Oak Forests in the Laughery Creek Valley, Indiana*

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The dissected wide valley of Laughery Creek offers a wide range of habitats with resultant major or minor changes in forest composition, ranging from mesic mixed hardwoods (beech, sugar maple, ash) on well-drained uplands or gentle slopes, to variants of oak-hickory type on steep slopes. One of these variants has been described in detail by Reynolds and Potzger (4), characterized by great abundance of *Quercus muhlenbergii*, a species which customarily has only small representation. In 1950 Potzger and Chandler (2) reported on ten stands of beech forests in this valley and a study of oak stands in the same region seemed essential for a concept of forest characteristics of the region in general.

It was a rather optimistic plan when the venture was made to study oak stands which had experienced little disturbance by man. From the highway many oak forests looked promising but upon closer observation were found poor for sociological studies to depict forest primeval conditions. Oak has been a valuable timber crop which has felt the pressure of lumbermen upon farmers for many years. Even though oak occupies the least favorable habitat sites, agriculturally speaking, the value of the timber made cutting a common occurrence. Only four suitable stands were found. Distribution of the stands is shown in figure 1.

Methods

Each stand was studied on basis of 20 ten-meter-square quadrats. The quadrats were delimited by stout cord, and all stems one inch or over were measured with wooden calipers. All young stems below one inch DBH. and at least three feet in height were tabulated. Such procedure gave information on abundance, diameter classes, reproduction, and per cent F. I.

Results

Tables 1 to 4 show results in summary form. The oak forests in Laughery Creek valley are not typical of the xeric oak type as one finds on south-facing slopes in unglaciated Indiana, as described in great detail by Potzger and Friesner (3). There are really four variants characterized by different combinations of oak species, viz. *Quercus muhlenbergii-Q. rubra* (Table IV), *Q. alba-Q. muhlenbergii-Q. rubra* (Table III), *Q. alba-Q. rubra* (Table I), *Q. alba-Q. velutina* (Table II).

One hesitates to classify the forest complex as typical oak-hickory, even though Carya has a high representation, because of very important representation of the climax forest species, such as Fagus, *Acer saccharum* and species of Fraxinus. The climax forest species are especially abundant in the small stem sizes, but may also play an important part in crown control (Tables I, II, III).
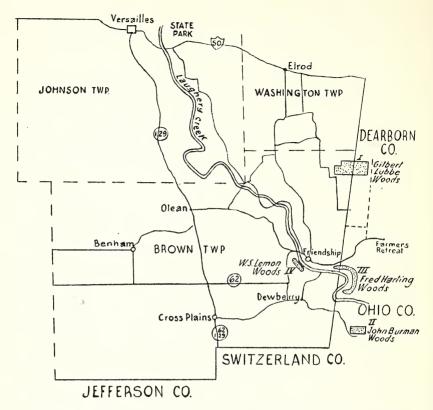

Figure 1. Sketch map showing location of the four stands of oak with reference to townships and highways.

The least typical oak forest is the Lubbe woods (Table I). The habitat is a moderately dissected upland. The crown cover is really more beech-maple-ash than oak-hickory, but the oaks are mostly magnificent giant trees, up to 54 inches DBH. The eye is held spellbound by the immense trunks of white oak so that the true sociology of the forest association and prominent crown control by beech, sugar maple, and ash go unobserved until a quadrat study is made. Fagus, *Acer saccharum*, and *Fraxinus americana* have each a higher frequency index than *Quercus alba*. The almost total lack of reproduction by oaks suggests decadent status of oak in the crown cover (Table I).

Discussion

In an area like Indiana, where the most favorable habitat sites are convered by a mixed hardwoods of mesic species, especially beech, sugar maple and ash, one can expect a mosaic of forest cover types which represent ranges in soil moisture between beech-maple-ash mesic condition on the one hand and the oak-hickory xeric condition on the other, as Potzger (1) has described for the Versailles Park area. The Laughery

TABLE I. Tabulation of woody species in twenty 10-meter-square quadrats in the Lubbe woods. Diameter classes in inches.

Species	Below 1 in.	1-2	3-5	6-9	10-15	16-20	Above 20	Total 1 in. or above	Per cent F. l.
Acer rubrum	20	9	1	2	1			13	60
A. saccharum	91	42	15	4	1			62	95
Carya cordiformis			.				1	1	5
C. glabra	17	8	5	1	1			15	60
C. ovata	8	2	1	1				4	35
Celtis occidentalis	1								5
Cornus florida	56	31	16					47	75
Fagus grandifolia	54	35	9	4	7	2	1	58	100
Fraxinus americana	30	4	2	2				8	85
F. pennsylvanica	22	2						2	40
F. quadrangulata	2	1						1	15
Liriodendron tulipifera	1	2						2	15
Morus rubra	13	1						1	30
Nyssa sylvatica	17	7	1		1	1		10	20
Ostrya virginiana	63	5	6					11	65
Prunus serotina	18								20
Quercus alba	3						11	11	55
Q. rubra					2		3	5	25
Q. velutina			1					1	5
Sassafras albidum	3	2						2	15
Ulmus americana	10								15
U. fulva	5	4	1	1				6	25
Amelanchier canadensis	2	1						3	15
Aralia spinosa	3							3	5
Celastrus scandens	4							4	10
Dirca palustris	16							16	20
Euonymus atropurpureus	2							2	5
Lindera benzoin	3							3	10
Smilax glauca	40							40	45
S. rotundifolia	5							5	5
Viburnum acerifolium	100							100	60
V. prunifolium	1							1	5
Vitis spp.	11							11	30

TABLE II. Tabulation of woody species in twenty 10-meter-square quadrats in the John Burman woods. Diameter classes in inches.

Species	Below 1 in.	1-2	3-5	6-9	10-15	16-20	Above 20	Total 1 in. or over	Per cent F.I.
Acer saccharum	389	215	25	1			2	243	100
Amelanchier canadensis	3	2						2	25
Carya cordiformis				1	4			5	15
C. glabra	9	6	1	3	5			15	45
C. ovata	19	5	2	3	7	2		19	75
Celtis occidentalis		1						1	5
Cercis canadensis	4	3						3	20
Cornus asperifolia	1	1						1	5
C. florida	16	32	4					36	60
Crataegus sp.	1								5
Fagus grandifolia	4	6						6	5
Fraxinus americana	36	21	3					24	80
F. pennsylvanica	2								5
Juglans nigra				2				2	10
Juniperus virginiana	1								5
Morus rubra	8	2	1					3	45
Nyssa sylvatica	3								5
Ostrya virginiana	56	28	2					30	45
Prunus serotina	3		1					1	20
Quercus alba	18	8		3		4	11	26	75
Q. velutina	4	2				6	4	12	45
Sassafras albidum	1								5
Ulmus americana		1	1	1				3	15
U. rubra	24	12	1					13	50
Celastrus scandens	7								15
Euonymus atropurpureus	6								5
Rhus glabra	1								5
Smilax glauca	1								5
Viburnum prunifolium	6	1						1	20
Vitis sp.	1								5

TABLE III. Tabulation of woody species in twenty 10-meter-square quadrats in the Fred Harting woods. Diameter classes in inches.

Species	Below 1 in.	1-2	3-5	6.9	10-15	16-20	Above 20	Total 1 In. or over	Per cent F.I.
Acer saccharum	339	112	37	3		4	1	157	100
Aesculus glabra	9	4	2	2				8	40
Carpinus caroliniana	5							—	10
Carya cordiformis	2			2	2			4	30
C. glabra		2	2	2		3		7	30
C. ovata	11	3	8	5	1		1	20	70
Celtis occidentalis	2	1	1					2	15
Cercis canadensis	25	9						9	55
Cornus florida	3	4	2					6	25
Fagus grandifolia	1	4	3					7	20
Fraxinus americana	60	8	4	3	1		1	17	80
F. quadrangulata	59	4						4	85
Juglans nigra				3				3	10
Morus rubra	30	2						2	70
Ostrya virginiana	21	24	6					30	60
Prunus serotina	1	1						1	10
Quercus alba	4		14	11	7	5	1	38	60
Q. muhlenbergii	3		3	5	6	3	2	19	45
Q. rubra			2	4	3	2	1	12	50
Q. velutina					2			2	10
Sassafras albidum	3							—	5
Ulmus rubra	25	13						13	85
Celastrus scandens	8							—	15
Euonymus atropurpureus	1							—	5
Parthenocissus quinquefolia	5							—	20
Ribes sp.	14							—	25
Smilax glauca	5							—	15
Viburnum prunifolium	3							—	10
Vitis sp.	2							—	10

TABLE IV. Tabulation of woody species in twenty 10-meter-square quadrats in the Lemon woods. Diameter classes in inches.

Species	Below 1 in.	1-2	3-5	6.9	10-15	16-20	Above 20	Total 1 in. or over	Per cent F. I.
Acer saccharum	110	63	42	12	4	2		77	100
Aesculus glabra	16	7	5					12	55
Carpinus caroliniana	3	2						2	10
Carya cordiformis	1	1	5	11	11	1		29	60
C. glabra	1	2						2	15
C. ovata		1	6	7				14	35
Celtis occidentalis	2	2	1	2	1			6	15
Cercis canadensis	19	4	1					5	40
Cornus asperifolia	10							—	10
C. florida	1							—	5
Crataegus sp.	1							—	5
Fraxinus americana	33	8	8	5	2	1		24	90
F. quadrangulata	4		1					1	15
Juglans nigra				3	2			5	20
Morus rubra	3							—	15
Ostrya virginiana	14	6	15					21	60
Quercus muhlenbergii			1	3	1			5	25
Q. rubra	1			3	10	2	1	16	45
Q. velutina	3	1				1		2	15
Tilia americana	11	8	3	6	4			21	40
Ulmus americana	1	2	2	2				6	30
Ulmus rubra		4		3	2			9	35
Asimina triloba	5							—	5
Celastrus scandens	14							—	5
Dirca palustris	9							—	20
Euonymus atropurpureus	1							—	5
Parthenocissus quinquefolia	29	1						1	60
Ribes sp.	7							—	20
Smilax glauca	4							—	15
Viburnum prunifolium	17							—	25
Vitis sp.	4	2	1					3	15
Xanthoxylum americanum	13	1						1	10

Creek valley is perhaps unique in the variants of oak forests (Tables I-IV). This is evidently determined by the mosaic of numerous micro-climatic habitats on the slopes of deep-set Laughery Creek and its tribu-taries. The extreme competition which the climax mixed hardwoods places upon oak-hickory is well shown by the present study. Only in the John Burman woods (Table II) does reproduction by oaks seem adequate for continuation of prominent crown control by species of oak.

A unique feature in the Laughery Creek valley is as shown by Potzger and Reynolds (4) and Potzger (1) as well as by Tables II and IV of this study, the prominent role played by *Quercus muhlenbergii*. If one com-pares the composition of oak forests in the Laughery Creek valley with those of xeric south-facing slopes of Brown, Monroe and other Indiana counties with dissected topography it becomes quite evident that the Ripley county habitats must be less xeric and so have a more transitional oak-hickory forest cover.

Summary and Conclusions

1. The study presents qualitative and quantitative data on four oak-hickory stands in the Laughery Creek valley.

2. The oak-hickory forest appears to be transitional in nature, since dominants of the climatic climax (Fagus, Fraxinus, and *Acer sac-charum)* usually assume a prominent place in crown control.

3. A unique feature is the unusual importance of *Quercus muhlenbergii* in the oak forests of the region.

4. Oak-hickory forest is apparently limited to steep slopes.

5. The Lubbe woods has without doubt some of the most magnificent large trees of *Quercus alba* in Indiana.

Literature Cited

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