

SHORT COMMUNICATION

POINT-CENTERED-QUARTER ANALYSIS OF THE UPLAND FOREST AT YUHAS WOODS IN RANDOLPH COUNTY, INDIANA

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The Frank and Phyllis Yuhas Woods is one of the most botanically rich and diverse natural areas in east-central Indiana. It is a 33.6 ha tract with approximately 30 ha of woodland located in the southwest region of Randolph County, Indiana. It is owed by The Red Tail Nature Conservancy. Yuhas Woods lies in the Tipton Till Plain section of the Central Till Plain Natural Region. This region of Indiana was comprised of beech-maple forests with scattered sections of oak-hickory forests during presettlement times (Homoya et al. 1985). It is now mostly agricultural land with scattered woodlots.

The composition of tree species in a forest indicates much about its overall structure and habitat. In August of 2005, a systematic point-centered-quarter (PCQ) technique was used to provide basic statistics, e.g., frequency, basal area, and density, of the tree composition of the upland forest at Yuhas Woods. From these measures relative frequency (RFREQ, the percent frequency of one species per ha compared to all species), relative basal area (RBA, the percent basal area for one species compared to the total basal area for all species), and relative density (RDEN, the percent density of one species compared to all species per ha) were calculated and used to determine importance values (IV, the sum of RDEN, RBA and RFREQ) and relative importance values (RIV, the average of RDEN, RBA, and RFREQ expressed as a percent) for all tree species recorded (Cottam and Curtis 1956).

Only trees with a DBH (diameter at breast height) ≥ 10 cm were sampled. The DBH (to the nearest 0.1 cm), the distance from the middle of the stem to the point (to the nearest 0.1 m), and the species were recorded. These data provided the basis to place Yuhas Woods into a classification system devised by Lindsey et al. (1965). This study is part of a larger project examining the floral compositions of woody and herbaceous vegetation at Yuhas Woods. Nomenclature follows Gleason & Cronquist (1991).

A total of 29 species with a DBH ≥ 10 cm was

documented. The results from the top six most important species can be seen in Table 1. *Acer saccharum* ranked highest in relative importance due primarily to its high frequency of smaller-sized trees. *Quercus alba* and *Ulmus rubra* were the next most important and the only other species with relative importance values above 9.0. The high RIV of *Q. alba* was due principally to one very large stem (DBH = 77.7 cm), since its frequency was much less than *A. saccharum*. Similar to *A. saccharum*, the RIV of *U. rubra* was due to a high frequency of small stems. *Carya ovata* ranked fourth and was followed by a steady decline in RIV by *Prunus serotina* and *Carya cordiformis*. No other species in the upland woods had a RIV above 5.0. For later classification purposes, the RIV for all *Quercus* species (e.g., *Q. alba*, *Q. muhlenbergii* Engelm., *Q. palustris* Muenchh., *Q. rubra*, and *Q. velutina* Lam.) was calculated at 19.1, for all *Carya* species (e.g., *C. cordiformis*, *C. glabra* (Miller) Sweet, and *C. ovata*) at 14.5, and the RIV of *Fagus grandifolia* Ehrh. was 0.8.

According to Lindsey et al. (1965), for a wooded area to be classified as Oak-Hickory the total IV of *Quercus* spp. and *Carya* spp. must be double that of *Acer saccharum* plus *Fagus grandifolia*. Respectively, their IVs are 101.6 and 79.0. These IVs do not meet the requirements set down by Lindsey et al. (1965) for Yuhas Woods to be classified as Oak-Hickory; thus, it is best classified as a Mixed Woods. However, *Quercus* spp. and *Carya* spp. made up 33.6% of the overall RIV, overtopping the combined RIV of *A. saccharum* and *F. grandifolia* by almost 10.0%. Despite the data indicating a comparative IV not high enough to classify the woods as Oak-Hickory, the data do indicate that the oaks and hickories are of major importance.

Yuhas Woods may have once been classified as an Oak-Hickory forest. Yuhas has been selectively logged throughout its recent history, especially for oaks (Gibbons pers. commun.; Perkins pers. commun.). Selective harvesting of oak forests does not always promote oak re-establishment, and it may hasten the conversion of the land to another type of

Table 1.—Data for the upland forest of Yuhas Woods. Species are listed by the relative importance values. Density (DEN) is the number of stems per hectare. Relative density (RDEN) is the number of individuals of a species relative to the total number of trees expressed as a percent. Basal area (BA) is the meters squared per hectare of each species. Relative basal area (RBA) is the total basal area of a species relative to the total basal area of all species expressed as a percent. Frequency (FREQ) is the proportion of plots in which a species occurred relative to the total number of plots. Relative frequency (RFREQ) is the frequency of each species relative to all species expressed as a percent. Importance value (IV) is the sum of RDEN, RBA, and RFREQ. Relative importance value (RIV) is the average of RDEN, RBA, and RFREQ expressed as a percent.

Species	DEN	RDEN	BA	RBA	FREQ	RFREQ	IV	RIV
<i>Acer saccharum</i> Marsh.	137.5	31.7	6.3	21.1	0.7	23.7	76.5	25.5
<i>Quercus alba</i> L.	39.3	9.0	5.4	18.2	0.3	10.1	37.4	12.5
<i>Ulmus rubra</i> Muhl.	42.4	9.8	2.0	6.9	0.3	11.2	27.8	9.3
<i>Carya ovata</i> (Mill.) Koch	32.0	7.4	1.7	5.9	0.2	7.8	21.0	7.0
<i>Prunus serotina</i> Ehrh.	32.0	7.4	0.9	3.2	0.2	7.1	17.6	5.9
<i>Carya cordiformis</i> (Wang.) Koch	25.8	6.0	1.7	5.9	0.2	5.4	17.2	5.7

woods (Lorimer 1983). Also, it has been demonstrated that *A. saccharum* outcompetes *Quercus* spp. in small canopy gaps created by selective logging (Parker & Sherwood 1986). Another factor is the suppression of fire in this region since European settlement that may have kept many forests from reaching a climax community (Abrams 1992; McClain 1993). Oak forests are considered to be an early-to-mid stage of succession, with the next stage composed of more shade-tolerant but fire-intolerant trees such as *Acer saccharum* (Abram 1992). These factors make it probable that the lack of oak trees in Yuhas Woods is due to the past logging and fire suppression and, had more oaks been found, the total IV for *Quercus* spp. and *Carya* spp. would have doubled the total for *A. saccharum* and *F. grandifolia*.

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