

# Use of NRCS Soil Database Information in UW Nutrient Application Rate Guidelines (UWEX A2809)



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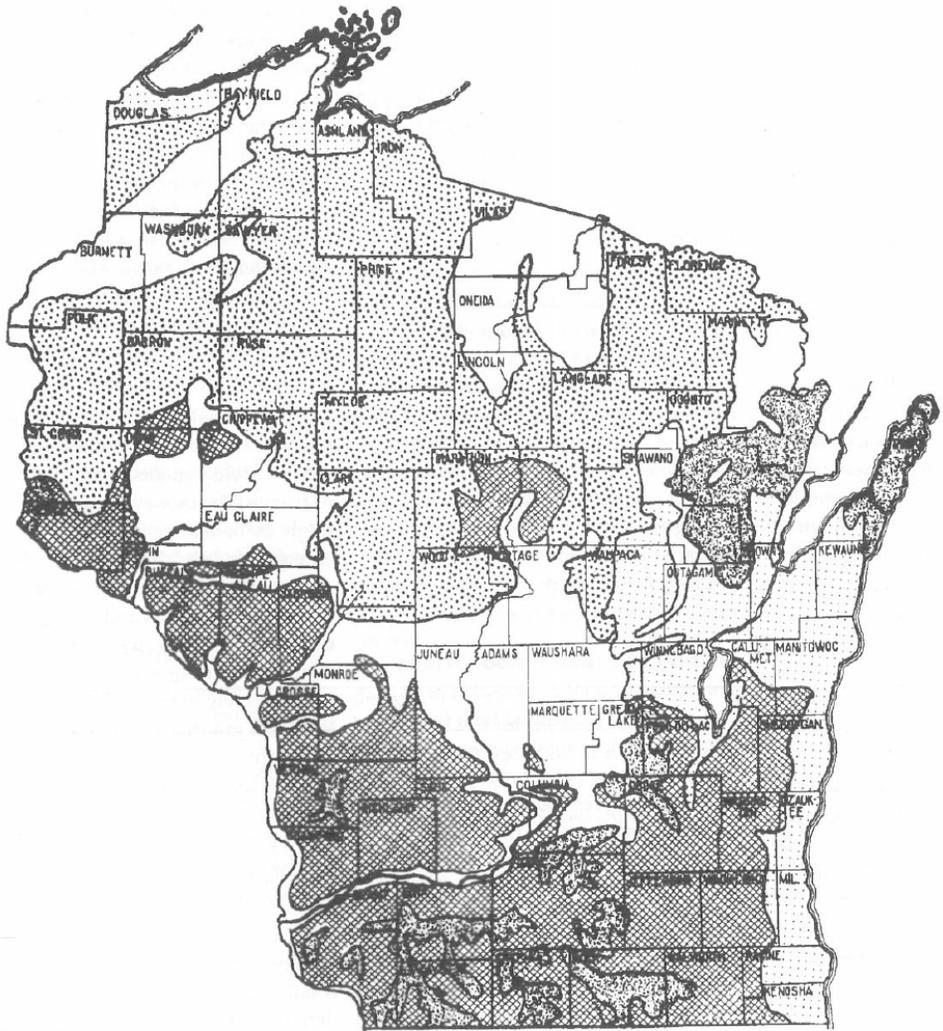


# Prior to December 2012

# Subsoil groups

- Used to determine P & K soil test interpretation categories

**Figure 1.** General subsoil fertility groups, based on available phosphorus and potassium in subsoils



Subsoil group	Legend	Nutrient supplying power <sup>a</sup>	Nutrient buffering capacity <sup>b</sup>	
			P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
A	[Solid black]	P high, K medium	18	7
B	[Dotted]	P medium, K medium	18	7
C	[Horizontal lines]	P low, K high	18	7
D	[Vertical lines]	P medium, K low	18	7
E	[White]	P variable, K low	12	6
O	[White]	P variable, K low	18	5

<sup>a</sup>All data refer to subsoils (8" to 30") only. Low, medium and high ratings are relative and are not defined in absolute units. Adapted from M.T. Beatty and R.B. Corey, 1961.

<sup>b</sup>The soil nutrient buffering capacity is the approximate amount of fertilizer in lb/a (oxide basis) required to change the soil test level (elemental basis) by 1 ppm.

**Table 11.** Criteria for determining the appropriate subsoil group for a soil sample when the soil name is not provided with the sample

Subsoil group	Description	Organic matter (%)	pH	Hues <sup>a</sup> (color)	Location (see map)
A	Southern "forested" medium- and fine-textured soils	≤3.0	<7.5	less pink	southern Wisconsin
B	Southern "prairie" medium- and fine-textured soils	3.1–10.0	<7.5	less pink	southern Wisconsin
C	Red medium- and fine-textured soils	≤10.0	<7.5	more pink	throughout state
D	Northern medium- and fine-textured soils	≤10.0	<7.5	less pink	northern Wisconsin
E	Sandy coarse-textured soils (sands and loamy sands)	≤10.0	all	—	throughout state
O	Organic soils (mucks and peats)	>10.0	all	—	throughout state
X	High pH soils <sup>b</sup>	≤10.0	≥7.5	—	throughout state

<sup>a</sup> Hues are relative to Munsell color 7.5YR.

<sup>b</sup> Used only with phosphorus recommendations for non-irrigated field and fruit crops on soils with pH equal to or greater than 7.5. For all other purposes, if pH is less than 7.5, the appropriate subsoil group is used.

# Soil Yield Potential

- Based on several criteria:
  - Water holding capacity
  - Drainage class
  - Depth to bedrock
  - Growing degree days (frigid soils were medium YP; <2300 GDD)
- Details of the criteria were not documented and archived
  - Memory and word of mouth
  - Howard (NRCS) & Fred Madison

# Beginning December 2012

# Soil Groups

- Organic soils (group O)
  - taxonomic soil order is histosols
- Sandy soils (group S)
  1. the upper 8 inches has a weighted average sand content greater than or equal to 75%,
  2. the subgroup or great group contains “Psam” and the weighted average sand content in the upper 8 inches is 65% or more, or
  3. the taxonomic particle size class matches sandy, and the weighted average sand content in the upper 8 inches is 65% or more
  - In general, group S soils have a sand or loamy sand texture
- Loamy soils (group L)
  - If a soil is not group S or O, then it is group L
  - medium- to fine-textured, sandy loam or finer textured soils

# Soil yield potential (YP)

- Soil YP is a relative ranking of a soil's ability to produce high corn yields along with the responsiveness of corn yield to nitrogen (N) fertilizer
- All sandy soils are low (sandy YP)
- Organic soils
  - High YP, if mesic
  - Medium YP, if frigid

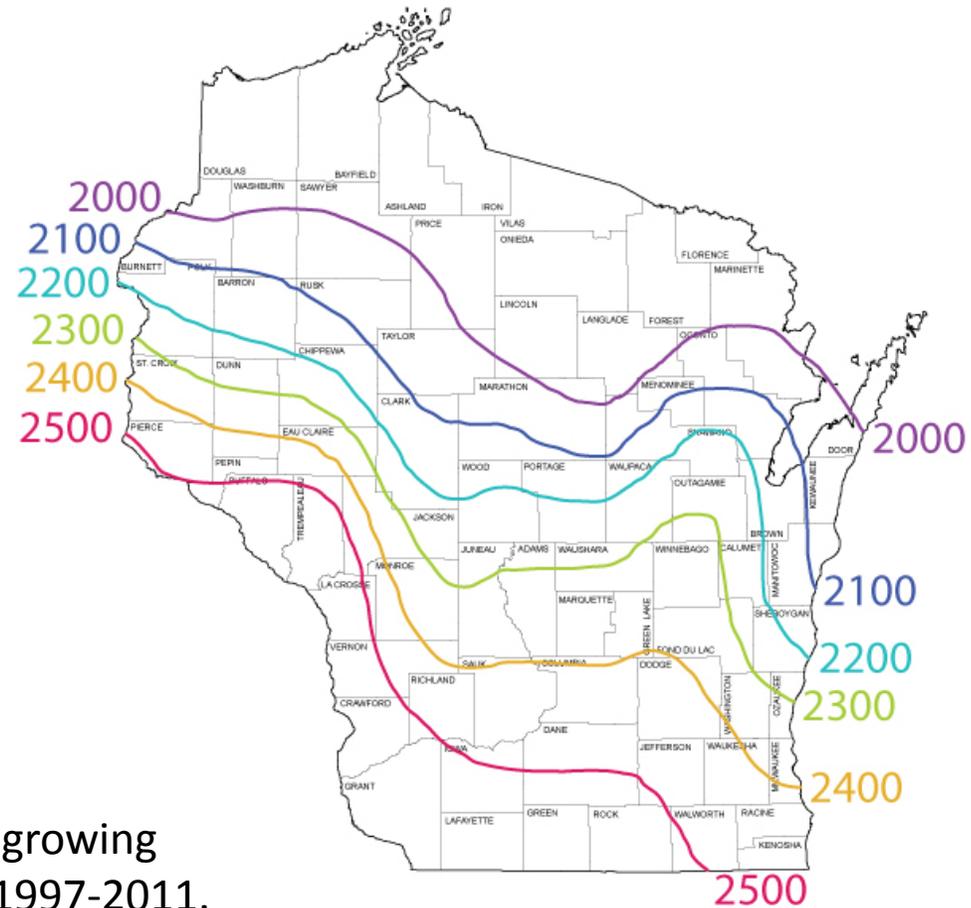
# Soil yield potential (YP)

- Loamy soils are medium or high YP
  - Defined by soil properties
  - If at least one of the properties is limiting then the soil is medium YP

Soil Property	Interpretation that limits YP to medium
Drainage class	excessively drained somewhat excessively drained poorly drained very poorly drained
Available water in the top 60" of soil	Very low (< 3 inches) and low (3–6 inches)
Depth to bedrock (lithic contact)	<30"

# Additional criteria for loamy soil YP

- If a soil's location has, on average, <2100 GDD, it should be considered medium YP regardless of soil property limitations

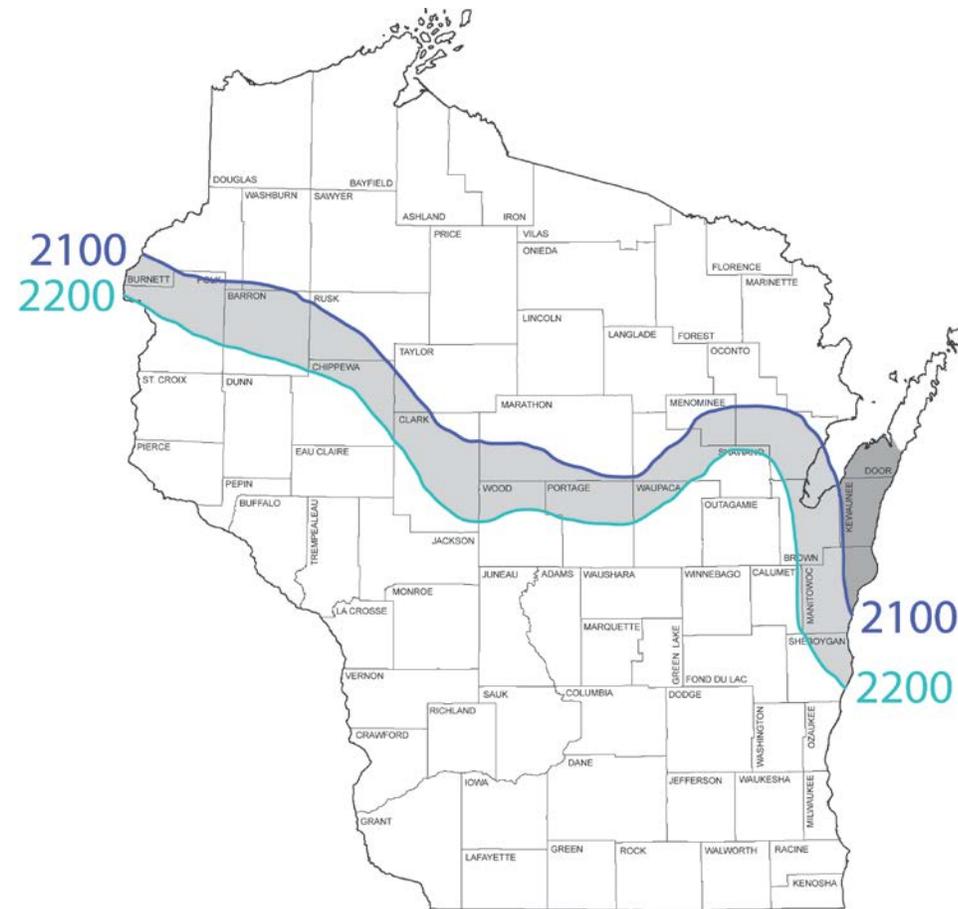


Average accumulated (May 1 to Sept. 30) growing degree day (GDD) isolines for Wisconsin, 1997-2011.

[http://www.soils.wisc.edu/uwex\\_agwx/thermal\\_models](http://www.soils.wisc.edu/uwex_agwx/thermal_models)

# Additional criteria for loamy soil YP

- Soils with no soil property limitations on yield potential are in a transition area if:
  1. 2100 to 2200 GDD; or
  2. <2100 GDD and a mesic temperature regime are in a transition area
- In the transition area, growers and agronomists should choose the most appropriate YP based upon experience

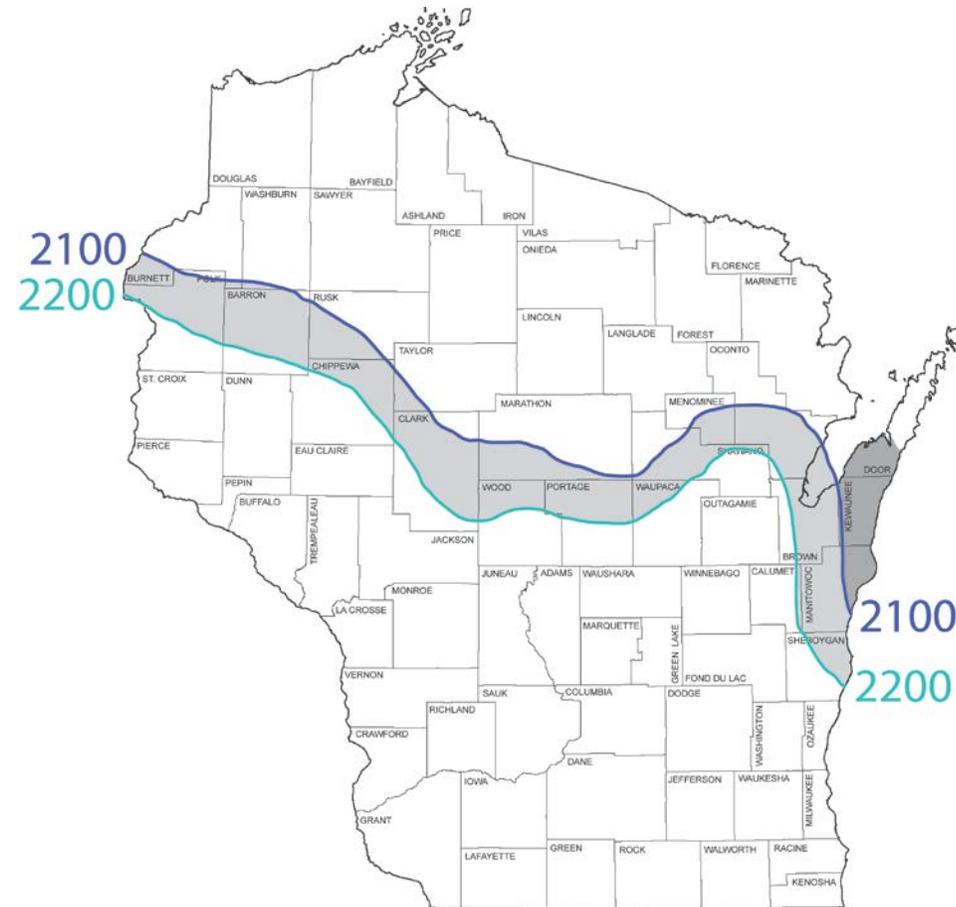


# Additional criteria for loamy soil YP

- Medium YP loamy soils that have >2200 GDD or are in a transition area can be considered high YP if,
  - Irrigated
  - Artificially drained (e.g., tilled)
- If loamy soils are limited by shallow depth to bedrock and field evaluation demonstrates that there is more than 30” of soil over bedrock throughout a majority of the field,
  - then the soil can be considered high YP

# All High YP soils in the following counties will be Medium YP in SnapPlus

- Ashland
- Bayfield
- Burnett
- Douglas
- Florence
- Forest
- Iron
- Langlade
- Lincoln
- Marinette
- Oneida
- Price
- Sawyer
- Vilas
- Washburn



# Soil map units

- Each map unit was evaluated for soil group and YP
- Not all map units within a soil series interpret the same
  - The interpretation of the majority of the map units is presented in A2809 and is acceptable for obtaining a nutrient recommendation
  - For more site specific recommendations use the interpretation for individual map units
    - Will be in SnapPlus and
    - <http://uwlab.soils.wisc.edu/a2809-soil-map-unit-info/>

# Examples

	Soil Group	Soil YP	Drainage class	AWC	Bedrock depth	Soil temp. regime
<b>Dodgeville*</b>	<b>L</b>	<b>M</b>	<b>W</b>	<b>L</b>	<b>.</b>	<b>M</b>
DgB	L	M	W	L	.	M
DgB2	L	M	W	L	.	M
DgC2	L	M	W	L	.	M
DgD2	L	M	W	L	.	M
DgE2	L	M	W	L	.	M
DhA	L	H	W	M	.	M
DhB	L	H	W	M	.	M
DhB2	L	H	W	M	.	M
DhC2	L	H	W	M	.	M
DhD2	L	H	W	M	.	M
DIB2	L	M	W	L	S	M
DIC2	L	M	W	L	S	M
DID2	L	M	W	L	S	M
DmB2	L	M	W	L	.	M
DmC2	L	M	W	L	.	M
DmD2	L	M	W	L	.	M
DnB2	L	H	W	M	.	M
DnC2	L	H	W	M	.	M
DnD2	L	H	W	M	.	M

Different Soil YP results in different suggested corn N rates

19 of 23 map units for Dodgeville soil series in Iowa Co.  
 Total # of Dodgeville map units statewide = 48

	Soil Group	Soil YP	Drainage class	AWC	Bedrock depth	Soil temp. regime
<b>Delton*</b>	<b>S</b>	<b>S</b>	<b>W</b>	<b>M</b>	.	<b>M</b>
DeA	S	S	W	M	.	M
DeB	S	S	W	M	.	M
DeC	S	S	W	M	.	M
DsA	S	S	W	L	.	M
DeB	S	S	MW	M	.	M
DeC2	S	S	W	M	.	M
DeB	S	S	W	M	.	M
DfA	L	H	W	M	.	M
DfB	L	H	W	M	.	M
DfC2	L	H	W	M	.	M

- For this soil, the difference in soil group between map units results in:
  - Different P and K interpretation categories
  - Corn N rate guidelines

**Table 6.1.** Suggested nitrogen (N) application rates for corn at different nitrogen:corn grain price ratios.

	Nitrogen:Corn price ratio			
	0.05	0.10	0.15	0.20
Soil and previous crop	----- total lb N/a to apply <sup>a</sup> -----			
<b>Loamy: high yield potential soil</b>				
Corn, forage legumes, legume vegetables, green manures <sup>d</sup>	<b>190<sup>b</sup></b> 170-----210 <sup>c</sup>	<b>165</b> 155-----180	<b>150</b> 140-----160	<b>135</b> 125-----150
Soybean, small grains <sup>e</sup>	<b>140</b> 125-----160	<b>120</b> 105-----130	<b>105</b> 95-----115	<b>90</b> 80-----105
<b>Loamy: medium yield potential soil</b>				
Corn, forage legumes, legume vegetables, green manures <sup>d</sup>	<b>145</b> 130-----160	<b>125</b> 115-----140	<b>115</b> 105-----125	<b>105</b> 95-----110
Soybean, small grains <sup>e</sup>	<b>130</b> 110-----150	<b>100</b> 85-----120	<b>85</b> 70-----95	<b>70</b> 60-----80
<b>Sands/ loamy sands</b>				
Irrigated—all crops <sup>d</sup>	<b>215</b> 200-----230	<b>200</b> 185-----210	<b>185</b> 175-----195	<b>175</b> 165-----185
Non-irrigated—all crops <sup>d</sup>	<b>140</b> 130-----150	<b>130</b> 120-----140	<b>120</b> 110-----130	<b>110</b> 100-----120

<sup>a</sup> Includes N in starter.

<sup>b</sup> Rate is the N rate that provides the maximum return to nitrogen (MRTN).

<sup>c</sup> Range is the range of profitable N rates that provide an economic return to N within \$1/a of the MRTN rate.

<sup>d</sup> Subtract N credits for forage legumes, legume vegetables, animal manures, and green manures. This includes first-, second-, and third-year credits where applicable. Do not subtract N credits for leguminous vegetables on sand and loamy sand soils.

<sup>e</sup> Subtract N credits for animal manures and second-year forage legumes.

**Table 7.1.** Soil test phosphorus (P) interpretation categories. Choose the highest demanding crop in your rotation to set the soil test interpretation categories for the rotation. If the desired crop is not listed on the table, consult Table 4.2 to determine its demand level.

Soil group <sup>a</sup>	Soil test category				
	Very low (VL)	Low (L)	Optimum (O)	High (H)	Excessively high (EH)
-----soil test P ppm <sup>b</sup> -----					
Demand level 1: corn grain, soybean, clover, small grains (but not wheat), grasses, oilseed crops, pasture					
Loamy	< 10	10–15	16–20	21–30	> 30
Sandy, Organic	< 12	12–22	23–32	33–42	> 42
Demand level 2: alfalfa, corn silage, wheat, beans, sweet corn, peas, fruits					
Loamy	< 12	12–17	18–25	26–35	> 35
Sandy, Organic	< 18	18–25	26–37	38–55	> 55
Demand level 3: tomato, pepper, brassicas, leafy greens, root, vine, and truck crops					
Loamy	< 15	15–30	31–45	46–75	> 75
Sandy, Organic	< 18	18–35	36–50	51–80	> 80
Demand level 4: potato					
Loamy	< 100	100–160	161–200	> 200	
Sandy, Organic	< 30	30–60	61–90	91–120	> 120

<sup>a</sup> See Chapter 4: Soil and crop information for more details on soil groups.

<sup>b</sup> ppm (wt/vol; g/m<sup>3</sup>)