# SOME ASPECTS OF THE ALIEN COMPONENT OF THE SPONTANEOUS ILLINOIS VASCULAR FLORA

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## ABSTRACT

Comparative studies of twelve Illinois vascular plant floras published between 1846 and 1978 indicate that there has been an increasing number of alien species in the spontaneous vascular flora and that they now constitute about 29% of the flora. Of these alien species, 77% have Old World origins, 54% are escaped cultivated species, 81% are considered weeds somewhere in the United States, and 13% are woody species. Most of the Illinois aliens occur primarily in disturbed areas with far fewer in undisturbed areas. In comparison with other states and regions in the United States, Illinois has a rather high percent of alien species in the spontaneous flora.

## INTRODUCTION

Many aspects of the Illinois vascular plant flora have been examined, resulting in a rather complete and current knowledge of most of these aspects. The floristic and systematic aspects have been documented by Mohlenbrock (1975), Mohlenbrock and Ladd (1978), Mohlenbrock (1967, 1970a, 1970b, 1972, 1973, 1976, 1978, 1980), Myers (1972), Jones and Fuller (1955), and Winterringer and Evers (1960); the vegetational aspect by Jones (1963), Jones and Fuller (1955), Anderson (1970), and Schwegman (1973); the preservation and protection aspect by White and Corbin (1978), Illinois Department of Conservation (1979) and in addition, a list of endangered and threatened vascular plant species has been submitted to the Illinois Endangered Species Protection Board for official approval; and the recreational aspect by the Illinois Department of Conservation (1978).

With all of this knowledge of the Illinois vascular flora, analysis of the alien component has generally been neglected. With the exception of Myers (1972), the last account of the alien flora of Illinois was published nearly 60 years ago by Darlington (1922), who listed and discussed the herbaceous introduced flora from 1826 to 1921. Darlington did not include tree and shrub introductions as he did not consider them to be weeds. His paper was written from the standpoint of introduced plants being actual or potential weeds in Illinois. The study which follows represents an attempt to summarize and update certain aspects of the alien component of the spontaneous Illinois vascular flora.

## METHODS

The present spontaneous vascular plant flora of Illinois was taken to be those plants listed in Mohlenbrock and Ladd (1978). Assignment of species to alien status was based on information in Fernald (1950), Gleason (1953), Jones (1945, 1950, 1963), Jones and Fuller (1955), Mohlenbrock (1975), Myers (1972), and Shetler and Skog (1978). Twelve Floras have listed the vascular plants of Illinois, the first being in 1846 and the most recent in 1978 (Table 1). For each of the twelve floras the percentage of spontaneously-occurring alien plant species was determined using information provided in the floras as well as the species determined to be alien as stated above. All nomenclature was standardized to Mohlenbrock and Ladd (1978). Hybrids and infraspecific taxa were not used except when a subspecific taxon was the only one for a species in the flora.

The geographical origin of the aliens was determined by consulting Fernald (1950), Jones (1963), Mohlenbrock (1975), Myers (1972), and Bailey (1949). Aliens were evaluated as to their weed status in the United States from Darrow (1966) and in Illinois from Slife, Buchholtz and Kommedahl (1960) and Illinois Department of Agriculture (1978). Bailey (1949), Mohlenbrock (1975) and Myers (1972) were examined to determine which aliens have been cultivated.

## RESULTS AND DISCUSSION

*Percent of Aliens in the Flora.* The percent of alien species in the spontaneous Illinois flora has risen from 10.2% in 1846 to 28.7% in 1978 (Table 1) confirming the steady increase of alien flora constituents over the past 132 years.

The unexpectedly high proportion of alien species in 1846 may be due to Dr. Mead's interpretation of the status of plants having "been introduced and occasionally seen growing spontaneously about gardens and cabins" being too liberal.

The increase in the number of alien species from the time of settlement to the present undoubtedly reflects the parallel increase in man's activities in the state, including agriculture, urbanization, industrialization, recreation and transportation. There has been a general increase of alien species introduced per year into the flora up to the present: 2.18 between 1846 and 1878, 2.63 between 1879 and 1945, and 14.4 between 1946 and 1978. According to Darlington (1922) between 1826 and 1921 the largest herbaceous alien increase per year was 3.3 between 1872 and 1897 which he explained was due to a "rapid settling of farm lands." The high rate of introduction per year of woody and herbaceous aliens since World War II (which is more than four times that between 1872 and 1897) probably is due to the increase of disturbed land accompanying the very intense agricultural-urban-industrial development associated with the increase in population. Apparently the first collector of plants in Illinois was the French botanist Michaux (Mohlenbrock, 1975) who collected 89 plants of which three (3.4%) were aliens: *Polygonum aviculare, Polygonum hydropiper* and *Cardiospermum halicacabum.* Darlington (1922) omitted the latter two species from his list.

Alien plants form a higher percent of the present floristic additions in relation to native plant species which formed more of the additions to past floras. Between 1964 and 1978, 59% of all new species in the flora were aliens, whereas from 1975 to 1978 aliens were 75.3% of the additions. The additional taxa discovered too late to be incorporated into the text of Mohlenbrock (1975) and Mohlenbrock and Ladd (1978) were 70.8% and 86.6% alien plants respectively.

*Origins of Aliens.* The majority (77%) of the aliens in the present flora originated in the Old World. Nineteen percent originated from the continental United States outside of Illinois (14% from west of the Mississippi River) with the remaining Illinois aliens originating in the New World Tropics. For Illinois aliens originating elsewhere in the United States, the breakdown of origins by U.S. geographic area is as follows: N, 0%; NE, 2%; E, 7%; SE, 10%; S, 9%; SW, 13%; W, 62%; and NW, 1%. Clearly, most plants that are not native to Illinois but have origins in the United States come from the West and Southwestern parts of the country.

It is interesting to note that the sources of aliens in the flora are nearly identical to those reported by Darlington in 1922, who found 78% of aliens having an Old World Origin, 14% from the United States west of the Mississippi, and 6% from the New World Tropics.

*Aliens Introduced Through Cultivaion.* A major source of aliens in the present flora is the introduction of plants for cultivation. Many of these plants escape from cultivation and occur spontaneously. Fifty-four percent of the alien species determined to be occurring spontaneously in Illinois are, or have at some time, been cultivated.

There is a trend for deliberately introduced cultivated aliens to escape and form a higher amount of the present alien flora in relation to the accidentally introduced weedy type aliens which comprised more of the earlier aliens introduced into the flora. The additional alien taxa discovered too late to be incorporated into the text of Mohlenbrock (1975) and Mohlenbrock and Ladd (1978) were 58.8% and 61.5% escaped cultivated plants respectively. Myers (1972) states that of all 150 species reported between 1963 and 1972, over half were alien cultivated plants. From 1964 to 1978, 40.9% of the added alien herbaceous plants and 100% of the added alien woody plants

## TABLE 1

Percent of Alien Species in the Illinois
Spontaneous Vascular Plant Flora from 1846 to 1978

| Flora Author | Year of Publication | % Alien Species |
|---|---|---|
| Mead | 1846 | 10.2 |
| Lapham | 1857 | 6.6 |
| Patterson | 1876 | 7.5 |
| Flagg & Burrill | 1878 | 10.5 |
| Jones | 1945 | 15.9 |
| Jones | 1950 | 15.9 |
| Jones & Fuller | 1955 | 25.0 |
| Winterringer & Evers | 1960 | 26.0 |
| Jones | 1963 | 24.7 |
| Myers | 1972 | 25.4 |
| Mohlenbrock | 1975 | 27.9 |
| Mohlenbrock & Ladd | 1978 | 28.7 |

## TABLE 2

Percent of Alien Species in Other States
or Regions of the United States

| State or Region | Source | Year | % Alien Species in the Flora |
|---|---|---|---|
| Northeastern U.S. | Gleason, 1963 | 1890 | 12.7 |
| Northeastern U.S. | Robinson & Fernald, 1908 | 1908 | 16.3 |
| Northeastern U.S. | Fernald, 1950 | 1950 | 19.8 |
| New England | Seymour, 1969 | 1969 | 30.5 |
| Arizona | Kearney & Peebles, 1964 | 1964 | 7 |
| Indiana | Myers, 1972 | 1940 | 15 |
| Missouri | Steyermark, 1963 | 1963 | 23 |
| Vermont | Dole, 1937 | 1937 | 24 |
| S.E. Washington and Adjacent Idaho | St. John, 1963 | 1963 | 14 |

were escaped cultivated plants. Of all the woody aliens in the flora today, 99% are escaped cultivated species. By 1972, 58% of the 351 naturalized aliens had been cultivated as ornamentals or introduced for economic purposes (Myers, 1972).

*Weed Component of Alien Flora.* The alien flora of Illinois was examined to determine how many alien species were considered weedy. Based on Darrow (1966), it was ascertained that 81% of the alien plants in this state are weeds at least somewhere in the United States. Twenty percent of plant species alien to Illinois are weeds in Illinois based on Slife, Buchholz, and Kommedahl (1960). These figures are in contrast to the native Illinois flora, 25% of which are weeds somewhere in the U.S. and 4.5% of which are considered to be weeds in Illinois. Of the legislated Illinois noxious weeds (Illinois Department of Agriculture, 1978), six of the eight plants listed are aliens. Myers (1972) reported that over 200 (8.7%) of the 2281 established plants (native and naturalized aliens in the Illinois flora were weeds.

*Habitats of Aliens.* The 758 alien species reported for the state as of 1975 were categorized as to their typical habitat according to Mohlenbrock (1975). As might be anticipated, most (54%) of the aliens occurred in disturbed and waste ground habitats. Another 3% had a wet habitat and 2% were found in woods or prairie. Forty-one percent of the aliens listed did not have information concerning habitat; however, it seems reasonable to assume that many of these would also occur in disturbed environments.

Much of the land area in Illinois has suffered at least some disturbance as evidenced by figures from the Illinois Cooperative Extension Service (1975) which reports 72% of the land area in Illinois is used for agricultural crops, 19% is in woods, pasture and grasslands plus aquatic areas, wetlands and other land having low value for agricultural purposes, and the remaining 9% of land area is urbanized. Today relatively undisturbed areas include less than 0.1% of the total land and water areas of Illinois (White and Corbin, 1978).

Certain Illinois counties were selected to determine if it is possible to correlate the amount of disturbance in a county with the percent of alien species in the flora of that county. For each county selected, the percent of alien species was determined from the total number of plants reported for that county, using Mohlenbrock and Ladd (1978). Cook County, a highly urbanized and populous county which includes Chicago, has a flora composed of 38% alien species, reflecting the extensive land disturbance. Likewise, Livingston County, with almost total land disturbance due to intensive agriculture, has an alien species component of 28%. By contrast, two of Illinois' least ecologically disturbed counties, Pope and Hardin, had alien species totals of 16% and 15% respectively.

*Woody Aliens.* Woody species, primarily trees and shrubs, comprise 13% of the present alien flora. Woody vines represent only about one-tenth of all woody alien species.

Darlington (1922) states that he excluded shrub and tree introductions (such as *Populus alba, Salix alba,* etc.) "since they are hardly to be counted as weeds." Nevertheless, he did include two woody shrub aliens (*Rosa rubiginusa*[5][R. eglanterial] and *Lycium holimifolium*) in his list. That woody plants can be weeds is substantiated by the fact that 35.3% of the woody alien species in the Illinois vascular flora are on the list of plants (Darrow, 1966) considered weeds in the United States. Today, a number of alien woody plants can be considered weeds in Illinois, e.g. *Rosa multiflora, Lonicera japonica, Ailanthus altissima, Maclura pomifera, Morus alba,* and *Populus alba.* Considering the time, effort and money spent to eradicate "brush", many woody plants both native and alien can certainly be categorized as weeds.

*Percent of Aliens in Other States.* Current information about the number of aliens in other states is not always available, but a search of some state and regional floras yielded some data with which to compare Illinois' alien flora (Table 2). Illinois, with nearly 29% alien species in its flora, appears to have a relatively high alien composition. More recent information for other states particularly in the East will probably find higher numbers of alien species. There seems to be a trend toward fewer alien species as one travels westward in the United States.

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