

Results of a Systematic Search for  
*Thismia americana* Pfeiffer  
in Illinois

Prepared for

The Illinois Department of Conservation  
&  
The Fish and Wildlife Service

By

Marlin Bowles, Michael Jones,  
Linda Wetstein, Rich Hyerczk, & Ken Klick

The Morton Arboretum  
Rt. 53  
Lisle, IL 60532

Conducted July-August, 1993

Report completed February, 1994

## ABSTRACT

A systematic search of potential habitat for *Thismia americana* failed to find the plant among 38 sites in 1993. Based on presence of *Thismia* indicator species in relatively undisturbed prairie, sedge meadow, and marsh habitat, nine sites were identified with 323.2 acres of high or moderate potential for maintaining *Thismia*. Eight of these sites were also identified by the Illinois Natural Areas Inventory, but only three have been protected and managed. Fire protection, invasion by purple loosestrife, and development threaten these sites. Modern ecological conditions were found to differ to some extent from the time of *Thismia*'s discovery. A greater amplitude of mean annual Lake Michigan levels could have altered habitat for *Thismia* since its discovery, but modern precipitation cycles appear similar.

## INTRODUCTION AND PROBLEM

*Thismia americana*, or "Thismia," was found new to science by Norma Pfeiffer in 1912 in the vicinity of Lake Calumet (Pfeiffer, 1914), in the Chicago Lake Plain Section of the Northeastern Morainal Natural Division of Illinois (Schwegman *et al.* 1973). It was seen for five consecutive years, and it has never been found again despite repeated searches by scientists and botanical groups (Wetstein 1993). Steyermark and Swink relocated the type locality, but not *Thismia* (Steyermark and Swink 1952); more recently the locality has been destroyed by fill. *Thismia* is an obligate saprophyte without chlorophyll with a root system penetrated by fungi mycelium (Pfeiffer 1914). It is only visible above ground when in flower, and could be easily overlooked as the 5-6 mm diameter flowers extended only 4-6 mm above the soil surface. Fire and growing season rainfall may be critical factors affecting the occurrence of *Thismia*, as they are known to affect flowering of grassland orchids, which have by soil fungi mycorrhizae (Bowles *et al.* 1992). Because of its lake plain habitat, changes in cyclic precipitation or in fluctuations of Lake Michigan may have also affected the appearance of *Thismia*.

*Thismia* is listed as an Illinois endangered species (Illinois Endangered Species Protection Board 1990) and is a candidate for listing as federal endangered or threatened requiring further biological information, but whose continued existence is in doubt (U.S. Fish & Wildlife Service 1993). Single-day 1991, 1992, and 1993 volunteer searches coordinated by the Morton Arboretum, Illinois Native Plant Society, and The Nature Conservancy did not find the plant. However, no intensive systematic search of suitable habitat throughout its flowering season has been conducted. In order to determine if such an effort would find *Thismia*, the U.S. Fish & Wildlife Service funded the Illinois Department of Conservation to contract for a systematic search and evaluation of potential habitat, which was conducted by The Morton Arboretum in 1993.

## METHODS

The survey was conducted by Michael Jones with assistance from Rich Hyerczyk, Ken Klick, and Marlin Bowles during late July and August. Pfeiffer's observations and collections

of *Thismia*, which were from early July through mid-September, were used to identify potential habitat (Pfeiffer 1914). She indicated that *Thismia* grew in low prairie characterized by *Solidago gigantea*, *Solidago graminifolia*, *Rudbeckia hirta*, *Eupatorium perfoliatum*, *Asclepias incarnata*, *Iris virginica* var. *shrevei*, *Acorus calamus*, *Agrostis alba*, *Selaginella apoda*, and two mosses, *Aneura pinguis* and *Hypnum*. *Thismia* usually occurred in spots where the soil was not closely covered by mosses or *S. apoda*, but it was occasionally found amongst mosses. Pfeiffer also indicated that *Thismia* occurred about 1/3 mile away from the type locality "in the midst of *Typha*" between beach ridges of Lake Chicago (Mohlenbrock 1985). Although she did not list other associates, the description suggests a habitat different from lake plain prairie.

Thirty-eight potential *Thismia* habitats were searched during this study (Table 1), most of which were identified for the 1991-93 volunteer searches (Wilhelm 1992). Many of the sites are well known natural areas, including eight recognized by the Illinois Natural Areas Inventory (White 1978). One of these sites, Burnam Prairie, was also identified by the Inventory as likely habitat of *Thismia*. Other lake plain wetland habitat and railroad right-of-ways identified on current 7.5' quadrangle maps were also examined. Despite floristic differences, a hydromesophytic forest in the Keiser survey unit in the Indiana Dunes National Lakeshore (Wilhelm 1990) was also surveyed. Most of the known *Thismia* species grow in rich-loamed primeval forests that receive large amounts of precipitation (Jonker 1938, Mass, *et al.* 1986).

However, primary vegetation types searched were **wet-mesic prairie**, **wet prairie**, **sedge meadow**, and **marsh**.

Each potential site was searched for these communities and presence of *Thismia* indicators by traversing the sites in parallel transects across topographic features. Then, concentrated searches for *Thismia* were conducted on specific habitats found to support *Thismia* indicators. Each area and community type searched was characterized by a releve of plant species (including *Thismia* indicators) on survey forms (Appendix I); potential habitats were then plotted on topographic maps and their areas determined from dot grid overlays. The sites were ranked into categories with **high**, **moderate**, or **low** potential as *Thismia* habitat based on a combination of lack of disturbance, presence of *Thismia* indicators, and proximity and topographic similarity to the type location. After sites were ranked, additional search time was focused on the high and moderate, resulting in approximately 200 hours searching among nine sites (see below). Micro-sites that seemed to best fit potential *Thismia* habitat were most closely examined, including removal of surficial soil to expose potential subterranean *Thismias*.

## RESULTS AND DISCUSSION

Although *Thismia* was not found in any of the 38 sites searched (Figure 1), they comprised 1177.8 acres of habitat with a wide diversity of habitats and indicator species (Table 1). Wet prairie occurred at 37% of the sites, wet-mesic prairie at 34%, sedge meadow at 32% and marsh at 53%. Indicator species were present in all of the these habitats, and were most

abundant in wet prairie (2.7 indicator species/site). Although marsh was the most frequent habitat, it had the lowest abundance of indicators (0.89/site) and was the most heavily disturbed, primarily by fill. Nine sites comprising 323.2 acres were identified as **high** or **moderate** potential habitat for *Thysanotus*. Among these sites, *Agrostis alba*, *Asclepias incarnata*, *Eupatorium perfoliatum*, and *Solidago gigantea* were the most common indicator species in wet and wet-mesic prairie. *Asclepias incarnata* and *Eupatorium perfoliatum* were most common among sedge meadow sites, and *Asclepias incarnata* and *Iris versicolor* were most common among marsh sites.

#### Ranking and status of sites

Five sites comprising were considered to have high potential for *Thysanotus*, and included 183.8 acres of potential habitat. **Sand Ridge Nature Center** had the best and only potential marsh habitat in this category, with two indicator species in 14.6 acres of marsh. **Burnham Prairie** is apparently the most similar to the type locality; it contains 109.8 acres of potential habitat that is threatened by purple loosestrife and aspen invasion, and it remains unprotected. This site had *Thysanotus* indicators in all four primary habitats, with the best conditions within a fenced radio tower area. **Calumet City Prairie** also had indicators in all four habitats, but did not have mosses. This site contained 27.2 acres of potential habitat and is unprotected. The site has been impacted by development and fire protection. **Dolton Prairie** had *Thysanotus* indicators in 14.4 acres of wet prairie and in wet-mesic prairie. The **Wentworth Prairie** had 17.8 acres of wet prairie, wet-mesic prairie, and marsh habitat with indicator species, large amounts of *Mnium* and *Hypnum*, and comparatively high levels of soil organic matter.

Four sites were considered to have moderate potential for *Thysanotus*, containing 139.4 acres of potential habitat. **Powderhorn Prairie** had indicators in 35.6 acres containing all four primary habitats and had stands of *Mnium* but not *Hypnum* moss. This site is protected and managed by burning, but has undergone invasion by purple loosestrife. **Sand Ridge Nature Preserve** also had indicators in 34.2 acres containing all four primary habitats, including five indicators in wet prairie. This site is protected as a state nature preserve and is managed by burning. **Thornton Fractional North High School Prairie** had indicators in 39 acres in three habitats, also including five indicators in wet prairie. Although this site is publically owned, it is threatened by development for recreational use. The **Country Club Wetland** had 30.6 acres containing indicators in three habitats, excluding wet-mesic prairie. This site is unprotected.

We considered the remainder of the sites, which comprised 854.6 acres, to have low potential for *Thysanotus*. Although many had lower natural quality and fewer indicator species, some might still support this species, especially if it might respond to disturbance. The Norfolk Western and Penn Central Railroad sites especially have potential; the latter is adjacent to Burnham Prairie. Most of the sites searched in Indiana are high quality natural areas, but support communities that appear different from the historic habitat.

### Ecological conditions during the discovery and search for *Thismia*

Specific ecological conditions at the time of *Thismia*'s discovery are not well known. For example, it is unknown if the type locality was frequently burned at that time, or if had undergone other disturbances such as altered flooding regimes or human disturbance. The type locality's location adjacent to the Calumet River indicates that its drainage might have been easily affected by Lake Michigan fluctuations or by human intervention with the river's drainage. Over the past 140 years, lake level conditions of Lake Michigan were differed before, during, and after the time of *Thismia*'s discovery, and might have altered *Thismia* habitat. Lake levels were extremely high between 1850-1890, averaging about 581 ft above sea level (Figure 2). From 1900-1930, average lake levels had dropped almost two feet, to about 579 ft, and were comparatively stable. More recently, there has been a wider amplitude in lake levels fluctuations, possibly due to human impacts on Lake Michigan's watershed. Growing season precipitation during the observation of *Thismia* was cyclic, but apparently not extreme (Figure 3). Palmer drought severity indices for 1910-1918 indicate that northeastern Illinois experienced two years of mild to moderate drought before *Thismia*'s discovery (Karl & Knight 1985). This was followed by alternating periods of mild to moderate wetness, drought, and normal conditions. Precipitation was also cyclic between 1991 and 1993 (Figure 4). Rainfall was below normal in May of all three years and remained low during 1991. In 1992, rainfall was near or slightly above normal for the rest of the growing season. In June, 1993 rainfall reached over nine inches (twice the norm) and wet habitats remained saturated for the rest of the growing season. Although this sequence of weather might have promoted growth and flowering of *Thismia*, wet habitats could not be thoroughly searched because they were inundated by mid-August, 1993. Because most of the potential *Thismia* sites are unprotected, few have undergone frequent prescribed burning. In 1993, prescribed burns occurred at two sites (Sand Ridge Nature Preserve, and Powderhorn Prairie), while a wildfire occurred at Burnham Prairie (Paul Strand, pers. comm.). Thus, burning apparently had no effect on our abilities to find *Thismia*.

### SUMMARY

The current status of *Thismia americana* remains unknown. Although the type locality is destroyed, at least nine sites comprising 323.2 acres of high to moderate potential habitat remain extant within near proximity to the type locality. Eight of these sites were recognized by the Illinois Natural Areas Inventory, and most contain four different habitats, with good diversity of *Thismia* indicators. However, if *Thismia* remains extant in these areas, its persistence is threatened. For example, only three of the sites (Sand Ridge Nature Center and Nature Preserve, and Powderhorn Prairie) are protected and managed. The remaining sites are threatened by successional changes caused by fire protection and by invasion of purple loosestrife (including protected areas). An increasing threat is development activities that range from residential sites to the proposed Lake Calumet airport construction, which would essentially eliminate habitat for this species (Johnson 1993).

Whether or not *Thismia* remains extant can be discussed with some speculation. Its type locality habitat at Lake Calumet may have received cyclic disturbance from fluctuating

levels of Lake Michigan. This disturbance regime appears to have changed in two ways since about 1850. First, average lake levels dropped prior to the discovery of *Thismia*, and second, a much wider amplitude of lake level fluctuations now maintains the modern lake level. If *Thismia* was dependent upon moderate lake level fluctuations, the more dynamic disturbance regime after about 1930 could have eliminated it, especially in concert with changing land use, fire protection, and increased drainage. *Thismia* was found during a period of cyclic precipitation levels that do not appear different from modern climatic variation. Thus it is unlikely that the searches conducted between 1991 and 1993 were under climatic conditions not likely to allow the discovery of *Thismia*.

## REFERENCES

- Bowles, M.L., R. Flakne, and R. Dombek. 1992. Status and population fluctuations of the eastern prairie fringed orchid [*Platanthera leucophaea* (Nutt.) Lindl.] in Illinois. *Erigenia* 12:26-40.
- Bowles, M.L., R. Flakne, K. McEachern, & N. Pavlovic. 1993. Recovery planning and reintroduction of the federally threatened Pitcher's thistle (*Cirsium pitcheri*) in Illinois. *Natural Areas Journal* 13:164-176.
- Illinois Endangered Species Protection Board. 1990. Checklist of endangered and threatened animals and plants of Illinois. Illinois Department of Conservation, Springfield.
- Johnson, G. 1993. Natural areas threatened by the proposed Lake Calumet Airport. Proceedings of the 10th Northern Illinois Prairie Workshop. Northern Illinois University, DeKalb, IL.
- Jonker, F.P. 1938. A monograph of the Burmanniaceae. Mededeelingen van het Botanisch Museum en Herbarium van de Rijks Universiteit te Utrecht 51:1-297.
- Karl, T.R. and R.W. Knoght. 1985. Atlas of monthly Palmer Drought Severity Index (1896-1930) for the contiguous United States. National Climatic Data Center, Asheville, North Carolina.
- Maas, P.J.M., H. Maas-van de Kamer, J. van Benthem, H.C M. Snelders, and T. Rübsamen. 1986. *Flora neotropica*. Monograph Number 42: Burmanniaceae. New York Botanical Garden, New York.
- Mohlenbrock, R.H. 1985. Recent developments in *Thismia americana* N.E. Pfeiffer. *Erigenia* 5:31-39.
- Pfeiffer, N.E. 1914. Morphology of *Thismia americana*. *Botanical Gazette*. 57:122-135.
- Schwegman, J.E., G.D. Fell, M. Hutchison, G. Paulson, W.M. Shepherd, & J. White. 1973. The Natural Divisions of Illinois. Comprehensive Plan for the Illinois Nature Preserves System - Part II. Illinois Nature Preserves Commission, Springfield.
- Steyermark, J. A. and F.A. Swink. 1952. Plants new to Illinois and to the Chicago region. *Rhodora* 54:208-213
- U.S. Fish & Wildlife Service. 1993. Plant Taxa for listing as endangered or threatened species; notice of review. Department of the Interior. Federal Register 58 (188):51144-51190.
- Wetstein, L.. 1993. *Thismia americana*, a history. Proceedings of the 10th Northern Illinois Prairie Workshop. Northern Illinois University, DeKalb, IL.
- White, J. 1978. Illinois Natural Areas Inventory technical report. University of Illinois Department of Landscape Architecture, Champaign-Urbana & Natural Land Institute, Rockford, Ill.
- Wilhelm, G.S. 1990. Special vegetation of the Indiana Dunes National Lakeshore. Indiana Dunes National Lakeshore Research Program. Report 90-02.
- Wilhelm, G. 1992. Checklist of the vascular flora of the Chicago Lake Plain region. The Morton Arboretum, Lisle, IL.

Table 1. Sites and plant communities searched for *Thismia americana*, and occurrences of indicator species among sites. Numbers indicate number of *T. americana* indicators in communities present. **H** = high potential, **M** = moderate potential for *Thismia americana*. Asterisks (\*) indicate sites recognized by the Illinois Natural Areas Inventory. Acreage of potential *T. americana* habitat for each site is given in parentheses.

No. and Site Name (Acreage)	Wet		Wet-Mesic Sedge		Marsh	Other Communities
	Prairie		Prairie	Meadow		
1 * <b>M Thornton Fractional North High School Prairie (39)</b>	5		3	2		
2 * <b>H Wentworth Prairie (17.8)</b>	3		2		2	
3 * <b>H Dolton Prairie (14.4)</b>	4		2			
4 * <b>H Sand Ridge Nature Center (14.6)</b>					2	
5 * <b>M Sand Ridge N.Preserve (34.2)</b>	5		3	2	1	
6 * <b>H Burnham Prairie (109.8)</b>	2		2	4	2	
7 * <b>M Powderhorn Prairie (35.6)</b>	3		3	3	2	
8 Unnamed (heavily disturbed) (21)			0			
9 - Big Marsh (24.2)					1	Cornus swamp (3)
10 - Unnamed (32)						shrubland (1)
11 - Eggers Woods (22.4)	1		2	1	0	Buttonbush swamp (0)
12 - Unnamed (88)						dry-mesic prairie/ weed community (0)
13 - Unnamed (19)					0	
14 - Hegewish Marsh (154)					0	
15 - Unnamed (area buried under 100 ft of trash) (15.4)						
16 - Beaubien Woods Forest Preserve (37.4)				0		
17 - Indian Ridge Marsh-South (32.2)					0	
18 - Type Locality (51.8)					0	
19 - Lake Calumet Rookery (20.6)						<i>Phragmites</i> (0)
20 - Van Vlissingen Prairie (58)						
21 - Unnamed (4.6)						wetland (0)
22 * <b>H Calumet City Prairie (27.2)</b>		3	2		3	2
23 - Unnamed (7.6)					2	
24 - <b>M Country Club Wetland (30.6)</b>		2			2	2
25 - Clarke and Pine Nat. Preserve (8.2)		2	2		0	1
26 - Keiser Wood INDU (28.6)						hydromesophytic forest (0)
27 - West Beach (17.8)						panne (1)
28 - Wolf Lake - Forsyth Park (27.6)					0	0
29 - Ivanhoe Nature Preserve (23.4)	2		0	2		
30 - Clarke and Pine East (26.6)	0		0	0		
31 - Grand Calumet River - Kennedy Avenue (13.2)					0	
32 - Shell Oil (11)			0			
33 - Penn Central (52.4)						weed community (0)
34 - Chicago & Western Indiana (28.8)						
35 - Norfolk Western (47.6)	3		2			
36 - Unnamed (51.6)						weed community (0)
37 - Hyde Lake South (21.4)					0	
38 - Penn Central (46.8)	3		3			wet area (2)
<b>Numbers of habitats in high and moderate potential <i>T. americana</i> sites in which <i>Thismia</i> indicator species.</b>						
<i>Acorus calamus</i>					1	
<i>Agrostis alba</i>	7		6	1		
<i>Aneura pinguis</i>						
<i>Asclepias incarnata</i>	6			6	5	
<i>Eupatorium perfoliatum</i>	8			5		
<i>Hypnum</i>			2	1		
<i>Iris versicolor</i>	3			4	7	
<i>Rudbeckia hirta</i>			2			
<i>Selaginella apoda</i>			2	1		
<i>Solidago gigantea</i>	3		5		1	
<i>Solidago graminifolia meadia</i>						



## FIELD CHECK FORM FOR DUNE &amp; SWALE REMNANTS

SITE NAME \_\_\_\_\_ COUNTY \_\_\_\_\_ STATE \_\_\_\_\_  
 MAPE CODE \_\_\_\_\_ DATE \_\_\_\_/\_\_\_\_/\_\_\_\_ SURVEYOR(S) \_\_\_\_\_

QUALITY ASSESSMENT BY NATURAL COMMUNITY IN MINIMUM 5-ACRE INCREMENTS

A = essentially undisturbed, B =lightly disturbed, C =- moderately disturbed,  
 D = severely disturbed, E = very severely disturbed (Follows Indiana & Illinois  
 Natural Community classification and ranking system)

SAND PRAIRIE

Dry

Dry-mesic

Mesic

Wet-Mesic

Wet

SAND SAVANNA

Dry-mesic

Mesic

SAND FOREST

Dry

Dry-mesic

Mesic

WETLAND

Marsh

Swamp

Sedge meadow

Panne

Pond

ANTHROPOGENIC

TOTAL



Figure 2. Lake Michigan fluctuations 1850-1990. Data provided by T. Thompson (Indiana Geological Survey), based on U.S. Army Corps of Engineers Great lakes Datum 1985. Figure from Bowles *et al* (1993).

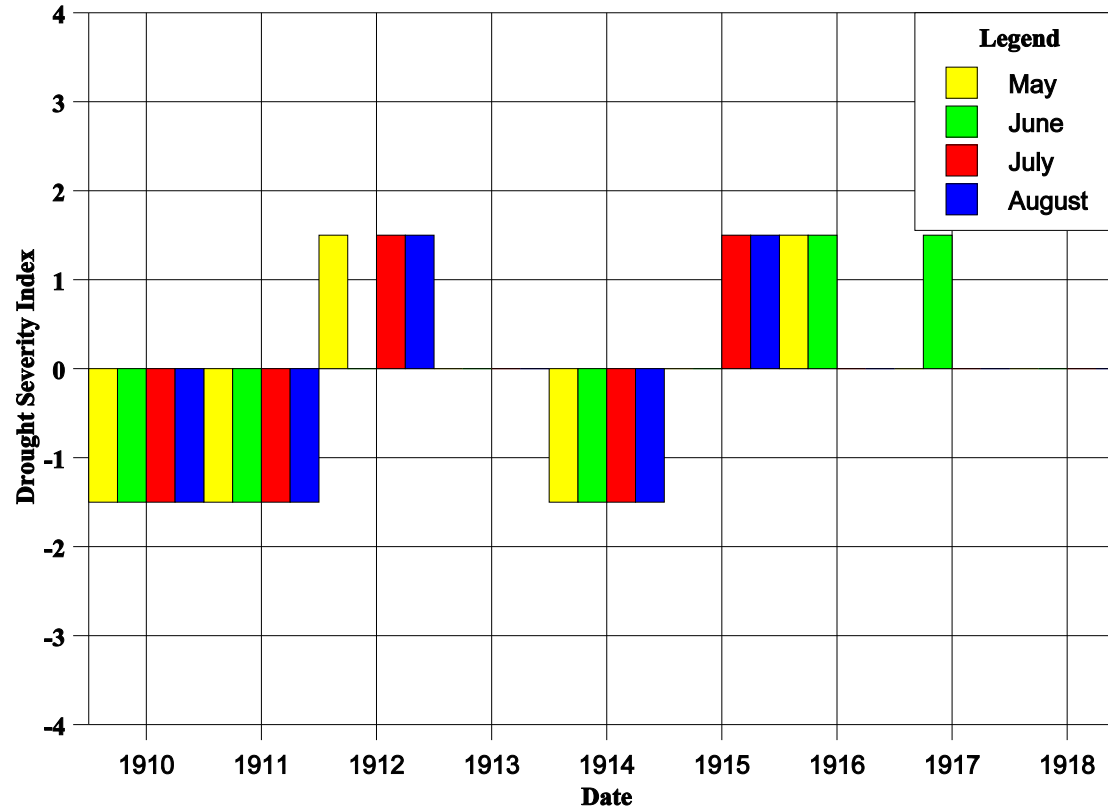


Figure 3. Cyclic climatic variation during the known occurrence of *Thismia americana* (1912-1916). Palmer drought severity indices: 0 = near or normal, 1.5 = mild to moderate, 3 = severe, 4 = extreme; positive values = wetness, negative values = drought (Karl & Knight 1985). Note: absence of bar indicates near or normal conditions.

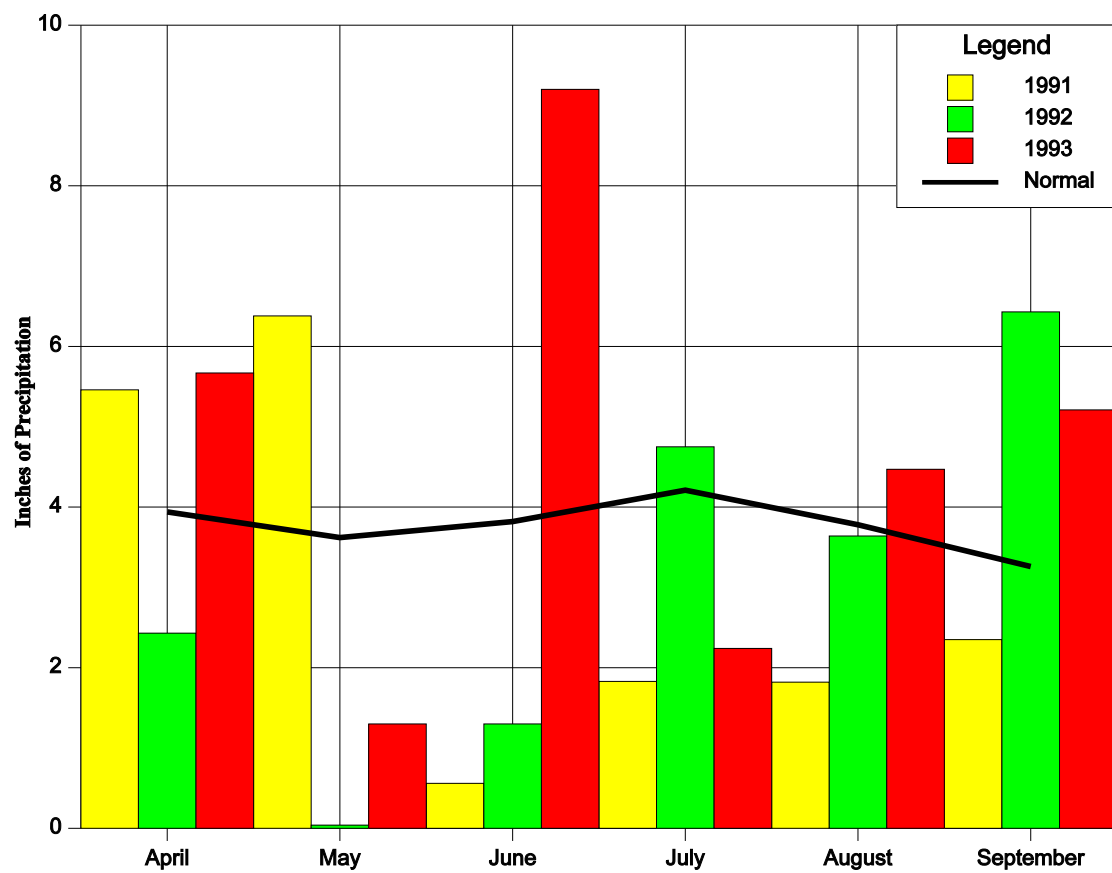


Figure 4. Precipitation patterns for 1991-1993 in relation to the 30-year norm for Wheaton, DuPage Co., Illinois. Data Provided by the Morton Arboretum.

