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Nonwoody Vascular Plants in the Streams of Champaign County, Illinois

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ABSTRACT

Vegetation surveys were conducted in the six river drainages in Champaign County from 1987 to 1989. Specimens were collected from 38 of 112 stations visited. Thirty-six species of vascular plants from 20 families were identified, along with several nonvascular plants. All of the vascular plants collected are considered common in Illinois, and many are considered tolerant of degraded environmental conditions. A numerical rating indicative of environmental quality suggests that these stream communities have suffered significantly from abuse or degradation but that some of the natural character remains.

INTRODUCTION

Streams in Champaign County have undergone dramatic changes since the early 1900s. Channelization of the streams in the county began in 1890 to facilitate drainage of river floodplains and marshes (Larimore and Smith 1963). This improved drainage allowed these very fertile soils to be tilled and used for rowcrop agriculture that presently accounts for more than 90% of the land use within the county (Osborne and Wiley 1988). Channelization also had the effect of increasing the length of the drainage network by extending channels into the prairie wetlands and draining them (Wiley et al. 1990).

The six basins that drain Champaign County (the Salt Fork and the Middle Fork of the Vermilion and the Little Vermilion, the Sangamon, the Embarras, and the Kaskaskia rivers) have been extensively studied. Scientists at the Illinois Natural History Survey (INHS) have studied fish assemblages since the late 19th century (Forbes and Richardson 1908, Thompson and Hunt 1930, Larimore and Smith 1963, Osborne et al. 1991), and others have examined distribution and

abundance patterns of aquatic invertebrates (Alexander 1925). Jones and Bell (1974) have published data on the vascular plants of the Sangamon River Basin. The data presented here were collected as part of a larger study designed to determine changes in fish communities that have occurred in the streams of Champaign County over the past 90 years, and to associate these changes with changes in aquatic habitat and land use (Osborne et al. 1991). To our knowledge, this undertaking represents one of very few comprehensive surveys of aquatic vascular plants associated with the streams in central Illinois (Jones and Bell 1974), and the first such survey of the streams in Champaign County. Our purpose in reporting this information is to describe the existing vascular flora inhabiting streams of Champaign County, thereby providing a basis for comparison with future surveys. This information should prove useful in assessing further change in the environmental condition of streams in central Illinois.

MATERIALS AND METHODS

From 1987-1989 a total of 112 stations in the six major drainages in Champaign County were visited (Figure 1). The network of sampling stations was designed to cover as broad a range of stream types and sizes as possible. Stations sampled in this survey represented a subset of those sampled for fish by Larimore and Smith (1963) and Osborne et al. (1991). Each station was visited at least once and generally twice during the three-year period. Station visits occurred from June through September of each year.

Stations were 150 feet in length with the most downstream portion located a minimum of 100 feet upstream of a highway crossing. This location generally provided relatively easy access but avoided highly disturbed areas associated with highway crossings and areas immediately downstream. Representatives of each species of nonwoody vascular plants that occurred in the wetted perimeter of the stream channel, along distinctly moist lateral margins of the stream, or on emerged sand bars and mudflats were either identified on sight or taken to INHS laboratories for identification. Because many of the smaller streams of the county had been channelized in the early 20th century, most stream banks were very steep and did not support vegetation typically considered aquatic or semiaquatic. Specimens were identified according to Fassett (1957), Gleason and Cronquist (1963), Swink and Wilhelm (1979); nomenclature follows that of the latter two. Vouchered specimens are archived in the Illinois Natural History Survey Herbarium (ILLS).

RESULTS AND DISCUSSION

Vascular plants occurred at 38 of the 112 stations sampled and were present in all but the Little Vermilion River drainage (Table 1, Fig. 1). A total of 36 species were collected representing 30 genera and 20 families; five (14%) of the 36 were nonnative (Swink and Wilhelm 1979) (Table 2). All of the vascular plants collected are common in Illinois (Mohlenbrock and Ladd 1978). The most widely distributed genera were *Polygonum, Potamogeton*, and *Eleocharis* found at 15,

14, and 11 stations, respectively. *Polygonum* spp. were found in four of the streams; *Potamogeton* spp. and *Eleocharis* spp. were present in three. *Lemna* spp. and *Spirodela polyrhiza*, the only vascular plants collected that do not root in the substrate, were collected primarily from the Salt Fork and the Middle Fork of the Vermilion.

In addition to the vascular plants, several nonvascular plants were collected during the study. Algae, including undetermined species of *Pithophora*, *Spirogyra*, and *Cladophora*, were present in all but the Middle Fork drainage. *Spirogyra* and *Cladophora* have been found in other reaches of the Middle Fork drainage, although they were not collected within the borders of Champaign County (Osborne per. obs.). The bryophyte *Fontinalis* was collected in the Salt Fork drainage.

The number of stations with vegetation present within each drainage varied considerably, from none in the Little Vermilion to 18 in the Salt Fork of the Vermilion (Table 3). When expressed as a percentage of the number of stations examined, the Middle Fork of the Vermilion had the most vegetated sites (71%). No apparent relationship was found between species richness within a given drainage and the area of that drainage, or between species richness and the number of stations surveyed within a drainage. Species diversity or richness was highest in the Middle Fork of the Vermilion, which contained a number of plants found in no other drainage, e.g., members of the Scrophulariaceae, *Typha* sp., *Rumex crispus* (Table 2). On the other hand, the Sangamon had little vegetation associated with the stream and stream bed and the Little Vermilion had none. An earlier survey of vegetation in the entire Sangamon Drainage, listed for Champaign County all the genera identified in the Sangamon during this survey and several that were not found during our survey, e.g., *Ceratophyllum, Elodea, Myriophyllum, Nasturtium, Potamogeton, Ranunculus,* and *Scirpus* (Jones and Bell 1974).

As mentioned earlier, the data reported here were collected as part of a larger study designed to determine changes in fish communities that have occurred in the streams of Champaign County over the past 90 years, and to associate these changes with those in aquatic habitat and land use (Thompson and Hunt 1930, Larimore and Smith 1963, Osborne et al. 1991). Earlier surveys of these Champaign County streams indicated the presence of vegetation but did not identify the exact collection location. As a result, we cannot compare individual drainages; however, we can compare combined stream communities. About half of the 25 plants identified during the 1930 survey were not observed during our survey (Thompson and Hunt 1930), including several species of *Potamogeton, Scirpus*, and *Bidens*; and *Sparganium* sp., *Callitriche* sp., *Myriophyllum heterophyllum, Equisetum hiemale, Ambrosia trifida,* and *Nymphaea advena.* Larimore and Smith (1963) identified several plants not observed in the 1930 survey, including, *Equisetum arvense, Spartina pectinata, Carex cristatella, Rumex altissimus, Rorippa islandica, Lysimachia nummularia, Ascelpias incarnata, Phyla lanceolata, Justicia americana, Lycopus americanus, Eupatorium perfoliatum,* and *Hibiscus militaris.* Larimore and Smith did not list any of the

Potamogeton spp. observed by Hunt and Thompson but did identify *Potamogeton foliosus*. Only four of the approximately 15 plants that Larimore and Smith added to the earlier list were present during our survey.

Evaluating the environmental quality of one area and comparing it to that of other areas is a difficult task. One measure of habitat quality is the percentage of native versus nonnative taxa. In the stream drainages of Champaign County during 1987-1989, we found five nonnative species, or 14% of the total number of species identified. Another approach to evaluating environmental quality, one developed by Swink and Wilhelm (1979), relies on an index in which a numerical rating is assigned to each plant; that rating expresses the relative autecological value of that taxon relative to all other taxa in the flora. Using this method, we found that the combined drainage areas surveyed in this study have a value of 23.5. Natural areas that rank below 35 can be assumed to have suffered significantlly from abuse or degradation; however, those with values between the mid-20's and the mid-30's are considered to have evidence of natural character (Swink and Wilhelm 1979). We calculated the Rating Index for the species lists prepared during the previous surveys of these streams in order to compare them with current conditions. The Thompson and Hunt (1930) list has a Rating Index of 28.1, and the list given by Larimore and Smith (1963) has a Rating Index of 27.9. Although the three ratings are similar, the values are clearly decreasing, suggesting continued degradation of the streams during this century. Potential mechanisms responsible for the apparent degradation in these streams are the continued application of herbicides to adjacent agricultural areas and the periodic maintenance and dredging of streams by drainage districts.

The conditions in the streams of Champaign County have changed dramatically since the early 1900s. Many streams have been channelized, and changes in land use practices have undoubtedly altered the stream and bank flora. Perhaps the values of the Rating Index are similar for the three surveys because the data were collected after most of the channelization had been completed. Many of the species now present in the drainages of Champaign County are considered tolerant of degraded environmental conditions, although the Rating Index indicates that some of the natural character of the vegetation communities associated with these stream systems remains intact.

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Table 1. Station number and location within each river drainage where vascular plants were collected in 1987-1989. The Little Vermilion is excluded because no vegetation was present during our surveys.

	Station	Township	Range	Section
Embarras				
	1023	19N	9E	31NE1/4
	1024	19N	8E	36NE1/4
	1027	18N	8E	25NE1/4
	1029	18N	9E	27SW1/4
	1035	17N	9E	28SE1/4
	1113	17N	8E	35SE1/4
	1115	17N	8E	33SW1/4
	Supp 15	15N	9E	11SW1/4
Kaskaskia				
	1106	20N	8E	30S1/2
	1110	18N	7E	25S1/2
	1116	17N	7E	36NW1/4
	1117	17N	7E	35S1/2
	1130	19N	8E	33SW1/4
Middle Fork				
	1145	22N	10E	1N1/2
	1146	22N	11E	1E1/2
	1157	22N	14W	9W1/2
	INHS 55	22N	14W	9NW1/4
	Sugar-02	22N	14W	9N1/2
Salt Fork				
	1042	19N	9E	11NE1/4
	1043	19N	9E	8NW1/4
	1044	19N	9E	9W1/2
	1092	20N	9E	16S1/2
	1093	20N	9E	32NW1/4
	1095	20N	8E	24NE1/4
	1096	20N	8E	12NE1/4
	1099	21N	9E	34SW1/4
	1192	19N	14W	30SE1/4
	1196	21N	10E	29S1/2
	1198	21N	10E	26SW1/4
	1200	20N	10E	13S1/2
	1206	19N	10E	27SW1/4
	Scum-02	20N	9E	8SE1/4
	Scum-03	20N	9E	7E1/2
	Supp 25	20N	10E	26NW1/4
	Supp 26	20N	10E	25W1/2
	Supp 27	22N	14W	5SW1/4
Sangamon				
	1122	19N	7E	30NW1/4
	1175	21N	8E	30NW1/4

Table 2. Vascular plant species collected in five river drainages in Champaign County, Illinois. Station numbers are given for each species collected; see Table 1 for station locations. An asterisk (*) denotes species archived in the Illinois Natural History Survey Herbarium (ILLS); a plus (+) denotes those that are nonnative (Swink and Wilhelm 1979).

	DRAINAGE				
	Embarras	Kaskaskia	Middle Fork	Salt Fork	Sangamon
Acanthaceae					
Justicia americana (L.) Vahl.*	1035		1146		
Alismataceae					
Sagittaria sp.	1113			1206 Scum-02 Supp 26	1122
Amaranthaceae					
Amaranthus rudis Sauer.*			1146		
Amaranthus sp.*	Supp15				
Ceratophyllaceae					
Ceratophyllum demersum L.		1117			
Compositae					
Bidens tripartita L.*	Supp 15		1146		
Senecio glabellus Poir.*+			1146		
Cruciferaceae					
Nasturtium officinale R.Br.*+		1106 1130			
Cyperaceae					
Carex sp.	Supp 15			1198 1206	

Table 2 continued.

	DRAINAGE				
	Embarras	Kaskaskia	Middle Fork	Salt Fork	Sangamon
Cyperus ferruginescens Boeckl.*	Supp 15		1146	1200	
Eleocharis acicularis (L.) Roem.&Schultes*			1157	Scum-02	
			Sugar-02		
Eleocharis erythropoda Steud.*	Supp 15		INHS 55		
Cyperaceae (cont.)					
Eleocharis sp.*			1157	1198	
			INHS 55	Scum-02	
			Sugar-02	Supp 25	
Scirpus validus Vahl.				1096	
Equisetaceae					
Equisetum arvense L.*				Scum-02	
				1096	
Equisetum sp.				1198	1175
				1200	
Gramineae					
Eragrostis hypnoides (Lam) B.S.P.*	Supp 15				
Leersia oryzoides L. Swartz*	Supp 15		1146		
Halorrhagidaceae					
Myriophyllum exalbescens Fern.*		1116			
Hydrocharitaceae					
Elodea canadensis Michx.*		1106			
Vallisneria americana Michx.				1042	

Table 2 continued.

	DRAINAGE				
	Embarras	Kaskaskia	Middle Fork	Salt Fork	Sangamon
Juncaceae					
Juncus sp.		1106		1198	
Lemnaceae					
Lemna spp.	1029		1145	1096	
			1146	1099	
			INHS55	Scum-02	
			Supp27	Scum-03	
				1092	
Spirodela polyrhiza (L.) Schleid.				Scum-03	
Lythraceae					
Ammania coccinea Rottb.*			Sugar-02		
Onagraceae					
Ludwigia palustris (L.) Ell.*				Scum-02	
Polygonaceae					
Polygonum amphibium L.*	Supp 15		1157		
Polygonum lapathifolium L.*	Supp 15				
Polygonum persicaria L.*+			1146		
Polygonum sp.*	Supp 15		1157	1043	1122
	1035			1095,1096	1175
				1196	
				1200	
				Scum-02	

Table 2 concluded.

	DRAINAGE				
	Embarras	Kaskaskia	Middle Fork	Salt Fork	Sangamon
Rumex altissimus Wood.*			Sugar-02 INHS 55		1122
Rumex crispus L.*+			Sugar-02		
Rumex verticillatus L.*					1122
Potamogetonaceae					
Potamogeton crispus L.+				1192	
Potamogeton foliosus Raf.*	1023 1024 1115	1130		1042 1044 1096 Scum-03 Supp 26	
Potamogeton pectinatus L.*	1115	1110			
Potamogeton sp.	1027			1093	
Saxifragaceae					
Penthorum sedoides L.*			1146		
Scrophulariaceae					
Leucospora multifida (Michx.) Nutt.*			1146		
Lindernia dubia Penn.*			1146		
Mimulus ringens L.*			1146		
Typhaceae					
Typha sp.			1157		

Table 3. Size, and vegetative characteristics for the six drainage basins in Champaign County. Basin size is an estimate of the total drainage area at the point of exit from Champaign County.

	No. Habitat Stations	No. Stations with Vegetation	No. Plant Species	Basin size (mi ^{2}) at point of exit
Embarras	20	8 (40%)	16	139
Kaskaskia	13	5 (38%)	7	159
Little Vermilion	1	0 (0%)	0	26
Middle Fork	7	5 (71%)	21	264
Salt Fork	42	18 (43%)	17	347
Sangamon	29	2 (7%)	5	405

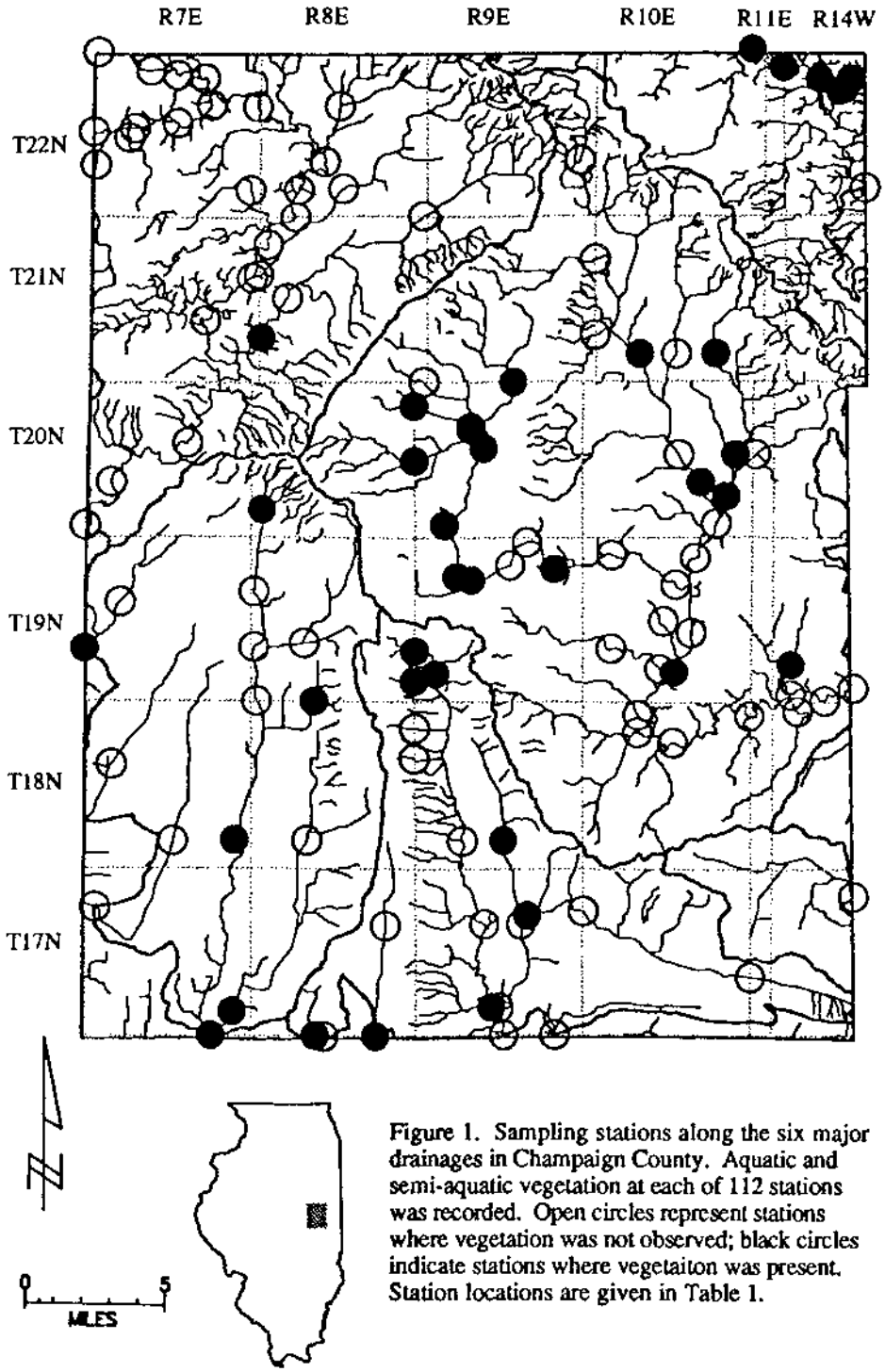

Figure 1. Sampling stations along the six major drainages in Champaign County. Aquatic and semi-aquatic vegetation at each of 112 stations was recorded. Open circles represent stations where vegetation was not observed; black circles indicate stations where vegetaiton was present. Station locations are given in Table 1.