pollution reaching surface water.

**Look over your worksheet scores for individual activities:**

- **Low risk** practices (1's): are ideal and should be your goal regardless of your site's vulnerability to pollution reaching ground or surface water. Cost and other factors may make it difficult to achieve a low risk rating for all activities.
- **Moderate-low risk** practices (2's): provide reasonable water quality protection unless your site's vulnerability to pollution reaching ground or surface water is moderate-high or high.
- **High-moderate risk** practices (3's): do not provide adequate protection in many circumstances, especially if your site's vulnerability to pollution reaching ground or surface water is high or high-moderate. They may provide reasonable water quality protection if your site's vulnerability to pollution reaching ground or surface water is low to moderate-low.
- **High risk** practices (4's): pose a serious danger of polluting water, especially if your site's vulnerability to pollution reaching ground or surface water is high, high-moderate, or moderate-low. Some high risk activities may not immediately threaten water quality if your site's vulnerability to pollution reaching ground or surface water is low, but still pose a threat over time if not corrected.

Read ***Fact Sheet 11 Improving Land Application of Manure*** and consider how you might modify your farm practices to better protect your drinking water supply and other ground and surface water supplies. Some concerns you can take care of right away; others could be major or costly projects requiring planning and prioritizing before you take action.





|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                             |
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