US Army Corps
of Engineers
St Paul District

Public Notice

96-01078-SDE

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GUIDELINES
FOR SUBMITTING WETLAND DELINEATIONS
IN WISCONSIN
TO THE ST. PAUL DISTRICT CORPS OF ENGINEERS

1. INTRODUCTION

State, federal and local agencies of government, and private consultants, are involved in delineating wetlands and/or reviewing delineations for purposes of Section 404 of the Clean Water Act, the "Swampbuster" provisions of the Food Security Act, State of Wisconsin water/wetland regulatory authorities, and shoreland-wetland zoning (e.g., NR 115 and NR 117). Certain questions have arisen concerning guidelines for submitting delineations to the reviewing agencies. A number of omissions and errors are commonly made by consultants and agency staff, some of which are easily corrected if delineators are advised of what the reviewing agencies are checking for. The purpose of this public notice is to inform delineators of these items so that errors and delays are minimized. These recommendations are applicable for the on-site methods under the 1987 *Corps of Engineers Wetlands Delineation Manual*, which is the manual used by the federal agencies. NOTE: For state and local regulatory purposes, the State of Wisconsin employs a slightly different definition of wetlands and method for delineating wetlands, one that closely follows the 1989 *Federal Manual For Identifying And Delineating Jurisdictional Wetlands*. In most cases, wetland delineations under either manual will be the same. Refer to the *Basic Guide To Wisconsin's Wetlands And Their Boundaries*, published in 1995 by the Wisconsin Coastal Management Program, for more information on the state approach. Questions on state and local regulatory requirements involving wetlands should be directed to the Wisconsin Department of Natural Resources and the appropriate local unit of government.

Two memoranda from the Corps, the 7 October 1991 "Questions and Answers on the 1987 Manual" and the 6 March 1992 "Clarification and Interpretation of the 1987 Manual", are essential for delineators applying the 1987 Corps delineation manual. Delineators who do not have these memoranda can obtain copies by contacting the Corps at the address listed at the end of this public notice.

2. SAMPLING TECHNIQUES

a. The sampling technique chosen by delineators must adequately characterize all plant communities/soils/hydrology within a project site. This includes wetlands as well as the bordering uplands. The most common deficiency of wetland delineations submitted to the reviewing agencies is that all sample points were determined to be wetlands, yet the delineation submitted shows upland areas within the project site. Delineators need to document what was encountered in the way of soils/vegetation/hydrology that indicated a change from wetland to upland conditions. The best way to address this situation is to establish plots/transects that run from obvious uplands to obvious wetlands (if present). Establish a sample point in each and record soils/vegetation/hydrology on data sheets. Additional sample points are then recorded between those two initial sample points until a break between upland and wetland characteristics is identified.

b. The number of sample points and transects required will be a function of the size and complexity of the area being delineated. Apply professional judgement in determining the degree of sampling necessary to adequately characterize the plant communities/ soils/hydrology of the site. For small (e.g., 1/3 acre) wetland basins with abrupt boundaries, only two sample points (each with a completed data sheet) may be necessary -- one for the immediate wetland side of the wetland boundary, and one for the immediate upland side. Larger sites with abrupt boundaries and homogeneous vegetation can be documented with the minimum number of sample points necessary to characterize both the immediate upland and immediate wetland sides of the line (Figure 1). Multiple vegetation sample points are not necessary if the plant community is homogenous such as a reed canary grass (Phalaris arundinacea) monotype. Sites that are more varied in soils, hydrology, degree of disturbance, and plant community composition/structure, will require more thorough sampling and documentation. A general approach that works in many situations is to establish transects every 100 to 200 feet perpendicular to the wetland/upland boundary or topographic gradient. Sample points along each transect can be located at fixed intervals (e.g., every 50 feet), or where a change in soils/vegetation/hydrology/topography is observed (Figure 2).

c. More intensive sampling techniques may be required in cases where plant communities are diverse in terms of species richness and/or multiple strata. A detailed description of these more intensive methods is found on pages 35 to 50 of the *Federal Manual For Identifying And Delineating Jurisdictional Wetlands* (1989 Manual). Additionally, the data forms of Appendix B (B-3 through B-13) of the 1989 Manual are recommended for use in documenting more intensive vegetation sampling. (NOTE: While the 1989 Manual methodology is no longer used by the federal agencies, descriptions of vegetation sampling techniques and associated data sheets contained in the 1989 Manual remain valid and may be used under the 1987 Manual approach.)

TYPICAL LOCATION OF VEGETATION AND SOIL SAMPLE SITES

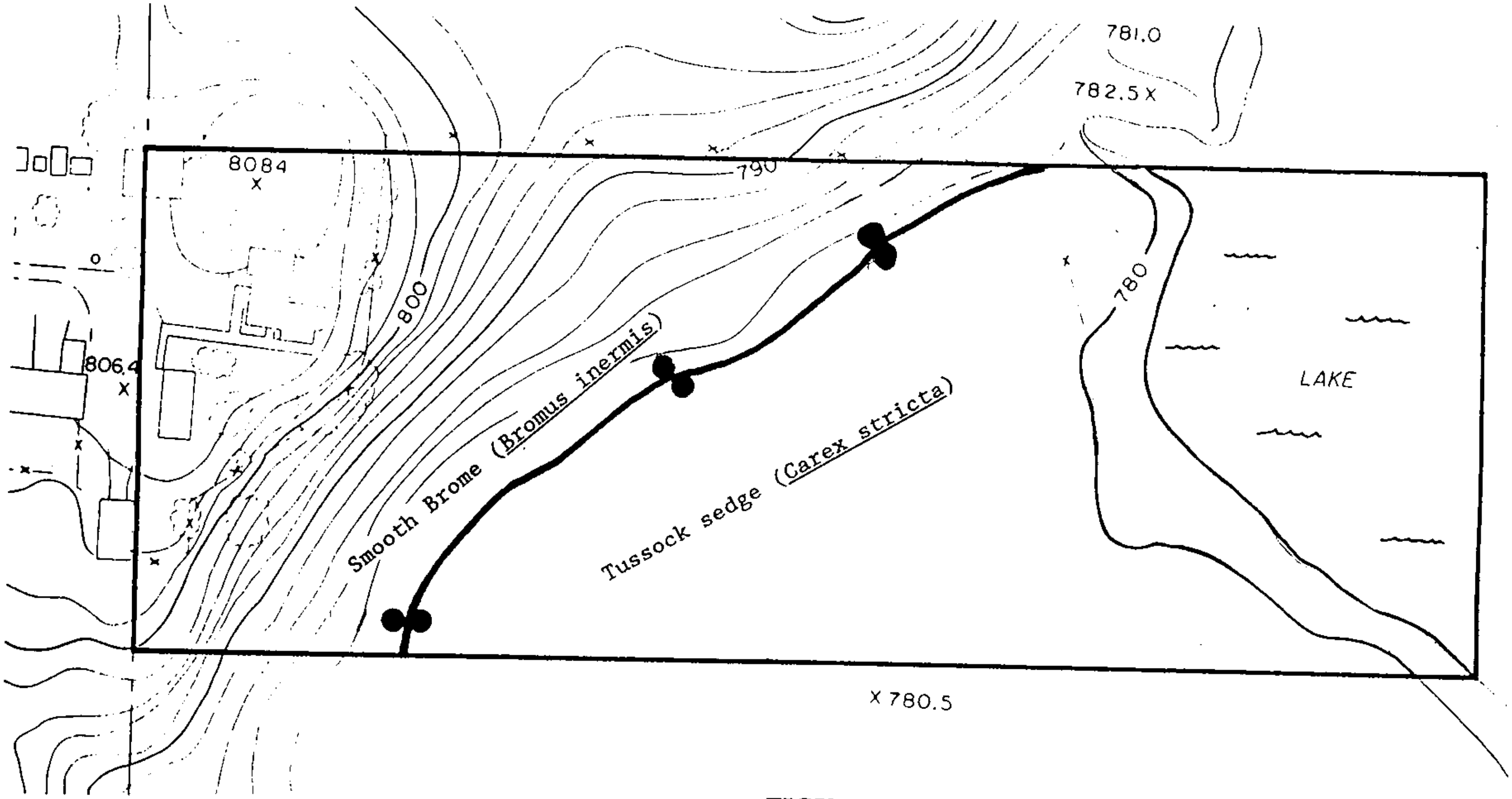


FIGURE 1

ROUTINE METHOD SAMPLING TECHNIQUE WHEN PLANT COMMUNITIES ARE HOMOGENEOUS AND UPLAND/WETLAND BOUNDARY IS ABRUPT

LEGEND

- PROJECT BOUNDARY
- SOIL AND VEGETATION SAMPLE SITES
- PLANT ASSOCIATION AREA
- WETLAND BOUNDARY

NOTE: TWO-FOOT CONTOUR INTERVAL

Source: SEWRPC.

TYPICAL LOCATION OF VEGETATION AND SOIL SAMPLE SITES

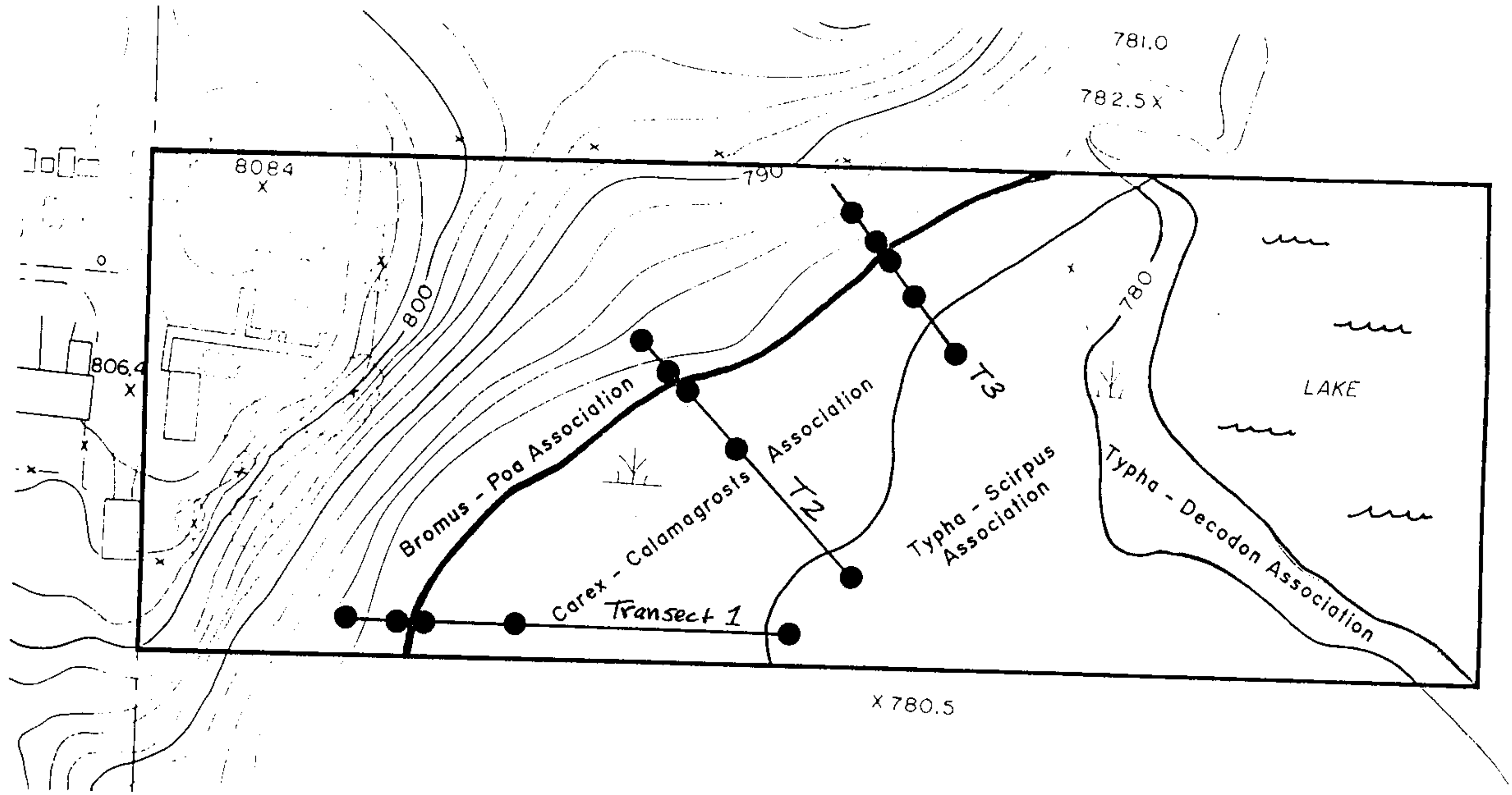


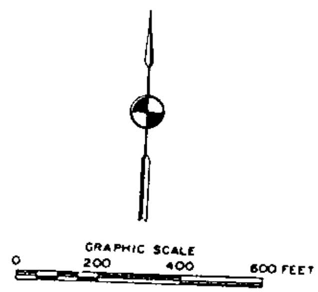
FIGURE 2

TRANSECT SAMPLING TECHNIQUE

LEGEND

- PROJECT BOUNDARY
- SOIL AND VEGETATION SAMPLE SITES AND TRANSECT
- PLANT ASSOCIATION AREA
- WETLAND BOUNDARY

NOTE: TWO-FOOT CONTOUR INTERVAL



Source: SEWRPC.

d. **Growing Season:** As indicated by the definitions of hydric soils and wetland hydrology, the concept of "growing season" is a key factor. The technical definition of growing season is that portion of the year when soil temperatures at 19.7 inches below the soil surface are above biologic zero (41 degrees F.). Growing season can be approximated by the number of frost-free days -- the period between the last frost in spring and first frost of autumn. Corps guidance on implementation of the 1987 Manual employs the 28 degree temperature occurring 5 years out of 10. Most modern soil surveys include a table with this information. If a modern soil survey is not available in a particular county, several options are available such as obtaining historical data from the nearest weather station, or using a soil survey from an adjacent county.

The definition of growing season is based on the safe planting period for agricultural crops, as opposed to native vegetation. In Wisconsin, skunk cabbage (Symplocarpus foetidus), tussock sedge (Carex stricta), lake sedge (Carex lacustris), silver maple (Acer saccharinum), eastern cottonwood (Populus deltoides), willows (Salix spp.), as well as other native species, are actively growing in March-April, four to six weeks before the safe planting date for agricultural crops. Some species, such as silver maple and willows, are typically in flower during this period, several weeks prior to the 28 degree F. temperature 5 years in 10. Soils may have sub-surface frost, or a temperature less than 41 degrees F., during this period. The 7 October 1991 Corps guidance on the 1987 Manual provides flexibility in determining the growing season by stating "...where plant communities have become more adapted to regional conditions, local means of determining growing season may be more appropriate and can be used." CAUTION: If a delineator intends, in a specific case, to expand "growing season" beyond the 28 degree temperature 5 years in 10, he/she must be able to document and defend their rationale.

Field indicators that can be useful in determining the start of the growing season include the following. **Frost/Frozen Soils:** Soils frozen throughout the upper profile, or with sub-surface frost, generally confirm that the growing season has not begun. Thus, ponding or soil saturation in the upper 12 inches of the profile that is "perched" by sub-surface frost is typically not an indicator of wetland hydrology in this region. **Vegetation:** "Growing season" is in reference to active growth by vegetation and soil microorganisms. While we have not incorporated field techniques for measuring microbial activity in soils for purposes of wetland delineation, vegetation is a central tenet of wetland delineation. Actual field data documenting observations of bud-break, leaf-out, flowering, etc., by the dominant plant species of a particular site -- confirming active growth in a given year -- may prove more defensible than applying an average of climatic readings taken over a number of years.

Some delineators have installed thermometers to monitor soil temperatures at a project site and determine the start of a specific growing season. We have seen few applications of this method and have not determined its reliability or suitability as a field technique for delineations. In the few cases reviewed to date, use of this method found that the soil temperature did not meet the technical definition of growing season until 2 or 3 weeks later in spring than the 28 degree temperature 5 years in 10 method. This later date for the start of the growing season did not correspond with observations of bud-break, flowering, and leaf-out by the majority of native vegetation, which had occurred several weeks earlier. Complicating this issue is the fact that both plants and microbes have been found to be actively growing in soil temperatures less than biologic zero. Delineators may continue to use the thermometer method, but consider it an experimental field technique that has undetermined reliability.

Much remains to be learned about field techniques for determining "growing season" for purposes of wetland delineations. Delineators must consider the soils, vegetation, hydrology and climatic conditions of a particular site and apply professional judgment.

It is possible to conduct wetland delineations outside of the growing season, but severe limitations are often encountered. Off-site techniques such as examining aerial photography, Wisconsin Wetland Inventory mapping, and the county soil survey, may provide a reasonable wetland "determination" that can suffice until an on-site "delineation" can be made during the growing season. A disclaimer should accompany the "determination" explaining that it is based on remote sensing and does not constitute a "delineation." In the absence of snow cover, delineations in October and November may not pose serious problems, but onset of frozen soil conditions and snow cover may preclude identification of soils and certain herbaceous vegetation (trees, shrubs and certain herbaceous species can usually be identified by delineators proficient in winter botany). Wetlands with abrupt, obvious boundaries can sometimes be delineated in winter. Hydrology determinations are often not possible during winter conditions. Exceptions include groundwater fed wetlands where springs and seepages remain flowing year round. In floodplain settings, water marks and drift lines may still be visible during winter.

Delineators are advised to consult with the reviewing agencies to obtain confirmation on acceptance of delineations conducted outside of the growing season. It is highly recommended that delineations conducted outside of the growing season be field-checked during the growing season prior to final acceptance of that delineation.

e. **Normal Circumstances:** "Normal circumstances" refers to the soil and hydrologic conditions normally present without regard to whether vegetation has been removed. It requires an evaluation of the extent and relative permanence of the physical alteration of wetland hydrology and hydrophytic vegetation. In cases where the natural vegetation has been removed by plowing/planting, mowing, bulldozing, logging, etc., delineators need to determine if the site possesses wetland hydrology and hydric soils. If yes, the removal of vegetation does not eliminate wetland status because the normal circumstance of areas with hydric soils and wetland hydrology would be dominance by hydrophytes. In general, a planted crop does not constitute the normal circumstance. A good illustration of the normal circumstances concept are formerly cropped hydric soils that were enrolled in the

Conservation Reserve Program. With cessation of cropping (removal of natural vegetation), areas with wetland hydrology have typically been recolonized and dominated by hydrophytes in a few years.

A physical alteration to the hydrology of a site (e.g., a dam, ditch system, tile drainage system) that has been in place for decades and is being maintained, can establish a new "normal circumstance" because of its extent and relative permanence.

3. DATA SHEETS AND BASE MAPS

a. Completed routine method data sheets constitute the minimum basic requirement for documenting delineations. The format for data sheets can vary as long as the essential information on soils/vegetation/hydrology is recorded. A copy of the data sheet used by the Corps of Engineers (1987 manual) is attached (Attachment A).

b. It is essential that the location of sample points and transects be shown on a base map or aerial photograph. If available, aerial photographs at a scale of 1 inch equals 100, 200 or 400 feet are ideal. Large scale topographic maps can also serve this purpose. We have seen good results using GPS (global positioning system) when accuracy to within 1 to 5 meters is acceptable. The most accurate technique, a survey conducted by a registered land surveyor, may be warranted in more complex and/or controversial delineations, such as those involving litigation.

4. SOILS

a. **Definition of Hydric Soils**: Soils that are saturated, flooded or ponded for long enough periods of time during the growing season to develop anaerobic conditions in the upper part.

b. **Change in Wording for Hydric Soil Criteria**: A wording change in the criteria for hydric soils, published in the Federal Register on February 24, 1995, was developed by the National Technical Committee For Hydric Soils and is shown by Table 1.

c. **Criteria 3. and 4. For Hydric Soils**: These hydric soil criteria are met by hydrology rather than soil morphology. Before concluding that soils lacking low chroma, redox features, gleying, and/or a histic epipedon are not hydric, determine if those soils meet the hydric soil criteria for flooded or ponded for long or very long duration during the growing season. Long duration is 7 to 30 days for a single event, while very long duration is 30+ days for a single event, with more than a 50 percent chance of occurring in a given year. This includes many alluvial soils as well as created wetlands that are too young for the development of low chroma or other hydric soil morphology (e.g., abandoned gravel pits, wetland creation sites, impoundments). In floodplain settings where gaging data is available, the elevation of the 2-year frequency flood event is an important factor for

TABLE 1
CRITERIA FOR HYDRIC SOILS

1. All Histosols except Folists, or

2. Soils in Aquic suborders, great groups or subgroups, Albolls suborder, Aquisalids, Pachic subgroups, or Cumulic subgroups that are:

   a. somewhat poorly drained with a water table equal to 0.0 foot from the surface during the growing season, or

   b. poorly drained or very poorly drained soils and have either:

      (1) water table equal to 0.0 foot during the growing season if textures are coarse sand, sand, or fine sand in all layers within 20 inches, or for other soils, or

      (2) water table at less than or equal to 0.5 foot from the surface during the growing season if permeability is equal to or greater than 6 inches per hour in all layers within 20 inches, or

      (3) water table at less than or equal to 1.0 foot from the surface during the growing season, if permeability is less than 6 inches per hour in any layer within 20 inches, or

3. Soils that are frequently ponded for long duration or very long duration during the growing season, or

4. Soils that are frequently flooded for long duration or very long duration during the growing season.

determining if criteria 4 applies. Soil survey data on degree of flooding and ponding is also very useful (see 6.f.).

d. **Depth to Sample:** Professional judgement is involved when deciding the depth used to determine whether a soil meets hydric criteria. Typically, the most important portion of the soil profile for determining hydric versus nonhydric characteristics is that immediately below the A-horizon. The reason for this is that organic matter often masks the mineral soil colors and features of the A-horizon. Overall, soil pits or probes should be a minimum of 18 inches in depth to allow for: (1) observation of an adequate portion of the soil profile to determine presence/absence of hydric soil characteristics; (2) observation of hydrology including depth to the water table and saturated soils; and (3) identification of disturbances such as buried horizon, plow line, etc.

NOTE: The 1987 Manual references sampling immediately below the A-horizon, or 10 inches, whichever is shallower (pages 31 and 32). However, when the 1987 Manual was put into use, soil scientists found the 10-inch limit to be a technical error. Therefore, this 10-inch limit is not used by the St. Paul District of the Corps. The general rule is to sample immediately below the A-horizon, even if it exceeds 18 inches. This is particularly important in soils that developed under prairie vegetation (Mollisols).

e. **Regional Indicators Of Hydric Soils**: Soil scientists with the Natural Resources Conservation Service (NRCS), in cooperation with the National Technical Committee For Hydric Soils, have developed regional indicators of hydric soils. While these regional indicators have not been officially adopted by the Corps, the national headquarters of the Corps has provided guidance that these regional indicators may be used on an unofficial basis provided they relate to a hydric soil indicator listed in the 1987 Manual. An example is that the regional indicators may be used to further address "problem soils" listed in the 1987 Manual (see f. below). Delineators need to check "Other" for hydric soil indicators and explain in the "Remarks" section of the data sheet that they are using these regional indicators. Delineators are encouraged to provide comments to NRCS on the usefulness and validity of these indicators.

f. **Problem Soils:**

(1) **Mollisols** are a dominant soil type within prairie areas of Wisconsin and they are problem soils in that both hydric and nonhydric Mollisols have deep, dark A-horizons (mollic epipedon). The recommended approach is to sample the first layer <u>below</u> the mollic epipedon, which can be 10 to 30+ inches in depth, to distinguish hydric from nonhydric Mollisols. Redox depletions in a low chroma matrix or gleying immediately below the mollic epipedon are indicators of a hydric Mollisol. Redox depletions within the mollic epipedon can also be an indicator of a hydric Mollisol. Additionally, soil scientists rely on topographic position with hydric Mollisols being located in depressional areas while nonhydric Mollisols are typically located on higher positions on the landscape. The NRCS regional indicators of hydric soils include a number of indicators specifically developed for Mollisols.

(2) **Entisols** are problem soils in that they are too young to have developed some of the distinct morphological indicators of hydric soils such as low chroma. These soils are often located in floodplains. Flood events result in both erosion and deposition of these soils, which results in stratified layers of silt and/or sand with minimal profile development (e.g., a shallow A horizon and deep C horizon). Some of these soils are hydric due to criteria 3 or 4 for hydric soils: flooded or ponded for long or very long duration.

(3) **Red Clay Parent Materials** are problem soils encountered in the Lake Superior clay plain and surrounding uplands. Both hydric and nonhydric series have red, high

chroma colors (2.5YR and 5YR 4/4 and 3/4) below the uppermost soil layer. In hydric series, the upper 4 to 12 inches of the soil profile typically has reduced matrix colors (low chromas) similar to other mineral hydric soils. Underneath this reduced upper layer is often a zone with high chroma mottles. Underlying this is the unaltered red clay parent material with a chroma of 4. Sites with a semi-permanent to permanent water regime may have a histic epipedon. Microrelief is used to determine degree of wetness; thus, delineators need to be cognizant of hydric soil criteria 3, ponded for long or very long duration, as the slightest depression in these red clays ponds water with almost no loss due to infiltration. The best advice is to seek assistance from a professional soil scientist.

g. **Requirements** :

(1) Soil pits or soil probes should be a minimum of 18 inches deep with 20 to 24 inches being optimum in most cases. Be sure to characterize that horizon immediately below the A-horizon.

(2) Essential soils information includes:

-- Depth and thickness of each soil layer (e.g., horizons);
-- Textures of each soil layer;
-- Matrix color of each layer (using Munsell Color Charts),
-- Presence or absence of a histic epipedon;
-- Redox concentrations/depletions
  -- Note abundance, size and contrast (see Table 2);
  -- Where found in the profile (depth, horizon)

Failure to document these soil characteristics at each sample point could lead to a determination that insufficient information was submitted on soils. NOTE: The routine delineation data sheet in the 1989 Manual has inadequate space to record this essential soils information. Use an addendum or a different form such as that currently used by the Corps for the 1987 Manual.

TABLE 2
DESCRIPTORS FOR REDOXIMORPIC FEATURES

Abundance (% of surface)	Size (Diameter)	Contrast (Color)
Few <2 Common 2-20 Many >20	Fine <5 mm Medium 5-15 mm Coarse >15 mm	Faint Distinct Prominent (Contrast between matrix color and redox feature)

5. VEGETATION

a. **Hydrophytic Vegetation Criteria:** More than 50 percent of the dominants from all strata are FAC, FACW and/or OBL (excluding FAC-).

b. **The National List Of Plant Species That Occur In Wetlands: North Central (Region 3)** by Porter Reed (1988) assigned an indicator status to plant species that identifies their probability of occurrence in wetlands (page 9 of the Region 3 list). Plants need to be accurately identified to the species level in order to use Reed (1988). A minimum of 80 percent of the plant species within a plot/sample point need to be accurately identified to the species level in order to have a valid sample.

c. **1995 Supplement:** A 1995 Supplement to the above list has been prepared by the Region 3 Interagency Review Panel, composed of representatives from the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, and Natural Resources Conservation Service. It includes changes or additions involving 149 species of plants. At this time, the 1995 Supplement is currently under review by the National Review Panel. It will likely be published in the Federal Register to solicit public comments.

d. **Methodologies:** There are innumerable methods to sample and document the vegetation of a project site (refer to pages 35 to 50 of the 1989 Manual). Establish at least one sample point in each plant community, which should be outlined on a base map. The percent areal cover, basal area (trees) or other dominance measure is assigned by species to determine the dominants of each stratum. NOTE: The same species can be a dominant in more than one stratum; for example, a tree species may occur as a dominant in the shrub, sapling and tree strata. Percent areal cover is the most universally used approach and works well in most situations. Circular plots of 5 foot radius for herbaceous plants and 30-foot radius for shrubs, saplings, trees and woody vines, are easy to set up (page 65 of 1987 Manual, page 37 of 1989 Manual). Belt transects and meter square plots are other techniques that can be used (Figure 3).

e. **Vegetation Strata:** Table 3 lists two options for identifying strata.

Once percent cover, basal area or other dominance measure has been assigned to each plant species, the dominant species of each stratum can be determined. The "50/20 Rule" (Tables 4 and 5) is the recommended approach. NOTE: Wetland delineators who intend to seek certification from the Corps of Engineers are advised that the "50/20 Rule" is also the recommended approach for the field practicum. We have found that use of data form B-4 in the 1989 Manual (intermediate level, vegetation unit sampling form) is useful as a scratch sheet to list plant species according to stratum and apply the "50/20 Rule" (see Table 6). This scratch sheet should be attached to your other data sheet for each sample point as it constitutes important field information.

FIGURE 3: Multiple vegetation sampling techniques

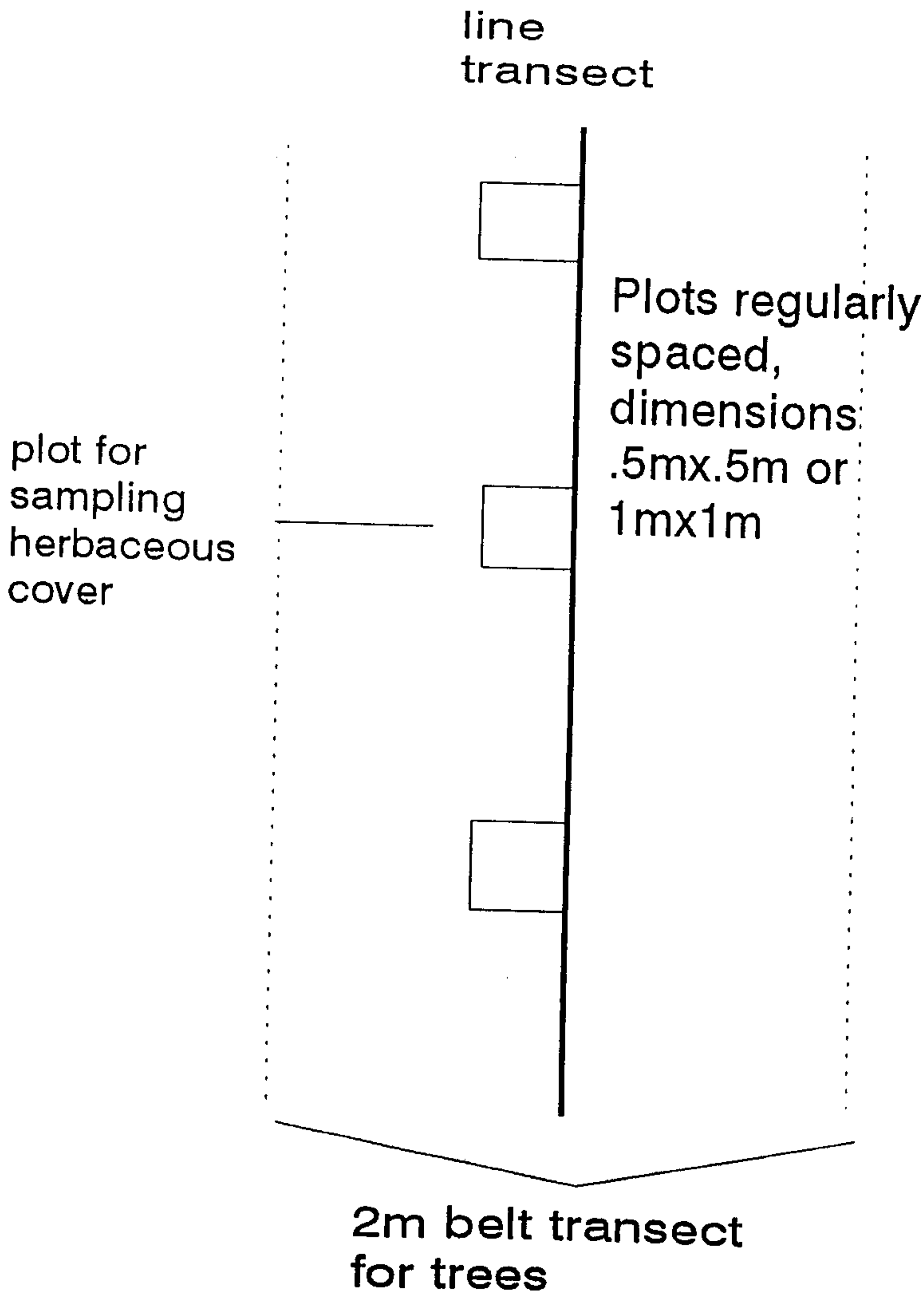


TABLE 3
VEGETATION STRATA

OPTION A (From 1989 Manual):

Trees: 5.0 inches or greater dbh and greater than 20 feet in height

Saplings: 0.4 to 4.9 inches dbh and greater than 20 feet in height

Shrubs: Usually 3 to 20 feet in height, includes multiple stemmed brushy shrubs and small trees

Woody Vines: Includes wild grape, vine form of poison ivy, etc.

Herbaceous: Includes grasses, sedges, forbs and ferns, as well as tree and shrub seedlings that are less than 3 feet in height

Bryophytes: Mosses and liverworts that, if abundant, should be sampled as a separate stratum (e.g., Sphagnum bogs); otherwise, include bryophytes as part of the herbaceous stratum

OPTION B (From 1987 Manual):

Trees: 3.0 inches or greater dbh regardless of height

Saplings/Shrubs: Less than 3.0 dbh and a height greater than 3.2 feet

Woody Vines: Those greater than 3.2 feet in height

Herbaceous: All nonwoody plants and those woody plants less than 3.2 feet in height

f. **Requirements** for completing the vegetation portion of a data sheet for each sample plot:

(1) Identify the strata;
(2) Use professional judgement to select a sampling technique;
(3) Accurately identify plant species using scientific names (not common names);
(4) Determine dominant plant(s) of each stratum and record on data sheet;
(5) Assign the indicator status for each from Reed (1988);
(6) Apply the basic hydrophytic vegetation criteria.

NOTE: If the result of (6) above is at precisely 50 percent, professional judgement may be used to consider non-dominants and evaluate the plant community as a whole.

TABLE 4
THE "50/20" RULE
FOR DETERMINING DOMINANCE

1. In each stratum, rank plant species in descending order of abundance (most abundant first) and arrive at a total dominance measure (percent cover, basal area, etc.).

2. Dominant species are those that immediately exceed 50 percent of the total dominance measure.

3. Additionally, any species that comprises 20 percent or more of the total dominance measure is considered a dominant species.

Example:

	Dominance Measure
SPECIES A:	60
SPECIES B:	50
SPECIES C:	40
SPECIES D:	30
	180

Fifty percent of 180 is 90. Species A, with a dominance measure of 60, does not exceed this 50 percent threshold; therefore, the next most abundant species is added. Species A and B in combination (dominance measure of 110) exceed the 50 percent threshold of 90. Therefore, both are considered dominant species. Next, we need to determine if any other species comprises 20 percent or more of the total dominance measure. One-fifth, or 20 percent, of 180 is 36. Species C, with a dominance measure of 40, meets this criteria so it too is considered a dominant species. Species D is not a dominant.

TABLE 5
DETERMINING DOMINANCE
BY THE "50/20" RULE

SPECIES	STRATUM I	STRATUM II	STRATUM III	
A	45	20	20	
B	5	25	10	
C	--	10	25	
D	20	10	10	
E	--	15	5	
F	5	10	10	
G	20	5	10	
H	5	5	10	(50 percent threshold = 50,
	100	100	100	20 percent threshold = 20)

NOTE: The numbers listed under "Stratum" represent a dominance measure (percent cover, basal area, etc.). For simplicity in this example, the total dominance measure adds up to 100. In actual cases, this may vary. For example, if percent cover is used as the dominance measure, it may be less than 100 percent if there are gaps within that stratum, or it may exceed 100 percent where there is overlap within the same stratum.

STRATUM I: Species A, with a dominance measure of 45, does not exceed the 50 percent threshold, so the next most abundant species is added. This is a tie between Species D and G, both with 20 percent of the dominance measure. In cases of a tie, both are included. The combination of dominance measure for these 3 species (85) exceeds the 50 percent threshold so all are considered dominants. No additional species exceeds the 20 percent threshold so no others are considered dominants.

STRATUM II: Species B (dominance measure of 25), does not exceed the 50 percent threshold. Neither does adding the dominance measure of 20 for Species A. So the next most abundant species is included, Species E with a dominance measure of 15. In combination the three exceed the 50 percent threshold and all are considered dominants. No additional species comprise 20 percent or more of the dominance measure.

STRATUM III: Species C (25) and Species A (20) do not surpass the 50 percent threshold. Therefore, the next most abundant species is added. This turns out to be a tie with 5 species all of which have a dominance measure of 10. Therefore, Species C, A, B, D, F, G and H are dominants.

TABLE 6

DATA FORM
INTERMEDIATE-LEVEL ONSITE DETERMINATION METHOD
VEGETATION UNIT SAMPLING PROCEDURE
(Herbs and Bryophytes)

Field Investigator(s): D. Lynn Eator Date: 25 August 1995
Project/Site: Highway 25 State: MN County: Anoka
Applicant/Owner: ______ Vegetation Unit #/Name: Old Field
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Species	Indicator Status	Percent Areal Cover	Cover[1] Class	Midpoint[1] of Cover Class	Rank[2]
1. Poa pratensis	FAC-	30	4	38.0	1 *
2. Agropyron repens	FACU	20	3	20.5	2 *
3. Bromus inermis	UPL	15	2	10.5	3
4. Phalaris arundinacea	FACW+	15	2	10.5	3
5. Solidago gigantea	FACW	5	1	3.0	4
6. Onoclea sensibilis	FACW	<1	T	0.0	
7. Pteridium aquilinum	FACU	<1	T	0.0	
8. Equisetum arvense	FAC	<1	T	0.0	
9.					
10.					
11.					
12.					
13.					
14.					

Dividing the sum of the midpoints (82.5) by 2 to arrive at the 50 percent threshold yields 41.25. The 38.0 midpoint of cover class for Poa does not exceed this 50 percent threshold so we add the next most abundant species, Agropyron. Adding its midpoint of cover class of 20.5 results in 58.5, which now exceeds the 50 percent threshold of 41.25. Both of these species are, therefore, dominants. The next step is to determine if any of the remaining species comprise 20 percent or more of the total dominance measure. Dividing 82.5 by 5 (one-fifth or 20 percent) yields 16.5. None of the remaining species has a midpoint of cover class equaling or exceeding 16.5 so no additional species are considered dominants.

29.					
30.					
31.					
32.					
33.					
34.					
35.					
36.					

Sum of Midpoints 82.5
Dominance Threshold Number Equals 50% x Sum of Midpoints 41.25

82.5/5 = 16.5

[1] Cover classes (midpoints): T<1% (none); 1 = 1-5% (3.0); 2 = 6-15% (10.5); 3 = 16-25% (20.5); 4 = 26-50% (38.0); 5 = 51-75% (63.0); 6 = 76-95% (85.5); 7 = 96-100% (98.0).

[2] To determine the dominants, first rank the species by their midpoints. Then cumulatively sum the midpoints of the ranked species until 50% of the total for all species midpoints is immediately exceeded. All species contributing to that cumulative total (the dominance threshold number) *plus* any additional species having 20% of the total midpoint value should be considered dominants and marked with an asterisk.

NOTE: Dominants from all strata are considered equally. For example, in a forested site with tree, shrub and herbaceous strata, the tree stratum is not given greater weight than the other strata.

NOTE: If Reed (1988) lists an NI (no indicator) for the plant species in question, one option is to consult the botanical literature (see Appendix B) for habitat descriptions of that species.

See the discussion of the "major portion of the root zone" under 6.e. HYDROLOGY.

g. **Problem Species:** A number of plant species commonly encountered during delineations have posed problems in identification. Similar species may have a very different indicator status under Reed (1988) necessitating accurate identification to the species level. Several problematic species are discussed below. Nomenclature shown in the boxes follows Ownbey and Morley (1991), *Vascular Plants Of Minnesota: A Checklist And Atlas*. Botanical references are listed in Appendix B.

(1) RASPBERRIES (Rubus):

Eurasian red raspberry (Rubus idaeus L.) -- FACU+
American red raspberry (Rubus strigosus Michx. var. strigosus and var. canadensis (Richards.) House) -- FACW-
Black raspberry (Rubus occidentalis L.) -- UPL

These raspberries have compound leaves that are green above and strongly whitened beneath and can be distinguished as follows:

(a) Canes heavily glaucous (white-powdery); flower stalks and stalk of the inflorescence with glandless, broad-based, slightly hooked prickles; mature fruit purple-black; native..R. occidentalis

(b) Canes may be somewhat glaucous but not conspicuously so; lacking broad-based prickles, instead has gland-tipped bristles on petioles, younger stems, flower stalks and stalk of the inflorescence (use 10x lens, the glandular bristles resemble a stalk with ball on the end); mature fruit red; native and widespread.....................R. strigosus (two varieties)(synonym: R. idaeus var. strigosus (Michx.) Maxim.)

(c) Similar to b. above, but glandless; the cultivated red raspberry, introduced from Eurasia, occasionally escaping gardens but seldom persisting in the wild...R. idaeus

It has been our experience that the red raspberry typically encountered in the upland/wetland transition zone in Wisconsin is the American red raspberry. Swink and Wilhelm (1994) note that Eurasian red raspberry rarely escapes cultivation and then usually does not persist in the wild. Reed (1988) lists the American red raspberry under R. strigosus and assigned an indicator status of FACW-. Additional sources used for the above: Voss (1985); Great Plains Flora Association (1991); and Britton and Brown (1970).

(2) ALDERS (Alnus):

Speckled alder (Alnus incana (L.) Moench subsp. rugosa (Du Roi) Clausen) -- OBL
Eurasian alder (Alnus incana (L.) Moench) -- FACU
Green alder (Alnus viridis (Vill.) Lam & DC. subsp. crispa (Ait.) Turrill) -- FAC

The widespread and abundant alder of Wisconsin's shrub and forested wetlands is the native speckled alder, long known under A. rugosa (Du Roi) Spreng., and presently addressed as Alnus incana var. rugosa by Ownbey and Morley (1991). Reed (1988) lists both A. rugosa and A. incana subsp. rugosa (see synonymy, page 62) and assigned it an OBL status. Our field experience confirms that OBL is the most appropriate indicator status (see following note specific to the red clay plain). Petrides (1972) notes that the European A. incana rarely escapes from cultivation. Green alder (A. viridis subsp. crispa) is primarily found in northern Wisconsin counties. Reed (1988) uses the synonym A. crispa (Dryand. In Ait.) Pursh and assigned it the indicator status of FAC. It has leaf margins that are finely serrate whereas leaf margins of speckled alder are both serrate and coarsely dentate (see figures on page 60 and key on page 63 of Voss (1985)).

NOTE: On the red clay parent materials of glacial Lake Superior, the native speckled alder (A. incana subsp. rugosa) can extend beyond the wetland boundary and colonize clay slopes on uplands.

(3) CREEPERS (Parthenocissus)

Virginia creeper (P. quinquefolia (L.) Planch.) -- FAC-
Thicket creeper (P. inserta (Kerner) Fritsch) -- FACU

Voss (1985) describes P. quinquefolia as: leaflets dull above when fresh, pale green and whitened or slightly glaucous beneath; tendrils with each branch forming an adhesive disc at the end if it comes in contact with a support; inflorescence with a definite central axis (i.e., branches forking unequally).

Voss (1985) describes P. inserta (synonym: P. vitacea (Knerr) Hitchc.) as: leaflets more or less shiny above when fresh, at most slightly paler beneath but not whitened; tendrils not developing discs (though sometimes club-shaped at the ends when in a crevice; inflorescence dichotomous (or trichotomous) throughout (i.e., branches of each set more or less equal in thickness).

(4) BUCKTHORNS (Rhamnus)

Common buckthorn (Rhamnus cathartica L.) -- FACU (Reed 1988); FAC- (Region 3 Interagency Review Panel 1993)
Glossy buckthorn (Rhamnus frangula L.) -- FAC+

These Eurasian shrubs have invaded both wetland and upland habitats in Wisconsin. Common buckthorn in particular has become widespread, especially around urban areas. Both buckthorns are found in disturbed areas (e.g., partially or effectively drained hydric soils) as well as relatively undisturbed wetland complexes. In addition to wetlands, common buckthorn is frequent in disturbed, upland oak forests. Glossy buckthorn, as indicated by its FAC+ indicator status, occurs more frequently in wetlands than common buckthorn. It is especially aggressive in invading calcareous fens, one of its native habitats in Europe.

Leaves of glossy buckthorn are conspicuously glossy and entire (sometimes slightly crisped but at most very obscurely and irregularly crenulate). Leaves of common buckthorn are dull and leaf margins have close, small, crenulate teeth (Voss 1985).

Reed (1988) assigned an indicator status of FACU for common buckthorn. In 1993, the Region 3 Interagency Review Panel reached a consensus to change this status to FAC- based on information that common buckthorn was occurring in wetlands at greater frequency than that reflected by FACU status. FAC- species occur in wetlands approximately 34 to 44 percent of the time whereas FACU species occur in wetlands approximately 1 to 33 percent of the time. The change to FAC- is included in the 1995 Supplement For Region 3, which is under review by the National Review Panel. Since 1993, the St. Paul District of the Corps has been using the revised indicator status of FAC- on an unofficial basis.

(5) BLUEGRASSES (Poa)

Annual bluegrass (Poa annua L.) -- FAC-
Canada bluegrass (Poa compressa L.) -- FACU+
Kentucky bluegrass (Poa pratensis L.) -- FAC-
Fowl bluegrass (Poa palustris L.) -- FACW+

The four species listed above are among the most frequent plant species encountered during wetland delineations. It is essential that they be correctly identified as they range from non-hydrophyte to hydrophyte. In general, bluegrasses have several traits that distinguish them from most other grasses: base of the lemmas have crinkled, cobwebby hairs (use 10x lens); spikelets are more than 1-flowered and laterally compressed; and leaf tips often end in a boat-shaped tip. These traits differentiate the bluegrasses from other common grasses encountered during delineations such as: (1) redtop (Agrostis stolonifera var. major), a FACW species that has one-flowered spikelets and lacks the cobwebby hairs; and (2) blue-joint grasses (Calamagrostis), primarily OBL and FACW species that have straight, silky hairs at the base of the lemma with one-flowered spikelets. In Poa, features of the lemma, including hairs and number of nerves, are very important to distinguish the species, but are difficult to confirm with a hand lens -- a dissecting scope may be needed. Below are a number of traits that can be recognized in the field:

(a) A low, tufted annual, rarely more than 25 cm high; lacking rhizomes; lacking cobwebby hairs (one of the exceptions in the bluegrasses); introduced from Eurasia ....P. annua

(b) A perennial with creeping rhizomes; stems strongly flattened (compressed) and wiry; panicle more or less stiff and compact; cobwebby hairs at base of lemma rather sparse; ligules typically less than 2 mm long; introduced from Eurasia..... ....P. compressa

(c) A perennial with creeping rhizomes, often sod-forming (lawns); stems round to slightly flattened; panicle moderately open to somewhat contracted; abundant cobwebby hairs at base of lemma; ligules typically less than 2 mm long; both native and Eurasian strains..P. pratensis

(d) A perennial but lacking rhizomes; stems round; panicle more open, loose and weak than (b) and (c) above; stems tall (6-12 dm) but may be decumbent or leaning; cobwebby hairs at base of lemma; best distinguishing trait are ligules of 2 to 5 mm in length -- conspicuously longer than above species; native................................P. palustris

Note that Fassett (1951) lists 8 other species of Poa that occur in Wisconsin. While these additional species are encountered less frequently during delineations, refer to Voss (1972), Gleason and Cronquist (1963), Swink and Wilhelm (1994), and other sources, for keys to the bluegrasses.

(6) REED CANARY GRASS (Phalaris)

Reed canary grass (Phalaris arundinacea L.) -- FACW+

Some delineators have discounted reed canary grass as a hydrophyte because it can occur in uplands; however, the fact that reed canary grass occasionally occurs in uplands is why it was not assigned an OBL status by Reed (1988). Instead, Phalaris arundinacea fits the concept of a facultative wetland (FACW) plant perfectly -- occurring in wetlands between 67 and 99 percent of the percent of the time. In fact, reed canary grass is one of the most tolerant of all our herbaceous species to anoxia created by flooded conditions (Apfelbaum and Sams. 1987. *Ecology and control of reed canary grass Phalaris arundinacea.* Natural Areas Journal. Vol. 7(2): 69-74). Reed canary grass is invasive and tolerant of a wide range of conditions leading to situations, especially in disturbed sites, where it colonizes areas extending upland of the wetland boundary. In such cases, finding the break between hydric and non-hydric soils often drives the delineation. In hydrologically disturbed sites, hydrology data, correlated with precipitation records, typically drives the delineation.

(7) PRICKLY ASH (Zanthoxylum)

Prickly ash (Zanthoxylum americanum Mill.) -- FACU+ (Region 3 Interagency Review Panel 1993)

Prickly ash was not included by Reed in the 1988 list of plant species that occur in wetlands. In 1993, the Region 3 Interagency Review Panel reached a consensus of FACU+ for this species and included this listing in the 1995 Supplement for Region 3, currently under review by the National Review Panel. Since 1993, the St. Paul District of the Corps has used this addition to the list on an unofficial basis.

6. HYDROLOGY

a. **Hydrology Criteria:** The 1987 Manual states that areas inundated or saturated to the surface for 5 to 12.5 percent of the growing season in most years may be wetlands, and areas inundated or saturated to the surface for greater than 12.5 percent are wetlands.

This refers to a consecutive number of days. "In most years" means at least 51 out of 100 years (March 1992 Corps guidance on the 1987 Manual). Using Dunn County as an example, Table 2 of the Dunn County Soil Survey (1975) shows that the 28 degree temperature 5 years out of 10 is April 27 to October 10, or 166 days. Five percent of 166 is slightly more than 8 days, which represents the minimum number of consecutive days of inundation or saturation necessary, in most years, to meet 1987 Manual hydrology criteria.

b. Hydrology is the most variable of the mandatory criteria for wetlands as it is subject to daily, seasonal, annual and longer-term fluctuations, such as the multi-year drought and wet cycles of the prairie pothole region. Furthermore, site visits are often conducted outside of the "wet" season (e.g., April-May), as well as during drought years, meaning that direct observation of inundation or saturation may not be made on the day of the site visit, or during short-term monitoring (one year or less) of wells. Development of the multi-parameter approach to wetland delineation under the 1987 Manual is based on the interrelationships between hydrology, soils and vegetation. Implementation of this approach allows delineators to use soils, vegetation and indicators of hydrology to accurately delineate wetlands outside of the "wet" season when direct evidence of hydrology (inundation, saturation) may be lacking.

The 1987 Manual first requires an independent indicator of hydrology, which can be difficult to identify during site visits conducted outside of the early portion of the growing season or during dry years. To account for this, the 1987 Manual allows use of other indicators for hydrology. For example, vegetation can be used as an indicator of wetland hydrology in sites with no substantial hydrologic modifications and dominance by OBL plants, or sites where OBL/FACW plants dominate and the wetland/upland boundary is abrupt. Furthermore, the 1987 Manual (pages 93-95) recognizes seasonal wetlands as "problem areas" in that they may lack one or more of the 3 parameters during certain times of the year due to natural seasonal or annual variations. This includes many of the saturated soil wetland types found in Wisconsin. Delineators will need to rely on other indicators, and their professional judgement, to make the correct wetland delineation in problem areas. Refer to the discussion under 7. PROBLEM AREAS for more information.

c. The question for wetland delineators is not whether a site has wetland hydrology on a given day or during a given growing season, but whether inundation or saturation to the surface occurs at a frequency and duration sufficient to meet the criteria stated in 6.a. above. The technical criteria do not require that wetland basins or the upper boundary of wetlands to be inundated or saturated to the surface every year, which recognizes the dynamic nature of wetlands. Wetlands may lack direct evidence of hydrology during several consecutive years, or one out of three years, or two out of five years, etc., and meet the wetland hydrology criteria.

d. **Soil Saturation:** Saturation is defined as a condition in which all easily drained pores between soil particles are temporarily or permanently filled with water. Soils can be saturated due to free water (i.e., below the water table) and by the capillary fringe (Figure 4).

(1) **Free Water:** Refers to water that will flow from the soil matrix into an unlined auger hole and represents the water table. The length of time for free water in an unlined auger hole to equilibrate with the water table depends on soil texture. In sandy soils this may be only minutes, while in heavier textured soils it may take hours. Accurate readings in clay soils may be difficult to obtain.

(2) **Capillary Fringe:** Capillary fringe, also called the zone of tension saturation, consists of water drawn upwards from the water table due to adhesion of water molecules to soil particles, and cohesion between water molecules. Free water in the soil pit or monitoring well represents depth to the water table; depth to saturated soils will always be nearer the surface due to capillary fringe (page 38, 1987 Manual). Soil textures determine the degree to which soil water is drawn upwards. Heavier textures, like silty clay, possess the greatest capillary fringe (16 to 24 inches) and coarse sand the least (0.4 to 3 inches). In comparison, loam can have a capillary fringe of 8 to 12 inches. Organic soils may have a capillary fringe of 12 to 18 inches. In the field, precise determinations of soil textures throughout a project site is time consuming and can be difficult for those who are not soil scientists. This can lead to inconsistencies and other problems in applying the variable capillary fringe estimates based on soil textures. In most cases, the approach of (3) below is recommended.

(3) **General Rule And Field Indicators For Determining Saturation:** The general rule is that soil saturation in the upper 12 inches of the soil profile is a positive indicator of wetland hydrology. For mineral soils, a field indicator of saturation is water glistening on a freshly broken ped face. The "squeeze test" has been discounted for determining saturation in mineral soils. It can be used to determine a degree a wetness, e.g., it may be important to note whether the soil is dry and powdery versus wet enough to squeeze water from a sample. In organic soils, which have high water holding capacity, there is debate on whether slight pressure can be used to indicate saturation. Some delineators contend that this only shows the degree of water held by the peat/muck and is not an indicator of saturation.

e. **Major Portion of the Root Zone:** For soil saturation to inhibit or preclude non-hydrophytes, it must occur within a major portion of the root zone. The major portion of the root zone is that portion of the soil profile in which more than half of the plant roots occur, usually within 12 inches of the surface (page 38, 1987 Manual). In general, if soil saturation only occurs at depths of 12 inches or deeper, hydrophytes will not dominate because insufficient wetness occurs in the major portion of the root zone to preclude survival by non-hydrophytes. In hydrologically disturbed systems, dominance by

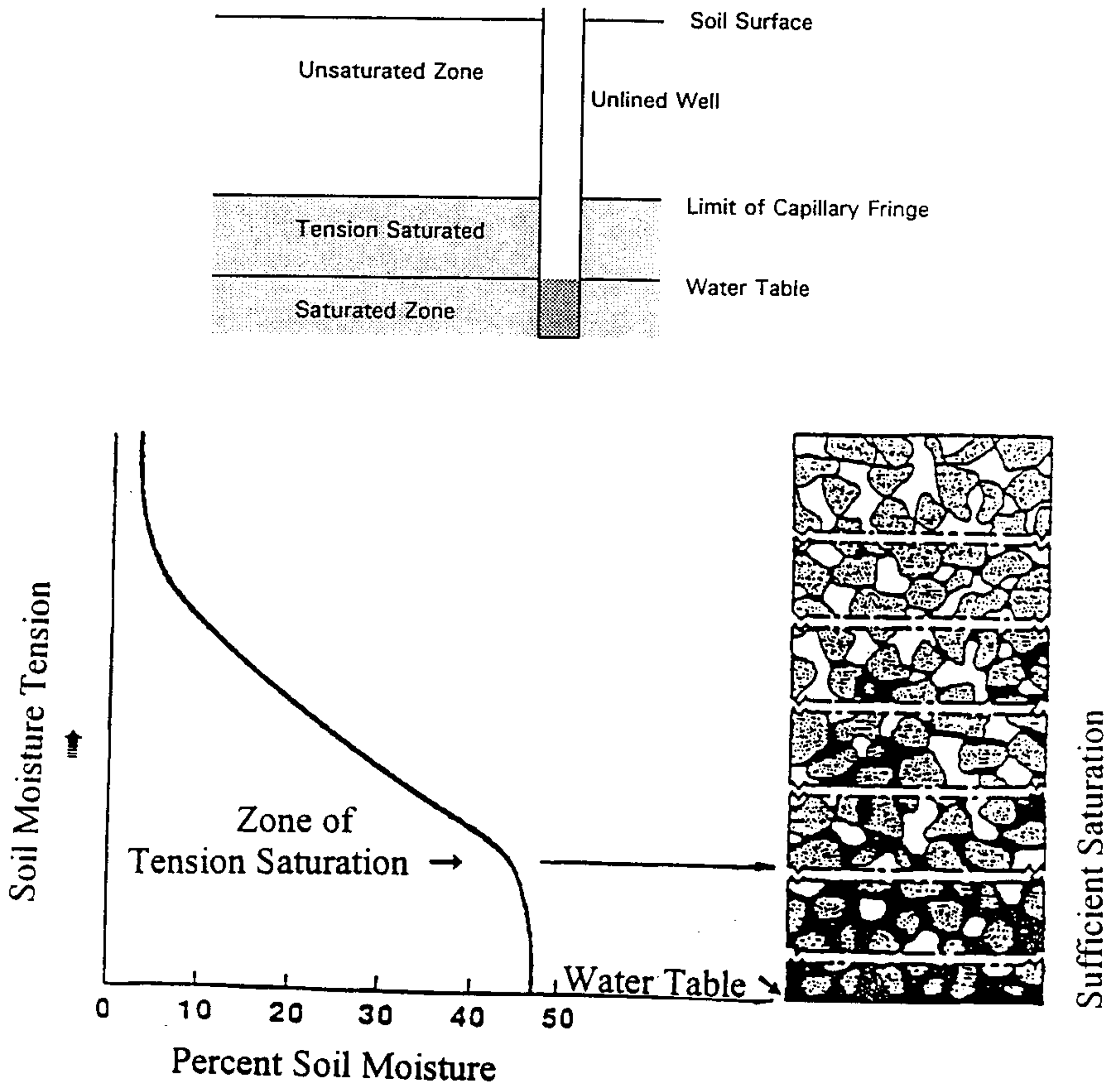


FIGURE 4

CAPILLARY FRINGE
(ZONE OF TENSION SATURATION)

hydrophytes may persist for a period of time after soil saturation has been removed from the major portion of the root zone. See discussion of hydrologically disturbed areas under 6.i.

f. **Other Indicators of Wetland Hydrology:** In addition to direct observation of inundation and soil saturation, other primary and secondary indicators of hydrology are applied under the 1987 Manual. Some of these are especially useful for delineations made outside of the first few weeks of the growing season, as well as during dry years. Primary indicators include water marks, drift lines, wetland drainage patterns and sediment deposits. Secondary indicators of hydrology (two or more required) include the following:

(1) **FAC-Neutral Test:** This test requires the delineator to consider the list of dominant plants for a particular sample point. FAC species, if present, are considered "neutral" and the delineator determines whether there are more OBL/FACW dominants than FACU/UPL dominants.

STEP 1: Determine dominants from all strata.
STEP 2: Drop out all those that are FAC (ignore + and -).
STEP 3: Do OBL and FACW dominants outnumber FACU and UPL dominants?

YES: It is a secondary indicator of wetland hydrology.
NO: Does not count as a secondary indicator of hydrology.
IF A TIE: Consider the non-dominants, are there more OBL/FACW species than FACU/UPL?

(2) **Oxidized Rhizospheres In Upper 12 Inches:** This redoximorphic feature consists of a ring of iron oxide concentrations (often orangish or reddish brown in color) around living roots/rhizomes where oxygen supplied by the plant roots oxidized the surrounding depleted matrix. Oxidized rhizospheres must be associated with living roots/rhizomes to be used as an indicator of current hydrology.

(3) **Soil Survey Data:** Soil survey data describing a particular soil series can be used such as the table listing depth to seasonal high water table. For example, Dawson Muck is listed as having a seasonal high water table of +1.0 to -1.0 (one foot of standing water to a water table one foot below the surface) during September-June. This indicates that inundation and saturation in the upper 12 inches typically occurs during the early growing season (April-May-June) and late growing season (September-October). (NOTE: Few hydric soils in Wisconsin will be listed as having a seasonal high water table in July-August due to high evapotranspiration and high temperatures that occur during those months.) Soil survey tables also show frequency, duration and time frame that a particular soil series is typically subject to flooding. For example, the Algansee series is listed as subject to frequent flooding for long duration (7 to 30 days for a single event) during November-May, which includes the April-May portion of the growing season. Of course,

use of this soil survey data is not applicable if the site being delineated has been subject to substantial hydrologic modifications.

g. **Monitoring Wells:** Shallow monitoring wells (pipes with perforations along most of the length below the ground surface) are used to observe depth to the water table. Monitoring wells can provide a wealth of information for use in characterizing the hydrology of a site and use of this technique is encouraged. A 1993 report by Steven Sprecher of the Corps of Engineers Waterways Experiment Station entitled, *Installing Monitoring Wells/Piezometers In Wetlands*, is recommended. A copy can be obtained from the Corps at the address listed at the end of this public notice.

Recommendations for use of monitoring wells:

(1) Install and begin monitoring the wells during the first two weeks of April or when frost is out, whichever comes first;
(2) 1 April through 30 June is the most important period to record monitoring well data;
(3) Use 0.75 to 1.25 inch diameter pipes (larger sizes respond too sluggishly to be useful for wetland hydrology determinations);
(4) Install and monitor wells consistent with Sprecher (1993);
(5) Install a sufficient number of wells to account for variations in soils, microtopography, vegetation, disturbances (e.g., distance from a ditch), etc.;
(6) Correlate monitoring well data with precipitation records of the preceding 2 weeks, 3 months, 1 year, 2 years, etc., as well data should be placed in a context of both short- and long-term climatic conditions;
(7) Correlate monitoring well data with "scope and effect" determinations of hydrologic modifications such as drainage ditches, drain tile, groundwater pumping, etc.;
(8) Correlate monitoring well data with vegetation and soils, as well as primary and secondary indicators of hydrology (NOTE: In hydrologically disturbed sites, soils and vegetation may not correlate with hydrology data);
(9) If drainage ditches are present, use staff gages or stage monitors to correlate water levels in the ditches to groundwater fluctuations.

Ideally, monitoring well data for a site should be collected over a period of 3 or more years to provide adequate characterization of the dynamics of wetland hydrology in addressing the "in most years" factor. Short-term (one year or less) monitoring well data may be insufficient for valid determinations as to whether saturation occurs "to the surface," as seasonal wetlands and the upper boundary wetlands may not be subject to inundation or saturation to the surface every year. In the absence of long-term monitoring well data, saturation within the upper 12 inches is considered a positive indicator of wetland hydrology. Additionally, greater emphasis is placed on other primary and secondary indicators of hydrology, as well as soils and vegetation.

Erroneous delineations have occurred when delineators placed too great an emphasis on short-term monitoring well data. Delineations can be skewed towards a one parameter approach if short-term monitoring well data is used to override the presence of hydric soils and dominance by hydrophytes because this data may not accurately reflect long-term hydrologic conditions of a site. For example, groundwater dependent wetlands may have a lag period of a year or more in response to drought year(s) and wet year(s). Monitoring well data should also be correlated with the "scope and effect" of hydrologic modifications. A determination that wetland hydrology no longer exists within a site composed of hydric soils and dominance by hydrophytes needs to be supported by a plausible explanation as to what modification(s) removed the hydrology under which the wetland soils and plant communities developed. In summary, a balanced, multi-parameter approach tempered with professional judgement is the method required under the 1987 Manual.

Correlation of monitoring well data with preceding precipitation records strengthens interpretations of this data. It has been suggested that a climate-related "sliding scale" be employed to determine how much monitoring needs to be done. Shorter-term monitoring periods could be acceptable when it: (1) does not occur during a drought recovery period; (2) occurs during a wet period consisting of one or more consecutive years of above average precipitation including the preceding two weeks, 1 month, etc.; and (3) includes the early portion of the growing season (April-May-June).

h. **Piezometers**: Piezometers are pipes set into the ground that are only open at the bottom of the pipe, or along a short perforation near the bottom. Consequently, the water level in a piezometer reflects the water pressure only at the bottom of the pipe. This makes piezometers much less useful for wetland hydrology determinations compared to monitoring wells. However, in settings where it is important to identify if a perched water condition is present, piezometers are necessary. "Nests" of both types of wells can be installed to provide a better picture of the hydrology of a site.

i. **Hydrology Determinations For Disturbed Sites**: When investigating hydrologically disturbed sites, delineators encounter more difficult interpretations and must differentiate between areas where wetland hydrology has been <u>eliminated</u> from those where hydrology has been <u>altered,</u> but still meets wetland criteria. This can be estimated by determining the "scope and effect" of the ditch system or drainage tile network by applying lateral effect calculations such as the van Schilfgaarde equation found in standard drainage manuals. (NOTE: Scope and effect calculations include assumptions (e.g., complete removal of surface water, uniform soil permeability in each horizon) that must be acknowledged by the delineator. Furthermore, the tables tend to be conservative in identifying the lateral effect.) The objective is to determine the extent that a hydrologic alteration has removed inundation and/or soil saturation in the upper portion of the root zone such that the wetland hydrology criteria is no longer met. These equations consider the depth of the ditch/tile as well as the permeability of the soil to determine lateral effect, which typically is a corridor along both sides of a ditch or tile line. That portion of the corridor closest to the ditch/tile where wetland hydrology has been eliminated is nonwetland because it has been effectively drained. Note that dominance by hydrophytes may persist following a recent, substantial hydrologic modification. This is especially true of woody species, as well as some perennial herbaceous species. Over a period of years, a shift to dominance by non-hydrophytes typically occurs with herbaceous species usually the first indicator of this shift. If OBL and/or FACW herbaceous species continue to dominate years after a substantial hydrologic modification, it may be an indicator that the site is not effectively drained as discussed below. Note that in organic soils where saturation has been eliminated by hydrologic modifications, dominance by hydrophytes may persist indefinitely due to the water holding capacity of these soils.

In contrast to the effectively drained corridor, that portion of the corridor within the scope and effect of the ditch/tile, but which still maintains inundation or soil saturation sufficient to meet wetland hydrology criteria "in most years," meets wetland criteria. A common situation in Wisconsin are wetlands that have been ditched/tiled and converted from a shallow/deep marsh to a wet meadow. Such areas have been converted to a "drier" wetland type by the artificial drainage, but still meet all three wetland parameters.

Monitoring well data can be an excellent tool in conjunction with a scope and effect calculation to confirm and fine tune that calculation. However, short-term monitoring well data that shows a substantial increase in the area considered effectively drained by the scope and effect calculations should be scrutinized. This is especially true when short-term monitoring well data is collected. Longer-term (e.g., 3 years) monitoring well data may be required to more fully evaluate hydrology of such sites.

j. **Use of Farm Services Administration (FSA) Photography**: The annual, aerial photography (slides) taken by FSA can be an excellent tool for observing year-to-year hydrologic conditions of a site, especially those in agricultural areas.

7. PROBLEM AREAS

"Problem areas" involve wetlands that periodically lack one or more of the three parameters due to natural seasonal or annual variations (pages 93-95, 1987 Manual).

a. **Seasonal Wetlands** are problem areas as they may normally lack indicators of wetland hydrology and/or hydrophytic vegetation during the drier portion of the growing season and during dry years. These wetlands include seasonally flooded basins, sedge/wet meadows, shallow marshes, shrub swamps, wooded swamps and floodplain forests. Secondary hydrology indicators can be used as discussed previously in 6.f. above. For example, a depressional hydric soil area that is not subject to substantial hydrologic modifications, may be dry during mid- to late summer of most years. Professional judgement should recognize that wetland hydrology would normally be present earlier in the growing season of most years.

b. **FACU Dominated Wetlands:** Some wetlands are dominated by FACU species, which occur in wetlands between 1 and 33 percent of the time. Jack pine (Pinus banksiana) and white pine (Pinus strobus) swamps are two examples. These are problem wetlands in that they do not conform to the hydrophytic vegetation criteria, but have obvious wetland hydrology and hydric soils. These facts should be noted as part of the documentation for the delineation and why the site was delineated as wetlands.

c. **Problem Soils:** See discussions under 4. Soils.

8. THE FOURTH AND FIFTH PARAMETERS

In addition to the three mandatory criteria for wetlands, topography can be considered a fourth parameter and professional judgement a fifth. Soil scientists know the importance of topography and make abundant use of it (e.g., in distinguishing hydric from nonhydric Mollisols). After weighing all the evidence from the sampling of soils, vegetation and hydrology, the final decision is based on professional judgement.

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APPENDIX A

CORPS OF ENGINEERS ROUTINE METHOD DATA SHEET

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: ____ Applicant/Owner: ____ Investigator: ____	Date: ____ County: ____ State: ____
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: ____ Transect ID: ____ Plot ID: ____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1.			9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). ____

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks): ___ Stream, Lake, or Tide Gauge ___ Aerial Photographs ___ Other ___ No Recorded Data Available Field Observations: Depth of Surface Water: ____ (in.) Depth to Free Water in Pit: ____ (in.) Depth to Saturated Soil: ____ (in.)	Wetland Hydrology Indicators: Primary Indicators: ___ Inundated ___ Saturated in Upper 12 Inches ___ Water Marks ___ Drift Lines ___ Sediment Deposits ___ Drainage Patterns in Wetlands Secondary Indicators (2 or more required): ___ Oxidized Root Channels in Upper 12 Inches ___ Water-Stained Leaves ___ Local Soil Survey Data ___ FAC-Neutral Test ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): ____________________ Drainage Class: ________

Taxonomy (Subgroup): ____________________ Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	No	(Circle)	
Wetland Hydrology Present?	Yes	No		(Circle)
Hydric Soils Present?	Yes	No		Is this Sampling Point Within a Wetland? Yes No

Remarks:

Approved by HQUSACE 2/92

APPENDIX B

RECOMMENDED BOTANICAL REFERENCES FOR WISCONSIN

Voss, Edward. 1972 and 1985. Michigan Flora Volumes I and II. Cranbrook Institute of Science, Bloomfield Hills, Michigan. 1,212 pages.

-- Highly applicable to MN and WI except some Great Plains species found in western MN not included
-- covers 2/3rds of our flora (Vol III still in preparation)
-- Best keys for sedges, grasses, rushes; in general, keys are clear and concise
-- Has ink drawings for representative number of species, a few color photos
-- Available at U of M -- St. Paul Campus bookstore for $12.50 per Vol., $25 for both superb texts, a great value!

Great Plains Flora Association. 1991. Flora of the Great Plains. University of Kansas Press. 1,402 pp.

-- if you work in western MN, this text will cover the gap in Great Plains species not included in Voss
-- very straightforward keys, no pictures or drawings

Fassett, Norman. 1957. A manual of aquatic plants. University of Wisconsin Press, Madison, Wisconsin. 405 pp.

-- excellent text to learn keying and learn taxonomic terms as nearly every term referred to in the keys has an ink drawing.

-- focus is on more aquatic species so many species of saturated soils, such as bog species, and species of transition zones, are omitted so it is necessary to go to other texts that include all grasses, the FAC and FACU species, etc.

-- available at U of M -- St. Paul campus bookstore, probably around $35

Petrides, George. 1972. A field guide to trees and shrubs. Peterson Field Guides series, Houghton Mifflin Company, Boston, Mass. 420 pp.

Peterson, Roger and Margaret McKenny. 1968. A field guide to wildflowers of Northeastern and Northcentral North America. Peterson Field Guide series, Houghton Mifflin Company, Boston, Mass. 420 pp.

-- can't go wrong in obtaining these two texts -- color and b/w drawings with quick and easy pointers on how to distinguish similar looking plants

-- caution in that for some groups of plants only representative species are included, there may be other similar species ~~that~~ you would need to go to a key to distinguish the various species

-- available at most book stores for less than $20

Gleason, Henry and Arthur Cronquist. 1963. Manual of vascular plants of Northeastern United States and adjacent Canada. D. Van Nostrand Company, NY, NY. 810 pp.

-- advantage: one text that covers all our flora

-- keys are challenging due to use of highly technical terms; no drawings

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Fassett, Norman. 1951. Grasses of Wisconsin. University of Wisconsin Press, Madison, WI. 173 pp.

-- very good keys complete with numerous ink drawings

-- complete list of grass species so includes those species not covered by Fassett's Manual of aquatic plants.

Swink, Floyd and Gerould Wilhelm. 1979 (and new version just out 1994). Plants of the Chicago region. The Morton Arboretum, Lisle, IL. 922 pp.

-- a standard for those working in southeast WI

-- excellent keys, no drawings

Fernald, Merritt. 1991. Gray's manual of botany. D. Van Nostrand Company, NY, NY. 1,632 pp.

-- comprehensive coverage, but keys can be very challenging

-- about $90 at U of M bookstore

Tyron, Rolla. 1980. Ferns of Minnesota. University of Minnesota Press, Minneapolis, MN. 165 pp.

-- excellent guide, easy to use keys and lots of ink drawings

-- includes scouring rushes and club mosses

Britton, Nathaniel and Addison Brown. 1970. An illustrated flora of the Northern United States and Canada Volumes I-III. Dover Publications, NY. About 2,000 pages.

-- Updated version is out of print. Can still obtain the older version, problem in that many name changes have occurred

-- nearly all species illustrated by ink drawings

-- relatively inexpensive, about $16 per volume or $48 for the set

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