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Wetland Identification and Delineation Manual

VOLUME II

Field Methodology

WETLAND IDENTIFICATION AND DELINEATION MANUAL

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FIELD METHODOLOGY

by

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PREFACE

According to Corps of Engineers and Environmental Protection Agency (EPA) regulations (33 CFR Section 328.3 and 40 CFR Section 230.3, respectively), wetlands are ". . . areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." Although this definition has been in effect since 1977, the development of formal guidance for implementing it has been slow, despite the fact that such guidance could help assure regional and national consistency in making wetland jurisdictional determinations. Moreover, a consistent, repeatable operational methodology for determining the presence and boundaries of wetlands as defined under the federal regulations cited above would alleviate some concerns of the regulated public and various private interest groups; it would also substantially reduce interagency disputes over wetland jurisdictional determinations. Therefore, this Wetland Identification and Delineation Manual was developed to address the need for operational jurisdictional guidance.

EPA's Wetland Identification and Delineation Manual is comprised of two volumes. Volume I presents EPA's rationale on wetland jurisdiction, elaborates on the three wetland parameters generally considered when making wetland jurisdictional determinations, and presents an overview of the jurisdictional approaches developed by EPA in Volume II, the Field Methodology. Thus, it lays the foundation for the three jurisdictional approaches presented in Volume II.

The basic rationale behind EPA's wetland jurisdictional approach was initially conceived in 1980 with the issuance of interim guidance for identifying wetlands under the 404 program (Environmental Protection Agency, 1980). In 1983 the rationale was expanded and a draft jurisdictional approach was developed consistent with the revised rationale.

EPA distributed the 1983 draft rationale and approach to about forty potential peer reviewers. Because the responses were, for the most part, favorable, additional revisions were made and a second draft was circulated to about sixty potential peer reviewers in 1985. Individuals receiving the drafts for review were associated with federal, state, and regional governmental agencies, academic institutions, consulting firms, and private environmental organizations; they represented a wide range of wetland technical expertise. The 1985 draft also went through EPA regional review, as well as formal interagency review by the U.S. Fish and Wildlife Service, Corps of Engineers, National Marine Fisheries Service, and Soil Conservation Service. Based upon the 1985 peer review comments, the comments from the federal agencies, and subsequent EPA field testing in Arkansas, Illinois, Louisiana, Mississippi, Virginia (bottomland hardwoods), North Carolina (pocosins), Maryland and Virginia (marshes and forested swamps), an interim final Wetland Identification and Delineation Manual was developed. The interim final Manual was field tested again during 1987 in Idaho (riparian forests, shrub swamps, montane wet meadows, and bogs), Iowa (forested swamps and marshes), Louisiana (fresh, brackish and saline tidal marshes), Maryland (forested swamps and fresh tidal marshes), Massachusetts (wet meadows, bogs and forested swamps), Texas (bottomland hardwoods) and Washington (forested wetlands, wet meadows and bogs). Based upon the 1987 field testing, peer review comments and comments from EPA regional offices, the Manual was further revised where appropriate. Although the rationale and technical criteria remain essentially the same, a number of procedural improvements have been made to both the simple and detailed approaches and a new approach for dealing with atypical situations and/or normally variable environmental conditions has been added. A more detailed explanation of these most recent revisions can be found in a report on the field testing effort (Sipple, 1988). During this same review period, the Corps of Engineers conducted field review of its wetland delineation manual (Environmental Laboratory, 1987). Now that their reviews are complete, both agencies plan to meet, consider the comments received, and attempt to merge the two documents into one 404 wetland jurisdictional methodology for use by both agencies.

The author truly appreciates the efforts of the many peer reviewers who commented on the 1987 interim final Manual or earlier drafts, including Greg Auble, Barbara Bedford, Virginia Carter, Harold Cassell, Lew Cowardin, Bill Davis, Dave Davis, Doug Davis, Frank Dawson, Mike Gantt, Cathy Garra, Mike Gilbert, Frank Golet, Dave Hardin, Robin Hart, John Hefner, Wayne Klockner, Bill Kruczynski, Lyndon Lee, Dick Macomber, Gene McColligan, Ken Metsler, John Organ, Greg Peck, Don Reed, Charlie Rhodes, Charley Roman, Dana Sanders, Bill Sanville, Hank Sather, Jim Schmid, Joe Shisler, Pat Stuber, Carl Thomas, Doug Thompson, Ralph Tiner, Fred Weinmann, and Bill Wilen. Their many constructive comments and recommendations have been very helpful in refining this document. EPA also appreciates the help of its Regional Bottomland Hardwood Wetland Delineation Review Team (Tom Glatzel, Lyndon Lee, Randy Pomponio, Susan Ray, Charlie Rhodes, Bill Sipple, Norm Thomas, and Tom Welborn) in field testing the basic rationale underlying the Field Methodology at a number of bottomland hardwood sites in 1986. The vegetation sampling protocol in the Field Methodology is to a large extent an outgrowth of that effort. In addition, the 1987 field testing could not have been accomplished without the aid of various agency and non-agency personnel, including Bob Barber, Susan Bitter, John Bruza, Steve Caicco, Tom Davidson, Alex Dolgas, Ronnie Duke, Woody Francis, Mike Hollins, Bill Jenkins, Gene Keepper, Mark Kern, Kathy Kunz, Bob Mosley, Tom Nystrom, Jeanene Peckham, Charlie Rhodes, Matt Schweisberg, Norm Sears, Eric See, Rod Schwarm, Ellaine Somers, Michele Stevens, Rusty Swafford, Ralph Tiner and Gary Voerman. I certainly appreciate all of their help. Helpful review and administrative guidance was provided by Suzanne Schwartz, John Meagher, and Dave Davis of EPA's Office of Wetlands Protection. Comments and suggestions received during the federal interagency review in 1985 were also instrumental in further refining the manual. In fact, in addressing the soil and hydrology parameters in this manual in 1987, the author relied heavily upon materials already developed by the Corps of Engineers in their wetland delineation manual cited above. Blake Parker's review of the soil sections of the current version of the Manual was also very helpful. Stan Franczak ably handled the huge typing load associated with the 1987 and current versions of the Manual, as well as the earlier drafts.

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SECTION I: INTRODUCTION

This Field Methodology is intended for use by Environmental Protection Agency field personnel in making wetland jurisdictional determinations. It was developed as a separate volume to facilitate its use in the field. The Field Methodology includes five sections and six appendices. Section I is an introduction which indicates the purpose of the document, outlines its contents, and explains its relationship to Volume I (Rationale, Wetland Parameters, and Overview of Jurisdictional Approaches). Section II addresses scoping and preliminary data gathering, two steps that are generally necessary prior to making jurisdictional determinations. A simple approach for making more or less routine jurisdictional determinations is outlined in Section III. A detailed approach for making jurisdictional determinations for large and/or controversial sites or projects is presented in Section IV. Both approaches should give the same results since the upland-wetland boundary is determined in a similar fashion. The detailed approach, however, allows for more extensive documentation. Section V should be used for atypical situations (i.e., situations where one or more indicators of vegetation, soils and/or hydrology cannot be found due to the effects of recent human activities or natural events) or when normal seasonal, annual or long-term cyclic variations in environmental conditions result from causes other than human activities or catastrophic natural events. Appendix A is a Jurisdictional Decision Flow Chart; Appendix B is a Jurisdictional Decision Diagnostic Key. Both of these appendices are tools that will expedite and conceptually guide decisions about jurisdiction for vegetation units and sample plots once the field data have been collected. They closely track each other and will lead to the same conclusions; one's preference for use will be solely a matter of choice. Some field investigators may find the flow chart easier to use than the key, especially if they have had limited experience using diagnostic keys. Although these tools will be particularly helpful to people who are not that familiar with the Field Methodology, their use is optional since jurisdictional determinations can be conducted without them. Appendices C and D include field data sheets for the simple and detailed approaches, respectively. These data sheets are comprehensive, with short explanatory notes to aid data collection. As field investigators become intimately familiar with the Field Methodology, particularly the three approaches involved, they will be able to implement these approaches in the field with the data sheets alone, referring to the Field Methodology only as necessary. In fact, because of their comprehensive nature, the data sheets are to some extent short versions of the approaches involved. Yet with practice, they are not really difficult or time consuming to complete in the field. Lists of necessary and optional equipment for both approaches are included in Appendix E. Appendix F is a diagram of the sample plot used in the detailed approach.

Volume II should not be utilized in isolation from Volume I. Users should first become very familiar with the rationale, wetland parameters, and overview of the jurisdictional approaches presented in Volume I. It is also very important to thoroughly review the glossary in Volume I, since a good understanding of the terms used in the methodology is imperative. Thus, Volume I should be thought of, in part, as a prerequisite training document on the use of Volume II, in that an understanding of the former will help assure the proper use of the jurisdictional approaches presented in the latter.

SECTION II: SCOPING AND PRELIMINARY DATA GATHERING

A. General

Prior to making a wetland jurisdictional determination, it is generally necessary to gather preliminary data on the site or project and scope out the task. This will allow the field investigator to determine whether the simple or detailed jurisdictional approach is appropriate.

B. Steps for Preliminary Data Gathering and Scoping

1. Obtain and review any aerial photographs, vegetation maps, wetland maps, topographic maps, soil surveys, technical reports, or other pertinent information depicting and/or describing the site.

2. Estimate the size of the site.

3. Determine the site's geomorphological setting (e.g., floodplain, isolated depression, ridge and swale complex) and its habitat or vegetative complexity (i.e., the range of habitat or vegetation types).

4. Determine whether a permit situation or an enforcement situation is involved.

5. If necessary, do a field reconnaissance to complete Steps 2-4.

6. Based upon Steps 1-5, determine whether the simple jurisdictional approach (Section III), the detailed jurisdictional approach (Section IV), or the approach for atypical situations and/or normally variable environmental conditions (Section V) is appropriate. This step assumes that a field investigator is already familiar with all three approaches and the types of projects or sites that would generally be applicable to them as described in Sections IIIA, IVA, and VA of this Field Methodology.

7. Gather together the equipment (Appendix E) necessary to make the jurisdictional determination, including an ample supply of the appropriate data sheets (Appendices C and/or D).

SECTION III: SIMPLE JURISDICTIONAL APPROACH

A. General

The simple jurisdictional approach is generally applicable to sites or projects that are relatively small in extent (i.e., up to 15 acres, such as a narrow fringe marsh along a shoreline or a small depressional wetland) and/or non-controversial in terms of public or private interests, ecological significance, potential jurisdictional challenges, enforcement status, etc. Discretion must be exercised in deciding whether a project is simple, however, since even small sites may be so vegetatively complex to require detailed examination; larger sites may be so uniform to allow for a simple examination. Controversial sites will generally entail conducting a detailed field examination regardless of size. Significantly altered sites, particularly enforcement situations, will generally require the use of the approach presented in Section V for atypical situations and/or normally variable environmental conditions in conjunction with either the simple or the detailed jurisdictional approaches.

The simple jurisdictional approach involves inspecting the majority of the site and making ocular vegetation estimates for the vegetation units as a whole (as opposed to detailed sampling along transects as in the detailed approach), and when appropriate, examining soil and hydrologic conditions as well. Because fifteen steps are potentially involved in the simple jurisdictional approach, on the surface it appears more complex than it really is. Actually, many jurisdictional determinations can be made without going through all fifteen steps. The simple jurisdictional approach will generally be applied only to smaller sites, which probably will have only one or at the most, a few vegetation units. Furthermore, a field investigator will only have to proceed through Step 7 for any vegetation units dominated by one or more obligate plant species, assuming there is no evidence of significant hydrologic modifications. And if a vegetation unit is comprised of only herbaceous plants, which is the situation with most marshes, dominants will have to be determined just for those species. Thus, jurisdictional determinations for small herbaceous wetlands, especially those with dominant obligate wetland species, should be rather easy to conduct.

All sites or projects for which the simple jurisdictional approach is not appropriate, should be examined using the approaches in either Section IV or Section V. Field data sheets are included in Appendix C. A list of necessary and optional equipment is given in Appendix E.

B. Steps for Implementing the Simple Jurisdictional Approach

1. Decide how the jurisdictional determination will be presented (e.g., ground delineation, delineation on aerial photographs or topographic maps, written technical report, or any combination of these). Proceed to Step 2.

2. Inspect the site and horizontally stratify it into different vegetation units either mentally, or on an aerial photograph or a topographic map. The approach used to stratify the site will be contingent upon how the jurisdictional determination will be presented. If the determination is to be presented using aerial photographs, then vegetation units should be tentatively delineated directly on the photographs or on photographic overlays prior to going into the field. These vegetation units should then be refined as appropriate in the field. If a ground delineation is planned, vegetation units can also be shown on aerial photographs or topographic maps, but the upland-wetland boundary will also have to be delineated on the ground using stakes or flagging tape. Note: In some instances involving large vegetation units, it may be best to divide the units into subunits and treat each subunit independently even though they are similar vegetatively. Another option with large units if they appear to be either obvious wetland or obvious upland (i.e., units dominated by either obligate wetland species and/or facultative wetland species growing on hydric soils or obligate upland species and/or facultative upland species growing on non-hydric soils, respectively) is to sample only a subset of the units. For example, when the vegetation unit on the upland side of an apparent upland-wetland boundary occurs on a steep, dry slope supporting dominant obligate upland and/or dominant facultative upland species, it can be examined using one or more sample plots in representative

areas of the unit. Under this option, use the plot size described in Step 8 (page 22) of the detailed approach (or a smaller plot where appropriate) and then apply Steps 9-19 of the detailed approach to collect data on the plots. Remember though, under such conditions (i.e., the unit appears to be obvious upland), it is only necessary to collect enough data to confirm whether the unit is in fact what it appears to be. Similarly, if the upland side of the upland-wetland boundary is obvious made land (e.g., a road embankment or parking lot), it is only necessary to address the made land in conjunction with the boundary line procedure described in Step 15 (page 16). If any of these options is exercised, however, it should be explained on the data sheets and documented in a field notebook. Proceed to Step 3.

3. Develop lists of the understory species (with bryophytes listed separately), woody vines, shrubs, saplings and trees as appropriate for each vegetation unit. This should be done by walking the majority of each vegetation unit, periodically scanning the vegetation, and listing the species on Data Forms C-1 through C-3. Note: Because of the multiple strata, more time will be necessary for this step in forested units. Also see note in Step 8 (page 11). Proceed to Step 4.

4. Determine the dominant plant species for each vegetation unit by inspecting the majority of each unit and making ocular estimates. Because of seasonal die-back, some plants (e.g., the skunk cabbage, Symplocarpus foetidus) may not appear dominant at the time of observation. Likewise, other species (e.g., high density, leafless plants such as the common three-square, Scirpus pungens) may actually be dominants even though they have low cover values due to their habit. Such species should be added to the list of dominants as appropriate with an explanation for why they were added in the "comment" section of the pertinent data sheet.

   a. Visually estimate the percent areal cover (by species) of the graminoids, forbs, ferns, fern allies, tree seedlings, and herbaceous vines in the non-bryophytic understory and record it on Data Form C-1 (bryophytes are treated separately in Step 4g below). This should be done by estimating the area of the vegetation unit covered by the foliage of a given plant species projected onto the ground. Note: Although the field observations made in Step 2 will be helpful in making these estimates, additional inspection will probably be necessary.

b. Indicate the cover class into which each understory species falls and its corresponding midpoint. The cover classes (and midpoints) are: 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).

c. Rank the understory species according to their midpoints. If two or more species have the same midpoints and the same or essentially the same recorded percent areal cover, equally rank them. Use absolute areal cover values as a tie-breaker only if they are obviously different.

d. Sum the midpoint values of all understory species.

e. Multiply the total midpoint values by 50%.

f. Compile the cumulative total of the ranked species in the understory until 50% of the sum of the midpoints for all understory species is reached or initially exceeded. All species contributing areal cover to the cumulative 50% threshold should be considered dominants. If the threshold is reached by two or more equally ranked species, consider them all dominants, along with any higher ranked species. If all species are equally ranked, consider them all dominants. Place an asterisk next to the dominants.

g. Visually estimate the percent areal cover of the bryophyte species and record it on a separate Data Form C-1 than was used for the non-bryophytic understory. Follow the same procedure used for the non-bryophytic understory species in Step 4a-f (page 7-8).

h. Visually estimate the percent areal cover of the shrub species and record it on Data Form C-2. Follow the same procedure used for non-bryophytic understory species in Step 4a-f (page 7-8).

i. Visually estimate the percent areal cover of the woody vine species independent of the strata in which they occur and record it on Data Form C-2. Follow the same procedure used for non-bryophytic understory species in Step 4a-f (page 7-8).

j. Visually estimate the percent areal cover of the sapling species and record it on Data Form C-3. Follow the same procedure used for non-bryophytic understory species in Step 4a-f (page 7-8).

k. Visually estimate the relative basal area of the tree species (exclusive of saplings) and record it on Data Form C-3. This should be done by considering both the size and number of individuals of a tree species and comparing that species to other tree species in the vegetation unit. The total relative basal area for all the species in a vegetation unit will always equal 100%. Note: An alternative option would be to establish sample points in one or more representative areas of each vegetation unit from which basal area data can be collected following the procedure described in Step 9q (page 24) of the detailed approach. If this option is implemented, document it on the data sheets and in a field notebook, then proceed to Step 5; otherwise continue below.

l. Rank the tree species by relative basal area. If two or more species have the same or essentially the same relative basal area, equally rank them.

m. Compile the cumulative sum of the ranked tree species until 50% of the total relative basal area for all tree species is reached or initially exceeded. All species contributing relative basal area to the cumulative 50% threshold should be considered dominants. If the threshold is reached by two or more equally ranked species, consider them all dominants, along with any higher ranking species. If all of the species are equally ranked, consider them all dominants. Place an asterisk next to the dominants. Proceed to Step 5.

5. Determine the indicator status of the dominant plant species in each vegetation unit using the national, regional, or state lists of plants that occur in wetlands and record it on Data Forms C-1 through C-3. Transfer this information (i.e., the dominant species and their respective indicator status) to the data summary sheets (Data Form C-5). Proceed to Step 6.

6. Determine whether the vegetation units have been hydrologically modified (e.g., whether a vegetation unit with dominant obligate wetland species has been ditched or a vegetation unit with dominant obligate upland species has been impounded).

   a. In the presence of one or more dominant obligate wetland species or one or more dominant obligate upland species in a vegetation unit, and in the absence of hydrological modifications, there is no need to consider hydrology further, or soils. If hydrological modifications are evident, however, the significance of these modifications must be determined before proceeding to Step 7. Note: For an elaboration on how to deal with natural or man-induced disturbances, see Section V.

b. When the only dominants in a vegetation unit are facultative species (i.e., facultative wetland, straight facultative, and/or facultative upland), proceed to Step 8.

c. If both situations exist at a site, (i.e., vegetation units with one or more obligate dominants and vegetation units with only facultative dominants) Steps 7 and 8 must be completed. If hydrological modifications are evident, however, the significance of these modifications must be determined before making the jurisdictional determination under Step 7. Note: For an elaboration on how to deal with natural or man-induced disturbances, see Section V.

7. Complete the remaining portions of the data summary sheets (Data Form C-5) that are not yet filled out. Using the data summary sheets and optionally either the Jurisdictional Decision Flow Chart (Appendix A) or the Jurisdictional Decision Diagnostic Key (Appendix B), decide whether the vegetation units supporting one or more dominant obligate wetland species or one or more dominant obligate upland species, are wetland units. Note: In a situation involving multiple vertical strata in which the only dominants in a given stratum occur sparsely because the total percent areal cover for that stratum is low, more weight should be given to the dominants in any strata that have substantially greater overall percent areal cover. For example, if a vegetation unit in a herbaceous wetland (e.g., a marsh) has one shrub species represented by a few scattered individuals, the shrub species would be considered the dominant shrub species present and thus a dominant under this methodology. However, that shrub species should be given relatively little weight in comparison with the dominant herbaceous species, which are obviously more abundant overall. This can be particularly significant if the shrub species is either an obligate wetland species or an obligate upland species and its indicator status is inconsistent with the indicator status of the herbaceous species that are more abundant overall (i.e., both obligate wetland species and obligate upland species occur as dominants in the same vegetation unit). This situation, which would usually result from anomalous conditions (e.g., man-induced disturbance), natural disturbance, or the presence of microsites, should be documented in the "comments" section of the data summary sheets (Data Form C-5). For an elaboration of how to deal with natural and man-induced disturbances, see Section V. Proceed to Step 15.

8. If the dominant plant species in any vegetation units are all facultative (i.e., facultative wetland, straight facultative, and/or facultative upland), examine the soils and hydrology as indicated in Steps 9-13. Note: If it appears that soils and hydrology data are required (i.e., when only facultative plant species appear to dominate a vegetation unit), it might be more efficient to sample the soils and make hydrologic observations periodically as the unit is transversed to examine the vegetation in Steps 3 and 4 (page 7-9).

9. Check the appropriate county soil survey (or other sources of soils information in the absence of a published survey) to determine the soil series or phases (or other applicable soil mapping units) for the vegetation units containing only facultative species. Record this information on Data Form C-4 and proceed to Step 10.

10. Check the national list of hydric soils or the pertinent state hydric soils list to determine whether the soil series or phases for the vegetation units are considered hydric. Record this information on Data Form C-4 and proceed to Step 11.

11. Examine the soil profiles in the vegetation units to confirm whether they fit the soil series or phase descriptions in the soil survey. This is necessary due to the possibility of inclusions of other soil series or phases and to check for possible mapping errors. Also some mapping units will be hydric (e.g., alluvial land, swamp, tidal marsh, muck, and peat) but will not be on the list of hydric soils because they do not yet have series names for the area in question. Note: Because of the possibilities mentioned above and perhaps others, the field characteristics at a given site should be given precedence over how a site is mapped on a county soil survey. However, any divergence from the soil survey or the national or state lists of hydric soils should be well-documented technically, and unless there is a good reason to believe otherwise for a given series/phase (e.g., the exceptions mentioned above), any series/phase not on the hydric soils lists should be considered non-hydric.

The number of soil pits necessary will depend upon the size of the vegetation units, but generally between one and three soil pits per unit (or one soil pit with supplemental soil probes) will suffice. Whenever possible, pits should be dug to at least 40 centimeters (16 inches) and the soil characteristics observed in the major portion of root zone, generally the upper 30 centimeters (12 inches) of soil. Note: In some instances (e.g., bedrock or extremely rocky terrain), it may not be possible to excavate to 16 inches. Be sure, however, to examine the soil profile at least to the depth of the major portion of the root zone. The units should be considered hydric if they either (a) meet the hydric soil criteria in Volume I (page 10) or (b) manifest any of the field indicators of hydric soil listed in Step 12 below. Proceed to Step 12.

12. Determine whether field indicators of hydric soil conditions exist in the vegetation units and record them on Data Form C-4. The presence of one or more of the following indicators is indicative of the presence of hydric soils. Note: The soil examination can be terminated when a hydric soil indicator is encountered. After considering these indicators, proceed to Step 13.

    a. Organic soils (Histosols) or mineral soils with a histic epipedon.

    b. Gleyed mineral soils or mineral soils with low soil matrix chromas. Using Munsell Soil Color Charts, record the soil matrix color and mottle color (i.e., the hue, value, and chroma) of a soil sample by matching the sample with the appropriate color chips. For example, a soil sample with a hue of 10YR, a value of 6, and a chroma of 2 would be recorded as 10YR 6/2. Also determine whether the soil is gleyed by matching the soil sample with the color chips on the gley page of Munsell Soil Color Charts. These samples should be taken at a 25-30 centimeter (10-12 inch) depth, or immediately below the A horizon, whichever is higher in the soil profile. Note: The soil should be moistened if it is dry when examined. Apply the following diagnostic soil key to confirm whether the colors in the soil matrix are indicative of hydric soil conditions:

    1a. Soil is mottled:

    2a. Matrix is gleyed.............................hydric.

    2b. Matrix is not gleyed:

    3a. Chroma of matrix is $\leq$ 2................hydric.

    3b. Chroma of matrix is > 2............not hydric.

1b. Soil is not mottled:

4a. Matrix is gleyed............................hydric.

4b. Matrix is not gleyed and chroma is $\leq$ 1.......hydric.

4c. Matrix is not gleyed and chroma is > 1...not hydric.

Thus, gleyed soils, mottled soils with a matrix chroma of less than or equal to 2, and unmottled soils with a matrix chroma less than or equal to 1 are all hydric soils. Note: Because of their high organic content, certain mineral soils (e.g., some Mollisols) may not meet these hydric criteria. However, in such dark (black) soils, the presence of gray mottles within 25-30 centimeters (10-12 inches) of soil surface is considered indicative of hydric conditions. For the most part in the United States, Mollisols are mainly the dark colored, base-rich soils of the Prairie Region. Because of the color of the parent material (e.g., the red soils of the Red River Valley), some soils will not meet any of these color characteristics. Soil color is also generally not a good indicator in sandy soils (e.g., barrier islands). When problematic parent materials or sandy soils are encountered, hydric soil indicators other than color may have to be relied on in the field.

c. Aquic or peraquic moisture regime. Soils with peraquic moisture regimes are always hydric; those with aquic moisture regimes are usually hydric (i.e., they are hydric if they meet the hydric soil criteria specified in Section IIIB2 of Volume I, page 10-11).

d. Sulfidic materials. The smell of hydrogen sulfide (rotten egg odor) is indicative of the presence of sulfidic materials. Hydrogen sulfide forms under extreme reducing conditions associated with prolonged soil saturation or inundation.

e. Iron or manganese concretions. These are usually black or dark brown and occur as small aggregates near the soil surface.

f. Oxidized root-rhizome channels associated with living roots and rhizomes. These oxidized (generally brown or orange-brown) channels contrast sharply with the surrounding reduced (generally gray, greenish or bluish) soils.

g. Ferrous iron. This is chemically reduced iron, the presence of which can be determined using a colorimetric field test kit.

h. Other organic materials. In sandy soils (e.g., on barrier islands) look for any of the indicators listed below.

(1) A layer of organic matter above the mineral surface or high organic matter content in the surface horizon. The mineral surface layer generally appears darker than the mineral

material immediately below it due to organic matter interspersed among or adhering to sand particles. Note: Because organic matter also accumulates in upland soils, in some instances it may be difficult to distinguish a surface organic layer associated with a wetland site from litter and duff associated with an upland site unless the plant species composition of the organic material is determined.

(2) Dark vertical streaking in the root zone of subsurface horizons due to the downward movement of organic materials from the surface. When the soil from a vertical streak is rubbed between the fingers, a dark stain will result. This may sometimes be associated with a thin organic layer of hardened soil (i.e., an organic pan or spodic horizon) occurring at 30-75 centimeter (12-30 inch) depths.

13. Make hydrologic observations in the vegetation units and record them on Data Form C-4. See the note in Step 8 (p. 11).

a. Record any evidence of surface inundation, such as drift lines, water marks, sediment deposition, bare areas, moss lines, water-stained leaves, standing or flowing water, surface scouring, drainage patterns, etc., within a 10 foot radius of the soil samples taken in Step 11 (p. 11). Note: These phenomena should be used as indicators only within the context that they are used in Section IIIC2 of Volume I.

b. After sufficient time has passed to allow water to drain into the soil pit(s) dug in Step 11, examine the pit(s) for evidence of standing water and soil saturation. Note: Because of the capillary zone, the soil will be saturated higher in the soil profile than the depth of standing water in the soil pit(s).

c. Record any plant species that have morphological adaptations (e.g., buttressed tree bases and adventitious roots) to saturated soil conditions or surface inundation within a 10 foot radius of the soil samples taken in Step 11 (p. 11).

d. When necessary, additional information on hydrology should be obtained from recorded sources, such as stream gauge data, tide gauge data, flood predictions, piezometric data, soil surveys, and the national or state lists of hydric soils.

Note: It is not necessary to directly demonstrate that wetland hydrology is present. It is only necessary to show that the soil or its surface is at least periodically saturated or inundated, respectively, during a significant part of the growing season (i.e., soil saturation for usually a week or more, ponding for a long or very long duration, and frequent flooding for long or very long duration). Specifically, with a vegetation unit dominated by one or more obligate wetland plant species, it is necessary to show either (1) that there have been no significant hydrologic modifications or (2) that there is one or more hydrologic indicators at least periodically present during a significant part of the growing season when the significance of the hydrologic modification is in doubt. With a vegetation unit dominated by only facultative species (i.e., facultative wetland, straight facultative, and/or facultative upland) occurring on a hydric soil, it is necessary to demonstrate that there is one or more hydrologic indicators at least periodically present during a significant part of the growing season. Indicators of surface inundation and the presence of saturated soils in the major portion of the root zone (i.e., generally the upper 30 centimeters (12 inches) of soil) are considered hydrology indicators. Plant morphological adaptations are also considered hydrology indicators, unless the vegetation unit has been significantly altered hydrologically. Other hydrology indicators include the various recorded sources listed in Step 13d (page 14). Proceed to Step 14.

14. Complete the remaining portions of the data summary sheets (Data Forms C-5) that are not yet filled out. Using the data summary sheets and <u>optionally</u> either the Jurisdictional Decision Flow Chart (Appendix A) or the Jurisdictional Decision Diagnostic Key (Appendix B), decide whether the vegetation units dominated by facultative species (i.e., facultative wetland, straight facultative and/or facultative upland) are wetland units. See the note in Step 7 (page 10) and proceed to Step 15 (or back to Procedure 1 of Part V if unauthorized activities are involved).

15. Indicate the extent of wetlands at the site by one of the following options.

    a. Written report. If the extent of wetlands is to be conveyed in a written description, the various vegetation units should be described in a detailed technical report, including information on the dominant plant species, as well as soil and hydrologic conditions as appropriate. This information should be derived from Data Forms C-1 through C-5. The geographic extent of wetlands at the site will coincide with the distribution of the various wetland vegetation units determined in Steps 7 and/or 14, as applicable. Therefore, any upland-wetland boundaries at the site will essentially coincide with the boundaries between the upland vegetation units and the wetland vegetation units that are present. However, it should be indicated in the report that, if necessary, a more definitive boundary could be established by an on-site ground delineation.

    b. Aerial photographs/topographic maps. If the extent of wetlands is to be conveyed on aerial photographs or topographic maps, the various vegetation units can be delineated directly on the photographs or maps or on overlays thereof. The geographic extent of wetlands at the site will coincide with the distribution of the various wetland vegetation units determined in Steps 7 and/or 14, as applicable. Therefore, any upland-wetland boundaries at the site will essentially coincide with the boundaries between the upland vegetation units and the wetland vegetation units that are present. However, it should be indicated on the photographs or maps that, if necessary, a more definitive boundary could be established in an on-site ground delineation.

    c. Ground delineation. If the extent of wetlands at the site is to be delineated on the ground, the following additional steps are necessary.

        (1) Review the data summary sheets (Data Forms C-5) for the various vegetation units to refresh your memory on which vegetation units are upland versus wetland. This will give you an indication of the approximate upland-wetland boundary.

(2) Walk the interface between the upland vegetation units and the wetland vegetation units and make observations of vegetation, soils, and hydrology as necessary. Note: Soils generally are more useful than vegetation in establishing the upland-wetland boundary, particularly if there is no evident vegetation break or when facultative species dominate two adjacent vegetation units. However, in the presence of dominant obligate plant species in a vegetation unit, particularly when in conjunction with a sharp topographic break, vegetation alone will generally suffice for establishing the boundary.

(3) If it is obvious that vegetation alone will suffice for establishing the upland-wetland boundary (i.e., in the presence of dominant obligate plant species) observations should be made along the apparent boundary. The frequency of observations necessary along the boundary will depend upon its nature (e.g., a rather straight boundary occurring along a sharp topographic breaks will allow for a lower observation frequency than a meandering boundary with a less distinct topographic break). Observations should be periodically documented (i.e, as a general guide, at 100 foot intervals) by estimating the dominant plant species to each side of the upland-wetland boundary and listing them in the soils "comments" section of two Data Form C-4's numbered 1BU and 1BW, respectively (i.e., the 1BU refers to the observations on the upland side of the upland-wetland boundary at the first location where data are recorded along the boundary and 1BW refers to observations on the wetland side). Based upon these observations along the interface between upland and wetland vegetation units, establish the various boundary points along the upland-wetland boundary and stake or flag them. The boundary points in aggregate, and by interpolation any lines established between them using the vegetation break or topographic break as a guide, constitute the upland-wetland boundary at the site.

(4) If vegetation alone will not suffice for establishing the upland-wetland boundary, soils should be examined along the apparent boundary. At each location along the boundary where soils are examined, samples should be taken across (i.e., perpendicular to) the boundary. Although data sheets do not have to be filled out for each location along the boundary where soils are examined, they should be periodically completed (i.e., as a general guide, at 100 foot intervals). When data sheets are used, one sheet (Data Form C-4) should be completed for areas immediately to each side of the upland-wetland boundary (i.e., one form should be completed for the wetland unit and one form should be completed for the upland unit). The data sheets should be numbered 1BU and 1BW, respectively (i.e., the 1BU refers to the sample taken on the upland side of the upland-wetland

boundary at the first location where data are recorded along the upland-wetland boundary and 1BW stands for the sample on the wetland side). Hydrological observations should also be made within a five foot radius of the soil samples. Like with soils, this hydrological information should be periodically entered on data sheets (i.e., the same ones used for the two soil samples). The dominant plant species on the upland side of the upland-wetland boundary should also be estimated and indicated in the soils "comments" section of the Data Form C-4 used for sample 1BU and the dominant plants on the wetland side should be estimated and indicated in the soils "comments" section of the Data Form D-4 used in sample 1BW. In addition, any vegetation and/or topographic breaks in the immediate vicinity of the upland-wetland boundary should be recorded in the soils "comments" section of one of the two Data Form C-4's. Based upon the soil, hydrology and vegetation samples/observations along the interface between upland and wetland vegetation units, establish the upland-wetland boundary points and stake or flag them. Also record the distances and compass directions between the boundary points and their respective two soil samples (e.g., 1BU and 1BW) on the appropriate Data Form C-4. The boundary points in aggregate, and by interpolation any lines established between them using vegetation breaks or topographic contours as a guide, constitutes the upland-wetland boundary at the site.

(5) If desired, the extent of wetlands can also be indicated on aerial photographs or topographic maps, and/or a written report can be produced.

Note: Once the jurisdictional determination is complete, a permanent file should be set up that includes (1) the documentation developed in Step 15 above, including all of the data forms, (2) a general site location map, (3) a sketch map where appropriate, (4) reference to information gathered in the preliminary data gathering and scoping effort if it was subsequently useful in the delineation effort, and (5) any other pertinent information (e.g., that gathered from interviews with people familiar with the site).

SECTION IV: DETAILED JURISDICTIONAL APPROACH

A. General

The detailed jurisdictional approach is generally applicable to sites or projects that are relatively large (i.e., greater than 15 acres, such as an extensive riverine bottomland hardwood tract or a large depressional wetland) and/or controversial in terms of public or private interests, ecological significance, potential jurisdictional challenges, etc. In some instances, the detailed jurisdictional approach might also be appropriate for smaller sites or projects, especially those with complex vegetation. However, the detailed approach is very time consumptive and requires at a minimum two people, and preferably a team, to implement. Thus, whenever possible the simple approach should be utilized for making jurisdictional determinations.

The detailed jurisdictional approach involves standard quantitative vegetation sampling along transects and frequently an examination of the soils and hydrology as well. Field data sheets are included in Appendix D. A list of necessary and optional equipment is given in Appendix E. Appendix F is a diagram of the sample plot used in the detailed approach.

B. Steps for Implementing the Detailed Jurisdictional Approach

1. If a reconnaissance survey was not done in the preliminary data gathering and scoping effort, it should be done here. This can be very useful, particularly for forested sites, since it will give the field investigator a good idea of the range of vegetation and soil conditions over the site. Proceed to Step 2.

2. Based upon the reconnaissance study, horizontally stratify the site into different vegetation units either mentally or on aerial photographs or topographic maps. If aerial photographs or topographic maps are used, the vegetation units should be tentatively delineated directly on the photographs, on photographic overlays, or on the

topographic maps prior to going into the field. These vegetation units should then be refined on the photographs, overlays or maps as appropriate in the field. If a ground delineation is planned without the use of photographs or maps, then ground adjustments to the vegetation units can be made along the transects as appropriate. Either way, the upland-wetland boundary will have to be delineated on the ground using stakes or flagging tape. Proceed to Step 3.

3. Establish a baseline or baselines from which transects will extend into the site. A baseline might be the boundary of the site, a highway or unimproved road, or some other evident lineal feature. It should extend more or less parallel to any major watercourse at the site and/or perpendicular to the topographic gradient. Delineate the baseline on an aerial photograph or a topographic map and record its origin, length and compass heading in a field notebook. In the absence of obvious lineal features, the baseline can be established and flagged using a compass heading. When a limited number of transects are planned, a baseline may not be necessary as long as there are fixed points (e.g., structures such as a building) from which a transect could start. Proceed to Step 4.

4. Establish transect locations. The number of transects necessary to adequately characterize a site will vary with the size of the site and the complexity of the vegetation. It is generally best to divide the baseline into segments (e.g., 100 foot, 500 foot, or 1000 foot intervals depending on the size of the site) and randomly select a point within each segment to begin a transect. The location of each transect along the baseline should be recorded in a field notebook. When a fixed point is used in lieu of a baseline, that point will serve to locate the beginning of the transect. Be sure, however, that each vegetation unit is included within at least one transect. Proceed to Step 5.

5. Establish each transect along a compass heading perpendicular to the baseline. Record the compass heading in a field notebook. Transects should extend far enough into the site to adequately characterize all of the vegetation units along the heading. In most instances the transects will extend across the entire width of the wetland unless a body of water or other obstacles (e.g., an impenetrable thicket) prevents access. Under those circumstances, access from the opposite side of the site may be necessary to complete the transect and this should be explained on the data sheets and in a field notebook. Proceed to Step 6.

6. Following the compass heading and flagging it as you go, walk each transect to a point at which all of the vegetation units along the transect have been encountered. In the process, make any necessary adjustments to the tentatively delineated vegetation units or establish such units if they were not delineated in Step 2. If aerial photographs or topographic maps are used, delineate the transects on them. Proceed to Step 7.

7. After a transect has been established and walked to its terminus, it should be traversed again in the opposite direction following the flags to do the quantitative sampling. As you walk the transect, record its length by either pacing or measuring with a tape. The number of sample plots necessary will depend upon the length of the transect and the complexity of the vegetation. At least one 0.1 acre (0.04 hectare) circular sample plot should be established in each vegetation unit along a transect. Note: If a vegetation unit is small or so shaped (e.g., a narrow lineal swale) that the 0.1 acre plot would extend beyond its boundaries, an adjustment in the plot shape or size is warranted. This might involve a rectangular lineal plot of the same acreage, a smaller circular plot, or some other modification, whichever seems most appropriate to site conditions. Any modifications in plot size or shape, however, should be documented on the data sheets and in a field notebook. In addition, when the upland side of an apparent upland-wetland boundary is obviously

upland (i.e., a steep, dry slope supporting dominant obligate upland and/or dominant facultative upland species), a smaller plot size is warrented for the upland vegetation unit. Similarly the upland side of the boundary may be obvious made land (e.g., a road embankment or parking lot) in which case the boundary line sampling procedure described in Step 21 will suffice. Additional sample plots should be established within the unit at 91.5 meters (300 foot) intervals along the transect or sooner if a different vegetation unit is encountered. With exceptionally large vegetation units or very uniform or monotypic vegetation, however, a sampling interval larger than 91.5 meters may be more appropriate. Thus, a field investigator should exercise discretion in establishing sampling intervals. Sample plots should be shown on either the aerial photographs or topographic maps (when they are available), and their distances from the baseline should be recorded on the data sheets and in a field notebook. Proceed to Step 8.

8. Select a point along the transect in the ultimate vegetation unit to center the first 0.1 acre sample plot. Flag the center of the plot and the four cardinal compass points of the perimeter of the circular plot. This will divide the plot into four quadrants, and the plot will have a 11.35 meter (37.24 foot) radius. Proceed to Step 9.

9. Determine the dominant plant species for the sample plot. There are a number of ways to effectively sample vegetation. Many procedures will produce essentially the same results and some procedures may be appropriate for certain vegetation types but not for others. The following procedure has proven effective in the field, but may have to be adjusted as appropriate depending upon site conditions and the nature of the vegetation. Note: If a team approach is taken, field investigators have the option of completing Steps 14-18 (soils and hydrology) simultaneously with the vegetation analysis, even though these steps would not be necessary in the presence of dominant obligate plant species. Also see the third note in Step 16 (page 28).

a. Randomly toss two $0.1m^2$ quadrat frames into the understory of each quadrant of the 0.1 acre plot. On a Data Form D-1, record the percent areal cover of each non-bryophytic understory species (graminoids, forbs, ferns, fern allies, tree seedlings, and herbaceous vines) occurring soley within or extending into each quadrat frame when viewed from directly above it. Note: Record the percent areal cover of the bryophytes on a separate Data Form D-1 and see Step 9h below.

b. Construct a species area curve to determine whether the eight $0.1m^2$ quadrats are sufficient to adequately survey the understory (see back of Form D-1). The number of quadrats necessary will correspond to the point on the curve where it first levels off (and remains essentially level), indicating that the quadrats after that point added few if any additional species. If eight $0.1m^2$ quadrats are not sufficient, do additional quadrats in increments of four (one in each quadrant) until the necessary number of quadrats is reached.

c. For each species, sum the percent areal cover for all $0.1m^2$ quadrats and divide the total by the total number of quadrats sampled, which will give an average percent areal cover by species.

d. Rank the species in the understory by average percent areal cover. If two or more species have the same or essentially the same average percent areal cover, equally rank them.

e. Sum the average percent areal cover for all the species in the understory.

f. Multiply the total average percent areal cover by 50%.

g. Compile the cumulative sum of the ranked species in the understory until 50% of the total average percent areal cover for all species is reached or initially exceeded. All species contributing cover to the cumulative 50% threshold should be considered dominants. If the threshold is reached by two or more equally ranked species, consider them all dominants, along with any higher ranking species. If all of the species are equally ranked, consider them all dominants. Place an asterisk next to the dominants.

h. Repeat Step 9b-g above for the bryophyte component of the understory.

i. Determine the percent areal cover of the shrub species within the entire 0.1 acre sample plot and record the data on Data Form D-2. This should be done by traversing the plot a number of times, listing the shrub species present, and estimating their percent areal cover for the entire plot.

j. Indicate the cover class into which each shrub species falls and its corresponding midpoint. The cover classes (and midpoints) are: 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).

k. Rank the shrub species according to midpoints. If two or more species have the same midpoints and the same or essentially the same recorded percent areal cover, equally rank them. Only use absolute areal cover values as a tiebreaker if they are obviously different.

l. Sum the midpoint values of all shrub species.

m. Multiply the total midpoint values by 50%.

n. Compile the cumulative total of the ranked shrub species until 50% of the sum of the midpoints for all shrub species is reached or initially exceeded. All species contributing areal cover to the cumulative 50% threshold should be considered dominants. If the threshold is reached by two or more equally ranked species, consider them all dominants, along with any higher ranking species. If all of the species are equally ranked, consider them all dominants. Place an asterisk next to the dominants.

o. Determine the percent areal cover of the woody vine species within the entire 0.1 acre sample plot and record the data on Data Form D-2. This should be done by traversing the plot a number of times, listing the woody vine species present, and estimating the percent areal cover by species for the entire plot independent of the strata in which they occur. Follow the same procedure used for shrubs in Step 9i-n (page 23-24).

p. Determine the percent areal cover of the saplings within the entire 0.1 acre sample plot and record the data on Data Form D-3. This should be done by traversing the plot a number of times, listing the sapling species present, and estimating the percent areal cover by species for the entire plot. Follow the same procedure used for shrubs in Step 9i-n (page 23-24).

q. Determine the basal area of the trees (exclusive of saplings) using the point sampling (Bitterlich) system (Avery, 1967; Dillworth & Bell, 1978) and record the data on Data Form D-3. Since the Bitterlich system is a plotless method, both trees within and beyond the 0.1 acre plot should be tallied. This should be done using either a prism with the appropriate basal area factor (e.g., generally 10 in the East) or an angle gauge. Note: An alternative plotless method for sampling trees is the point quarter method.

(1) Hold the prism or angle gauge directly over the center of the 0.1 acre plot and record all individual trees by species "sighted in" according to the prism or angle gauge while

rotating 360 degrees in one direction. If a tree forks below 1.37 meters (4.5 feet) and both trunks are "sighted in," it should be tallied as two trees; if it forks above 1.37 meters, it should be counted as one if the trunk below the fork is "sighted in." With borderline trees, every other tree within a given species should be tallied. In the process, also measure the diameter of each tallied individual tree with a diameter tape and compute its basal area by the formula $A = \frac{d^2}{4}$.

Note: To expedite this calculation in the field, use a hand calculator into which a conversion factor has been stored (e.g., 0.0008454 for diameter data in centimeters). The basal area of the individual tree (in square feet) can then be obtained by simply squaring the tree diameter and multiplying the result by the stored conversion factor.

(2) Sum the individual tree basal areas by species.

(3) Rank the tree species by their basal areas. If two or more species have the same or essentially the same basal areas, equally rank them.

(4) Sum the basal areas of all tree species.

(5) Multiply the summed (total) basal area by 50%.

(6) Compile the cumulative sum of the ranked tree species until 50% of the total basal area for all tree species is reached or initially exceeded. All species contributing cover to the cumulative 50% threshold should be considered dominants. If the threshold is reached by two or more equally ranked species, consider them all dominants, along with any higher ranking species. If all species are equally ranked, consider them all dominants. If it is felt that a representative sample of the trees has not been obtained by the one Bitterlich tally, additional tallies should be obtained by offsetting perpendicularly from the center point of the plot in alternate directions and taking additional tallies.

r. As a check on the accuracy of the sampling in Step 9a-q above, scan the entire plot and estimate what you feel would be the dominant non-bryophytic understory, bryophytic, woody vine, shrub, sapling and tree species as applicable. If your observations appear inconsistent with the data, redo the steps for which inconsistencies exist and make adjustments to the data sheets as necessary. Proceed to Step 10.

10. Determine the indicator status of the dominant plant species determined in Step 9 using either the national, regional or state lists of plants that occur in wetlands and enter it on Data Forms D-1 through D-3 as appropriate. Also enter the dominant species, along with their indicator status, on the data summary sheet (Data Form D-5). Proceed to Step 11.

11. Determine whether the vegetation unit has been hydrologically modified (e.g., whether a vegetation unit with dominant obligate wetland plants has been ditched or a vegetation unit with dominant obligate upland plants has been impounded).

    a. In the presence of one or more dominant obligate wetland species or one or more dominant obligate upland species in the sample plot and in the absence of hydrological modifications, there is no need to consider hydrology further, or soils. If hydrological modifications are evident, however, the significance of these modifications must be determined before proceeding to Step 12. Note: For an elaboration on how to deal with natural or man-induced disturbances, see Section V.

    b. When the only dominants in the sample plot are facultative species (i.e., facultative wetland, straight facultative, and/or facultative upland), proceed to Step 13.

12. Complete the remaining portions of the data summary sheet (Data Form D-5) that is not yet filled out. Using the sample plot data summary sheet and optionally either the Jurisdictional Decision Flow Chart (Appendix A) or the Jurisdictional Decision Diagnostic Key (Appendix B), decide whether the sample plot supporting one or more dominant obligate wetland or one or more dominant obligate upland species, is wetland. Note: In a multiple-strata setting in which the only dominants in a given stratum occur sparsely in the sample plot because the total percent areal cover for that stratum in that plot is low, more weight should be given to the dominants in any strata that have substantially greater overall percent areal cover in the sample plot. For example, if a sample plot in a herbaceous wetland (e.g., a marsh) has one shrub species represented by a few scattered individuals, the shrub species would be considered the dominant shrub species present and thus a dominant under this methodology. However, it should be given relatively little weight in comparison with the dominant herbaceous species, which are obviously more abundant overall. This can be particularly significant if the shrub species is either an obligate wetland species or an obligate upland species and its indicator status is inconsistent with the indicator status of the herbaceous species that are more abundant

overall (i.e., both obligate wetland species and obligate upland species occur as dominants in the same plot). This situation, which would usually result from anomalous conditions (e.g., man-induced disturbance), natural disturbance, or the presence of microsites, should be documented in the "comments" section of the data summary sheet (Data Form D-5). For an elaboration on how to deal with natural and man-induced disturbances, see Section V. A second potential sampling problem may also occur. If a single large tree is recorded in a sample plot, it may be determined to be dominant for that plot under this methodology. Similarly to the example above, this species may have an indicator status that is inconsistent with the dominants in the other strata. Thus, when this situation is encountered, it is important to determine whether the individual tree is occurring under either anomalous conditions or on a microsite; in either case, it should be given relatively little weight in comparison with any more abundant species in the overall vegetation unit. This situation should be similarly documented on the data summary sheets. Proceed to Step 20.

13. If the dominant plant species in the sample plot are all facultative (i.e., facultative wetland, straight facultative, and/or facultative upland), examine the soils and hydrology as indicated in Steps 14-18.

14. Check the appropriate county soil survey (or other sources of soils information in the absence of a published survey) to determine the soil series or phase (or other applicable soil mapping unit). Record this information on Data Form D-4 and proceed to Step 15.

15. Check the national list of hydric soils or the pertinent state hydric soils list to determine whether the soil series or phase in question is considered hydric. Indicate whether or not the series is hydric on Data Form D-4 and proceed to Step 16.

16. Dig a soil pit near the center of the 0.1 acre sample plot and examine the soil profile to confirm whether it fits the soil series or phase descriptions in the soil survey. This is necessary due to the possibility of inclusions of other soil series or phases and to check for possible mapping errors. Also, some mapping units may be hydric (e.g., alluvial land, swamp, tidal marsh, muck, and peat) but will not be on the list of hydric soils because they do not yet have series names for the area in question. Note: Because of the possibilities mentioned above and perhaps others, the field characteristics at a given site should be given precedence over how a site is mapped on a county soil survey. However, any divergence from the soil survey or the national or state lists of hydric soils should be well-documented technically, and unless there is a good reason to believe otherwise (e.g., the exceptions mentioned above), any series/phase not on the hydric soils lists should be considered non-hydric. Whenever possible, the soil pit should be dug to at least 40 centimeters (16 inches) and the soil characteristics observed in the major portion of root zone, generally the upper 30 centimeters (12 inches) of soil. Note: In some instances (e.g., bedrock or extremely rocky terrain), it may not be possible to excavate to 16 inches. Be sure, however, to examine the soil profile at least to the depth of the major portion of the root zone. If it is felt that supplemental soil sampling should be done to adequately characterize the soils at the plot, additional samples can be readily obtained by randomly sampling in each quadrant with an Oakfield soil probe or similar device. Note: If it appears that soils and hydrology data are required (i.e., when only facultative plant species appear to dominate the plot a first glance), it might be best to dig the soil pit earlier (i.e., when the plot is first established) for purposes of the hydrology observations describe in Step 18b (page 31). Proceed to Step 17.

17. Determine whether field indicators of hydric soil conditions exist in the soil pits/probe holes and record the data on Data Form D-4. Transfer this information to the data summary sheet (Data Form D-5).

The presence of one or more of the following indicators is indicative of the presence of hydric soils. Note: The soil examination can be terminated when a hydric soil indicator is encountered.

a. Organic soils (Histosols) or mineral soils with a histic epipedon.

b. Gleyed mineral soils or mineral soils with low soil matrix chromas. Using Munsell Soil Color Charts, record the soil matrix color and mottle color (i.e., the hue, value, and chroma) of a soil sample by matching the sample with the appropriate color chips. For example, a soil sample with a hue of 10YR, a value of 6, and a chroma of 2 would be recorded as 10YR 6/2. Also determine whether the soil is gleyed by matching the soil sample with the color chips on the gley page of Munsell Soil Color Charts. These samples should be taken at a 25-30 centimeter (10-12 inch) depth or immediately below the A horizon, whichever is higher in the soil profile. Note: The soil should be moistened if it is dry when examined. Apply the following diagnostic soil key to confirm whether the colors in the soil matrix are indicative of hydric soil conditions:

1a. Soil is mottled:

2a. Matrix is gleyed.............................hydric.

2b. Matrix is not gleyed

3a. Chroma of matrix is $\leq$ 2.................hydric.

3b. Chroma of matrix is > 2.............not hydric.

1b. Soil is not mottled:

4a. Matrix is gleyed.............................hydric.

4b. Matrix is not gleyed and chroma is $\leq$ 1.......hydric.

4c. Matrix is not gleyed and chroma is > 1...not hydric.

Thus, gleyed soils, mottled soils with a matrix chroma less than or equal to 2, and unmottled soils with a matrix chroma less than or equal to 1 are all hydric soils. Note: Because of their high organic content, certain mineral soils (e.g., some Mollisols) may not meet these hydric criteria. However, in such dark (black) soils, the presence of gray mottles within 25-30 centimeters (10-12 inches) of the soil surface is considered indicative of hydric conditions. For the most part, in the United States, Mollisols are mainly the dark colored, base-rich soils of the Prairie Region.

Because of the color of the parent material (e.g., the red soil of the Red River Valley), some soils will not meet any of these color characteristics. Soil color is also generally not a good indicator in sandy soils (e.g., barrier islands). When problematic parent materials or sandy soils are encountered, hydric soil indicators other than color may have to be relied on in the field.

c. Sulfidic materials. The smell of hydrogen sulfide (rotten egg odor) is indicative of the presence of sulfidic materials. Hydrogen sulfide forms under extreme reducing conditions associated with prolonged soil saturation or inundation.

d. Iron or manganese concretions. These are usually black or dark brown and occur as small aggregates near the soil surface.

e. Oxidized root-rhizome channels associated with living roots and rhizomes. These oxidized (generally brown or orange-brown) channels contrast sharply with the surrounding reduced (generally gray, greenish or bluish) soils.

f. Ferrous iron. This is a chemically reduced iron, the presence of which can be determined by using a calorimetric field test kit.

g. Other organic materials. In sandy soils, look for any of the indicators listed below.

(1) A layer of organic matter above the mineral surface or high organic matter in the surface horizon. The mineral surface layer generally appears darker than the mineral material immediately below it due to organic matter interspersed among or adhering to sand particles. Note: Because organic matter also accumulates in upland soils, in some instances it may be difficult to distinguish a surface organic layer associated with a wetland site from litter and duff associated with an upland site unless the plant species composition of the organic material is determined.

(2) Dark vertical streaking in subsurface horizons due to the downward movement of organic materials from the surface. When the soil from a vertical streak is rubbed between the fingers, a dark stain will result. This may sometimes be associated with a thin organic layer of hardened soil (i.e., an organic pan or spodic horizon) occurring at 30-75 centimeter (12-30 inch) depths. Proceed to Step 18.

18. Make hydrologic observations in the sample plot and record the data on Data Form D-4. Transfer this information to the data summary sheet (Data Form D-5).

a. Traverse the 0.1 acre sample plot a number of times and record any evidence of surface inundation, such as drift lines, water marks, sediment deposition, bare areas, moss lines, water stained leaves, standing or flowing water, surface scouring, drainage patterns, etc. Note: These phenomena should be used as indicators only within the context that they are used in Section IIIC2 of Volume I.

b. After sufficient time has passed to allow water to drain into the soil pit dug in Step 16, examine the pit for evidence of standing water and soil saturation. Note: Because of the capillary zone, the soil will be saturated higher in the profile than the standing water in the soil pit. Also see the third note in Step 16 (page 28).

c. Record any plant species found that have morphological adaptations to saturated soil conditions or surface inundation.

d. When necessary, additional information on hydrology should be obtained from recorded sources, such as stream gauge data, tide gauge data, flood predictions, piezometric data, soil surveys, the national or state lists of hydric soils.

Note: It is not necessary to directly demonstrate that wetland hydrology is present. It is only necessary to show that the soil or its surface are at least periodically saturated or inundated, respectively, during a significant part of the growing season (i.e., soil saturation for usually a week or more, ponding for long or very long duration, and frequent flooding for long or very long duration). Specifically, with a vegetation unit dominated by one or more obligate wetland plant species, it is necessary to show either (1) that there have been no significant hydrologic modifications or (2) that there is one or more hydrologic indicators at least periodically present during a significant part of the growing season when the significance of the hydrological modifications is in doubt. With a vegetation unit dominated by only facultative species (i.e., facultative wetland, straight facultative, and/or facultative upland) occurring on a hydric soil, it is necessary to demonstrate that there is one or more hydrologic indicators at least periodically present during a significant part of the growing season. Indicators of surface inundation and the presence of saturated soils in the major portion of the root zone are considered hydrology indicators. Plant morphological adaptations are also considered hydrology indicators, unless the vegetation unit has been significantly altered hydrologically. Other hydrology indicators include the various recorded sources listed in Step 18d (page 31). Proceed to Step 19.

19. Complete the remaining portions of the data summary sheet (Data Form D-5) that is not yet filled out. Using the sample plot data summary sheet and <u>optionally</u> either the Jurisdictional Decision Flow Chart or the Jurisdictional Decision Diagnostic Key, decide whether the sample plot dominated by facultative species (i.e., facultative wetland, straight facultative and/or facultative upland) is wetland. See the note in Step 12 (page 26) and proceed to Step 20.

20. Proceed along the transect towards the baseline until another vegetation unit is encountered or 91.5 meters (300 feet), whichever comes first. Establish a second 0.1 acre sampling plot (plot two) at least 15.2 meters (50 feet) beyond the boundary of the new vegetation unit or at a distance 91.5 meters from the first plot if the same vegetation unit is encountered. Repeat the same procedures given in Steps 9-19. If the vegetation unit (including soils and topography) at the second plot is essentially the same as the first, or if the second is different but they are either both wetlands or both uplands, proceed to Step 22. If the vegetation unit at the second plot is different and one of the units is upland and the other is wetland, then an upland-wetland boundary has been traversed. Proceed to Step 21.

21. Determine the upland-wetland boundary between the two plots. <u>Note</u>: At this point in the overall procedure, soils generally become more useful than vegetation in establishing the upland-wetland boundary, particularly if there is no evident vegetation break or when facultative species dominate two adjacent vegetation units. However, in the presence of dominant obligate plant species in a vegetation unit, particularly when in conjunction with a sharp topographic break, vegetation alone will generally suffice for establishing the boundary.

a. Look for a change in vegetation or topography between sample plots one and two. Information from the data sheets for plots one and two will provide cues as to which parameters have changed. In a forested area, this will frequently involve changes in the shrubs or herbaceous plants. If there is a vegetation or topographic change or break, sample the soil at that point along the transect to see if it is hydric. If it is hydric, proceed towards the upland plot until a more evident change or break in the vegetation or topography is noted, and examine the soil again to see if it is hydric. If no evident change or break in vegetation or topography is initially noted, the soil should be examined half way between plots one and two. If the soil is hydric at this point on the transect, sample the soil again half way between this point and plot two. By repeating either of these procedures, make as many additional soil samples as necessary to determine the location of the upland-wetland boundary (actually a point) along the transect. A soil probe (e.g., an Oakfield soil probe) is very helpful to do this intensified soil sampling. Data sheets do not have to be filled out for all of these soil probes. Once the boundary point is determined for the transect, however, one data sheet (Data Form D-4) should be filled out for the areas immediately to each side of the upland-wetland boundary point (i.e., one form should be completed for the upland unit and one form should be completed for the wetland unit). These samples should be numbered T1-BU1 and T1-BW1, respectively (T1 refers to transect #1; BU1 refers to the boundary sample on the upland side of the first upland-wetland boundary encountered along transect #1; BW1 refers to the boundary sample on the wetland side of the first upland-wetland boundary encountered along transect #1). On the Data Form D-4's, also include any hydrology observations made within a five foot radius of the soil samples. Because quantitative vegetation data have already been obtained for 0.1 acre plots (sample plots one and two) to each side of the upland-wetland boundary, further detailed quantitative analysis of the vegetation is generally not necessary. However, the dominant plant species on the upland side of the boundary point should be estimated and indicated in the soils "comments" section of the Data Form D-4 used for sample T1-BU1 and the dominant plants on the wetland side should be estimated and indicated in the soils "comments" section of the Data Form D-4 used for sample T1-BW1. In addition, any vegetation or topographic breaks in the immediate vicinity of the soil samples should be recorded on one of the two Data Form D-4's. Also record the distances and compass directions between the boundary point and samples T1-BU1 and T1-BW1 on the appropriate Data Form D-4's.

b. Once the upland-wetland boundary point is determined, stake or flag the point, plot its location on the aerial photograph or topographic map and label it "BP", and record its distance from one of the two adjacent 0.1 acre sample plots and the baseline. Proceed to Step 22.

22. Make additional wetland determinations along the transect in accordance with Step 20. The procedure described in Step 21 should be applied at every place along the transect where an upland-wetland boundary occurs between successive 0.1 acre sampling plots. Proceed to Step 23.

23. Establish all other necessary transects and repeat the procedures in Steps 6-22. Proceed to Step 24.

24. Synthesize the sample data for all of the transects to determine the portion of the site that is wetlands.

    a. Examine the sample plot data summary sheets (Data Form D-5) and indicate on the aerial photograph or topographic map all plots that are wetlands and all plots that are uplands.

    b. If the sampling plots are all wetlands or all uplands, the entire site is either entirely wetlands or entirely uplands, respectively.

    c. If some sampling plots are uplands and some are wetlands, then an upland-wetland boundary is present. Connect the upland-wetland boundary points ("BP's") on the aerial photograph or topographic map by following either the vegetation break or the topographic contour that corresponds with the upland-wetland boundary points. This interpolated line passing through the "BP's" is the upland-wetland boundary.

    d. If the distances between transects are large or the vegetation breaks or the topographic contours do not consistently correspond with the upland-wetland boundary, it may be necessary to do additional soil sampling across the approximate boundary in the areas between transects. The sampling frequency along the upland-wetland boundary between transects is dependent upon the transect spacing and the nature of the boundary. Shorter inter-transect distances and/or the presence of discrete vegetation or topographic breaks allows for a minimum of inter-transect sampling. Data sheets should be periodically (i.e., as a general guide, at 100 foot intervals) filled out for sampling locations along the upland-wetland boundary as it is established. Where data sheets are used, one data sheet (Data Form D-4) should be filled out for areas immediately to each side of the upland wetland boundary point (i.e., one sheet should be completed for the wetland unit and one sheet should be completed for the upland unit). These samples should be numbered 1BU and 1BW, respectively (i.e., 1BU stands for the sample on the upland side of the upland-wetland boundary point at the <u>first</u> sampling location between transects and 1BW stands for the sample on the wetland side). Hydrologic observations should be made within five foot radius of the soil samples. Like with soils, this hydrologic information should be periodically entered on data sheets (i.e., the same ones used for the two soil samples). The dominant plants on the upland side of the boundary point should be estimated and indicated in the soils "comments" section of the Data Form D-4 used for sample 1BU and the dominant plants on the wetland side should be estimated and indicated in the soils "comments" section of the Data Form D-4 used for sample 1BW. In addition, any vegetation and/or topographic breaks in the immediate vicinity of the upland-wetland boundary should be recorded in the soils "comments" section of one of the two Data Form D-4's. Also record the distances and compass directions between the boundary point and samples 1BU and 1BW on the appropriate Data Form D-4.

e. Place stakes or flagging tape at all boundary points established during inter-transect sampling.

Note: Once the jurisdictional determination is complete, a permanent file should be set up that includes (1) the data forms, (2) any report or other documentation that might be produced, (3) a general site location map, (4) a sketch map where appropriate, (5) reference to information gathered in the preliminary data gathering and scoping effort if it was subsequently useful in the delineation effort, and (5) any other pertinent information (e.g., that gathered from interviews with people familiar with the site).

SECTION V: APPROACH FOR ATYPICAL SITUATIONS AND/OR NORMALLY VARIABLE ENVIRONMENTAL CONDITIONS

A. General

The simple and detailed approaches presented in Sections III and IV, respectively, rely hierarchically on vegetation, soils and hydrology. However, as pointed out by the Corps of Engineers (Environmental Laboratory, 1987), atypical situations may exist in which one or more indicators of hydrophytic vegetation, hydric soils and/or wetland hydrology cannot be found at a site because of unauthorized activities, man-induced conditions and/or recent natural events. Under such circumstances, an investigation of the pre-existing conditions is necessary to determine whether or not a wetland existed prior to the disturbance.

There are also certain wetland types and/or conditions that make application of indicators of one or more of the three parameters difficult, at least at certain times of the year. This should not be considered atypical. Rather, it is due to normal seasonal, annual, or long-term cyclic variations in environmental conditions that result from causes other than human activities or catastrophic natural events. The Corps (Environmental Laboratory, 1987) gives four examples of this situation (wetlands in drumlins, seasonal wetlands, prairie potholes, and vegetated flats). For example, mudflats, which would be otherwise dominated by annual plants during the growing season, are unvegetated during the nongrowing season. Therefore, an indicator of hydrophytic vegetation would not be evident for a significant part of the year. Likewise, a prairie pothole may not have inundated or saturated soils during most of the growing season in years of below normal precipitation. Thus, a hydrology indicator would be absent. Under these circumstances, a field investigator making a jurisdictional determination must decide whether or not wetland indicators are normally present during a significant portion of the growing season.

If based upon the scoping and preliminary data gathering (Section III), one or more indicators of hydrophytic vegetation, hydric soils, and/or wetland hydrology cannot be found because of unauthorized activities, recent natural events, man-induced conditions, and/or normal annual, seasonal or long-term variations of environmental conditions, then the procedures in Section B below should be followed. Selected atypical situations (e.g., drainage) are also discussed in Volume I.

B. Procedures to Follow When Atypical Situations and/or Normally Variable Environmental Conditions are Encountered

1. If unauthorized activities (e.g., the placement of dredged or fill material without a permit) have occurred at the site, the nature and extent of these activities and the pre-existing site conditions should be documented. This can be accomplished through the aid of historical data (e.g., aerial photographs, vegetation maps, county soil surveys, past jurisdictional determinations), peat analysis (Sipple, 1985), or accounts of reliable individuals intimately familiar with the site. This might involve documenting only the pre-existing vegetation if it is cleared or the pre-existing vegetation, soils and hydrology if a site is filled. Either way, vegetation units should be reconstructed (either mentally or on aerial photographs/maps) and the dominant plant species, along with their indicator status, estimated and entered on the data summary sheets normally used only for the simple approach (Data Form C-5). Once this is accomplished, complete Steps 6-14 of the simple approach (Section III). Then indicate the extent of wetlands at the disturbed site either in a written report, on aerial photographs or a topographic map, or by a ground delineation. The geographic extent of wetlands at the disturbed site will coincide with the distribution of the various wetland vegetation units determined in Steps 7 and 14 (simple jurisdictional approach). Therefore, any upland-wetland boundaries at the disturbed site will essentially coincide with the boundaries between the upland vegetation units and the wetland vegetation units that were present prior to

the disturbance. In the case of an unauthorized activity involving filling, more accurate boundaries can be delineated, if necessary, on the ground by coring through the fill material and analyzing the underlying natural soil profile (Sipple, 1985). Note: If standing vegetation still exists at the site, the detailed approach can be applied in lieu of the approach presented above, in which case the field investigator should complete Steps 1-24 of Section IV.

2. If recent natural events (e.g., impoundment of water by beaver) or man-induced conditions (e.g., legal drainage or inadvertent impoundment due to highway construction) result in atypical situations at the site that either effect wetland vegetation and hydrology in an area which was upland prior to flooding or effect upland vegetation and hydrology in an area which was wetland prior to ditching, these events should be documented by on-site inspection. Given the recent nature of these events, however, the flooded area may not yet have developed hydric soil indicators. Similarly, the ditched area may still be wet enough to support hydrophytic vegetation. It is important in the latter two circumstances (i.e., natural events and man-induced conditions) to determine whether or not the alterations to the area have resulted in changes that are now the "normal circumstances." The relative permanence of the change and whether or not the one-time upland area is now functioning as a wetland (or the one-time wetland area is now functioning as an upland) must be considered. Note: Because of the inherent difficulty in establishing how much the water table in a ditched wetland would have to drop to no longer be a wetland hydrologically, it is generally more appropriate to judge the significance of the hydrologic impact on the site by evaluating the nature and direction of secondary plant succession to determine whether the site still functions, or has the potential to function, as a wetland. In addition, a site with wetland vegetation and hydrology (other than from irrigation) that has not yet developed hydric soil characteristics due to recent flooding should be considered to have soils that are functioning as

hydric soils. Keeping all of this in mind, the field investigator should apply either the simple approach (Section III) or the detailed approach (Section IV) to make the jurisdictional determination.

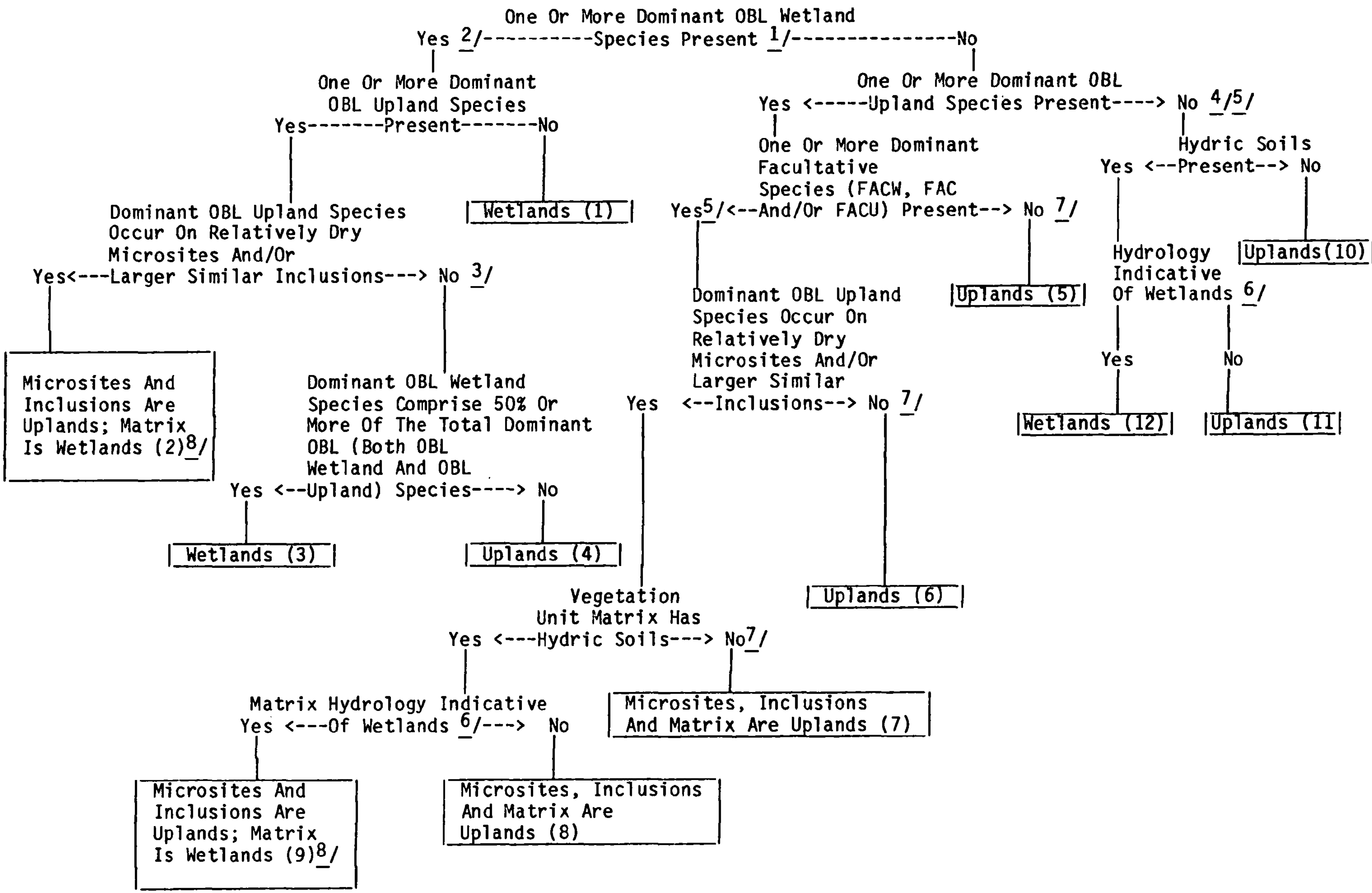
3. <u>If normal seasonal, annual, or long-term cyclic variations in environmental conditions</u> occur at the site, these conditions should be documented by field inspection, historical data (e.g., aerial photographs, vegetation maps, past jurisdictional determinations), accounts of reliable people intimately familiar with the site, and an understanding of natural processes that normally occur with the type of ecosystem involved. Keeping all of this in mind, the field investigator should apply either the simple (Section III) or the detailed (Section IV) approach to make the jurisdictional determination.

APPENDIX A

JURISDICTIONAL DECISION

FLOW CHART

APPENDIX A: JURISDICTIONAL DECISION FLOW CHART



Footnotes For Part A

1/ Dominant facultative species (FACW, FAC and/or FACU) and non-dominant species may be present.

2/ In the presence of one or more dominant obligate wetland species, assume wetland hydrology is present (except for upland microsites and/or larger similar inclusions) unless evidence of disturbance suggests otherwise. If hydrologic disturbance is evident, the significance of such disturbance must be determined.

3/ This situation (both dominant obligate wetland species and dominant obligate upland species in the same vegetation unit under non-microsite/inclusion circumstances) should only occur in disturbed units, either naturally (e.g., a saltmarsh invading a pine forest due to sea level rise) or unnaturally (e.g., a ditched wetland with wetland obligates dying out and upland obligates invading). When such atypical situations occur, a 50% rule should be applied to the vegetation. An alternative to the 50% rule for forested sites would be to examine tree vigor and reproduction (e.g., seedlings and saplings), which may give a good indication of the direction of vegetation change at the unit or site. For example, a comparison of the vegetation at a hydrologically disturbed wetland site with the vegetation at an "undisturbed" wetland site (control) should indicate which direction the vegetation is going successionally (i.e., the same, wetter or drier) and therefore indirectly whether the site is still wetlands hydrologically. This alternative should apply to herbaceous sites as well. Atypical situations are also discussed in Section V.

4/ Under these circumstances, dominant FACW, FAC, and/or FACU species must be present.

5/ Because facultative species are not diagnostic of wetlands or uplands, an examination of soil and hydrologic paramaters is necessary to help determine whether the vegetation unit is wetlands.

6/ At this point, a field investigator must decide whether or not wetland hydrologic indicators are naturally present for a significant part of the growing season. If one or more are present, the vegetation unit is wetlands; if not, the unit is uplands. If the site has been hydrologically disturbed, the significance of the disturbance must be considered in deciding whether or not the unit is still wetlands hydrologically.

7/ Under these circumstances, assume upland hydrology is present (except for wetland microsites and/or similar larger inclusions) unless evidence of disturbance suggest otherwise.

8/ An alternative would be to consider the vegetation unit to be all wetlands, but acknowledge the presence of local uplands in a written description of the unit.

Note: (1) - (12) are jurisdictional determination points.

OBL = obligate
FACW = facultative wetland
FAC = straight facultative
FACU = facultative upland

APPENDIX B

JURISDICTIONAL DECISION

DIAGNOSTIC KEY

APPENDIX B: JURISDICTIONAL

DECISION DIAGNOSTIC KEY

1a. One or more dominant obligate wetland plant species are present in the vegetation unit (or site if it is a monotypic site). Dominant facultative species (facultative wetland, straight facultative and/or facultative upland) and non-dominant species may be present.1/

2a. Obligate upland dominants (one or more) are present.

3a. Dominant obligate upland species occur on relatively dry microsites (e.g., live tree bases, decaying tree stumps, mosquito ditch spoil piles, small earth hummocks) and/or on larger similar inclusions occurring in an otherwise topographically uniform unit containing dominant obligate wetland species. The microsites and/or inclusions are UPLANDS and the matrix is WETLANDS.2/

3b. Dominant obligate upland species do not occur on relatively dry microsites and/or larger similar inclusions; they occur rather uniformly intermixed with the dominant obligate wetland species.3/

4a. 50% or more of the total dominant obligate species (both obligate wetland species and obligate upland species) are obligate wetland species....................WETLANDS (2)

4b. Less than 50% of the total dominant obligate species are obligate wetland species.....................UPLANDS (3)

2b. Obligate upland dominants are not present.............WETLANDS (4)

1b. One or more dominant obligate wetland plant species are not present in the vegetation unit (or site if it is a monotypic site). Dominant facultative species (facultative wetland, straight facultative and/or facultative upland) and non-dominant species may be present.

5a. Obligate upland dominants (one or more) are present.

6a. One or more dominant facultative species (facultative wetland, straight facultative and/or facultative upland) are present.4/

7a. Dominant obligate upland species occur on relatively dry microsites and/or larger similar inclusions.

8a. Vegetation unit matrix has hydric soils.

9a. Hydrology of vegetation unit matrix is indicative of wetlands.........Microsites and inclusions are UPLANDS; matrix is WETLANDS (5)[2/][5/]

9b. Hydrology of vegetation unit matrix is not indicative of wetlands....Microsites, inclusions and matrix are UPLANDS (6).

8b. Vegetation unit matrix does not have hydric soils...Microsites, inclusions, and matrix are UPLANDS (7).[6/]

7b. Dominant obligate upland species do not occur on relatively dry microsites and/or larger similar inclusions.....UPLANDS (8).[8/]

6b. One or more facultative species are not present......UPLANDS (9).[8/]

5b. Obligate upland dominants are not present; one or more dominant facultative species (facultative wetland, straight facultative and/or facultative upland) are present.[4/]

10a. Hydric soils are present

8a. Hydrology is indicative of wetlands......WETLANDS (10).[5/]

8b. Hydrology is not indicative of wetlands...UPLANDS (11).

10b. Hydric soils are not present......UPLANDS (12).

Footnotes for Key

1/ In the presence of one or more dominant obligate wetland species, assume wetland hydrology is present (except for upland microsites and/or larger similar inclusions) unless evidence of disturbance suggests otherwise. If hydrologic disturbance is evident, the significance of such disturbance must be determined.

2/ An alternative would be to consider the vegetation unit to be all wetlands, but acknowledge the presence of local uplands in a written description of the unit.

3/ This situation (both dominant obligate wetland species and dominant obligate upland species in the same vegetation unit under non-microsite/inclusion circumstances) should only occur in disturbed units, either naturally (e.g., a saltmarsh invading a pine forest due to sea level rise) or unnaturally (e.g., a ditched wetland with wetland obligates dying out and upland obligates invading). When such atypical situations occur, a 50% rule should be applied to the vegetation. An alternative to this 50% rule for forested sites would be to examine tree vigor and reproduction (e.g., seedlings and saplings), which may give a good indication of the direction of vegetation change at the unit or site. For example, a comparison of the vegetation at a hydrologically disturbed wetland site with the vegetation at an "undisturbed" wetland site (control) should indicate which direction the vegetation is going successionally (i.e., the same, wetter or drier) and therefore, indirectly whether the site is still wetlands hydrologically. This alternative should apply to herbaceous sites as well. Atypical situations are also discussed in Section V.

4/ Because facultative species are not diagnostic of wetlands or uplands, an examination of soil and hydrologic parameters is necessary to help determine whether the vegetation unit is wetlands.

5/ At this point, a field investigator must decide whether or not wetland hydrologic indicators are naturally present for a significant part of the growing season. If one or more are present, the vegetation unit is wetlands; if not, the unit is uplands. If the site has been hydrologically disturbed, the significance of the disturbance must be considered in deciding whether or not the unit is still wetlands hydrologically.

6/ Under these circumstances, assume upland hydrology is present (except for wetland microsites and/or larger, similar inclusions) unless evidence of disturbance suggests otherwise.

Note: (1)-(12) are jurisdictional decision points.

APPENDIX C

DATA FORMS FOR

SIMPLE JURISDICTIONAL DETERMINATIONS

DATA FORM C-1: UNDERSTORY SPECIES DATA
FOR SIMPLE JURISDICTIONAL DETERMINATION 1/

EPA Region: ___ Field Investigator(s): ______________________________ Date: ________
Project/Site: ______________________ State: ____________ County: ______________
Applicant/Owner: _________________________ Vegetation Unit #/Name: ______________

Bryophyte stratum _____ Non-bryophyte stratum _____
****

Species	Indicator Status	Percent Areal Cover	Cover Class 2/	Midpoint of Cover Class 2/	Rank
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					

Sum of Midpoints ________
50% X Sum of Midpoints ________
****
Do the dominant understory species indicate that the vegetation unit supports hydrophytic vegetation? 3/ Yes ______ No ______ Inconlusive ______ 4/
Comments: ____

****
1/ The understory includes herbaceous species, such as all graminoids, forbs, ferns, fern allies, bryophytes, and herbaceous vines, as well as tree seedlings. However, bryophytes should be treated as a separate stratum for purposes of computing dominance (check appropriate line above).

2/ 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).

3/ 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 reached or initially exceeded. All species contributing to that cumulative total should be considered dominants and indicated with an asterisk above.

4/ Inconclusive should be checked when only facultative (i.e., facultative wetland, straight facultative, and/or facultative upland) species dominate.

DATA FORM C-2: SHRUB AND WOODY VINE DATA
FOR SIMPLE JURISDICTIONAL DETERMINATION

EPA Region: ___ Field Investigator(s): ______________________________ Date: ________
Project/Site: ______________________ State: ______________ County: ______________
Applicant/Owner: __________________________ Vegetation Unit #/Name: ______________

****

SHRUBS 1/

Species	Indicator Status	Percent Areal Cover	Cover Class 2/	Midpoint of Cover Class 2/	Rank
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Sum of Midpoints ________
50% X Sum of Midpoints ________

****

WOODY VINES

Species	Indicator Status	Percent Areal Cover	Cover Class 2/	Midpoint of Cover Class 2/	Rank
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Sum of Midpoints ________
50% X Sum of Midpoints ________

****

Do the dominant shrub species indicate that the vegetation unit supports hydrophytic vegetation? 3/ Yes ______ No ______ Inconlusive ______ 4/
Do the dominant woody vine species indicate that the vegetation unit supports hydrophytic vegetation? 3/ Yes ______ No ______ Inconclusive ______ 4/
Comments: ____
____
____

****

1/ A shrub is usually less than 6.1 meters (20 feet) tall and generally exhibits several erect, spreading or prostrate stems and has a bushy appearance. Percent cover of woody vines should be estimated independent of strata and exclusive of seedlings.
2/ 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).
3/ To determine the dominants, first rank the shrub species by their midpoints. Then cumulatively sum the midpoints of the ranked shrub species until 50% of the total for all shrub species midpoints is reached or initially exceeded. Do the same for woody vines. All species contributing to these cumulative totals should be considered dominants and marked with an asterisk above.
4/ Inconclusive should be checked when only facultative (i.e., facultative wetland, straight facultative, and/or facultative upland) species dominate.

DATA FORM C-3: SAPLING AND TREE DATA
FOR SIMPLE JURISDICTIONAL DETERMINATION

EPA Region: ___ Field Investigator(s): ______________________ Date: ________
Project/Site: ________________ State: __________ County: ____________
Applicant/Owner: __________________ Vegetation Unit #/Name: ____________

****

SAPLINGS

Species	Indicator Status	Percent Areal Cover	Cover Class 2/	Midpoint of Cover Class 2/	Rank
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

Sum of Midpoints ________
50% X Sum of Midpoints ________

****

TREES 1/

Species	Indicator Status	Relative Basal Area (%)	Rank
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

Total Relative Basal Area Equals 100%

****

Do the dominant saplings indicate that the vegetation unit supports hydrophytic vegetation? 3/
Yes ______ No ______ Inconclusive ______ 4/
Do the dominant trees indicate that the vegetation unit supports hydrophytic vegetation? 3/ Yes ______ No ______ Inconclusive ______ 4/
Comments: ____

****

1/ A tree is greater than 10 centimeters (4 inches) diameter breast height (dbh). A sapling is from 1-10 centimeters (0.4-4 inches) dbh.

2/ 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).

3/ To determine the dominants, first rank the tree species by relative basal area. Then cumulatively sum the relative basal area of the ranked tree species until 50% of the total relative basal area for all tree species is reached or initially exceeded. Do the same for saplings using the sum of midpoints. All species contributing to these cumulative totals should be considered dominants and marked with an asterisk above.

4/ Inconclusive should be checked when only facultative (i.e., facultative wetland, straight facultative, and/or facultative upland) species dominate.

DATA FORM C-4: SOIL/HYDROLOGY DATA
FOR SIMPLE JURISDICTIONAL DETERMINATION 1/

EPA Region: ___ Field Investigator(s): ______________________ Date: ______
Project/Site: ______________ State: __________ County: __________
Applicant/Owner: ____
Vegetation Unit #/Name ____
Sample # Within Unit (or Boundary Sample #1): __________________
****

SOILS

Series/phase: ______________________ Subgroup: ______________________
Is the soil on the national or state hydric soils list? Yes _____ No _____
Is the soil a Histosol or is a histic epipedon present? Yes _____ No _____
Is the soil: 2/
Mottled? Yes _____ No _____ N/A ____ Matrix Color: _______ Mottle Color: _________
Gleyed? Yes _____ No _____ N/A ____
Other Indicators ____
Does the sampling indicate that the vegetation unit has hydric soils?
Yes _____ No _____ Inconclusive _____
Rationale for decision on hydric soils: ________________________
____
Comments: ____
____
____

****

HYDROLOGY

Is the ground surface inundated? Yes ___ No ___ Depth of surface water: ________
Is the soil saturated?3/ Yes ____ No ____
Depth to free-standing water in pit/soil probe hole: ________________
List other field evidence of surface inundation or soil saturation __________
____
Are hydrology indicators present or would they be expected to be present in the vegetation unit during a significant part of the growing season? 4/
Yes _____ No _____ Inconclusive _____
Rationale for decision on hydrology: ___________________________
____
Comments: ____
____

****

1/ Data Form C-4 can be used for soil/hydrology data within vegetation units or for soil/hydrology/vegetation data for boundary point determinations.

2/ For gleying and mottling, soils should be sampled within about 25-30 centimeters (10-12 inches) of the surface or immediately below the A horizon, whichever comes first. If desired, use the back of the form to diagram or describe the soil profile

3/ This is in reference to the majority of the root zone, which for most wetland species, particularly herbaceous plants, is generally within the upper 30 centimeters (12 inches) of soil. Also list the actual depth to saturation under "comments."

4/ It is not necessary to directly demonstrate that wetland hydrology is present. It is only necessary to show that the soil or its surface are at least periodically saturated or inundated, respectively, for a significant part of the growing season. Thus, it may be necessary to rely on supplemental hydrologic data (e.g., in the national or state hydric soils lists or county soil surveys) during the drier part of the growing season or in drought years, assuming the site has not been significantly hydrologically modified since the supplemental data were collected.

DATA FORM C-5: SUMMARY OF DATA FOR SIMPLE JURISDICTIONAL DETERMINATION

EPA Region: ___ Field Investigator(s): ______________________________ Date: ________
Project/Site: ______________________ State: ____________ County: ______________
Applicant/Owner: __________________________ Vegetation Unit #/Name: ______________

****

Dominant Species	Indicator Status
1. ______________________________	____________
2. ______________________________	____________
3. ______________________________	____________
4. ______________________________	____________
5. ______________________________	____________
6. ______________________________	____________
7. ______________________________	____________
8. ______________________________	____________
9. ______________________________	____________
10. ______________________________	____________
11. ______________________________	____________
12. ______________________________	____________
13. ______________________________	____________
14. ______________________________	____________
15. ______________________________	____________
16. ______________________________	____________
17. ______________________________	____________
18. ______________________________	____________
19. ______________________________	____________
20. ______________________________	____________

****

1. Is hydrophytic vegetation present? Yes ______ No ______ Inconclusive ______
2. Are hydric soils present? Yes ______ No ______ Inconclusive ______
3. Are hydrology indicators present or are they expected to be present in the vegetation unit during a significant part of the growing season ? Yes ____ No ____ Inconclusive _____
4. Overall, is the vegetation unit wetland? Yes ______ No ______ Inconclusive ______
5. Rationale for overall jurisdictional decision: ____________________________________
   ____
   ____
6. Comments: ____
   ____
   ____
7. Note: The source of information in #'s 1-3 above is Data Forms C-1 through C-4. Number 4 should be checked affirmatively only if either #'s 1-3 inclusive are answered affirmatively, or #1 is answered inconclusively (because only facultative species dominate) but hydric soils and hydrology indicators are present. A possible exception to this would be for disturbed sites (See Section V of Volume II).

APPENDIX D

DATA FORMS FOR

DETAILED JURISDICTIONAL DETERMINATIONS

DATA FORM D-1: UNDERSTORY SPECIES DATA FOR DETAILED JURISDICTIONAL DETERMINATION 1/

EPA Region: __ Field Investigator(s): ______________________________ Date: ________
Project/Site: ______________________ State: ____________ County: ____________
Applicant/Owner: ______________________ Transect #: _________ Plot #: _________
Bryophyte Stratum: ______________ Non-bryophyte Stratum: ______________

****

PERCENT AREAL COVER 2/

	Species	Status	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	$\bar{X}$	Rank
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												
9.												
10.												
11.												
12.												
13.												
14.												
15.												
16.												
17.												
18.												
19.												
20.												
21.												
22.												
23.												
24.												
25.												

Total of Averages (X's) of Percent Areal Cover __
50% X Total of Averages (X's) of Percent Areal Cover __

****

Do the dominant herbaceous species indicate that the sample plot supports hydrophytic vegetation? 3/ Yes _____ No _____ Inconclusive _____ 4/
Comments: ____

****

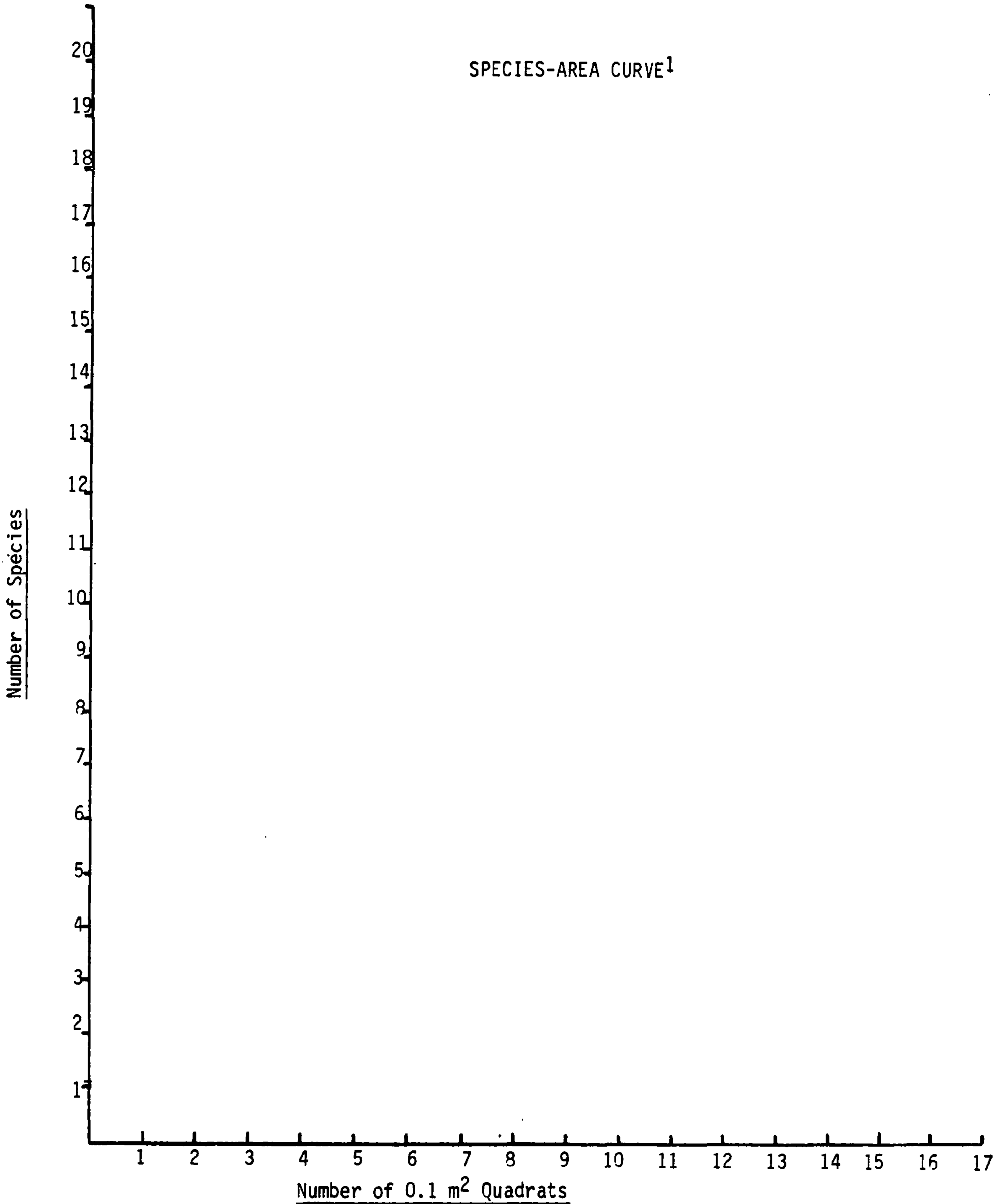
1/ The understory includes herbaceous species such as graminoids, forbs, ferns, fern allies, bryophytes, and herbaceous vines, as well as tree seedlings. However, bryophytes should be treated as a separate stratum for purposes of computing dominance (check appropriate line above).

2/ After the data for the eight quadrats are collected, construct a species area curve (see back of sheet) to determine if eight are sufficient to adequately survey the understory. See Step 9b in Volume II for more detailed explanation.

3/ To determine the dominants, first rank the species by their average percent areal cover. Then cumulatively sum the percent areal cover averages (X's) of the ranked species until 50% of the total of all the species averages is reached or initially exceeded. All species contributing to that cumulative total should be considered dominants and indicated with an asterisk above.

4/ Inconclusive should be checked when only facultative (facultative wetland, straight facultative, and/or facultative upland) species dominate.

SPECIES-AREA CURVE[1]



---

1 Plot the cumulative number of species against the quadrats (e.g., if quadrat #1 has 3 species and quadrat #2 has any, all, or none of those species but has 2 new species, then 5 cumulative species should be plotted against quadrat #2). The number of quadrats sufficient to adequately survey the understory will correspond to the point on the curve where it first levels off and remains essentially level.

DATA FORM D-2: SHRUB AND WOODY VINE
DATA FOR DETAILED JURISDICTIONAL DETERMINATION

EPA Region: ___ Field Investigator(s): ______________________ Date: ________
Project/Site: ______________________ State: ____________ County: ____________
Applicant/Owner: ______________________ Transects #: ________ Plot #: ________

****

SHRUBS [1]

Species	Indicator Status	Percent Areal Cover	Cover Class [2]	Midpoint of Cover Class [2]	Rank
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					

Sum of Midpoints ________
50% X Sum of Midpoints ________

****

WOODY VINES

Species	Indicator Status	Percent Areal Cover	Cover Class [2]	Midpoint of Cover Class [2]	Rank
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Sum of Midpoints ________
50% X Sum of Midpoints ________

****

Do the dominant shrubs indicate that the sample plot supports hydrophytic vegetation?[3]
Yes ______ No ______ Inconclusive ______ [4]
Do the dominant woody vine species indicate that the sample plot supports hydrophytic vegetation?[3] Yes ______ No ______ Inconclusive ______ [4]
Comments: ____

****

1/ A shrub usually is less than 6.1 meters (20 feet) tall and generally exhibits several erect, spreading or prostrate stems and has a bushy appearance. Percent cover of woody vines should be estimated independent of strata and exclusive of seedlings.

2/ 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).

3/ To determine dominants, first rank the shrub species by their midpoints. Then cumulatively sum the midpoints of the ranked shrub species until 50% of the total for all shrub species midpoints is reached or initially exceeded. Do the same for woody vines. All species contributing to these cumulative totals should be considered dominants and marked with an asterisk above.

4/ Inconclusive should be checked when only facultative (i.e., facultative wetland, straight facultative, and/or facultative upland) species dominate.

DATA FORM D-3: SAPLING AND TREE DATA
FOR DETAILED JURISDICTIONAL DETERMINATION

EPA Region: __ Field Investigator(s): ______________________________ Date: ________
Project/Site: ______________________ State: ____________ County: ______________
Applicant/Owner: _________________________ Transect #: ___________ Plot #: __________

****

SAPLINGS

Species	Indicator Status	Percent Areal Cover	Cover Class 2/	Midpoint of Cover Class 2/	Rank
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

Sum of Midpoints ________
50% X Sum of Midpoints ________

****

TREES (Bitterlich Method) 1/

Individual Tree (Species Name)	Indicator Status	DBH (cm/ft)	Basal Area Per Tree (sq ft)	Basal Area Per Species (sq ft)	Rank
1.		/			
2.		/			
3.		/			
4.		/			
5.		/			
6.		/			
7.		/			
8.		/			
9.		/			
10.		/			

Total Basal Area of All Species Combined ________
50% X Total Basal Area of All Species Combined ________

****

Do the dominant saplings indicate that the sample plot supports hydrophytic vegetation? 3/
Yes _____ No _____ Inconlusive _____ 4/
Do the dominant trees indicate that the sample plot supports hydrophytic vegetation? 3/
Yes _____ No _____ Inconclusive _____ 4/
Comments: ____

****

1/ A tree is greater than 10 centimeters (4 inches) diameter breast height (dbh). A sapling is from 1-10 centimeters (0.4-4 inches) dbh.

2/ 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).

3/ To determine the dominants, first rank the tree species by their basal areas. Then cumulatively sum the basal areas of the ranked tree species until 50% of the total basal area for all tree species is reached or initially exceeded. Do the same for saplings using the sum of midpoints. All species contributing to these cumulative totals should be considered dominants and marked with an asterisk above.

4/ Inconclusive should be checked when only facultative (i.e., facultative wetland, straight facultative, and/or facultative upland) species dominate.

DATA FORM D-4: SOIL/HYDROLOGY DATA FOR DETAILED JURISDICTIONAL DETERMINATION 1/

EPA Region: __ Field Investigator(s): ______________________ Date: ________
Project/Site: ______________________ State: ______ County: ____________
Applicant/Owner: ______________________ Transect #: __________ Plot #: ________
Boundary Sample #: ________

****

SOILS

Series/phase: ______________________ Subgroup: ______________________
Is the soil on the national or state hydric soils list? Yes _____ No _____
Is the soil a Histosol or is a histic epipedon present? Yes _____ No _____
Is the soil: 2/
Mottled? Yes _____ No _____ N/A _____ Matrix Color: ________ Mottle Color: ________
Gleyed? Yes _____ No _____ N/A _____
Other Indicators ____
Does the sampling indicate that the sample plot has hydric soils?
Yes _____ No _____ Inconclusive _____
Rationale for decision on hydric soils: ____

Comments: ____

****

HYDROLOGY

Is the ground surface inundated? Yes ___ No ___ Depth of surface water: ____________
Is the soil saturated? 3/ Yes ____ No ____
Depth of free-standing water in pit/soil probe hole: ______________
List other field evidence of surface inundation of soil saturation ____________

Are hydrology indicators present or would they be expected to be present in the sample plot during a significant part of the growing season? 4/
Yes _____ No _____ Inconclusive _____
Rationale for decision on hydrology: ____

Comments: ____

****

1/ Data Form D-4 can be used for soil/hydrology data within sample plots or for soil/hydrology/vegetation data for boundary point determinations.

2/ For gleying and mottling, soils should be sampled within about 25-30 centimeters (10-12 inches) of the surface or immediately below the A horizon, whichever comes first. If desired, use the back of the form to diagram or describe the soil profile.

3/ This is in reference to the majority of the root zone, which for most wetland species, particularly herbaceous plants, is generally within the upper 30 centimeters (12 inches) of soil. Also list the actual depth to saturation under "comments."

4/ It is not necessary to directly demonstrate that wetland hydrology is present. It is only necessary to show that the soil or its surface are at least periodically saturated or inundated, respectively, for a significant part of the growing season. Thus, it may be necessary to rely on supplemented hydrologic data (e.g., in the national or state hydric soils lists or county soil surveys) during the drier part of the growing season or in drought years, assuming the site has not been significantly hydrologically modified since the data were collected.

DATA FORM D-5: SUMMARY OF DATA
FOR DETAILED JURISDICTIONAL DETERMINATION

EPA Region: ___ Field Investigator(s): ______________________________ Date: __________
Project/Site: ________________________ State: ______________ County: ________________
Applicant/Owner: ____________________________ Transect #: ____________ Plot #: ________

****

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

****

1. Is hydrophytic vegetation present? Yes _____ No _____ Inconclusive _____
2. Are hydric soils present? Yes _____ No _____ Inconclusive _____
3. Are hydrology indicators present or are they expected to be present during a significant part of the growing season? Yes _____ No _____ Inconclusive _____
4. Overall, is the sample plot wetland? Yes _____ No _____ Inconclusive _____
5. Rationale for overall jurisdictional decision: ______________________________

6. Comments: ______________________________

7. Note: The source of information in #'s 1-3 above is Data Forms D-1 through D-4. Number 4 should be checked affirmatively only if either #'s 1-3 inclusive are answered affirmatively, or #1 is answered inconclusively (because only facultative species dominate) but hydric soils and hydrology indicators are present. A possible exception to this would be for disturbed sites (See Section V of Volume II).

APPENDIX E

EQUIPMENT NECESSARY FOR MAKING WETLAND JURISDICTIONAL DETERMINATIONS

APPENDIX E

EQUIPMENT NECESSARY FOR MAKING WETLAND JURISDICTIONAL DETERMINATIONS

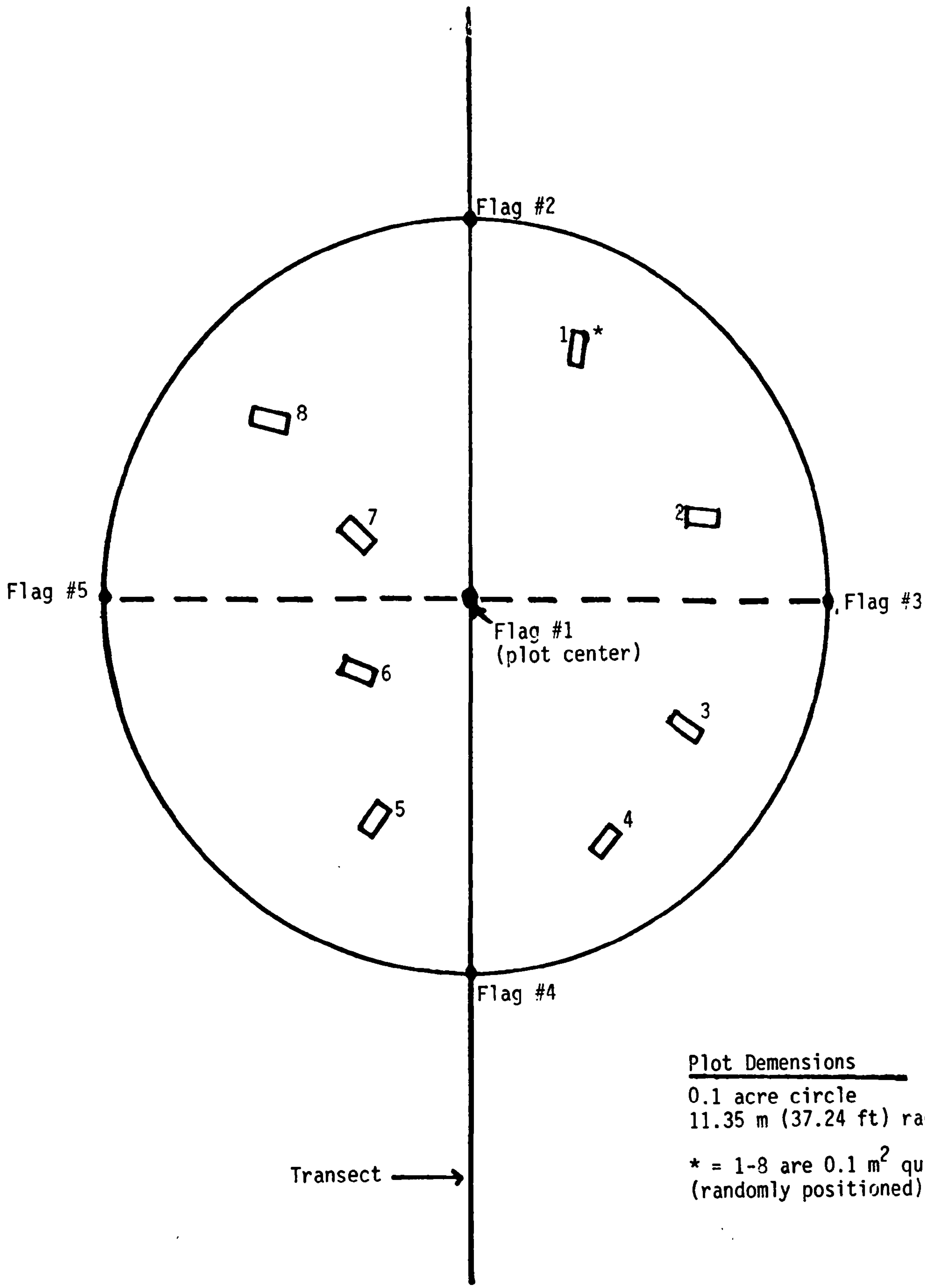
Item	Jurisdictional Approach 1/
National, regional or state list of plants that occur in wetlands	1,2
National or state hydric soils list	1,2
Key to Soil Taxonomy (optional) 2/	2
National List of Scientific Plant Names	1,2
State or regional plant identification manuals	1,2
Plant field guides	1,2
Spencer tape	2
Diameter tape	2
Two 0.1m^2 quadrat frames	2
Prism or angle gauge	2
Vasculum or plastic bags	1,2
Sighting compass	2
Pens or pencils	1,2
Clip board and data sheets	1,2
Field notebook	1,2
Flagging tape	1,2
Wooden stakes or wire flagging stakes (optional)	1,2
Increment borer (optional)	2
10X hand lens	1,2
Dissecting kit	1,2
Calculator	2
Aerial photographs or topographic map	1,2
Shovel	1,2
Bucket auger and/or soil probe	1,2
Munsell Color Soil Charts	1,2
Colorimetric field test kit (optional)	1,2

1/ 1 refers to equipment needed for simple jurisdictional approach.
2 refers to equipment needed for detailed jurisdictional approach.

2/ Optional items are not necessary, but may be useful in certain situations.

APPENDIX F

DIAGRAM OF THE SAMPLE PLOT FOR THE DETAILED APPROACH



Plot Demensions

0.1 acre circle
11.35 m (37.24 ft) radius

* = 1-8 are 0.1 m^2 quadrats
(randomly positioned)

SAMPLE PLOT FOR DETAILED
JURISDICTIONAL APPROACH