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1997 Hydric Soils of the Glaciated Upper Midwest

Tour Itinerary

Illinois Soil Classifiers Association and Indiana Association of Professional Soil Classifiers

in cooperation with

The Morton Arboretum
USDA-NRCS
and
Purdue University Department of Agronomy

1997 Hydric Soils of the Glaciated Upper Midwest Program

This field tour focuses on hydromorphic features in soils of natural wetlands. The relationship between site hydrology and soil development will be examined at natural wetlands in the glaciated upper Midwest. We will examine a palustrine wetland system in the Chicago metro region and a fine sand dunal system in northwest Indiana. The tour will begin on Thursday October 9 at the West Chicago Prairie and end on Friday October 10 at The Jasper-Pulaski Wildlife Area.

Thursday October 9, 1997

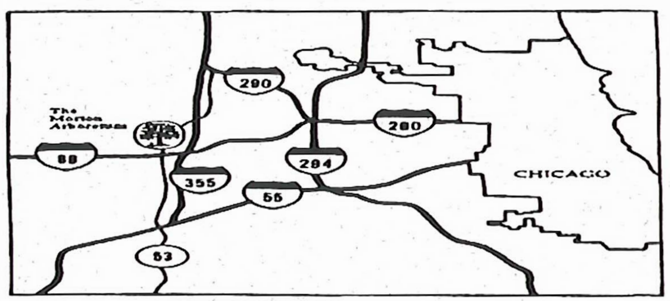
12:00pm Meet at The Morton Arboretum Thornhill Shelter
12:30pm **Stop 1. West Chicago Prairie**
Long term water table monitoring has been undertaken to assess the relationships between soils, plant communities, and site hydrology.
Leaders: Patrick Kelsey and Thomas Hanzely, The Morton Arboretum
3:30pm Depart for The Morton Arboretum
4:00pm Meetings
Illinois - Thornhill Shelter - Council Meeting
Indiana - Thornhill Shelter - General Membership Meeting
5:00pm Dinner (Provided - Brats, Burgers, Salads, etc.)
6:00pm Mike Whited, USDA-NRCS

Friday October 10, 1997

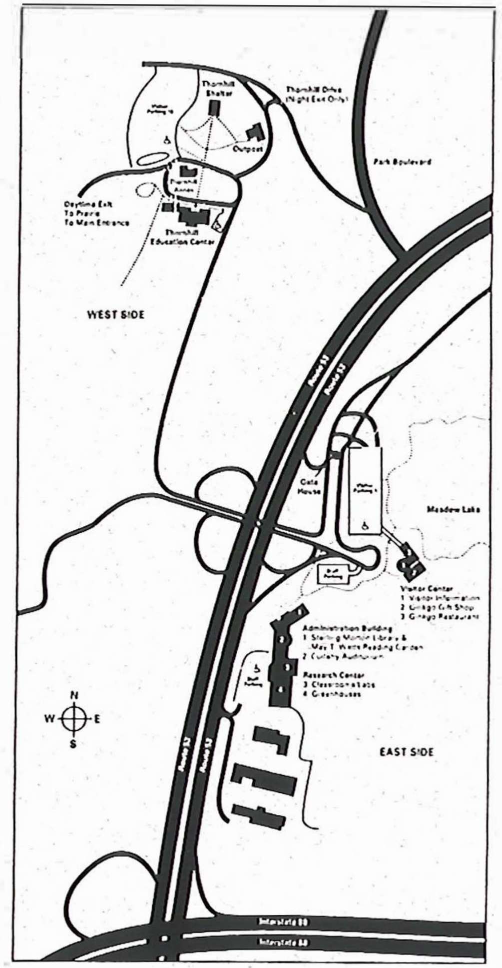
8:30am **Stop 2. Indiana Wet Soils Monitoring Project.**
The Jasper-Pulaski Wildlife Area serves as one site in Indiana for the Wet Soils Monitoring Project. Here we will observe water relationships associated with fine sands in a dunal landscape which lies atop the Kankakee outwash plain. This is a strong contrast to the finer textured materials seen earlier in the tour.
Leaders: Don Franzmeier and Byron Jenkinson, Purdue University
12:00pm Depart

Map and Directions

The Morton Arboretum is located on Illinois Route 53, just north of Interstate 88 and west of Interstate 355 in Lisle, Illinois.



To enter the Morton Arboretum, follow the directional signs on I-88 and Illinois Route 53 to the main entrance. Mention to the gatehouse attendant that you are here for the Soil Classifiers Field Tour and attendant will let you pass. Follow Arboretum signs to the Thornhill Education Center and park your vehicle at the northwest corner of Visitor Parking #19. We will meet at the Thornhill Shelter. *__The Month of October is our visitation peak for Arboretum fall color. Please allow time for possible delays.__*



Accommodations

__Accommodations are the responsibility of each individual__

Indiana Dunes State Park Camping
Chesterton, IN
(219) 926-1952

Indian Oaks Motel
Chesterton, IN
1-800-465-4329
Room Rates start at $69

Holiday Inn Express
Merrellville, IN
1-800-552-4332
Room Rates $65-$85

Super 8
Merrellville, IN
(219) 736-8383
Room Rates start at $41

1997 Hydric Soils of the Glaciated Upper Midwest Registration Form

__Pre-Registration is Required by **October 1, 1997**__

Cost: $30.00 (Includes Tour Preparation, Guidebook, and Dinner)

Name: ______________________

Address: ______________________

____

Telephone Number: ______________________

E-mail Address: ______________________

Send Registration Form and Fee to:

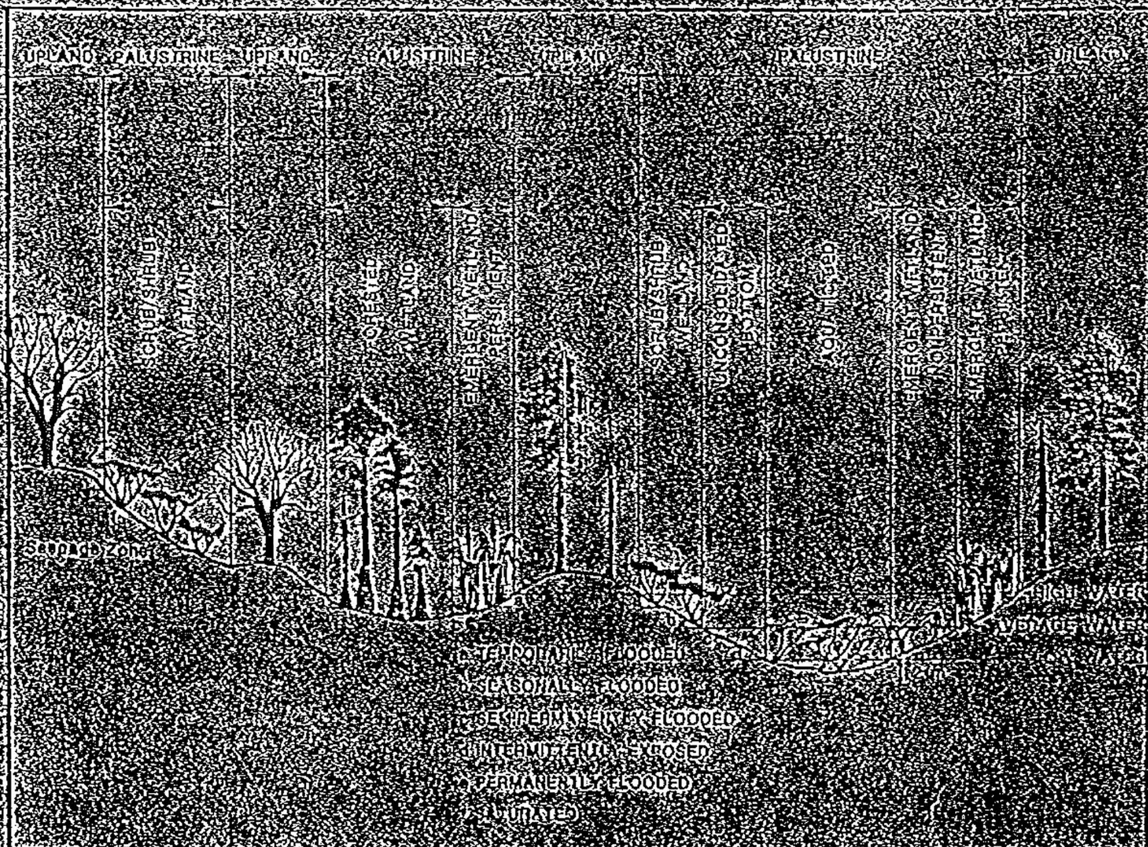
Chuck Frazee
ISCA Treasurer
65 Gaffney Rd.
Divernon, IL 62530

Questions and/or Concerns:

Call Patrick Kelsey at (630) 719-2417 or E-mail at pkelsey@mortonarb.org

PATRICK D. KELSEY

Hydric Soils of the Glaciated Upper Midwest



Sponsored by

Soil Science Society of America
Division S-10 Wetland Soils
Division S-5 Pedology
S884 Soil Micromorphology Committee
Illinois Soil Classifiers Association

In Cooperation with

The Morton Arboretum
Natural Resources Conservation Service
Purdue University Department of Agronomy
Des Plaines River Wetlands Demonstration Project

November 1-3, 1996

STOP 2

WEST CHICAGO PRAIRIE

FOREST PRESERVE DISTRICT OF DUPAGE COUNTY
DUPAGE COUNTY, ILLINOIS

Introduction

The West Chicago Prairie is a group of ecosystems owned and managed by the Forest Preserve District of DuPage County. Located in West Chicago, Illinois, the site consists of several different plant communities. These plant communities include: upland savanna, upland prairie, old field, mesic and wet-mesic prairies, sedge meadow, marsh, swamp, and open water (Figure 1).

The West Chicago Prairie is located at 41°52' North Latitude and 88°15' West Longitude. It is more than 122 hectares in size and 550 native plant species have been identified within the boundaries of the preserve. This natural area represents one of the few areas in northeastern Illinois where intact upland and wetland soils can be studied and monitored with respect to a high quality natural ecosystem.

Surficial Geology

The West Chicago Prairie lies within a geologically complex area in western DuPage County. The types of materials found on this site and their stratigraphy are the result of the most recent glaciation during the Wisconsinan Stage. Glaciers retreated from this site approximately 15,000 to 20,000 years before present.

The prairie is on an outwash complex near the front of the West Chicago Moraine, the western edge of the Valparaiso Morainic System. This outwash complex separates the West Chicago Moraine from the Minooka Moraine which lies just west of the site. The Manhattan-Minooka Ground moraine begins just to the south of the prairie.

The local relief of the prairie is about 5.2 meters. An elevation of approximately 233 meters above mean sea level (msl) occurs near the northeast and southeast corners of the parcel. This elevation drops to 227 meters (msl) in a wetland near the southwest corner (Figure 2).

The wetland ecosystem of the West Chicago Prairie lies within a subtle drainage way which winds its way east to west through the site. Pockets of open water are present throughout the wetland. The soils within the wetland have typically formed in 1) 25 to 51 centimeters of recently deposited organic materials over 51 to 76 centimeters of water reworked silty wash over sand and gravel outwash, or 2) silty alluvium over sand and gravel outwash. The alluvium is identified as Cahokia Alluvium (generally poorly sorted silt and sand) and the sand and gravel outwash is the Batavia Member of the Henry Formation (well sorted). Very small pockets of Grayslake Peat can be found within the area.

Upland soils on the prairie are mostly developed in Richland Loess underlain by stratified silts and sands over gravelly and sandy outwash. The silty and sandy wash materials comprised of backwater deposits (water reworked loess) (Figure 3). Localized soils within the oak savanna of the prairie have formed in nearly pure sand and gravel.

Two types of till are found near West Chicago Prairie: the Wadsworth Till Member and the Yorkville Member of the Wedron Formation. The West Chicago Moraine is comprised of Wadsworth Till, and is typically gray in color and has a silty clay loam to silty clay texture, though exceptions occur. It often has pebbles, cobbles, and even boulders. The Yorkville Till, found nearby in the Manhattan-Minooka Ground moraine and Minooka Moraine, is very similar to the Wadsworth Till (Willman and Frye, 1970). The Wadsworth Till, however, tends to be slightly more gravelly and less clayey than the Yorkville Till. The glacial till found beneath West Chicago Prairie underlies the outwash and appears to be more representative of the Wadsworth Till than the Yorkville Till.

Figure 1. West Chicago Prairie Plant Communities.

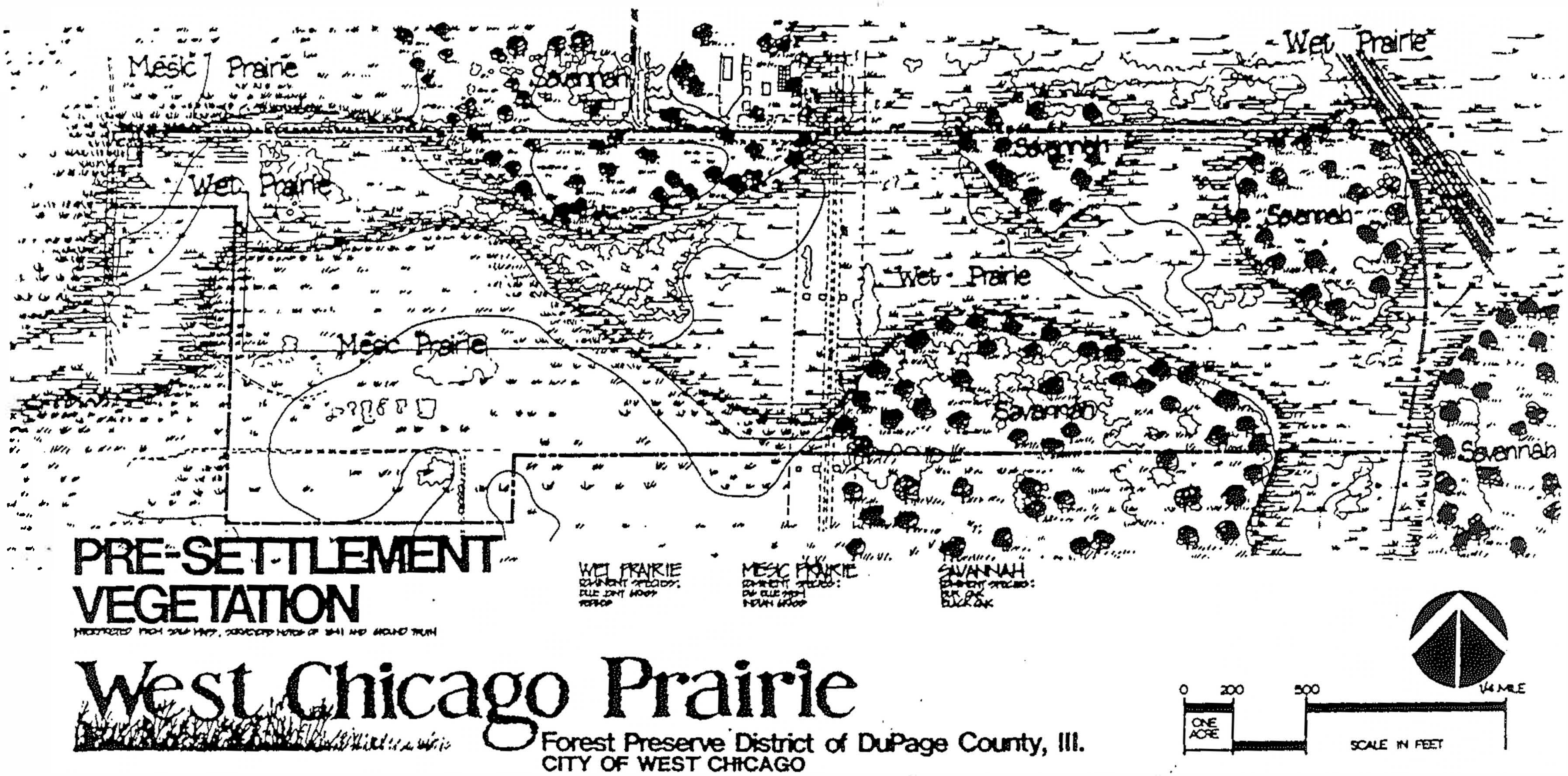


Figure 2. Topography of the West Chicago Prairie.

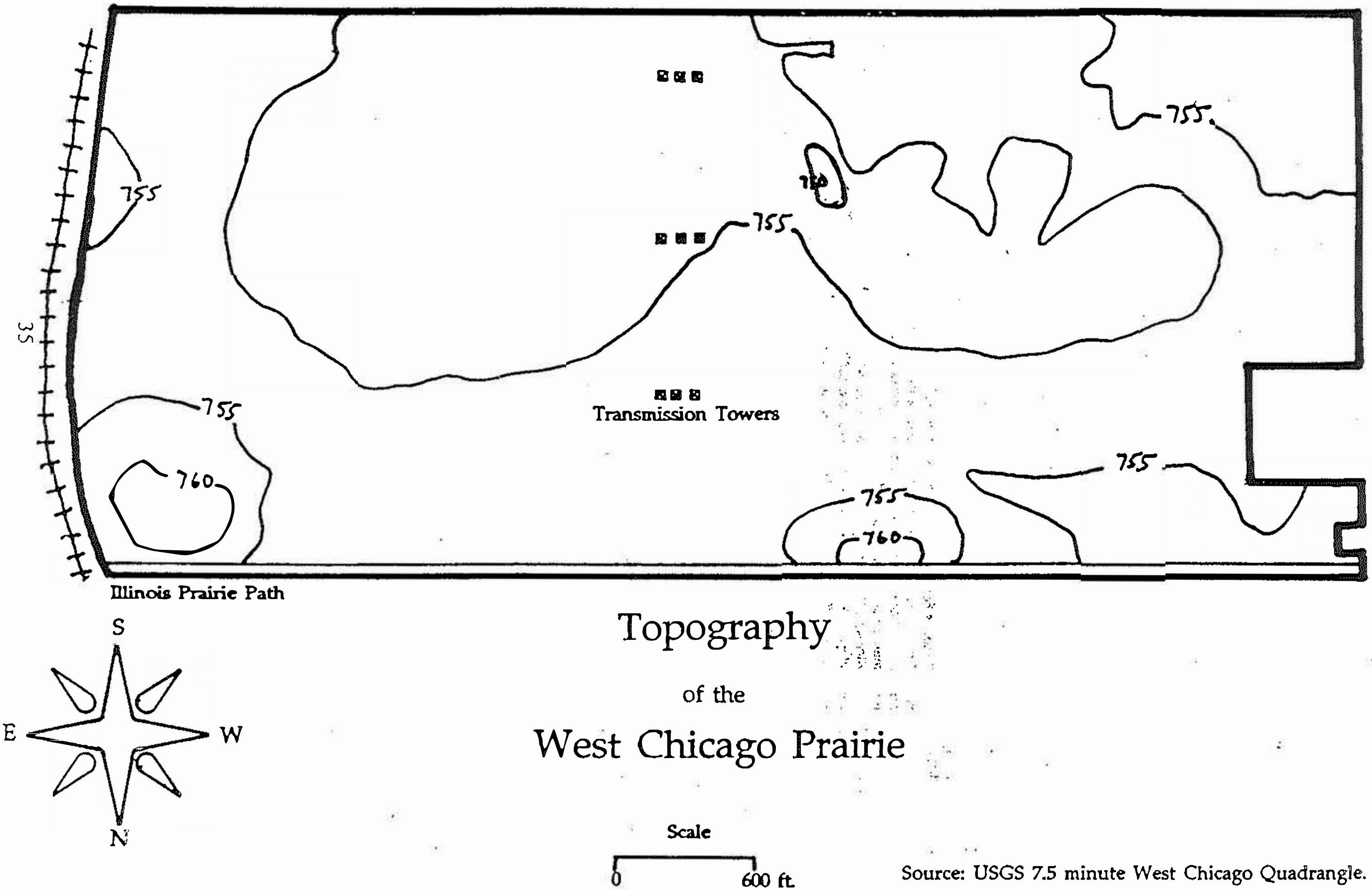
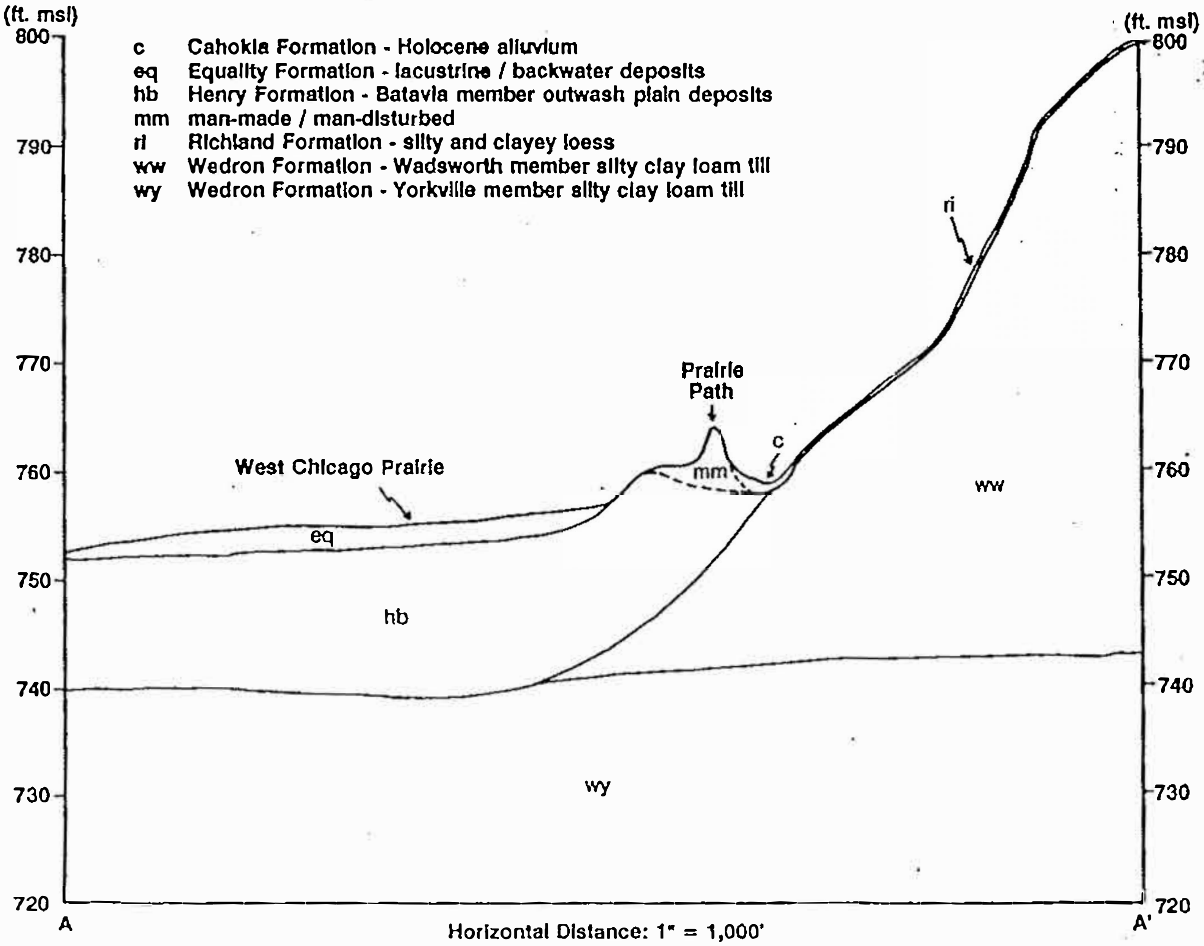


Figure 3. Geologic Cross Section of the West Chicago Prairie.



Cross section runs NW to SE across the northern 1/3 of the preserve.

Soils of the West Chicago Prairie

The soils identified on the West Chicago Prairie are shown in Figure 4 (Mapes, 1979). Seven soil series were mapped by NRCS staff on this site. The soils that were identified include: Drummer (152), Fox (327), Mundelein (442), Zurich (696), Wauconda (697), Grays (698), and Houghton-Muskego, wet (1903). A brief description of these series is given below. The Drummer, Mundelein, Wauconda, and Grays series have been sampled and described in detail for the field tour. Table 1 lists selected physical and chemical properties for these soils.

The Fox series is classified as a fine-loamy over sandy or sandy skeletal, mixed, mesic Typic Hapludalf. It formed in 61 to 102 centimeters of loamy deposits over stratified sand and gravel outwash. Fox is well drained and has moderate permeability in the loamy material and rapid or very rapid permeability in the sand and gravel. It is commonly associated with the Casco and Dresden series. Slopes on this map unit range from 2% to 5%.

Zurich formed in 61 to 102 centimeters of loess or silty material over stratified loamy outwash. It is classified as a fine-silty, mixed, mesic Typic Hapludalf. It is moderately well to well drained and has moderate permeability. Zurich is associated with the Aptakisic and Grays series. Slopes range from 2% to 5%.

Houghton-Muskego, wet is an organic soil complex that is inundated virtually year-round. These soils are found in the drainage way through the site and have a slope of less than 1%. Although Figure 3 shows this complex to occupy the entire drainage way, only small pockets actually exist. Much of the drainage way consists of Drummer with a histic epipedon.

Houghton is classified as a euic, mesic Typic Medisaprist and has developed in greater than 51 inches of herbaceous material. It is very poorly drained and has moderately slow to moderately rapid permeability. Muskego is classified as a coprogenous, euic, mesic Limnic Medisaprist. It differs from Houghton in that it has formed in 41 to 130 centimeters of herbaceous material over sedimentary peat.

Figure 5 shows a cross-section of the soil hydrosequence associated with Transect A. The water table data shown in the accompanying graphics are also from Transect A.

Wetland Vegetation

Five groups of vascular plants are used for classifying plants as wetland or upland indicators. This "wetland indicator status" is based upon the frequency that the plant occurs in wetlands. These four groups are obligate wetland plants, facultative wetland plants, facultative plants, and facultative upland plants (Fed. Interagency Comm. For Wetland Del., 1989)

1. Obligate wetland plants (OBL) occur almost always in wetlands under natural conditions. The estimated probability of their occurring in wetlands is greater than 99 %.

2. Facultative wetland plants (FACW) usually occur in wetlands but are sometimes found outside wetland areas. The estimated probability of their occurrence in wetlands is 67 to 99 %.

3. Facultative plants (FAC) have an equal chance of being found in a wetland as in a non-wetland. The estimated probability of their occurrence in a wetland is 34 to 66 %.

Table 1. Selected physical and chemical properties of West Chicago Prairie soils.

Grays: Mollic Hapludalf

	Sand	Silt	Clay	Text	OC	pH
A	11.95	71.12	16.93	SiL	1.7	6.4
BA	7.44	62.08	30.48	SiCL	0.5	6.5
$2Bt_1$	29.46	36.12	34.42	CL		6.6
$2Bt_2$	37.75	30.09	32.16	CL		6.3
$2Bt_3$	16.05	49.79	34.16	SiCL		7.6
2BC	44.81	28.89	28.30	CL		8.0
2C	8.25	78.33	13.42	SiL		8.5

Mundelein: Aquic Argiudoll

	Sand	Silt	Clay	Text	OC	pH
A	12.08	70.98	16.94	SiL	2.1	6.2
BA	11.65	64.37	23.98	SiL	1.1	6.2
Bt_1	14.99	46.11	38.90	SiCL		6.3
$2Bt_2$	46.45	26.78	26.77	CL		7.4
2BC	51.43	40.06	8.51	L		8.5
2C						

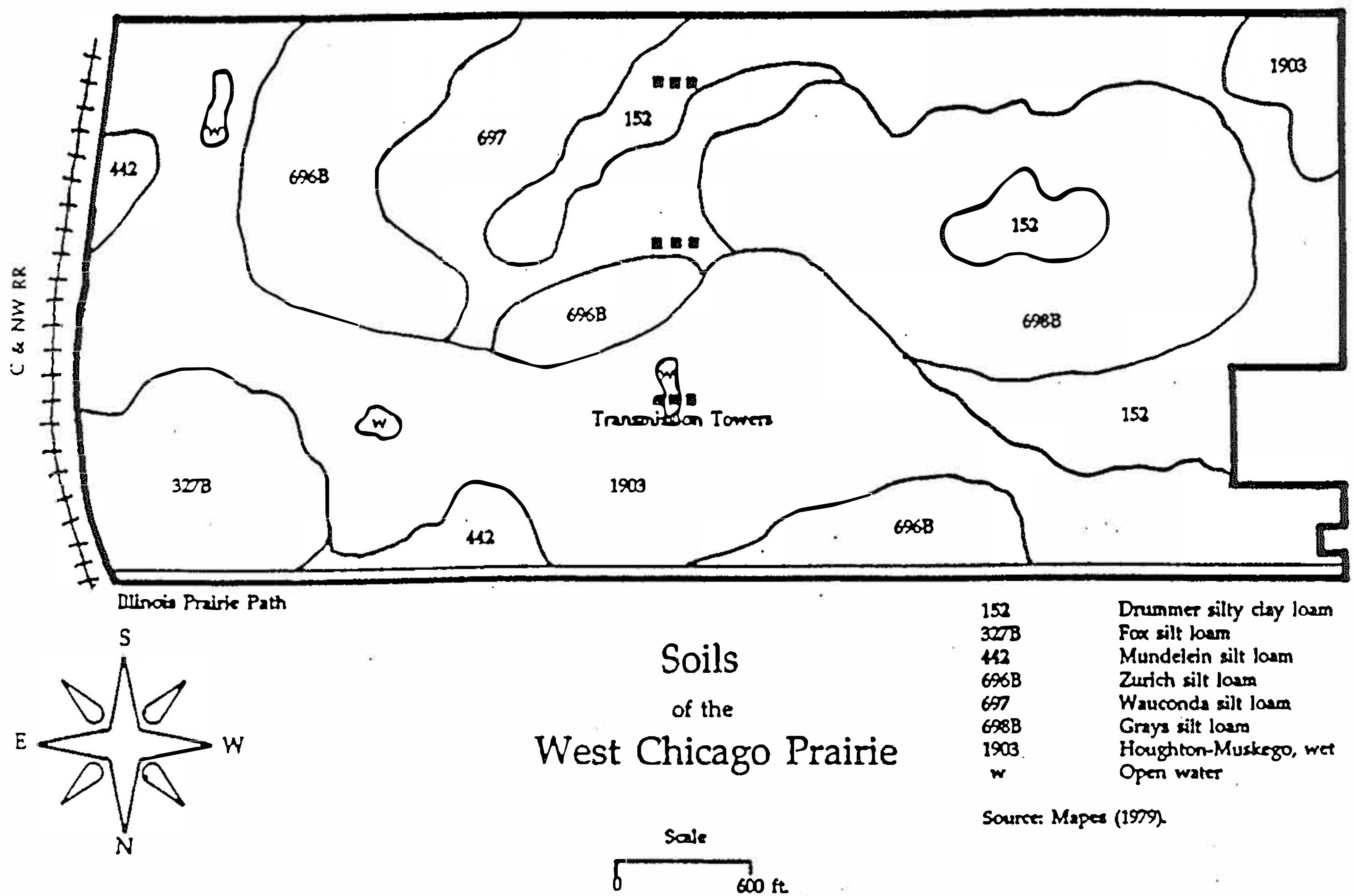
Drummer: Typic Endoaquoll

	Sand	Silt	Clay	Text	OC	pH
A_1	4.96	86.70	8.34	Si	6.3	6.9
A_2	6.25	75.65	18.10	SiL	4.7	7.2
AB	5.14	67.20	27.66	SiCL	2.7	7.3
Bg_1	3.02	59.03	37.95	SiCL		7.4
Bg_2	2.94	59.10	37.96	SiCL		7.6
BCg	3.18	57.12	39.70	SiCL		7.5
Cg						

Wauconda: Udollic Endoaqualf

	Sand	Silt	Clay	Text	OC	pH
A	14.24	73.60	12.16	SiL	3.7	5.8
BE	6.30	61.81	31.89	SiCL		5.9
Bt_1	3.04	57.85	39.11	SiCL		6.1
Bt_2	2.11	61.00	36.89	SiCL		6.6
BC	9.61	61.42	28.97	SiCL		7.7
2C	27.81	51.41	20.78	SiL		8.0

Figure 4. Soils of the West Chicago Prairie



4. Facultative upland plants (FACU) usually occur in non-wetlands. The estimated probability of their occurrence in a wetland is 1 to 33 %.

5. Plants with a less than 1 % probability of occurring in a wetland are obligate upland species (UPL).

A list is made in the field of the species identified in the wetland and their wetland status. The wetland status can be identified on the National List of Plant Species that Occur in Wetlands published by the U.S. Fish and Wildlife Service (Reed, 1988). Greater than 50 % of the dominant plant species occurring in a wetland must be OBL, FACW, or FAC to meet the hydrophytic criterion.

West Chicago Prairie Transect A Hydrophytic Vegetation

	------- % Hydrophytic -------		
	1991	1996	% Change
Mesic Prairie	28	14	-98
Wet Prairie	74	82	11
Marsh	100	100	0
Marsh	100	100	0
Wet Prairie	48	66	26
Oak Savanna	19	13	-43

* Positive change indicates an increase in hydrophytic vegetation.

The field tour sites represent locations where water table and soil temperature monitoring have been established by the Forest Preserve District and the Morton Arboretum. The tour will visit transect (A) which begins in a mesic prairie (A1) and ends in the oak savanna (A41). Figure 5 shows the cross section of this transect.

The overall water table relationships for transect A from 1990 to 1996 are shown in Figure 6. Figure 7 illustrates these relationships for 1991. The data show a summer depletion in the annual hydroperiod. During the 1990 and 1991 seasons there was a widespread summer drought in the upper Midwest. The data reflect this drought but they also show a quick water table recovery from each of these seasonal droughts. Upland soils, formed in similar materials, took more than a year before seasonal water tables (perched) were seen again.

The hydroperiod data, in this largely undisturbed system, show significant fluctuation in the water table relationships. Water flows into and out of the wetland with sufficient speed to produce little lag time between precipitation and water table response. This wetland has a large water storage capacity but retention times are relatively short even though there is only a small proportion of the stored water released through a surface outlet. Thus, groundwater movement through the system is rapid. Groundwater elevation, soil, and vegetation data for each site in transect A are presented in the field tour descriptions, which follows.

Soil temperature data have been included as Figures 8 and 9 to give some indication of thermal regime characteristic of northeastern Illinois. Data show the soil temperature lags among plant communities.

Selected chemical data for soils in transect A are shown in Figures 10, 11, and 12.

Figure 5. Cross Section of Soils and Plant Communities in a West Chicago Prairie Hydrosequence.

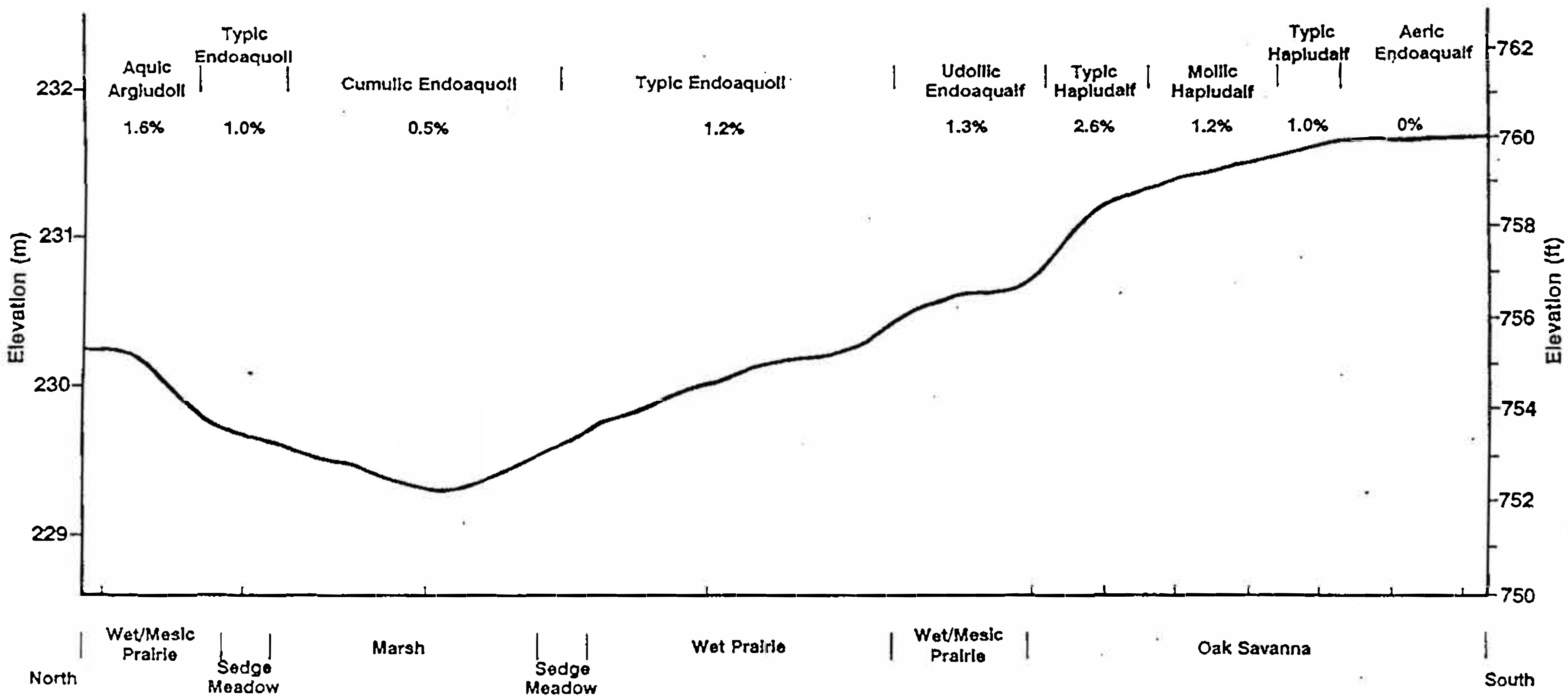


Figure 6. **Water Table Relationships at West Chicago Prairie from 1990 to 1996.**

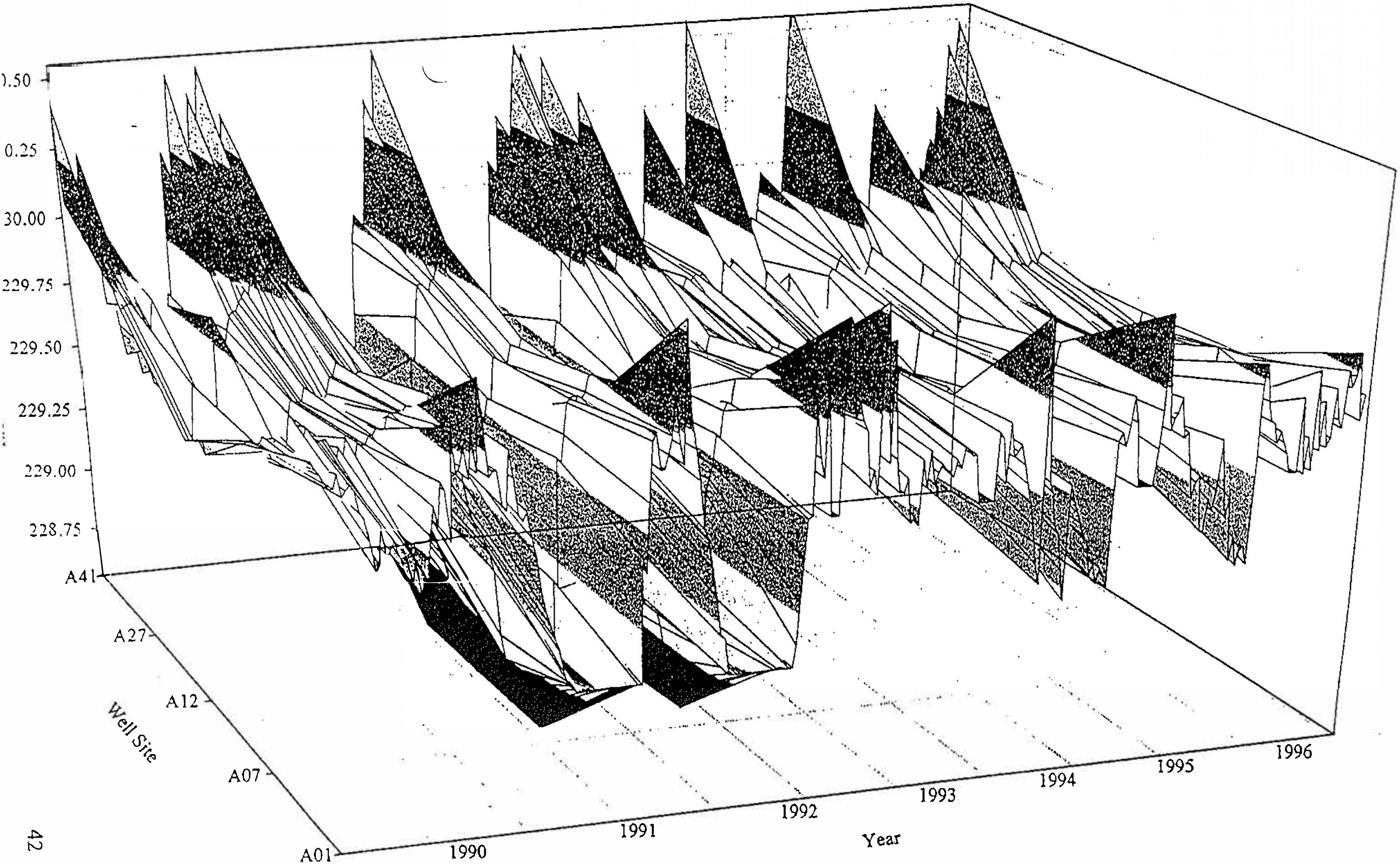


Figure 7. Water Table Relationships at West Chicago Prairie During the 1991 Hydroperiod.

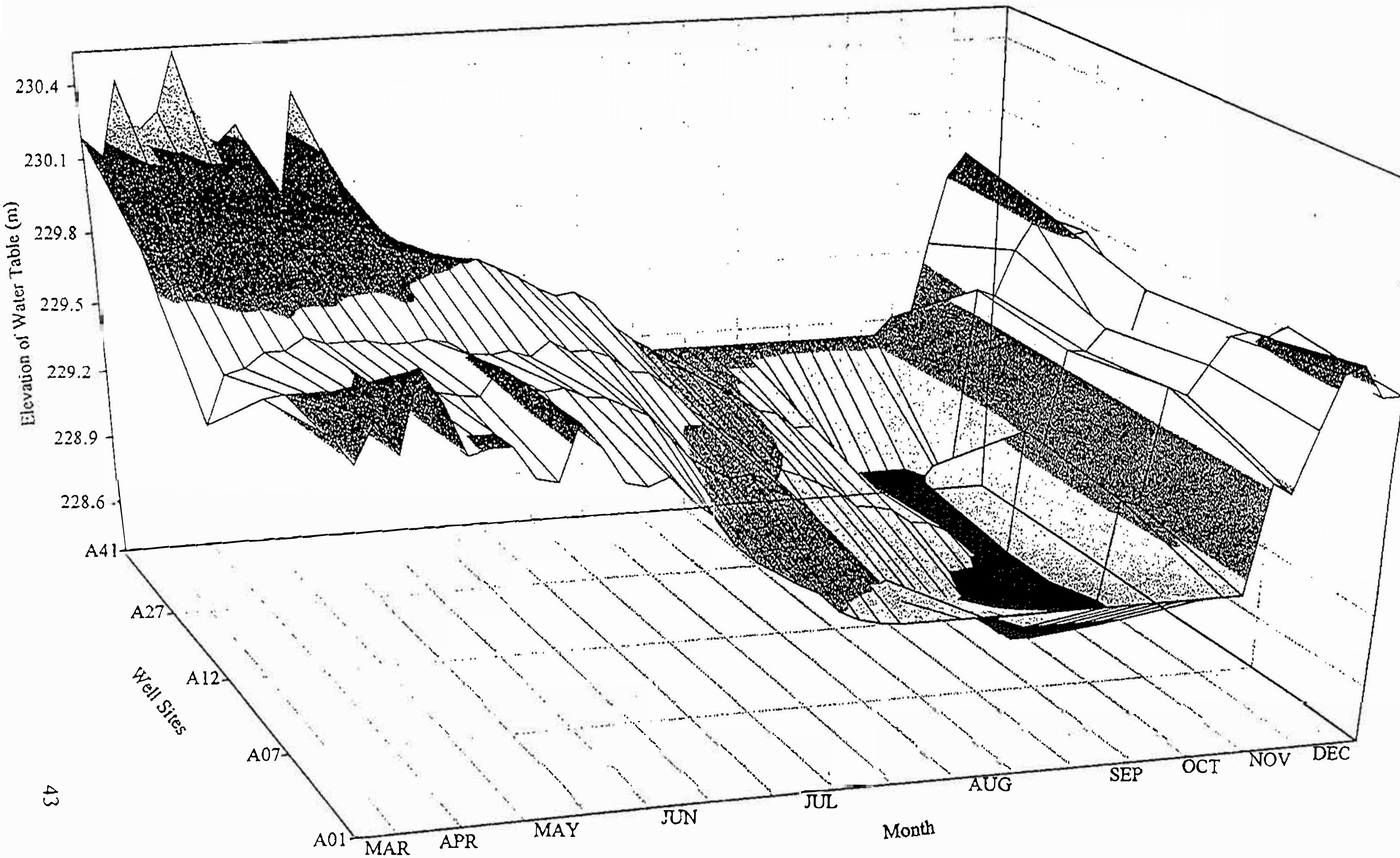


Figure 8. West Chicago Prairie Soil Temperatures (10 cm)
Comparison Between Different Plant Communities

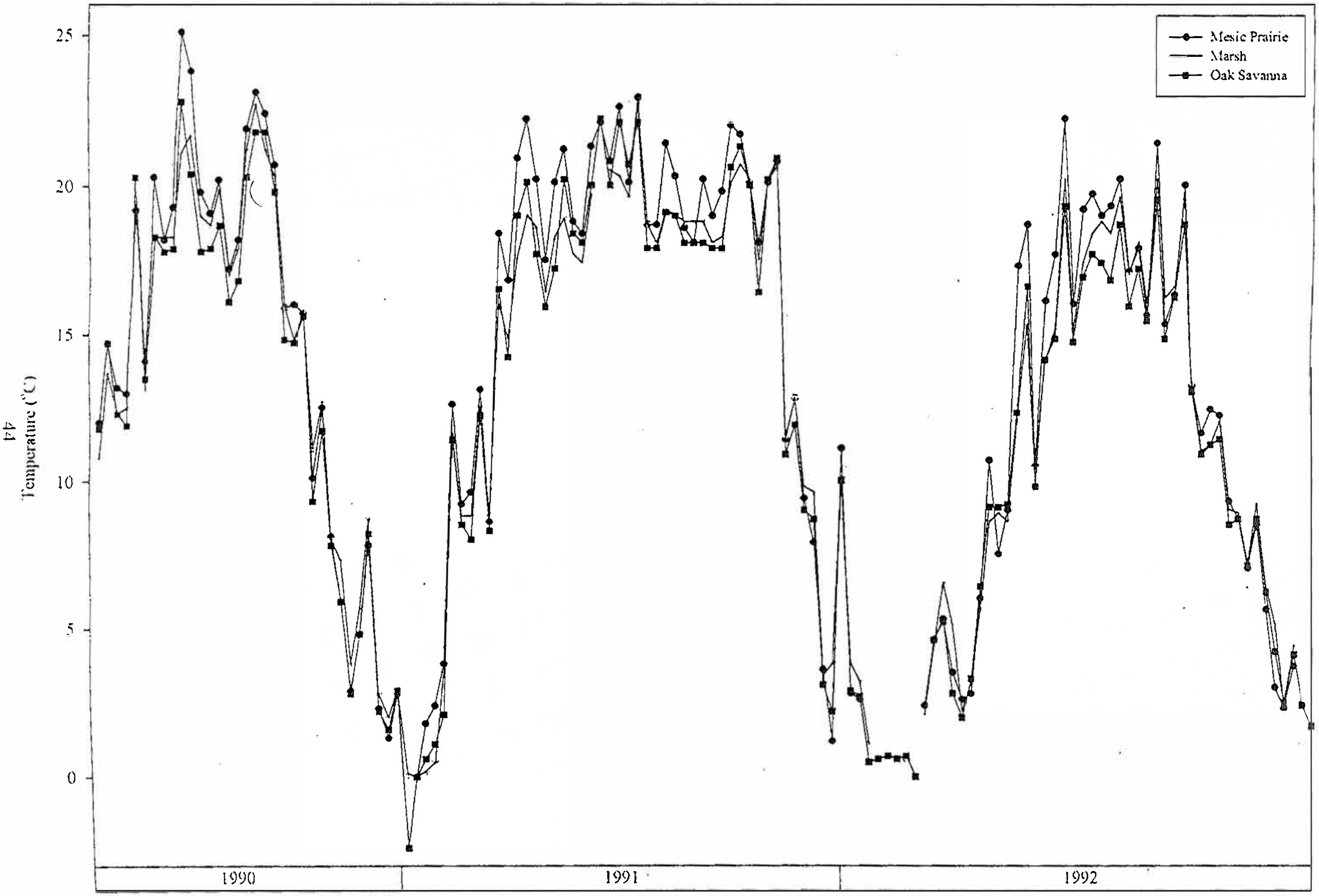


Figure 9. West Chicago Prairie Soil Temperatures (50 cm)
Comparison Between Different Plant Communities

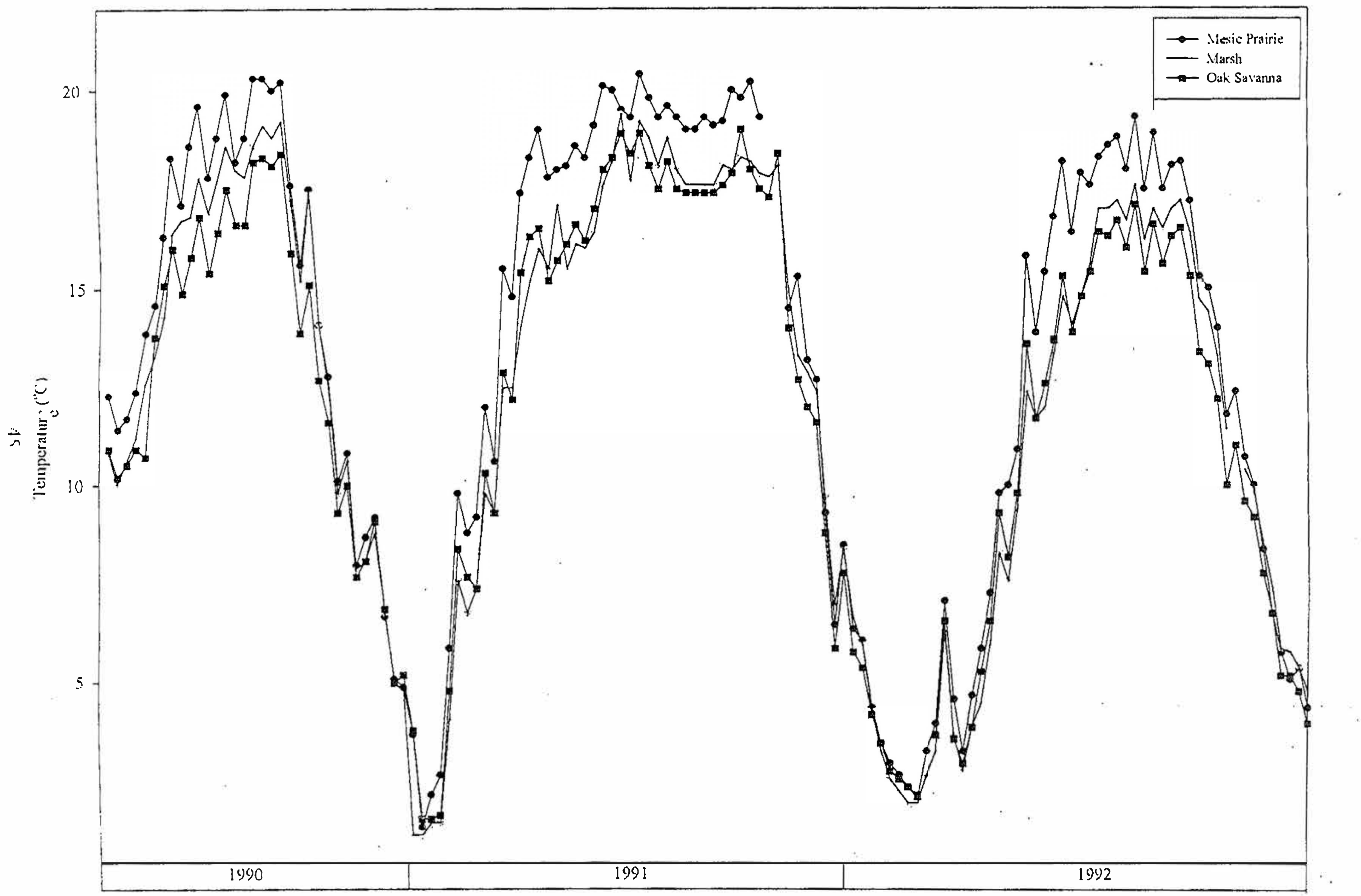


Figure 10. **Organic Carbon Relationships in Soils at West Chicago Prairie**

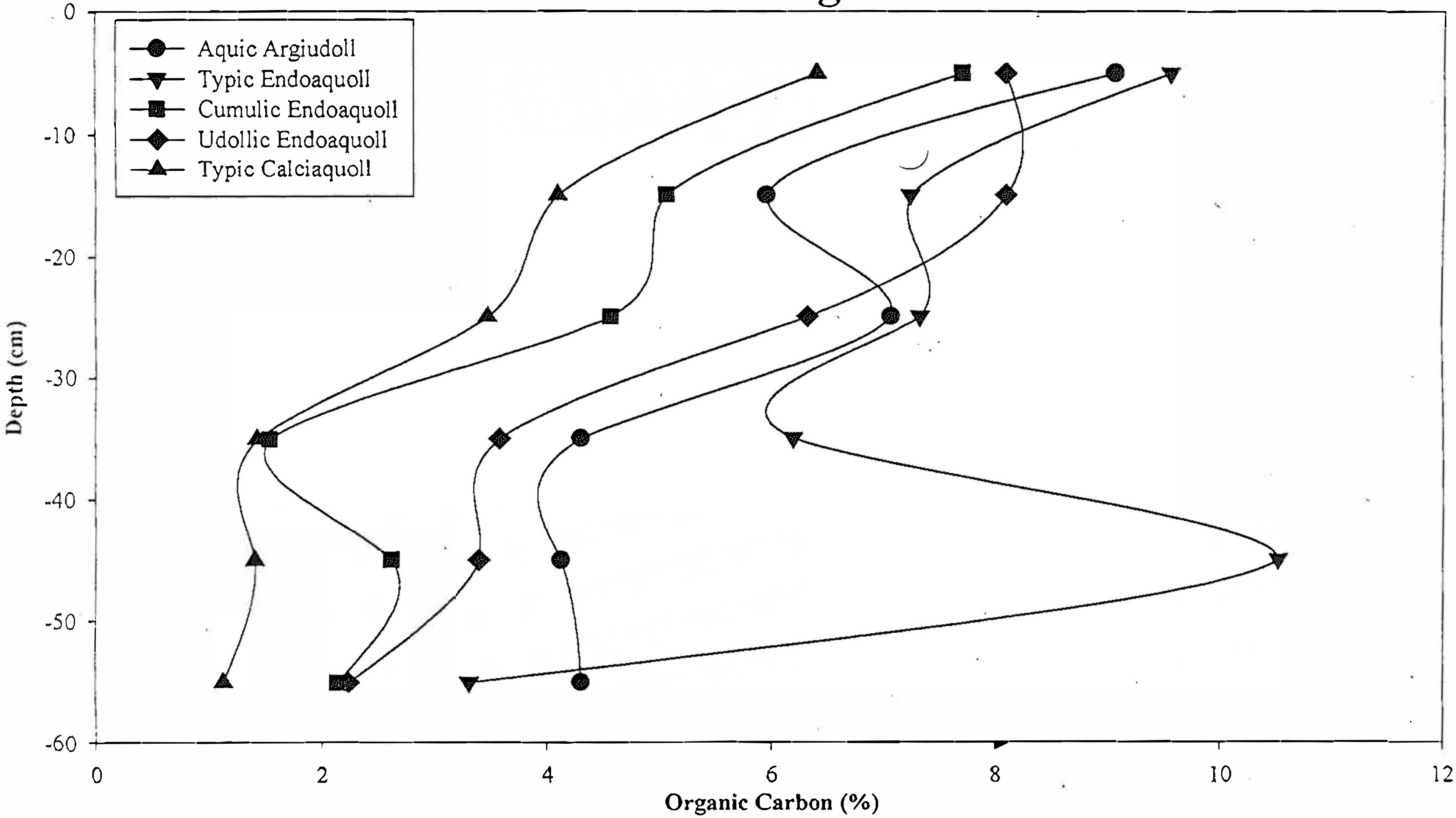


Figure 11. **Free Iron Oxide Relationships in Soils at West Chicago Prairie.**

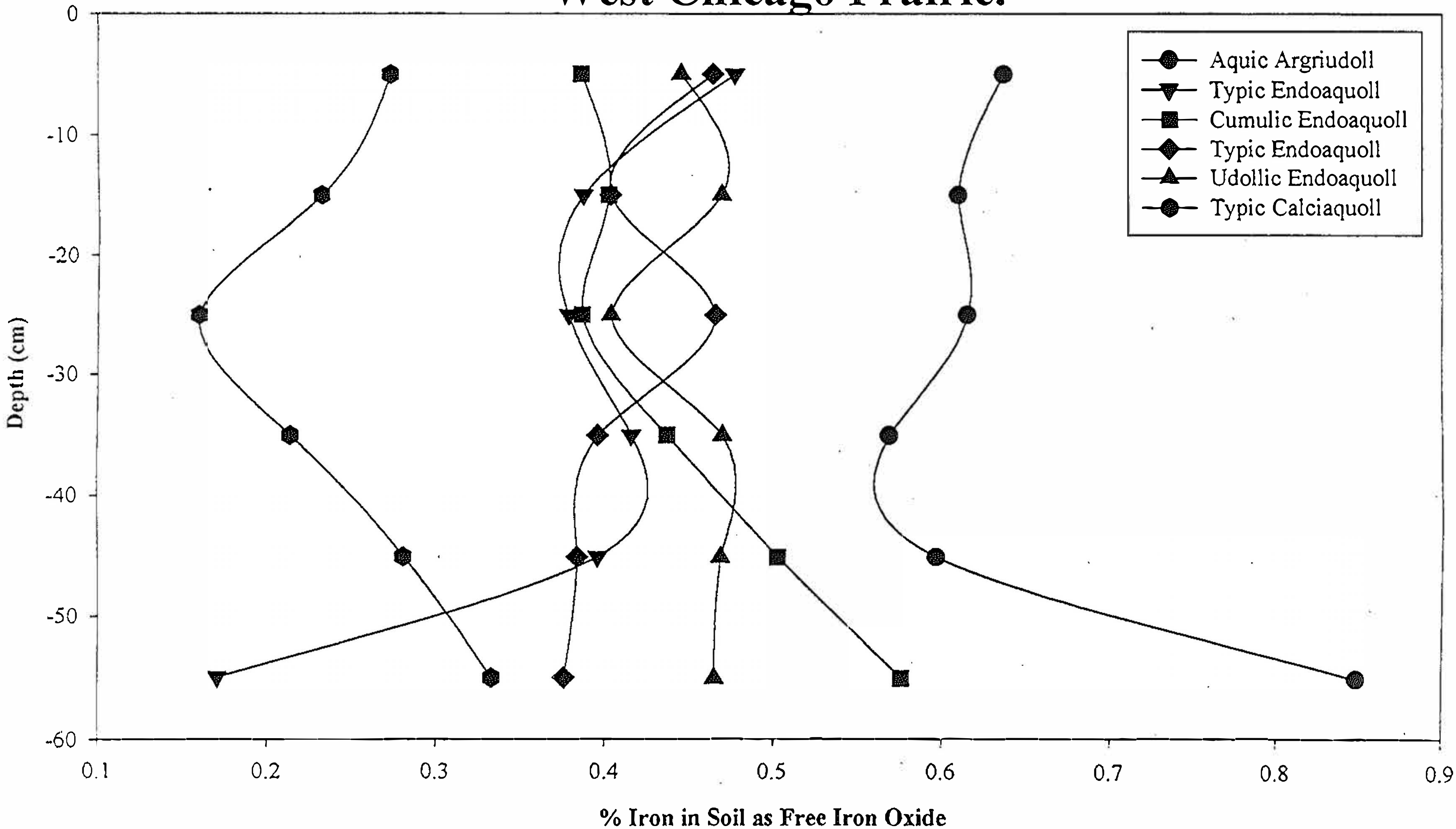
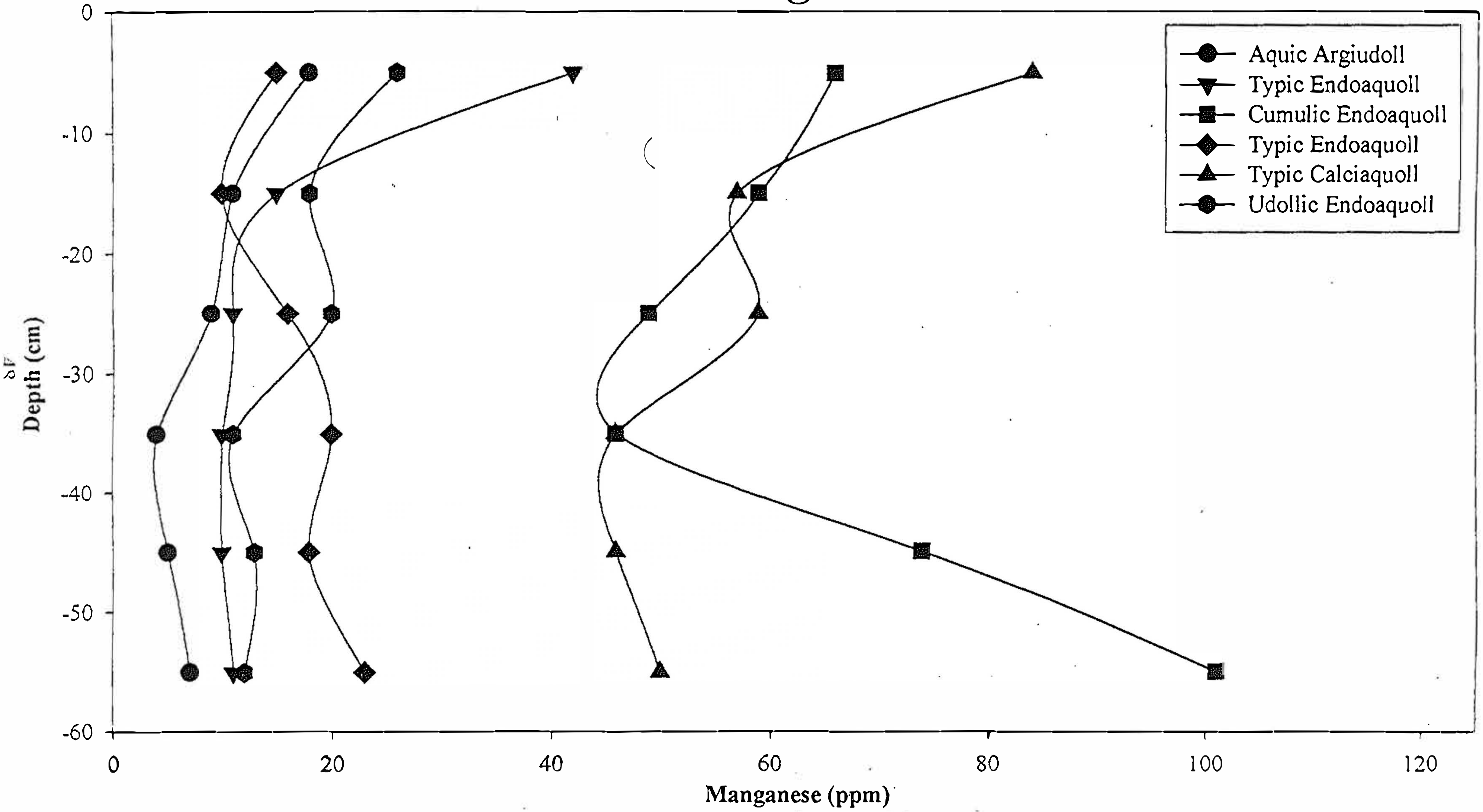


Figure 12. **DPTA Extractable Mn Relationships in Soils at West Chicago Prairie**



Field Tour Site Descriptions

Grays: Fine-loamy, mixed, mesic Mollic Hapludalf (Inclusion)

The Grays series are found on outwash plains and lake plains of Wisconsin age. The soils formed in 61 to 102 centimeters of loess or silty material over medium-textured outwash. They are typically on 1% to 5% slopes. Grays is moderately well to well drained and permeability is moderate. It is commonly associated with the Wauconda, Zurich, and Drummer series. Grays is not identified as a hydric soil. Note the dominant brown color below the A horizon. Gray or grayish colors are not found to a depth 102 centimeters. This is an indication of a relatively deep seasonal high water table.

A 0 to 20 centimeters; very dark gray (10YR 3/1) silt loam; moderate fine and very fine granular structure; friable; slightly acid.

BA 20 to 36 centimeters; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; brown (10YR 4/3) continuous clay coatings; friable; slightly acid.

$2Bt_1$ 36 to 64 centimeters; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; brown (10YR 4/3) continuous clay coatings; friable; neutral.

$2Bt_2$ 64 to 76 centimeters; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; brown (10YR 4/3) continuous clay coatings; very dark gray (10YR 3/1) organic matter coatings; friable; slightly acid.

$2Bt_3$ 76 to 86 centimeters; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; brown (10YR 4/3) continuous clay coatings; dark brown (10YR 3/3) organic matter coatings; friable; mildly alkaline.

2BC 86 to 102 centimeters; dark yellowish brown (10YR 4/4) loam; weak medium and coarse subangular blocky structure; brown (10YR 4/3) continuous clay coatings; dark brown (10YR 3/3) organic matter coatings; friable; moderately alkaline.

2C 102 to 152 centimeters; yellowish brown (10YR 5/4) and light grayish brown (10YR 6/2) silt loam; massive; common medium distinct yellowish brown (10YR 5/8) mottles; strongly alkaline.

Flora Associated with the Grays Series in the Mesic Prairie.

Scientific Name	Common Name	Wetness
Agrostis alba	Redtop	FACW
Allium cernuum	Nodding Wild Onion	UPL
Andropogon gerardi	Big Bluestem Grass	FAC-
Apocynum sibiricum	Dogbane	FAC+
Aster pilosus	Hairy Aster	FACU+
Carex normalis	NCN	FACW
Cirsium discolor	Pasture Thistle	UPL
Daucus carota	Queen Anne's Lace	UPL
Equisetum hyemale intermedium	Smooth Scouring Rush	FACW
Eupatorium altissimum	Tall Boneset	FACU
Eupatorium rugosum	White Snakeroot	FACU
Euphorbiua corollata	Flowering spurge	UPL
Galium triflorum	Sweet-scented Bedstraw	FACU+
Monarda fistulosa	Wild Bergamot	FACU
Panicum virgatum	Switch Grass	FAC+
Phleum pratense	Timothy	FACU
Physalis heterophylla	Clammy Ground Cherry	UPL
Physalis subglabrata	Tall Ground Cherry	UPL
Poa compressa	Canada Blue Grass	FAC-
Quercus macrocarpa	Bur Oak	FAC-
Rhus typhina	Staghorn Sumac	UPL
Rubus allegheniensis	Common Blackberry	FACU+
Rubus occidentalis	Black Raspberry	UPL
Ruellia humilis	Hairy Ruellia	FACU-
Solidago altissima	Tall Goldenrod	FACU
Solidago graminifolia nuttallii	Grass-leaved Goldenrod	FACW-
Veronicastrum virginicum	Culver's Root	FAC

Mundelein: Fine-silty, mixed, mesic Aquic Argiudoll

The Mundelein series developed in 61 to 102 centimeters of loess or silty material over stratified loamy outwash. The soil is typically found on level to gently sloping outwash plains. Slopes are generally less than 5%. Mundelein is somewhat poorly drained and has moderate to moderately slow permeability. It is not identified as a hydric soil.

A 0 to 36 centimeters; very dark gray (10YR 3/1) silt loam; moderate fine and very fine granular structure; friable; slightly acid.

BA 36 to 51 centimeters; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; dark grayish brown (10YR 4/2) continuous clay coatings; friable; slightly acid.

Bt_1 51 to 69 centimeters; brown (10YR 4/3) silty clay loam; moderate medium subangular blocky structure; dark grayish brown (10YR 4/2) continuous clay coatings; very dark gray (10YR 3/1) organic matter coatings; few fine distinct grayish brown (10YR 5/2) mottles; firm; slightly acid.

$2Bt_2$ 69 to 84 centimeters; brown (10YR 5/3) clay loam; weak medium subangular blocky structure; brown (10YR 4/3) continuous clay coatings; very dark gray (10YR 3/1) organic matter coatings; few fine distinct light grayish brown (10YR 6/2) and yellowish brown (10YR 5/6) mottles; firm; mildly alkaline.

2BC 84 to 97 centimeters; brown (10YR 5/3) loam; weak medium prismatic structure; brown (10YR 4/3) discontinuous clay coatings; common fine distinct light grayish brown (10YR 6/2) mottles; friable; strongly alkaline.

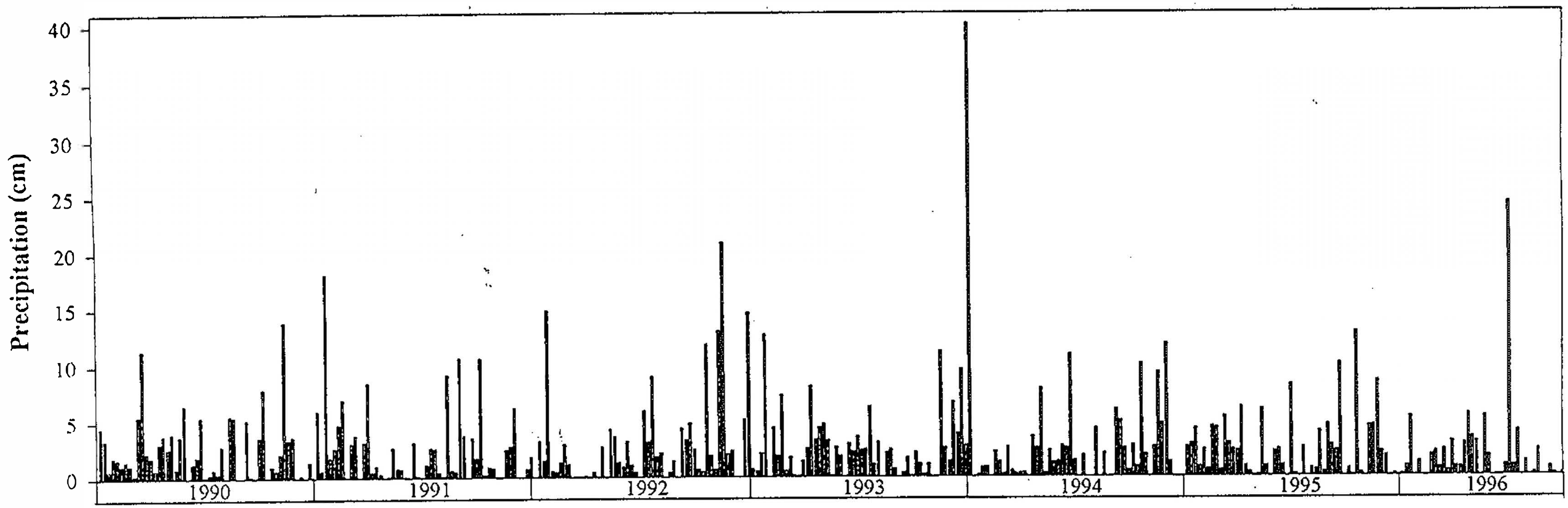
2C 97 to 152 centimeters; yellowish brown (10YR 5/6) stratified sandy loam and and silt loam; single grain and massive; common fine distinct light grayish brown (10YR 6/2) mottles; saturated.

Flora Associated with the Mundelein Series in the Mesic Prairie.

Monitoring Site A01

Scientific Name	Common Name	Wetness
Achillea millefolium	YARROW	FACU
Allium canadense	WILD ONION	FACU
Andropogon gerardii	BIG BLUESTEM GRASS	FAC-
Cornus racemosa	GRAY DOGWOOD	FACW-
Lobelia spicata	PALE SPIKED LOBELIA	FAC
Panicum implicatum	OLD-FIELD PANIC GRASS	FAC-
Prunus serotina	WILD BLACK CHERRY	FACU
Pycnanthemum virginianum	COMMON MOUNTAIN MINT	FACW+
Rudbeckia hirta	BLACK-EYED SUSAN	FACU
Solidago rigida	STIFF GOLDENROD	FACU-
Sorghastrum nutans	INDIAN GRASS	FACU+
Solidago graminifolia	COMMON GRASS-LEAVED GOLDENROD	FACW-
Spartina pectinata	PRAIRIE CORD GRASS	FACW+
Viola species	VIOLET	FAC

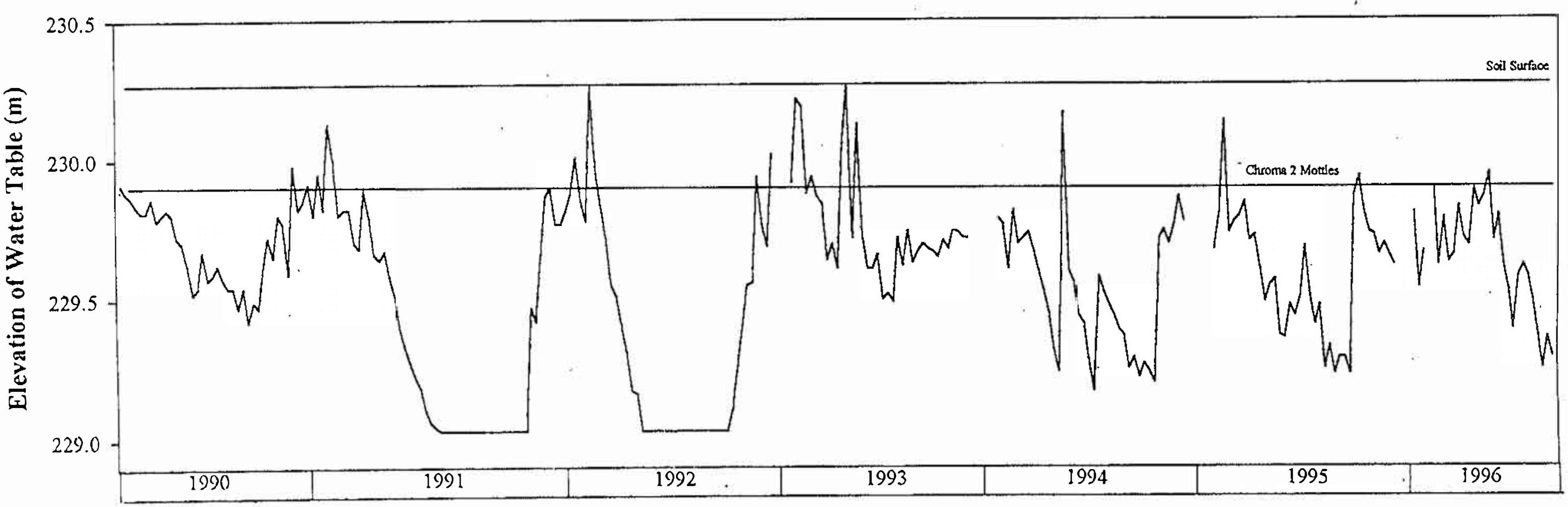
Weekly Precipitation Totals from 1990 to 1996



Hydroperiod Relationships at the West Chicago Prairie from 1990 to 1996

Site Location: Mesic Prairie

Soil: Aquic Argiudoll



Drummer: Fine-silty, mixed, mesic Typic Endoaquoll

The Drummer series is a poorly drained soil which has developed on nearly level or depressional outwash plains. Slopes are less than 2%. Drummer developed in 61 to 102 centimeters of loess or silty material over stratified Wisconsinan age outwash at the West Chicago Prairie; however it is also identified in areas with deeper loess and silt deposits. It has moderate permeability and is identified as a hydric soil.

A_1 0 to 25 centimeters; black (10YR 2/1) silt loam; moderate fine and very fine granular structure; friable; neutral.

A_2 25 to 41 centimeters; black (N 2/0) silt loam; moderate fine granular structure; friable; neutral.

AB 41 to 58 centimeters; very dark gray (N 3/0) light silty clay loam; weak medium subangular blocky structure; firm; neutral.

Bg_1 58 to 69 centimeters; dark gray (N 4/0) light silty clay loam; weak fine prismatic structure; grayish brown (2.5Y 5/2) clay coatings; black (10YR 2/1) organic matter coatings; firm; mildly alkaline.

Bg_2 69 to 91 centimeters; gray (5Y 5/1) light silty clay loam; moderate fine prismatic structure; black (10YR 2/1) organic matter coatings; few fine prominent yellowish brown (10YR 5/6) mottles; firm; mildly alkaline.

Bcg 91 to 122 centimeters; gray (5Y 5/1) silty clay loam; weak medium prismatic structure; common fine faint light gray (5Y 6/1), common fine prominent yellowish brown (10YR 5/6), and few fine distinct greenish gray (5BG 5/1) mottles; very firm; mildly alkaline.

Cg 122 to 152 centimeters; light gray (5Y 6/1) silty clay loam; massive; very firm; mildly alkaline.

Flora Associated with the Drummer Series in the Wet Prairie.

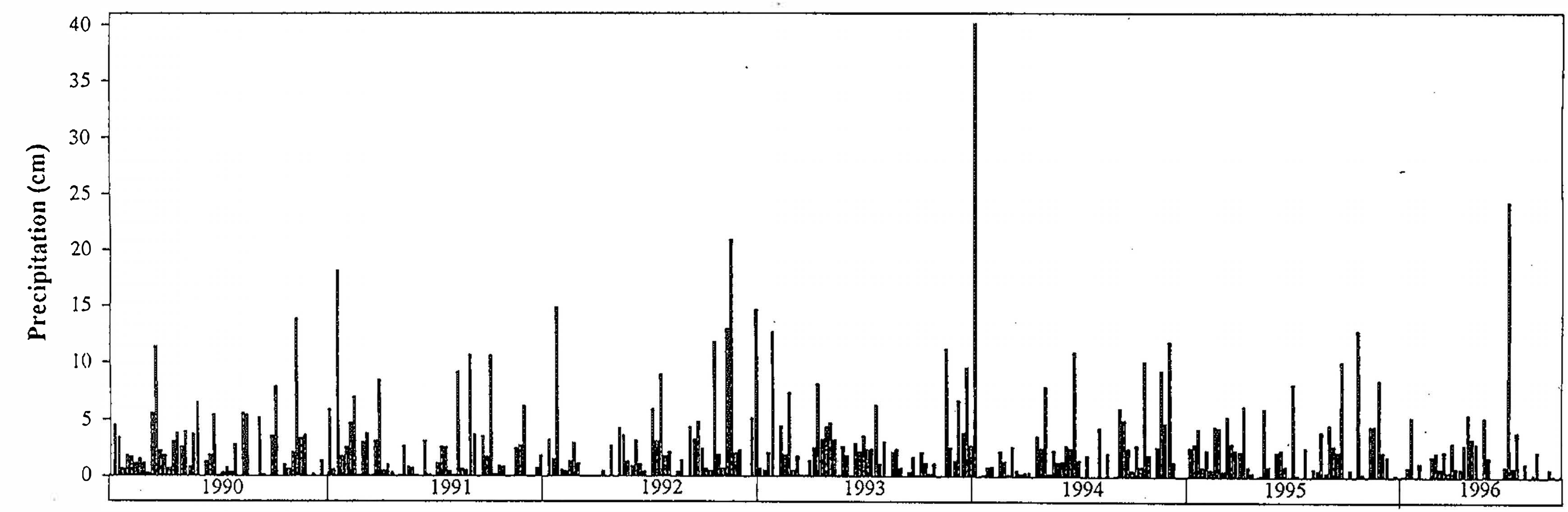
Monitoring Site A07

Scientific Name	Common Name	Wetness
Aster simplex	PANICLED ASTER	OBL
Carex stricta	COMMON TUSSOCK SEDGE	OBL
Cicuta maculata	WATER HEMLOCK	OBL
Calamagrostis canadensis	BLUE JOINT GRASS	OBL
Equisetum arvense	HORSETAIL	FAC
Galium obtusum	WILD MADDER	FACW+
Lycopus uniflorus	NORTHERN BUGLE WEED	OBL
Lycopus americanus	COMMON WATER HOREHOUND	OBL
Polygonum amphibium stipulaceum	WATER KNOTWEED	OBL
Scutellaria epilobiifolia	MARSH SKULLCAP	OBL
Teucrium canadense	GERMANDER	FACW
Verbena hastata	BLUE VERVAIN	FACW+

Monitoring Site A12

Scientific Name	Common Name	Wetness
Eleocharis smallii	MARSH SPIKE RUSH	OBL
Ludwigia polycarpa	FALSE LOOSESTRIFE	OBL
Penthorum sedoides	DITCH STONECROP	OBL
Polygonum punctatum	SMARTWEED	OBL
Proserpinaca palustris crebra	MERMAID WEED	OBL
Ranunculus flabellaris	YELLOW WATER CROWFOOT	OBL
Scirpus acutus	HARD-STEMMED BULRUSH	OBL
Typha latifolia	BROAD-LEAVED CATTAIL	OBL
Wolffia columbiana	AMERICAN WATER MEAL	OBL
Wolffia punctata	SPOTTED WATER MEAL	OBL

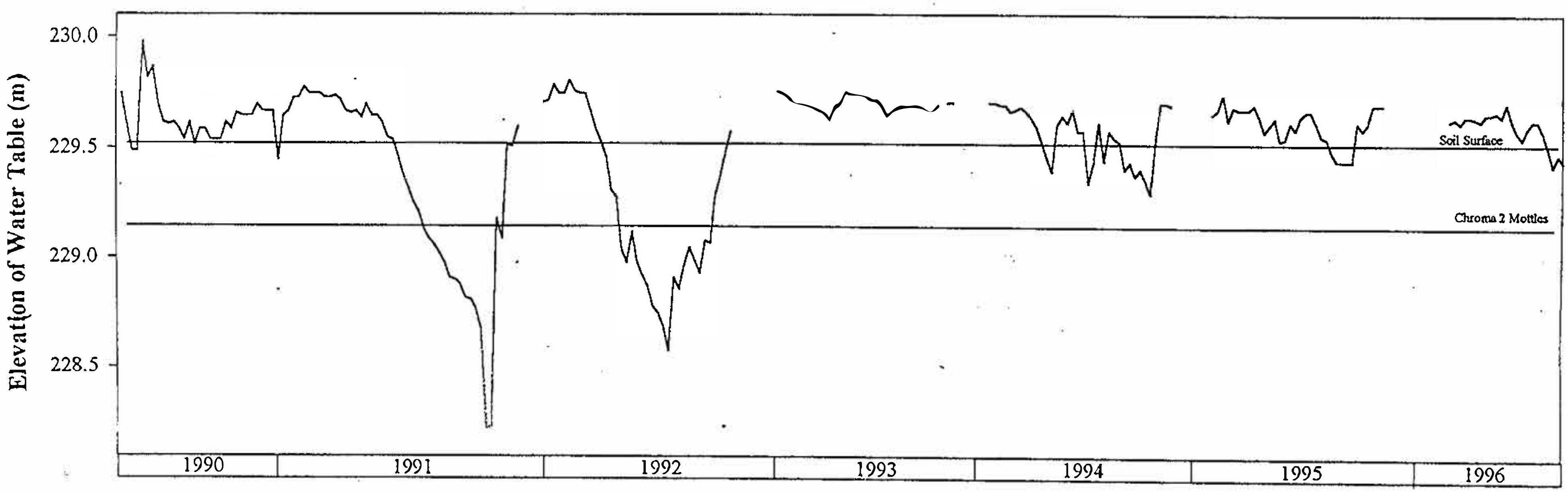
Weekly Precipitation Totals from 1990 to 1996



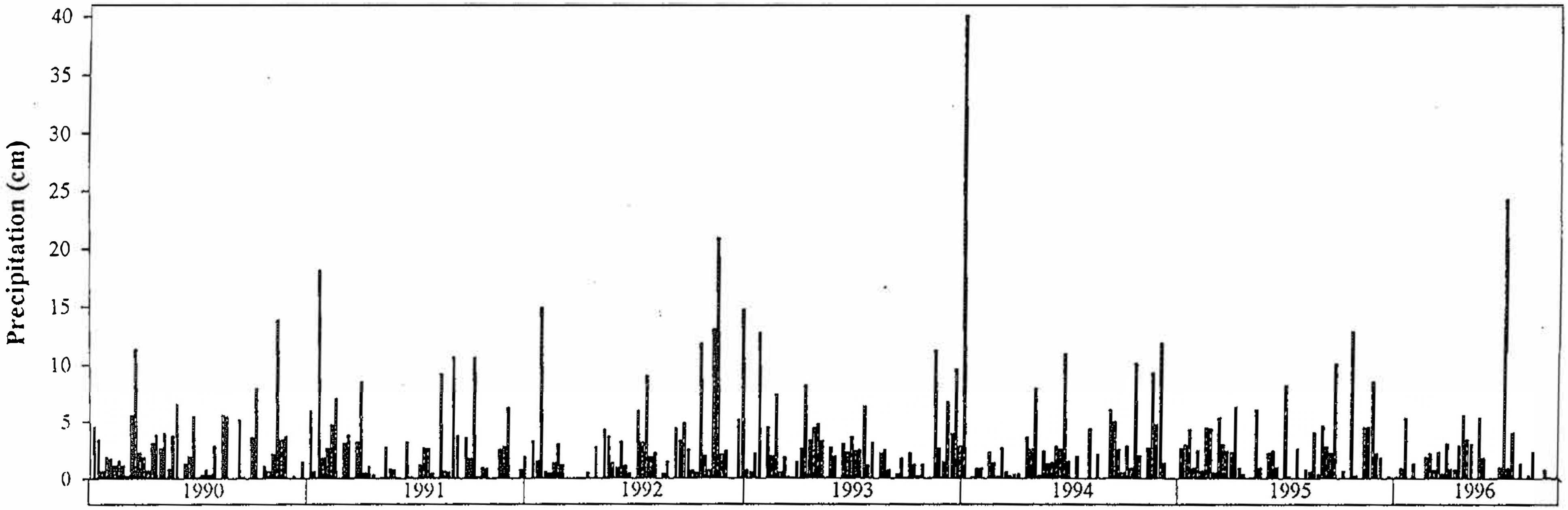
Hydroperiod Relationships at the West Chicago Prairie from 1990 to 1996

Site Location: Marsh

Soil: Typic Endoaquoll



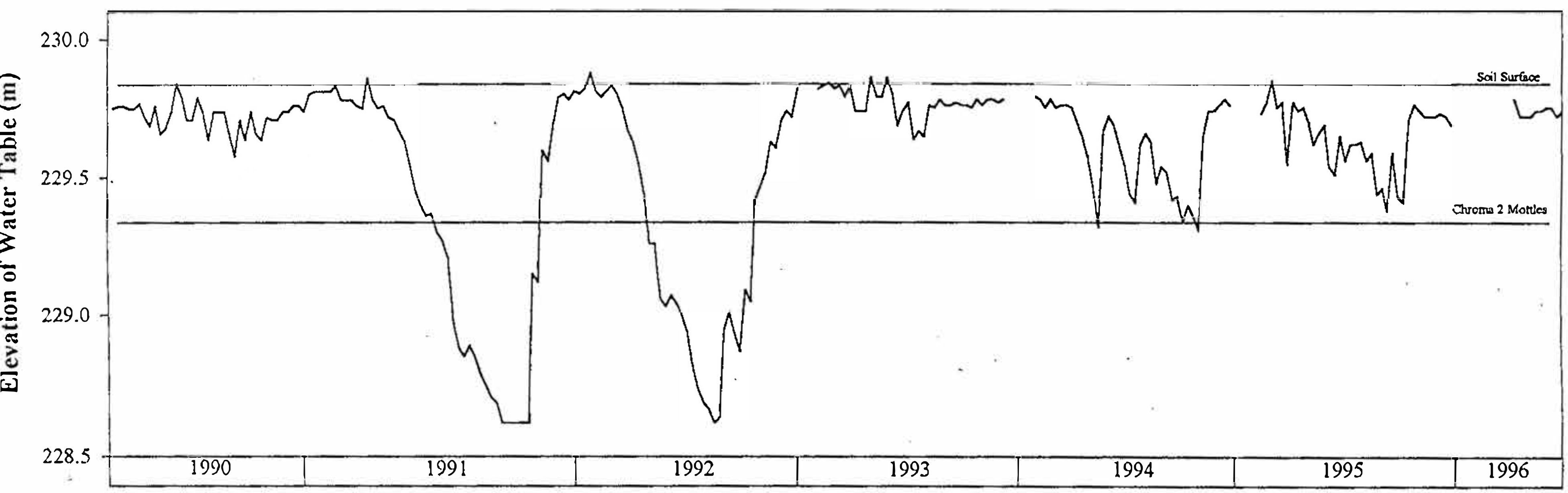
Weekly Precipitation Totals from 1990 to 1996

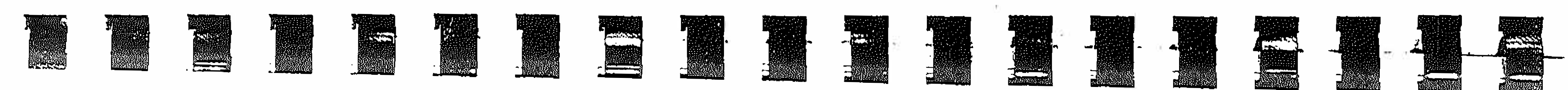


Hydroperiod Relationships at the West Chicago Prairie from 1990 to 1996

Site Location: Wet Prairie

Soil: Typic Endoaquoll





Peotone: Fine, montmorillonitic, mesic Cumulic Endoaquoll

The Peotone series consistes of very poorly drained soils formed in silty and clayey slackwater deposits in upland depressions. Slopes are generally less than 1%. This profile was taken from site A-19 at the West Chicago Prairie. These soils lie in the marsh drainageway at West Chicago Prairie. Typically, Peotone is found in closed depressions.

A_1 0 to 18 centimeters; black (N 2/0) silty clay loam; moderate medium granular structure; friable; many roots; neutral; clear smooth boundary.

A_2 19 to 33 centimeters; black (N 2/0) silty clay loam; moderate medium subangular blocky structure; firm; many roots; neutral; clear smooth boundary.

A_3 33 to 67 centimeters; black (N 2/0) heavy silty clay loam; strong medium prismatic structure; very firm; common roots; neutral; gradual smooth boundary.

Bg_1 67 to 87 centimeters; very dark gray (N 3/0) heavy silty clay loam; few fine distinct yellowish brown (10YR 5/6) soft iron accumulations and olive (5Y 5/3) depletions; moderate coarse prismatic structure parting to moderate coarse angular blocky structure; very firm; neutral; clear smooth boundary.

Bg_2 87 to 122 centimeters; gray (N 5/0) heavy silty clay loam; few fine distinct yellowish brown (10YR 5/6) soft iron accumulations and common fine prominent strong brown (7.5YR 5/8) soft iron accumulations; moderate coarse prismatic structure parting to moderate coarse angular blocky structure; very firm; mildly alkaline; clear smooth boundary

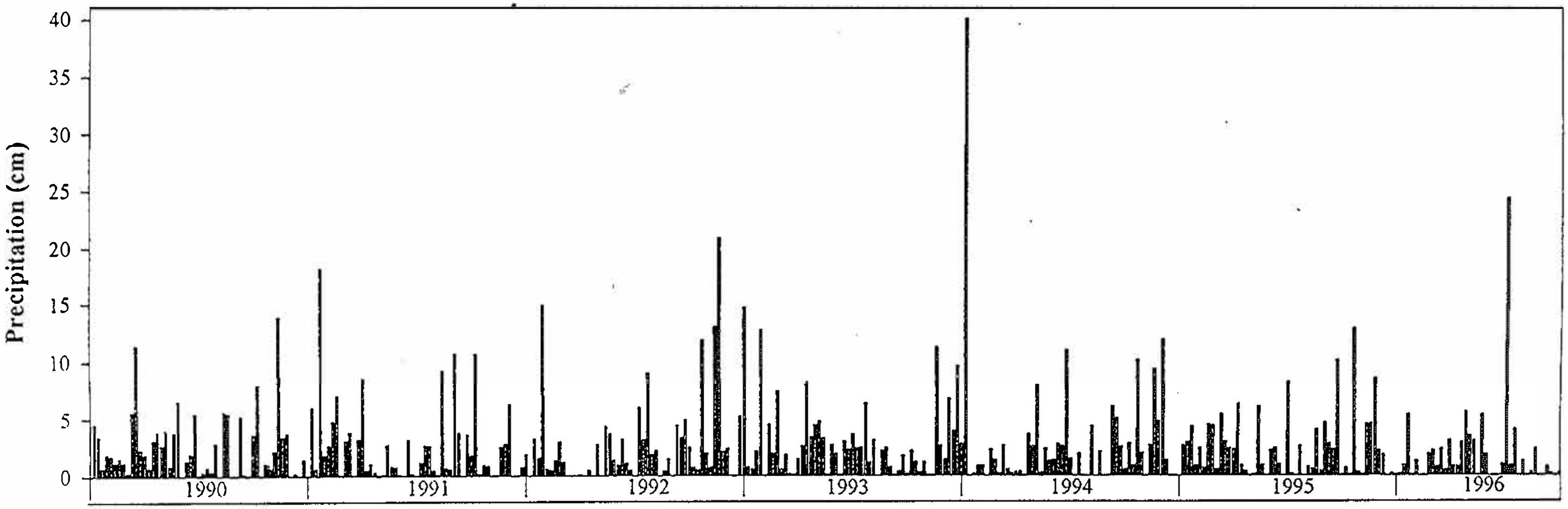
Cg 122+ centimeters; gray (N5/0) to light gray (N 6/0) silt loam; many fine and medium distinct light yellowish brown (2.5Y 6/4) soft iron masses; massive; firm; mildly alkaline.

Flora Associated with the Peotone Series in the Marsh.

Monitoring Site A15 and A19

Scientific Name	Common Name	Wetness
Carex comosa	BRISTLY SEDGE	OBL
Carex sartwellii	RUNNING MARSH SEDGE	[OBL]
Eleocharis smallii	MARSH SPIKE RUSH	OBL
Lemna minor	SMALL DUCKWEED	OBL
Ludwigia polycarpa	FALSE LOOSESTRIFE	OBL
Polygonum amphibium stipulaceum	WATER KNOTWEED	OBL
Polygonum coccineum	WATER HEARTSEASE	OBL
Polygonum punctatum	SMARTWEED	OBL
Proserpinaca palustris crebra	MERMAID WEED	OBL
Ranunculus flabellaris	YELLOW WATER CROWFOOT	OBL
Scirpus acutus	HARD-STEMMED BULRUSH	OBL
Sagittaria graminea	GRASS-LEAVED ARROWHEAD	OBL
Typha latifolia	BROAD-LEAVED CATTAIL	OBL
Utricularia vulgaris	GREAT BLADDERWORT	OBL
Wolffia columbiana	AMERICAN WATER MEAL	OBL
Wolffia punctata	SPOTTED WATER MEAL	OBL

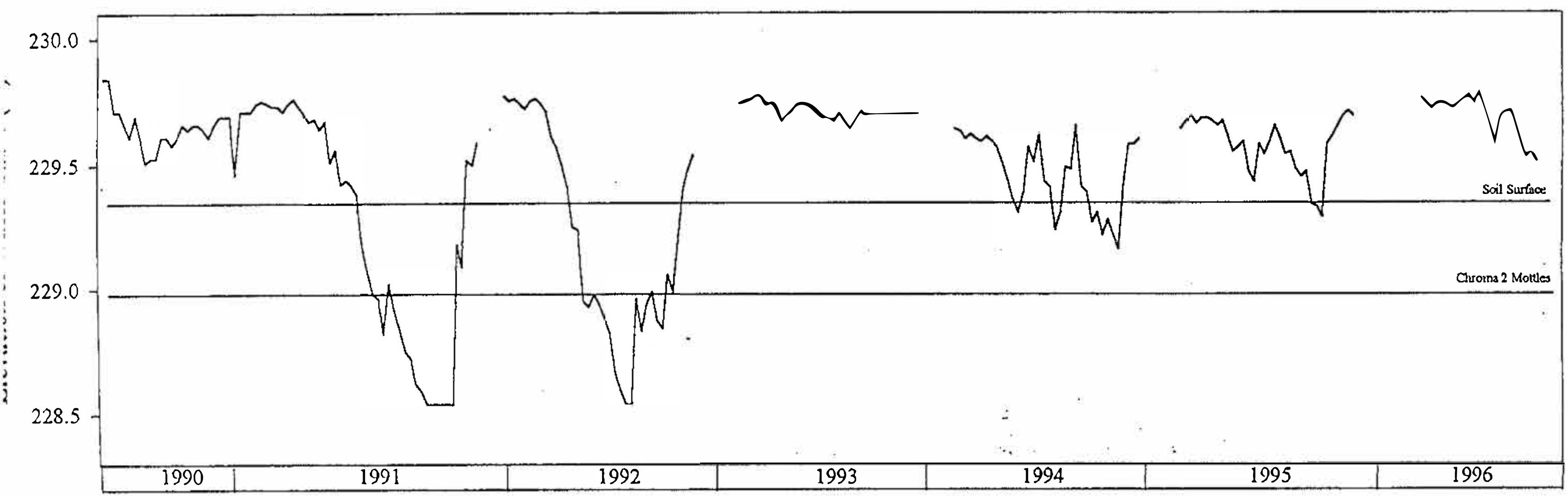
Weekly Precipitation Totals from 1990 to 1996



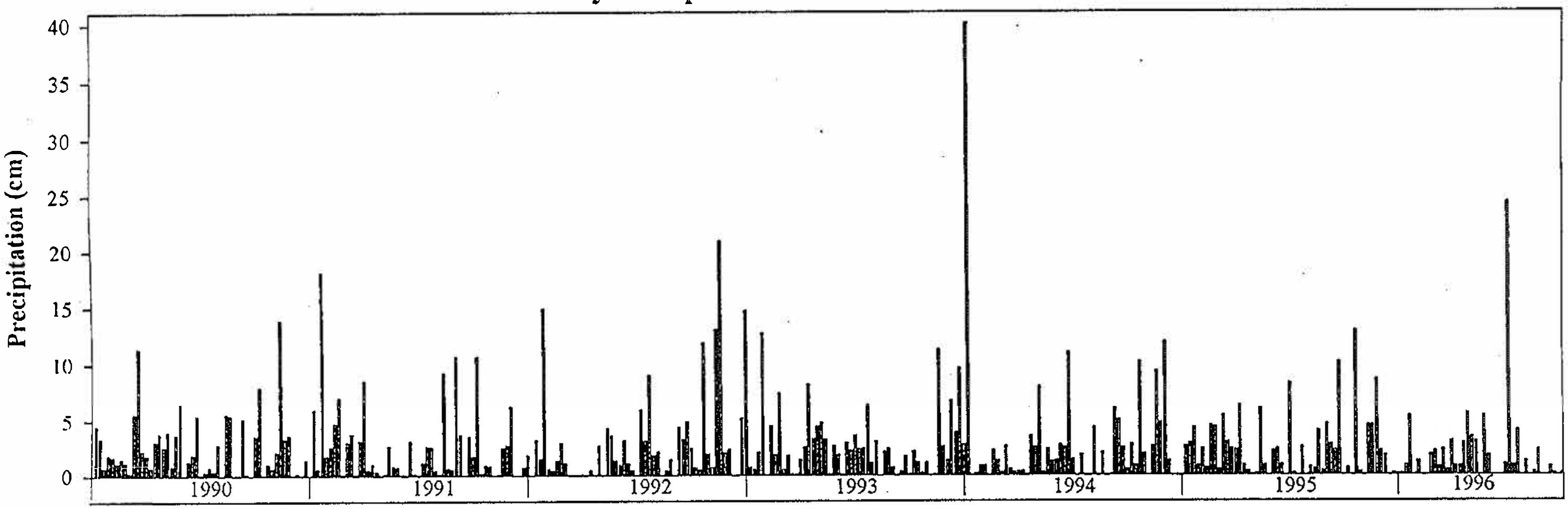
Hydroperiod Relationships at the West Chicago Prairie from 1990 to 1996

Site Location: Marsh

Soil: Cumulic Endoaquoll



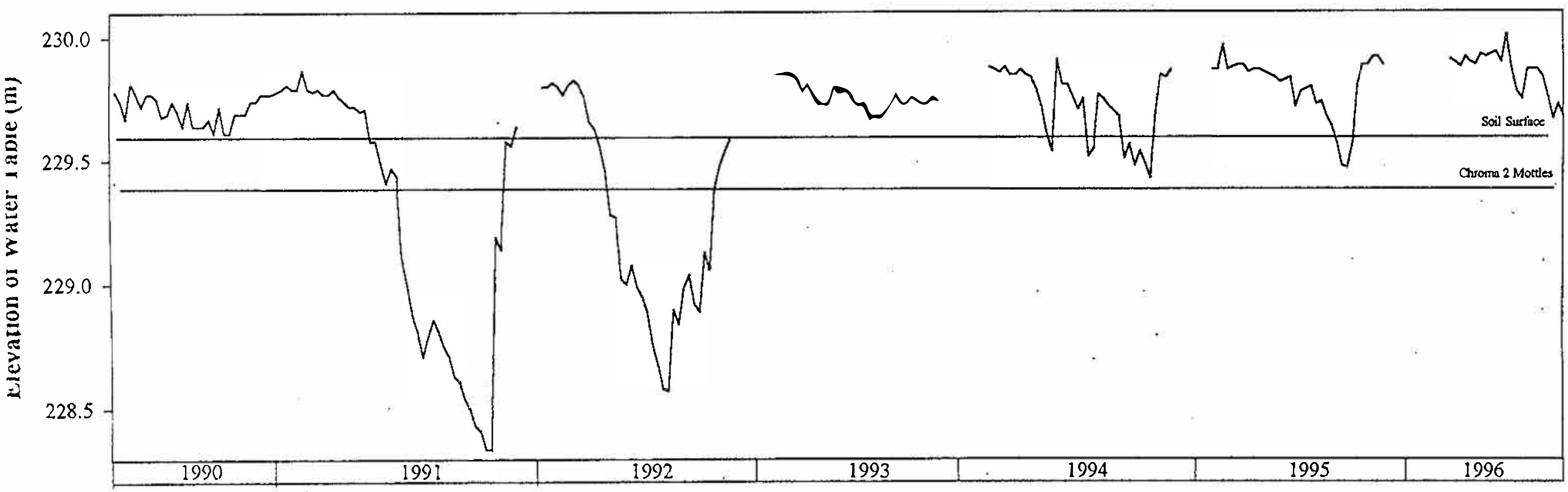
Weekly Precipitation Totals from 1990 to 1996



Hydroperiod Relationships at the West Chicago Prairie from 1990 to 1996

Site Location: Marsh

Soil: Cumulic Endoaquoll



Drummer: Fine-silty, mixed, mesic Typic Endoaquoll

The Drummer series is a poorly drained soil which has developed on nearly level or depressional outwash plains. Slopes are less than 2%. Drummer developed in 61 to 102 centimeters of loess or silty material over stratified Wisconsinan age outwash at the West Chicago Prairie; however it is also identified in areas with deeper loess and silt deposits. It has moderate permeability and is identified as a hydric soil.

A 0 to 33 centimeters; black (N 2/0) silt loam; moderate fine and medium granular structure; friable.

BA 33 to 43 centimeters; very dark gray (N 3/0) silty clay loam; weak medium subangular blocky structure; dark grayish brown (10YR 4/2) continuous clay coatings; friable.

Bg_1 43 to 74 centimeters; gray (5Y 5/1) and light olive brown (2.5Y 5/6) light silty clay loam; weak medium prismatic structure; black (10YR 2/1) organic matter coatings; common fine distinct greenish gray (5G 6/1) mottles; firm.

Bcg 74 to 94 centimeters; gray (5Y 5/1) and light olive brown (2.5Y 5/6) light silty clay loam; weak medium prismatic structure; black (10YR 2/1) organic matter coatings; common fine distinct greenish gray (5G 5/1) mottles; very firm.

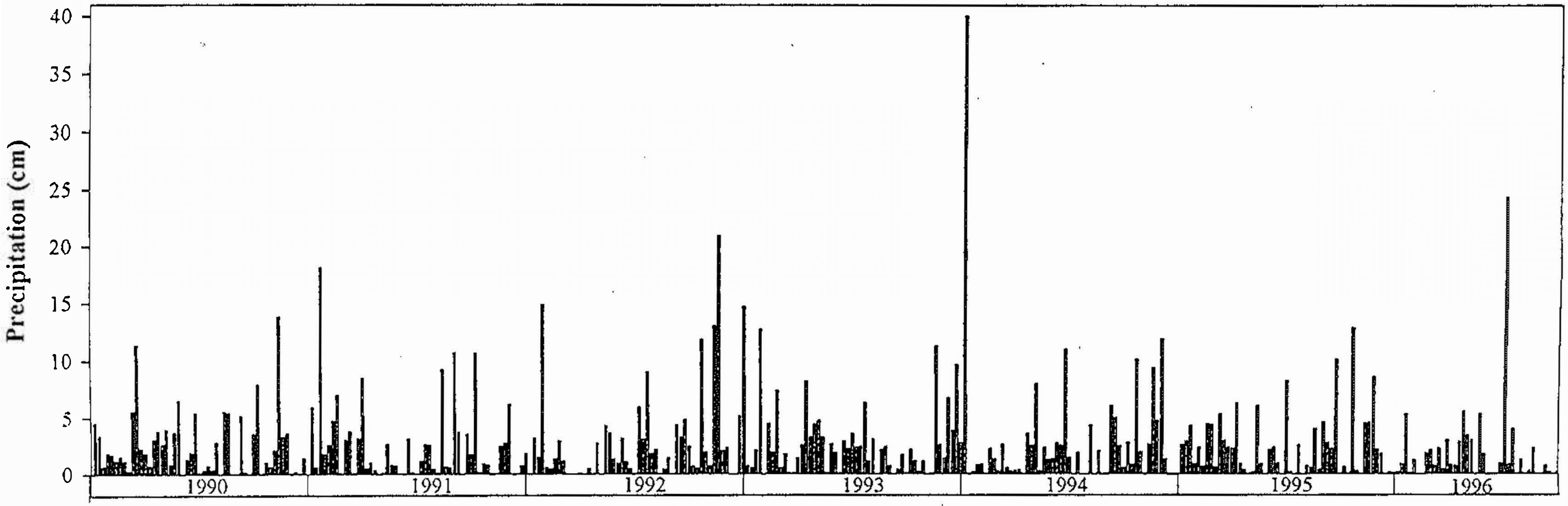
Cg 94 to 152 centimeters; gray (5Y 5/1) and light olive brown (2.5Y 5/6) light silty clay loam; massive; black (10YR 2/1) organic matter coatings; common fine distinct greenish gray (5G 5/1) mottles; very firm.

Flora Associated with the Drummer Series in the Wet Prairie.

Flora present at Monitoring Site A27

Scientific Name	Common Name	Wetness
Aster simplex	PANICLED ASTER	OBL
Calamagrostis canadensis	BLUE JOINT GRASS	OBL
Carex stricta	COMMON TUSSOCK SEDGE	OBL
Carex tetanica	COMMON STIFF SEDGE	FACW
Coreopsis tripteris	TALL COREOPSIS	FAC
Equisetum arvense	HORSETAIL	FAC
Galium obtusum	WILD MADDER	FACW+
Helianthus grosseserratus	SAWTOOTH SUNFLOWER	FACW-
Juncus dudleyi	DUDLEY'S RUSH	[FAC]
Lycopus americanus	COMMON WATER HOREHOUND	OBL
Lycopus uniflorus	NORTHERN BUGLE WEED	OBL
Lysimachia quadriflora	NARROW-LEAVED LOOSESTRIFE	OBL
Oxypolis rigidior	COWBANE	OBL
Phlox glaberrima interior	MARSH PHLOX	FACW
Poa pratensis	KENTUCKY BLUE GRASS	FAC-
Polygonum coccineum	WATER HEARTSEASE	OBL
Pycnanthemum virginianum	COMMON MOUNTAIN MINT	FACW+
Scutellaria epilobiifolia	MARSH SKULLCAP	OBL
Solidago altissima	TALL GOLDENROD	FACU
Solidago canadensis	CANADA GOLDENROD	FACU
Solidago gigantea	LATE GOLDENROD	FACW
Solidago graminifolia	COMMON GRASS-LEAVED GOLDENROD	FACW-
Solidago graminifolia nuttallii	HAIRY GRASS-LEAVED GOLDENROD	[FAC]
Solidago riddellii	RIDDELL'S GOLDENROD	OBL
Sphenopholis intermedia	SLENDER WEDGE GRASS	FAC
Veronicastrum virginicum	CULVER'S ROOT	FAC

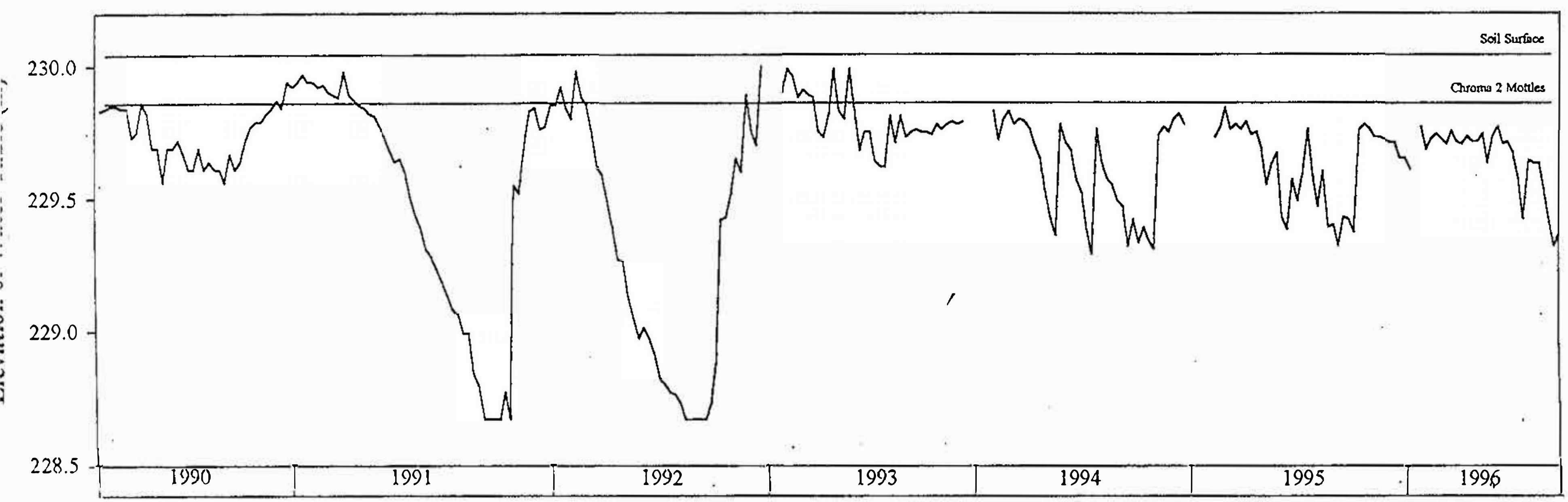
Weekly Precipitation Totals from 1990 to 1996



Hydroperiod Relationships at the West Chicago Prairie from 1990 to 1996

Site Location: Wet Prairie

Soil: Typic Endoaquoll



Wauconda: Fine, mixed, mesic Udollic Endoaqualf (Inclusion)

The Wauconda series has formed in 61 to 102 centimeters of loess or silty material over stratified loamy outwash. It is typically found on nearly level outwash plains or lake plains. Slopes are commonly less than 5%. Wauconda is somewhat poorly drained and is not identified as a hydric soil. It is moderately permeable. The series is typically associated with the Grays and Mundelein soil series.

A 0 to 23 centimeters; black (10YR 2/1) silt loam; moderate fine granular structure; friable; medium acid.

BE 23 to 38 centimeters; dark grayish brown (10YR 4/2) silty clay loam; moderate medium subangular blocky structure; black (10YR 2/1) organic matter coatings; friable; medium acid.

Bt 38 to 58 centimeters; brown (10YR 4/3) silty clay loam; strong medium subangular blocky structure; dark grayish brown (10YR 4/2) continuous clay coatings; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; very firm; slightly acid.

Bt_2 58 to 79 centimeters; brown (10YR 5/3) silty clay loam; moderate medium prismatic structure parting to moderate medium angular blocky structure; dark grayish brown (10YR 4/2) continuous clay coatings; black (10YR 2/1) organic matter coatings; common fine distinct light grayish brown (10YR 6/2) and gray (10YR 5/1) mottles; firm; neutral.

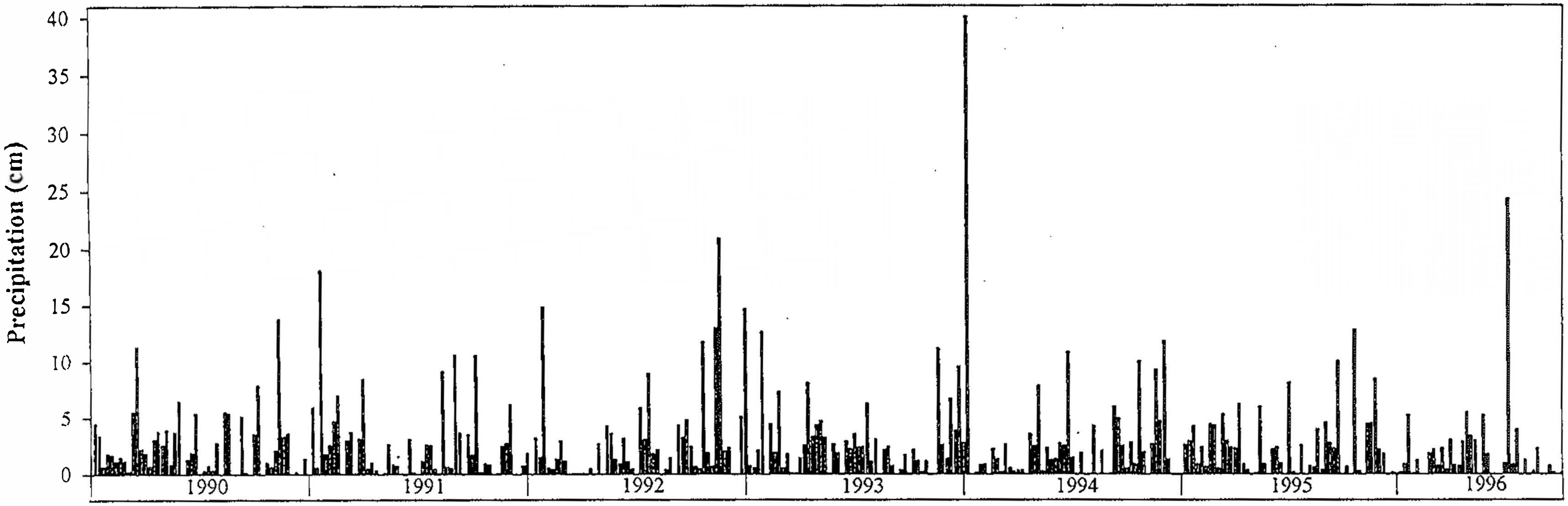
BC 79 to 102 centimeters; light brownish gray (2. 5Y6/2) light silty clay loam; weak medium prismatic structure; grayish brown (2. 5Y5/2) discontinuous clay coatings; common fine distinct yellowish brown (10YR 5/6) mottles; firm; mildly alkaline.

2C 102 to 152 centimeters; light brownish gray (2. 5Y6/2)and brown (10YR 5/3)stratified sandy loam and silt loam; single grain and massive; common fine distinct yellowish brown (10YR 5/6) mottles; moderately alkaline.

Flora Associated with the Wauconda Series in the Oak Savanna.
Monitoring Site A41

Scientific Name	Common Name	Wetness
Allium canadense	WILD ONION	FACU
Arctium lappa	GREAT BURDOCK	UPL
Aster pilosus	HAIRY ASTER	FACU+
Cirsium arvense	FIELD THISTLE	UPL
Circaea lutetiana canadensis	ENCHANTER'S NIGHTSHADE	FACU
Cornus racemosa	GRAY DOGWOOD	FACW-
Convolvulus sepium	HEDGE BINDWEED	FAC
Geranium maculatum	WILD GERANIUM	[UPL]
Hackelia virginiana	STICKSEED	FAC-
Parthenocissus quinquefolia	VIRGINIA CREEPER	FAC-
Polygonum scandens	CLIMBING FALSE BUCKWHEAT	FAC
Prunus serotina	WILD BLACK CHERRY	FACU
Quercus macrocarpa	BUR OAK	FAC-
Rubus occidentalis	BLACK RASPBERRY	UPL
Smilacina racemosa	FEATHERY FALSE SOLOMON'S SEAL	FACU
Solidago altissima	TALL GOLDENROD	FACU
Solidago canadensis	CANADA GOLDENROD	FACU

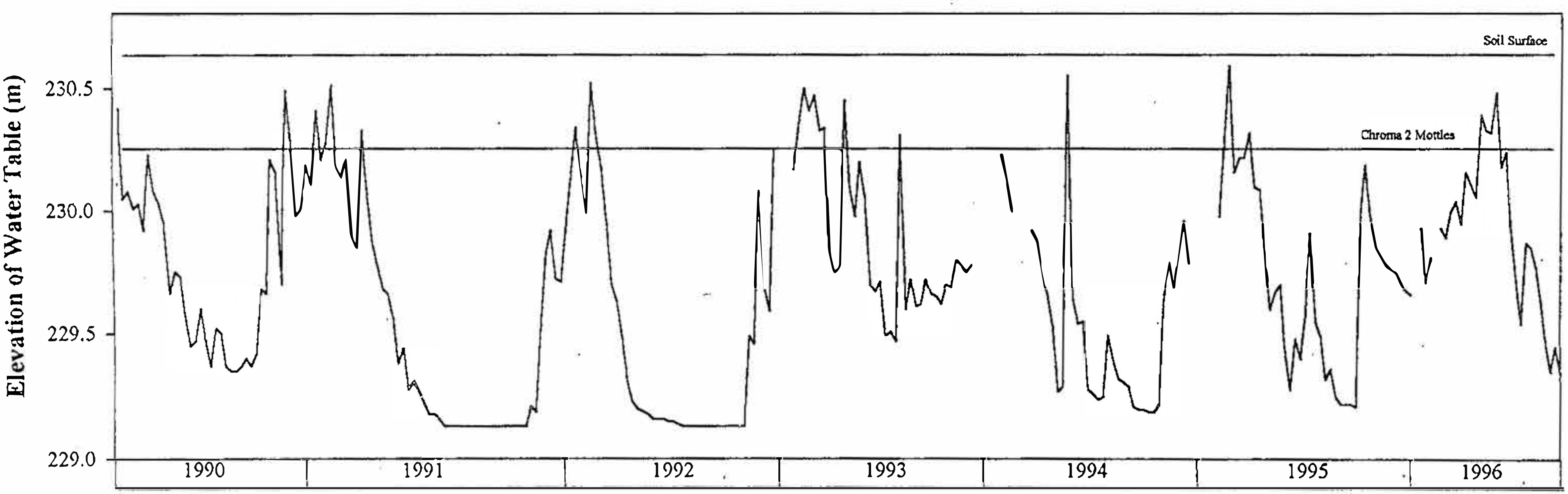
Weekly Precipitation Totals from 1990 to 1996



Hydroperiod Relationships at the West Chicago Prairie from 1990 to 1996

Site Location: Oak Savanna

Soil: Udollic Endoaqualf



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Creating Functional Wetlands

INTRODUCTION

Wetlands are probably the least appreciated and understood of all of our natural resources. The farmer sees the rich soil to be drained and put to the plow. The developer sees "wasted land" and seeks to fill it so that it can be "used". The average person sees a place infested with insects, dangerous animals and foul smelling slime which is to be avoided at all cost. With views like these, it is surprising that any wetlands remain in the area. Some, however, have managed to escape the plow and the bulldozer. Most of these in DuPage County are now under the protective care of the Forest Preserve District.

Wetlands are defined variously in the "Wetland Delineation Guidelines and Criteria" published jointly by the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Soil Conservation Service and the U.S. Army Corp of Engineers as:

". . . areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and 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." **Army Corp of Engineers and Environmental Protection Agency**

". . . areas that have a predominance of hydric soils and that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of hydrophytic vegetation typically adapted to life in saturated soil conditions. . . ." **Natural Resources Conservation Service**

". . . transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For the purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year." **Fish and Wildlife Service**

In short, wetlands must possess three essential characteristics: (1) HYDROPHYTIC VEGETATION, (2) HYDRIC SOILS, and (3) WETLAND HYDROLOGY, which is the driving force creating all wetlands.

For several years now, the Forest Preserve District has been involved with wetland construction and development, most often as part of Army Corp of Engineers permitted "mitigation" projects. To date, more than 300 acres of wetlands have been, or are being, developed on district lands. A review of these projects indicates widely varying, apparent success rates. Only a few of these seem to be living up to expectations at this time. There are several possible reasons for this:

1) Weather over the last several years (in particular, 1988 and 1991)
2) Planting problems, soil type and permeability, moisture, seed viability, etc.
3) Hydrologic regime - amount and duration of water
4) Design flaws
5) Other problems, such as deicing salts, wildlife predation, etc.

Whatever the reasons, it has been evident that we know very little about the structural and functional relationships which control these wetlands.

To achieve these goals, an intensive study of a small wetland at the eastern end of the West Chicago Prairie was initiated in 1989. It was hoped that, with information about its structure and ecology, we would be better able to manage existing wetlands, as well as design new ones to more closely approximate the structure and function of natural communities.

As of this writing, some relationships have been noted which are allowing us to draw some preliminary conclusions. This information has been applied to our most recent wetland creation efforts with positive results. With help from Applied Ecological Services and The Morton Arboretum (both of which have study projects underway in the prairie), I believe that we will gain further insight into the workings of these communities.

NATURAL HISTORY AND ECOLOGY

By the time of settlement in the 1830's, approximately 60% of the county was covered by various wetlands communities due primarily to the flat topography and clay soils. Prairie ponds, marshes, sedge meadows and wet prairies were very common, while fens, woodland ponds, bottomland forests and flatwoods were less so. All contributed to the 128,000 acres of wetlands in the county. The 6288 acres which are present on Forest Preserve District lands today represent 27% of our holdings and only 3.0% of the county.

Historical accounts from the earliest trappers and traders to enter the area, speak of large tracts of prairie which were waterlogged for most of the year.

"This morning I walked a league further into the meadow, having my feet almost always in the water, afterwards I met with a kind of pool or marsh which had a communication with several others of different sizes, but the largest not above a hundred paces in circuit."
Southern Cook County

Precipitation falling on the county stayed in its wetlands. Only during flood events did water leave the area.

The wetlands of presettlement times were not simply lakes or ponds but very diverse communities with little open water and large numbers of native plants and animals which provided the functions mentioned above.

Most of these are gone now, altered to suit man's purposes. Only a few of those which do remain are in relatively good condition. The majority of existing wetlands are in poor condition due to siltation from farming and construction, past attempts at draining, constant and excessive flooding, invasion by alien species, chemical pollutants and lack of fire. They have been turned into monotypic stands of cattails or reed canary grass with little or no floral or faunal diversity. They have lost most of the functional capabilities which are inherent in these types of communities. Our wetland communities have become nutrient sinks and/or sediment traps which are neither attractive nor healthy.

SITE LOCATION

The West Chicago Prairie is a natural prairie which is located on the outwash plain of the West Chicago moraine, just to the west of that city. The prairie constitutes a part of the headwaters of Kress Creek, a

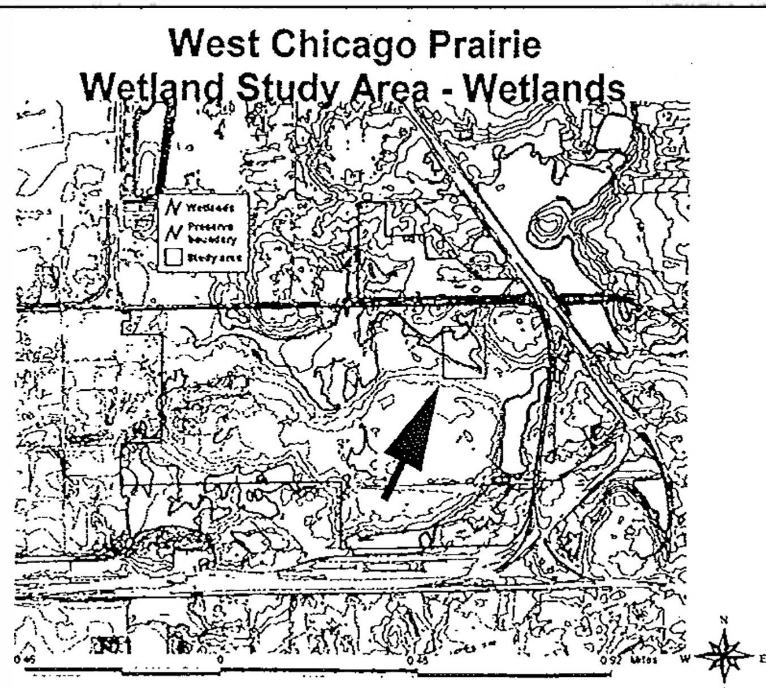

Figure 1

tributary of the West Branch of the Du Page river. It contains a variety of plant communities including pond, marsh, sedge meadow, wet prairie, mesic prairie, and savanna. Over 550 native plants have been sighted on the 301 acres (121.9 ha.) comprising the preserve. All but a small portion of the prairie drains through a 32-inch culvert under the Illinois Prairie Path (which forms the northern boundary for much of the preserve) near the west end of the property. The topography within the prairie varies as much as 15 feet (4.5m) from east to west (Figure 1).

The geodetic surveyors reported in 1841 that much of the land was wet. At the West Chicago Prairie, about 500 meters west of the study plot, the surveyors noted:

"Land all prairie except marsh with a few scattering bur oaks around it." and *"Land all prairie and marsh."*

The wetland study area is located about two hundred meters west of the Elgin Joliet & Eastern Railroad tracks. It grades into mesic prairie to the northwest and east and savanna to the south and northeast. The study area contains open water, emergent, sedge meadow, wet and wet-mesic prairie, and savanna communities. A general survey of the plot has produced a list of 230 native plant species.

A rectangle, 500 feet (152.4 m) east to west by 600 feet (182.9 m) and covering 6.9 acres (2.8 ha.) was laid out over the area with three corners anchored on high points. Elevations within the plot range from 752.0 feet (235.0 m) to 758.2 feet (236.0 m) above sea level (Figure 2).

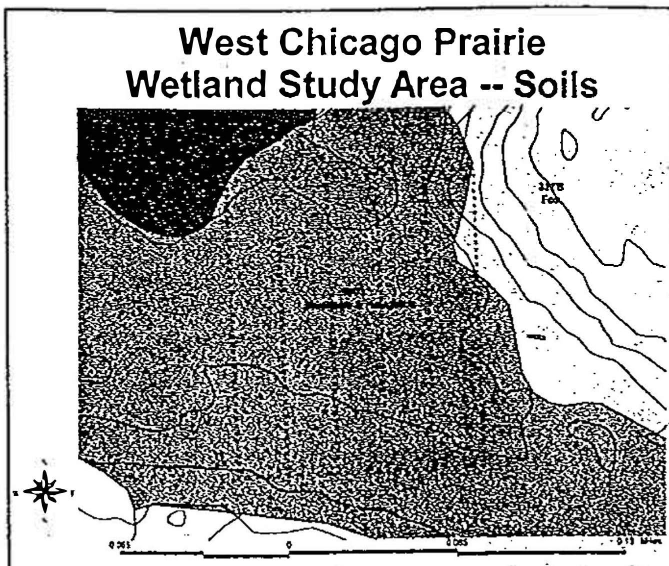

Figure 3

The wetland is underlain by Muskego and Houghton mucks (Figure 3). Uplands sustaining savanna vegetation are comprised of Wauconda, Zurich and Fox silt loams with some Drummer interspersed. The wetlands have developed on the Cahokia alluvium formation of bedded sand and gravel with imbedded lenses of clay. The uplands are situated on the Wadsworth Till Member of the Wedron Formation, which is a clay to silty clay till. Both the surface and subsurface water movements are generally to the west.

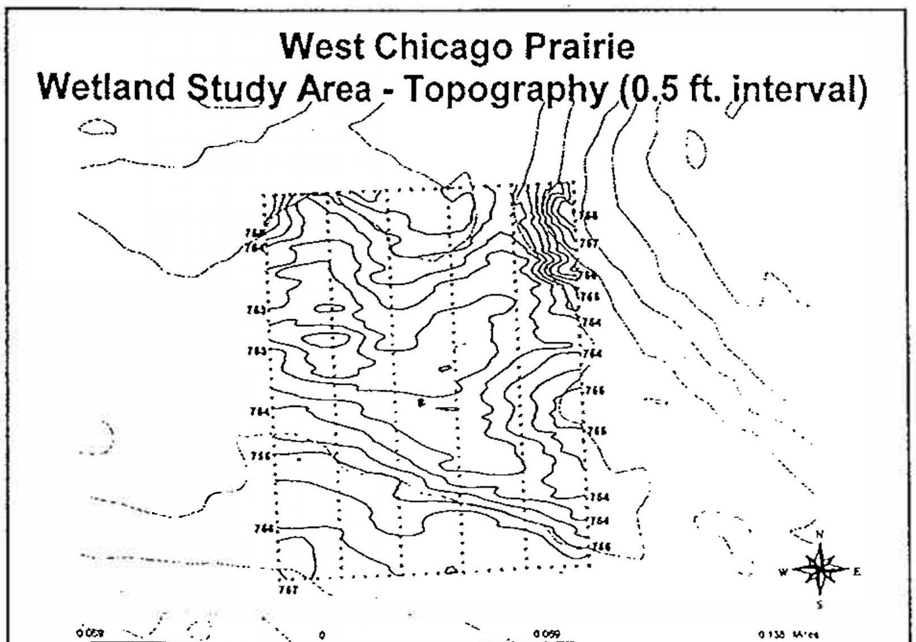

Figure 2

METHODS

Elevation to 1/100th of a foot (above mean sea level) were determined at each of 286 points.

Sample points were located every 20 feet (6.1 Meters) along the east/west lines and every 15 feet (4.6 Meters) along six north/south lines which were set 100 feet apart (Figure 4).

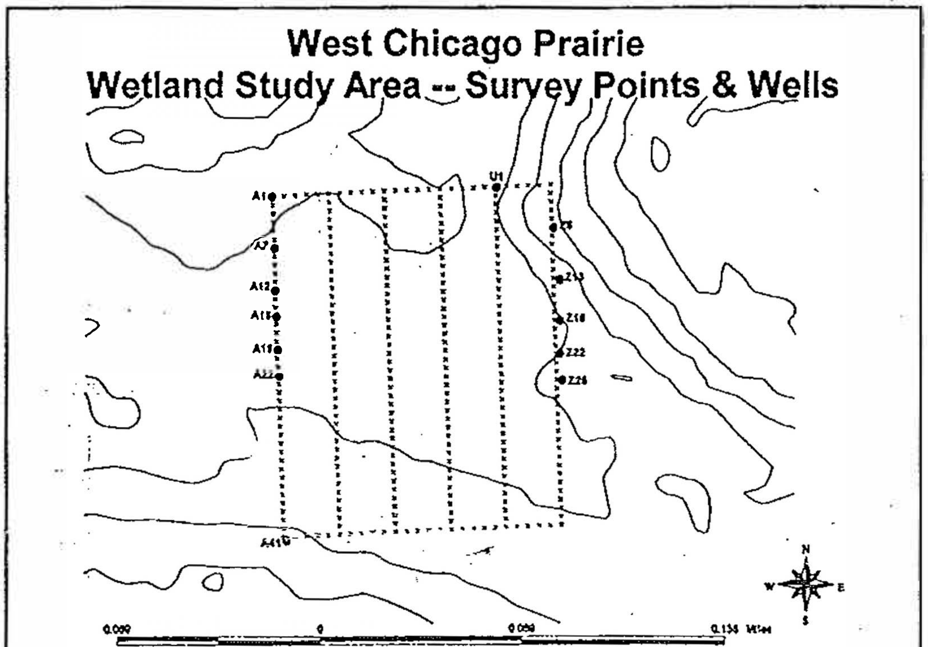

Figure 4

Each established sample point was marked with a survey flag, and a flora sample was taken during the month of June using both 1/16th and one square meter quadrat. During this survey, the quadrat was nested over the flag and every plant found growing within the quadrat was cataloged and assigned a Braun-Blanquet Cover-Abundance Index Coefficient with values ranging from 1 to 5. These coefficients were applied according to the following criteria:

1 = consisting of 1-few stems in only 1 quadrant of the quadrat, 1% to 10% coverage.

2 = occupying 1-3 quadrants and numbering several stems, 11% to 25% coverage.

3 = occupying 2-4 quadrants with notable density or cover in each quadrant, 26% to 75% coverage.

4 = occupying 3-4 quadrants with regular density throughout, 76% to 90% coverage.

5 = restricted to those species dominating all 4 quadrants 91% to 100% coverage.

Additional information was collected on the following topics:

* Total flora assessment for the area, as well as quadrat sampling data for all 386 survey points within the plot
* The average native plant quality of the total flora and quadrat flora. This is an average of the rating numbers assigned to each plant in the Chicago region by Swink and Wilhelm (1994)
* The native plant index ratings for the total and per quadrat floras. This is a plant community index rating based on the average plant quality as outlined in the above reference
* The number of native plant species noted during the total surveys and the transect surveys
* The number and percent of plants, native and adventive, occurring in the plot as shrubs, trees, vines, forbs, grasses and sedges
* Wetland index ratings for each quadrat, transect and plot. These are based on the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1979)
* Relative Importance Values (R.I.V.), which is a measure of the cover and abundance for each plant species noted during the survey
* The percent of plants noted during the surveys occurring in each of the rating classes (i.e. -3, -2, -1, 0, etc.)
* Wetland delineation based on the Corp of Engineers manual (1979) and delineated in August 1991
* A hydric soil delineation as performed by Pat Kelsey, soil scientist for Morton Arboretum, completed in August 1996
* Elevations (above mean sea level) for each of the 286 points (Figure 5)
* Ground water elevations from a total of 15 wells located in or near the plot (Figure 5)
* Soil mapping as taken from county GIS information for the area

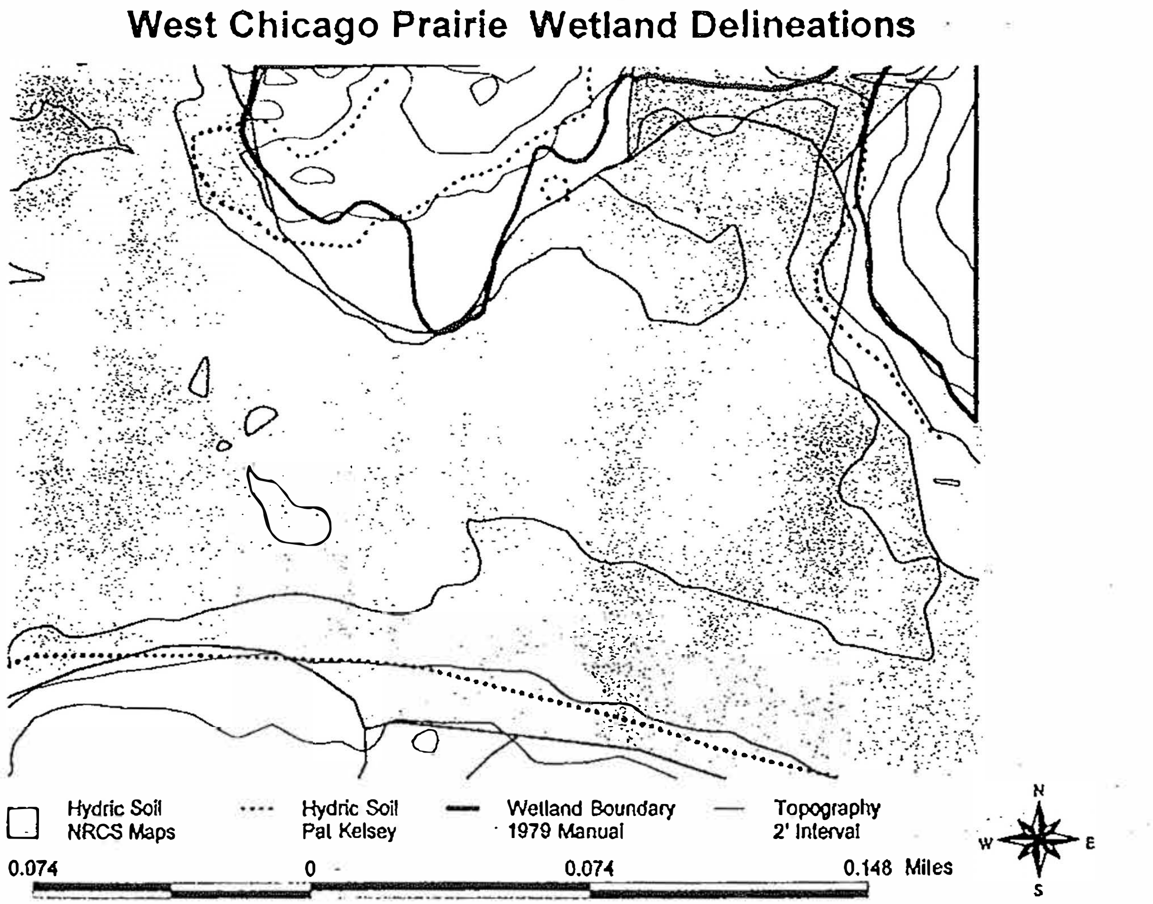

Figure 5

* Topographic data taken from county GIS information for the area (Figure 5)
* Watershed data as taken from county GIS information for the area
* Watershed hydrology data - collected by a staff gauge at the outlet of the prairie and computer modeling
* Rainfall data - collected weekly from a gauge at the outlet
* Visual plant community boundary plotted by GPS in July 1996 (Figure 6) and by vegetation analysis

At twelve locations along the north-south transect lines at the east and west boundaries of the plot, ground water monitoring wells were placed (Figure 4). These consisted of one-inch, perforated PVC pipes inserted to a depth of between 4 and 5 feet (1.25 and 1.60 m). Monitoring of the water levels in these wells has been conducted weekly since December of 1989.

RESULTS AND DISCUSSION

1) The overall structure of wetland insures a stable water regime. This allows the water to spread out over a large area during flood events.

2) Most of the wet parts of the prairie have slopes between 0% and 2%. This, along with the vegetation inhibit runoff and allow for saturation of the soil which, in turn, supports wetland vegetation at elevations up to three feet above the maximum water level.

3) The break point between emergent and sedge meadow communities falls at about the level at which water overtops a natural berm in the wetland. The vegetation of these communities appears to be adapted to this high water mark reached during the spring growing season, rather than some average level attained during summer.

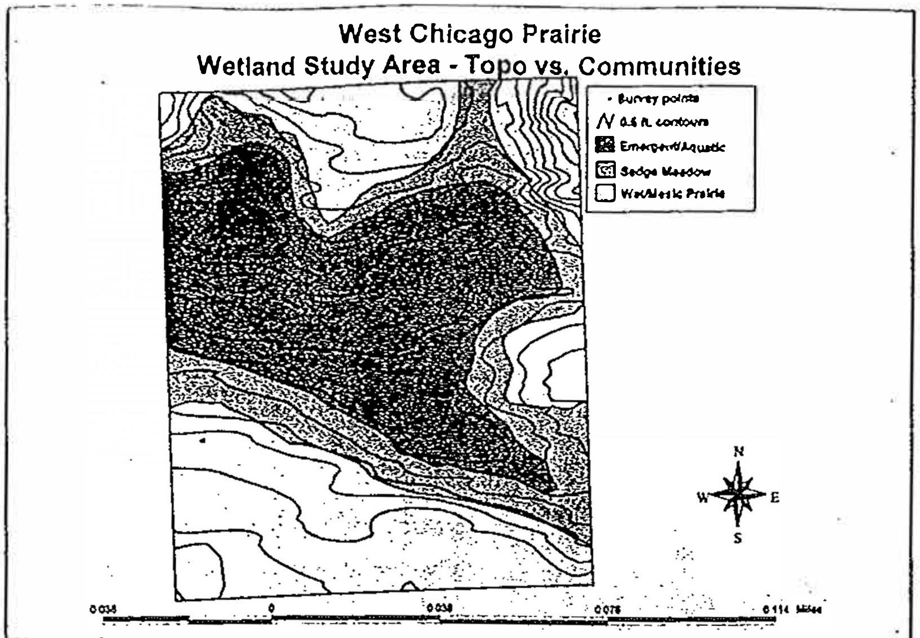

Figure 6

4) In overall terms, the study areas exhibit high floristic quality with an average Mean Rated Quality of 4.9. A total of 230 native species were noted in the study area with a Floristic Quality Index rating of 74.5. The plot showed a high degree of conservativeness, with 61% of the species rating 4 or higher on the rating scale. A high diversity is indicated by the fact that an average of 10.1 species were noted in each 1 meter quadrat. The actual range was between 18 species in the wet-mesic prairie and 2 species in the open water (aquatic) areas.

5) The wetlands on the prairie are ground water driven. The ground water levels, as indicated by the wells, intersects the surface at the same elevation as the break between emergent and sedge meadow communities, forming the spring pool elevation. For this reason, water is retained in the wetland for a greater part of the year than would normally be expected. Except for early spring, the water table is very flat regardless of topography. The ground water levels have demonstrated great fluctuations over the course of a year, particularly during the drought years of 1990 and 1991. The water table is generally high in the spring and tends to follow the contours. It flattens out as it recedes during the year and actually becomes deeper under the uplands. Overall, the water table is more stable (shows less fluctuation) below the wetland than below the uplands.

6) During most of the year, water falling on the prairie is retained. Flow through the outlet culvert occurs only during spring flooding and during extensive rain events. During 1991, consistent rains (12.2" or 30.5 cm) occurred between March 28 and May 28, then virtually ceased. By the 10th of June, water had stopped flowing from the prairie, but the ponds held water until July 23 (Figure 7). Only 3.8" (9.5 cm) of rain fell between May 28 and September 30, most of which occurred as a single 2.4" (6.0 cm) event, having no effect on the water table or surface waters of the prairie. More general rains returned in October and totaled 14.4" (36.0 cm) by December 19. Standing water was noted on the prairie on November 5, and water began to leave the prairie on November 18.

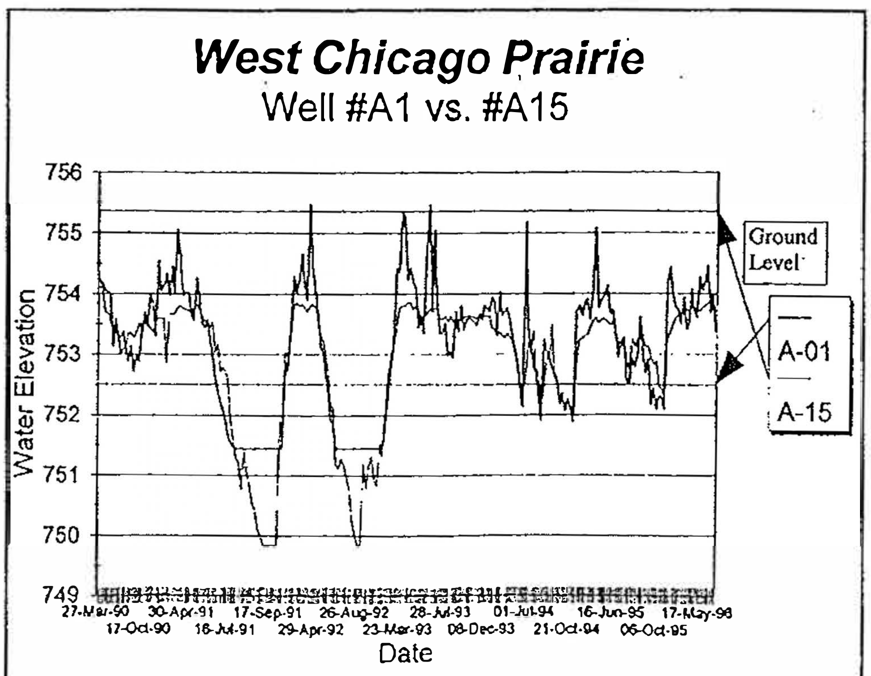

Figure 7

7) Most of the communities in this wetland appeared to be well defined (Figure 6). The boundaries between most of them are distinct, occurring (visually) over a span of a few feet even on gentle slopes. Quadrat studies demonstrate that this is not the case for all species. The appearance comes from a few dominant species, most overlap the boundaries significantly.

The following plant communities were determined for the study area based on the spring high water level:

AQUATIC	< -0.90 ft.	-27.00 cm
EMERGENT	-0.89 to 0.00 ft	-26.99 to 0.00 cm
SEDGE MEADOW	0.01 to 0.75 ft	0.01to 22.50 cm
WET PRAIRIE	0.76 to 1.50 ft.	22.51 to 45.00 cm
WET/MESIC	1.56 to 2.50 ft	45.01 to 75.00 cm

General flora noted for each zone are listed in Table 1.

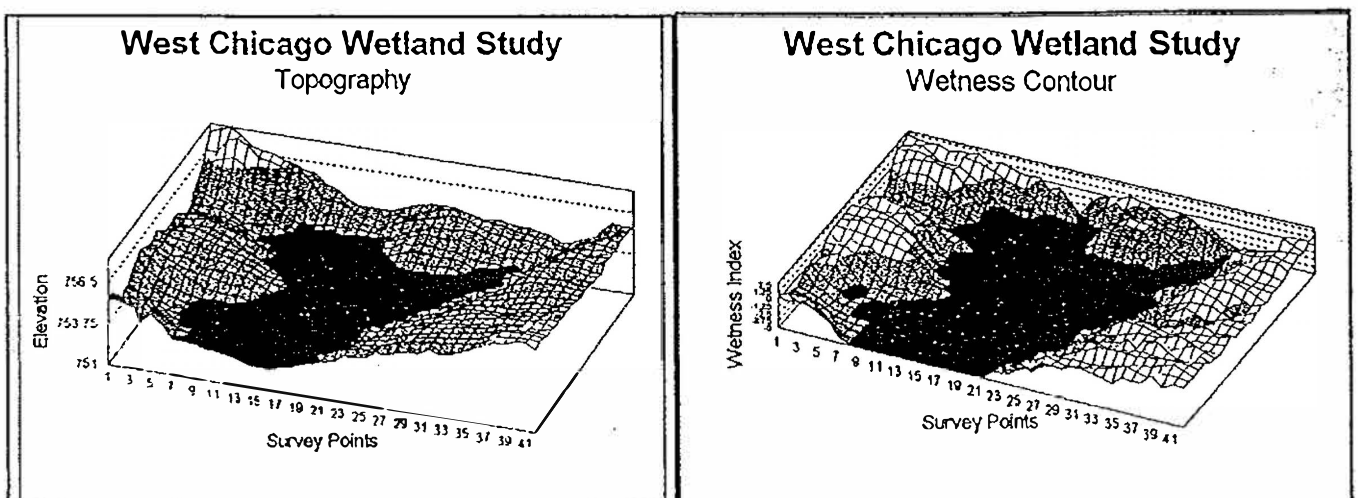

Figure 9

8) The wetlands, as they are determined by using the Army Corp of Engineers delineation system (1989 manual), do not coincide very well with traditional mapping of the hydric soils (Figure 6). A brief study of the delineated hydric soil boundary was conducted to test the soil determination against the vegetation on either side of the boundary. This was accomplished by means of 1 meter quadrat sampling at 5 and 10 meter intervals both up and down slope at six pints along the boundary. While individual quadrats vary somewhat, flora on the up slope side was generally facultative or dryer and those on the down slope side were facultative or wetter. Mapping the entire plot by the wetland index rating produced a map very similar to the topographic map of the area (Figure 8).

9) The entire area is underlain by fine gravel deposits at a depth of about one meter. These deposits are a product of outwash which occurred approximately 12,000 years ago during the construction of the West Chicago moraine to the east. They undoubtedly play a significant part in the ground water circulation throughout the prairie. During the 1991 summer

drought outlined above, the water table was lowered by four to six feet, but recovered when the rains returned in fall.

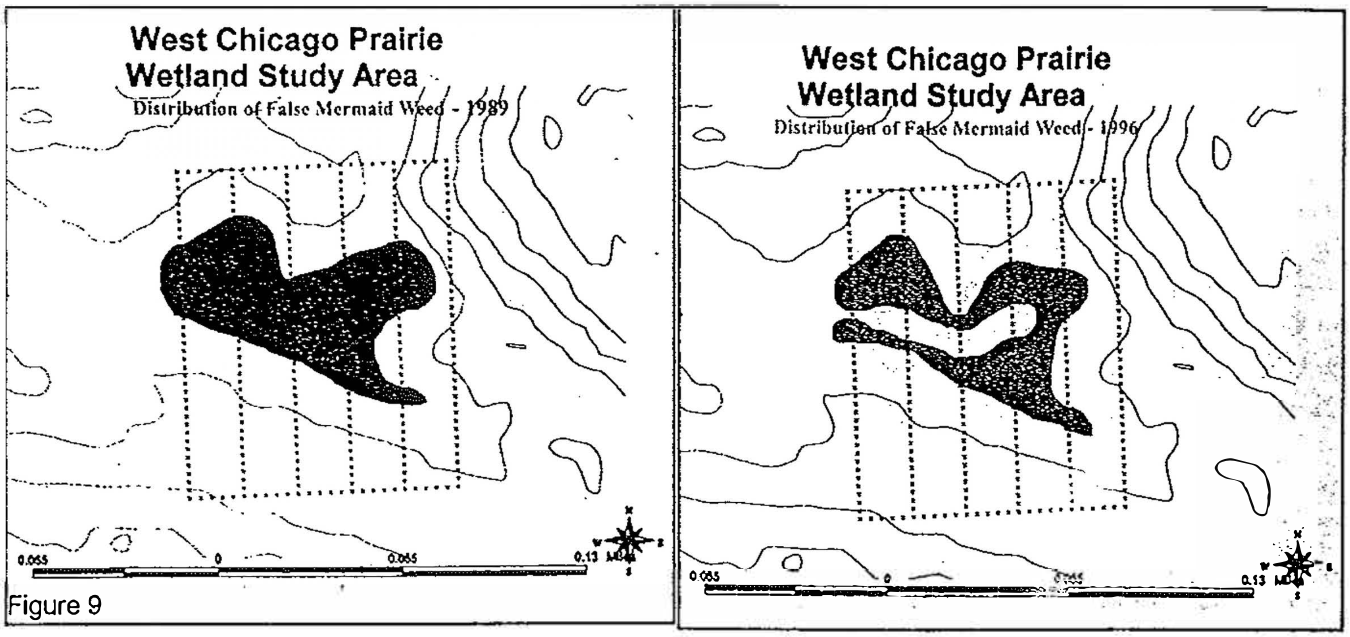

Figure 9

10) Water quality in the wetland is very high. The pH ranges from 7.9 at the sedge meadow boundary to 8.2 in the open water. Chemical pollutants were virtually non-existent.

11) The vegetative composition of some of the individual communities was considerably different than that which was expected especially in the sedge meadow and wet prairie. The study showed that individual species exhibited a wide range of elevations relative to the spring high water level. Obligate species ranged from the deepest part of the wetland at -1.96 to +3.25 feet (-58.8 to 97.5 cm) above that level. Species listed as Facultative Upland were noted at -0.14 feet (2.5 cm) below the spring water level. The average range of elevation for all species was 1.4 feet (42 cm).

12) No organic material has been noted in the wetlands. The soils are almost exclusively mineral.

13) The emergent and sedge meadow communities actually show some, long-term mobility (Figure 9). Most of the species are rhizomatous and therefore able to spread into appropriate areas during dryer or wetter cycles in the weather. The wet prairie appears to employ a different strategy for survival in the capricious climate of the Midwest. The plant diversity of this community includes species which are at home in both dry and wet conditions. When the conditions are dry, the mesic plants prosper, while the wetland plants conserve their resources. When the climate swings to the wet side for a few years, the reverse holds true. Thus, there is always prairie in spite of the climatic conditions.

14) The wetland exhibited a high degree of diversity and conservativeness. The plant cover ranges from 100% in the established prairie to 10% in some of the open water areas. More than 200 plants were cataloged from the plot.

Relative importance values for plant species are as follows:

Forbs	157	68.3%
Sedges	25	10.9%
Grasses	17	7.4%
Trees	14	6.1%

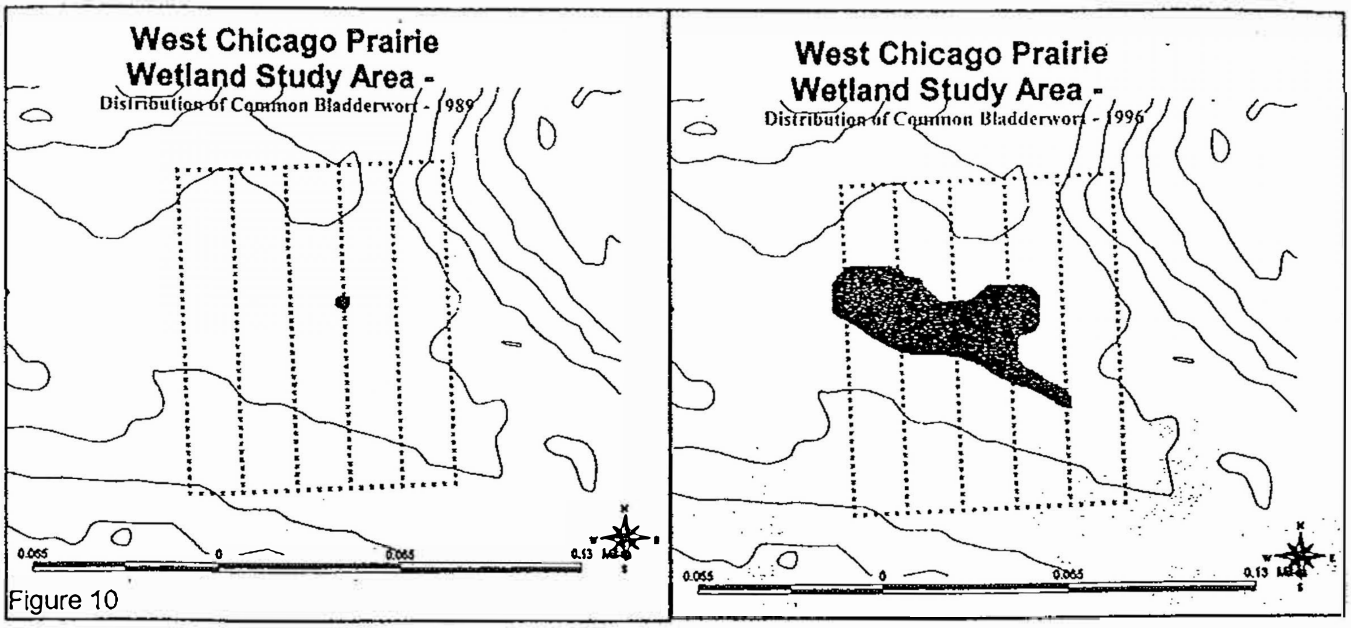

Figure 10

Shrubs	11	4.8%
Vines	5	2.2%
Cryptogams	3	1.3%

15) In terms of the vegetation, little has changed since 1989. Almost all of the sampling parameters (means, indices, number of species per quadrat, etc.) were similar. Only the total cover of some individual species and their distribution was different in 1996 (Figure 9 and 10). This may be accounted for by the differing weather conditions and the overall management regime. Weather may have played an important role in the overall distribution of some species between 1989 and 1996. The area experienced one of the hottest and driest summer on record in 1988. The drought carried over into the early part of 1989, undoubtedly influencing the flora. In contrast, 1995 was a normal year for rainfall, while precipitation during the early part of 1996 far exceeding the norms. The aquatic species, such as *Proserpinaca palustris crebra* (False Mermaid) and *Utricularia vulgaris* (Common Bladderwort) were particularly affected. *Proserpinaca* was noted throughout the wetland in 1989 due to the low water conditions that year. It was restricted more to the emergent zone in 1996 due to the higher water levels that year. *Utricularia* was virtually absent in 1989 but appeared in almost every quadrat in the open water and deeper emergent zones in 1996.

16) We discovered that quadrat size had little bearing on the statistics for most of the parameters sampled. The number of species was significantly different (twice as many in 16 times the area) but still constituted only twice as many species in the one-meter quadrat compared to the 1/16 meter quadrat. Relative cover per species, however, was similar.

CONCLUSIONS

The following are some general guidelines derived from the study we believe contribute toward the success of created wetland ecosystems:

1) ***ISOLATE WETLANDS FROM ALL POSSIBLE SOURCES OF DISTURBANCE AND POLLUTION.*** These include such things as highways, developments, parking lots, recreational facilities, etc. The more isolated the project is, the less chance there is for something to adversely affect it.

2) ***MAKE THEM AS LARGE AS POSSIBLE.*** Large wetlands have a greater chance of success, especially if the watershed is proportionally larger.

3) ***ASSOCIATE THEM, IF POSSIBLE, WITH EXISTING WETLANDS.*** The adjacent wetlands will contribute seed sources, wildlife, soil microorganisms, hydrology, etc. and will

lead to a higher probability of success.

4) ***WORK WITH THE LANDSCAPE.***
Choose a site, such as a broad, gentle swale where the wetland can cover a considerable area and distance. Sites such as these are not only easier to work with but are less expensive to construct because there is less earthwork. They will also produce a more natural wetland in function and appearance. There is a greater likelihood of success with these conditions than digging a hole in a corn field and trying to get water to stay in it.

5) ***AVOID RIPARIAN SITUATIONS.***
In riparian (floodplain) situations, especially in an urban setting, it is nearly impossible to establish high quality wetlands. This is due to excessive and repeated flooding, pollution (especially deicing salts), siltation, and other problems associated with urban streams.

6) ***STUDY THE AREA IN ADVANCE AS MUCH AS POSSIBLE.***
Gain as much knowledge about the site as possible. Information on existing conditions, especially soils, hydrology and vegetation, will greatly aid in the design phase of the project.

7) ***MAKE THE SLOPES AS GENTLE AS POSSIBLE.*** The slopes should be between 1% and 3% if reasonably extensive communities are to be established. For the most part, the plant community will be cut in half by a doubling of the slope. On steep slopes (10% or more), wetland vegetation is difficult, if not impossible, to establish due to rapid runoff and drying. Slopes should not be "engineered." They do not need to be perfectly flat. In fact, a rolling, varied slope is preferable from an ecological perspective. A rough-surfaced, gentle slope also reduces erosion problems during and immediately after construction.

8) ***USE EXISTING WETLAND SOILS, WHERE POSSIBLE, AND STRIVE FOR NATURAL SOIL STRUCTURE.***
Wetland soils (such as those removed from a destroyed site) already have the proper structure and texture. If the soils are not stockpiled for a long period of time (more than a few weeks), they will also retain much of the seed bank and soil microorganisms. Compaction of the soil during construction MUST be avoided. Wetland plants are very hard to establish in compacted soils. To allow for proper water infiltration and circulation and for root growth, the soil must be loose and friable. The use of upland soils should be avoided. These soils have developed under aerobic (oxidizing) conditions and, if previously farmed, will likely contain chemical compounds which, when placed in an anaerobic (reducing) environment, may produce other chemical compounds, inhibiting the growth of wetland plants. A more permeable substrate may be desirable in some instances. If upland soils must be used, inoculate them with soils from another wetland in the area.

9) ***INSURE STABLE WATER LEVELS.***
Storm water retention and wetlands do not mix! The large-scale water fluctuations inherent in retention and detention basins inhibit the establishment and growth of wetland vegetation. Natural systems control the level of water to the point that major storm events raise the water levels only slightly above that of more minor events. Summer draw-down (or dry-out) of a foot or more does not disturb established vegetation. Wetland plants are able to cope with lower water levels and even no water at all for remarkably long periods of time. However, these plants will readily succumb to frequent or excessive inundation in a very short period of time (a few weeks). Stable water levels are more likely to be maintained if the wetland is ground water driven than strictly dependent upon surface runoff. In order to support diverse and stable wetland communities, water levels must remain within a very narrow range! Where water levels fluctuate widely, all communities, except for the emergents, become unstable and do not function as they should.

10) ***SITE THE PLANT COMMUNITY ELEVATIONS PROPERLY.***
The majority of wetland plants have wide ranges of moisture tolerance and, therefore, must be mixed for planted in the proper zones. Wetland plants can tolerate dry conditions for long periods but cannot

survive long-term, excessive, or frequent flooding. Wetland plant communities are established and maintained on the basis of the normal spring water level (March through May). This is the benchmark for establishing the level for the emergent and sedge meadow communities. The appendix outlines general elevations, in relation to the spring water level, for the different types of plants and communities.

11) *KEEP OPEN WATER AREAS TO A MINIMUM TO CURTAIL WILDLIFE PREDATION.*
Several small, open areas are preferable to one or two large areas, which will attract large numbers of geese. These, in turn, will likely prohibit the growth of the wetland plant species by eating them before they become established. Some predation problems will occur in all creation projects. For this reason, emergent plantings with propagules are best placed in small groups with some form of netting or fencing to protect them during the early growth stages.

12) *ESTABLISH DIVERSE COMMUNITIES.*
Follow ecological principles in the design of the vegetative communities. The more diverse the community, the greater the chances of success. Nature does not establish monocultures. Wetlands are probably best established by the initial use of less conservative (weedy) native plants. More conservative species can be added later.

13) *CREATE ECOSYSTEMS, NOT WILDFLOWER GARDENS.*
A healthy wetland ecosystem contains many elements (most of which have been mentioned above). To insure success of the wetland and to have it FUNCTION as one, all of the elements are needed: plants, animals (including insects), soils (including microorganisms), and hydrology.

14) *DO NOT USE THE WETLAND AS A BIOFILTERI.*
The very contaminants intended to be filtered out adversely affect a majority of the wetlands plants. Only the weediest plants, such as cattails, are able to survive in the polluted environment thus created. Natural wetlands do filter low level NATURAL contaminants. However, even well-established wetlands are not able to handle the large volume of man-made pollutants we force into them today. Many of the retention basins found along interstate highways today are little more than alkali marshes.

15) *DO NOT EXPECT TOO MUCH TOO FAST.*
It takes time to establish any native community. Depending on the weather, it could take up to 10 years to establish a stable and diverse community. You should, however, see measurable results in two to three years. Studies of existing constructed wetlands, indicate that the following performance standards are reasonable to expect within two or three growing seasons. The wetland may be considered to have been "established" when:

* 20% OF THE GROUND IS COVERED BY NATIVE PERENNIAL SPECIES, AND
* 50% OF THE PLANTED PERENNIAL SPECIES ARE PRESENT ON THE SITE

Thus, the West Chicago Prairie has provided an excellent opportunity to study natural wetland ecosystems. The results are allowing us to better understand them and to create wetlands as part of our efforts to reestablish native ecosystems on the 90% of district land designated for restoration.

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STOP 3

HIDDEN LAKE WETLAND MITIGATION SITE

HIDDEN LAKE FOREST PRESERVE
MORTON ARBORETUM
DUPAGE COUNTY, ILLINOIS