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Vegetation Study of a Terrace Forest in Clark County, Illinois

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Vegetation Study of a Terrace Forest in Clark County, Illinois

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THESIS

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TERRACE FOREST IN CLARK COUNTY, ILLINOIS

INTRODUCTION

The woodlot surveyed is a 13 acre tract belonging to an 85 acre section of forest and associated lowland fields owned by the Hammond-Redman families. This woods consists of both terrace and upland communities located 5 miles ESE of Westfield, and 5 miles north of Martinsville in Clark County, Illinois. The woodlot is part of an original 4200 acres homesteaded by Clark Hammond in 1850. Mr. Clark Hammond was originally from Rutland, Vermont, moved to Illinois from California after he had made a small fortune in the gold fields. From all that can be determined, the small woodlot surveyed has never been clear cut, though it is very possible that an occasional tree was removed. Presently there is no evidence of previous cutting, and the area has been left relatively undisturbed except for some grazing in the upland areas. Undoubtedly, this small woodlot represents one of the few examples of well developed terrace forest in central Illinois.

A very general vegetation survey of the entire area was previously undertaken by Max Hutchinson of the Illinois Nature Preserve Commission in the spring of 1973. In this study, major woody and herbaceous components of the area were recorded, and a few of the larger trees were measured. According to that study, one white oak was found with a diameter of 56 inches.

DESCRIPTION OF THE WOODLOT

The area studied is a 13 acre woodlot located in the SW$\frac{1}{4}$ of Section 7, T11N, R13W, Clark County, Illinois. It is located on the Illinoian till, about 2 miles south of the Shelbyville Moraine, the terminal moraine of the Wisconsin glacier. The topography of the area ranges from flat terrace to gently sloping upland with the elevation varying from 595.4 to 631.9 feet above sea level. The woods is bordered on the north by Doyles Creek and on the west by the North Fork of the Embarrass River. The terrace is divided into a low terrace and a high terrace on the basis of elevation and plant zonation (Figure 1). A few shallow stream channels are found scattered throughout the low terrace. In contrast, parts of the high terrace becomes marsh-like during the spring and early summer because of poor drainage. Commonly the entire terrace area is flooded for short periods of time after heavy rains in early spring.

METHOD OF STUDY

The woodlot was divided into 25 meter square quadrats (0.154 acre) and the number, size, and species above 4 inches d.b.h. (diameter at breast height) were recorded for each quadrat. All living and dead trees were identified and measured to the nearest 1/10 inch. The Importance Value (IV) was then calculated for each species in the three vegetation zones (low terrace, high terrace, and upland) that exist in the woods to provide a better basis of comparing the species and the vegetation zones. As used here, the IV determination follows the procedure developed by McIntosh (1957) in which the IV is the sum of the

$$\text{relative density} = \frac{\text{number of individuals of a species}}{\text{number of individuals of all species}} \times 100 \ ,$$

$$\text{relative dominance} = \frac{\text{basal area of a species}}{\text{basal area of all species}} \times 100$$

$$\text{relative frequency} = \frac{\text{number of plots of occurence of a species}}{\text{total plots of occurence of all species}} \times 100$$

In each 25 meter quadrat, one 1/100 and one 1/1000 nested, circular plots were randomly located. The seedlings (less than 1 inch in diameter) were tallied on the smaller plot, while the saplings (1-4 inches d.b.h.) were tallied on the larger. From this data the density and frequency of each species was determined for three vegetation zones.

Soil texture, and pH were determined for more than 50 soil samples taken from throughout the woodlot. Two line transects were made through the woods with samples 10 cm deep being taken randomly from each 25 meter quadrat. Both transects dissected the three vegetation zones. Soil texture was determined by using the hydrometer method as outlined by Bouyoucos (1962). Soil pH was determined for each sample with a Fisher Accumet Glass Electrode pH meter using the procedure outlined by Reed and Cummings (1945).

Vines were surveyed along three 5 meter by 125 meter transects, one in each of the vegetation zones. Vines were recorded to find frequency, density, percent of total vines, percent of trees with vines as well as species identification. Procedures for the survey were determined by Voigt and Mohlenbrock (1964) and Ebinger and Nyboer.

Collections of all vascular species were made throughout the growing season of 1974. All species collected were identified and voucher specimens were deposited in the Stover Herbarium of Eastern Illinois University. The nomenclature used in this paper follows Jones (1963).

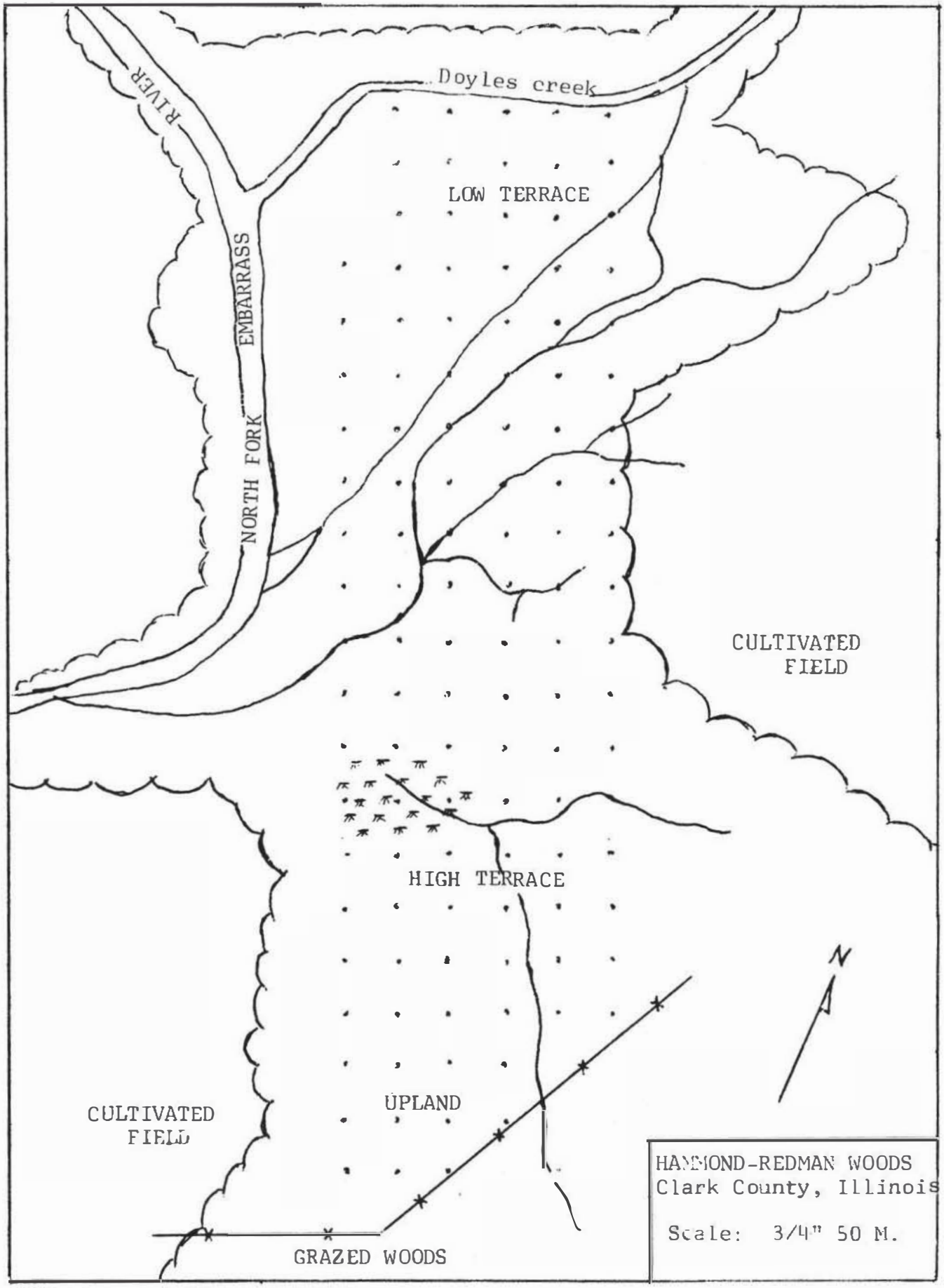

FIGURE 1. Map of Hammond-Redman Woods vegetation zones.

Table 1. Density and frequency of seedlings and saplings of the low terrace forest on the Hammond-Redman woodlot.

Scientific Name	Common Name	Symbol	Diameter Class					
			1"		1"-4"		4"+	
			Den.	Freq.%	Den.	Freq.%	Den.	Freq.%
Aesculus glabra L.	Buckeye	Bu	270	24	118	58	51.18	85
Acer negundo L.	Boxelder	BE	-	-	3	3	24.83	82
Celtis occidentalis L.	Hackberry	Ha	30	3	36	27	23.30	91
Platnus occidentalis L.	Sycamore	Sy	-	-	-	-	4.39	48
Acer saccharinum L.	Silver maple	Si	-	-	-	-	5.73	42
Juglans nigra L.	Black walnut	BW	-	-	-	-	7.64	52
Ulmus americana L.	American elm	AE	-	-	21	9	9.74	67
Acer saccharum Marsh.	Sugar maple	SM	-	-	-	-	3.06	27
Ulmus rubra Muhl.	Slippery elm	SE	-	-	-	-	2.29	33
Fraxinus lanceolata Borkh.	Green ash	GA	-	-	-	-	1.91	24
Populus deltoides Marsh.	Cottonwood	Co	-	-	-	-	.38	6
Carya cordiformis (Wang.) K. Koch	Bitternut hickory	Bi	-	-	-	-	.76	12
Quercus macrocarpa Michx.	Bur oak	BO	-	-	-	-	.38	6
Tilia americana L.	American linden	AL	-	-	-	-	1.34	9
Gleditsia tricanthos L.	Honey locust	HL	-	-	-	-	1.01	9
Quercus alba L.	White oak	WO	-	-	-	-	.38	6
Quercus rubra L.	Red oak	RO	-	-	-	-	.19	3
Cercis canadensis L.	Red bud	RB	-	-	-	-	.95	6
Carya ovata (Mill.) K. Koch	Shagbark hickory	SH	-	-	-	-	.19	3
Maclura pomifera (Raf.) Schneid.	Osage orange	OO	-	-	-	-	.38	3
Acer rubrum L.	Red maple	RM	-	-	-	-	.38	3
Carpinus caroliniana Walt.	Musclewood	Mu	-	-	-	-	.19	3
Crategus mollis (T.&G.) Scheele	Red hawthorn	RH	-	-	-	-	.38	3
Rhus radicans L.	Poison Ivy	PI	30	3	-	-	-	-
Asimina triloba (L.) Dunal.	Paw Paw	PP	90	3	6	3	-	-
Staphylea trifolia L.	Bladdernut	Bl	60	6	3	3	-	-
Euonumus atropurpureus Jacq.	Wahoo	Wa	30	3	-	-	-	-
Campsis radicans (L.) Seem.	Trumpet creeper	TC	60	3	-	-	-	-
Sambucus canadensis L.	Elder berry	EB	30	3	-	-	-	-
	TOTAL		610		188		139.97	

Table 2. Density and frequency of seedlings and saplings of the high terrace forest on the Hammond-Redman woodlot in Clark County, Illinois.

Scientific Name	Common Name	Symbol	Diameter Class					
			1"		1"-4"		4"+	
			Den.	Freq.%	Den.	Freq.%	Den.	Freq.%
Carya laciniosa (Michx.f.) Loud.	Bignut hickory	BN	220	16	19	14	23.19	92
Acer negundo L.	Box elder	BE	110	80	43	35	18.09	86
Fraxinus lanceolata Borkh.	Green ash	GA	30	30	16	11	10.98	86
Quercus alba L.	White oak	WO	30	30	3	3	3.71	35
Acer rubrum L.	Red maple	RM	-	-	-	-	5.10	41
Ulmus rubra Muhl.	Slippery elm	SE	-	-	43	24	10.05	62
Acer saccharum Marsh.	Sugar maple	SM	80	50	24	16	9.12	46
Quercus rubra L.	Red oak	RO	-	-	3	3	4.02	32
Celtis occidentalis L.	Hackberry	Ha	50	50	16	14	7.73	68
Ulmus americana L.	American elm	AE	-	-	32	19	7.73	57
Carya ovata (Mill.) K.Koch	Shagbark hickory	SH	30	30	3	3	4.95	38
Quercus macrocarpa Michx.	Bur oak	BO	50	50	8	5	1.86	22
Quercus bicolor Willd.	Swamp white oak	SO	50	50	3	3	1.86	22
Gleditsia tricanthos L.	Honey locust	HL	-	-	-	-	4.17	24
Juglans nigra L.	Black walnut	BW	30	30	-	-	2.32	19
Acer saccharinum L.	Silver maple	Si	30	30	5	3	1.55	11
Cercis canadensis L.	Red bud	RB	-	-	-	-	1.86	30
Carpinus caroliniana Walt.	Musclewood	Mu	-	-	16	14	1.70	24
Aesculus glabra L.	Buckeye	Bu	-	-	14	11	2.01	19
Platnus occidentalis L.	Sycamore	Sy	-	-	-	-	.62	11
Quercus palustris Muench.	Pin oak	PO	-	-	-	-	.62	11
Carya cordiformis (Wang.) K.Koch	Bitternut hickory	Bi	50	50	-	-	.93	8
Populus deltoides Marsh.	Cottonwood	Co	-	-	-	-	.46	5
Tilia americana L.	American linden	AL	-	-	-	-	.31	5
Maclura pomifera (Raf.) Schneid.	Osage orange	OO	-	-	-	-	.31	5
Crategus mollis (T.&G.) Scheele	Red hawthorn	RH	-	-	19	11	2.78	16
Prunus serotina Ehrh.	Black cherry	BC	-	-	-	-	.15	3
Carya glabra (Mill.) Sweet	Pignut hickory	PH	-	-	-	-	.15	3
Staphylea trifolia L.	Bladdernut	Bl	-	-	3	3	.31	5
Parthenocissus quinquefolia (L.) Planch.	Virginia creeper	VC	30	30	-	-	-	-
Rhus radicans L.	Poison ivy	PI	4760	54	-	-	-	-
Euonymus atropurpureus Jacq.	Wahoo	Wa	110	11	-	-	-	-
Viburnum prunifolium L.	Black haw	Vp	50	30	-	-	-	-
Sambucus canadensis L.	Elderberry	EB	30	30	-	-	-	-
Morus rubra L.	Red mulberry	Mr	30	30	-	-	-	-
	TOTAL		5770		275		126.78	

Table 3. Density and frequency of seedlings and saplings of the upland forest on the Hammond-Redman Woodlot in Clark County, Illinois.

Scientific Name	Common Name	Symbol	Diameter Class					
			<1"		1"-4"		4"+	
			Den.	Freq.%	Den.	Freq.%	Den.	Freq.%
Quercus alba L.	White Oak	WO	110	11	-	-	32.47	100
Quercus rubra L.	Red Oak	RO	440	33	11	11	23.09	100
Acer saccharum Marsh.	Sugar maple	SM	2110	67	144	67	15.15	56
Carya tomentosa (Poir.) Nutt.	Mockernut hickory	MH	-	-	56	22	10.10	56
Ulmus rubra Muhl.	Slippery elm	SE	4110	67	200	67	7.22	67
Carya ovata (Mill.) K. Koch	Shagbark hickory	SH	890	78	33	33	6.49	44
Fraxinus americana L.	White ash	WA	4780	89	-	-	4.33	44
Carya glabra (Mill.) Sweet.	Pignut hickory	PH	440	22	-	-	3.61	33
Celtis occidentalis L.	Hackberry	Ha	-	-	-	-	2.16	22
Juglans nigra L.	Black walnut	BW	-	-	-	-	1.44	22
Quercus velutina Lam.	Black oak	Qv	-	-	-	-	.72	11
Ulmus americana L.	American elm	AE	330	22	33	22	-	-
Acer negundo L.	Box elder	BE	1330	67	-	-	-	-
Morus rubra L.	Red mulberry	Mr	-	-	11	11	-	-
Rhus radicans L.	Poison ivy	PI	4560	56	-	-	-	-
Euonymus atropurpureus Jaqc.	Wahoo	Wa	110	11	-	-	-	-
Prunus serotina Ehrh.	Black cherry	BC	890	67	11	11	-	-
Cercis canadensis L.	Red bud	RB	110	11	-	-	-	-
Crategus mollis (T.&G.) Scheele	Red hawthorn	RH	110	11	-	-	-	-
Sassafras albidum (Nutt.) Nees.	Sassafras	Sa	110	11	-	-	-	-
	TOTAL		20540		499		106.78	

Table 4. Number of trees, basal area per acre, and Importance Value index of leading dominants.

	Species	Number of Trees and Basal Area Per Acre by Diameter Class												Relative Values			
		4-6		7-12		13-18		19-24		25+		Total		Rel.	Rel.	Rel.	I.V.
		No.	B.A.	No.	B.A.	No.	B.A.	No.	B.A.	No.	B.A.	No.	B.A.	Freq.	Den.	Dom.	
Low Terrace	Bu	32.3	4.9	13.8	6.3	4.4	5.6	0.8	1.7	-	-	51.3	18.5	13.6	36.6	15.4	65.6
	BE	7.8	1.3	12.8	7.3	3.2	4.4	1.0	2.4	-	-	24.8	15.4	13.1	17.8	12.7	43.6
	Ha	12.8	2.1	6.7	3.3	2.9	3.8	1.0	2.3	-	-	23.4	11.5	14.6	16.7	9.1	40.4
	Sy	-	-	-	-	0.2	0.3	0.6	1.4	3.6	30.2	4.4	31.9	7.8	3.2	25.9	36.9
	Si	0.4	0.1	1.1	0.9	1.7	2.4	1.0	2.4	1.5	10.2	5.7	16.0	6.8	4.1	13.0	23.9
	BW	0.4	0.1	4.2	2.5	1.3	1.5	1.3	3.2	0.4	2.2	7.6	9.5	8.3	5.5	7.5	21.3
	AE	5.3	0.8	4.2	1.9	-	-	-	-	0.2	0.9	9.7	3.6	10.7	7.0	2.9	20.6
	SM	0.8	0.1	1.2	0.5	0.6	0.8	0.4	1.1	0.2	0.8	3.2	3.3	4.4	2.2	2.6	9.2
	SE	1.3	0.2	0.4	0.1	0.6	0.8	-	-	-	-	2.3	1.1	5.4	1.7	0.9	8.0
	Other	1.8	0.8	3.0	1.6	1.4	1.7	0.8	1.7	1.2	9.1	8.2	14.9	15.3	5.2	10.0	30.5
	Total	62.9	10.4	47.4	24.4	16.3	21.3	6.9	16.2	7.1	53.4	140.1	125.7	100.0	100.0	100.0	300.0
High Terrace	BH	5.4	0.9	10.2	5.5	5.1	6.6	1.5	3.9	0.9	4.0	23.1	20.9	10.6	18.5	18.4	47.5
	BE	10.0	1.5	7.7	3.8	0.3	0.3	-	-	-	-	18.0	5.6	10.0	14.4	4.9	29.3
	GA	4.6	0.7	3.1	1.7	1.7	2.5	1.2	3.1	0.3	1.4	10.9	9.4	10.0	8.7	8.2	26.9
	WO	0.2	0.1	0.6	0.4	0.2	0.2	0.4	0.9	2.5	16.2	3.9	17.8	4.0	3.0	15.6	22.6
	RM	0.8	0.1	1.5	0.9	0.6	0.9	1.1	2.7	1.1	5.1	5.1	9.7	4.7	4.1	9.2	18.0
	SE	7.7	1.1	2.3	0.8	-	-	-	-	-	-	10.0	1.9	7.2	7.9	1.7	16.8
	SM	5.6	0.8	2.0	0.9	1.1	1.4	0.3	0.8	0.2	0.5	9.2	4.4	5.3	7.2	3.9	16.4
	RO	0.5	0.1	0.3	0.1	1.1	1.7	0.9	2.6	1.2	5.7	4.0	10.2	3.8	3.2	9.0	16.0
	Ha	5.4	0.8	2.3	1.0	-	-	-	-	-	-	7.7	1.8	7.8	6.1	1.6	15.5
	AE	6.3	0.9	1.4	0.6	-	-	-	-	-	-	7.7	1.5	6.6	6.1	1.2	13.9
	SH	1.2	0.2	1.9	1.0	1.2	1.9	0.6	1.5	-	-	4.9	4.6	4.4	4.0	4.0	12.4
	BO	-	-	0.3	0.2	0.3	0.4	0.3	0.8	0.9	5.7	1.8	7.1	2.5	1.4	6.2	10.1
	Other	10.2	2.0	5.1	1.5	2.0	2.1	0.9	1.9	1.1	5.4	14.7	18.1	23.1	15.4	16.1	53.7
	Total	57.9	9.2	39.0	19.6	13.6	18.2	7.5	19.2	8.8	47.4	126.8	113.6	100.0	100.0	100.0	300.0
Upland	WO	7.3	1.4	12.3	7.1	5.1	7.4	3.6	9.3	4.3	23.9	32.6	49.1	18.0	30.4	44.5	92.9
	RO	1.4	0.2	2.2	1.2	15.2	20.6	3.6	8.6	0.7	2.6	23.1	33.2	18.0	22.2	29.7	69.9
	SM	4.3	0.6	6.5	3.6	3.6	4.7	0.7	1.5	-	-	15.1	10.4	10.0	14.1	9.3	33.4
	MH	1.4	0.2	5.1	2.2	3.6	4.9	-	-	-	-	10.1	7.3	10.0	9.4	6.5	25.9
	SE	5.8	0.8	1.4	1.4	-	-	-	-	-	-	7.2	1.2	12.0	6.7	1.0	19.7
	SH	4.3	0.5	2.2	0.9	-	-	-	-	-	-	6.5	1.4	8.0	6.0	1.2	15.2
	WA	2.2	0.3	-	-	2.2	2.7	-	-	-	-	4.4	3.0	8.0	4.0	2.7	14.7
	PH	1.4	0.3	-	-	2.2	2.7	-	-	-	-	3.6	3.0	6.0	3.3	2.6	11.9
	Other	1.4	0.2	2.1	1.4	0.7	1.4	-	-	-	-	4.2	3.0	10.0	3.9	2.5	16.4
	Total	29.5	4.5	31.8	16.8	32.6	44.4	7.9	19.4	5.0	26.5	106.8	111.6	100.0	100.0	100.0	300.0

Table 5. Frequency, density, total vines, and trees with vines on the Hammond-Redman woodlot, Clark County, Illinois.

Scientific Name	Common Name	Freq.%	Density	Total Vines %	% Trees With Vines %
LOW TERRACE					
Parthenocissus quinquefolia (L.) Planch.	Virginia creeper	63	3.36	80.6	
Vitis aestivalis Michx.	Summer grape	54	1.31	14.0	27.9
Smilax hispida Muhl.	Common greenbrier	22	1.05	4.6	
Campsis radicans (L.) Seem.	Trumpet creeper	4	1.00	.6	
HIGH TERRACE					
Parthenocissus quinquefolia (L.) planch.	Virginia creeper	92	2.17	69.4	
Rhus radicans L.	Poison ivy	78	2.33	35.5	49.7
Vitis aestivalis Michx.	Summer grape	35	1.33	4.5	
Menispermum canadense L.	Moonseed	21	1.25	5.6	
Smilax hispida Muhl.	Common greenbrier	14	1.00	1.1	
UPLAND					
Parthenocissus quinquefolia (L.) Planch.	Virginia creeper	100	1.06	69.5	
Rhus radicans L.	Poison ivy	30	1.14	17.3	18.4
Vitis aestivalis Michx.	Summer grape	40	1.00	13.0	

RESULTS AND DISCUSSION

A total of 47 species of woody plants were found in the woodlot. Of this total, 29 were canopy trees, 9 were understory trees, and 9 were woody shrubs and vines. The woody species encountered in the three vegetation zones that exist in the woods are recorded with their density and frequency by diameter class in Tables 1, 2, and 3. The 19 leading dominants encountered in the vegetation zones, with their relative values, basal and number of individuals per acre in broad diameter classes, are included in Table 4.

Three broad cover-types were recognized in the woodlot, based on the Importance Value of the leading dominants on each quadrat. Quadrats of similar composition were grouped together and the cover-type boundaries, shown in Figure 1, were smoothed by field observation. The first of the three broad cover-types is low terrace in the northern third of the woodlot. Buckeye, with an I. V. of 65.6, dominated the area, followed by box elder, hackberry, and sycamore. The second cover-type is located to the south-west, just slightly higher than the low terrace. This high terrace is characterized by the dominance of big nut hickory, with an I. V. of 47, followed by box elder, green ash, and white oak. The third cover-type is located in a gently sloping upland area in the southwest corner of the woodlot. White oak, with an I. V. of 92. 9, and red oak, with an I.V. of 69.9, are the dominants in this vegetation zone (Table 4).

LOW TERRACE

The low terrace is relatively flat, with an elevation of 595.4 on the northeast side near the junction of Doyles Creek and the North Fork of the Embarras River, to an elevation of 596.6 where it rises slightly into the high terrace. A few low channels cut through this region and

help drain it (FIG. 1). During the rainy season, the low terrace is often inundated by flood water for short periods of time. This inundation leaves depositions of sand and silt from surrounding farm lands making the soil composition here a rich silty loam. Silty loams have a high content of silt particles (75%) in contrast to the amount of sand (10-15%) and clay (10-15%) particles. Soil pH for the low terrace ranged from 6.5 to 7.4, with a mean of 7.08.

The arborescent species of the low terrace average 140.1 stems per acre with an average basal area of 126 square feet per acre. The main overstory species are buckeye, box elder, hackberry, and sycamore. Buckeye dominates the area and has an Importance Value of 65.6. Most of the buckeye is in the lower diameter classes which indicate it as an incoming species. This is also indicated for the box elder and hackberry with these species having very few representatives in the larger diameter classes. The fourth leading dominant, sycamore, however, have no trees in the low diameter classes, indicating no reproduction. Sycamore was found mainly in the 25+ diameter class indicating it as an outgoing species. Silver maple, black walnut, and American elm also have high Importance Values and are rather evenly distributed throughout the diameter classes. It should be noted that the Other class has an Importance Value of 30.5 and is also relatively evenly distributed throughout the diameter classes, indicating a large diversity of species throughout the low terrace. In the Other category, green ash, cottonwood, bitternut hickory, bur oak, American linden, and honey locust have an I.V. above 2. The largest tree on this area is a cottonwood with a diameter of 61.4 inches.

The woody understory of the low terrace forest consisted of ten species. Buckeye ranked first in both seedlings and saplings. As in the

overstory, hackberry and box elder are co-dominants. Hackberry ranks second, however, while box elder rates a distant third because of the low number of saplings and no seedlings found. The woody shrubs included paw paw, bladdernut, wahoo, and elder berry, ranked in that order. Herbaceous cover of the low terrace varied due to seasonal aspects. Mertensia virginica (bluebells) dominate the area in the spring, changing to a characteristic Laportea canadensis (stinging nettle) cover in the early summer. A wide spectrum of wild flowers, ranging from Claytonia virginica (spring beauties) to Delphinium tricorne (larkspur), blanket this area as subdominates to the bluebells in the spring. A vine survey of the low terrace forest indicated that Virginia creeper has both the highest frequency and density of the four vine species recorded. The other species in their respective rankings are summer grape, common greenbrier, and trumpet creeper (Table 5).

HIGH TERRACE

The high terrace rises slightly to the southeast with an elevation of 594.2 feet at the southern edge of the low terrace, to 606.3 feet at the northern boundary of the upland area. Like the low terrace, the high terrace is relatively flat, but lacks the low drainage channels. A depressed area (Fig. 1) in the southwest part becomes marsh-like for long periods of time during the spring wet season. During periods of heavy rainfall, the high terrace becomes extremely marshy for short periods of time. Again as in the low terrace, spring floods can deposit sand and silt from the surrounding farm lands. The soil of the high terrace varies from a silty loam (75% silt: 10-15% sand) in the lower elevations, to a sandy loam (50% silt: 30% sand) in the higher elevations. The pH of the high terrace soils ranged from 7.1 in the lower elevations, to 5.8 near

the upland quadrats, with a mean pH of 6.89.

The aborescent species of the high terrace have an average of 127 stems per acre, with an average basal area of 114 square feet per acre (Table 4). Big nut hickory clearly dominates the high terrace with an Importance Value of 47.5 and is well-established in the high terrace as indicated by its even distribution throughout the diameter classes. Big nut hickory is found in 92% of the quadrats of the high terrace and ranks second in the seedling-sapling classes. The other representatives of the hickory group are the shagbark, bitternut, and pignut hickories. These species are found in the lower diameter classes and are not represented well in the seedling-sapling classes. These hickories are ranked 11th, 22nd, and 28th according to I.V. The hickory group as a whole has an I.V. of 62.5, second only to the maples. The third leading dominant is the green ash with an I.V. of 26.9. Found in 86% of the high terrace quadrats, the green ash is evenly distributed throughout the diameter classes. This species ranked fourth in individual species in the seedling-sapling classes, indicating good reproduction of the species (Table 2). Three other species groups are found in the high terrace (maples, oaks, and elms). The maple group, with an I.V. of 69.0, included box elder (ranks 2nd), red maple (ranks 5th), sugar maple (ranks 7th), and silver maple (ranks 16th). Box elder and sugar maple are found largely in the smaller diameter classes, with very good representation in the seedling-sapling classes. Box elder is found on 86% of the quadrats, while sugar maple is found on 46%. Both red and silver maple are found in the large diameter classes and are poorly represented in the seedling-sapling classes. Red maple is well represented in the high terrace having a frequency of 41%, while silver maple only occur in 11% of the quadrats. The third species group, the oaks,

included white oak (ranks 4th), red oak (ranks 8th), bur oak (ranks 12th), swamp white oak (ranks 13th), and pin oak (ranks 21st). The composite I.V. for the oak group is 59.2. All of the oaks, except pin oak, are mostly in the large diameter class trees. Only the more hydric species, bur and swamp white oak, had good representation in the seedling-sapling classes. Red and white oaks are found on about 35% of the quadrats in the high terrace, while bur oak and swamp white oak occur in 22% of the quadrats. The elms, slippery and American, make up the fourth species group, with a composite I.V. of 30.7. Both species are distributed evenly through the high terrace and occur in about 60% of the quadrats. Slippery and American elm, ranking sixth and tenth respectively, are found only in the 4-6 and 7-12 inch diameter classes. High elm mortality is found in the woodlot, probably the result of Dutch Elm disease and phloem necrosis, which is the reason these species are missing from the large diameter classes. Neither slippery nor American elm are recorded in the seedling class, but are ranked second and third in saplings. The Other group included a total of 16 species with a total I.V. of 53.7. In this group, honey locust, black walnut, red bud, musclewood, buckeye, and sycamore are the most important although they are mostly found in the lower diameter classes. The largest tree on the high terrace is a white oak with a diameter of 46.5 inches.

The woody understory of the high terrace forest consist of some 34 species (Table 2). Of this total, six are woody shrubs and understory trees. These are musclewood, red bud, red hawthorn, bladdernut, wahoo, and elderberry. The dominant in the seedling class is poison ivy, having 4760 stems per acre of the 5770 stems per acre total. The herbaceous cover of the high terrace, like the low terrace, varied because of seasonal aspects. Spring flora consists of wide expanses of Phacelia

bipinnatifida, P. purshii, Erythronium americanum, Claytonia virginica, Anemonella thalictroides, and Delphinium tricorne. This is replaced by Laportea canadensis, Cinna arundinacea, Elymus villosus, Glyceria striata, Sphenopholis intermedia, Carex davisii, and Carex rosea by early summer. Numerous vines are found in this vegetation zone, with Virginia creeper having the highest frequency and second highest density of the five vine species recorded. The other species in their respective rankings are poison ivy, moonseed, summer grape, and the common greenbrier (Table 5).

UPLAND

The gently sloping upland covers approximately 1.5 acres and lies to the southeast of the high terrace. It ranges in elevation from 601.2, at its northern boundary near the high terrace, to 631.9 at its highest point. The upland area drains into the high terrace and the cultivated field to the west (Fig. 1). The soil of the upland area is a sandy loam (silt and sand make up 80% of the soil particles). Soil pH for the upland soil ranged from 4.9 to 6.7, with a mean pH of 5.95. This is significantly acidic in comparison to the low terrace (7.08) and high terrace soil (6.89).

Aborescent species of the upland forest number 107 stems per acre with an average basal area of 112 square feet per acre. White and red oak dominate the upland with a combined I.V. of 163 and were found in 100% of the quadrats. Black oak is the third species of this group (ranks 11th in I.V.), with an I.V. of 3.8, is found only in the 13-18 inch diameter class and had no seedlings or saplings. White and red oak are the only species in the upland woodlot represented in the 25+ diameter class. Although the oaks dominated the overstory, they had poor showing in the seedling-sapling classes (Table 3). Sugar maple, the third ranking species

of the upland forest, has an importance value of 33.4. Sugar maple is well-represented in the lower diameter classes, indicating that sugar maple will be a more important species in the future upland forest. Sugar maple ranks fourth in the seedling class and is second in the sapling class, indicating good reproduction of the species. A second species group included mockernut hickory (ranks 4th), shagbark hickory (ranks 6th), and pignut hickory (ranks 8th). The hickories have a composite I.V. of 53.0 and are found in 45% of the quadrats. The hickories generally are well-represented in the seedling-sapling classes, with the exception of mockernut having no seedlings and pignut no saplings. Slippery elm and white ash make up the remaining sub-dominated with Importance Values of 19.7 and 14.7 respectively. White ash ranks first in the seedling class but had no saplings, while slippery elm ranks third in the seedling class and first in the sapling class, showing good reproduction of the elms in the upland. The Other category, made up of hackberry, black walnut, and black oak have an I.V. of 16.4 and are mostly found in the lower diameter classes.

The understory of the upland forest is composed of 17 species (Table 3). Most are saplings and seedlings of the overstory species, but box elder, red mulberry, red bud and red hawthorn are occasionally encountered as understory trees. Poison ivy and wahoo are the only shrubs encountered. Poison ivy seedlings were second only to the white ash and had 4560 stems per acre. Herbaceous cover for the upland was not as spectacular as that of the terrace forest. Dentaria laciniata and Claytonia virginica made up the prominent spring flora, while summer changes were to Poa slyvestris, Muhlenbergia sobolifera, Festuca obtusa, and Carex rosea. A vine survey included Virginia creeper, poison ivy, and summer grape

(Table 5). Virginia creeper dominated in both frequency and density, as in the high and low terrace.

CONCLUSION

The low terrace is changing from a flood plain and frontal flatland to more mesic conditions. This is evident in the recession of the true floodplain species, silver maple, cottonwood, sycamore and box elder as noted by Crites and Ebinger (1969) and Phillippe and Ebinger (1973). These species are important in the low terrace at present, but are either represented in the large diameter classes or are not reproducing as shown by the seedling-sapling classes (Table 1). The low terrace is dominated and will continue to be dominated by buckeye. Hackberry and American elm are also indicated as future co-dominates. It should be noted that seedlings (610/acre) and saplings (188/acre) are not as prevalent in the low terrace as in the high terrace (seedlings 5770/acre; saplings 275/acre) and the upland seedlings 20,540/acre; saplings 499/acre). This is probably due to the spring floods that scour the low terrace, making seedling germination and establishment difficult. If the low terrace becomes dryer, the soil will develop better, and it is evident the low terrace will become part of the high terrace.

The seedling-sapling data (Table 2) indicate that the present composition of the high terrace will not change greatly in the near future. This data suggests that both big nut hickory and box elder will continue to dominate the area. The major shift will be in the importance of sugar maple. This species has numerous seedlings and saplings in the high terrace and in the future will probably replace species such as green ash and red maple that are poorly represented in the seedling-sapling classes.

The elms will probably continue as an important component in the high terrace. Though not represented in the seedlings categories, where present in saplings, they will probably not increase in importance due to their high mortality caused by Dutch elm disease and phloem necrosis. The oaks (red and white) are found in the lower diameter classes, possibly due to a dryer period in the past, show little or no reproduction in seedling-sapling classes. Red and white oak will not become more important in the high terrace but will probably be replaced by the more hydric species, bur and swamp white oak. Both of these species are reproducing well as indicated by the seedling-sapling classes. The composition of the high terrace is similar to that of Foley Woods in Edgar County (Jackson and Petty, 1971).

The upland forest, dominated by white and red oak, is quite similar to the western part of Rocky Branch in Clark County, Illinois (Ebinger and Parker, 1969), in composition and ecological progression. Sugar maple and white ash are reproducing exceptionally well and will probably become co-dominants with the oaks. The seedlings of sugar maple make-up about one sixth of the overstory seedlings (Table 3). Sugar maple has the ability to take advantage of canopy openings and will probably out compete the white ash. The trend of the upland is to a more mesic woods, similar to observations by McClain and Ebinger (1968) and by Ebinger (1968) in most parts of upland forests in East-Central Illinois.

ANNOTATED CHECKLIST

A total of 150 species of vascular plants in 56 families were found growing in the woodlot studies. Of the species collected, 3 are ferns, 23 are monocots, and 124 are dicots. Of this latter group, 47 are trees, shrubs or woody vines, while 77 are herbaceous. The largest family

represented is the Gramineae with 13 taxa, followed by the Compositae with 8.

In the following list the nomenclature follows that of Jones (1963). The families are listed in alphabetic order within the major groups to facilitate the finding of names. The numbers following the binomials indicate the habitat types where each species was collected, (LT = low terrace, HT = high terrace, U = upland woods). An asterisk (*) indicates that the taxon has not been previously recorded for Clark County, by Jones and Fuller (1955) or Winterringer and Evers (1960).

FERNS

Ophioglossaceae

Botrychium virginianum (L.) Sw. HT U *

Polypodiaceae

Cystopteris fragilis (L.) Bernh. HT U

Onoclea sensibilis L. HT

ANGIOSPERMS

MONOCOTS

Commelinaceae

Commelina communis L. HT *

Tradescantia subaspera Ker. HT

Cyperaceae

Carex davisii Schw. and Torr. HT

Carex rosea Schk. HT U

Cyperus esculentus L. LT

Gramineae

Cinna arundinacea L. LT HT

Digitaria sanguinalis (L.) Scop. LT

Echinochloa crusgalli (L.) Beauv. LT

Elymus canadensis L. LT

Elymus villosus Muhl. LT HT

Elymus virginicus L. HT

Festica obtusa Bieler U

Glyceria striata (Lam.) Hitchc. LT HT

Muhlenbergia sobolifera (Muhl.) Trin. * U

Poa sylvestris A. Gray HT U

Secale cereale L. LT

Setaria faberii Herm. LT

Sphenopholis intermedia Rydb. LT HT

Liliaceae

Allium canadense L. HT

Erythronium americanum Ker. LT HT

Polygonatum commutatum (Schultes) Dietr. HT U

Smilacina racemosa (L.) Desf. HT U

Smilax hispida Muhl. LT HT

DICOTS

Aceraceae

Acer negundo L. LT HT

Acer rubrum L. LT HT

Acer saccharinum L. LT HT

Acer saccharum Marsh. LT HT U

Anacardiaceae

Rhus radicans L. LT HT U

Annonaceae

Asimina triloba (L.) Dunal. LT HT

Araceae

Arisaema dracontium (L.) Schott. LT HT

Arisaema triphyllum (L.) Schott. LT HT U

Aristolochiaceae

Asarum reflexum Bickn. HT

Balsaminaceae

Impatiens biflora Walt. HT LT

Impatiens pallida Nutt. LT HT

Betulaceae

Carpinus caroliniana Walt. LT HT

Bignoniaceae

Campsis radicans (L.) Seem. LT HT

Boraginaceae

Mertensia virginica (L.) Pers. LT HT

Campanulaceae

Campanula americana L. HT

Caprifoliaceae

Sambucus canadensis L. LT HT

Viburnum prunifolium L. LT HT *

Viburnum recognitum Fern LT HT

Celastraceae

Euonymus atropurpureus Jacq. LT HT

Compositae

Ambrosia trifida L. LT

Aster simplex Willd. LT *

Erigeron philadelphicus L. LT *

Eupatorium purpureum L. LT HT

Heliopsis helianthoides (L.) Sweet LT

Lactuca floridana (L.) Gaertn. LT

Rudbeckia lacinata L. LT HT

Silphium perfoliatum L. LT HT *

Convolulaceae

Ipomoea panurata (L.) G.F.W. Mey.

LT

Cruciferae

Arabis laevigata (Muhl.) Poir.

HT

Cardamine bulbosa (Schreb.) B.S.P.

LT

Dentaria laciniata Muhl. HT U

Iodanthus pinnatifidus (Michx.)

Steud. LT

Euphorbiaceae

Acalypha rhomboidea Raf. HT *

Fagaceae

Quercus alba L. LT HT U

Quercus bicolor Willd. LT HT *

Quercus macrocarpa Michx. LT HT

Quercus muhlenbergii Engelm. HT

Quercus palustris Muench. HT

Quercus rubra L. HT U

Quercus velutina Lam. U

Geraniaceae

Geranium maculatum L. HT

Hippocastanaceae

Aesculus glabra L. LT HT

Hydrophyllaceae

Ellisia nyctelea L. LT HT

Hydrophyllum appendiculatum Michx.

LT HT *

Phacelia bipinnatifida Michx. LT HT *

Phacelia purshii Buckl. LT HT

Juglandaceae

Carya cordiformis (Wang.) K. Koch

LT HT U

Carya glabra (Mill.) Sweet HT U *

Carya laciniosa (Michx. f) Loud HT

Carya ovata (Mill.) K. Koch HT U

Carya tomentosa (Poir.) Nutt

HT U

Juglans nigra L. LT HT U

Labiatae

Glecoma hedercea L. HT

Lamium purpureum L. LT HT *

Monarda fistulosa L. LT

Perilla frutescens (L.) Britt.

LT *

Prunella vulgaris L. HT

Teucrium canadense L. LT HT

Lauraceae

Sassafras albidum (Nutt.) Nees.

HT

Leguminosae

Cercis canadensis L. LT HT U

Desmodium nudiflorum (L.) D.C.

U

Gleditsia triacanthos L. HT

Trifolium hybridum L. HT

Lobeliaceae

Lobelia siphilitica L. HT

Menispermaceae

Menispermum canadense L. HT U

Moraceae

Morus alba L. LT HT

Morus rubra L. HT U *

Maclura pomifera (Raf.) Schneid.

LT *

Oleaceae

Fraxinus americana L. HT U *

Fraxinus lanceolata Borkh. LT HT

Fraxinus quadrangulata Michx.

LT *

Onagraceae

Circaea latifolia Hill. HT *

Oxalidaceae

Oxalis stricta L. U

Papaveraceae

Sanguinaria canadensis L. LT HT U

Passefloraceae

Passiflora lutea L. U

Phytholaccaceae

Phytolacca americana L. LT HT

Platanaceae

Platanus occidentalis L. LT HT

Podophyllaceae

Podophyllum peltatum L. HT U

Polemoniaceae

Phlox divaricata L. LT HT

Phlox paniculata L. HT

Polemonium reptans L. LT HT

Polygonaceae

Polygonum convolvulus L. LT *

Polygonum hydropiper L. LT HT

Polygonum pennslyvanicum L. LT

Polygonum virginianum L. HT

Rumex obtusifolius L. LT *

Portulaceae

Claytonia virginica L. LT HT U

Pimulaceae

Lysimachia ciliata L. HT

Lysimachia nummularia L. HT *

Ranunculaceae

Anemonella thalictroides (L.)

Spach. HT *

Delphinium tricorne Michx.

LT HT

Ranunculus abortivus L. LT

Ranunculus septentrionalis Poir.

HT

Rosaceae

Rosaceae

Agrimonia pubescens Wallr. HT U

Crataegus calpodendron (Ehrh.) Medic LT *

Crataegus mollis (T.&G.) Scheele LT HT

Geum canadense Jacq. HT

Geum verum (Raf.) T. & G. LT HT

Prunus serotina Ehrh. HT U

Rubiaceae

Galium aparine L. U

Galium circaezans HT U

Galium concinnum T. & G. LT HT

Salicaceae

Populus deltoides Marsh. LT HT

Scrophulariaceae

Mimulus alatus Ait. HT

Staphyleaceae

Staphylea trifolia L. LT HT

Tiliaceae

Tilia americana L. LT HT

Ulmaceae

Celtis occidentalis L. LT HT

Ulmus americana L. LT HT U

Ulmus rubra Muhl. LT HT U

Umbelliferae

Chaerophyllum procumbens (L.) Crantz LT HT

Conium maculatum L. LT

Crytotaenia canadensis (L.) D.C. LT HT

Erigenia bulbosa (Michx.) Nutt LT HT *

Heracleum lanatum Michx. LT *

Osmorhiza longstylis (Torr.) D.C. LT HT *

Sanicula canadensis L. LT HT

Sanicula gregaria Bickn. HT U *

Urticaceae

Laportea canadensis (L.) Gaud. LT HT

Pilea pumila (L.) A. Gray LT HT

Violaceae

Viola eriocarpa Schw. LT HT *

Viola papilionacea Pursh. LT HT U

Viola striata Ait. LT HT

Vitaceae

Parthenocissus quinquefolia (L.) Planch. LT HT U

Vitis aestivalis Michx. LT HT U

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