

## Summary of Sensitive Area and Practices Recommendations

08-08-2016

1. Before manure application, inspect fields (per a-c below) for shallow depth to bedrock soils, fracture traces, groundwater conduits and contributing channels or areas that drain to groundwater conduits. Update spreading maps.
  - a. Inspect annual cropped fields in spring before manure application, tillage, or planting or in late summer/fall after crop harvest and before manure application, tillage, or planting.
  - b. Inspect alfalfa and perennial cropped fields in spring and summer before or 7-10 days after cutting – look for uneven crop growth that follows distinct lines.
  - c. Use direct measurements (backhoe, probe, test pits, etc.) to verify depth to bedrock and groundwater.
2. No mechanical applications of manure on soils with a soil depth less than 1 foot to bedrock.
3. No liquid manure applications on soils with less than 2 feet to bedrock.
4. Avoid solid manure applications on soils with 1-2 feet to bedrock. If avoidance is not possible, apply solid manure in spring only @ rate of 15 tons/acre; apply within 10 days or less from planting date or apply on growing crop. If possible, apply composted solid manure to reduce pathogens.
5. Avoid manure application on soils with 2-5 feet depth to bedrock. If avoidance is not possible, implement standard practices for 2-20 feet bedrock soils - **table 1** - AND select applicable practices for 2-3 feet bedrock soils - **table 2** - or 3-5 feet soils - **table 3**, whichever applies.
6. Follow practices for manure application on soils with 5-20 feet depth to rock – **table 4**
7. Follow setbacks and other practices for Direct Conduits to Groundwater – see **table 5**
8. All livestock operations that apply manure prepare and implement a NM plan that reflects, at a minimum, the proposed 2015 NRCS 590 standard.

## Table 1 - Standard Practices - 2-20 feet Bedrock Depth

Avoidance is the best practice to reduce the risk for groundwater contamination on soils 0-5 feet. The mitigation practices that follow reflect interim or intermediate steps that farmers can implement on a voluntary basis to reduce the risk.

Some mitigation practices below focus on pathogen reduction and may have limited ability to reduce nitrate leaching to groundwater.

None of the standard practices below are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

Standard Practices
1. Use Kewaunee County, NRCS soils/maps or DNR CAFO maps and field verification to identify location of soils. When possible use direct measurement (e.g., test pit, probe, etc.) to verify depth to bedrock.
2. Application of manure or other wastes prohibited:
a. When rainfall > 1 inch is forecast within 24 hours
b. When DATCP Manure Management Advisory System is RED within application area
c. Within closed depressions* <b>in fall</b> after crop harvest unless: (1) manure is injected (following tillage practice #9 below) or immediately incorporated <sup>1</sup> AND (2) successful establishment** of fall seeded forage crop within application area(s)  * = Closed depressions are topographical basins with no external drainage outlet. They can be located using topographic maps and visual interpretation or using ArcGIS tools that use Light Detection and Ranging (LIDAR) surveys. Consult with local county government or DNR to determine if closed depressions meets the definition of direct conduits to groundwater <sup>2</sup> within NR 151 and NR 243.  ** = Successful establishment means a fall seeded crop germinates and grows to provide substantial vegetative cover of entire field; bare soil area(s) are avoided or minimized to isolated/small areas.
e. <b>In spring or summer</b> - within one mile radius of any area that drains into low areas within closed depressions (up to seasonal high water mark), unless manure is injected or incorporated* within 24 hours or prior to any rainfall event, whichever occurs first. * = does not apply to no fields following no-tillage practices OR fields with perennial forage and other established crops.
3. No emergency spreading or headland stacking on frozen or snow covered soils* * = already covered by Kewaunee County Ordinance, including exceptions

<sup>1</sup> Incorporate means using mechanical equipment to mix applied manure into the soil as much as practicable/possible.

<sup>2</sup> "Direct Conduit to Groundwater" means wells, sinkholes, swallets, fractured bedrock at the surface, mine shafts, non-metallic mines, tile inlets discharging to groundwater, quarries, or **depressional groundwater recharge areas over shallow fractured bedrock**

**Table 1 - Standard Practices - 2-20 feet Bedrock Depth**

<b>Standard Practices</b>
<p>4. Before applying manure, evaluate and rank fields with low, medium and high risk based upon criteria i-v., below; low risk fields are first priority for application. Avoid high risk fields or use as a last resort.</p> <ul style="list-style-type: none"><li>i. % of restricted area within field from setbacks and slope</li><li>ii. Number of identified karst features within or immediately adjacent to field</li><li>iii. % field area with identified fracture traces</li><li>iv. Number of channel(s) in field that lead to identified groundwater conduits or recharge areas within or adjacent to field</li><li>v. Evaluate soil type, soil conditions, soil depth to bedrock on fields and weather conditions</li></ul>
<p>5. Implement practices that build soil organic matter (e.g., crop rotation, cover crops, high residue crops, reduced tillage, rotational grazing).</p>
<p>6. No surface application* on slopes greater than 6% unless spread material immediately incorporated<sup>3</sup> or injected; no surface application on slopes greater than 12% ; * = does not apply to perennial forage or other established crops</p>
<p>7. When surface applying manure before planting or after harvest, complete incorporation* within 24 hours or before a rain event, whichever is sooner; * = does not apply to perennial forage and other established crops</p>
<p>8. Apply nitrogen based fertilizers as close to the time of crop establishment/crop uptake as possible or on established crops to minimize N losses below the crop root zone and to groundwater</p>
<p>9. Complete tillage* prior to application of liquid manure to a minimum of two inches below depth of manure injection/incorporation</p> <p>* = does not apply to fields following no-tillage practices OR fields with perennial forage and other established crops</p>
<p>10. Headland application (from equipment turning) shall be incorporated within 6 hours or before applying a different field or before a rain event, whichever occurs first.</p>

<sup>3</sup> Incorporate means using mechanical equipment to mix applied manure into the soil as much as practicable/possible.

## Table 2 – Bedrock Depth Practices - 2-3 feet

Avoidance is the best practice to reduce the risk for groundwater contamination on soils 2-3 feet. The mitigation practices that follow reflect interim or intermediate steps that farmers can implement on a voluntary basis to reduce the risk.

Applying manure on soils with 36 inches or greater depth to bedrock is necessary for adequate pathogen reduction.

Some mitigation practices below focus on pathogen reduction and may have limited ability to reduce nitrate leaching to groundwater.

None of the mitigation practices below are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

Practices														
1. Follow standard practices for > 2-20 feet to bedrock														
2. Use NRCS soil units/maps, County maps and field verification to identify location of soils with bedrock < 40 inches. When possible, use direct measurement (e.g., test pit, probe, etc.) to verify depth to bedrock.														
3. <b>Avoid</b> manure application on these soils and apply on other available acres OR if avoidance is not possible, implement all applicable mitigation practices (based on manure type) below:														
a. Apply solid manure with significant pathogen reduction (composting);														
b. Apply liquid manure with demonstrated pathogen treatment/reduction to 500,000 CFU/ ml or less AND implement the following: <ul style="list-style-type: none"> <li>Do not exceed NR 214.17(4)(d), Table 3 application rates; use as low application rate as is safe and practical to avoid hydraulic loading of soil</li> </ul>														
<p><b>Table 3</b>  <b>Maximum Weekly Volume of Liquid Waste to be Applied to Landspreading Sites (gal/ac/wk or in/wk)</b></p> <table border="1"> <thead> <tr> <th>Soil Texture</th> <th>18"–36" Depth to Groundwater or Bedrock</th> </tr> </thead> <tbody> <tr> <td>Sand</td> <td>6,750 (1/4 in.)</td> </tr> <tr> <td>Sandy Loam</td> <td>13,500 (1/2 in.)</td> </tr> <tr> <td>Loam</td> <td>13,500 (1/2 in.)</td> </tr> <tr> <td>Silt Loam</td> <td>13,500 (1/2 in.)</td> </tr> <tr> <td>Clay Loam</td> <td>13,500 (1/2 in.)</td> </tr> <tr> <td>Clay</td> <td>6,750 (1/4 in.)</td> </tr> </tbody> </table>	Soil Texture	18"–36" Depth to Groundwater or Bedrock	Sand	6,750 (1/4 in.)	Sandy Loam	13,500 (1/2 in.)	Loam	13,500 (1/2 in.)	Silt Loam	13,500 (1/2 in.)	Clay Loam	13,500 (1/2 in.)	Clay	6,750 (1/4 in.)
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Clay Loam	13,500 (1/2 in.)													
Clay	6,750 (1/4 in.)													
c. Apply liquid or solid manure to growing crop or within 10 days of crop establishment;														
d. Limit solid manure application rate to 15 tons/acre/year;														
e. Limit total liquid manure application rate to NR 214.17(4) (d), Table 3 rate or UW A2809 rate, whichever is less														

**Table 2 - Bedrock Depth Practices - 2-3 feet**

Practices
f. Split/reduce liquid manure application rate to reduce hydraulic loading of soil; factors to consider include: soil moisture and type (how much liquid can the field safely absorb) weather forecast, manure type and solids content and planned/planted cover crop stage;
g. If liquid manure has < 2.0% dry matter (field average), reduce application rate by 50% and complete split applications;
h. Use nitrification inhibitors and/or cover crops if they can be successfully established after application;
i. Do not inject or incorporate manure below 4 inches depth
j. For late summer and fall applications of manure and organic byproducts <sup>4</sup> : <ul style="list-style-type: none"><li>• Use established/growing perennial crops or cover crops as first priority for application.</li><li>• When a crop is growing, such as perennial crops, overwintering crops, double crops and cover crops, use rates that will not smother these crops and limit N rates to those specified in UWEX A2809 or to 120 lbs/acre, whichever is less.</li><li>• For annual crops that will not be planted until the following spring or summer, delay applications until soil temp's are less than 50F or October 1st, whichever occurs first and limit manure N application to UWEX A2809 or to 90lbs/acre, whichever is less.</li></ul>
k. For applications of liquid manure and/or organic by-products with less than or equal to 4.0% dry matter, limit application rates to criteria j. above and use a nitrification inhibitor or surface apply and do not incorporate for at least 3 days.

<sup>4</sup> Organic byproducts means organic materials that are produced as a byproduct of an industrial or agricultural process which can be land applied as a source of nutrients. Examples include: paunch manure, manure solids, food production wastes, process wastewater, and wastewater treatment plant biosolids and waste water if land applied. This definition does not include hazardous and/or industrial waste or manufactured nutrient sources.

## Table 3 - Bedrock Depth Practices – 3-5 feet

Avoidance is the best practice to reduce the risk for groundwater contamination on soils 3-5 feet. The mitigation practices that follow reflect interim or intermediate steps that farmers can implement on a voluntary basis to reduce the risk.

Applying manure on soils with 36 inches or greater depth to bedrock is necessary for adequate pathogen reduction.

Some mitigation practices below focus on pathogen reduction and may have limited ability to reduce nitrate leaching to groundwater.

None of the mitigation practices below are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

Practices for 3-5 feet
1. Follow standard practices for >2-20 feet to bedrock
2. Use current NRCS and County bedrock depth maps and field verification to identify soils location. When possible, use direct measurement (e.g., test pit, probe, etc.) to verify depth to bedrock.
3. <b>Avoid manure application</b> on these soils and apply on other available acres OR if avoidance not possible, implement all of the following mitigation practices:
a. Limit liquid manure application rate to 13,500 gallons/week* and follow UW A2809 to determine total liquid manure application; use low application rate that is safe and practical and avoid hydraulic loading of soil * = weekly liquid manure application rate helps reduce groundwater pathogen risk but may not reduce nitrate loading/loss risk after application; following UW A2809 rates and methods can help avoid applying nitrogen above crop N need.
b. For late summer and fall applications of manure and organic byproducts: <ul style="list-style-type: none"> <li>• Use established/growing perennial crops or cover crops as first priority for application.</li> <li>• When a crop is growing, such as perennial crops, overwintering crops, double crops and cover crops, use rates that will not smother these crops and limit N rates to those specified in UWEX A2809 or to 120 lbs/acre, whichever is less.</li> <li>• For annual crops that will not be planted until the following spring or summer delay applications until soil temp's are less than 50F or October 1st, whichever occurs first and limit manure N application to UWEX A2809 or to 90lbs/acre, whichever is less.</li> </ul>
c. For applications of liquid manure and/or organic by-products with less than or equal to 4.0% dry matter, limit application rates to criteria 3(b) above and use a nitrification inhibitor or surface apply and do not incorporate for at least 3 days;
d. Limit solid manure application to UW A2809 rates and incorporate* <sup>5</sup> within 72 hours; * = does not apply to no fields following no-tillage practices OR fields with perennial forage and other established crops
e. Do not inject or incorporate manure below 6 inches depth;
f. Implement as many applicable mitigation practices for 2-3 feet to bedrock soils [3(a-c) and 3(f-h)] as practicable

<sup>5</sup> Incorporate means using mechanical equipment to mix applied manure into the soil as much as practicable/possible.

## Table 4 – Bedrock Depth Practices- 5-20 feet

Applying manure on soils with 36 inches or greater depth to bedrock is necessary for adequate pathogen reduction.

Some mitigation practices below focus on pathogen reduction and may have limited ability to reduce nitrate leaching to groundwater.

None of the mitigation practices below are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation.

Practices															
1. Follow standard practices for >2-20 feet to bedrock															
2. Use current NRCS or County bedrock depth maps and field verification to identify soils location															
3. Implement the following mitigation practices:															
a. Limit weekly liquid manure application rate to NR. 214.14(4)(d), Table 3 (below) and follow UW A2809 to determine total liquid manure application; use as low application rate that is safe and practical; avoid hydraulic loading of soil by using split applications															
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b. Limit solid manure application to UW A2809 rates and incorporate* <sup>6</sup> within 72 hours; * = does not apply to no fields following no-tillage practices OR fields with perennial forage and other established crops															
c. Do not inject or incorporate manure below 8 inches depth															
d. As many applicable mitigation practices for 2-3 feet to bedrock soils [3(a-c) and 3(f-h)] as practicable															

<sup>6</sup> Incorporate means using mechanical equipment to mix applied manure into the soil as much as practicable/possible.

## Table 5 – Direct Conduits to Groundwater Practices

None of the mitigation practices are meant to override meeting current performance standards (e.g., NR 151 and NR 243) or technical standards (e.g., NRCS 590) related to nutrient management or soil conservation

“Direct Conduit to Groundwater” means wells, sinkholes, swallets, fractured bedrock at the surface, mine shafts, non-metallic mines, tile inlets discharging to groundwater, quarries, or depressional groundwater recharge areas over shallow fractured bedrock. - *Chapters NR 151.002 (11m) and NR 243.03 (20), Wis. Adm. Code*

Practice
1. Inspect fields according to Recommendation A (below).
2. Permanently mark identified direct conduits to groundwater and drain tile inlets within field AND implement the following: <ol style="list-style-type: none"> <li>a. Install a 5 foot vegetated buffer around all identified feature(s);</li> <li>b. The feature(s) and 5 foot buffer should not be tilled, planted or receive nutrients</li> </ol>
3. No manure application within: <ol style="list-style-type: none"> <li>a. 1000 feet of public “community” water supply wells (e.g., municipal water supply wells and other than municipal wells serving mobile home parks, nursing homes, apartment buildings, condominiums, etc.);</li> <li>b. 250 feet of private potable and public “non-community” water supply wells (e.g., bars and restaurants, churches and parks);</li> <li>c. 100 feet of all other “direct conduits to groundwater” and 300 feet when soil is frozen or snow covered;</li> <li>d. 100 feet of defined channels and concentrated flow path(s) that lead to 3a, 3b or 3c</li> </ol>
4. For groundwater monitoring wells, consult with local county government, DNR or well monitoring authority (e.g., USGS, UWGB, UWSP, WGNHS) to determine appropriate setback distance before applying manure.
5. Annually consult with local municipality for boundaries and requirements of local wellhead protection plans
<p>Recommendation A.</p> <p>Inspect fields according to a., b., and c. below for depth to bedrock, groundwater conduits, contributing channels or areas that drain to groundwater conduits, drain tiles that may drain/discharge to groundwater conduits and evidence of fracture traces; keep inspection logs and update NMP maps with identified features.</p> <ol style="list-style-type: none"> <li>a. Inspect annual cropped fields in spring before manure application, tillage, or planting or in late summer/fall after crop harvest and before manure application, tillage, or planting.</li> <li>b. Inspect alfalfa and perennial cropped fields in spring and summer before or 7-10 days after cutting – look for uneven crop growth that follows distinct lines.</li> <li>c. Use direct measurements* (e.g., backhoe, probe, test pits, etc.) to verify depth to bedrock and groundwater.</li> </ol> <p>* = electric resistivity is not a direct measurement of bedrock depth, but may be used as a guide to make such measurement</p>



