

Floristic Change in the Ross Biological Reserve, 1950-1971

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Abstract

The flora of the Ross Biological Reserve of Purdue University's Department of Biological Sciences was first surveyed by Chester W. Miller in 1950. At that time 339 taxonomic entities in 84 families were recorded including species, varieties, and forms. In 1960, Ronald deLanglade found 327 named entities in 82 families. The present (1971) survey revealed a total of 318 entities in 77 families. This trend toward decreased plant species diversity appears to parallel the general rate of successional advancement, particularly in the old-field areas. Considering the entire 21 year span of these surveys, 111 taxonomic entities have been lost since 1950 and 90 new entities were found for a net loss of 21. In the eleven years from 1960 to 1971, 53 new species and varieties were recorded. Twenty-eight of these new entities can be considered late successional in the Reserve, 12 are early successional and 11 are mid-successional or have wide ecological amplitudes and so do not fall conveniently in either of the first two categories. Further evidence of a shift from early to late successional species can be seen in the successional position of those plants present in 1960 but not found in 1971. There were 86 species and varieties on this list, 40 of them early successional, 27 late successional and 19 mid-successional. The evidence points to a loss of plants common to such disturbed habitats as fallow fields and roadsides and an influx of herbs characteristic of the forest floor.

Introduction

A brief description and history of the Ross Biological Reserve, a 55-acre research tract in Tippecanoe County, Indiana, appears in the 1972 paper by Von Culin and Lindsey (11) comparing 3 detailed vegetational surveys at 10-year intervals. The first floristic survey was made by Miller (7), reporting work done in 1950-1951. Ten years later another detailed report on the vascular flora was prepared by deLanglade (6).

Bush (1) reported 13 types of vegetation there following considerable disturbance, but a tendency toward convergence in the subsequent two decades has reduced this number (Von Culin and Lindsey (11)) and increased habitat uniformity for herbaceous species, particularly.

Other work in the Ross Reserve, related more to the flora than the vegetation, was by Bush and Lindsey (2), Carpenter (3), Plummer (8), Rock (9), and Williams (10).

Methods

The field work and collecting was done by Von Culin during the growing seasons of 1971 and 1972. When necessary for positive identification, specimens were taken for the Kriebel Herbarium of Purdue University. To minimize disturbance in the natural area, a complete collection was not made.

Observations were made and specimens collected at approximately weekly intervals with more frequent visits in the periods of most active flowering in spring and fall. Gleason (5), Deam's *Flora of Indiana* (4) and the Kriebel Herbarium at Purdue University were

used for specimen identification. Nomenclature used in this survey follows Deam (4). Although this reference is now dated, it was considered desirable to maintain consistency with the previous surveys of Bush (4) and deLanglade (5). Von Culin (12) gives in Appendix B a complete floristic list for the Ross Reserve, incorporating the surveys reported in 1951, 1961, and the present one. Von Culin (12) in Appendix B gives a complete floral list for the Reserve in alphabetical order by families.

Results

About 1950, Miller (7) found 319 species, 16 varieties, and 4 forms for a total of 339 named entities in 84 families. This figure decreased in 1960 to 327 named entities in 82 families (deLanglade 1961, Appendix B). The 1971-72 survey revealed a total of 318 entities in 77 families. The continuing loss of taxonomic entities from decade to decade could be partly the result of difference in the methods and habits of the collectors. However, assuming that the intensity of effort was fairly equal in each survey, it may be concluded that there is a general trend in the Reserve toward a loss of plant species diversity. This trend was, of course, predictable and appears to parallel the general rate of successional advancement, particularly in the old-field areas.

During the first decade of study, the rapid change in the vegetation of the old-field resulted in the loss of many weedy annuals and other early successional forms. Since the loss of this recently disturbed habitat reduces the overall habitat diversity of the Reserve, species diversity would be expected to decline as well. The loss of species was smaller during the period from 1960 to 1971-72. This change probably reflects the deceleration in successional change in these same old-field areas as the well-established herbaceous perennials slowly yield to invading woody species from the surrounding forest.

There were actually many more entities lost during the decade intervals but these were balanced by new additions to the list. In 1960, eighty-six new species were found and in 1971-72 fifty-three were added. In addition to these 53, twenty-nine species were relocated which had first been listed in 1950 but apparently missed in 1960. Considering the entire 21-year span of these surveys, 111 taxonomic entities have been lost since 1950 and 90 new entities found for a net loss of 21.

Table 1 lists the species new to the Reserve in 1971-72 and classifies them in one of the three following categories: early successional species, mid-successional or wide-ranging species, and late successional species. This classification is based largely on the habitat descriptions in Deam (1940) and Gleason (1952) and is intended only to serve as an aid in characterizing overall trends in the flora and relating them to successional developments in the vegetation. The terms "early" and "late" refer only to the species position in relation to an assumed forest climax condition in most of the Reserve. Thus, many plants which would be considered late successional in a prairie situation are regarded here as belonging to the earlier successional stages. This method was also applied to species lost to the Reserve flora during the same period. These results are given in Table 2.

TABLE 1. *Plants new to the Reserve in 1971-72, showing approximate successional position of each species.*

Species	Successional Position		
	Early	Middle	Late
<i>Agrimonia pubescens</i>			X
<i>Andropogon furcatus</i>	X		
<i>Apocynum cannabinum</i> <i>var. glaberrimum</i>	X		
<i>Arabis dentata</i>			X
<i>Aster lateriflorus</i>			X
<i>Carex bromoides</i>			X
<i>Carex communis</i>			X
<i>Carex convoluta</i>			X
<i>Carex Davisii</i>			X
<i>Carex laevivaginata</i>		X	
<i>Carex normalis</i>			X
<i>Carex rosea</i>			X
<i>Carex siccata</i>		X	
<i>Chaerophyllum procumbens</i>			X
<i>Corallorhiza odororhiza</i>			X
<i>Cyperus filiculmis</i> <i>var. macilentus</i>	X		
<i>Desmodium canescens</i>	X		
<i>Desmodium Dillenii</i>			X
<i>Desmodium marilandicum</i>		X	
<i>Desmodium paniculatum</i>			X
<i>Elymus virginicus</i>		X	
<i>Erythronium albidum</i>			X
<i>Fragaria pennsylvanica</i>			X
<i>Galium Aparine</i>			X
<i>Houstonia longifolia</i>		X	
<i>Hydrophyllum appendiculatum</i>			X
<i>Hypoxis hirsuta</i>		X	
<i>Lepidium virginicum</i> <i>var. typicum</i>		X	
<i>Medeola virginiana</i>			X
<i>Oenothera lacinata</i>	X		
<i>Osmorhiza Claytoni</i>			X
<i>Oxypolis rigidior</i>	X		
<i>Pastinaca sativa</i>	X		
<i>Phlox paniculata</i>			X
<i>Physalis heterophylla</i>		X	
<i>Polygonum Persicaria</i>		X	
<i>Prunus americana</i>		X	
<i>Prunus nigra</i>			X
<i>Ranunculus hispidus</i>		X	
<i>Ranunculus recurvatus</i>			X
<i>Sanicula marilandica</i>			X
<i>Senecio obovatus</i>		X	
<i>Silene noctiflora</i>	X		
<i>Sisymbrium Thalianum</i>	X		
<i>Sorghastrum nutans</i>	X		
<i>Sphenopholis intermedia</i>			X
<i>Stachys tenuifolia</i>			X
<i>Thaspium trifoliatum</i>			X
<i>Uvularia grandiflora</i>			X
<i>Veronica arvensis</i>	X		

TABLE 2. Plants found in the Reserve 1960 but not in 1971-72 showing approximate successional position of each species.

Species	Successional Position		
	Early	Middle	Late
<i>Acalypha rhomboidea</i>		X	
<i>Agrimonia parviflora</i>	X		
<i>Amaranthus blitoides</i>	X		
<i>Aplectrum hyemale</i>			X
<i>Apocynum sibiricum</i>	X		
<i>Arabis viridis</i>	X		
<i>Aralia racemosa</i>			X
<i>Arisaema Dracontium</i>			X
<i>Asclepias phytolaccoides</i>			X
<i>Aster novae-angliae</i>	X		
<i>Aster prealtus</i>	X		
<i>Aster puniceus</i>	X		
<i>Bidens bipinnata</i>	X		
<i>Bidens frondosa</i>	X		
<i>Bromus tectorum</i>	X		
<i>Botrychium dissectum</i>			X
<i>Cacalia atriplicifolia</i>	X		
<i>Cacalia suaveolens</i>	X		
<i>Carex picta</i>			X
<i>Cassia marilandica</i>		X	
<i>Chelone glabra</i>			X
<i>Cirsium arvense</i>	X		
<i>Clematis Viorna</i>			X
<i>Conyza canadensis</i>	X		
<i>Cuscuta compacta</i>			X
<i>Cypripedium parviflorum</i>			X
<i>var. pubescens</i>			X
<i>Danthonia spicata</i>			X
<i>Desmodium bracteosum</i>			X
<i>var. longifolium</i>			X
<i>Desmodium rotundifolium</i>			X
<i>Dioscorea hirticaulis</i>			X
<i>Dioscorea villosa</i>			X
<i>Dirca palustris</i>			X
<i>Draba incana</i>	X		
<i>Draba reptans</i>	X		
<i>Dryopteris hexagonoptera</i>			X
<i>Galium boreale</i>			
<i>var. intermedium</i>		X	
<i>Galium parisiense</i>	X		
<i>Gaura biennis</i>	X		
<i>Glechoma hederacea</i>	X		
<i>Habenaria lacera</i>		X	
<i>Helianthus divaricatus</i>	X		
<i>Hybanthus concolor</i>			X
<i>Hypericum perforatum</i>	X		
<i>Impatiens pallida</i>			X
<i>Iris brevicaulis</i>		X	
<i>Iris virginica</i>			
<i>var. shrevii</i>		X	
<i>Juglans cinerea</i>			X
<i>Krigia biflora</i>		X	
<i>Lemna minor</i>		X	
<i>Lespedeza intermedia</i>			X
<i>Linum virginianum</i>		X	

TABLE 2. (cont.)

Species	Successional Position		
	Early	Middle	Late
<i>Lobelia spicata</i>			
<i>var. leptostachys</i>	X		
<i>Lycopus americanus</i>		X	
<i>Lysimachia lanceolata</i>			X
<i>Malus angustifolia</i>		X	
<i>Medicago sativa</i>	X		
<i>Melica mutica</i>			X
<i>Onosmodium molle</i>	X		
<i>Orobanche uniflora</i>			X
<i>Oxalis stricta</i>	X		
<i>Oxalis violacea</i>	X		
<i>Panax quinquefolium</i>			X
<i>Plantago aristata</i>	X		
<i>Plantago major</i>	X		
<i>Plantago virginica</i>	X		
<i>Potentilla monspeliensis</i>	X		
<i>Prunus avium</i>		X	
<i>Pseudotaenidia montana</i>	X		
<i>Pteridium latiusculum</i>	X		
<i>Quercus macrocarpa</i>		X	
<i>Ruellia strepens</i>			X
<i>Sagittaria latifolia</i>	X		
<i>Salix discolor</i>		X	
<i>Sambucus canadensis</i>	X		
<i>Silphium perfoliatum</i>	X		
<i>Sisyrinchium graminoides</i>		X	
<i>Solanum carolinense</i>	X		
<i>Solidago hispida</i>	X		
<i>Solidago media</i>	X		
<i>Specularia perfoliata</i>	X		
<i>Syringa vulgaris</i>		X	
<i>Uvularia pudica</i>			X
<i>Verbena urticaefolia</i>		X	
<i>Veronica verna</i>	X		
<i>Vitis cinerea</i>		X	
<i>Vitis labrusca</i>		X	
<i>Xyris torta</i>	X		

Table 1 shows 28 new species which can be considered late successional in the Reserve. This list compares with 12 early successional species and 11 which do not fall conveniently in either of these two categories. Many of those new species listed as late successional are herbs of the forest floor such as *Hydrophyllum appendiculatum*, *Erythronium albidum*, *Osmorhiza Claytoni*, and *Corallorhiza odontorhiza*. Others on that list were obviously present in 1960 because of large size, as *Fraxinus lanceolata*, or widespread distribution, as in the case of *Galium Aparine*, and were simply missed or named differently.

The shift from early to late successional species in the flora can also be viewed from the negative side. Table 2 lists 86 species which were present in 1960 but not found in 1971-72. In this case there are 40 early successional species, 27 characteristic of more advanced successional stages, and 19 intermediate species which are mid-successional

or have wide ecological amplitudes. There is evidence here for a trend toward the loss of plants common to such disturbed habitats as fallow fields and roadsides, and of several prairie species. Several of these plants might have been overlooked in 1971-72, but this probability should be nearly constant for each of the three categories.

Conclusions

The total number of taxonomic entities found in the Ross Reserve decreased gradually from 1950 through 1972. In 1950, 339 were recorded, decreasing to 327 in 1960 and then to 318 in 1971-1972. This trend parallels the general rate of successional advancement, particularly in the old-field areas.

Fifty-three new species and varieties were found and 86 were lost from 1960 to 1971-1972. The majority of new species can be classed as late successional in relation to the highest vegetational development occurring in the Reserve. Conversely, the largest group of those lost since 1960 were plants characteristic of early successional stages there.

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