CRITICAL METHODS IN WETLAND DELINEATION - VEGETATION

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COMPREHENSIVE WETLAND VEGETATION SAMPLING METHODS

- *Used to define plant characteristics for an area much larger than actual being sampled;*
- *Used to estimate plant cover;*
- *Used to determine major dominant plant species.*
- *Most common quantitative sampling methods are the quadrat and line-intercept methods.*
- *Note: Plant species often overlap and may have several different vertical layers. Therefore, % cover values may Exceed 100%.*
- *Care to obtain samples representative of the entire habitat.*
- *Need to Reduce/eliminate human bias factors.*
- *Employment of sampling design that ensures random placement of transects, quadrats, and line-intercepts along the baseline.*

QUADRAT SAMPLING METHOD

- **Sample area defined by a square, rectangular, or circular "frame".**
- **At least seven 1- square meter (11 sq. ft.) [or a single 5-foot radius circular (78.5 sq. ft.)] plots for herbaceous vegetation.**
- **Usually 30-foot radius from center of quadrat [263 Sq. Meters] for trees and vines. 15-foot radius for shrubs and saplings.**
- **Quadrats [3 minimum] placed randomly along transect.**
- **Maybe used to determine plant density [No. of plants/stems per unit area].**
- **Species cover is measured. Species cover is the % of all vegetation – of a given species -- covering the ground surface of the quadrat area.**

QUADRAT SAMPLING METHOD (con't)

- **For shrubs, vines, and trees, include plants whose aerial foliage overlies the 30-foot/15-foot circular "quadrat".**
- **Overlap of the same species [in same layer] should not be counted twice, but counted as a continuous cover between two or more plants.**
- **Measures and records only that plant cover occurring inside the "frame**
- **%cover and basal area may be combine for 50/20 rule.**
- **%cover and basal area cannot be combined for PI.**

PROBLEMS WITH THE QUADRAT SAMPLING METHOD

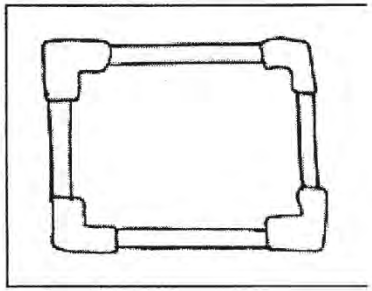
- **Care must be taken to randomly select sample sites that represent the entire habitat [always a problem when sampling in ecotones].**
- **Assumes that the spatial distribution of individual plant species is random [which they're usually not].**
- **Results are dependent on the size of the quadrat in relationship to the size of the plant community and the spatial distribution of individual plant species.**
- **Small quadrats [less than 1 square meter for ground layer species] are much quicker to survey, but are likely to yield much less reliable data than larger ones.**

QUADRAT SAMPLING

Procedure: A- Sampling for percent cover using 1 meter square transects

To estimate the abundance of the herbaceous vegetation use 1 x 1 m frames made of PVC (w/ 90 deg corners to attach the pieces).

1. Lay the frame on the ground. Stands above the frame and looks perpendicularly to the ground surface, estimating the vertical projection of the foliage of each species to the ground (in percentage of the plot area).
2. If there is overlap in the foliage of the different species present, one can end up with > 100% "total" cover of plants.



You'll need to use at least three 1 x 1 m plots to characterize the vegetation in each of your study areas, because plants are patchily distributed. Make sure to select sites that are representative of the general conditions at the site.

DMR/mlh
6/23/06
#119075 v1 - Data form 2

SEWRPC DATA FORM 2

VEGETATION-COMPREHENSIVE DETERMINATION WORKSHEET

Applicant Name: _____ E-File No.:_____ Project Name: _____

Location:_____ Plot No.:_____ Date: _____ Determined By: _____

Trees (30' Radius)	Basal Area	Rank	Indicator Status	Herbs (1 Meter^2)	% Cover Class	Rank	Indicator Status
1				1			
2				2			
3				3			
4				4			
5				5			
6				6			
7				7			
8				8			
9				9			
10				10			

Saplings/Shrubs (30' Radius)	% Cover Class	Rank	Indicator Status	Woody Vines (30' Radius)	% Cover Class	Rank	Indicator Status
1				1			
2				2			
3				3			
4				4			
5				5			
6				6			
7				7			
8				8			
9				9			
10				10			

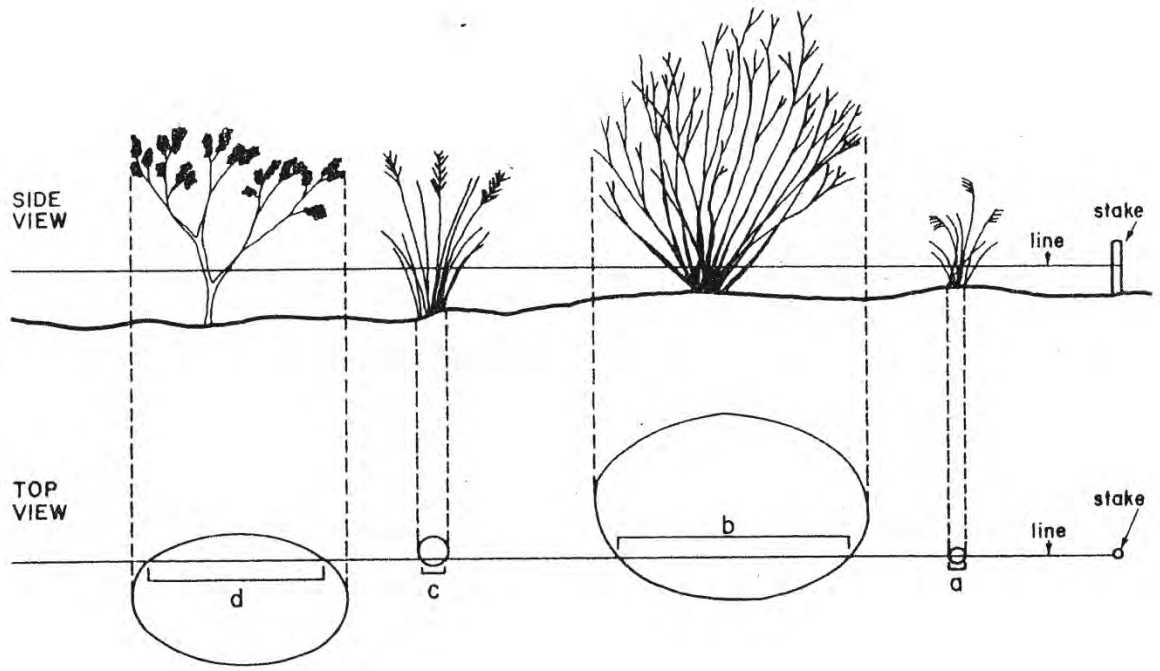
LINE-INTERCEPT SAMPLING TECHNIQUE

- **Often used in grassland and sedge dominated communities because of the problem in distinguishing between individual plants.**
- **Extend a measuring tape between two points perpendicular to the transect line.**
- **The line may range from 30 to 90 or more meters long. The longer lengths being more useful in sampling wider spaced plants.**
- **Measure and record intercept length for each plant species.**
- **Intercept length [distance]: that portion of the line intercepted by a plant or patch of plant species or by a perpendicular projection of plants foliage intercepted by the line.**
- **Dense vegetation: measure only those plants physically intercepted by the tape.**
- **Less dense vegetation: measure all plants that occur within a 1-cm. Strip of the tape.**
- **In addition, include plants whose aerial foliage overlies the tape.**
- **Adequately represent the plant community: 2 or more lines.**

PROBLEMS WITH THE LINE-INTERCEPT METHOD

- **May only be used for relative estimates of cover [since area is not being sampled].**
- **Cannot be use to determine plant densities.**
- **Probability of being sampled dependent on size of plant.**
- **Large, dense plant species appear more frequently than small, dense species.**
- **Pattern of distribution may affect estimates of frequency.**
- **Care must be taken to randomly select sample sites that represent the entire habitat [always a problem when sampling in ecotones].**
- **Assumes that the spatial distribution of individual plant species is random [which they're usually not].**

LINE-INTERCEPT SAMPLING



The intercept length (brackets) is that portion of a line intercepted by a plant (or clump of plants, as the basal intercept length for plants a and c) or by a perpendicular projection of the foliage to the line (as the aerial intercept length for plants b and d).

Source: Brower & Zar, 1977.

LINE-INTERCEPT SAMPLING

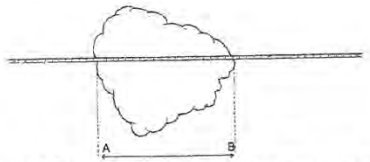


Figure LI-2. Measure canopy intercept in feet (m) along the measuring tape. Since canopy intercept can vary on each side of the measuring tape, measure intercept on one side of the measuring tape only. We suggest using the right side as you move along the tape. Record the start of the plant intercept (A) in the Start field and the end intercept (b) in Stop field.

Canopy overlap within a species is not distinguished but canopy overlap between different species *is* recorded (figure LI-3).

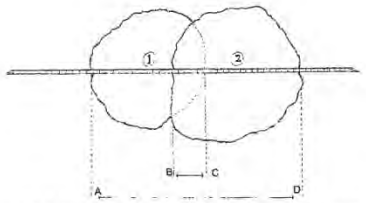


Figure LI-3. Canopy overlap (points B to C) is not measured if the canopy of two or more plants of the same species overlap. For example, if shrubs 1 and 2 are the same species, then the canopy intercept is measured from points A to D. If shrubs 1 and 2 are different species, then canopy intercept is measured from points A to C for shrub species 1 and from points B to D for shrub species 2.

Percent cover is calculated by totaling the intercept measurements for all individuals of that species (in the Intercept field) along the transect and dividing by the total length of the transect. Most plant species have some gaps in their canopies, such as bunchgrasses with dead centers or shrubs with large spaces between branches. Examiners must determine how to deal with gaps in the canopy. One solution is for the observer to assume a closed canopy unless the gap is greater than some predetermined length. We recommend that gaps less than 2 inches (5 cm) be considered part of the canopy (figure LI-4).

OTHER SAMPLING METHODS

- **RELEVE' or SAMPLE STAND METHOD:**
- **cover is measured as a category [usually 0 – 7 denoting 0 -100% cover, respectively];**
- **requires preparation of species area curves to determine minimum sample area size;**
- **most efficient and useful for large scale sites with more homogeneous covers.**

Table III-5

BRAUN-BLANQUET COVER-ABUNDANCE AND SOCIABILITY SCALES

I. Cover-Abundance Scale

Classification Code	Range of Species Cover and Abundance
5	75 to 100 percent cover
4	50 to 75 percent cover
3	25 to 50 percent cover
2	5 to 25 percent cover
1	1 to 5 percent cover
+	Few, less than 1 percent cover
r	Solitary or rarely occuring

II. Sociability Scale

Classification Code	Distribution of Species
5	Population growing as large, nearly pure stands.
4	Population growing as small colonies or forming carpets.
3	Population growning in small patches or cushions.
2	Population growing in small, dense clumps.
1	Population growing as solitary plants.

Source: Mueller-Dombois and Ellenberg, 1974.

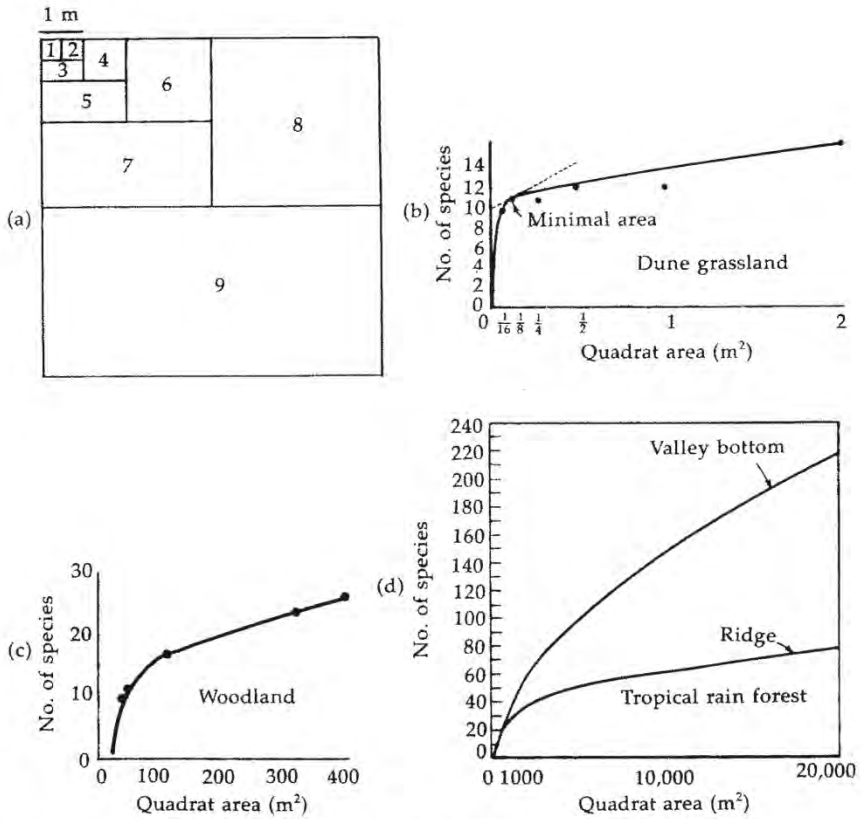
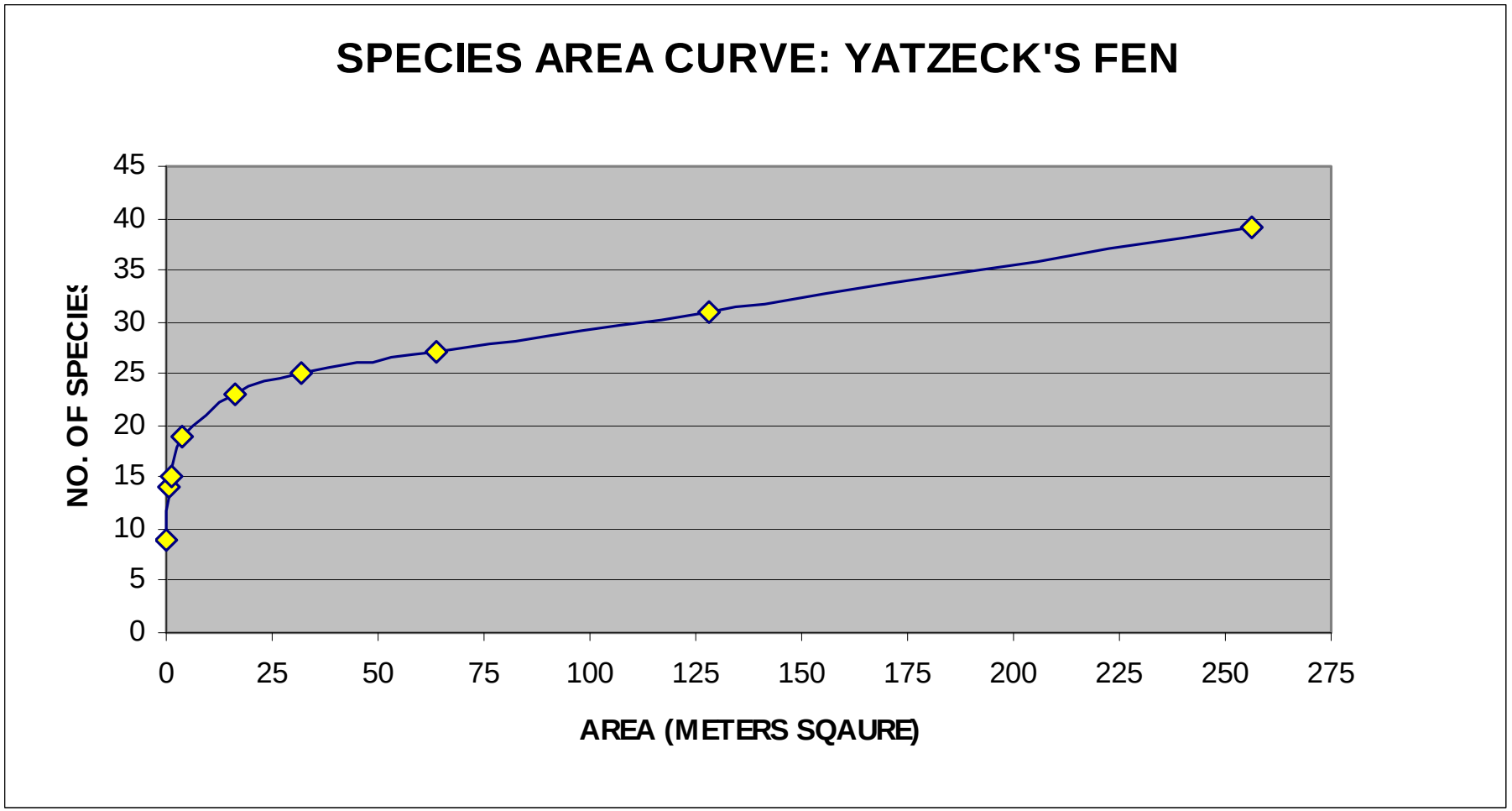


Figure 8–2. The species-area curve. (a) A system of nested plots for determining minimal area. (b) Minimal area for dune grassland in North Carolina is about 0.13 m^2. (c) Minimal area for an English woodland is about 100 m^2. (d) Minimal area for two stands of tropical rain forest in Brunei are 1000 m^2 (a ridge) and 20,000$^+$ m^2 (a valley bottom). ((a) and (d) from *Aims and Methods of Vegetation Ecology*. Mueller-Dombois and Ellenberg. Copyright 1974 John Wiley and Sons, Inc. Reprinted by permission of John Wiley and Sons, Inc. (b) from Smith 1940. By permission of the Ecological Society of America. (c) from Hopkins 1957. By permission of the British Ecological Society.)


SPECIES AREA CURVE: YATZECK'S FEN
NO. OF SPECIES
45
40
35
30
25
20
15
10
5
0
0
25
50
75
100
125
150
175
200
225
250
275
AREA (METERS SQAURE)

OTHER SAMPLING METHODS

- **QUARTER POINT METHOD:**
- **may be conducted as point centered or a variable area transect;**
- **measures point to plant distances in 4 quadrants at each point;**
- **records area covered or basal area for each plant species;**
- **species coverage: estimated from sum of areas sampled for each species and species density;**
- **may be used for measuring tree and shrub cover along with 1-Sq. Meter quatrats for herbaceous cover.**

QUARTER POINT SAMPLING

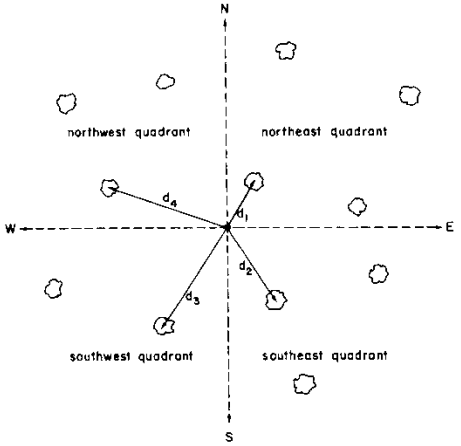


Figure 3C.1. In point-quarter sampling, determine the shortest point-to-plant distance (d_i) in each of four quadrants.

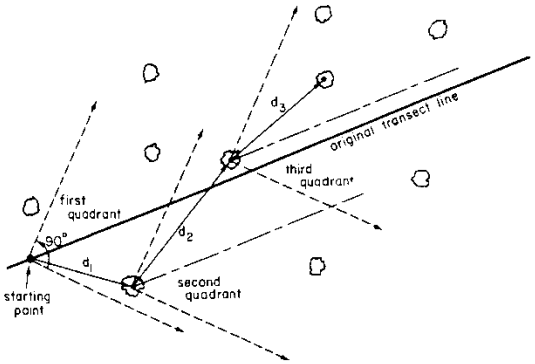


Figure 3C.2. In wandering-quarter sampling, determine the nearest plant in a quadrant bisected by a transect, and that plant becomes the apex of a similar quadrant bisected by a line parallel to the transect. Each value of d_i is the distance from the quadrant apex to the nearest plant in that quadrant.

Source: Brower & Zar, 1977

OTHER SAMPLING METHODS

- **Other methods are available: delineator must justify their use.**
- **All vegetation sampling methods require solid delineator knowledge of Wisconsin vegetation and plant taxonomy**

FIELD PROCEDURES FOR VEGETATION SAMPLING

- **Follow 1987 Corps of Engineers wetland delineation manual:**
- **Identify project area.**
- **Determine number and type of plant community areas present.**
- **Determine type and number of vegetation layers present in each plant community area.**
- **Establish a baseline: should be parallel to any major watercourse and/or topographic gradient.**
- **Determine baseline length and divide into appropriate number of equal segments [see figure 17].**
- **Establish transect locations: use random numbers table to determine the position of a transects starting point within each baseline segment.**

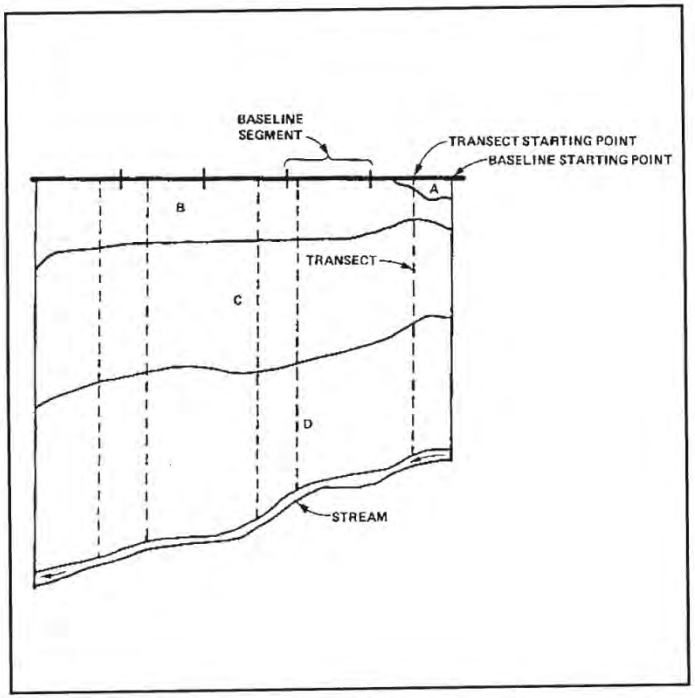


Figure 17. General orientation of baseline and transects in a hypothetical project area. Alpha characters represent different plant communities. Transect positions were determined using a random numbers table

Baseline Length, ft	Number of Segments	Length of Baseline Segment, ft
>50 - 500	3	18 - 167
>500 - 1,000	3	167 - 333
>1,000 - 5,000	5	200 - 1,000
>5,000 - 10,000	7	700 - 1,400
>10,000[1]	Variable	2,000

[1] If the baseline exceeds 5 miles, baseline segments should be 0.5 mile in length.

Use a random numbers table or a calculator with a random numbers generation feature to determine the position of a transect starting point within each baseline segment. For example, when the baseline is 4,000 ft, the number of baseline segments will be five, and the baseline segment length will be 4,000/5 = 800 ft. Locate the first transect within the first 800 ft of the baseline. If the random numbers table yields 264 as the

FIELD PROCEDURES FOR VEGETATION SAMPLING [con't]

- **Determine minimum number of required sample sites [points] along each transect. Dependent on transects length [see guideline in 1987 manual].**
- **Apply appropriate sampling methodology.**

distance from the baseline starting point, measure 264 ft from the baseline starting point and establish the starting point of the first transect. If the second random number selected is 530, the starting point of the second transect will be located at a distance of 1,330 ft (800 + 530 ft) from the baseline starting point. *CAUTION: Make sure that each plant community type is included in at least one transect. If not, modify the sampling design accordingly.* When the starting point locations for all required transects have been determined, PROCEED TO STEP 8.

- *STEP 8 - Determine the number of required observation points along transects.* The number of required observation points along each transect will be largely dependent on transect length. Establish observation points along each transect using the following as a guide:

Transect Length, ft	Number of Observation Points	Interval Between Observation Points, ft
<1,000	2-10	100
1,000 - <5,000	10	100 - 500
5,000 - <10,000	10	500 - 1,000
≥10,000	>10	1,000

Establish the first observation point at a distance of 50 ft from the baseline (Figure 17). When obvious nonwetlands occupy a long portion of the transect from the baseline starting point, establish the first observation point in the obvious nonwetland at a distance of approximately 300 ft from the point that the obvious nonwetland begins to intergrade into a potential wetland community type. Additional observation points must also be established to determine the wetland boundary between successive regular observation points when one of the points is a wetland and the other is a nonwetland. *CAUTION: In large areas having a mosaic of plant community types, several wetland boundaries may occur along the same transect.* PROCEED TO STEP 9 and apply the comprehensive wetland determination procedure at each required observation point. Use the described procedure to simultaneously characterize the vegetation, soil, and hydrology at each required observation point along each transect, and use the resulting characterization to make a wetland determination at each point. *NOTE: ALL required wetland boundary determinations should be made while proceeding along a transect.*

- *STEP 9 - Characterize the vegetation at the first observation point along the first transect.*[1] Record on DATA FORM 2 the vegetation occurring

[1] There is no single best procedure for characterizing vegetation. Methods described in STEP 9 afford standardization of the procedure. However, plot size and descriptors for determining dominance may vary.

PLANT IDENTIFICATION METHODS

- **All Plant Identification should be to the SPECIES level [for Major Dominant plants - required in all cases].**
- **80% minimum for all species required to apply PI.**
- **All Genera [sp.] level are Categorized as NI [unless all species in the subject range are categorized the same]**
- **Knowledge of Wisconsin Plant Taxonomy Required.**

United States
Department of
the Interior

Fish and
Wildlife
Service

National List of Plant Species That Occur in Wetlands: 1988

Wisconsin

In cooperation with the National and Regional Interagency Review Panels

NATIONAL LIST OF PLANT SPECIES THAT OCCUR IN WETLANDS: 1988--WISCONSIN

SCI-NAME	AUTHOR	COMMON-NAME	R3IND	NAT-IND	HABIT
CAREX LACUSTRIS	WILLD.	SEDGE,LAKEBANK	OBL	OBL	PNEGL
CAREX LAEVICONICA	DEWEY	SEDGE,SMOOTH-CONE	OBL	OBL	PNEGL
CAREX LAEVIVAGINATA	(KUEKENTH.) MACKENZ.	SEDGE,SMOOTH-SHEATH	OBL	OBL	PNGL
CAREX LANUGINOSA	MICHX.	SEDGE,WOOLY	OBL	OBL	PNGL
CAREX LASIOCARPA	EHRH.	SEDGE,WOOLLY-FRUIT	OBL	OBL	PNEGL
CAREX LENTICULARIS	MICHX.	SEDGE,SHORE	OBL	FACW+,OBL	PNGL
CAREX LEPTALEA	WAHLENB.	SEDGE,BRISTLY-STALK	OBL	OBL	PNGL
CAREX LEPTONERVIA	FERNALD	SEDGE,NERVELESS WOOD	FAC	FAC,FACW	PNGL
CAREX LIMOSA	L.	SEDGE,MUD	OBL	OBL	PNGL
CAREX LIVIDA	(WAHLENB.) WILLD.	SEDGE,LIVID	OBL	OBL	PNGL
CAREX LONGII	MACKENZ.	SEDGE,GREENISH-WHITE	OBL	OBL	PNEGL
CAREX LUPULIFORMIS	SARTH. EX DEWEY	SEDGE,FALSE HOP	FACW+	FACW+,OBL	PNGL
CAREX LUPULINA	MUHL. EX WILLD.	SEDGE,HOP	OBL	FACW+,OBL	PNEGL
CAREX LURIDA	WAHLENB.	SEDGE,SHALLOW	OBL	FACW+,OBL	PNEGL
CAREX MEADII	DEWEY	SEDGE,MEAD'S	FAC	FACU,OBL	PNGL
CAREX MEDIA	R. BR.	SEDGE,INTERMEDIATE	FACW	FACW	PNGL
CAREX MICHAUXIANA	BOECK.	SEDGE,MICHAUX'S	OBL	OBL	PNGL
CAREX MUSKINGUMENSIS	SCHWEINITZ	SEDGE,MUSKINGUM	OBL	OBL	PNGL
CAREX NORMALIS	MACKENZ.	SEDGE,LARGER STRAW	FACW	FACU,OBL	PNGL
CAREX NORVEGICA	RETZ.	SEDGE,SCANDINAVIAN	FACW	FACW	PNGL
CAREX NOVAE-ANGLIAE	SCHWEINITZ	SEDGE,NEW ENGLAND	NI	FACU	PNGL
CAREX OLIGOSPERMA	MICHX.	SEDGE,FEW-SEED	OBL	OBL	PNGL
CAREX PAUCIFLORA	LIGHTF.	SEDGE,FEW-FLOWER	OBL	OBL	PNGL
CAREX PAUPERCULA	MICHX.	SEDGE,POOR	OBL	OBL	PNEGL
CAREX PRAEGRACILIS	W. BOOTT	SEDGE,CLUSTERED FIELD	FACW	FACW-,FACW+	PNGL
CAREX PRAIREA	DEWEY	SEDGE,PRAIRIE	FACW+	FACW,OBL	PNGL
CAREX PRASINA	WAHLENB.	SEDGE,DROOPING	OBL	OBL	PNGL
CAREX PROJECTA	MACKENZ.	SEDGE,NECKLACE	FACW+	FACW,FACW+	PNGL
CAREX PSEUDOCYPERUS	L.	SEDGE,CYPRESS-LIKE	OBL	OBL	PNEGL
CAREX RETRORSA	SCHWEINITZ	SEDGE,RETRORSE	OBL	FAC,OBL	PNGL
CAREX ROSTRATA	J. STOKES	SEDGE,BEAKED	OBL	OBL	PNEGL
CAREX SARTWELLII	DEWEY	SEDGE,SARTWELL'S	FACW+	FACW,OBL	PNGL
CAREX SCABRATA	SCHWEINITZ	SEDGE,ROUGH	OBL	OBL	PNGL
CAREX SCHWEINITZII	DEWEY	SEDGE,SCHWEINITZ'S	OBL	OBL	PNEGL
CAREX SCOPARIA	SCHKUHR EX WILLD.	SEDGE,POINTED BROOM	FACW	FACW	PNGL
CAREX SEORSA	E.C. HOWE	SEDGE,WEAK STELLATE	FACW+	FACW,FACW+	PNGL
CAREX SHORTIANA	DEWEY	SEDGE,SHORT'S	FACW+	FAC,FACW+	PNGL
CAREX SPARGANIOIDES	MUHL. EX WILLD.	SEDGE,BUR-REED	FAC	FACU,FAC+	PNGL
CAREX SPRENGELII	DEWEY EX. SPRENG.	SEDGE,LONG-BEAK	FAC	FACU,FAC	PNGL
CAREX STERILIS	WILLD.	SEDGE,DIOECIOUS	OBL	OBL	PNGL
CAREX STRAMINEA	WILLD.	SEDGE,STRAW	OBL	OBL	PNGL
CAREX STRICTA	LAM.	SEDGE,UPTIGHT	OBL	OBL	PNEGL
CAREX SUBERECTA	(OLNEY) BRITTON	SEDGE,PRAIRIE STRAW	OBL	OBL	PNGL
CAREX SWANII	(FERNALD) MACKENZ.	SEDGE,SWAN'S	FACU	UPL,FACU	PNGL
CAREX SYCHNOCEPHALA	J. CAREY	SEDGE,MANY-HEAD	FACW+	FACW,FACW+	PNGL
CAREX TENERA	DEWEY	SEDGE,SLENDER	FAC+	FACU+,FACW	PNGL
CAREX TENUIFLORA	WAHLENB.	SEDGE,SPARSE-FLOWER	OBL	OBL	PNGL
CAREX TETANICA	SCHKUHR	SEDGE,RIGID	FACW	FACW,FACW+	PNGL
CAREX TORREYI	TUCKERMAN	SEDGE,TORREY'S	NI	UPL,FAC	PNGL
CAREX TRIBULOIDES	WAHLENB.	SEDGE,BLUNT BROOM	FACW+	FACW,OBL	PNGL
CAREX TRICHOCARPA	MUHL. EX WILLD.	SEDGE,HAIRY-FRUIT	OBL	OBL	PNEGL
CAREX TRISPERMA	DEWEY	SEDGE,THREE-SEED	OBL	OBL	PNGL

CAREX LACUSTRIS

CAREX TRISPERMA

NATIONAL INDICATOR LIST UPDATE

- *UNDER THE NEW WETLAND DELINEATION SUPPLEMENTS:*

1. *(+) and (-) are dropped for the facultative categories*
2. *(+) and (-) were not based on ecological data; rather, used as tiebreakers*
3. *FAC- species go to FAC for now*
4. *Exception for Food Security Act delineations*

- *Update to National List of Wetland Plants will also drop (+) and (-)*

- *National List of Wetland Plants will ultimately determine if FAC- species should be FAC or FACU*

CHECKLIST
of the
VASCULAR PLANTS *of* WISCONSIN

MARK ALLEN WETTER, THEODORE S. COCHRANE, MEREL R. BLACK, HUGH. H. ILTIS, AND PAUL E. BERRY

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NATIONAL LIST OF PLANT SPECIES THAT OCCUR IN WETLANDS: 1988--WISCONSIN,SYNONYMY

SYNONYMY	SCI-NAME	AUTHOR	REGION
CALAMAGROSTIS STRICTA	*CALAMAGROSTIS INEXPANSA*	A. GRAY	1,3,4,5,7,8,9,0,A
CALAMINTHA ARKANSANA	*SATUREJA ARKANSANA*	(NUTT.) BRIQ.	1,2,3,5,6
CALOPOGON PULCHELLUS	*CALOPOGON TUBEROSUS*	(L.) B.S.P.	1,2,3,6
CALTHA ARCTICA	*CALTHA PALUSTRIS*	L.	1,2,3,4,5,9,0,A
CALTHA ASARIFOLIA	*CALTHA PALUSTRIS*	L.	1,2,3,4,5,9,0,A
CAMASSIA ANGUSTA	*CAMASSIA SCILLOIDES*	(RAF.) CORY	1,2,3,5,6
CAMELINA PARODII	*CAMELINA SATIVA*	(L.) CRANTZ	1,2,3,4,5,7,8,9,0,A
CAMPANULA ALASKANA	*CAMPANULA ROTUNDIFOLIA*	L.	1,3,4,5,6,7,8,9,0,A
CAMPANULA DUBIA	*CAMPANULA ROTUNDIFOLIA*	L.	1,3,4,5,6,7,8,9,0,A
CAMPANULA ULIGINOSA	*CAMPANULA APARINOIDES*	PURSH.	1,2,3,4,5
CAMPANULASTRUM AMERICANUM	*CAMPANULA AMERICANA*	L.	1,2,3,4,5,6
CARDAMINE ARENICOLA	*CARDAMINE PARVIFLORA*	L.	1,2,3,5,6,7,8
CARDUUS LANCEOLATUS	*CIRSIUM VULGARE*	(SAVI) TENORE	1,2,3,4,5,6,7,8,9,0,A,H
CARDUUS MUTICUS	*CIRSIUM MUTICUM*	MICHX.	1,2,3,4,5,6
CAREX ABBREVIATA	*CAREX TORREYI*	TUCKERMAN	3,4,5,8,9
CAREX ABRVEGICA SSP. INFERALPINA	*CAREX MEDIA*	R. BR.	1,3,7,8,9,A
CAREX ANGUSTIOR	*CAREX ECHINATA*	MURRAY	1,2,3,8,9,0,A,H
CAREX BASILATA	*CAREX ECHINATA*	MURRAY	1,2,3,8,9,0,A,H
CAREX BULBOSTYLIS	*CAREX AMPHIBOLA*	STEUD.	1,2,3,4,5,6
CAREX CEPHALANTHA	*CAREX ECHINATA*	MURRAY	1,2,3,8,9,0,A,H
CAREX COLORATA	*CAREX WOODII*	DEWEY	1,2,3
CAREX DEMISSA	*CAREX VIRIDULA*	MICHX.	1,3,4,5,7,8,9,0,A
CAREX ELACHYCARPA	*CAREX STERILIS*	WILLD.	1,2,3,4,9
CAREX HAWAIIENSIS	*CAREX ECHINATA*	MURRAY	1,2,3,8,9,0,A,H
CAREX KATAHDINENSIS	*CAREX CONOIDEA*	SCHKUHR.	1,2,3,7
CAREX LAXIFLORA	*CAREX BLANDA*	DEWEY	1,2,3,4,5,6
CAREX MAGELLANICA	*CAREX PAUPERCULA*	MICHX.	1,3,8,9,A
CAREX MAGELLANICA SSP. MAGELLANICA	*CAREX PAUPERCULA*	MICHX.	1,3,8,9,A
CAREX MONILE	*CAREX VESICARIA*	L.	1,3,4,5,7,8,9,0
CAREX MURICATA	*CAREX ECHINATA*	MURRAY	1,2,3,8,9,0,A,H
CAREX SALTUENSIS	*CAREX VAGINATA*	TAUSCH	1,3,A
CAREX SCHORTIANA	*CAREX SHORTIANA*	DEWEY	1,2,3,5,6
CAREX SICCATA	*CAREX FOENEA*	WILLD.	1,3,4,5,7,8,9
CARYA ALBA	*CARYA OVATA*	(MILL.) K. KOCH	1,2,3,4,5,6
CASTALIA LEKOPHYLLA	*NYMPHAEA ODORATA*	SOLAND. IN AIT.	1,2,3,4,5,6,7,8,9,C
CATALPA CATALPA	*CATALPA BIGNONIOIDES*	WALTER	1,2,3,5,6,7
CATHARTOLINUM MEDIUM	*LINUM MEDIUM*	(PLANCH.) BRITTON	1,2,3,5,6
CATHARTOLINUM VIRGINIANUM	*LINUM VIRGINIANUM*	L.	1,2,3
CERASTIUM FONTANUM	*CERASTIUM VULGATUM*	L.	1,2,3,4,5,6,7,8,9,0,A,H
CERASTIUM HOLOSTEOIDES	*CERASTIUM VULGATUM*	L.	1,2,3,4,5,6,7,8,9,0,A,H
CERASTIUM LONGIPEDUNCULATUM	*CERASTIUM MUTANS*	RAF.	1,2,3,4,5,6,7,8,9,A
CERASTIUM OREOPHILUM	*CERASTIUM ARVENSE*	L.	1,2,3,4,5,7,8,9,0,A
CERASTIUM STRICTUM	*CERASTIUM ARVENSE*	L.	1,2,3,4,5,7,8,9,0,A
CERASTIUM THERMALE	*CERASTIUM ARVENSE*	L.	1,2,3,4,5,7,8,9,0,A
CERASTIUM VELUTINUM	*CERASTIUM ARVENSE*	L.	1,2,3,4,5,7,8,9,0,A
CERATOPHYLLUM ECHINATUM	*CERATOPHYLLUM MURICATUM*	CHAM.	1,2,3,5,6
CERATOPHYLLUM FLORIDANUM	*CERATOPHYLLUM MURICATUM*	CHAM.	1,2,3,5,6
CHAMAEPERICLYMENUM CANADENSIS	*CORNUS CANADENSIS*	L.	1,3,4,5,7,8,9,0,A
CHAMAESYCE MACULATA	*EUPHORBIA MACULATA*	L.	1,2,3,4,5,6,7,8,9,0
CHAMAESYCE MATHEWSII	*EUPHORBIA MACULATA*	L.	1,2,3,4,5,6,7,8,9,0
CHAMAESYCE POLYGONIFOLIA	*EUPHORBIA POLYGONIFOLIA*	L.	1,2,3
CHAMAESYCE TRACYI	*EUPHORBIA MACULATA*	L.	1,2,3,4,5,6,7,8,9,0

METHODS FOR DETERMINING MAJOR DOMINANCE

- The “50/20” rule
- The Prevalence Index
- Morphological Adaptations

HYDROPHYTIC VEGETATION SEQUENCE

1. *Apply the Dominance Test ("50/20 Rule")*
   - **a. If the 50/20 Rule is met, the vegetation is hydrophytic**
   - **b. If 50/20 Rule is not met but indicators of hydric soils and wetland hydrology are <u>BOTH</u> present, Proceed to Step 2.**

     (Be aware of problem areas and atypical situations – see Chapter 5)

2. *Prevalence Index*
   - **a. If the PI is <u>≤</u>3.0, the vegetation is hydrophytic**
   - **b. If this is not met, go to Step 3.**

HYDROPHYTIC VEGETATION SEQUENCE (con't)

3. Morphological Adaptations

a. If >50% of individuals of a FACU species exhibit morphological adaptations, assign FAC status and recalculate Steps 1 and 2 above.

RECOGNIZING HYDROPHYTIC VEGETATION: STRATA

- **Moss layer (bogs; some fens)**
- **Herbaceous layer**
- **Shrub/sapling layer**
- **Vine layer**
- **Tree/canopy layer**
- **Delineator must determine the major dominant species in each layer [stratum].**

RECOGNIZING HYDROPHYTIC VEGETATION: STRATA

- **Trees: woody plants 3 inches or more DBH (regardless of height).**
- **Saplings/Shrubs: woody plants less than 3 in. DBH and taller than 1 meter (3.28 feet).**
- **Herbaceous: all non-woody plants including herbaceous vines, regardless of size, and woody plants less than 1 meter in height.**
- **Woody Vines: all woody vines greater than 1 meter in height.**

THE 50/20 RULE

- ✓ **The “50” portion: species that comprise more than 50% of the total dominance measure in that stratum are considered dominants**
- **The “20” portion: after the “50” determination is made, any remaining species with at least 20% of the total dominance measure in that stratum is also considered a dominant**
- **First appeared in the 1989 Manual**
- **Standard adopted for interagency REG IV delineation training since 1994**

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

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

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

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

Example:

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

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

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

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

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

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

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

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

PREVALENCE INDEX

- *Uses the same percent cover data as that for the 50/20 Rule !!*

- *PI is a weighted average by indicator status:*

% cover of all OBL spp. x 1
% cover of all FACW spp. x 2 B = PI
% cover of all FAC spp. x 3 A
% cover of all FACU spp. x 4
% cover of all UPL spp. x 5
A B

- *Divide sum of weighted cover value by sum of actual cover.*
- *If PI ≤3.0 then veg is hydrophytic.*

PREVALENCE INDEX (con't)

- *At least 80 percent of total cover must be correctly identified to the species level*
- *Species used must have an assigned indicator status*
- *Advantage of PI vs. "50/20 Rule": PI is more comprehensive as it uses the cover of all plant species vs. a few dominants*
- *Disadvantages of PI vs. "50/20 Rule": (1) requires more time; and (2) requires greater plant identification skills*

PREVALENCE INDEX (con't)

- *Vegetation fails dominance test, but meets PI*
- *Not expected to be frequent occurrence*
- *One exception: when percent of dominants FAC or wetter is exactly 50%*

  (Remember - the hydrophytic vegetation criterion is <u>more than half</u> of all dominants are FAC or wetter)

Prevalence Index Example

A = 158 B = 423

B/A = 2.68

Veg is hydrophytic

Indicator Status Group		Absolute Percent Cover by Species	Total Cover by Group	Multiply by:[1]	Product
OBL species		0	0	1	0
FACW species	*Salix nigra*[2] *Panicum virgatum*	50 40	90	2	180
FAC species	*Iva annua* *Celtis laevigata* *Cardiospermum halicacabum* *Xanthium strumarium* *Toxicodendron radicans*[3]	15 12 8 6 ----	41	3	123
FACU species	*Ambrosia artemisiifolia*	15	15	4	60
UPL species	*Maclura pomifera*	12	12	5	60
Sum			158 (A)		423 (B)
Hydrophytic Vegetation Determination		Prevalence Index = B/A = 423/158 = 2.68 Therefore, this community is hydrophytic by Indicator 2 (Prevalence Index).			

[1] Where OBL = 1, FACW = 2, FAC = 3, FACU = 4, and UPL = 5.

[2] *Salix nigra* was recorded in two strata (see Table 2-3), so the cover estimates for this species were summed across strata.

[3] *Toxicodendron radicans* at 4% cover failed to meet the minimum cover required for consideration as a separate stratum. Therefore, it was not included in the prevalence index.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	_____	x 1 =	_____
FACW species	_____	x 2 =	_____
FAC species	_____	x 3 =	_____
FACU species	_____	x 4 =	_____
UPL species	_____	x 5 =	_____
Column Totals:	_____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** _____ **No** _____

Remarks:

SITE NO. 1

Herb Layer		
Carex stricta	OBL	35%
Calamagrostis canadensis	OBL	30%
Aster simplex	FACW	26%
Aster lucidulus	FACW+	10%
Carex lacustris	OBL	5%
Asclepias incarnata	OBL	3%
Bromus ciliatus	FACW	1%
		110%
Shub Layer		
Salix bebbiana	FACW+	10%
Alnus rugosa	OBL	10%
Betula pumila	OBL	5%
Toxicodendron vernix	OBL	3%
Larix laricina	FACW	2%
		30%
Tree Layer		
Larix laricina	FACW	20%
		20%

SITE NO. 2

Herb Layer		
Viola sororia	FAC-	50%
Trillium recurvatum	FACU-	25%
Hydrophyllum Virginianum	FACW-	20%
Allium tricoccum	FACU+	15%
Alliaria petiolata	FAC	10%
Carex blanda	FAC	5%
		125%
Shrub Layer		
Acer saccharum	FACU	15%
Cornus racemosa	FACW-	15%
Viburnum rafinesquianum	NI	3%
		33%
Tree Layer		
Acer saccharum	FACU	50%
Quercus borealis	FACU	33%
Tilia Americana	FACU	10%
		93%

SITE NO. 3

Herb Layer		
Hydrophyllum Virginianum	FACW-	33%
Alliaria petiolata	FAC	20%
Geum canadense	FAC	20%
Carex pensylvanica	NI	20%
Carex blanda	FAC	5%
		98%
Shrub Layer		
Cornus racemosa	FACW-	15%
Rhamnus cathartica	FACU	15%
		30%
Tree Layer		
Fraxinus pennsylvanica	FACW	40%
Quercus macrocarpa	FAC-	33%
Tilia Americana	FACU	10%
Acer saccharinum	FACW	2%
		85%

SAMPLE SITE NO. 11
TRANSECT NO. 1
1 OCT. 2002

HERBS:

PHALARIS ARUNDINACEA (FACW+).....70%

SOLIDAGO GIGANTEA (FACW).....10%

SHRUBS AND SAPLINGS:

SALIX EXIGUA (OBL).....3%

TREES:

ULMUS AMERICANA (FACW-).....20%

FIELD METHODS AND REPORTS

- **Routine Field Methods [1987 Manual & its Supplements].**
- **Plants, Soils, and Hydrology.**

FINDING THE WETLAND BOUNDARY

Process

- Preparation
- Field Work
- Report Writing
- Cautions

Preparation

- Locate Site on Map
- Aerial Photographs
- Hydric Soil List
- County Soil Survey
- USGS Quad Map
- Topographic Features
- Wisconsin Wetland Inventory Maps

Field Investigation

- Equipment
- Maps

RECONNAISSANCE SURVEY

- Inspect Lowest, Wettest Position on Landscape
- Note Human-Induced Alterations
- Identify the Plants Present
- Examine the Soils
- Determine How Site Meets Wetland Parameters for Plants, Soils and Hydrology
- Find Outer Wetlands Boundary
- Community Characterization

COLLECTING DATA

- Is it a “Problem” Wetland?
- Dominant Species – 50/20 rule
- Hydrology
- Soils
- Wetland Delineation

USING TRANSECTS

- Establish a Baseline
- Divide it into Equal Segments
- Mark the Boundary (Figure 5.6 in Wetland Guide)

PREPARING OR EVALUATING A DELINEATION REPORT

- Delineator Qualifications.
- Introductory Section.
- Methods Section.
- Results and Discussion Section.
- Concluding Section.
- Literature Cited Section.
- Appendices Section (See Basic Guide, Table 6.1, p.67).

REPORTING THE WETLAND DELNATION TO THE STATE

- See Appendix B, Basic Guide.
- Updating Wisconsin Wetland Inventory Map.
- Comment Sheet for Public Review of Wetland Maps, p. 86.

US Army Corps
of Engineers
St Paul District

Public Notice

96-01078-SDE

ISSUED: 22 MAY 1996

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

1. INTRODUCTION

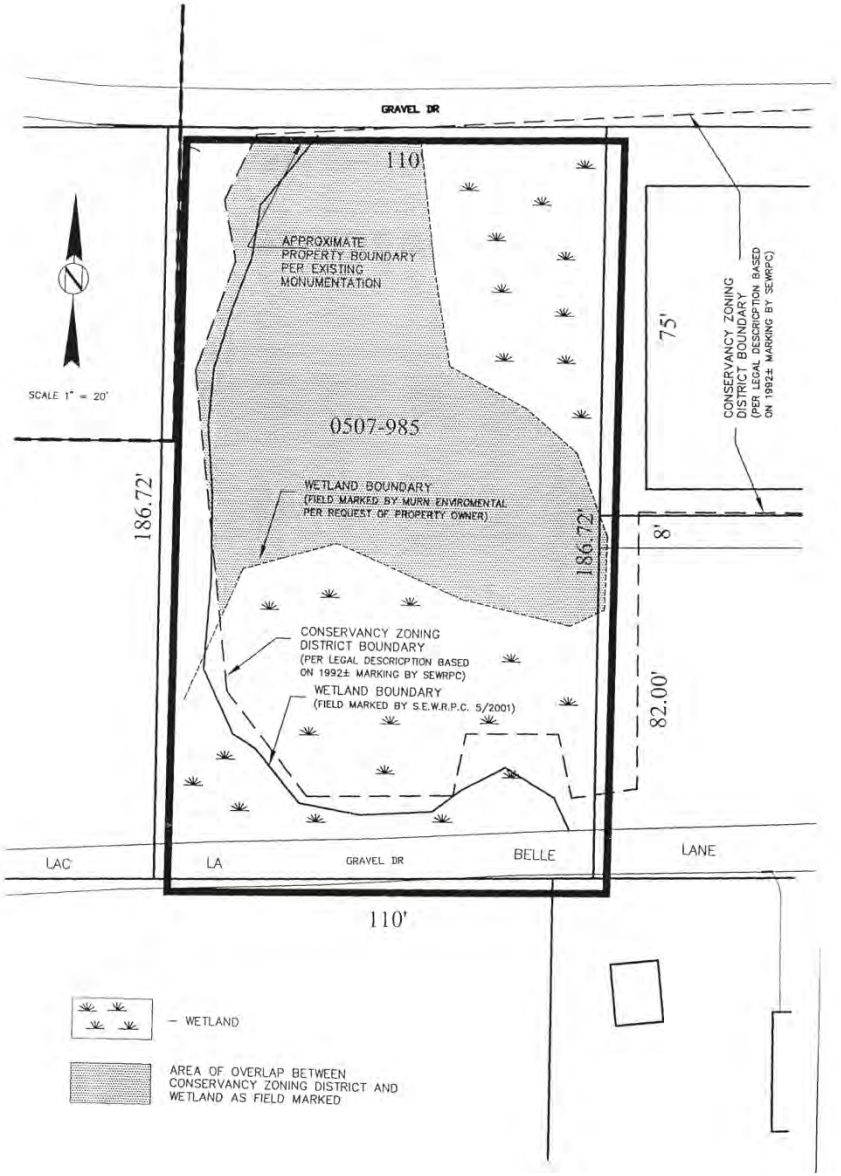
State, federal and local agencies of government, and private consultants, are involved in delineating wetlands and/or reviewing delineations for purposes of Section 404 of the Clean Water Act, the "Swampbuster" provisions of the Food Security Act, State of Wisconsin water/wetland regulatory authorities,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

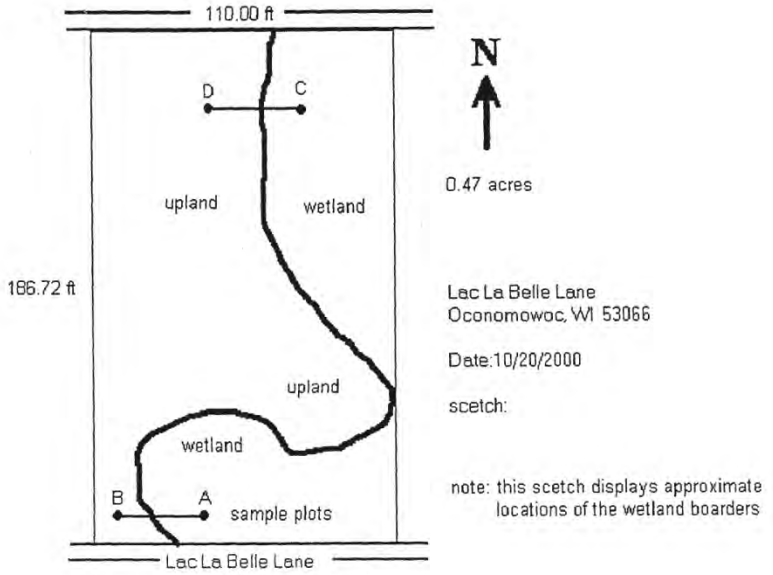
Two memoranda from the Corps, the 7 October 1991 "Questions and Answers on the 1987 Manual" and the 6 March 1992 "Clarification and Interpretation of the 1987 Manual", are essential for delineators applying the 1987 Corps delineation manual. Delineators who do not have these memoranda can obtain copies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

COMMON WETLAND DELINEATOR PROBLEMS SOUTHEASTERN WISCONSIN REGION

- **Failure to properly identify problem and atypical wetland conditions.**
- **Failure to identify all on site primary and secondary hydrology indicators.**
- **Failure to confirm mapped soil type(s).**
- **Failure to consider normal vs. non-normal precipitation conditions.**
- **Failure to consider new normal circumstances (hydrology).**
- **Failure to examine a sufficient number of transects and data points.**
- **Failure to place sample points within previously included or excluded wetland areas to confirm delineation inclusion or exclusion.**

MAP LAC LA BELLE SITE





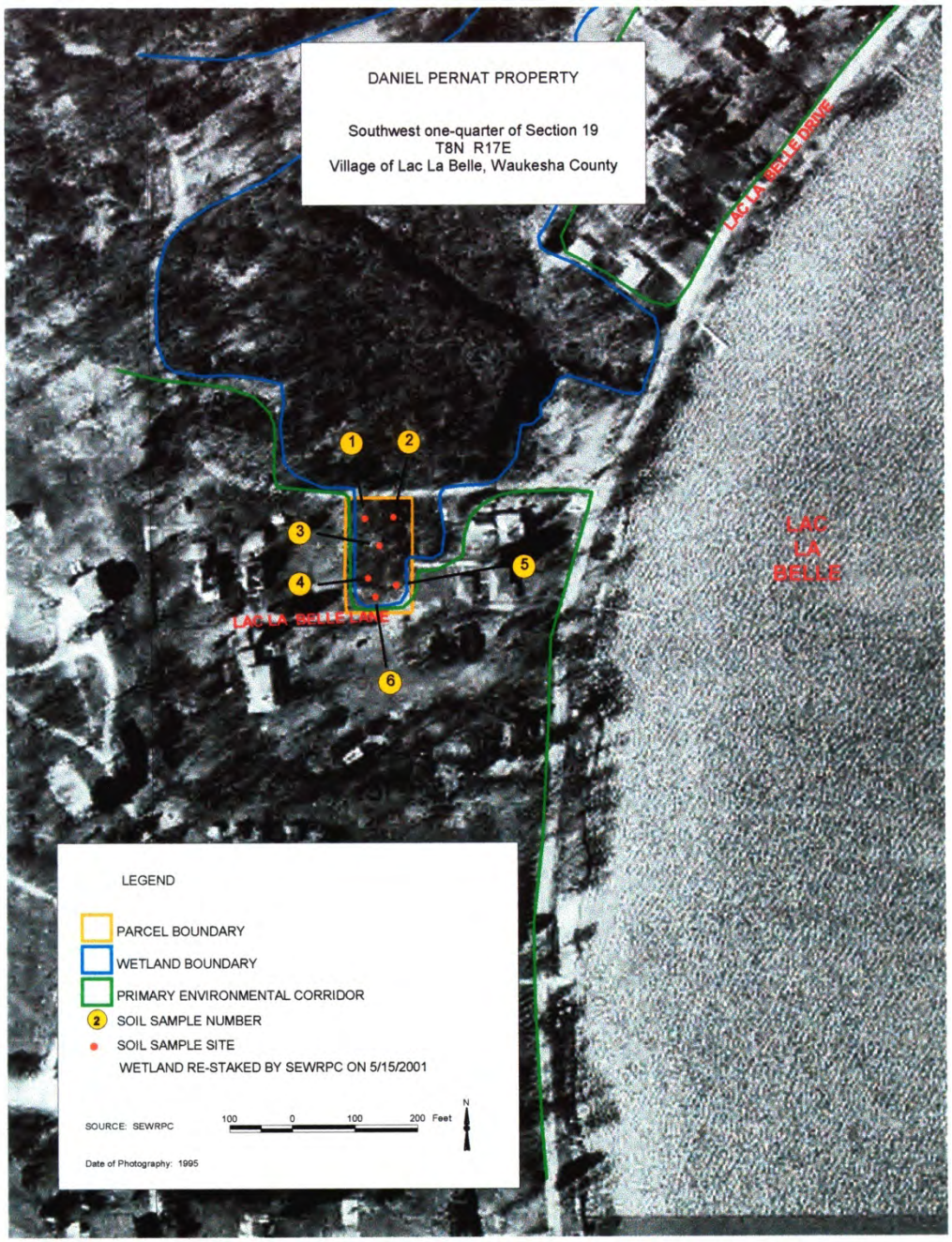
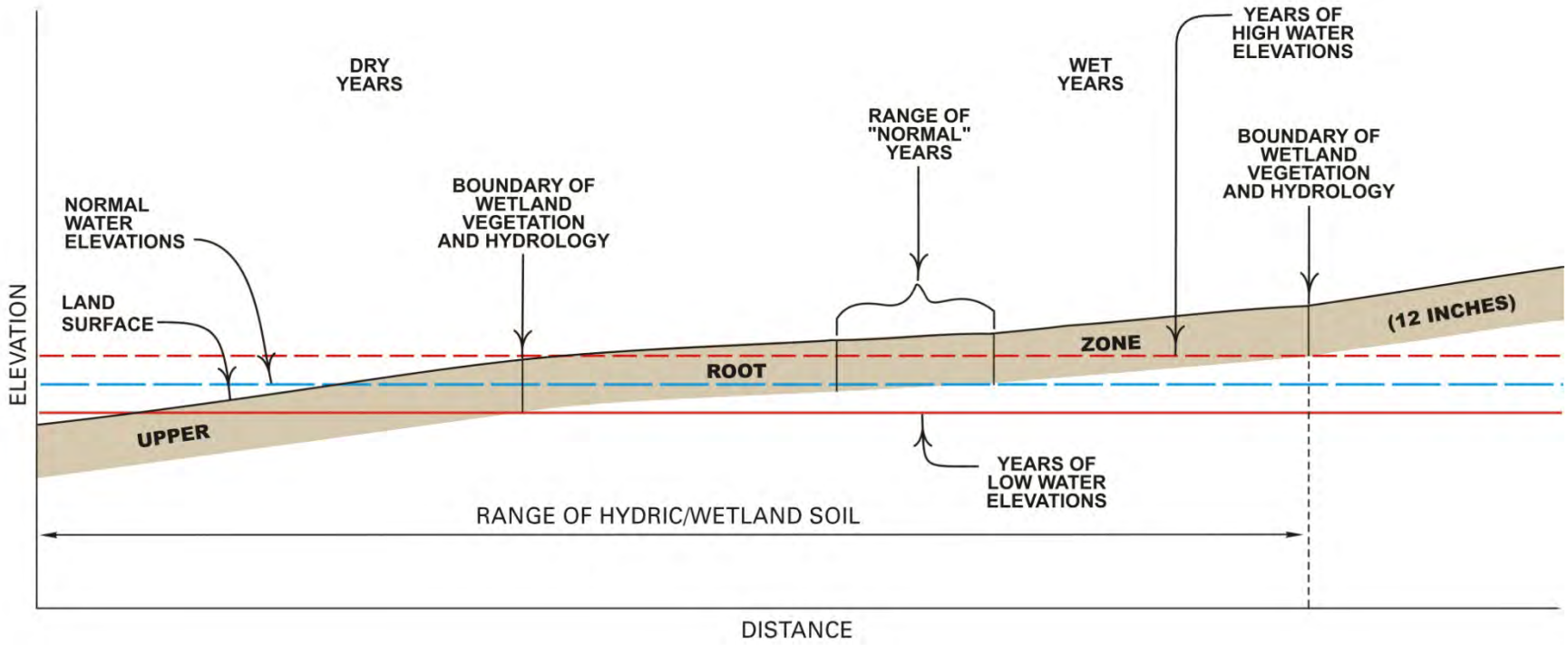

DANIEL PERNAT PROPERTY
Southwest one-quarter of Section 19
T8N R17E
Village of Lac La Belle, Waukesha County
LAC LA BELLE DRIVE
LAC LA BELLE DRIVE
LAC
LA
BELLE
1
2
3
4
5
6
LEGEND
PARCEL BOUNDARY
WETLAND BOUNDARY
PRIMARY ENVIRONMENTAL CORRIDOR
2 SOIL SAMPLE NUMBER
SOIL SAMPLE SITE
WETLAND RE-STAKED BY SEWRPC ON 5/15/2001
SOURCE: SEWRPC
100 0 100 200 Feet
N
Date of Photography: 1995

Figure 1

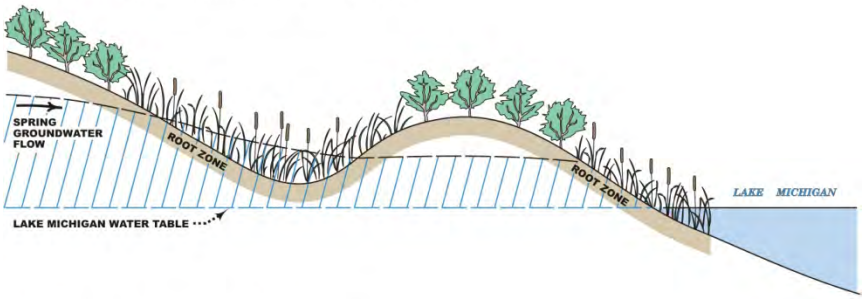
WETLAND BOUNDARY DYNAMICS



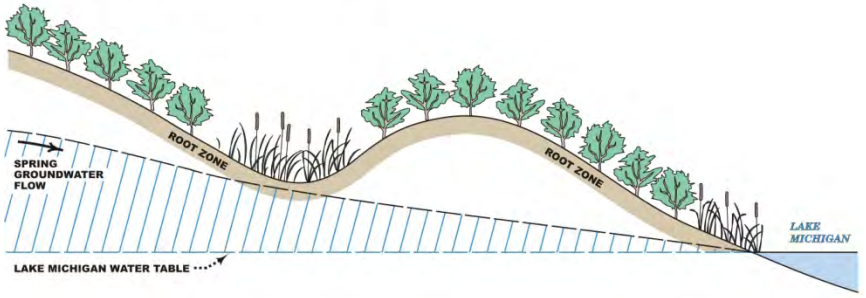
Source: SEWRPC.

LAKE MICHIGAN INTERDUNAL SWALE CONDITIONS

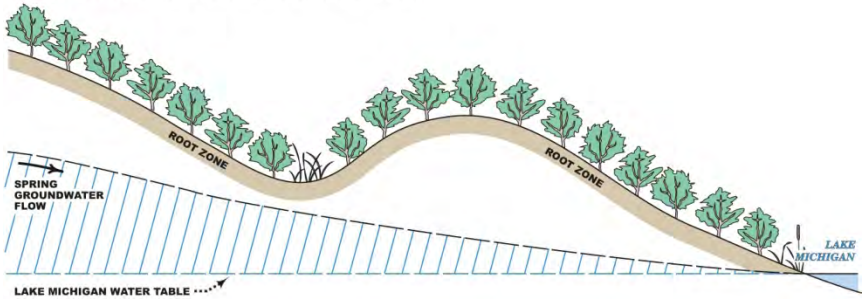
YEARS OF ABOVE NORMAL LAKE LEVELS AND PRECIPITATION



YEARS OF NORMAL LAKE LEVELS AND PRECIPITATION



YEARS OF BELOW NORMAL LAKE LEVELS AND PRECIPITATION



Source: SEWRPC.