Online Weather Resources for Manure Application
UW Extension Nutrient Management Team
Custom Manure Applicator Subcommittee

One of the most common factors in manure runoff situations is precipitation. Rainfall, snowmelt, or a surprise summer thunderstorm can quickly turn a normal manure application into a potential problem. Forecasted precipitation events should not be viewed as a reason to hurry up and get manure applied to fields. Rather, they represent a spreading condition that must be viewed with caution. Producers need to manage their applications with respect to potential future precipitation and consider additional management options or avoiding application altogether when precipitation is forecasted or imminent. Weather forecasts are one means of determining when additional management options are necessary or appropriate. While weather forecasts have not always been accurate (a 1997 study by UW-Green Bay students showed that the precipitation accuracy for January-March was <60%), more modern forecasts are the best tool we have when planning applications during certain times of the year.

The following pages outline several resources available online for professional manure applicators and farmers. There are far too many online sites to examine here in detail, but the following will give you a flavour for what is available. Radar is available on hundreds of sites, so that will not be covered here. The mention or absence of a particular service does not imply endorsement or lack thereof.

Fee vs. Free: There are a number of fee-based online weather services available – some online, and some through speciality services like DTN.com or cell phone providers. These non-internet services may be a better deal in the field where internet access is not available or older phone lines make decent connections difficult.

Liability: When depending on forecasts in making a decision on whether or not to spread, it is important that you print copies of the forecast used and keep on file for at least one year. Keeping them for 3 years is better, but space in your filing system may be limited. Since forecasts change often, you should check at least once per day, more often if necessary. While documenting that you took into account forecasted precipitation does not remove liability when runoff events occur, it is a factor that can be considered when regulatory agencies are determining an appropriate enforcement response. In addition, documenting that you looked at a forecast does not provide any benefit if you did not take appropriate responses to the forecast. Other factors that can impact an enforcement response include the actions a producer takes to address a precipitation-related runoff event once it is discovered.

Local Forecasts by Zip Code: Many websites and local TV stations now offer the ability to type in the zip code of the farm and view the forecast. Popular ones include www.weather.com, www.intellicast.com, and www.weather.gov. It is important to make sure that the forecast you are viewing is up-to-date. Some services update every few hours, others every day or so.

Tabular Forecasts: A number of services now offer hour by hour forecasts. Below is the www.weather.gov forecast for Abbotsford, WI (go to “Additional Forecasts and Information”, click on “tabular”) for September 25, 2006: Note that it lists the % chance of rain for each hour from the current time to 3 days out, in addition to high temperatures.

Starting at hour 16 (1600 hours military time, 4 pm conventional), the hour by hour predicted conditions are shown. Note that the chance of rain (PoP) remains below 20% until hour 19 on the 26th (5 pm), then jumps to 61% until 1 am, then back down again. The bottom row (Rain) shows it is likely during these hours, then becoming a scattered chance (SChc) after. Of course, this type of forecast does not predict the amount of rain, just whether it will rain or not (or whether the temperature will get above freezing and the snow start melting).
So How Much Will It Rain?

The decision on whether or not to spread manure must also be based on the amount of rainfall forecast. One of the easier to use options for determining precipitation probabilities is the National Weather Service forecast model graphics website:  

The National Weather service uses several computer models (GFS (MAV) MOS, Eta/MET MOS and GFSX/MEX MOS)—the one EPA recommends for the upper Midwest is the GFV (MAV) MOS, and this link takes you right to that model’s output. Note that the forecast is a synthesis of all 3 models (plus the intuition of the weather forecasting staff), while the graphic is just one model’s output. Hence this map may differ (and on this date, it did) from the tabular forecast.

Once there, under “Precipitation” on the left side, select the incremental category you want (1 hour, 3 hour, 6 hr, 12 hr or 24 hr) and the amount of rain (0.1 inches up to >1 inch). This will generate a map, and across the bottom of the screen are the time increments you selected. For the one below, I’ve looked at the > .1 inch in 6 hour increments, and have clicked on Thursday (that’s the first time that rain is forecast in Wisconsin by this model). PLEASE NOTE that the time on the map is not in our timezone – during Standard time, subtract 6 hours. During Daylight Savings, subtract 5 hours. This is explained by clicking on the yellow button on the bottom of these screens.
The map above shows the chance of rain between 7 am and 1 pm on Wednesday of that week (remember, 5 hours difference in summer, 6 in winter)

Using the Maps

Once you have the maps, you now need to make a decision: Is it safe to spread, or should I wait? While there are no hard and fast regulations for all farms in Wisconsin at this time, the following guidelines will help you make that decision.

1. **What can the soil absorb?** The 590 standard has a table that looks at how much moisture a field can absorb before runoff occurs. Use of this table is only required in sensitive areas (near water resources), however it does provide good guidance for determining if soils in any field are saturated or can absorb liquid manure.

<table>
<thead>
<tr>
<th>Surface Texture Class</th>
<th>A</th>
<th>B</th>
<th>Allowable Soil Moisture Description for Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine</td>
<td>&lt; 30%</td>
<td>3000</td>
<td>Easily ribbons out between fingers, has a slick feel.</td>
</tr>
<tr>
<td>Medium</td>
<td>≥ 30%</td>
<td>5000</td>
<td>Forms a ball, is very pliable, slicks readily with clay.</td>
</tr>
<tr>
<td>Coarse</td>
<td></td>
<td>7000</td>
<td>Forms a weak ball, breaks easily.</td>
</tr>
</tbody>
</table>

   A Fine – clay, silty clay, silty clay loam, clay loam
   Medium – sandy clay, sandy clay loam, loam, silt loam, silt
   Coarse – loamy sand, sandy loam, sand. This category also includes peat and muck based on their infiltration capacity

   B Crop residue or vegetative cover on the soil surface after manure application.

   C Soils are saturated **when you can do these actions with a handful of soil** – do not apply in these cases along stream and sensitive areas.
In addition, factors that producers must also take into account include previous manure applications and precipitation events. If the soil is already moist, it can absorb less liquid manure than a dry soil. Remember too that recent manure applications events can seriously inhibit the ability of the soil to absorb additional moisture. This makes pollutants associated with manure highly mobile when any amount of additional precipitation occurs.

2. **What will happen if it rains after application?** Different soils absorb moisture differently—sands much more quickly than clays. The EPA guidance for permitted livestock operations is based on soil hydrologic group. Their guidance suggests that manure, litter, or process wastewater shall not be surface applied when the National Weather Service predicts a 50 percent or more probability of rain in excess of the amount that is reasonably likely to generate runoff, as provided below, within 24 hours of the end of an intended application.

**Minimum Quantity of Rainfall Required to Create Runoff (EPA Guidance)**

<table>
<thead>
<tr>
<th>Hydrologic Soil Group</th>
<th>Quantity of Rainfall (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.0</td>
</tr>
<tr>
<td>B</td>
<td>0.5</td>
</tr>
<tr>
<td>C</td>
<td>0.25</td>
</tr>
<tr>
<td>D</td>
<td>0.25</td>
</tr>
</tbody>
</table>

For Hydrologic Soil Group B soils, you would on the previous page, select the forecast product labeled, “24H Prob.>=0.5in. Different soils react differently based on cropping history, and this map should only be one of many factors you consider. The actual Hydrologic Group for each field (and soil) is available from the NRCS (Natural Resources Conservation Service) soil survey. Talk to the local office or the farmer’s crop consultant for more information.

Soils that become saturated as a result of recent manure applications or precipitation following applications can no longer hold moisture. Manure related pollutants can run off a field either with the manure or along with the precipitation related runoff. Under saturated conditions, pollutants associated with recent applications are also more prone to seep or be “pushed” into drain tiles that can lead directly to streams.

**Summary and Conclusions:**

Given the history of manure-contaminated runoff, it is essential that manure applicators pay attention to both soil conditions and the weather forecast. Using the technological tools available and documenting your actions will reduce the chance of a problem happening, and decrease your liability should one occur.