



MN Wetland Professional Certification Program Regional Training



m BOARD OF WATER AND SOIL RESOURCES

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2023 MWPCP Schedule

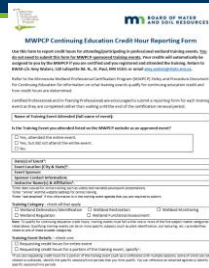
- WCA Regulatory Training- St Cloud MNDOT Training Facility- April 20
- Regional Training: Rochester - May 16-17
- Wetland Delineation and Regulation Basic Class: Arden Hills- June 12-16
- Floristic Quality Assessment (FQA)- MNDOT Shoreview Training Center – June 20
- Basic Wetland Plant ID- Farmington (July 18) or Brainerd (July 20)
- Wetland Delineation Refresher- Prairie Woods ELC- Spicer- August 8
- Regional Training: Fergus Falls – August 15-16
- Wetland Delineation and Regulation Basic Class: Brainerd - September 11-15



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End of the current renewal period

- Current certification renewal period ends on December 31, 2023 for all who transferred to the MWPCP from the U of MN Wetland Delineation Certification Program.
- Credit reporting deadline for this renewal period is January 1, 2024.
- Submit the [Credit Hour Reporting Form](#) with proof of attendance no later than January 1, 2024.
- Not required to submit a credit hour reporting form for MWPCP courses.
- COVID-related [temporary continuing education policies](#) will lapse at the end of 2023.



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Next renewal period

- The next credit renewal period begins January 1, 2024 and ends on December 31, 2026.
- [MWPCP Continuing Education policy](#) requires 18 credit hours of MWPCP-approved training.
- Six of those may be online training.



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MWPCP Regional Training- Fergus Falls

Day One:


- NRCS Wetland Determinations
- Special Considerations
- Restorations Orders
- Lunch
- Ag Bank Case Studies
- De minimis
- Group Delineation Review

Day Two:


- Ecologic provinces of Otter Tail County
- Common Soil & Hydrology Indicators
- Soil Profile description exercise
- Lunch
- Chapter 5 or drainage exercises
- Antecedent Precipitation Tool
- Field exercise- small group delineation exercise

Class Portal: <https://bwsr.state.mn.us/node/4681>

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Ecologic Provinces of Otter Tail County

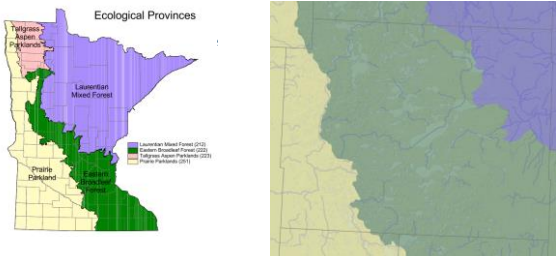


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BWSR Wetland Section | www.state.mn.us/wetlands

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Ecologic Provinces of Otter Tail County



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Land Resource Regions



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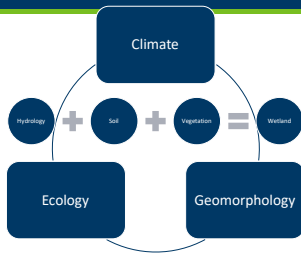
Reading a Hydroscape: Factors & Parameters

Factors:

- Climate
- Ecology
- Geomorphology

Parameters:

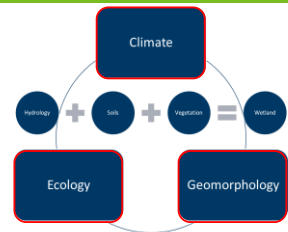
- Hydrology
- Soil
- Plant Communities



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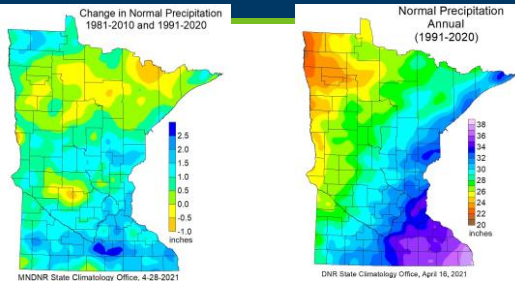
Factors

- Overarching factors that determine much of the condition of an area
- Examples:
 - Climate determines antecedent precipitation
 - Ecology determines dominant plant communities
 - Geomorphology determines landscapes and soil parent material



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Climate- long term weather pattern of an area

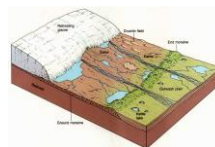


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Geomorphology


Study of physical features on the surface of the earth and their relation to its geologic structures

glacial geology of MN




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Glacial Geology of MN



Glaciation of the Quaternary period (oldest to youngest):

- Nebraskan
- Kansan
- Illinoian
- Wisconsin
 - Wadena lobe
 - Rainy-Superior lobe
 - Des Moines lobe



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Glacial Geology of MN

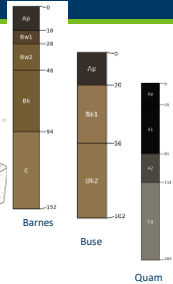



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Soils of the Region

- Parent material- variable: ground moraines, end moraines, till plains, lake plains, outwash
- loam- dark, well drained
- Till thickness dependent on landscape position

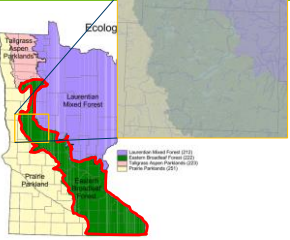




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Eastern Broadleaf Forest Province

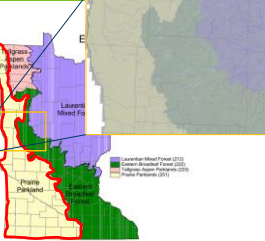
- Large province- Almost 12 million acres across MN, IA, WI, OH, NY, IL, IN, KT, MS, AR
- Transition between semi-arid prairie and semi-humid mixed forest of SE/NE
 - Prairie species meet eastern ranges
 - Forest species meet western ranges
- Landforms largely glacial deposits and recent erosion
- Precipitation approximately equals evapotranspiration
- Avg Precipitation 24-35 inches
- Avg temperatures 38-46 F



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Prairie Parkland Province

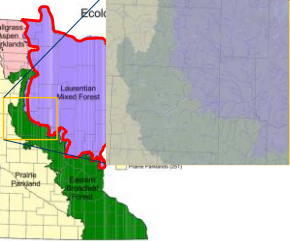
- In MN covers over 16 million acres
- Historically tallgrass prairie
- Evapotranspiration greater than precipitation
- Heavily glaciated including multiple advances during Wisconsin glaciation
- Des Moines lobe fronted by largest proglacial lake in North America- Glacial Lake Agassiz
- Glacial river Warren outlet south end of Agassiz and eroded much of current MN River valley



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Laurentian Mixed Forest Province

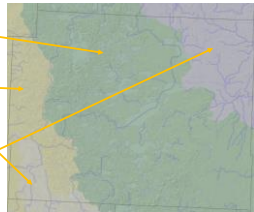
- Covers MN, WI, MI, southern Ontario and parts of New England
- In MN covers 23 million acres
- Mixed conifer and hardwood forests
- Varies from thin glacial deposits over bedrock, deep glacial till, thick peatlands
- Precipitation increases SW-NE
- Temperature decreases SW-NE
- Vegetation changes accordingly



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Ecologic Sections of Otter Tail County

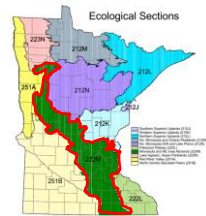
- Eastern Broadleaf Forest Province
 - MN & NE Iowa Morainal Section
- Prairie Parkland Province
 - Red River Valley Section
 - North Central Glaciated Plains Section
- Laurentian Mixed Forest Province
 - Northern MN Drift and Lake Plains Section



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Eastern Broadleaf- MN Morainal Section

- Deciduous forests and prairie from Polk County to Iowa
- Glacial moraines deposited along eastern edge of Des Moines lobe
- Sand plains- including the Anoka- formed from sand deposited from melt water
- Historically varied plant communities based on topography, tolerance to moisture and fires
- Mesic forests found on fine textured soils on moraines
- Oak Savanna and aspen woodlands in sand plains
- Floodplain terrace forests along the Mississippi, Minnesota and St Croix rivers
- Sedge meadows found in former lake beds



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Prairie Parkland- Red River Valley Section

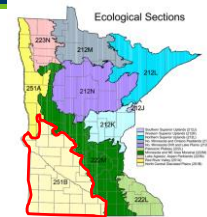
- Uniform basin of Glacial Lake Agassiz
- Flattest region of MN
- Drained by Red River flowing north
- Poorly drained silt and clay soils
- Beach ridges indicated former shorelines
- Prairie species dominate
- Hardwood forests found in river valleys and on moraines along eastern edge
- Marsh and wet meadow complexes found in river bottoms and shallow depressions



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Prairie Parkland- North Central Glaciated Plains Section

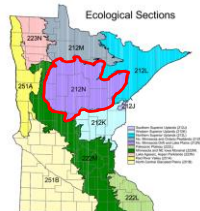
- Rolling glacial till from Des Moines lobe
- Moraines, lakes plains and outwash plains
- Minnesota River valley bisects the section
- Historically upland prairie fire-dependent communities
- Prairie potholes shallow marsh and wet meadow wetlands



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Northern MN Drift and Lake Plains Section

- Complex surficial geology formed by multiple glacial advances
- Moraines, outwash plains, lake plains, drumlin fields
- Headwaters of the Mississippi River
- Glacial lakes Upham and Aitkin found in east
- Vegetation distribution varies with landforms:
 - Historically jack and red pine fire dependent forests
 - Sugar maple, basswood, aspen, red oak along moraines
 - Peatland black spruce and black ash swamps



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Ecologic Subsections of Otter Tail County

- Eastern Broadleaf Forest Province
 - MN & NE Iowa Morainal Section
 - Hardwood Hills Subsection
- Prairie Parkland Province
 - Red River Valley Section
 - Red River Prairie Subsection
 - North Central Glaciated Plains Section
 - MN River Prairie Subsection
- Laurentian Mixed Forest Province
 - Northern MN Drift and Lake Plains Section
 - Pine Moraines and Outwash Plains Subsection



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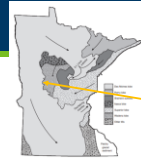
Hardwood Hills Subsection

- Eastern Broadleaf Forest Province
 - MN & NE Iowa Morainal Section
- Alexandria moraine along the sub continental divide is headwaters to many rivers
 - Chippewa, Long Prairie, Sauk and Crow Wing Rivers
 - Mississippi River forms portion of east
- Landforms- Alexandria moraine west and south, end moraines, outwash plains
- Topography- steep slopes, hills and lakes along glacial terminal moraines
- Geology- 100-500 ft glacial till, Precambrian granite exposed along Crow River
- Soil- loamy sands/sandy loams on outwash plains, loams to clay loams on moraines
- Pre-settlement Vegetation- maple-basswood with oak savannas
- Present Land Use- agriculture, tourism



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Hardwood Hills Subsection



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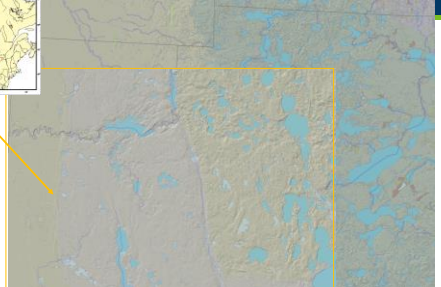
Red River Prairie Subsection

- Prairie Parkland Province
 - Red River Valley Section
- Glacial Lake Agassiz basin
- Red River of the north flowing north
 - Flooding is common as frozen conditions to north backs up water over level areas
- Landforms- glacial lake plain
- Topography- level to gently rolling
- Geology- 200-400 ft glacial till over Precambrian bedrock in the east, west underlain by Cretaceous sedimentary rock.
- Soil- lacustrine clays, silts and sands
- Pre-settlement Vegetation- tallgrass prairie and wet prairie
- Present Land Use- agriculture, extensive ditching



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Red River Prairie Subsection



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MN River Prairie Subsection

- Prairie Parkland Province
 - North Central Glaciated Plains Section
- MN River bisects the subsection in half. Valley was formed by glacial lake Warren draining Lake Agassiz
- Shallow, perched lakes common
- Many drained prairie pothole wetlands
- Landforms- large till plains along the MN River, series of end moraines form east boundary, lake plains
- Topography- level to gently rolling along moraines, steeper along MN River and the Big Stone moraine
- Geology- 100-400 ft glacial till over Cretaceous sedimentary. Large area of granite near Ortonville scoured by Glacial River Warren
- Soil - well to moderately well drained loamy soils with some clay/sand/gravel inclusions
- Pre-settlement Vegetation- tallgrass prairie and wet prairie. Silver maple, elm, cottonwood along floodplains
- Present Land Use- Agriculture, remnants of tallgrass prairie



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MN River Prairie Subsection



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Pine Moraines and Outwash Plains Subsection

- Laurentian Mixed Forest Province
 - Northern MN Drift and Lake Plains Section
- Headwaters of the Mississippi River
 - Kettle lakes common in outwash plains and stagnation moraines
 - Pine and Crow Wing Rivers
- Landforms- Itasca moraine north boundary, Alexandria moraine west, Rainy lobe ground and end moraines east
- Topography- moraines, outwash plains and drumlin fields, lakes within moraines
- Geology- thick glacial till (200-600 ft) over Precambrian bedrock
- Soil- course textured sand and sandy loams
- Pre-settlement Vegetation- jack pine and northern pin oak
- Present Land Use- forest management, agriculture (west) and tourism



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Pine Moraines and Outwash Plains Subsection



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Hydrology Indicators



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Wetland Hydrology

1987 Corps Manual: *"The sum total of wetness characteristics in areas that are inundated or have saturated soils for a sufficient duration to support hydrophytic vegetation."*

Regional Supplements: *"Wetland hydrology indicators are used in combination with hydric soil and hydrophytic vegetation to determine whether an area is wetland under the Corps manual."*



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Hydrology Technical Standard

..."inundated or saturated by surface or ground water at a frequency and duration"

Technical standard if hydrology indicators not observed:

- 14 or more consecutive days of flooding or ponding;
- Water table 12 in. or less below soil surface;



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Hydrology Indicators

Evidence that there is continuing hydrology and confirms that an episode of inundation/saturation occurred recently.

Wetland hydrology indicators are divided into two categories:

- Primary** – provide stand-alone evidence of a current or recent hydrologic event; and
- Secondary** – provide evidence of recent hydrology when supported by one or more other hydrology indicators.



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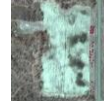
Hydrology Indicator Groups



Group A – direct observation of water



Group B – evidence of flooding/ponding



Group C – evidence of current or recent saturation.



Group D – Landscape and veg. characteristics that indicate contemporary wetland conditions.

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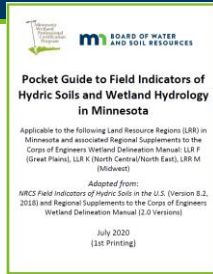
Land Resource Regions

Regions dictate which indicators are used and how they are used



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Flipbook



B15. Marl Deposits: Presence of marl (calcium carbonate precipitated from standing or flowing water through the action of algae or diatoms) as a tan or whitish deposit on the soil surface.
Primary Indicator.

North Central/North East Supplement (LRR K) only

B16. Moss Trim Lines: The presence (on trees or other upright objects) of an abrupt trim line below which water-intolerant mosses have been killed by prolonged inundation in a seasonally inundated area.
Secondary Indicator. Does not include lichen trim lines or trim lines caused by ice scour or abrasion, indicated by bark or tissue damage.

North Central/North East Supplement (LRR K) only

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A2: High water table

Category: Primary

Water table 12 in. (30 cm) or less below the surface in a soil pit, auger hole, or shallow monitoring well.



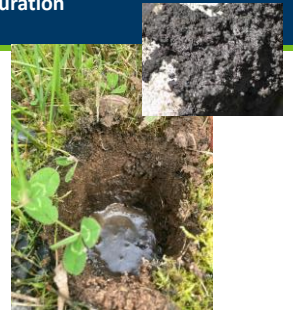
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A3: Saturation

Category: Primary

Visual observation of saturated soil conditions 12 in. or less from the soil surface as indicated by water **glistening** on the surfaces and broken interior faces of soil samples.

*Must be associated with a water table immediately below the saturated zone except when zone of saturation is above a relatively impermeable layer of soil or bedrock ≤ 12 inches of the soil surface.

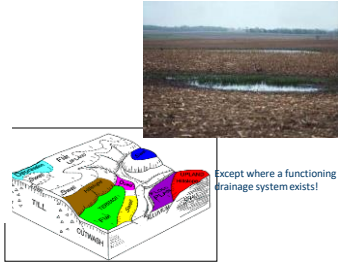


42

D2: Geomorphic position

Category: Secondary

This indicator is present if the area in question is located in a **localized depression**, linear drainageway, concave position within a floodplain, at the toe of a slope, on the low-elevation fringe of a pond or other water body, or in an area where groundwater discharges.



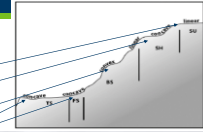
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Reading a landscape

What do we mean "reading" the landscape?

Landscape position:

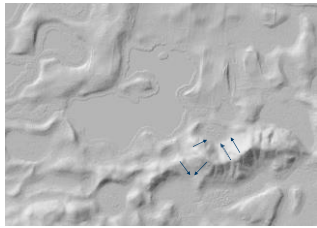
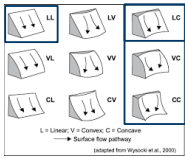
- Summit
- Shoulder
- Backslope
- Foot slope
- Toe slope



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Surface shape

- Convex- surface curves outward
- Concave- surface curves inward
- Linear- flat, one-dimensional surface



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B8: Sparsely vegetated concave surface

Category: Primary. (Secondary in LRR F)

On concave land surfaces, the ground surface is either unvegetated or sparsely vegetated due to long-duration ponding during the growing season.

Sparsely vegetated concave surfaces should contrast with vegetated slopes and convex surfaces in the same area. Less than 5% ground cover.



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B6: Surface soil cracks

Category: Secondary

Water destroys the soil structure which facilitates the cracking. Surface soil cracks consist of shallow cracks that form when fine-grained mineral or organic sediments dry and shrink

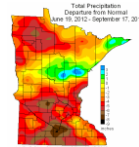


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C2: Dry season water table

Category: Primary (GP) Secondary (NCNE/M)

Visual observation of the water table between 12 and 24 in. (30 and 60 cm) below the surface during the normal dry season or during a drier-than-normal year.



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B2: Sediment Deposits

Category: Primary

Sediment deposits are thin layers or coatings of fine-grained mineral material or organic matter remaining on tree bark, plant stems or leaves, rocks, and other objects after surface water recedes



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D5: FAC – neutral test

Category: Secondary

The plant community passes the FAC-neutral test:

1. Compile list of dominant plant species across all strata
2. Drop any with FAC
3. >50 % of remaining dominant species are FACW and/or OBL

If it's an equal number of each, then use non-dominant

*This indicator uses the longer term nature of plants

Herb stratum	(Plot size: _____)	#	% Total Cover	
1	<i>Andropogon gerardii</i>	40	Y	FAC
2	<i>Solidago gigantea</i>	12	Y	FACW
3	<i>Bromus inermis</i>	18	N	FACU
4	<i>Sonchus oleraceus</i>	10	N	FACU
5	<i>Cirsium arvense</i>	8	N	FACU
6	<i>Phalaris arundinacea</i>	5	N	FACU
7	<i>Melilotus officinalis</i>	5	N	FACU
8				
9				

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Indicator D7: Frost-heave hummocks

Category: Secondary

This indicator consists of hummock microtopography produced by frost action in saturated wetland soils.



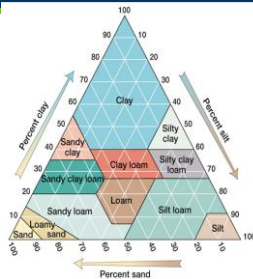
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Hydric Soil Indicators

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Field Indicator Organization- Texture

- Use regardless of texture(s)
 - All Mineral
 - All Organic
- Typically, organic matter influences near the surface
- Includes smell
 - Rotten egg

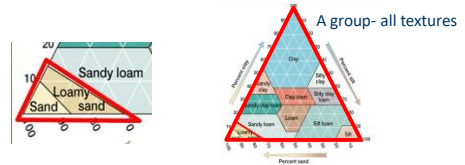


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Soil Indicator Groups- Texture

- Sandy Soil Indicators (S):
- Use when texture is:
 - Loamy Fine Sand or coarser

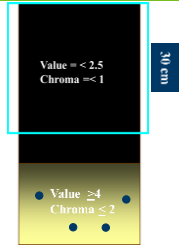
- Fine Grained Soil Indicators (F):
- Use when texture is:
 - Loamy Very Fine Sand or finer



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Diagnostic Zones

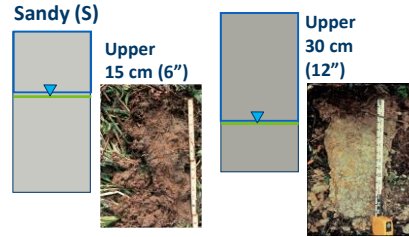
- Layers with :
 - Certain Colors
 - high value and low chroma
 - redoximorphic features
 - organic matter accumulations
- Specific Depths from Surface
- Thickness requirements



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Diagnostic Zones for S and F indicator groups

Loamy / Clayey (F)



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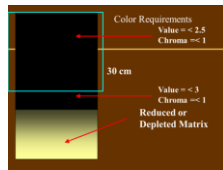
A12- Thick Dark Surface

- Applicable land resource regions (LRR)
 - Use in all LRRs
- User notes
 - Most often associated with overthickened soils in concave landscape positions.



A12—Thick Dark Surface. For use in all LRRs. Observation is needed to determine whether a soil meets the requirements of this indicator to the full depth of the horizon shown.

A12—Thick Dark Surface. For use in all LRRs. A layer at least 10 cm (4 inches) thick with a depleted or glewed matrix that has 60 percent or more chroma of 2 or less starting 20 cm (8 inches) of the surface. This horizon above the depleted or glewed matrix and starting at a depth of 10 cm (4 inches) from the soil surface must have value of 4.5 or less and



chroma of 1 or less to a depth of at least 20 cm (8 inches) and value of 5 or less and chroma of 4 or less in any remaining layers above the depleted or glewed matrix. In any sandy material above the depleted or glewed matrix, at least 70 percent of the visible soil particles must be masked with organic material. Viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear to be close to 100 percent masked.

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Problematic Hydric Soils

- Covered in Chapter 5 of the regional supplements
- Problematic hydric soils are the norm in some landscapes
 - Red Parent Material (*inhibited, or difficult to see redox features*)
 - Active floodplains (*deposition of new material*)
 - Drained systems (*relict hydric indicators*)
 - High Value (*bright*) / Low Chroma (*grey*),
 - Thick prairie soils
 - Sandy soils



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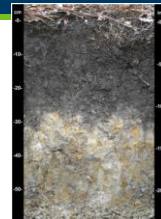
Procedure for Determining Problematic Soil

- Determine whether hydrophytic vegetation is present (or problematic) & hydrology indicators are present
- Describe the soil profile
- Interpret whether landscape position has potential to concentrate water
- Use one or more of the following approaches:
 - apply indicators common to problem soils (thin muck, dark surface, poly value)
 - Determine whether problematic soil situations are present (examples previously listed)
 - Soil changes when exposed to air
 - Hydrology monitoring

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A11- Depleted Below Dark Surface

- Applicable land resource regions (LRR)
 - Use in all MN LRRs



A11—Depleted Below Dark Surface. For use in all LRRs, except for W, X, and Y for testing in LRRs W, X, and Y. A layer with a depleted or glewed matrix that has 60 percent or more chroma of 2 or less starting at a depth 20 cm (8 inches) from the soil surface and having a minimum thickness of either: a. 10 cm (4 inches), or b. 5 cm (2 inches) if the 5 cm consists of fragmental soil material. Organic, hoary, or clayey layer(s) above the depleted or glewed matrix must have value of 5 or less and chroma of 2 or less starting at a depth of 10 cm (4 inches) from the soil surface and extend to the depleted or glewed matrix. Any sandy material above the depleted or glewed matrix must have value of 3 or less and chroma of 1 or less starting at a depth of 10 cm (4 inches) from the soil surface and extend to the depleted or glewed matrix. Viewed through a 10x or 15x hand lens, at least 70 percent of the visible sand particles must be masked with organic material. Observed without a hand lens, the sand particles appear to be close to 100 percent masked.

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F6- Redox Dark Surface

- Applicable land resource regions (LRR)
 - Use in all LRRs

F6—Redox Dark Surface. For use in all LRRs, except W, X, and Y, for testing in LRRs W, X, and Y. A layer that is at least 10 cm (4 inches) thick, starting at a depth ≤ 20 cm (8 inches) from the mineral soil surface, and has:

- Matrix value of 3 or less and chroma of 1 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings, or
- Matrix value of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

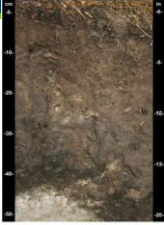


Figure 16—Indicators F6 (Redox Dark Surface) and F7 (Depleted Dark Surface). A soil that meets the requirements of indicator F7 (chroma) also meets the requirements of indicator F6. If the dark surface layer has depletions, it most likely also has concentrations.

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F7- Depleted Dark Surface

- Applicable land resource regions (LRR)
 - Use in all LRRs
 - User notes
 - Careful to not mistake an E horizon for depletions!

F7—Depleted Dark Surface. For use in all LRRs, except W, X, and Y, for testing in LRRs W, X, and Y. Redox depletions with value of 5 or more and chroma of 2 or less in a layer that is at least 10 cm (4 inches) thick, starting at a depth ≤ 20 cm (8 inches) from the mineral soil surface, and has:

- Matrix value of 5 or less and chroma of 1 or less and 10 percent or more redox depletions, or
- Matrix value of 9 or less and chroma of 2 or less and 20 percent or more redox depletions.

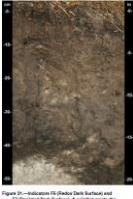


Figure 17—Indicators F6 (Redox Dark Surface) and F7 (Depleted Dark Surface). A soil that meets the requirements of indicator F7 (chroma) also meets the requirements of indicator F6. If the dark surface layer has depletions, it most likely also has concentrations.

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A1- Histosol

- A1. Histosol:** Classifies as a Histosol. A Histosol has a layer of organic matter accumulation of ≥ 16 inches in the upper 32 inches of soil material.
- Use in all LRRs

A1—Histosol (for use in all LRRs) or Histel (for use in LRRs with permafrost). Classifies as a Histosol (except Folist) or as a Histel (except Folist).

User Notes: In a Histosol, typically 40 cm (16 inches) or more of the upper 80 cm (32 inches) is organic soil material (fig. 7). Organic soil materials have organic carbon contents (by weight) of 12 to 18 percent or more, depending on the clay content of the soil. These materials include muck (sapric soil material), mucky peat (hemic soil material), and peat (fibric soil material). See Keys to Soil Taxonomy (Soil Survey Staff, 2014) for a complete definition.

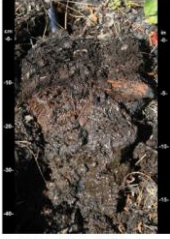


Figure 7—Histosol A1 (Histosol or Histel). This soil has more than 40 cm (16 inches) of organic material, starting at the soil surface.

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A2- Histic Epipedon

Histic epipedon- saturated, organic horizons 8 inches or more thick in the upper part

- Applicable land resource regions (LRR)
 - Use in all LRRs

A2—Histic Epipedon. For use in all LRRs. A histic epipedon underlain by mineral soil material with chroma of 2 or less.

User Notes: Most histic epipedons are surface horizons 20 cm (8 inches) or more thick of organic soil material (fig. 8). Aquic conditions or artificial drainage is required. See Keys to Soil Taxonomy (Soil Survey Staff, 2014) for a complete definition.




Figure 8—Indicators A2 (Histic Epipedon) and A3 (Black Histic). This soil meets the depth criteria of A2 and the color and depth criteria of A3. The black color, a requirement of A3, results from the accumulation of organic matter when the soil is saturated and anaerobic.

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A3- Black Histic

- A layer of peat, mucky peat, or muck 8 in or more thick that starts at a depth of ≤ 6 in from the soil surface; has hue of 10YR or yellow, value of 3 or less, and chroma of 1 or less; and is underlain by mineral soil material with chroma of 2 or less.
- Applicable land resource regions (LRR)
 - Use in all LRRs

A3—Black Histic. For use in all LRRs. A layer of peat, mucky peat, or muck 20 cm (8 inches) or more thick that starts at a depth of ≤ 15 cm (6 inches) from the soil surface, has hue of 10YR or yellow, value of 3 or less, and chroma of 1 or less, and is underlain by mineral soil material with chroma of 2 or less.

User Notes: Unlike indicator A2, this indicator does not require proof of aquic conditions or artificial drainage (fig. 6).

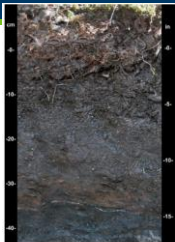


Figure 6—Indicators A2 (Histic Epipedon) and A3 (Black Histic). This soil meets the color criteria of A2 and the color and depth criteria of A3. The black color, a requirement of A3, results from the accumulation of organic matter when the soil is saturated and anaerobic.

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S5- Sandy Redox

- Applicable land resource regions (LRR)
 - Use in all LRRs

S5—Sandy Redox. For use in all LRRs, except for Q, V, W, X, and Y. A layer starting at a depth ≤ 15 cm (6 inches) from the soil surface that is at least 10 cm (4 inches) thick and has a matrix with 60 percent or more chroma of 2 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings.

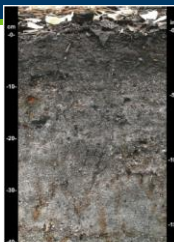


Figure 22—Indicator S5 (Sandy Redox). This soil meets the requirements of indicator S5, having a matrix chroma of 2 or less and at least 2 percent redox concentrations starting at a depth of about 15 cm.

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Sandy mucky mineral & mucky peat

S1—Sandy Mucky Mineral. For use in all LRRs except for T, U, W, X, Y, and Z, and portions of LRR P outside of M&A 126. A layer of mucky modified sandy soil material 5 cm (2 inches) or more thick starting at a depth 2.5 cm (1 inch) from the soil surface.

User Notes: "Mucky" is a USDA texture modifier for mineral soils. The content of organic carbon is at least 5 percent and ranges to as high as 14 percent for sandy soils. The percent required depends on the clay content of the soil; the higher the clay content, the higher the content of organic carbon required. For example, a mucky fine sandy soil contains between 5 and 12 percent organic carbon.

S3—5 cm Mucky Peat or Peat. For use in LRRs F and M for feeing in LRRs K, L, and R. A layer of mucky peat or peat 5 cm (2 inches) or more thick with value of 3 or less and chroma of 2 or less, starting at a depth 2.5 cm (1 inch) from the soil surface, and underlain by sandy soil material.

User Notes: Mucky peat (hemie soil material) and peat (folic soil material) have a minimum organic carbon content of 12 to 18 percent, depending on the content of clay. Organic soil material is called peat if virtually all of the peat remains are sufficiently intact to permit identification of plant remains. Mucky peat is at an intermediate stage of decomposition between peat and highly decomposed peat. To ascertain if mucky peat and/or peat are present, determine the percentage of rubbed fibers.



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Drainage Setback Tables

Lynda Ponting, Steve Hofstad, John Hansel
BWSR Wetland Specialists

BWSR Wetland Section | www.bwsr.state.nm.us/wetlands

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Drainage Setbacks



BWSR Wetland Section | www.bwsr.state.nm.us/wetlands

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Agenda

- Intro – the basics of a drain (ditch or tile)
- Setback Guidance – walk through the BWSR guidance, highlight key points
- Examples – Case studies of drainage proposals
- Applications of the setback guidance – drainage reviews, violations, banking
- Questions

BWSR Wetland Section | www.bwsr.state.nm.us/wetlands

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What is Drainage?

• Anything that **decreases** the input or **increases** the output of water can cause a drainage.

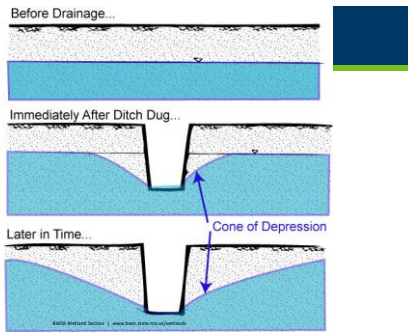
The challenge concerns determining if a decrease or increase is acceptable!!

BWSR Wetland Section | www.bwsr.state.nm.us/wetlands

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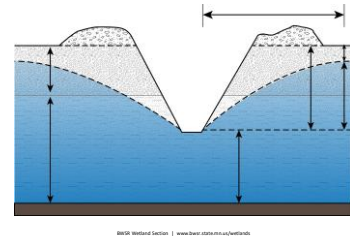
The Ditch

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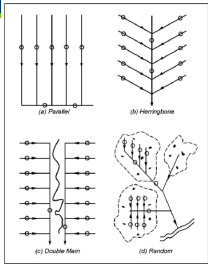
Ditch Drainage Hydraulics



80

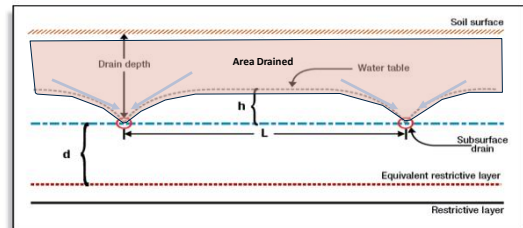
Tile Drainage

Figure 2. Subsurface draining systems.



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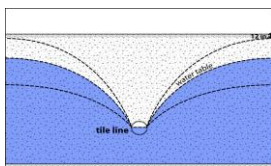
Figure 1 Schematic of dimensions for describing subsurface drainage hydraulics



From Strook et al. (2011)

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Tile Hydraulics



8000 Wetland Section | www.baei.state.nh.us/wetland

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WCA Drainage

Any method for removing or diverting waters from a wetland

- Excavation of a ditch
- Tile Installation
- Filling
- Diking
- Pumping
- Diverted water
- Etc.



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Setback Guidance

Why was guidance created???

- “promote consistency”
- For “wetland managers”
- Complements existing sources



BWSR Guidance Concerning NRCS – Developed Drainage Setback Tables

October 2013

Version 2.0

Purpose: Promote consistency among wetland managers when determining the impact of a drainage system on wetland hydrology.
Audience: Wetland managers
Rule reference or statute: Not applicable
Intended use: Guidance Intended to complement USDA NRCS Drainage Setback Tables and Corps of Engineers Regional Supplements for wetland delineation.

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Setback Guidance

1. Executive Summary

Guidance concerning the effect of a drain on wetland hydrology was developed. The guidance is intended as a **companion** to NRCS (Natural Resources Conservation Service)-issued drainage setback tables and to complement Regional Supplements to the Corps of Engineers Delineation Manuals in effect in Minnesota: Great Plains, Midwest and Northcentral and Northeast Regions, specifically those parts addressing altered hydrology. Elements of the guidance include purpose and applicability, background, technical discussion, drainage setback tables and instructions for their use, references and duration of the guidance. Appendices concerning barriers to permeability and organic soils are also provided.

- Developed after the Supplements were published
- Links, does not replace, other sources

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Setback Guidance

2. Purpose and Applicability

This guidance was developed for several reasons:

- **Promote consistency** among wetland managers when determining the impact of a drainage system on wetland hydrology. This was done by adopting NRCS-derived estimates of drainage setback. NRCS setback information is provided in county-specific tables generated from a generally accepted and consistent soils data base and by a generally accepted and consistent method of calculation;
- **Provide supplemental guidance** concerning the background and assumptions behind the van Schilfgaarde equation, the drainage equation used by NRCS to develop setback tables;
- **Guide users** from the need to research and self-generate drainage estimates; and
- **Provide additional information** needed to assess hydrologic modification to wetlands.

- Supplement development = improvement in delineation methodology
- This guidance intended to direct users to one method

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Setback Guidance

3. Background

Development of this guidance was necessitated by:

- The loss of on-line drainage equations and supporting soils data previously available through Hydrology Tools and supporting websites
- The difficulty for casual users to use ND-Drain, the replacement on-line procedure, and produce consistent results.

- Older guidance/sources were ‘going away’
- Guidance needed to preserve the ‘best’ methodology

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Setback Guidance

Drainage setback tables are approximations only and may not reflect actual field conditions. If the nature of their use requires more “precision”, setback tables should be verified by comparison with other techniques for evaluating drainage. Wet conditions may persist after drainage. Consequently, in no case should drainage tables overrule onsite evidence of wetland hydrology.¹ The extent to which wet conditions persist after drainage depends on several factors:

- The methodology is NOT precise – assumptions abound!!!
- “Lateral effect ‘precision’ is akin to a meat axe as opposed to a scalpel” Greg Larson via email (2008)

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Setback Guidance

5. Drainage setback tables, their use and limitations

5a. Tables

Minnesota setback tables are available through the Minnesota NRCS Technical Resources Website. A link is provided below. The tables are county-specific, have a date of issuance, and include user notes. **NRCS specifically states on user notes that the setback distances are only for the situation where a drainage system will be installed and the landowner wishes to avoid impacting wetland hydrology. The tables are subject to change so users should refer to the NRCS Website for current information.**

Minnesota NRCS uses “setback distance” rather than lateral effect. **These terms are not interchangeable.** In the judgment of NRCS staff, the setback distance is the minimum distance, in feet, from the wetland boundary to the centerline of the tile line or to the toe of the ditch bank for drainage ditches necessary to minimize adverse hydrologic impacts to adjacent wetlands.

- Setback distances do not fully protect wetlands
- Distances ‘minimize’ hydrologic impacts *if appropriately used*

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Drainage Project Fact Sheet for Wetland Conservation Act Compliance

Wetlands Section, Minnesota Board of Water & Soil Resources

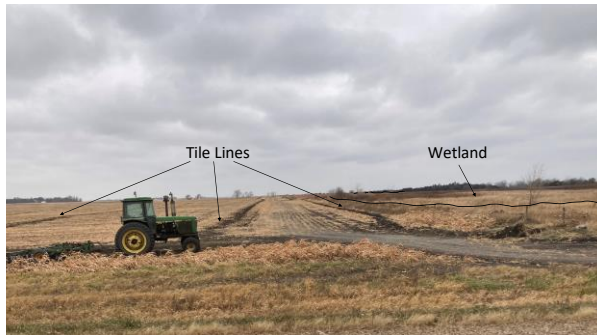
Version: 1.1
Date: 4/26/2019

Purpose

Projects that involve the installation, improvement, repair and/or maintenance of public or private drainage systems (collectively referred to as "drainage projects") must comply with the provisions of the Minnesota Wetland Conservation Act (MCA). These projects typically involve construction-type activities in or near wetlands regulated under WCA rules and have the potential to impact these wetlands. Wetland impacts regulated by the WCA include drainage, fill and excavation (under certain circumstances). This fact sheet is intended to identify the type of information that is often needed to evaluate drainage projects for WCA compliance. Drainage authorities, private landowners and consultants can use this document to inform their applications for WCA compliance, and local government unit (LGU) and technical evaluation panel (TEP) representatives can use it to inform their review of applications.

WCA Compliance Information | www.bwsr.state.mn.us/wetlands

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Lateral Effect & Drainage Setback

All drains have some effect on an adjacent wetland. The question, then, concerns what is an acceptable negligible hydrologic effect on the wetland. To this, various lateral effect or scope and effect equations have been developed to estimate the extent that a drain will lower the adjacent water table. The lateral effect is variably defined by different wetland-related programs. The Natural Resource Conservation Service (NRCS) defines lateral effect as the distance on either side of a ditch or tile line within which wetland hydrology would be impacted by the installation of the ditch or tile line such that it results in loss of eligibility for USDA program benefits. Some have defined it as the width of a strip of land drained south that it no longer meets the wetland hydrology criteria set forth in the 1987 Corps of Engineers Wetland Delineation Manual. For wetland regulatory purposes in Minnesota, lateral effect is a non-physical effect of a drain on the adjacent water table. Estimates of these effects can sometimes be used to evaluate whether or not a drain will cause an unacceptable loss of wetland hydrology.

A series of tables have been developed and refined over time by NRCS to estimate the lateral effect of various drains in different soil types. These tables have been used as the standard for estimating lateral effect in Minnesota. BWSR in consultation with the St. Paul District Army Corps of Engineers (Corps) has developed specific guidance on the use of these tables in relation to wetland regulatory programs and wetland delineation manuals as follows. Note that the BWSR 2012 document are no longer operative, but the guidance is still applicable aside from the certification below.

2012 Drainage Setback Tables by County

Subsequent revisions of the 2012 drainage setback tables were made to clarify further clarification on assessing lateral effect for wetland regulatory purposes. Users should first go to the **Minnesota NRCS Engineering website** to view the lateral effect distance link. You must download the Lateral Effect Ditch Data and open it using Microsoft Excel software program. Follow the steps below on the website and you will be able to enter County and easement table sets which will generate the Lateral Effect Distance (LED) for your project. If you know to have high impact, contact users will be prompted to seek further assistance from NRCS staff. In those instances, users should not use NRCS staff assistance and should instead use the setback distance in the 2012 ditch setback tables that BWSR has adopted. NRCS can only provide technical support for USDA program eligibility, not the Wetland Conservation Act. The 2020 drainage setback guidance applies regardless of which tables are used.

2012 Drainage Setback Tables by County (see only if no value given in current NRCS tables per above)

2012 Drainage Setback Tables by County

Select a County: Any

Wetlands Section | www.bwsr.state.mn.us/wetlands

Minnesota Form 8000

Drainage Setback Tables File

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USDA Lateral Effect Database

for use in IA, MN, ND, & SD

User Name: [] Date: 08/07/23

Customer Info: [] State: [Select State] Survey Area: [Select State]

Farm #: [] Tract #: [] Field #: []

Drain/Ditch Configuration: []

Depth (ft): []

Diameter (in): []

Lateral Effect: Lateral Effect Distance (ft): []

Select parameters to determine lateral effect

Clear Print PDF Exit

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Instructions Database | General Information

USDA Lateral Effect Database

for use in IA, MN, ND, & SD

User Name: jah Date: 08/07/23

Customer Info: Customer Name: Farmer 1 Location: State: Minnesota Survey Area: Lyon County

Farm # 1 Tract # 2 Field # 3

Drain/Ditch Configuration: Depth (ft): 3.0 Diameter (in): 5.0 Lateral Effect: Lateral Effect Distance (ft): 130

Soils Information: Field Soil: Select Soil Wetland Soil: Select Soil

Note: Retrieving data for a new Survey Area may take time. Please be patient. The Drain Configuration and Soils Information fields will "lock" when retrieval is complete.

Select parameters to determine lateral effect.

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for use in IA, MN, ND, & SD

User Name: jah Date: 08/07/23

Customer Info: Customer Name: Farmer 1 Location: State: Minnesota Survey Area: Lyon County

Farm # 1 Tract # 2 Field # 3

Drain/Ditch Configuration: Depth (ft): 3.0 Diameter (in): 5.0 Lateral Effect: Lateral Effect Distance (ft): 130

Soils Information: Field Soil: J107A Wetland Soil: J198C2

Note: Retrieving data for a new Survey Area may take time. Please be patient. The Drain Configuration and Soils Information fields will "lock" when retrieval is complete.

The wetland soil indicates the hydrogeomorphic wetland class is DEPRESSION, Discharge. The lateral effect distance from the edge of the certified wetland boundary is 130 feet. To maintain compliance with USDA's wetland conservation provisions it is advised to maintain at least this distance for drainage installations.

Clear Print PDF Exit

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for use in IA, MN, ND, & SD

User Name: jah Date: 08/07/23

Customer Info: Customer Name: Farmer 1 Location: State: Minnesota Survey Area: Lyon County

Farm # 1 Tract # 2 Field # 3

Drain/Ditch Configuration: Depth (ft): 3.0 Diameter (in): 5.0 Lateral Effect: Lateral Effect Distance (ft): 130

Soils Information: Field Soil: J107A Wetland Soil: J198C2

Note: Retrieving data for a new Survey Area may take time. Please be patient. The Drain Configuration and Soils Information fields will "lock" when retrieval is complete.

The wetland soil indicates the hydrogeomorphic wetland class is DEPRESSION, Discharge. The lateral effect distance from the edge of the certified wetland boundary is 130 feet. To maintain compliance with USDA's wetland conservation provisions it is advised to maintain at least this distance for drainage installations.

Clear Print PDF Exit

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for use in IA, MN, ND, & SD

User Name: jah Date: 08/07/23

Customer Info: Customer Name: Farmer 1 Location: State: Minnesota Survey Area: Lyon County

Farm # 1 Tract # 2 Field # 3

Drain/Ditch Configuration: Depth (ft): 3.0 Diameter (in): 5.0 Lateral Effect: Lateral Effect Distance (ft): 130

Soils Information: Field Soil: J107A Wetland Soil: J45A

Note: Retrieving data for a new Survey Area may take time. Please be patient. The Drain Configuration and Soils Information fields will "lock" when retrieval is complete.

The wetland soil indicates the hydrogeomorphic wetland class is DEPRESSION, Discharge. The lateral effect distance from the edge of the certified wetland boundary is 130 feet. To maintain compliance with USDA's wetland conservation provisions it is advised to maintain at least this distance for drainage installations.

Clear Print PDF Exit

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USDA U.S. DEPARTMENT OF AGRICULTURE

Subject: Lateral Effect Determination Date: 8/7/2023

Customer and Location Information: Customer Name: Farmer 1 Completed By: jah Farm: 1 Tract: 2 Field:

Drain Information: Name: Address: Soil Survey Area: Lyon County Field Soil Mapunit Symbol: J107A Field Soil Mapunit Name: Lakespark Reticul. Pannell, depression, complex, 0 to 3 percent slopes Wetland Soil Mapunit Symbol: J198C2 Wetland Soil Mapunit Name: Southern silty clay loam, 0 to 3 percent slopes Drain Depth (feet): 3.0 Drain Diameter (inches) or Depth: 5.0

Result of Determination: Lateral Effect Distance (feet): 130

Note: The wetland soil indicates the hydrogeomorphic wetland class is DEPRESSION, Discharge. The lateral effect distance from the edge of the certified wetland boundary is 130 feet. To maintain compliance with USDA's wetland conservation provisions it is advised to maintain at least this distance for drainage installations.

Data Points of Concern: [USDA Wetland Section | www.nrc.usda.gov/wetlands]

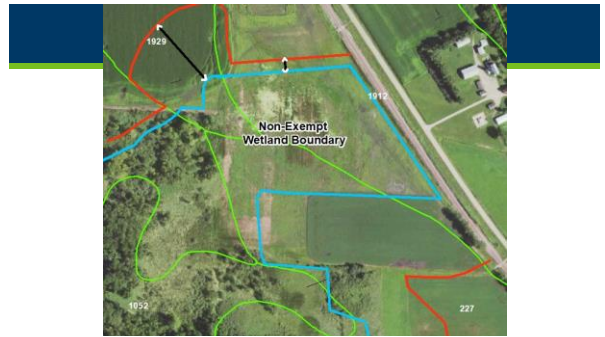
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Setback Distance Use

Wetland Banking - check all that apply

Wetland Boundary Type Reservoir Replacement Plan Bank Plan (not credit purchased)
 Wetland (not credit) Wetland (credit) Conversion (not credit) Conversion (credit)
 Part: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AU AV AW AX AY AZ BA BB BC BD BE BF BG BH BI BJ BK BL BM BN BO BP BQ BR BS BT BU BV BW BX BY BZ CA CB CC CD CE CF CG CH CI CJ CK CL CM CN CO CP CQ CR CS CT CU CV CW CX CY CZ DA DB DC DD DE DF DG DH DI DJ DK DL DM DN DO DP DQ DR DS DT DU DV DW DX DY DZ EA EB EC ED EE EF EG EH EI EJ EK EL EM EN EO EP EQ ER ES ET EU EV EW EX EY EZ FA FB FC FD FE FF FG FH FI FJ FK FL FM FN FO FP FQ FR FS FT FU FV FW FX FY FZ GA GB GC GD GE GF GG GH GI GJ GK GL GM GN GO GP GQ GR GS GT GU GV GW GX GY GZ HA HB HC HD HE HF HG HH HI HJ HK HL HM HN HO HP HQ HR HS HT HU HV HW HX HY HZ IA IB IC ID IE IF IG IH II IJ IK IL IM IN IO IP IQ IR IS IT IU IV IW IX IY IZ JA JB JC JD JE JF JG JH JI JJ JK JL JM JN JO JP JQ JR JS JT JU JV JW JX JY JZ KA KB KC KD KE KF KG KH KI KJ KL KM KN KO KP KQ KR KS KT KU KV KW KX KY KZ LA LB LC LD LE LF LG LH LI LJ LK LL LM LN LO LP LQ LR LS LT LU LV LW LX LY LZ MA MB MC MD ME MF MG MH MI MJ MK ML MN MO MP MQ MR MS MT MU MV MW MX MY MZ NA NB NC ND NE NF NG NH NI NJ NK NL NM NO NP NQ NR NS NT NU NV NW NX NY NZ OA OB OC OD OE OF OG OH OI OJ OK OL OM ON OO OP OQ OR OS OT OU OV OW OX OY OZ PA PB PC PD PE PF PG PH PI PJ PK PL PM PN PO PP PQ PR PS PT PU PV PW PX PY PZ QA QB QC QD QE QF QG QH QI QJ QK QL QM QN QO QP QQ QR QS QT QU QV QW QX QY QZ RA RB RC RD RE RF RG RH RI RJ RK RL RM RN RO RP RQ RR RS RT RU RV RW RX RY RZ SA SB SC SD SE SF SG SH SI SJ SK SL SM SN SO SP SQ SR SS ST SU SV SW SX SY SZ TA TB TC TD TE TF TG TH TI TJ TK TL TM TN TO TP TQ TR TS TU TV TW TX TY TZ UA UB UC UD UE UF UG UH UI UJ UK UL UM UN UO UP UQ UR US UT UY UV UW UX UZ VA VB VC VD VE VF VG VH VI VJ VK VL VM VN VO VP VQ VR VS VT VU VV VW VX VY VZ WA WB WC WD WE WF WG WH WI WJ WK WL WM WN WO WP WQ WR WS WT WU WV WW WX WY WZ XA XB XC XD XE XF XG XH XI XJ XK XL XM XN XO XP XQ XR XS XT XU XV XW XX XY XZ YA YB YC YD YE YF YG YH YI YJ YK YL YM YN YO YP YQ YR YS YT YU YV YW YX YZ ZA ZB ZC ZD ZE ZF ZG ZH ZI ZJ ZK ZL ZM ZN ZO ZP ZQ ZR ZS ZT ZU ZV ZW ZX ZY ZZ

Replacement Plan Impact (replacement plan duration only)

Plan Start: Plan End:

Bank Account Information:

Bank Account Number(s):

Setback of Substrate, Spoil, Filling, and Recommendations (setback if any)

Approve Approve w/Conditions Deny No TSP Recommendation

Comments:

Approved with Conditions (specify below) Approved Denied

All Conditions

A person conducting an activity in a wetland under no loss or part 8420-8423 or an exemption in part 8420-8423 must ensure that:

A. appropriate erosion control measures are taken to prevent sedimentation of the wetland or any adjoining waters;

B. the activity does not block fish activity in a watercourse, except when done pursuant to permit requirements of applicable fish species in accordance with a recommendation from the commissioner; and

C. the activity is conducted in compliance with all other applicable federal, state, and local requirements, including but not limited to permit requirements according to the documents referenced in part 8420-8423, items 1, 4, and 5, and water resource protection requirements established under Minnesota Statutes, Chapter 103A.

Conditions:

Only non-permitted drain the within red shaded areas located around wetlands under 10 mgd.

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Setback Distance Use

Wetland Banking - check all that apply

Wetland Boundary Type Reservoir Replacement Plan Bank Plan (not credit purchased)
 Wetland (not credit) Wetland (credit) Conversion (not credit) Conversion (credit)
 Part: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AU AV AW AX AY AZ BA BB BC BD BE BF BG BH BI BJ BK BL BM BN BO BP BQ BR BS BT BU BV BW BX BY BZ CA CB CC CD CE CF CG CH CI CJ CK CL CM CN CO CP CQ CR CS CT CU CV CW CX CY CZ DA DB DC DD DE DF DG DH DI DJ DK DL DM DN DO DP DQ DR DS DT DU DV DW DX DY DZ EA EB EC ED EE EF EG EH EI EJ EK EL EM EN EO EP EQ ER ES ET EU EV EW EX EY EZ FA FB FC FD FE FG FH FI FJ FK FL FM FN FO FP FQ FR FS FT FU FV FW FX FY FZ GA GB GC GD GE GF GG GH GI GJ GK GL GM GN GO GP GQ GR GS GT GU GV GW GX GY GZ HA HB HC HD HE HF HG HH HI HJ HK HL HM HN HO HP HQ HR HS HT HU HV HW HX HY HZ IA IB IC ID IE IF IG IH IJ IK IL IM IN IO IP IQ IR IS IT IU IV IW IX IY IZ JA JB JC JD JE JF JG JH JI JJ JK JL JM JN JO JP JQ JR JS JT JU JV JW JX JY JZ KA KB KC KD KE KF KG KH KI KJ KL KM KN KO KP KQ KR KS KT KU KV KW KX KY KZ LA LB LC LD LE LF LG LH LI LJ LK LL LM LN LO LP LQ LR LS LT LU LV LW LX LY LZ MA MB MC MD ME MF MG MH MI MJ MK ML MN MO MP MQ MR MS MT MU MV MW MX MY MZ NA NB NC ND NE NF NG NH NI NJ NK NL NM NO NP NQ NR NS NT NU NV NW NX NY NZ OA OB OC OD OE OF OG OH OI OJ OK OL OM ON OO OP OQ OR OS OT OU OV OW OX OY OZ PA PB PC PD PE PF PG PH PI PJ PK PL PM PN PO PP PQ PR PS PT PU PV PW PX PY PZ QA QB QC QD QE QF QG QH QI QJ QK QL QM QN QO QP QQ QR QS QT QU QV QW QX QY QZ RA RB RC RD RE RF RG RH RI RJ RK RL RM RN RO RP RQ RR RS RT RU RV RW RX RY RZ SA SB SC SD SE SF SG SH SI SJ SK SL SM SN SO SP SQ SR SS ST SU SV SW SX SY SZ TA TB TC TD TE TF TG TH TI TJ TK TL TM TN TO TP TQ TR TS TU TV TW TX TY TZ UA UB UC UD UE UF UG UH UI UJ UK UL UM UN UO UP UQ UR US UT UY UV UW UX UZ VA VB VC VD VE VF VG VH VI VJ VK VL VM VN VO VP VQ VR VS VT VU VV VW VX VY VZ WA WB WC WD WE WF WG WH WI WJ WK WL WM WN WO WP WQ WR WS WT WU WV WW WX WY WZ XA XB XC XD XE XF XG XH XI XJ XK XL XM XN XO XP XQ XR XS XT XU XV XW XX XY XZ YA YB YC YD YE YF YG YH YI YJ YK YL YM YN YO YP YQ YR YS YT YU YV YW YX YZ ZA ZB ZC ZD ZE ZF ZG ZH ZI ZJ ZK ZL ZM ZN ZO ZP ZQ ZR ZS ZT ZU ZV ZW ZX ZY ZZ

Replacement Plan Impact (replacement plan duration only)

Plan Start: Plan End:

Bank Account Information:

Bank Account Number(s):

Setback of Substrate, Spoil, Filling, and Recommendations (setback if any)

Approve Approve w/Conditions Deny No TSP Recommendation

Comments:

Approved with Conditions (specify below) Approved Denied

All Conditions

A person conducting an activity in a wetland under no loss or part 8420-8423 or an exemption in part 8420-8423 must ensure that:

A. appropriate erosion control measures are taken to prevent sedimentation of the wetland or any adjoining waters;

B. the activity does not block fish activity in a watercourse, except when done pursuant to permit requirements of applicable fish species in accordance with a recommendation from the commissioner; and

C. the activity is conducted in compliance with all other applicable federal, state, and local requirements, including but not limited to permit requirements according to the documents referenced in part 8420-8423, items 1, 4, and 5, and water resource protection requirements established under Minnesota Statutes, Chapter 103A.

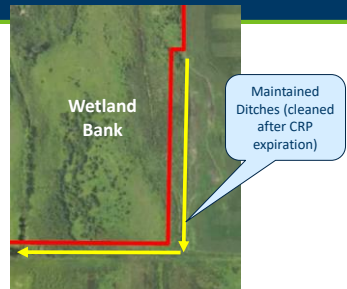
Conditions:

Only non-permitted drain the within red shaded areas located around wetlands under 10 mgd.

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Setback Distance Use

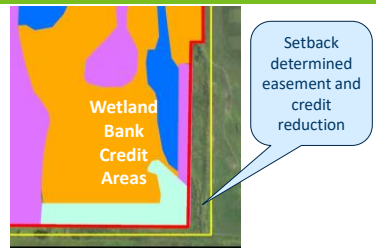
- Wetland Banking Adjustments
- Legal drainage maintenance
 - Adjacent use may affect wetland function



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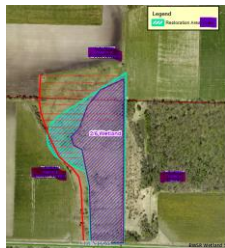
Setback Distance Use

- Incompatible Adjacent Activities may lead to...
- Boundary changes
 - Reduced credit, or no credit areas



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Violations



- Landowner installed pattern perforated tile within the wetland.
- Restoration order issued and perforated tile was replaced with non-perforated tile.
- SWCD verified that restoration order was complied with.

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Violations



- SWCD initially issued a NOD for a setback of 90' for this producer.
- SWCD was reviewing aerials for another project near this particular site and notice potential violation.
- SWCD discussed problem with producer
- Perforated tile within the setback distance was replaced with non-perforated tile.

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Corps Antecedent Precipitation Tool



<https://www.epa.gov/wotus/antecedent-precipitation-tool-apt>

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Enter Lat-Long, Date and Calculate

Antecedent Precipitation Tool (APT)
Version 10: Technical and User Guide
By: Andrew, Anderson and David J. Stone

Applicability: This tool is applicable to wetlands that are subject to the National Pollutant Discharge Elimination Act (NPDES) and the Clean Water Act (CWA) and are located in the United States. It is not applicable to wetlands that are not subject to the NPDES and CWA, or to wetlands that are located outside of the United States.

Applicability: The APT is applicable to wetlands that are subject to the NPDES and CWA and are located in the United States. It is not applicable to wetlands that are not subject to the NPDES and CWA, or to wetlands that are located outside of the United States.

Note: Decimal Degrees format = "46.79032"
And include the "°" in Longitude

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Where do you find decimal degrees format?

- Latlong.net

<https://www.latlong.net/>

Latitude and Longitude Finder

Latitude and Longitude are the units that represent the coordinates of geographic coordinate system. To make a point on the globe of a place, city, state, or address, or just the location of the map in horizontal coordinates.

Find Location

Address (country code for better results):

Latitude: Longitude:

For better accuracy please use Home Address City State Zipcode

Lat Long

(46.271020; -96.571040)

GPS Coordinates

46° 16' 14.9622" N
96° 4' 27.264" W

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Results

- Tool opens pdf in a temporary folder on desktop
- Open pdf to view results:

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Antecedent Precipitation Evaluation Review

- Important for accurate interpretations/observations
- Done by the delineator
- Included in the report
- Should support your conclusion.
- Not always clear...Best Professional Judgement needed.
- Several methods available, each with certain strengths/weaknesses...
- Discussed in detail via BWSR and other Guidance Documents.

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