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THE ROOTS OF TRADITION: SOCIAL ECOLOGY, CULTURAL GEOGRAPHY, AND MEDICINAL PLANT KNOWLEDGE IN THE OZARK-OUACHITA HIGHLANDS

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ABSTRACT. — This paper examines the ecological and cultural factors effecting medicinal plant use and knowledge in the Ozark-Ouachita Highlands of Missouri and Arkansas. Information on useful species was collected from 14 local experts in the Ozark and Ouachita Mountains, each from different communities evenly distributed between the two regions. Forest composition data were examined using the index of similarity in order to establish an overview of each region's distinct ecological characteristics. Despite the observed ecological differences, similar patterns of medicinal plant use emerge between the two regions, which is attributed to the persistence of shared traditions of plant use in the Highlands. Other informant-specific factors, such as length of experience with medicinal plants, and community-specific factors, such as geographic proximity to cosmopolitan centers, are also responsible for the observed variation in medicinal plant knowledge. It is suggested that the guardianship of medicinal plant knowledge and praxis in the Ozark-Ouachita Highlands—and elsewhere in the rural US—ultimately depends upon the interdependent processes of cultural and ecological conservation.

RESUMEN. — Este trabajo examina los factores ecológicos y culturales que afectan el uso y conocimiento de las plantas medicinales en la zona alta Ozark-Ouachita de Missouri y Arkansas, Estados Unidos de Norteamérica. Se colectó información acecra de especies útiles consultando a 14 especialistas locales en las montañas Ozark y Ouachita, cada uno de ellos de comunidades diferentes distribuídas uniformemente entre las dos regiones. Se examinaron datos acerca de la composición de los bosques empleando el índice de similitud para establecer un panorama general de las características ecológicas distintivas de cada región. A pesar de las diferencias ecológicas observadas, emergen patrones similares de uso de plantas medicinales entre las dos regiones, lo cual es atribuido a la persistencia de tradiciones compartidas de uso de plantas en la zona alta. Otros factores específicos a los informantes, tales como la duración de la experiencia con plantas medicinales, y factores específicos a las comunidades, tales como la proximidad geográfica a centros cosmopolitas, son también responsables de la variación observada en el conocimiento de las planta medicinales. Se sugiere que el resguardo del conocimiento de las plantas medicinales y su práctica en la zona alta Ozark-Ouachita — y en otras áreas rurales de los Estados Unidos — depende ultimadamente de los procesos interdependientes de conservación cultural y ecológica.

RÉSUMÉ. — Dans cet article, nous examinons les facteurs écologiques et culturels qui influencent l'utilisation et la connaissance des plantes médicinales dans les Hautes-Terres des Monts Ozark et Ouachita dans le Missouri et l'Arkansas. Des

données sur les espèces utiles ont été rassemblées auprès de 14 experts locaux des Monts Ozark et Ouachita, les informateurs provenant de communautés différentes également réparties dans les deux régions. Les données relatives à la composition des forêts ont été analysées en fonction d'un indice de similarité afin d'établir un portrait général des caractéristiques écologiques propres à chaque région. Malgré les différences écologiques observées, les deux régions montrent des modèles similaires d'utilisation des plantes médicinales, ce qui peut être attribué à la persistance des traditions communes d'utilisation des plantes dans les Hautes-Terres. D'autres facteurs spécifiques aux informateurs, tels que l'expérience des plantes médicinales, ainsi que des facteurs spécifiques aux communautés, tels que la proximité géographique de centres cosmopolites, peuvent aussi expliquer les variations observées dans la connaissance des plantes médicinales. Nous proposons que la protection des pratiques et des connaissances relatives aux plantes médicinales dans les Hautes-Terres des Monts Ozark et Ouachita et ailleurs, dans les milieux ruraux américains, dépend en fin de compte de processus interdépendants de conservation culturelle et écologique.

Ethnobotanical research has traditionally focused on the collection and documentation of cultural information on useful plants. In recent years, however, ethnobotanists have begun to explore the various factors that influence and sustain indigenous plant knowledge. That is, *how* do people engage in plant selection, and *why* do people know about the plants they do? To a certain extent, diversity and availability play a role in shaping ethnobotanical knowledge; human cultures are most cognizant of ambient plant species that are ecologically accessible (Brush 1996; Turner 1988). However, the abundance of a given species in nature does not necessarily ensure its use (Moerman 1979, 1989). As Nina Etkin has suggested, the construction of local pharmacopoeias occurs through carefully calculated plant selection, or "ascriptions of efficacy" (1988:28).

This paper examines the ecological, cultural, and socioeconomic factors that effect medicinal plant use in the Ozark and Ouachita Mountains of the Southern US. Natives of these mountains belong to the same Upper South cultural heritage, yet the two zones are quite distinct in terms of physiography and biogeography. For this reason, the Ozark-Ouachita Highlands provide a unique ethnographic location in which to research how medicinal plant knowledge among experts is effected by forest composition and regional plant availability.

Traditional ethnobotanical knowledge among European-Americans, including the native residents of the Ozark-Ouachita Highlands, is a relatively unexplored area of study. One of the goals of this paper is to describe the cultural and geographic continuity of medicinal plant use, a folk tradition that connects the Ozark-Ouachita region and to its cultural sources of Southern Appalachia and the British Isles. Because folk botanical knowledge is effected by more than ecology and tradition, this paper also examines a number of socioeconomic and demographic variables thought to be associated with its preservation.

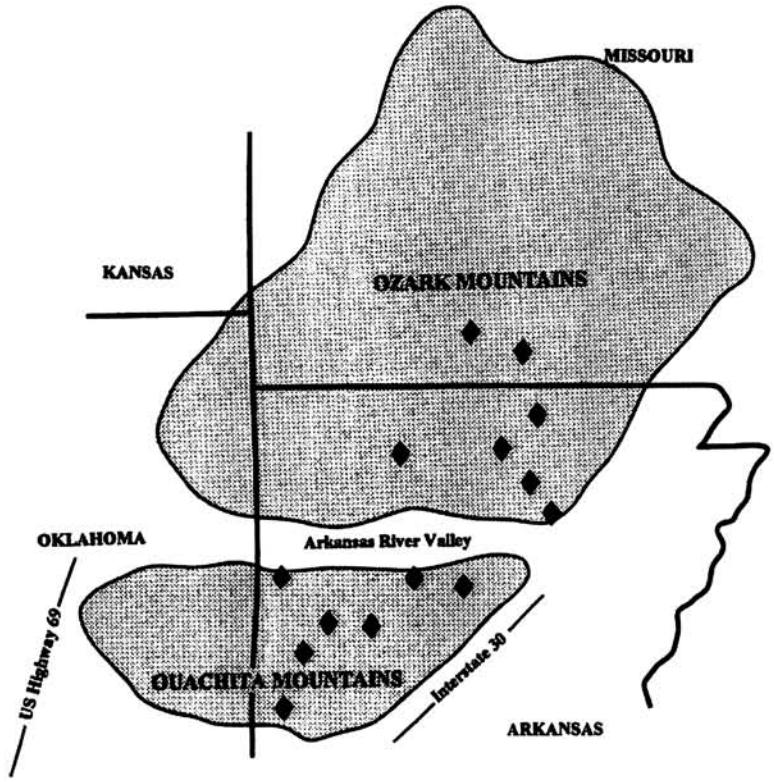


FIGURE 1. — Map of the Ozark-Ouachita study area (Markers represent location of communities visited.)

DESCRIPTION OF THE STUDY REGION

The Ozark and Ouachita Mountains comprise a remote, densely wooded region of America's heartland. Collectively known as the Interior Highlands of the United States, the combined area encompasses around 70,000 m^2 in four Midwestern states (Fig.1). Extending across 93 counties in Missouri, Arkansas, Oklahoma, and Kansas, the Ozarks cover nearly 50,000 m^2 (Rafferty 1980); the Ouachitas subsume around 20,000 m^2 across 37 counties within the states of Arkansas and Oklahoma (Rafferty and Catau 1991).

Physiographic features. — The Ozarks are a rugged region of hills and low mountains with elevations ranging from 250 to 2400 feet above sea level. Formed during the Early Paleozoic, the Ozarks are comprised of repetitive sedimentary rocks dissected into high hills and deep valleys through the process of watershed erosion (Unklesbay and Vineyard 1992). Mixed upland forest dominates the region's flora, which is rich and diverse due to the fertile limestone soils (Hunter 1989). A blend of oaks, hickories, maples, and shortleaf pines cover the Ozark hillsides, with the oak-hickory forest type predominating. The region's bottomland habitats are characterized by sweet-gum, sycamore, and river birch forest types (Ware *et al.* 1992; Hines 1988a).

In the Ouachita Mountains to the south, elevations range from 400 to 2800 feet at the highest peaks. Geologically much younger than the Ozarks, the Ouachitas were formed during the Late Paleozoic when the native bedrock underwent intensive structural folding and warping (Rafferty and Catau 1991; Hunter 1989). Characterized by long, parallel ridges running east to west, the Ouachitas are covered with thin, acidic soils which are generally less fertile that the Ozarks and consequently support fewer types and numbers of wild plant species (Hunter 1989). Vast stands of shortleaf and loblolly pine forests dominate the region's forests (Hines 1988b), which have been subjected to many decades of heavy timber extraction.

Cultural characteristics. — The cultural landscape of both the Ozark and Ouachita Mountains is colored by rural ways of life, marked by a retention of traditional Upper South customs and a resistance to change and modern technology (McNeil 1995; Rafferty and Catau 1991). Most natives of both Highland regions are white Protestants of Scotch-Irish descent (Gerlach 1986; Rafferty and Catau 1991; Rossiter 1992), described as resourceful people (Parker 1992) with a strong sense of identity (Randolph 1947), history (Rossiter 1992), and place (Rafferty 1987). Before the Civil War era, the dominant form of settlement adaptation in the region had been rural agriculturalism. The frontier migrants who settled both the Ozarks and the Ouachitas were European-American farmers from Southern Appalachia, specifically eastern Tennessee and Kentucky (Hensley 1987; Randolph and Wilson 1953). Not long after settling the region, the hill dwellers were branded with "hillbilly" stereotypes by virtue of their relative socioeconomic isolation (Sabo *et al.* 1990), a popular image still romanticized in American literature and film. However, like their Appalachian forebears, the contemporary hill people of the Ozarks and the Ouachitas remain somewhat separated from cosmopolitan cultural influences, which has fostered certain sociocultural traits including self-sufficiency, economic resourcefulness, and a distinctive regional dialect[1].

In a descriptive account of changing lifeways in the Ozark and Ouachita Highlands, Milton Rafferty identifies the salient characteristics of the Ozark-Ouachita cultural model, which include

> "clinging to the traditional technologies, a disdain for city life and education, a suspicion of outsiders, conservative politics...a reverence for outdoor activities...fundamental religious beliefs, with the persistence of traditional religious practices such as brush-arbor revivals and river baptisms...[and] a preference for traditional forms of entertainment and music" (Rafferty 1987:7).

Sadly, however, folk culture is vanishing in the Ozarks and the Ouachitas. Natives have begun to abandon traditional lifeways in favor of mainstream technology, modern services, and a more "progressive" worldview. The Highland economy has diversified from subsistence farming to include the large scale cultivation of corn, cotton, and livestock, along with the industries of lead mining, lumbering, tourism, and recreation (Rafferty 1980; Rafferty and Catau 1991). Economic growth and improved education have had mixed effects within the Ozarks and Ouachitas, bringing progress and money to the region yet causing the gradual dissimilation of vernacular culture.

Nonetheless, some Highland natives are resolute about maintaining deliberately independent and simple lifestyles, especially in the more remote mountain communities. In these isolated places, people continue to practice a number of time-honored cultural traditions. One of these is the custom of using wild plants for medicinal purposes. Much like the folk medicine of Southern Appalachia, medicinal plant use in the Ozarks and Ouachitas involves the direct procurement of wild plants and roots from the woods and using them to create a variety of medicinal extracts and decoctions (e.g., Gibbens 1992). It is deep in the forests where locals believe the most powerful medicines can be found.

RESEARCH METHOD AND DESIGN

Forest composition analysis. — In order to establish the different ecological character of the Ozarks and Ouachitas, forestry data were compiled and examined prior to conducting the ethnographic work. Statistical analysis was performed using raw forestry data supplied by the US Department of Agriculture. These documents provided detailed counts of trees based on grid sample estimates for forest survey locations covering 3,840 acres in the Ouachitas and 3,840 acres in the Ozarks (Foti and Devall 1994; Hines 1988a, 1988b). From these raw data, an index of similarity was calculated as a means of identifying differences in species abundance, variety and dominance that characterize the flora of the Ozarks and Ouachitas. In addition, the herbaceous and woody species associated with the dominant forest types of each region were compiled to establish the general differences in plant availability between the two zones.

Selection and interviewing the informants. — Fourteen communities across the Ozarks and Ouachitas were visited during the summers of 1995 and 1996. Communities are evenly distributed between the two regions. These locales, situated within counties classified as "Ozark" or "Ouachita" by Rafferty (1980) and Rafferty and Catau (1991), were chosen on the basis of relative geographic isolation from major cities and interstate highways. Twelve of the communities are located in western and northern Arkansas; two lie in southern Missouri.

One key informant in each community was selected according to local reputation[2] (Martin 1995). Nine of the 14 informants are elderly females, known locally as *granny women*, who offer plant-based therapy to all comers, usually free of charge. Granny women gather plants directly from the woods and roadsides near their homes, although some will travel short distances to obtain the plants that do not grow close by. After collecting the plants they need, the granny-women will either prepare them into hot infusions for internal use by steeping the plants in boiling water, or prepare poultices for external application by drying the plants outdoors and later crushing the leaves and mixing them with substances such as lard or vegetable oil.

The other five informants are males of mixed ages. Three call themselves *yarb doctors*, a colloquial term for male practitioners who specialize in combining wild botanicals with a number of household items such as liquor, honey, turpentine, milk, oil, vinegar, and salt. Like the granny-women, yarb doctors readily offer their expertise to any community member in need. The remaining two informants

are expert *root-diggers* who earn a living by collecting the medicinal roots of young trees and shrubs and selling them to wholesale drug buyers or local store owners. Each of the 14 informants gather their own plants rather than cultivating them or purchasing them from outside sources.

Unlike larger ethnobotanical surveys that document knowledge variation on a regional or community level (e.g., Benz *et al.* 1994), only local plant *specialists* were consulted during this project. Non-experts ("lay" plant users), whose knowledge is potentially different from that of the plant experts, were not interviewed. Hence, this study addresses the esoteric (specialized) knowledge of medicinal plants versus the *exoteric* (common) knowledge of the broader community.

During semistructured interviews, all informants completed a free list task (Bernard 1994; Robbins and Nolan 1997) designed to elicit the common names of culturally significant medicinal plants. Free listing, an effective survey tool for ethnobotanists (Martin 1995), was the primary mode of inquiry into the nature of medicinal plant use. Once the informant had completed the free list task, she or he was asked to list all of the ways that each listed plant could be used to treat illnesses[3]. The informant was also asked to indicate which part of the plant is used and how it is prepared for use by the patient. Finally, informants were asked to describe the attributes of each listed plant (leaf shape, flowering time, etc.) to aid in the formal identification of reported species. Ethnobotanical data collection resulted in (1) an exhaustive list of medicinal plant names, (2) the corresponding applications, (3) the name of the useful plant part, (4) the method of preparation, and (5) a physical description. Additional ethnographic information, including informant age, length of residence in community, and length of experience in curing or plant procurement was also collected during interview sessions.

Data analysis. — Each reported plant was identified to species level by consulting floral keys (Hunter 1984, 1989; Moore 1988; Denison 1991) and by cross-checking the published species descriptions against those supplied by the informants. The natural habitats for each reported species were documented in order to determine the relationship between ecological presence and local knowledge of plants. The distribution of plant reports was analyzed and compared to inventories of locally available understory species in each zone to further assess the association between vernacular plant knowledge and availability. In addition, a number of relevant sociodemographic variables pertaining to the informants and their home communities were examined to identify how regional geography and economy effect medicinal plant use and knowledge throughout the study area.

REGIONAL FOREST COMPOSITION

Index of similarity. — In order to assess the ecological characteristics of each region, the index of percent similarity (S) was used. The index of similarity offers a good way to assess regional differences in floral assemblages between two forest communities. By taking into account both richness (the number of species represented) and evenness (the abundance of individuals within species) the index of similarity integrates two of the three principal components of diversity[4]. For each species present in the sample, a proportion is calculated by dividing the number of indi-

viduals by the sum total of individuals in the inventory. Accordingly, S is calculated as follows:

$$S = 1 - \frac{1}{2}\Sigma | P_a - P_b |$$

where P_a is the proportion of each species inventoried in the Ozark forests and P_b the proportion of each tree species documented in the Ouachita forests. The index generates a value ranging between 0 and 1, where 1 indicates perfect similarity and 0 indicates perfect dissimilarity between two forest communities.

A similarity index of 0.787 was computed for the two forests (see Table 1 for calculations of percent presence for all species present in both samples). Although this value does not suggest a dramatic difference between the two forest regions, the index reveals two clear points. First, the Ozarks are richer in species than the Ouachitas, and similarly show a higher level of evenness. Secondly, there is a notable contrast in species composition that differentiates the two regions. To illustrate: the Ozarks contain high percentages of hickory (15.44%) and other hardwoods (22.28%), with a low percentage of pine varieties (7.06%). In the Ouachitas, shortleaf and loblolly pine dominate by an enormous margin (24.84%), while hickory

TABLE 1. — Calculation of index of similarity for Ozark and Ouachita forests.

	Ozarks		**Ouachitas**		
Species	Number*	% (P_a)	Number*	% (P_b)	$\lvert P_a - P_b \rvert$
Shortleaf-loblolly pine	256943	7.064	513678	24.842	17.778
Cypress	1512	0.042	898	0.043	0.001
Other softwoods	255568	7.026	53316	2.578	4.448
Select white oaks	324041	8.908	157858	7.634	1.274
Select red oaks	104386	2.869	56764	2.745	0.142
Other white oaks	274144	7.537	157724	7.268	0.269
Other red oaks	281990	7.753	100568	4.864	2.889
Hickory	561743	15.443	241913	11.699	3.744
Hard maple	61497	1.691	5572	0.269	1.422
Soft maple	119916	3.296	63914	3.091	0.205
Beech	10776	0.296	9	0	0.296
Sweet gum	65131	1.791	96100	4.648	2.857
Tupelo-blackgum	147054	4.043	81981	3.965	0.078
Ash	61918	1.702	30569	1.478	0.224
Cottonwood-aspen	42	0.001	20	0.001	0
Basswood	3840	0.106	3276	0.158	0.052
Yellow poplar	46	0.001	0	0	0.001
Black walnut	8633	0.237	0	0	0.001
Other hardwoods	810322	22.278	317318	15.346	6.932
Noncommercial	287884	7.915	186262	9.008	1.093
Σ(all species)	3637386		2067742		

$\Sigma|P_a - P_b|$
Index of similarity $[S = 1 - \frac{1}{2}\Sigma | P_a - P_b |] = 0.79$

*per 3,840 acres of forested land in each region
Sources: Foti and Devall 1994; Hines 1988a, 1988b

and other hardwoods are relatively less abundant (11.70% and 15.34%, respectively). Nearly all of the Ozarks' hardwood proportions exceed those found in the Ouachitas, a reflection of the high percentage of softwood in the Ouachita mountain forests. At the outset, the index of similarity reflects only a moderate difference between the two regions' proportions of tree assemblages. Yet the species counts reveal that the Ozark forests contain several species not found in the Ouachitas, such as beech, tupelos, magnolias, yellow-poplars, and a variety of locusts and elms (Hinds 1988a, 1988b). Ecologists have determined that the Ozarks are home to a greater number of forest types, such as the oak savanna and the cedar glade communities, which appear abundantly throughout the Missouri Ozarks and less frequently across the Ouachitas (Vogele 1990).

Unfortunately, systematic forest surveys such as those employed in this study do not inventory the understory plants growing in an area; therefore, it is impossible to calculate a complete species-by-species percent similarity index that compares all aspects of plant growth between the Ozarks and Ouachitas. However, certain important inferences about the overall nature of plant availability can be drawn from the data. Biologists report that the herbaceous layer of forests

TABLE 2. — Commonly occurring herbaceous and woody plants in dominant forests of the Ozark and Ouachita Mountains.

Region and Forest Type	*Herbaceous Plants*	*Woody Plants*
Ozarks	Violet	Woodbine
(Oak-hickory and Mixed	Tick trefoil	Grape
Hardwood Dominant)	Bedstraw	Coralberry
	Snakeroot	Bluebeech
	Aster	Hickory
	Sorrel	Greenbrier
	Skullcap	Redbud
	Bidens	Red elm
	Mint	Dogwood
	Ironweed	Paw paw
	Black cohosh	Witch Hazel
	Hound's tongue	Maple
	Jewelweed	Ironwood
	Ginseng	
	Golden Seal	
Ouachitas	Lespedeza	Blueberry
(Pine Dominant)	Tick trefoil	Hickory
	Aster	Sassafras
	Pussy's toes	Black oak
	Cinquefoil	White oak
	Goat's rue	Post oak
	Dittany	Grape
	Spurge	Brambles
	Sunflower	Woodbine
	Mint	Goldenrod

Sources: Hunter 1984, 1989; Murphy and Crawford 1970; Murphy and Ehrenreich 1965; Read 1951.

is structurally dependent on the nature of the forest itself (Falinska 1985). To illustrate, factors such as overstory crown cover, which is greater in hardwood forests than pine forests (Murphy and Crawford 1970), are known to effect the growth patterns of understory species (Ehrenreich and Crosby 1960). Table 2 lists the most abundant herbaceous and woody plant species associated with the oak-hickory forests of the Ozarks and the pine forests which dominate the Ouachitas. As shown in Table 2, the two regions provide a natural habitat for quite different assemblages of understory species and woody taxa. In general, the forest habitat of the Ozarks is suitable for a greater number and diversity of shade tolerant plants, given the higher percentage of crown closure that characterizes the locally dominant oak-hickory woodlands. Deciduous forests of this variety are thought to be optimal sources for medicinal plant procurement because the herbaceous layer of understory growth is characteristically lush and more continuous than other forest types (Price 1998; Raitz and Ulack 1984). Although there is some overlap between the kinds of plants associated with each of the two study zones, the pine woodlands of the Ouachitas provide fewer kinds and numbers of trees and herbs than the Ozark forests (e.g., Hunter 1989).

The natural landscape of these Highlands offers an interesting distinction in terms of regional plant geography. The differences in growth patterns of understory and woody plants could potentially effect the cultural use and knowledge of wild medicinal species by local experts. However, despite this observed ecological contrast, the following discussion will show that similar patterns of medicinal plant selection and use are found among experts between the two regions.

RESULTS AND DISCUSSION

Thirty-nine medicinal plant names were collected from the 14 informants. The length of each informant's list of plants varied from 4 to 15 plant names, with a median of 9.5. A total of 129 reports were made. Informants reported a mean of 9.21 plants, with a standard deviation of 3.19 and a coefficient of relative variation (CRV) of .346. A total of 224 different plant applications were recorded (see Appendix for applications of reported plants). The number of applications reported varied from 6 to 26, with a median of 16. The average number of applications per informant was 16, with a standard deviation of 6.71 and a CRV of .419.

The distribution of medicinal plant reports. — Ozark informants reported a higher number of medicinal plants on average (11.29 per informant) than those of the Ouachitas (7.14 per informant). Of the 129 reports of medicinal plant names collected from all informants, 61% of the reports were supplied by Ozark informants, while the Ouachita informants provided 39% of the total. The distribution of reported plant applications closely parallels the distribution of reported plant names, with 59% of the 224 applications given by Ozark informants and 41% supplied by Ouachita informants.

Table 3 lists all of the medicinal plants reported by informants in alphabetical order with both scientific and vernacular names. Listed alongside each species are the number and percentage of informants reporting the plant. Corresponding percentages were calculated by dividing each number of reports by 14, the total number

TABLE 3. — Frequency of mention for reported medicinal plants.

Species	Vernacular Name	Family	Number of Informants	Percent of Informants Reporting
Impatiens capensis L.	Jewelweed	Balsaminaceae	11	79%
Podophyllum peltatum L.	May Apple	Berberidaceae	8	57%
Sassafras albidum Nees	Sassafras	Lauraceae	8	57%
Eryngium yuccafolium L.	Snakeroot	Apiaceae	7	50%
Prunus serotina L.	Black Cherry	Rosaceae	7	50%
Rhus aromatica L.	Sumac	Anacardiaceae	6	43%
Juniperus virginiana L.	Juniper	Cupressaceae	6	43%
Prunella vulgaris L.	Heal-All	Lamiaceae	6	43%
Phytolacca americana L.	Pokeweed	Phytolaccaceae	6	43%
Zanthoxylum americanum L.	Toothache Tree	Rutaceae	6	43%
Juglans nigra L.	Black Walnut	Juglandaceae	5	36%
Magnolia tripetala L.	Magnolia	Magnoliaceae	5	36%
Rubus spp.	Blackberry	Rosaceae	5	36%
Panax quinquefolius L.	Ginseng	Araliaceae	4	29%
Tilia americana L.	Basswood	Tiliaceae	4	29%
Betula nigra L.	River Birch	Betulaceae	3	21%
Hamamelis virginiana L.	Witch Hazel	Hamamelidaceae	3	21%
Monarda spp.	Mint, Horsemint	Lamiaceae	3	21%
Hydrastis canadensis L.	Golden Seal	Ranunculaceae	3	21%
Carya texana Nutt.	Hickory	Juglandaceae	3	14%
Myrica cerifera L.	Wax Myrtle	Myricaceae	2	14%
Ulmus rubra L.	Slippery Elm	Ulmaceae	2	14%
Arisaema atrorubens Mart.	Indian turnip	Araceae	1	7%
Asclepias sp.	Milkweed	Asclepiadaceae	1	7%
Solidago sp.	Goldenrod	Asteraceae	1	7%
Alnus serrulata Mill.	Alder	Betulceae	1	7%
Lithospermum incisum L.	Yellow Puccoon	Boraginaceae	1	7%
Lobelia sp.	Lobelia	Campanulaceae	1	7%
Cornus sp.	Dogwood	Cornaceae	1	7%
Castanea pumila Mill.	Chinquapin	Fagaceae	1	7%
Geranium sp.	Crane's Bill	Geraniaceae	1	7%
Liquidambar styracifula L.	Sweet Gum	Hamamelidaceae	1	7%
Allium stellatum L.	Wild Onion	Liliaceae	1	7%
Morus rubra L.	Mulberry	Moraceae	1	7%
Fraxinus quadrangulata L.	Blue Ash	Oleaceae	1	7%
Passiflora incarnata L.	Passion Flower	Passifloraceae	1	7%
Rhamnus caroliniana L.	Buckthorn	Rhamnaceae	1	7%
Populus alba L.	Poplar	Salicaceae	1	7%
Salix sp.	Willow	Salicaceae	1	7%

TABLE 4. — Regional distribution of medicinal plant reports.

		Number of Informants Reporting	
Species	Vernacular Name	Ozarks	Ouachitas
Impatiens capensis L.	Jewelweed	7	4
Podophyllum peltatum L.	May Apple	5	3
Sassafras albidum Nees	Sassafras	3	5
Eryngium yuccafolium L.	Snakeroot	5	2
Prunus serotina L.	Black Cherry	4	3
Rhus aromatica L.	Sumac	2	4
Juniperus virginiana L.	Juniper	5	1
Prunella vulgaris L.	Heal-All	4	2
Phytolacca americana L.	Pokeweed	4	2
Zanthoxylum americanum L.	Toothache Tree	2	4
Juglans nigra L.	Black Walnut	2	3
Magnolia tripetala L.	Magnolia	3	2
Rubus spp.	Blackberry	3	2
Panax quinquefolius L.	Ginseng	4	0
Tilia americana L.	Basswood	2	2
Betula nigra L.	River Birch	1	2
Hamamelis virginiana L.	Witch Hazel	2	1
Monarda spp.	Mint, Horsemint	1	2
Hydrastis canadensis L.	Golden Seal	3	0
Carya texana Nutt.	Hickory	2	0
Myrica cerifera L.	Wax Myrtle	2	0
Ulmus rubra L.	Slippery Elm	1	1
Arisaema atrorubens Mart.	Indian turnip	0	1
Asclepias sp.	Milkweed	1	0
Solidago sp.	Goldenrod	0	1
Alnus serrulata Mill.	Alder	1	0
Lithospermum incisum L.	Yellow Puccoon	1	0
Lobelia sp.	Lobelia	0	1
Cornus sp.	Dogwood	1	0
Castanea pumila Mill.	Chinquapin	1	0
Geranium sp.	Crane's Bill	0	1
Liquidambar styraciflula L.	Sweet Gum	1	0
Allium stellatum L.	Wild Onion	0	1
Morus rubra L.	Mulberry	1	0
Fraxinus quadrangulata L.	Blue Ash	1	0
Passiflora incarnata L.	Passion Flower	1	0
Rhamnus caroliniana L.	Buckthorn	1	0
Populus alba L.	Poplar	1	0
Salix sp.	Willow	1	0
Total Number of Reports Per Region		79	50
Mean Number of Reports Per Informant		11.3	7.1

Correlation Coefficient = .48, $p < .01$.

of informants in the sample. The regional distribution of medicinal plant reports is given in Table 4, which lists the plants according to the number and location of informants reporting use. For the 22 plants listed by more than one informant, the number of reports are divided rather evenly between the two informant groups. Only two of these plants, golden seal (*Hydrastis canadensis*) and ginseng (*Panax quinquefolius*), were reported exclusively in the region to which they are ecologically restricted — the Ozarks. All of the remaining medicinal plants listed by informants generally occur in wide distribution across both regions (Denison 1991; Hunter 1984, 1989). A rank order correlation analysis was performed on the plant reports to measure the degree of informant agreement on medicinal plant use. A highly significant correlation coefficient was found ($r_s = .48$, $p < .01$), which suggests that informants from both areas are essentially familiar with the medicinal properties of the same constellation of plants. The high level of informant agreement regarding these species' usefulness is probably the result of cultural assimilation of medicinal plant knowledge and the persistence of shared traditions of plant use.

Shared traditions of medicinal plant use. — A number plants commonly mentioned by informants can be traced historically to the pharmacopoeia of Southern Appalachia and beyond to the traditional plant lore of the British Isles. Sassafras (*Sassafras albidum*), one of the most commonly mentioned plants in both the Ozarks and the Ouachitas, has had widespread use as a hematic, or blood-building, herb by the frontier settlers of Appalachia, who learned much about healing plants from the native Cherokee Indians (Williams 1995). Informants in the Ozark and Ouachita Highlands similarly referred to the plant as a good treatment for purifying the blood and for reducing fever and body pain. The root of the young tree is still known to bring an appreciable price on the crude drug commercial market (Price 1998). The bark of wild black cherry (*Prunus serotina*) was frequently mentioned by Ozark and Ouachita experts for treating coughs and colds. The medicinal use of wild black cherry bark can also be traced to Southern Appalachia, where it has been widely used by folk healers as the chief component of cough syrups and cold remedies (Price 1998; Williams 1995). The less abundant ginseng and golden seal, which share similar habitats of undisturbed forests, have also been gathered extensively by the root-diggers and traditional healers of Appalachia (Price 1998). Ginseng was traditionally used by the Cherokee Indians for headaches and muscle cramps, while the Europeans of Appalachia and the Ozarks have adopted its use as a cure for fatigue and general malaise. Golden seal has been used in Appalachia to combat stomach pain and venereal diseases. In the Ozarks, the plant is similarly reported as a treatment for stomach pain, but it is also reported as a cleansing agent for infections and blood impurities. Several other plants reported by experts from both regions have been used in the same way by traditional Appalachian practitioners, including may apple (*Podophyllum peltatum*), slippery elm (*Ulmus rubra*), snakeroot (*Eryngium yuccafolium*), river birch (*Betula nigra*), pokeweed (*Phytolacca americana*), and toothache tree (*Zanthoxylum americanum*) (Allen 1995; Williams 1995; Price 1998).

Interestingly, a number of other reported species were important in the traditional medical culture of the British Isles. Blackberry (*Rubus* sp.) was highly

regarded in Scotland as a treatment for burns, gout, rheumatism; it was also coveted for its reputed power to protect the soul against evil spirits (Freethy 1985). Its folk use survives today in the Ozarks and Ouachitas, but only as a treatment for cold and flu symptoms. Heal-all (*Prunella vulgaris*), also known as woundwort, is native to Britain and Europe, and its use as a panacea for mouth ulcers in the Ozarks and Ouachitas was well known in the folk medicine of Britain and Ireland (Freethy 1985). Relatives of the Anglo-American black walnut, reported in this study as useful for stopping diarrhea and treating ringworm, have been used for many generations by folk medical experts in Great Britain (Rudd 1990). Slippery elm, ash, and juniper also appear in the native pharmacopoeias of Scotland and Ireland (Freethy 1985; Rudd 1990). Not surprisingly, the original applications for some of these plants have changed across time and space. Yet the contemporary inhabitants of the Ozarks and Ouachitas maintain a number of the same uses known by the Appalachian mountaineers and their Scotch-Irish predecessors. The cultural continuity of these shared traditions of plant use may account for the response pattern observed in the free-list task.

Knowledge variation. — While similar plant use patterns are evident among informants, considerable variation exists regarding the practitioners' knowledge of medicinal plants. Table 5 presents data on geographic and socioeconomic variables for the 14 informants and their respective home communities, including region (Ozark or Ouachita), distance from the nearest urban center of 50,000, informant age, sex, length of residence in community, and number of years of experience with plants as a folk practice. The number of plants and applications mentioned

TABLE 5. — Sociodemographic data for communities and informants.

Community Data			Informant Data			Medicinal Plant Data	
Informant/ Community	Region	Miles from Urban	Age and Sex	Length of Residence in Community	Length of Folk Practice	Number of Plants Reported	Number of Apps. Reported
1	Ouachita	56	76/ F	9	9	6	11
2	Ouachita	66	61/ F	50	15	4	6
3	Ouachita	52	65/ M	15	5	6	9
4	Ouachita	64	86/ F	60	10	7	8
5	Ouachita	89	77/ F	20	20	9	19
6	Ouachita	86	70/ M	45	20	8	16
7	Ouachita	81	79/ F	79	40	10	22
		Mean = 70.6	Mean = 73.4	Mean = 39.7	Mean = 17	Mean = 7.1	Mean = 13
8	Ozark	127	80/ F	80	60	12	19
9	Ozark	115	67/ F	58	50	12	25
10	Ozark	106	47/ M	47	30	10	16
11	Ozark	50	74/ M	74	50	6	8
12	Ozark	83	36/ M	36	16	11	16
13	Ozark	95	70/ F	70	50	13	23
14	Ozark	97	78/ F	78	60	15	26
		Mean = 96.1	Mean = 64.6	Mean = 63.3	Mean = 45.1	Mean = 11.3	Mean = 19

by each informant are also listed. As depicted in Table 5, the most expert of the informants are generally the granny-women, who provided the most information (numbers of plants and numbers of applications) about native medicinals.

A close examination of the data shows that the most knowledgeable of the granny-women are those who have lived for longer periods of time in their respective communities. It is these informants who have the most years of experience in curing with medicinal plants. When compared to the younger, less experienced male experts in the sample, granny-women emerge as true compendiums of botanical knowledge. This finding supports Wilkinson (1987), who suggests that folk medical knowledge in America has traditionally been the domain of elderly, experienced women whose social roles as healers have been essential within families in rural communities, much like the village *wise women* who served as folk curers in Old World History (McDonough 1975). Figure 2 illustrates the regression correlation between the length of folk practice (years of experience with wild plants) and the number of medicinal plant applications reported per informant. The r-squared value of .45 is highly significant ($p < .01$) and suggests that length of

FIGURE 2 — Correlation between length of informant experience in folk practice and level of medicinal plant knowledge demonstrated.

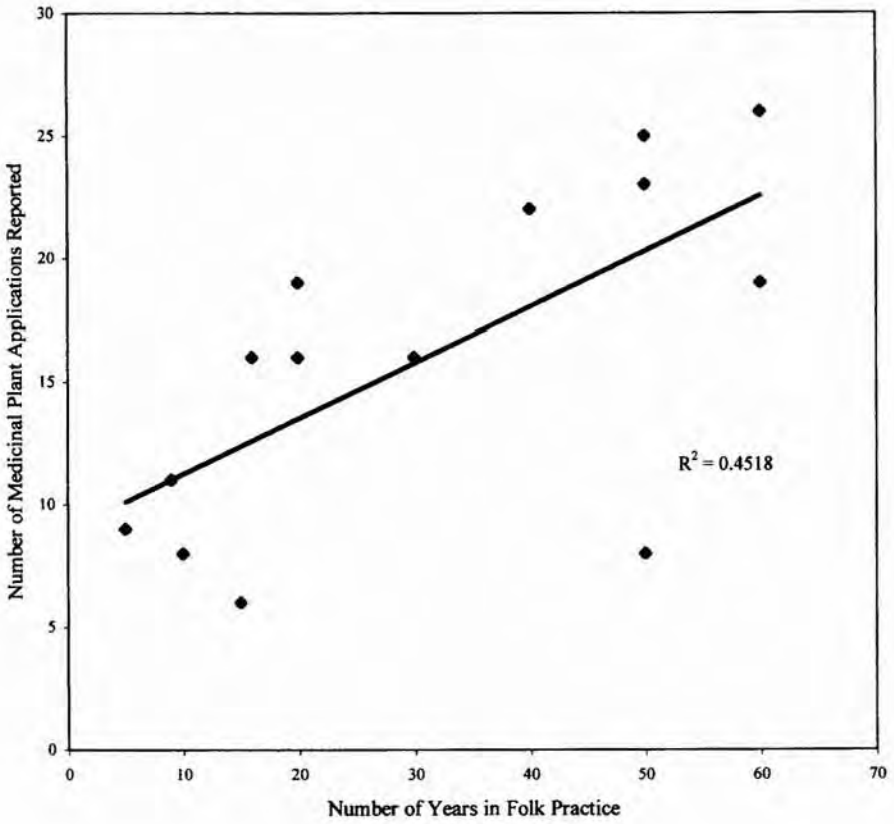
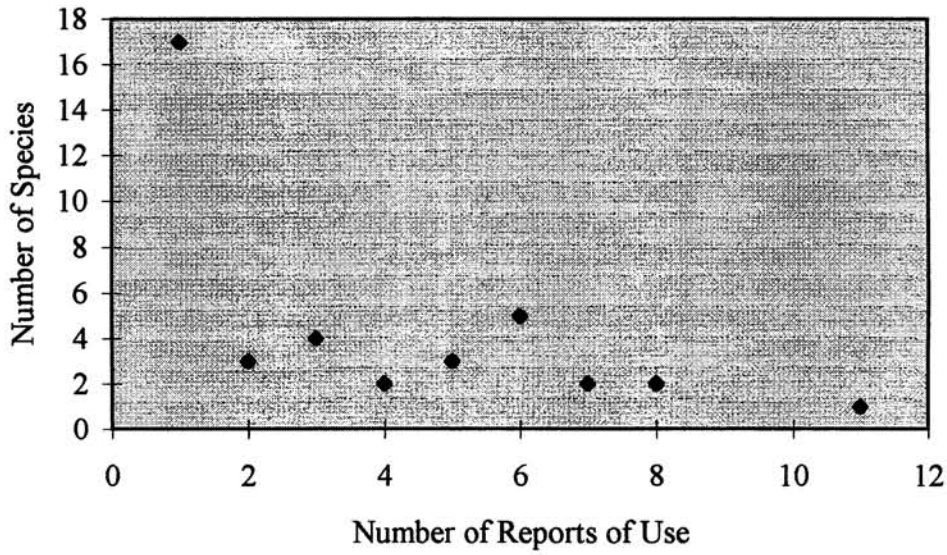


FIGURE 3 — Abundance diagram illustrating the number of reports of use for all species listed.



informant experience with plant procurement may explain the variance in the number of medicinal plant applications reported by experts from both regions.

Folk specialties and expert knowledge. Figure 3 displays the distribution of medicinal plant reports, or the number of reports of use for the plants mentioned in the free-list task. As is commonly observed in ethnobotanical inventories, several plants received only one report of use by a single informant. This pattern may be a reflection of the dissimilation of traditional knowledge (e.g., Benz *et al.* 1994), or alternately, a function of knowledge specialization among expert informants. For instance, throughout the interview process, it became evident that some experts, especially the granny-women, are fundamentally more experienced in treating certain kinds of health problems. Some granny-women specialize primarily in childhood diseases (i.e., colic, thrush) while others are more knowledgeable about treating chronic conditions associated with aging (i.e., rheumatism, arthritis). Experts with specialized knowledge listed more unique plants with medicinal applications in their corresponding area of expertise.

In contrast to the granny women who rely chiefly upon plant-based remedies, the male yarb doctors use a number of nonbotanical ingredients in their healing concoctions such as turpentine, whiskey, oils, and other solvents in which different plant parts are steeped or boiled (e.g., Randolph 1947). The knowledge of the yarb doctor frequently overlaps with that of the granny-woman, but appears have a more arcane and esoteric orientation. The root-diggers, who represent the youngest informants consulted in the sample, have the fewest years of experience with plants, which probably explains why these individuals supplied the fewest names and applications for wild medicinals. Unlike the folk medical practitioners, root-diggers do not generally act as dispensaries of medical knowledge within their

communities. Rather, root-diggers focus on procuring a limited number of plants, namely those that will bring an attractive price from commercial drug buyers. Thus, the folk specialty of the informants and their respective relationships with plants appear to have a significant effect on the level and type of knowledge reported.

Demographic and socioeconomic influences. — In a separate study on the cultural conservation of medicinal plant use in the Ozarks and Ouachitas (Nolan and Robbins, in press), a multiple regression analysis was performed using the number of plant applications reported and six relevant socioeconomic variables which include, in descending order of importance, 1) community distance from urban centers of 50,000, 2) number of county physicians, 3) yearly county retail sales, 4) county population density, 5) percent of county population over age 18, and 6) acres of county farms. A partial correlation analysis was performed to determine the relative order of magnitude for each variable. The partial correlation coefficients revealed that community distance from urban centers is the best predictor variable for the number of medicinal plant applications reported. In the same study, a multiple correlation coefficient of 0.84 was found, which indicates that a promising 71% of the variance in numbers of applications reported can be explained by the six variables combined.

As presented in Table 5, the Ozark communities in the study are essentially more isolated from cosmopolitan cultural influences than those in the Ouachita region. The average distance to the nearest urban location is 96.1 miles for Ozark communities and 70.6 miles for those in the Ouachitas, a difference which is statistically significant ($t = 2.34$, $p < .02$). Also responsible for the higher number of plants and applications reported in the Ozarks is length of folk practice among the experts. On average, Ozark informants have more experience with plants (45.1 years) than the Ouachita informants (17 years). This difference in means is very significant ($t = 3.7$, $p < .003$) and suggests that length of plant-based experience is useful for explaining the variation in medicinal plant knowledge *between* the two regions in addition to the variation observed among all fourteen informants.

Traditional knowledge and delocalization. In essence, the survival of traditional plant knowledge in the Ozarks and Ouachitas is inversely linked to what has been called *delocalization*. Delocalization is a form of modernization in which the members of a socioeconomic system become increasingly dependent upon exogenous, commercially distributed technologies (Pelto 1973:165). In the more delocalized Ouachita communities, experts offered far fewer names and treatments for native medicinal plants. Evidently, traditional botanical expertise has faded in the wake of cosmopolitan cultural influences, including the accessibility of trained health care professionals and the availability of modern medicine. Conversely, most of the Ozark communities are relatively detached from the larger framework of state socioeconomics. Often there are no physicians, clinics, or health services available within these isolated locales. The lack of health-care options, combined with light commerce, low population density, and age-old patterns of individual self-sufficiency, combine to explain the greater retention of traditional medical knowledge among experts from the Ozark region.

CONCLUSION

While the ecological contrast between the Ozarks and Ouachitas is quite apparent, this disparity has little effect on medicinal plant knowledge and use among local specialists. This conclusion is supported by two observations: (1) there is a highly significant correlation in plant use patterns between the informants from both regions, and (2) the vast majority of the reported plants occur in broad distribution across the entire Ozark-Ouachita study area, despite the apparent ecological heterogeneity. Vernacular knowledge of medicinal flora in the Highlands is therefore a construct of several interrelated sociodemographic and cultural factors. The length of the informants' experience with plants and the proximity of their home communities to cosmopolitan centers are the most sound explanations for the variation in medicinal plant knowledge observed among the experts consulted. On the collective level, however, common patterns of medicinal plant use endure among informants from both regions. The combined Ozark-Ouachita pharmacopoeia contains many of the same plants still in use among the hill dwellers of Southern Appalachia, the region's most proximal cultural source area. Some of the reported species were historically significant in the traditional medicine of the British Isles, the ancestral homeland for many contemporary hill folk in the Interior Highlands. This cultural perpetuation of medicinal plant knowledge indicates that firmly rooted social and historical traditions are important factors accounting for the similarity in plant use patterns.

There are few studies that document the use of wild plant resources in the American Interior. A wealth of ethnobotanical information remains untapped across the backwoods of the Midwest, and the need to recover it is hastened by the dissolution of rural family life and the social effects of modernization (Nearing 1996). The notion that medicinal plant knowledge is a construct of cultural factors first and ecological factors second bears important implications for future studies in ethnobotany. Researchers should acknowledge that the survival of traditional lifeways and knowledge is dependent upon a number of interconnected socioeconomic, demographic, and ecological variables. By recognizing this, it may be possible to safeguard irreplaceable knowledge on our forests' native species and to design policies for conserving the cultures that harbor this information.

NOTES

[1]In a study of the folk speech patterns of the Interior Highlands, Randolph and Wilson (1953) group the people of the Ozarks and Ouachitas together because they share similar vernacular dialects; this is considered a function of common ancestry and folk heritage. Other folklorists who have studied the customs and beliefs of the people of the Ozarks and Ouachitas similarly describe them as members of the same Upland South cultural tradition (e.g., Brown 1992; McDonough 1975; Randolph 1964).

[2]Like other studies based on a relatively small sample of informants, it is presumed here that each expert represents the *minimum* level of esoteric knowledge within their respective communities.

[3]All medicinal plant applications given by the informants were indicated for the straightforward relief of symptoms or illness resolution.

[4]In addition to richness and evenness, there is a third component of diversity-density: the size of each species population. The nature of the available data called for an index that takes into account richness and evenness as a comparative measure of diversity.

[5]The high concentration of softwood in the Ouachita mountains is also a result of years of intensive timber extraction by regional lumber industries. The Ozarks, by contrast, have been subjected to less timber removal over recent decades, resulting in a somewhat more pristine woodland region.

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APPENDIX. — Inventory of reported plants and medicinal applications.

Family	Species	Common Name	Medicinal Use(s)	Part(s) Used
Anacardiaceae	*Rhus aromatica L.*	Sumac	colds, fevers, diarrhea	berries, leaves
Apiaceae	*Eryngium yuccafolium L.*	Snakeroot	snakebite	roots
Araceae	*Arisaema atrorubens Mart.*	Indian turnip	asthma, rheumatism	roots
Araliaceae	*Panax quinquefolius L.*	Ginseng	stimulant, cure-all	roots
Asclepiadaceae	*Asclepias sp.*	Milkweed	kidney pain, warts	plant
Asteraceae	*Solidago sp.*	Goldenrod	indigestion, fatigue	flowers, leaves
Balsaminaceae	*Impatiens capensis L.*	Jewelweed	poison ivy	leaves
Berberidaceae	*Podophyllum peltatum L.*	May Apple	colds, fevers	fruit
Betulaceae	*Betula nigra L.*	River Birch	wounds, urinary pain	bark
Betulceae	*Alnus serrulata Mill.*	Alder	sore throat	inner bark
Boraginaceae	*Lithospermum incisum L.*	Yellow Puccoon	stomach pain, vomiting	roots
Campanulaceae	*Lobelia sp.*	Lobelia	pneumonia	leaves, flowers
Cornaceae	*Cornus sp.*	Dogwood	fever, diarrhea, malaise	bark, berries
Cupressaceae	*Juniperus virginiana L.*	Juniper	dropsy, bronchitis, heartburn	berries
Fagaceae	*Castanea pumila Mill.*	Chinquapin	constipation	nuts
Geraniaceae	*Geranium sp.*	Crane's Bill	sore throat	stems, leaves
Hamamelidaceae	*Hamamelis virginiana L.*	Witch Hazel	wounds, infections, diarrhea	bark
Hamamelidaceae	*Liquidambar styracifula L.*	Sweet Gum	expectorant, skin rashes	balsam
Juglandaceae	*Juglans nigra L.*	Black Walnut	ringworn, diarrhea	bark, fruit rind
Juglandaceae	*Carya texana Nutt.*	Hickory	asthma	bark
Lamiaceae	*Prunella vulgaris L.*	Heal-All	ulcers, blood purifier, thrush	leaves
Lamiaceae	*Monarda spp.*	Mint, Horsemint	insomnia, nausea, coughing	leaves
Lauraceae	*Sassafras albidum Nees*	Sassafras	fever, pain, blood purifier	roots, bark
Liliaceae	*Allium stellatum L.*	Wild Onion	high blood pressure, heartburn	bulb
Magnoliaceae	*Magnolia tripetala L.*	Magnolia	colds	bark
Moraceae	*Morus rubra L.*	Mulberry	laxative	bark
Myricaceae	*Myrica cerifera L.*	Wax Myrtle	wounds, dysentary	bark, leaves
Oleaceae	*Fraxinus quadrangulata L.*	Blue Ash	laxative	fruit
Passifloraceae	*Passiflora incarnata L.*	Passion Flower	tension	fruit, seeds
Phytolaccaceae	*Phytolacca americana L.*	Pokeweed	pain, arthritis	leaves, roots
Ranunculaceae	*Hydrastis canadensis L.*	Golden Seal	infections, stomach pain, purifier	roots
Rhamnaceae	*Rhamnus caroliniana L.*	Buckthorn	laxative	bark
Rosaceae	*Prunus serotina L.*	Black Cherry	colds, coughing, kidney pain	bark
Rosaceae	*Rubus spp.*	Blackberry	colds, coughing, diarrhea	roots
Rutaceae	*Zanthoxylum americanum L.*	Toothache Tree	tooth pain, rheumatism	bark
Salicaceae	*Populus alba L.*	Poplar	wounds	buds
Salicaceae	*Salix sp.*	Willow	fever, arthritis	bark
Tiliaceae	*Tilia americana L.*	Basswood	colds	flowers
Ulmaceae	*Ulmus rubra L.*	Slippery Elm	sore throat, dysentary	bark